

BHARATI VIDYAPEETH UNIVERSITY, PUNE
BACHELOR OF HOMOEOPATHIC MEDICINE AND SURGERY
B.H.M.S.

DEGREE COURSE CURRICULUM AND SYLLABUS

A) NOTIFICATION:

The rules and regulations adopted by Bharati Vidyapeeth University are in complete conformity to/ with homoeopathy (Degree course) regulations. In exercise of the powers conferred by clauses (i), 9j) and (k) of section 33 and sub-section (1) of section 20 of the Homoeopathy Central Council Act, 1973 (59 of 1973), the central Council of Homoeopathy, with the previous sanction of the Central Government, hereby makes the following regulations, namely.

Preliminary

Commencement (1) This Regulation may be called (Degree Course) Reg. 1983

(2) Come into force on the date of their publication (14th July 2015)

N.B.- shall apply to students admitted to I yr. BHMS (Degree Course) from Ac.

Session (2015-16)

B) PART-I

1. **AIMS & OBJECTIVES:** The main objectives of B.H.M.S. degree course as per Central Council of Homoeopathy are, "To standardize education of homoeopathic medicine and to turn out able and efficient practitioners, Teachers and Research workers in the field, " and endeavor has therefore been made in curriculum to ensure imparting of requisite training to students under going this course so as to fulfill the above objective.
2. **ELIGIBILITY FOR ADMISSION / QUALIFICATION & AGE:**
 - a) 10+2 Equivalent after period of 12yr. study and last 2 years with Physics, Chemistry, Biology with mathematics any other with English
 - b) 10+2 (PCB including practical test) English
 - c) Pre-Profession premedical with PCB after passing pre university or Equivalent with PCB & English
 - d) First year of the three years degree course 10+2 (PCB including practical test English)
 - e) Any other Examination which in scope & Standard of found to be equivalent to the intermediate science exam

Minimum Age for Admission:

17 years as on 31st December in the year of admission for the B.H.M.S. Course.

3. DURATION OF THE COURSE:

5 1/2 years including compulsory internship of one year as under :

- | | | | |
|----|---------------------|---|----------|
| a) | First B.H.M.S. | - | 1 year. |
| b) | Second B.H.M.S. | - | 1 year. |
| c) | Third B.H.M.S. | - | 1 year |
| d) | Final B.H.M.S. | - | 1&½ year |
| e) | Internship B.H.M.S. | - | 1 year |

4. **DEGREE TO BE AWARDED AFTER SUCCESSFUL COMPLETION OF COURSE:**
"Bachelor of Homoeopathic Medicine and Surgery (B.H.M.S.)"
5. **MEDIUM OF INSTRUCTION:**
English
6. **COURSE OF STUDY**
 - i) The degree courses of B.H.M.S. (Degree) shall comprise a course of study consisting of curriculum and syllabus. Provided in these regulations, spread over a period of 5 1/2 years including compulsory internship of 1 year duration after passing the final degree examination.
 - ii) The internship should be undertaken at the hospital attached to the college and in cases where such hospital cannot accommodate all of its students for internship such students may undertake their internship in a hospital a dispensary run by the Central Govt. and State Govt. or Local bodies.
 - iii) At the completions of internship of the specified period and on the recommendation of the head of the institution where internship was undertaken the Bharati Vidyapeeth University shall issue the degree to the successful candidates.

Criteria for selection of student

The Selection of students to the college shall be based solely on merit of candidate in the competitive examination conducted by University (Board any agency notified by state/Central Government)

- (a) State having one college one university conducting competitive examination
- (b) State having more than one university an more than in college competitive examination
- (c) There are more than one college in a state and only one university/board then joint selection board of principals of the colleges, constituted by the state Govt. and representative of faculty
- (d) Central Govt. notified competitive Exam.
Competitive examination conducted by university/Board or state/central Govt.

The Curriculum.

Subjects of Study and examination for v c B.H.M.S. (Degree) Course shall be as under namely:-

Sr. No.	Course	Subject of Teaching	Subject of Examination
1	I Year	1)Anatomy, 2)Physiology, 3)Homeopathic Pharmacy, 4)Homeopathic Materia Medica 5)Organon of Medicine	1)Anatomy, 2)Physiology, 3) Homeopathic Pharmacy
2	II Year	1)Pathology, 2) Forensic Medicine, 3) Homeopathic Materia Medica, 4)Organon of Medicine, 5)Surgery, 6) Obstetrics & Gynecology	1)Pathology, 2) Forensic Medicine, 3) Homeopathic Materia Medica, 4)Organon of Medicine,
3	III Year	1)Surgery, 2) Obstetrics & Gynecology 3)Homoeopathic. Materia Medica, 4)Practice of Medicine, 5)Organon of Medicine, 6)Community Medicine, 7)Repertory	1)Surgery, 2) Obstetrics & Gynecology 3)Homoeopathic Materia Medica 4)Organon of Medicine, ,
4	IV Year	1)Practice of Medicine, 2) Homoeopathic Materia Medica, 3)Organon of Medicine, 4)Community Medicine, 5)Repertory	1)Practice of Medicine, 2) Homoeopathic Materia Medica, 3)Organon of Medicine, 4)Community Medicine, 5)Repertory

1. SCHEME OF EXAMINATION :

- (i) There shall be a regular examination and a supplementary examination in a year and the supplementary examination shall be conducted within two months of declaration of results (including issue of mark sheets)
- (ii) The student shall be admitted to the First, Second, Third & Fourth B.H.M.S' examination provided he has required 75% attendance at the minimum in each of the subjects (in theory and practical including clinical) for appearing in the University examinations shall be compulsory. “The candidate shall pass First B.H.M.S, examination in all the subjects at least one term (six months) before he is allowed to appear in the Second B.H.M.S examination provided that he has passed in the subjects of anatomy and physiology (including Biochemistry) examinations two terms (twelve months) before he is allowed to appear in the Second B.H.M.S examination.” No candidate shall be admitted to the Second BHMS Examination unless he has passed the First BHMS examination.
The candidate must pass the Second BHMS examination at least one term (6 months) before he is allowed to appear in the Third BHMS examination. No candidate shall be admitted to the Third BHMS examination unless he has passed the Second BHMS examination.
The candidate must pass the Third BHMS examination at least one term (6 months) before he is allowed to appear in the Fourth BHMS examination.No candidate shall be admitted to the Fourth BHMS examination unless he has passed the third BHMS examination.
- (iii) The First BHMS examination shall be held in the 12th month of admission.
The Second BHMS examination shall be held in the 24th month of admission to First BHMS.
The Third BHMS examination shall be held in the 36thmonth of admission to First BHMS.The
Fourth BHMS examination shall be held in the 54th month of admission of First BHMS.
- iv) No candidate shall be admitted to third and fourth examination unless he has passed second and third BHMS examination respectively at least 1 term/6months before.

NUMBER OF PAPERS AND MARKS FOR EACH SUBJECT

(iv) Full marks for each subject and minimum marks required for pass are as follows, namely:-

FIRST BHMS EXAMINATIONS

Subject	Written		Practical(including oral)		Total	
	Full marks	Pass marks	Full marks	Pass marks	Full marks	Pass marks
Homoeopathic Pharmacy	100	50	100	50	200	100
Anatomy	200	100	200	100	400	200
Physiology	200	100	200	100	400	200

SECOND BHMS EXAMINATION

Subject	Written		Practical or Clinical including oral		Total	
	Full marks	Pass marks	Full marks	Pass marks	Full marks	Pass marks
Pathology	200	100	100	50	300	150
Forensic Medicine & toxicology	100	50	100	50	200	100
Homoeopathic Materia Medica	100	50	100	50	200	100
Organon of Medicine	100	50	100	50	200	100

THIRD BHMS EXAMINATION

Subject	Written		Practical or clinical including oral		Total	
	Full marks	pass marks	Full marks	Pass marks	Full marks	Pass marks
Surgery	200	100	200	100	400	200
Gynaecology and Obstetrics	200	100	200	100	400	200
Homoeopathic Materia Medica	100	50	100	50	200	100
Organon of Medicine	100	50	100	50	200	100

FOURTH BHMS EXAMINATION

Subject	Written		Practical or clinical including oral		Total	
	Full marks	Pass marks	Full marks	Pass marks	Full marks	Pass marks
Practice of medicine	200	100	200	100	400	200
Homoeopathic Materia Medica	200	100	200	100	400	200
Organon of medicine with homoeopathic philosophy	200	100	100	50	300	150
Repertory	100	50	100	50	200	100
Community medicine	100	50	100	50	200	100

Total:- 1000 + 900 + 1200 + 1500 = 4600 Marks

2. **PASS MARKS:**
Pass marks in all subjects both homoeopathic and allied Medical subjects shall be 50% in each part (written, oral and practical).
3. **RULES OF EXAMINATION:**
The examination will be conducted as per prescribed norms and regulations of Central Council of Homoeopathy, New Delhi and Bharati Vidyapeeth University.

Three hrs. shall allowed for each theoretical paper in each subject.

A candidate who appears at First BHMS examination, Second BHMS examination, Third BHMS examination or Fourth BHMS examination but fails to pass in the subject or subjects shall be re-admitted to the next examination in the subject or subjects (theory and practical including oral where in he has filed).

If a candidate fails to pass in all the subjects with in four chances in examination, he shall be required to prosecute a further course of studying all the subjects and in all parts for one year to the satisfaction of the head of the college and appearing for examination in all th4 subjects.

Provided that if a student appearing for the Fourth BHMS examination has only one subject to pas at the end of prescribed chances, he shall be allowed to appear at the next examination in that particular subject and shall complete the examination with this special chance.

Candidates who have passed in one or more subjects need not appear in the subject or those subjects again in the subsequent examinations if the candidate passes the whole examination with in four chances including the original examination.

There shall be regular examination and a supplementary examination for First BHMS (only for Pharmacy subject) in a year and the supplementary examination shall be conducted within two months after declaration of results (including issue of mark sheets)

For non-appearance in an examination for any reason, a candidate shall not have any liberty for availing additional chance to appear in that examination.

Grace Marks:

Grace marks at the maximum up to ten marks in total shall be awarded if a student fails in one or more subjects (including any head of passing) and if a student is passing examination as a whole by award of grace marks.

Rules of ATKT:

If a candidate appearing at First BHMS will be issued marksheet with the result Pass, fail or Fail ATKT as the case may be

- 1) If a candidate fails in the subject 'Pharmacy' only, then the result will be given as Fail ATKT and he will be allowed to appear in supplementary examination, which will be held within two months after declaration of result.
- 2) If a candidate fails in subject 'Pharmacy' along with 'Anatomy' or 'Physiology' or both the subjects the result will be given as fail. In this case he will not be allowed to appear at the supplementary examination in the subject 'Pharmacy'
- 3) If a candidate passes in 'Pharmacy' subject and fails in "Anatomy" / 'Physiology' or both the subjects the result will be given as Fail.
- 4) Result for Second & Third BHMS examinations will be given either in Fail ATKT or Pass.

The candidate must pass the First BHMS examination in all the subjects at least one term (6 months) before he is allowed to appear in the Second BHMS examination provided that he has passed in the subjects of Anatomy and Physiology (including Biochemistry) examination two terms (12 month) before he is allowed to appear in the Second BHMS examination.

- a) No candidate shall be admitted to the Second-BHMS examination unless he has passed the First BHMS examination.
- b) No candidate shall be admitted to the Third-BHMS examination unless he has passed the Second BHMS examination.

c) No candidate shall be admitted the Fourth-BHMS examination unless he has passed the Third BHMS examination.

The candidate must pass the Second BHMS examination at least one term (6 months) before he is allowed to appear in the Third BHMS examination.

Supplementary examination will be conducted after two months of declaration of results only in the subject of Pharmacy at First BHMS. If a student fails in the subjects Anatomy or Physiology or both, he is not allowed to appear in supplementary examination in any of the subject. He can appear in next university subsequent examination only.

Duration of Course : 4 & ½ Year (Total Marks: 4600)

(First-12 months, Second -12months, Third-12months, Fourth-18months)

Every candidate shall compete the course including the passing of examination in all subjects and compete the compulsory internship training within a period of eleven years from the date of admission in first BHMS degree course.

The minimum of hours for lecture, Demonstration Practical and seminar classes in the subject shall be as under

FIRST BHMS

Sr. No.	Subject	Theoretical lecture (in hours)	Practical or clinical or tutorial or seminars (in hours).
1	Pharmacy	100	75
2	Anatomy	200 (including 10 hours each for histology and embryology).	275 (including 30 on histology and embryology).
3	Physiology	200 (including 50 hours for bio-chemistry)	275 hours (including 50 hours for Biochemistry).
4	Homoeopathic Materia Medica	35	--
5	Organon of Medicine with Homoeopathic Philosophy	35 (including 10 for logic)	

SECOND BHMS

Sr. No.	Subject	Theoretical lecture (in hours)	Practical or clinical or tutorial or seminar (in hours)
1.	Pathology	200	80
2.	Forensic Medicine and Toxicology	80	40
3.	Organon of Medicine with Homoeopathic Philosophy	160	60
4.	Homoeopathic Materia Medica	160	60
5.	Surgery	80	60 (One term of three months in surgical ward and outpatient department)
6.	Gynaecology and Obstetrics	40 and 40=80	60 (One term of three months in gynecology and obstetrics ward and outpatient department).

THIRD BHMS

S. N.	Subject	Theoretical lecture (in hours)	Practical or clinical or tutorial or seminars (in hours)
1.	Practice of medicine	50}75 25}	75 One term of three months each in outpatient department and inpatient department in different wards or department.
2.	Surgery	100}150 50}.	75 One term of three months each in surgical ward and outpatient department.
3.	Gynaecology and Obstetrics	100}150 50}	75 One term of three months gynaecology and obstetrics ward and outpatient department.
4.	Homoeopathic Materia Medica	100	75
5.	Organon of Medicine	100	75
6.	Repertory	50	25
7.	Community Medicine	35	15

FOURTH BHMS

Subject	Theoretical lecture (in hours)	Practical or clinical or tutorial classes (in hours)
Practice of Medicine	120}180 60}	One term of three months each in outpatient department and inpatient department respectively for case taking, analysis, evaluation and provisional prescription just for case presentation on ten cases per month.
Homoeopathic Materia Medica	180	
Organon of Medicine with Homoeopathic Philosophy	180	
Repertory	100	
Community Medicine	100	100

4. **RESULTS AND RE-ADMISSION TO EXAMINATION:**

- i) Results of the examination are published at the **maximum within one month** of the last date examination.
- ii) Candidate who have passed in one or more subjects need not appear in that subject or those subjects again in the subsequent examinations if the candidate passes the whole examination within 4 chances including the original examination.
- iii) “The candidate shall pass First B.H.M.S, examination in all the subjects at least one term (six months) before he is allowed to appear in the Second B.H.M.S examination provided that he has passed in the subjects of anatomy and physiology (including Biochemistry) examinations two terms (twelve months) before he is allowed to appear in the Second B.H.M.S examination.

- iv) “a candidate who appears at First B.H.M.S examination, Second B.H.M.S examination, Third B.H;M.S examination or Fourth B.H.M.S examination but fails to pass in the subject or subjects shall be re-admitted to the next examination in the subject or subjects (theory and practical or clinical including oral or practical or clinical wherein he has failed);”;
- v) Special classes, seminars, demonstrations, practical, tutorials, etc. shall be arranged for the repeaters in the subject in which they have failed before they are allowed to appear at the next examination, in which attendance shall be compulsory.
- vi) If a candidate fails to pass in all the subjects within the prescribed chances he shall be required to prosecute a further course of study in all the subject and in all parts for 1 year to the satisfaction of the head of college and appearing for examinations in all the subjects.
- vii) Grace Mark University/examining authority shall have the discretion to **award maximum 10 marks** in total if a student fails in one/more subjects.

11. EXAMINERS:

- i) No person other than the holder of the qualification prescribed for the teaching staff in Homoeopathy (minimum standards of education) regulations amended from time to time shall be appointed an internal or external examination or paper setter for the B.H.M.S. Degree course.

Provided that :

- a) No such person shall be appointed as an examiner unless he has at least three years continuous regular teaching experience in the subject concerned, gained in a Degree level Homoeopathic Medical College.
- b) Internal examiners shall be appointed from amongst the teaching staff of Homoeopathic Medical College.
- c) No person shall be appointed as an external examiner in any allied medical subject unless he possesses recognized Medical qualification as required for appointment to teaching post in accordance with annexure of the Homoeopathy (Minimum standards education) regulations, 1983.
- d) A paper setter may be appointed as an internal or external examiner.

The criteria for appointing the Chairman or paper-setter or moderator shall be as follows, namely:-

- (1) Chairman: Senior most person from amongst the examiners or paper-setters appointed for theory and oral or practical or clinical examinations shall be appointed as Chairman and the eligibility qualification for the Chairman shall be the same as for appointment of a Professor.
- (2) Moderator: A Professor or Associate Professor or Reader shall be eligible to be appointed as moderator:
- (3) Paper setter A Professor or Associate Professor or Reader shall be appointed as a paper setter.

Provided that an Assistant Professor or Lecturer with three years experience as an examiner shall be eligible to be appointed as paper setter

For non appearance in an examination for any reason, a candidate shall not have any liberty for availing additional chance to appear in that examination.

12. INTERNSHIP TRAINING:

- 1) II) Each candidate shall be required to undergo compulsory rotating Internship of one year, after passing the Final B.H.M.S. examinations, to the satisfaction of the Principal of the Homoeopathic College. Thereafter only, the candidate shall be eligible for the award of Degree of bachelor of Homoeopathic Medicine and Surgery (B.H.M.S.) by the University
 - i) (a) All parts of the internship training shall be undertake at the hospital attached to the College, and in cases where such hospital cannot accommodate all of its students for internship then such candidates/ students shall be informed in writing by the college and it shall be the responsibility of the College to ensure that each of such students is put on internship training in a Homoeopathic Hospital or dispensary run by Government or local bodies.
 - ii) To enable the State Board/ Council of Homoeopathy to grant provisional registration of minimum of one year to each candidate to undertake the internship, the University concerned shall issue a provisional passed certificate on passing the Final B.H.M.S. examination to each successful candidate.
Provide that in the event of shortage or unsatisfactory work, the period of compulsory internship and the provisional registration shall be accordingly extended by the State Board/ Council.
 - iii) Full registration shall only be given by the State Board if the B.H.M.S. degree awarded by the University concerned is a recognized medical qualification as per Section 13(1) of the Act, and Board shall award registration to such candidates who produce certificate to completion or compulsory rotating internship of not less than one year duration from the Principal of College where one has been a bonafide student which shall also declare that the candidate is eligible for it.
 - iv) The internee students shall not prescribe the treatment including medicines and each of them shall work under the direct supervision of Head of Department concerned and/ or a Resident Medical Officer. No intern student shall issue any medico legal document under his/ her signatures.
2. The internship training shall be regulated by the Principal in consultation with concerned Heads of Departments and R.M.O. as under :
 - i) Each internee student shall be asked to maintain a record of work, which is to be constantly monitored by the Head of concerned Department and / or Resident Medical Officer under whom the internee is posted. The scrutiny of record shall be done in an objective way to update the knowledge, skill and aptitude of internee.
 - ii) The stress during the internship training shall be on case taking, evaluation of symptoms, nosological and miasmatic diagnostic analysis, repertorization and management of sick people based on principles of Homoeopathy. The Principal or Head of the College in consultation with heads of concerned clinical departments (including Organon of Medicine, Materia Medica and Repertory) shall make medical units having integration of teaching faculty of concerned departments to regulate internship training to be given to each student. Weekly seminars shall be conducted wherein interns in rotation be given a chance to present their cases for discussion, and, concerned teachers/ R.M.O. shall assess performance of each of interns. Resident Medical Officer shall co-ordinate with teachers concerned in conduct of weekly seminars

- iii) Rotation of intern students shall be as under :
 - a) Practice of Medicine - 8 Months wherein internee will be rotated in each Psychology, Respiratory, Gastro intestinal Endocrinology. Skin and V.D., Locomotor Cardiology, Paediatrics sections.
 - b) Surgery - 1 Month.
 - c) Obstetrics and Gynaecology - 2 months [1 month each (including Reproductive and child health care)].
 - d) Community medicine (including PHC/ CHC) - 1 month.
- iv) Each internee shall be exposed to clinicopathology work to acquire skill in taking samples and doing routine blood - examination, blood smear for parasites, sputum examination, urine and stool examination. Student shall be trained to correlate laboratory findings with diagnosis and management of sick people.
- v) Each internee shall be given opportunities to learn the diagnostic techniques like x-rays, Ultrasonography, E.C.G., Spirometer and other forthcoming techniques and correlate their findings with diagnosis and management of cases.
- vi) Each internee student shall be given adequate knowledge about issuing of medico-legal certificates including medical and fitness certificates, death certificates, birth certificates, court producers and all of such legislation's be discussed which were taught in curriculum of Forensic Medicine.
- vii) Each internee shall maintain records of 40 acute and 25 chronic cases complete in all manner including follow up in Practice of Medicine, record of 5 antenatal checkup and 3 delivery cases attended by him/ her in Department of Obstetrics and 3 cases of Gynaecology; records of 5 surgical cases assisted by him (and demonstrational knowledge of dressings) in Surgery department, and records of knowledge gained in Primary Health Centers, Community health Centers, various health programmes.
- viii) Each internee shall be given a liberty to choose an elective assignment on any subject, and complete output shall be furnished in writing by the internee in respect of elective assignment to the Principal of the College within internship duration.
- ix) Each intern shall be posted on duty in such a manner that each of them attend at least 15 days in O.P.D. and 15 days I.P.D. at least in each month (except for duty in Community Medicine) and attend the other parts of duty including self preparation in Library.
- x) Each intern-student shall be made to learn importance of maintaining statistics and records; intern-student shall also be familiarized with research methodology.
- 3. i) Each internee shall have not less than 80% of attendance during the internship training.
- ii) Each internee shall be on duty of at least 6 hrs. per day during the compulsory internship training.

C) **PART-II :**

a) **INTRODUCTION :**

Basic objectives of education and training in a Homoeopathic institution is to prepare a competent Homoeopathic Physician who is capable of functioning independently and effectively under Rural and Urban set ups.

A. **Sound Foundation :**

To function effectively as a Homoeopathic Physician a thorough grasp over the medical concepts is imperative. For this, the educational process shall be perceived as an integrated evolving process and not merely as an acquisition of a large number of disjointed facts.

A student shall have to pass through a Training procedure which encompasses the above well, right from I-B.H.M.S. to IV-B.H.M.S. and also during the internship period.

He shall undergo an education process wherein learning of Facts and concepts right from 1st Year are in a continuity, in an evolutionary and progressive pattern. In I-B.H.M.S., student shall study the fundamental principles of Homoeopathy and will also learn more of applied anatomy than a multitude of minor anatomical details.

In II-B.H.M.S., a student shall be exposed to very vital concept of susceptibility and symptomatology with Analysis-Evaluation and details of the Homoeopathic concepts, old logic of Homoeopathy. these will attain much deeper significance (if care is taken by teachers of pathology and Organon-Philosophy) when the current knowledge of INFLAMMATION, IMMUNITY, is correlated well with concepts of susceptibility.

In III-B.H.M.S., there is opportunity to fortify the foundation at the best by correlating between Theory of Chronic diseases and the Patho-Physiological facts on the Gynecology, Surgery and Medicine. A student shall have to be taught the spectrums of various diseases in correlation with the spectrum of miasmatic manifestations. He will then be able to use a well concluded EVALUATION ORDER OF Characteristics to derive an Operationally valid repertorial Totality.

The knowledge gathered in this pattern will keep him constantly aware of his objectives and his role as a Homoeopathic Physician. The Integration will eliminate the state of confusion. The Therapeutics action then will be right and Complete, utilizing the full repertories of the Medicinal and Non-medicinal measures, keeping him up-to-date about the fresh scientific developments and inculcating values of Continuous Medical Education.

B. **Execution :**

Maximum emphasis shall be placed on the applied aspects of all the subjects. Thus teachings of Anatomy, Physiology and Biochemistry will demand greater emphasis on applied aspects of these sciences. Teaching of Pathology will demand sharp focus on general Pathology, while Regional Pathology will come up as an application. it shall require correlation with Medicine, Surgery and Gynecology. All these need to be studied from Homoeopathic perspectives, hence emphasis on applied aspect of Organon Philosophy and Homoeopathic Therapeutics representing application to all other subjects.

C. Inter-Department co-ordination :

Essentially, the entire approach becomes an integrated approach. All departments shall develop a cohesive well-defined programme which demand marked inter-departmental co-ordination.

It is therefore desirable to have teaching programmes wherein, by rotation each department participates in the teaching co-ordinating well with the other faculties with constant updating and evaluation. The co-ordination has to be in the way as given in the text under each subject inside these Regulations. This will ensure fundamental and exceptional clarity.

D. Deductive – Inductive Teachings :

While teaching, there shall be balance in designing deductive and inductive process in mind. There shall be less emphasis on didactic lectures. Major portion of the time of the students shall be devoted to demonstrations, group discussions, seminars and clinics. Every attempt shall be made to encourage students to participate in all these to develop his personality, character, expressions and to ensure the grasp over concepts rapidly.

E. Patient Oriented Teaching :

In order to impart the integrated medical education PATIENT has to be in the Centre right from day one of the II-B.H.M.S.

Importance of social factors in relation to the problem of health and disease shall receive proper emphasis throughout the course and to achieve this objective, the educational process shall be community as well as hospital based.

GENERAL GUIDELINES THERAPEUTICS

Homoeopathy has a distinct approach to disease. Concept of individualization and concept chronic miasm makes it distinct.

It recognizes an ailing individual by studying him as a whole rather than in terms of sick parts. It emphasizes that study of man from the state of Health i.e. DISPOSITION DIATHESIS DISEASE, taking into account all predisposing and precipitating factors i.e. FUNDAMENTAL CAUSE, MAINTAINING CAUSE AND EXCITING CAUSE.

Hahnemann's theory of chronic miasm provides us an evolutionary understanding of the chronic disease PSORA - SYNCOSIS-SYPHILIS and acute manifestations of chronic diseases, evolution of the natural disease shall be comprehended in the light of theory or chronic miasm. However, current knowledge of Pathology and clinical medicine assist in defining this must demonstrated.

Study of therapeutics does not mean simply list of specifics. For the clinical condition, but teaching of applied Materia Medica. Here we demonstrate how various drugs would come up in psoric, sycotic, tubercular or syphilitic state of the clinical conditions. Thus emphasize would be in correlating pace of evolution of disease, peculiar, respectively and of characteristics.

Thus, teaching of THERAPEUTICS would essentially demand an effective correlation of

- i) Knowledge of clinical/ Medicine/ Surgery.
- ii) Appreciation of Natural disease its evolution in the light of Theory of chronic miasm. Thus correlation with Organon Philosophy.
- iii) Applied Materia Medica and Repertory.

NOTE :

The modifications in this syllabus will be published as and when published by Central Government.

- 3) Following shall be subjectwise Syllabus for the Bachelor of Homoeopathic Medicine and Surgery (B.H.M.S.) course.

SYLLABUS

. **Syllabus for Degree Course:** Following shall be the syllabus for B.H.M.S. (Degree) Course:-

HOMOEOPATHIC PHARMACY

Instructions:

Instruction in Homoeopathic Pharmacy shall be so planned as to present

- (1) Importance of homoeopathic pharmacy in relation to study of Homoeopathic Materia Medica, Organon of medicine and national economy as well as growth of homoeopathic pharmacy and research;
- (2) Originality and speciality of homoeopathic pharmacy and its relation, to pharmacy of other recognised systems of medicine.
- (3) The areas of teaching shall encompass the entire subject but stress shall be laid on the fundamental topics that form the basis of homoeopathy

A. Theory;

I. General concepts and orientation:

1. History of pharmacy with emphasis on emergence of Homoeopathic Pharmacy.
2. Official Homoeopathic Pharmacopoeia (Germany, Britain, U.S.A., India).
3. Important terminologies like scientific names, common names, synonyms.
4. Definitions in homoeopathic pharmacy.
5. Components of Pharmacy.
6. Weights and measurements.
7. Nomenclature of homoeopathic drugs with their anomalies.

II. Raw Material: drugs and vehicles

1. Sources of drugs (taxonomic classification, with reference to utility).
2. Collection of drug substances.
3. Vehicles.
4. Homoeopathic Pharmaceutical Instruments and appliances.

III. Homoeopathic Pharmaceutics:

1. Mother tincture and its preparation - old and new methods
2. Various scales used in homoeopathic pharmacy.
3. Drug dynamisation or potentisation.
4. External applications (focus on scope of Homoeopathic lotion, glycerol, liniment and ointment).
5. Doctrine of signature.
6. Posology (focus on basic principles; related aphorisms of organon of medicine).
7. Prescription (including abbreviations)
8. Concept of placebo.
9. Pharmaconomy - routes of homoeopathic drug administration.

10. Dispensing of medicines.

11. Basics of adverse drug reactions and pharmaco-vigilance

IV. Pharmacodynamics

1. Homoeopathic Pharmacodynamics

2. Drug Proving (related aphorisms 105 - 145 of organon of medicine) and merits and demerits of Drug Proving on Humans and Animals.

3. Pharmacological study of drugs listed in Appendix -A

V. Quality Control:

1. Standardisation of homoeopathic medicines, raw materials and finished products.

2. Good manufacturing practices; industrial pharmacy.

3. Homoeopathic pharmacopoeia laboratory - functions and activities, relating to quality control of drugs.

VI. Legislations pertaining to pharmacy:

1. The Drugs and Cosmetics Act, 1940 (23 of 1940) {in relation to Homoeopathy}

2. Drugs and Cosmetics Rules, 1945 {in relation to Homoeopathy}

3. Poisons Act, 1919 (12 of 1919)

4. The Narcotic Drugs and Psychotropic Substances Act, 1985 (61 of 1985)

5. Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954 (21 of 1954)

6. Medicinal and Toilet Preparations (Excise Duties) Act, 1955 (16 of 1955).

B. Practical:

Experiments

1. Estimation of size of globules.

2. Medication of globules and preparation, of doses with sugar of milk and distilled water.

3. Purity test of sugar of milk, distilled water and ethyl alcohol.

4. Determination of specific gravity of distilled water and ethyl alcohol.

5. Preparation of dispensing alcohol and dilute alcohol from strong alcohol.

6. Trituration of one drug each in decimal and centesimal scale.

7. Succussion in decimal scale from Mother Tincture to 6X potency.

8. Succussion in centesimal scale from Mother Tincture to 3C potency.

9. Conversion of Trituration to liquid potency: Decimal scale 6X to 8X potency.

10. Conversion of Trituration to liquid potency: Centesimal, scale 3C to 4C potency.

11. Preparation of 0/1 potency (LM scale) of 1 Drug.
12. Preparation of external applications - lotion, glycerol, liniment, ointment.
13. Laboratory methods - sublimation, distillation, decantation, filtration, crystallisation.
14. Writing of prescription.
15. Dispensing of medicines.
16. Process of taking minims.
17. Identification of drugs (listed in Appendix B)-
 - (i) Macroscopic and Microscopic characteristic of drug substances- minimum 05 drugs;
 - (ii) Microscopic study of Trituration of two drugs (up to 3X potency)
18. Estimation of moisture content using, water bath.
19. Preparation of mother tincture-maceration and percolation-
20. Collection of 30 drugs for herbarium.
21. Visit to homoeopathic pharmacopoeia laboratory and visit to a large scale manufacturing unit of homoeopathic medicines (GMP compliant). (Students shall keep detailed visit reports as per proforma at Annexure. 'B')

C. Demonstration

1. General instructions for practical or clinical in pharmacy.
2. Identification and use of homoeopathic pharmaceutical instruments and appliance and their cleaning.
3. Estimation of moisture content using water bath.
4. Preparation of mother tincture - maceration and percolation,

APPENDIX-A

List of drugs included in the syllabus of pharmacy for study of pharmacological action:-

1.	Aconitum napellus	2.	Adonis vernalis
3.	Allium-cepa	4.	Argentum nitricum
5.	Arsenicum album	6.	Atropa Belladonna
7.	Cactus grandiflorus	8.	Cantharis vesicatoria
9.	Cannabis indica	10.	Cannabis sativa
11.	Cinchona officinalis	12.	Coffea cruda
13.	Crataegus oxyacantha	14.	Crotalus horridus
15.	Gelsemium sempervirens	16.	Glonoinum
17.	Hydrastis canadensis	18.	Hyoscyamus niger
19.	Kali bichromicum	20.	Lachesis
21.	Lithium carbonicum	22.	Mercurius corrosivus
23.	Naja tripudians	24.	Nitricum acidum

25	Nux vomica	26	Pssifiora incarnata
27	Stannum metallicum	28	Stramonium
29	Symphytum officinale	30	Tabacum

APPENDIX - B

List of drugs for identification

I. Vegetable Kinngdom.

1	Aegle folia	2.	Anacardium orientale
3.	Andrographis paniculata	4.	Calendula officinalis
5.	Cassia sophera	6.	Cinchona officinalis
7.	Cocculus indicus	8.	Coffea cruda
9.	Colocythis	10.	Crocus sativa
11.	Croton tiglium	12.	Cynodon dactylon
13.	Ficus religiosa	14.	Holarrhena antidysenterica
15.	Hydrocotyle asiatica	16.	Justicia adhatoda
17.	Lobelia inflata	18.	Nux vomica
19	Ocimum sanctum	20.	Opium
21.	Rauwolfia serpentina	22.	Rheum
23	Saraca indica	24	Senna
25	Stramonium	26	Vinca minor

II. Chemicals or Minerals

1	Aceticum acidum	2.	Alumina
3.	Argentum metallicum	4.	Argentum nitricum
5.	Arsenicum album	6.	Calcarea carbonica
7.	Carbo vegetabilis	8.	Graphites
9.	Magnesium phosphorica	10.	Natrum muriaticum
11.	Sulphur		

III. Animal kingdom

1	Apis mellifica	2.	Blatta orientalis
3.	Formica rufa	4.	Sepia
5.	Tarentula cubensis		

Note:

1. Each student shall maintain practical or clinical record or journal and herbarium file separately.
2. College authority shall facilitate the students in maintaining record as per Appendix-C.

D. Examination:

1. Theory

1.1.	Number of papers - 01
1.2.	Marks: 100

3. Practical including viva voce or oral

2.1.		Marks100
2.2	Distribution of marks	
2.2.1	Experiments	15
2.2.2	Spotting	20
2.2.3	Maintenance of practical records or journal	10
2.2.4	Maintenance of herbarium record	05
2.2.5.	Viva Voce (oral)	50
	Total	100

ANATOMY

Instructions:

- I(a)** Instructions in anatomy should be so planned as to present a general working knowledge of the structure of the human body.
- (b)** The amount of detail which a student is required to memorize should be reduced to the minimum.
- (c)** Major emphasis should be laid on functional anatomy of the living subject rather than on the static structures of the cadaver, and on general anatomical positions and broad relations of the viscera, muscles, blood-vessels, nerves and lymphatic and Study of the cadaver is the only a mean to achieve this.
- (d)** Students should not be burdened with minute anatomical details which have no clinical significance.

II Though dissection of the entire body is essential for the preparation of the student of his clinical studies, the burden of dissection can be reduced and much saving of time can be effected, it considerable reduction of the amount of topographical details is made and the following points are kept in view:-

- (1) Only such details as have professional or general educational value for the medical student.
- (2) The purpose of dissection is to give the student an understanding of the body in relation to its function, and the dissection should be designed to achieve this goal.
- (3) Normal radiological anatomy may also form part of practical or clinical training and the structure of the body should be presented linking functional aspect.
- (4) Dissection should be preceded by a course of lectures on the general structure of the organ or the system under discussion and then its function. In this way anatomical and physiological knowledge can be presented to students in an integrated form and the instruction of the whole course of anatomy and physiology and more interesting, lively and practical or clinical.
- (5) A good part of the theoretical lectures on anatomy can be transferred to tutorial classes with the demonstrations.
- (6) Students should be able to identify anatomical specimens and structures displayed in the dissections.
- (7) Lectures or demonstrations on the clinical and applied anatomy should be arranged in the later part of the course and it should aim at demonstrating the anatomical basis of physical signs and the value of anatomical knowledge to the students.

- (8) Seminars and group discussions to be arranged periodically with a view of presenting these subjects in an integrated manner.
- (9) More stress on demonstrations and tutorials should be given. Emphasis should be laid down on the general anatomical positions and broad relations of the viscera, muscles, blood vessels, nerves and lymphatics.
- (10) There should be joint seminars with the departments of Physiology and Bio-chemistry which should be organised once a month.
- (11) There should be a close correlation in the teaching of gross Anatomy, Histology, Embryology and Genetics and the teaching of Anatomy, Physiology including Bio-Chemistry shall be integrated.

A. Theory

- a) A complete course of human anatomy with general working knowledge of different anatomical parts of the body.

The Curriculum includes the following namely:-

1. General Anatomy-

1.1	Modern concepts of cell and its components; cell division, types with their significance.
1.2	Tissues.
1.3	Genetics.

2. Development anatomy (Embryology):

2.1	Spermatogenesis	2.2	Oogenesis
2.3	Formation of germ layer	2.4	Development of embryonic disc
2.5	Placenta	2.6	Development of abdominal organs
2.7	Development of cardio vascular	2.8	Development of nervous system
2.9	Development of respiratory system	2.10	Development of body cavities
2.11	Development of uro-genital system		

3. Regional anatomy:

This will be taught under the following regions:-

3.1	Head, Neck and Face, Brain	3.2	Thorax
3.3	Abdomen	3.4	Upper and Lower Extremities
3.5	Special Senses		

Each of the above areas will cover:-

a)	Osteology	b)	Syndesmology (joints)
c)	Myology	d)	Angiology
e)	Neurology	f)	Splanchnology (viscera and organs)
g)	Surface anatomy	h)	Applied anatomy
i)	Radiographic anatomy		

4 Histology (Microanatomy):

B PRACTICAL

1. Dissection of the whole human body, Demonstration of dissected parts
2. Identification of histological slides related to tissues and organs.
3. Students shall maintain practical or clinical journals and dissection cards.

C Examination:

1. Theory:

The written papers in anatomy shall be in two papers, namely-

1.1 - Paper – I

a)	General Anatomy	b)	Head, Face
c)	Neck	d)	Central nervous system
e)	Upper Extremities	f)	General Embryology

1.2 - Paper – II

a)	Thorax	b)	abdomen
c)	Pelvis	d)	Lower Extremities
e)	Histology (micro-anatomy)	f)	Special Embryology.

2. The Practical including viva voce or oral examination includes the following:-

2.1.		Marks200
2.2	Distribution of marks	
2.2.1	Knowledge of dissected parts	20
2.2.2	Viscera	20
2.2.3	Bones	20
2.2.4	Surface Anatomy	10
2.2.5	Spotting (including Radiology and Histology)	20
2.2.6	Maintenance of Practical record or journal and dissection card	10
2.2.7	Viva Voce (Oral)	100
	Total	200

PHYSIOLOGY

Instructions:

- I (a) The purpose of a course in physiology is to teach the functions, processes and inter-relationship of the different organs and systems of the normal disturbance in disease and to equip the student with normal standards of reference for use while diagnosing and treating deviations from the normal.
- (b) To a Homoeopath the human organism is an integrated whole of body life and mind and though life includes all the chemico-physical processes it transcends them.
- (c) There can be no symptoms of disease without vital force animating the human organism and it is primarily the vital force which is deranged in disease.
- (d) Physiology shall be taught from the stand point of description physical processes underlying them in health.
- (e) Applied aspect of every system including the organs is to be stressed upon while teaching the subject.
- II (a) there should be close co-operation between the various departments while teaching the different systems.
- (b) There should be joint courses between the two departments of anatomy and physiology so that there is maximum co-ordination in the teaching of these subjects.
- (c) Seminars should be arranged periodically and lecturers of anatomy, physiology and bio-chemistry should bring home the point to the students that the integrated approach is more meaningful.

A. Theory:

The curriculum includes the following, namely:-

I. General physiology:

1. Introduction to cellular physiology
2. Cell Junctions
3. Transport through cell membrane and resting membrane potential
4. Body fluids compartments
5. Homeostasis

II. Body fluids:

1.	Blood	2.	Plasma Proteins
3.	Red Blood Cells	4.	Erythropoiesis
5.	Hemoglobin and Iron Metabolism	6.	Erythrocyte Sedimentation Rate
7.	Packed Cell Volume and Blood Indices	8.	Anemia
9.	Haemolysis and Fragility of Red Blood cell	10.	White Blood Cell'
11.	Immunity	12.	Platelets
13.	Haemostasis	14.	Coagulation of Blood
15.	Blood groups	16.	Blood Transfusion
17.	Blood volume	18.	Reticulo-endothelial System and Tissue Macrophage
19	Lymphatic System and Lymph	20	Tissue Fluid and Oedema

III. Cardio-vascular system:

1	Introduction to cardiovascular system	2	Properties of cardiac muscle
3	Cardiac cycle	4	General principles of circulation
5	Heart sounds	6	Regulation of cardiovascular system
7	Normal and abnormal Electrocardiogram (ECG)	8	Cardiac output
9	Heart rate	10	Arterial blood pressure
11	Radial Pulse	12	Cardiovascular adjustments during exercise
13	Regional circulation- Cerebral, Splanchnic, Capillary, Cutaneous & skeletal muscle circulation		

IV. Respiratory system and environmental physiology:

1	Physiological anatomy of respiratory tract	2	Mechanism of respiration; Ventilation, diffusion of gases
3	Transport of respiratory gases	4	Regulation of respiration
5	Pulmonary function tests	6	High altitude and space physiology
7	Deep sea physiology	8	Artificial respiration
9	Effects of exercise on respiration		

V. Digestive system.

1	Introduction to digestive system Physiological anatomy of Stomach,	2	Composition and functions of digestive juices
3	Pancreas, Liver and Gall bladder, Small intestine, Large intestine	4	Movements of gastrointestinal tract Digestion and absorption of
5	Gastrointestinal hormones	6	carbohydrates, proteins and lipids

VI. Renal physiology and skin:

1	Physiological anatomy of kidneys and urinary tract	2	Renal circulation
3	Urine formation: Renal clearance, glomerular filtration, tubular reabsorption, selective secretion, concentration of urine, acidification of urine	4	Renal function tests
5	Micturition	6	Skin
7	Sweat	8	Body temperature and its regulation

VII. Endocrinology

1	Introduction to endocrinology	2	Hormones and hypothalamo-hypophyseal axis
3	Pituitary gland	4	Thyroid gland
5	Parathyroid	6	Endocrine functions of pancreas
7	Adrenal cortex	8	Adrenal medulla
	Endocrine functions of other organs		

VIII. Reproductive system:

1	Male reproductive system- testis and its hormones; seminal vesicles, prostate gland, semen.	2	Introduction to female reproductive system
3	Menstrual cycle	4	Ovulation
5	Menopause	6	Infertility
7	Pregnancy and parturition	8	Placenta.
9	Pregnancy tests	10	Mammary glands and lactation
11	Fertility	12	Foetal circulation

IX Central nervous system:

1	Introduction to nervous system	2	Neuron
3	Neuroglia	4	Receptors
5	Synapse	6	Neurotransmitters
7	Reflex	8	Spinal cord
9	Somato-sensory system and somato-motor-system	10	Physiology of pain
11	Brainstem, Vestibular apparatus	12	Cerebral cortex
13	Thalamus	14	Hypothalamus
15	Internal Capsule	16	Basal ganglia
17	Limbic System	18	Cerebellum — Posture and equilibrium
19	Reticular information	20	Proprioceptors
21	Higher intellectual function	22	Electroencephalogram (EEG)
23	Physiology of sleep	24	Cerebro-spinal fluid (CSF)
25	Autonomic Nervous System (ANS)		

X. Special senses:

Eye: Photochemistry of vision, Visual pathway Pupillary reflexes, Colour vision, Errors of refraction

1	Ear: Auditory pathway, Mechanism of hearing, Auditory defects	2	Sensation of smell: Olfactory receptors, olfactory pathways
3	Sensation of taste : Taste receptors, Taste pathways	4	Sensation of touch

XI. Nerve muscle physiology:

1	Physiological properties of nerve fibres	2	Nerve fibre- types, classification, function, Degeneration and regeneration of peripheral nerves
3	Neuro-Muscular junction	4	Physiology of Skeletal muscle
5	Physiology of Cardiac muscle	6	Physiology of Smooth muscle
7	EMG and disorders of skeletal muscles	8	

Bio-physical sciences

1	Filtration	2	Ultra filtration
3	Osmosis	4	Diffusion
5	Adsorption	6	Hydrotropy
7	Colloid	8	Donnan Equilibrium
9	Tracer elements	10	Dialysis
11	Absorption	12	Assimilation
13	Surface tension		

B. Practical:

I. Haematology:

1	Study of the Compound Microscope	2	Introduction to Haematology
3	Collection of Blood samples	4	Estimation of Haemoglobin Concentration
5	Determination of Haematocrit	6	Haemocytometry
7	Total RBC count	8	Determination of RBC indices
9	Total Leucocytes Count (TLC)	10	Preparation and examination of Blood Smear
11	Differential Leucocyte Count (DLC)	12	Absolute Eosinophil Count
13	Determination of Erythrocyte Sedimentation Rate	14	Determination of Blood Groups
15	Osmotic fragility of Red cells	16	Determination of Bleeding Time and Coagulation Time
17	Platelet Count	18	Reticulocyte Count

1. Human experiments:

1	General Examination	2.	Respiratory System- Clinical examination, Spirometry, Stethography
2	Gastrointestinal System-Clinical examination	4	Cardiovascular System- Blood pressure recording, Radial pulse, ECG, Clinical examination
5	Nerve and Muscle Physiology-Mosso's Ergography, Handgrip Dynamometer	6	Nervous System- Clinical examination
7	Special Senses- Clinical examination	8	Reproductive System-Diagnosis of pregnancy

BIO-CHEMISTRY

A. Theory:

Carbohydrates:	Chemistry, Metabolism, Glycolysis, TCA, HMP, Glycogen synthesis and degradation, Blood glucose regulation.
Lipids:	Chemistry, Metabolism, Intestinal uptake, Fat transport, Utilisation of stored fat, Activation of fatty acids, Beta oxidation and synthesis of fatty acids
Proteins:	Chemistry, Metabolism, Digestion of protein, Transamination, Deamination, Fate of Ammonia, Urea cycle, End products of each ammo acid and their entry into TCA cycle
Enzymes:	Definition, Classification, Biological Importance, Diagnostic use, Inhibition
Vitamins:	Daily requirements, Dietary source, Disorders and physiological role
Minerals	Daily requirement, Dietary Sources, Disorders and physiological role
Organ function tests	Tests and interpretation

B. Practical:

1	Demonstration of uses of instruments or equipment
2	Qualitative analysis of carbohydrates, proteins and lipids
3	Normal, characteristics of urine
4	Abnormal constituents of urine
5	Quantitative estimation of glucose, total proteins, uric acid in blood
6	Liver function tests
7	Kidney function tests
8	Lipid profile
9	Interpretation and discussion of results of biochemical tests.

C. Examination:

1. Theory:

(1) No. of Papers-02

(2) Marks: Total marks: 200; Paper I- 100
Paper II- 100

1.1. Contents:

1.1.1. Paper-I:

a)	General Physiology	b)	Biophysics
c)	Body fluids	d)	Cardiovascular system
e)	Reticuloendothelial system	f)	Respiratory system
g)	Excretory system	h)	Regulation of body temperature
i)	Skin	j)	Nerve Muscle physiology

1.1.2. Paper-II:

a)	Endocrine system	b)	Central Nervous System
c)	Digestive system and metabolism	d)	Reproductive system
e)	Sense organs	f)	Biochemistry
g)	Nutrition		

2. Practical Including viva voce or oral:

2.1.	Practical and viva voce	Marks 200
2.2	Distribution of marks	
2.2.1	Experiments	50
2.2.2	Spotting	30
2.2.3	Maintenance of Practical record/Journal	20
2.2.4	Viva Voce (Oral)	100
	Total	200

HOMOEOPATHIC MATERIA MEDICA

Instructions:

- I (a) Homoeopathic Materia Medica is differently constructed as compared to other Materia Medicas;
- (b) Homoeopathy considers that study of the action of drugs on individual parts or systems of the body or on animal or their isolated organs is only a partial study of life processes under such action and that it does not lead us to a full appreciation of the action of the medicinal substance, the drug substance as a whole is lost sight of.
- II Essential and complete knowledge of the drug action as a whole can be ascertained only by qualitative drug proving on healthy persons and this alone can make it possible to elicit all the symptoms of a drug with reference to the psychosomatic whole of a person and it is just such a person as a whole to whom the knowledge of drug action is to be applied.
- III (a) The Homoeopathic Materia Medica consists of a schematic arrangement of symptoms produced by each drug. Incorporating no theories for explanations about their interpretation or inter-relationship;
- (b) Each drug should be studied synthetically, analytically and comparatively, and this alone would enable a Homoeopathic student to study each drug individually and as a whole and help him to be a good prescriber.
- IV (a) The most commonly indicated drugs for day to day ailments should be taken up first so that in the clinical classes or outdoor duties the students become familiar with their applications and they should be thoroughly dealt with explaining all comparisons and relationship;
- (b) Students should be conversant with their sphere of action and family relationships and the rarely used drugs should be taught in outline, emphasizing only their most salient features and symptoms.
- V Tutorials must be introduced so that students in small numbers can be in close touch with teachers and can be helped to study and understand Materia Medica in relation to its application in the treatment of the sick.
- VI (a) While teaching therapeutics an attempt should be made to recall the Materia Medica so that indications for drugs in a clinical condition can directly flow out from the proving of the drugs concerned.
- (b) The student should be encouraged to apply the resources of the vast Materia Medica in any sickness and not limit himself to memorize few drugs for a particular disease and this Hahnemannian approach will not only help, him in understanding the proper perspective of symptoms as applied and their curative value in sickness but will even lighten his burden as far as formal examinations are concerned.
- (c) Application of Materia Medica should be demonstrated from case-records in the outdoor; and the indoor.
- (d) Lectures on comparative Materia Medica and therapeutics as well as tutorials should be integrated with lectures on clinical medicine.
- VII For the teaching of drugs, the department should keep herbarium sheets and other specimens for demonstrations to the students and audio-visual material shall be used for teaching and training purposes.

- VIII (a) There is a large number of Homoeopathic medicines used today and much more medicines are being experimented and proved at present and more will be added in future and some very commonly used Homoeopathic medicines are included in this curriculum for detailed study.
- (b) It is essential that at the end of this course each student should gain basic and sufficient knowledge of "How to study Homoeopathic Materia Medica" and to achieve this objective basic and general topic of Materia Medica should be taught in detail during this curriculum, general topics should be taught in all the classes.
- (c) The medicines are to be taught under the following headings, namely:-
- (1) Common name, family, habitat, parts used, preparation, constituents (of source material)
 - (2) Proving data
 - (3) Sphere of action.
 - (4) Symptomatology of the medicine emphasizing the characteristic symptoms (mental, physical generals and particulars including sensations, modalities and concomitants) and constitution.
 - (5) Comparative study of medicines.
 - (6) Therapeutic applications (applied Materia Medica).

FIRST B.H.M.S.

A. Theory:

General topics of Materia Medica (including introductory lectures) :-

(a) Basic Materia Medica -

1. Basic concept of Materia Medica
2. Basic construction of various Materia Medicas
3. Definition of Materia Medica

(b) Homoeopathic Materia Medica

1. Definition of Homoeopathic Materia Medica
2. Basic concept and construction of Homoeopathic Materia Medica.
3. Classification of Homoeopathic Materia Medica.
4. Sources of Homoeopathic Materia Medica.
5. Scope and Limitations of Homoeopathic Materia Medica.

Note: There shall be no examination in First B.H.M.S.

SECOND B.H.M.S.

A. Theory:

(a) In addition to syllabus of First B.H.M.S. Course, following shall be taught, namely: -

- (i) Science and philosophy of Homoeopathic Materia Medica.
- (ii) Different ways of studying Homoeopathic materia medica (e.g. psycho-clinical, pathological, physiological, synthetic, comparative, analytical, remedy relationships, group study, portrait study etc.)
- (iii) Scope and limitations of Homoeopathic materia medica.
- (iv) Concordance or remedy relationships.
- (v) Comparative Homoeopathic materia medica, namely:-
Comparative study of symptoms, drug pictures, drug relationships,
- (vi) Theory of Biochemic system of medicine, its history, concepts and principles; according to Dr. Wilhelm Heinrich Schuessler. Study of 12 Biochemic medicines, (tissue remedies).

(b) Homoeopathic Medicines to be taught in Second B.H.M.S as per Appendix -I.

APPENDIX-I

1.	Aconitum napellus	26.	Dulcamara
2.	Aethusa cynapium	27.	Euphrasia
3.	Allium cepa	28.	Ferrum Phosphoricum
4.	Aloe socotrina	29.	Gelsemium
5.	Antimonium crudum	30.	Hepar sulph
6.	Antimonium tartaricum	31.	Hypericum perforatum
7.	Apis mellifica	32.	Ipecacuanha
8.	Argentum nitricum	33.	Kali muriaticum
9.	Arnica montana	34.	Kali phosphoricum
10.	Arsenicum album	35.	Kali sulphuricum
11.	Arum triphyllum	36.	Ledum palustre
12.	Baptisia tinctoria	37.	Lycopodium clavatum
13.	Bellis perennis	38.	Magnesium phosphoricum
14.	Bryonia alba	39.	Natrum muriaticum
15.	Calcarea carbonica	40.	Natrum phosphoricum
16.	Calcarea fluorica	41.	Natrum sulphuricum
17.	Calcarea phosphoric	42.	Nux vomica
18.	Calcarea sulphurica	43.	Pulsatilla
19.	Calendula officinalis	44.	Rhus toxicodendron
20.	Chamomilla	45.	Ruta graveolens
21.	Cina	46.	Silicea
22.	Cinchona officinalis.	47.	Spongia tosta
23.	Colchicum autumnale	48.	Sulphur
24.	Colocyntis	49.	Symphytum officinale
25.	Drosera	50.	Thuja occidentalis

B: Practical or clinical:

This will cover,-

- (i) Case taking of acute and chronic patients.
- (ii) Case processing including totality of symptoms, selection of medicine, potency and repetition schedule

Each student shall maintain practical record or journal with record of five cases.

C. Examination:

The syllabus covered in First BHMS and Second BHMS course are the following, namely:-

1. Theory:

1.1.	Number of papers- 01	
1.2.	Marks: 100	
1.3.	Distribution of marks	
1.3.1.	Topics of I B.H.M.S.	50 Marks
1.3.2.	Topics of II B.H.M.S.	50 Marks

2. Practical including viva voce or oral

2.1.		Marks100
2.2	Distribution of marks	
2.2.1	Case taking and Case processing of one long case	30
2.2.2	Case taking of one short Case	10
2.2.3	Maintenance of Practical record or journal	10
2.2.4	Viva Voce (oral)	50
	Total	100

THIRD B.H.M.S

In addition to the syllabus of First and Second B.H.M.S. including the use of medicines for Second BHMS (Appendix-I), the following additional topics and medicines, are included in the syllabus of Homoeopathic materia medica for the Third B.H.M.S examination.

A. General Topics of Homoeopathic Materia Medica-

In addition to the syllabus of First and Second B.H.M.S. including the use of medicines, for Second BHMS (Appendix-I), the following additional topics and medicines are included in the syllabus of Homoeopathic Materia Medica for the Third B.H.M.S. Examination.

(a) Concept of Nosodes - definition of nosodes, types of nosodes, general indications of Nosodes.

(b) Concepts of constitution, temperaments, diathesis-

Definitions, various concepts of constitution with their peculiar characteristics, importance of constitution, temperaments and diathesis and their utility in treatment of patients.

B. Concept of mother tincture.

C. Homoeopathic medicines to be taught in Third B.H.M.S. as in Appendix-II

APPENDIX-II

1.	Acetic acid	40.	Graphites
2.	Actea spicata	41.	Helleborus niger
3.	Agaricus muscarius	42.	Hyoscyamus niger
4.	Agnus castus	43.	Ignatia amara
5.	Alumina	44.	Kali bichromicum
6.	Ambra grisea	45.	Kali bromatum
7.	Ammonium carbonicum	46.	Kali carbonicum
8.	Ammonium muriaticum	47.	Kreosotum
9.	Anacardium orientale	48.	Lachesis muta
10.	Apocynum cannabinum	49.	Moschus
11.	Arsenicum Iodatum	50.	Murex purpurea
12.	Asafoetida	51.	Muriatic acid
13.	Aurum metallicum	52.	Naja tripudians
14.	Baryta carbonica	53.	Natrum carbonicum
15.	Belladonna.	54.	Nitric acid
16.	Benzoic acid	55.	Nux moschata
17.	Berberis vulgaris	56.	Opium
18.	Bismuth	57.	Oxalic acid
19.	Borax	58.	Petroleum
20.	Bovista Iycoperdon	59.	Phosphoric acid
21.	Bromium	60.	Phosphorus
22.	Bufo rana	61.	Phytolacca decandra
23.	Cactus grandiflorus	62.	Picric acid
24.	Caladium seguinum	63.	Platinum metallicum

25.	Calcarea arsenicosa	64.	Podophyllum
26.	Camphora	65.	Secale cornutum
27.	Cannabis indica	66.	Selenium
28.	Cannabis sativa	67.	Sepia
29.	Cantharis vesicatoria	68.	Staphysagria
30.	Carbo vegetabilis	69.	Stramonium
31.	Chelidonium majus	70.	Sulphuric acid
32.	Conium maculatum	71.	Syphilinum
33.	Crotalus horridus	72.	Tabacum
34.	Croton tiglium	73.	Taraxacum officinale
35.	Cyclamen europaeum	74.	Tarentula cubensis
36.	Digitalis purpurea	75.	Terebinthina
37.	Dioscorea villosa	76.	Theridion
38.	Equisetum hyemale	77.	Thlaspi bursa pastoris
39.	Ferrum metallicum	78.	Veratrum album

Sr.No	Group studies
1	Acid group
2	Carbon group
3	Kali group
4	Ophidia group
5	Mercurius group
6	Spider group

D. Practical or clinical:

(1) This will cover,-

(a) Case taking of acute and chronic patients.

(b) Case processing including selection of medicine, potency and repetition schedule

(2) Each student shall maintain a journal having record, of ten (10) case takings.

E. Examination

1. Theory:

1.1.	Number of papers- 01
1.2.	Marks: 100
1.3.	Distribution of marks:
1.3.1.	Topics of Second B.H.M.S. - 50Marks
1.3.2.	Topics of Third B.H.M.S. - 50 Marks

2. Practical including viva voce or oral:

2.1.		Marks100
2.2	Distribution of marks	
2.2.1	Case taking and Case processing of one long case	30
2.2.2	Case taking of one short Case	10
2.2.3	Maintenance of Practical record or journal	10
2.2.4	Viva Voce (oral)	50
	Total	100

FOURTH B.H.M.S.

In addition to the syllabus of First, Second and. Third BHMS including the medicines taught as per the Appendices I and II, the following additional topics and medicines are included in the syllabus for the Fourth BHMS examination.

A. General topics of Homoeopathic materia medica - Sarcodes - definition and general indications.

B. Medicines indicated in Appendix-III shall be taught in relation to the medicines of -Appendices-I and II for comparison wherever required.

APPENDIX-III.

1.	Abies canadensis	62.	Capsicum
2.	Abies nigra	63.	Cedron
3.	Carbo animalis	64.	Eupatorium perfoliatum
4.	Carbolic acid	65.	Abroma augusta
5.	Condurango	66.	Calotropis gigantea
6.	Fluoricum acidum	67.	Carica papaya
7.	Hydrastis canadensis	68.	Cassia sophera
8.	Raphanus sativus.	69.	Ficus religiosa
9.	Magnesia carbonica	70.	Jonosia asoca
10.	Magnesia muriatica	71.	Justicia adhatoda
11.	Anthracinum	72.	Ocimum sanctum
12.	Bacillinum:	73.	Syzigium jambolanum
13.	Lac caninum	74.	Ratanhia peruviana
14.	Lac defloratum	75.	Collinsonia canadensis
15.	Lyssin	76.	Antimonium arsenicosum
16.	Medorrhinum	77.	Sticta pulmonaria
17.	Psorinum	78.	Asterias rubens
18.	Pyrogenium	79.	Iodium
19.	Vaccinium	80.	Thyroidinum
20.	Variolinum	81.	Argentum metallicum
21.	Hydrocotyle asiatica	82.	Cuprum metallicum
22.	Mezereum	83.	Plumbum metallicum
23.	Radium bromatum	84.	Zincum metallicum
24.	Urtica urens	85.	Adonis vernalis
25.	Vinca minor	86.	Kalmia latifolia
26.	Abrotanum	87.	Physostigma venenosum
27.	Rheum palmatum	88.	Mercurius corrosivus
28.	Sanicula aqua	89.	Mercurius cyanatus
29.	Acalypha indica	90.	Mercurius dulcis
30.	Corallium rubrum	91.	Mercurius solubilis
31.	Lobelia inflata	92.	Mercurius sulphuricus
32.	Mephitis putorius	93.	Causticum
33.	Rumex crispus	94.	Bacillus No, 7
34.	Sabadilla officinalis	95.	Dysentery co
35.	Sambucus nigra	96.	Gaertner
36.	Squilla maritima	97.	Morgan pure
37.	Baryta muriatica	98.	Morgan gaertner
38.	Crataegus oxyacantha	99.	Proteus bacillus

39.	Lithium carbonicum	100.	Sycotic bacillus
40.	Rauwolfia serpentina	Additional medicines	
41.	Caulophyllum	101.	Aesculus hippocastanum
42.	Cocculus indicus	102.	Adrenalinum
43.	Crocus sativus	103.	Artemesia vulgaris
44.	Helonias dioica	104.	Avena sativa
45.	Lilium tigrinum	105.	Blatta orientalis
46.	Sabina	106.	Carcinosin
47.	Trillium pendulum	107.	Carduus marianus
48.	Viburnum opulus	108.	Ceanothus
49.	Cicuta virosa	109.	Chininum arsenicosum
50.	Ranunculus bulbosus	110.	Cholesterinum
51.	Rhododendron chrysanthum	111.	Coca erythroxyton
52.	Clematis erecta	112.	Diphtherinum
53.	Sabal serrulata	113.	Erigeron canadensis
54.	Sarsaparilla officinalis	114.	Malandrinum
55.	Coffea cruda	115.	Menyanthes
56.	Glonoine	116.	Onosmodium
57.	Melilotus	117.	Passiflora incarnata
58.	Millefolium	118.	Ustilago maydis
59.	Sanguinaria canadensis	119.	Stannum metallicum
60.	Spigelia	120.	Valeriana officinalis
61.	Veratrum viride	121.	X-ray

Sr. No.	Group studies
1.	Baryta group
2.	Calcarea group
3.	Magnesia group
4.	Natrum group
5.	Compositae family
6.	Ranunculaceae family
7.	Solonaceae family

C. Practical or clinical:

Each student shall maintain a journal having record of ten (10) acute and ten(10) chronic case takings,

D. Examination:

1. Theory:

1.1.	Number of papers-02
2.1	Marks: 200
2.1.1	Distribution of marks:
2.1.2	Paper-I: Topics of First, Second and Third B.H.M.S. - 100 Marks
2.1.3	Paper-II Topics of IV B.H.M.S. - 100 Marks

2. Practical including viva voce or oral:

2.1.		Marks 200
2.2	Distribution of marks	
2.2.1	Case taking and Case processing of one long case	60
2.2.2	Case taking of one short Case	20
2.2.3	Maintenance of Practical record or journal	20
2.2.4	Viva Voce (oral)	100
	Total	200

ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY

Instructions for all classes from Ist BHMS to IVth BHMS.

- I(a) Organon of Medicine with Homoeopathic Philosophy is a vital subject which builds up the conceptual base of the physician.
- (b) It illustrates those principles which when applied in practice enable the physician to achieve results, which he can gain logically and rationally in medical practice with greater competence.
- (c) Focus of the education and training should be to build up the conceptual base of Homoeopathic Philosophy for use in medical practice.
- II Homoeopathy should be taught as a complete system of medicine with logical rationality of its holistic, individualistic and dynamistic approach to life, health, disease, remedy and cure and in order to achieve this, integration in the study of logic, psychology and the fundamentals of Homoeopathy becomes necessary.
- III (a) It is imperative to have clear grasp of inductive and deductive' logic, and its application and understanding of the fundamentals of Homoeopathy
- (b) Homoeopathic approach in therapeutics is a holistic approach and it demands a comprehension of patient as a person, disposition, state of his mind and body, along with the study of the disease process and its causes.
- (c) Since Homoeopathy lays great emphasis on knowing the mind, preliminary and basic knowledge of the psychology becomes imperative for a homoeopathic physician and introduction to psychology will assist the student in building up his conceptual base in this direction.
- IV The department of Organon of medicine shall co-ordinate with other departments where students are sent for the pre-clinical and clinical training and this will not only facilitate integration with other related departments, but also enhance the confidence of / the students when they will be attending specialty clinics.

ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY

FIRST B.H.M.S.

Instructions I to IV to be followed

A. Theory:

1. Introductory lectures

- 1.1. Evolution of medical practice of the ancients (Prehistoric Medicine, Greek Medicine, Chinese medicine, Hindu medicine and Renaissance) and tracing the empirical, rationalistic and vitalistic thoughts.
- 1.2. Short history of Hahnemann's life, his contributions, and discovery of Homoeopathy, situation leading to discovery of Homoeopathy
- 1.3. Brief life history and contributions of early pioneers of homoeopathy like C.V. Boenninghausen, J.T. Kent, C. Hering, Rajendra Lai Dutta, M.L. Sircar
- 1.4. History and Development of Homoeopathy in India, U.S.A. and European countries
- 1.5. Fundamental Principles of Homoeopathy.
- 1.6. Basic concept of:
 - 1.6.1. Health: Hahnemann's concept and modern concept.
 - 1.6.2. Disease: Hahnemann's concept and modern concept.
 - 1.6.3. Cure.
- 1.7. Different editions and constructions of Hahnemann's Organon of Medicine.

2. Logic

To understand Organon of medicine and homoeopathic philosophy, it is essential to be acquainted with the basics of LOGIC to grasp inductive and deductive reasonings.

Preliminary lectures on inductive and deductive logic (with reference to philosophy book of Stuart Close Chapter 3 and 16).

3. Psychology

3.1.	Basics of Psychology
3.2.	Study of behavior and intelligence.
3.3.	Basic concepts of Sensations
3.4.	Emotion, Motivation, Personality, Anxiety, Conflict, Frustration, Depression, Fear, Psychosomatic Manifestations
3.5.	Dreams.

4. Aphorisms 1 to 28 of Organon of medicine

5. Homoeopathic 'Prophylaxis

B. Examination: There shall be no examination in the subject in First B.H.M.S.

ORGANON OF MEDICINE WITH HOMOEOPATHIC PHYSIOPHY

SECOND B.H.M.S.

Instructions I to IV to be followed

A.Theory

1. Aphorisms 29-104 including foot notes of Organon Medicine(5 & 6thEditions translated by R.E. Dudgeon and W. Boericke)
2. Homoeopathic philosophy
 - 2.1. Chapters of Philosophy books of J.T. Kent (Chapters 1 to 17, 23 to 27, 31 to 33), Stuart Close (Chapters- 8, 9, 11, 12) and H.A. Roberts (Chapters 3, 4, 5, 6, 8, 9, 11, 17, 18, 19, 20) related to Aphorisms 29-104 of Organon of Medicine
 - 2.2. Symptomatology:
Details regarding Symptomatology are to be comprehended by referring to the relevant aphorisms of organon of medicine and chapters of the books on homoeopathic philosophy
 - 2.3. Causations:
Thorough comprehension of the evolution of disease, taking into account pre-disposing, exciting and maintaining causes.
 - 2.4. Case taking
The purpose of homoeopathic case taking is not merely collection of the disease symptoms from the patient, but comprehending the patient as a whole with the correct appreciation of the factors responsible for the genesis and maintenance of illness. Hahnemann's concept and method of case taking, as stated in his Organon of Medicine is to be stressed upon
 - 2.5. Case processing: This includes,
 - (i) Analysis of Symptoms,
 - (ii) Evaluation of Symptoms,
 - (iii) Miasmatic diagnosis,
 - (iv) Totality of symptoms

B. Practical or clinical:

1. Clinical posting of students shall be started from Second B.H.M.S onwards.
2. Each student shall maintain case records of at least ten acute cases

C. Examination:

1. Theory

1.1.	No. of papers -01
1.2.	Marks; 100
1.3.	Distribution of marks:
1.3.1.	Logic-15 marks
1.3.2.	Psychology-15 marks
1.3.3.	Fundamentals of homoeopathy and aphorisms 1 to 104 - 50 marks
1.3.4.	Homoeopathic philosophy- 20 marks

2. Practical including viva voce or oral:

2.1.		Marks100
2.2	Distribution of marks	
2.2.1	Case taking and Case processing	40
2.2.2	Maintenance of practical record or journal	10
2.2.4	Viva voce (oral)	50
2.2.4	Total	100

ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY

THIRD B.H.M.S.

Instructions I to IV to be followed

A. Theory:

In addition to revision of Aphorisms studied in First B.H.M.S and Second B.H.M.S, the following shall be covered, namely:-

1. Hahnemann's Prefaces and Introduction to Organon of Medicine.
2. Aphorisms 105 to 294 of Hahnemann's Organon of Medicine, including foot notes (5th and 6th Editions translated by R.E. Dudgeon and W. Boericke)
3. Chapters of Philosophy books of J.T. Kent (Chapters- 28,29; 30, 34to37), Stuart Close (Chapters- 7,10,13,14,15) & H.A. Roberts (Chapters- 7,10,12 to 19,21, 34) related to 105-294 Aphorisms of Organon of Medicine.

B. Practical or clinical:

Each student appearing for Third B H.MS examination shall maintain records of 20 cases (10 acute and 10 chronic cases).

C. Examination:

1. Theory:

1.1.	Number of papers - 01
1.2.	Marks: 100
1.3.	Distribution of Marks:
1.3.1.	Aphorisms 1 to 294 60 marks
1.3.2.	Homoeopathic philosophy: 40 marks

3. Practical including viva voce or oral:

2.1.		Marks100
2.2	Distribution of marks	
2.2.1	Case taking and Case processing	40
2.2.2	Maintenance of practical record or journal	10
2.2.4	Viva voce (oral)	50
2.2.4	Total	100

ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY

FOURTH B.H.M.S.

Instructions I to IV to be followed

A. Theory:

In addition to the syllabus of First B.H.M.S, Second B.H.M.S and Third B.H.M.S, the following shall be covered, namely:-

1. Evolution of medical practice of the ancients (Prehistoric Medicine, Greek Medicine, Chinese medicine, Hindu medicine and Renaissance) and tracing the empirical, rationalistic and vitalistic thoughts
2. Revision of Hahnemann's Organon of Medicine (Aphorisms 1-294) including footnotes (5th & 6th Editions translated by R.E. Dudgeon and W. Boericke).
3. Homoeopathic Philosophy
Philosophy books of Stuart Close (Chapters- 1, 2, 4, 5, 6, 8, 17), J.T. Kent (Chapters - 18 to 22) and H.A. Roberts (Chapters- 1 to 5, 20, 22 to 33, 35), Richard Hughes (Chapters-1 to 10) and C. Dunham (Chapters- 1 to 7).
4. Chronic Diseases:
 - 4.1. Hahnemann's Theory of Chronic Diseases.
 - 4.2. J.H. Allen's The Chronic Miasms - Psora and Pseudo-psora, Sycosis
 - (a) Emphasis should be given on the way in which each miasmatic state evolves and the characteristic expressions are manifested at various levels and attempt should be made to impart a clear understanding of Hahnemann's theory of chronic miasms.
 - (b) The characteristics of the miasms need to be explained in the light of knowledge acquired from different branches of medicine
 - (c) Teacher should explain clearly therapeutic implications of theory of chronic miasms in practice and this will entail a comprehension of evolution of natural disease from miasmatic angle, and it shall be-correlated with applied Materia Medica

B. Practical or clinical

- (a) The students shall maintain practical records of patients treated in the Out Patient Department and In Patient Department of the attached hospital.
- (b) The following shall be stressed upon in the case records, namely:
 - (1) receiving the case properly (case taking) without distortion of the of patient's expressions.
 - (2) nosological diagnosis.

- (3) analysis and evaluation of the symptoms, miasmatic diagnosis and portraying the totality of symptoms.
- (4) Individualisation of the case for determination of the similimum, prognosis, general management including diet and necessary restrictions on mode of life of the individual patients.
- (5) State of susceptibility to formulate comprehensive plan of treatment.
- (6) Order of evaluation of the characteristic features of the case would become stepping stone for the repertorial totality.
- (7) remedy selection and Posology.
- (8) Second prescription.

Note; (1) Each student has to maintain records of twenty thoroughly worked out cases (ten chronic and ten acute cases).

(2) Each student shall present at least one case in the departmental symposium or seminar.

C. Examination:

1. Theory

1.1.	Number of papers - 02
1.2.	Marks: Paper I: 100, Paper II: 100
1.3.	Distribution of marks:
	Paper I: Aphorisms 1-145:- 30 marks
	Aphorisms 146-294:- 70 marks
	Paper II; Chronic diseases - 50 marks
	Homoeopathic philosophy - 50 marks

2. Practical including viva voce or oral:

2.1.		Marks100
2.2	Distribution of marks	
2.2.1	Case taking and case processing of a long case	30
2.2.2	Case taking and case processing of a short case	10
2.2.3	Maintenance, of practical record, or journal	10
2.2.4	Viva Voce (oral)	50
	Total	100

PATHOLOGY

Instructions:

- I (a) Pathology and microbiology shall be taught in relation to the concept of miasms as evolved by Samuel Hahnemann and further developed by JT Kent, H.A. Robert, J.H. Allen and other stalwarts, with due reference to Koch's postulate, correlation with immunity, susceptibility and thereby emphasizing homoeopathic concept of evolution of disease and cure
- (b) Focus will be given on the, following points, namely: -
- (1) Pathology in relation with Homoeopathic Materia Medica.
 - (2) Correlation of miasms and pathology.
 - (3) Characteristic expressions of each miasm.
 - (4) Classification of symptoms and diseases according to pathology.
 - (5) Pathological findings of diseases, their interpretation, correlation and usage in the management of patients under homoeopathic treatment.
- (c) To summarise, all the topics in the general and systemic pathology and microbiology should be correlated each juncture, with homoeopathic principles so that the importance, of pathology in Homoeopathic system could be understood by the students.

A. Theory:

(a) General Pathology

1.	Cell Injury and cellular adaptation	15.	Regeneration
2.	Inflammation and repair (Healing).	16.	Hyperemia
3.	Immunity	17.	Infection
4.	Degeneration	18.	Pyrexia
5.	Thrombosis and embolism	19.	Necrosis
6.	Oedema	20.	Gangrene
7.	Disorders of metabolism	21.	Infarction
8.	Hyperplasia and hypertrophy	22.	Amyloidosis
9.	Anaplasia	23.	Hyperlipidaemia and lipidosis
10.	Metaplasia	24.	Disorders of pigmentation
11.	Ischaemia	25.	Neoplasia (Definition, variation in cell growth, nomenclature and taxonomy, characteristics of neoplastic cells, aetiology and pathogenesis, grading and staging, diagnostic approaches, interrelationship of tumor and host, course and management).
12.	Hemorrhage	26.	Calcification
13.	Shock	27.	Effects of radiation
14.	Atrophy	28.	Hospital infection

(b) Systemic pathology

In each system, the important and common diseases should be taught, keeping in view their evolution, aetio-pathogenesis, mode of presentation, progress and prognosis, namely:-

1. Mal-nutrition and deficiency diseases.
2. Diseases of Cardiovascular system
3. Diseases of blood vessels and lymphatics.
4. Diseases of kidney and lower urinary tract
5. Diseases of male reproductive system and prostate.
6. Diseases of the female genitalia and breast.
7. Diseases of eye, ENT and neck
8. Diseases of the respiratory system.
9. Diseases of the oral cavity and salivary glands.
10. Diseases of the G.I. system
11. Diseases of liver, gall bladder, and biliary ducts
12. Diseases of the pancreas (including diabetes mellitus)
13. Diseases of the haemopoetic system, bone marrow and blood
14. Diseases of glands-thymus, pituitary, thyroid, and parathyroid, adrenals, parotid.
15. Diseases of the skin and soft tissue.
16. Diseases of the musculo-skeletal system.
17. Diseases of the nervous system.
18. Leprosy

(c) Microbiology

(I) General Topics:

1. Introduction.
2. History and scope of medical microbiology.
3. Normal bacterial flora
4. Pathogenicity of micro-organisms
5. Diagnostic microbiology

(II) Immunology:

1. Development of immune system
2. The innate immune system
3. Non-specific defense of the host
4. Acquired immunity
5. Cells of immune system, T cells and cell mediated immunity; B cells and Humoral immunity.
6. The complement system.
7. Antigen, Antibody, Antigen - Antibody reactions (Anaphylactic and Atopic), Drug Allergies

8. Hypersensitivity
9. Immuno-deficiency.
10. Auto-immunity
11. Transplantation
12. Blood group antigens
13. Clinical aspect of immune-pathology.

(III) Bacteriology:

1. Bacterial structure, growth and metabolism.
2. Bacterial genetics and bacteriophage
3. Identification and cultivation of bacteria
4. Gram positive aerobic and facultative anaerobic cocci, e.g. Streptococci, Pneumococci.
5. Gram positive anaerobic cocci, e.g. peptostreptococci.
6. Gram negative aerobic cocci, e.g. neisseria, moraxella, kingella.
7. Gram positive aerobic bacilli, e.g. corynebacterium, bacillus anthrax, cereus subtitis, mycobacterium tuberculosis, M. leprae, actinomycetes; nocardia, organism of enterobacteriac group.
8. Gram positive anaerobic bacilli, e.g. genus clostridium, lactobacillus.
9. Gram negative anaerobic bacilli, e.g. bacteroides, fragilus, fusobacterium.
10. Others like- cholerae vibrio, spirochaetes, leptospirae, mycoplasma, chlamydiae, rickettsiae, yersinia and pasturella.

(IV) Fungi and Parasites:

1. Fungi -(1) True pathogens (cutaneous, sub-cutaneous and systemic infective agents), (2) Opportunistic pathogens.
2. Protozoa - (1) Intestinal (Entamoebahistoltylica, Giardia lamblia, Cryptosporidiumparvum), (2) Urogenital (Trichomonasvaginaiis) 3) Blood and Tissues (Plasmodium -species, Toxoplasma gondii, Trypanosoma species, Ieishmania species).
3. Helminths - (1) Cestodes (tapeworms)- Echinococcus granulosus, Taenia solium, Taenia saginata (2) Trematodes (Flukes): Paragonimuswestermani, Schistosomamansoni, Schistosomahaematobium (3) Nematodes- Ancylostoma duodenale, Ascaris lumbricoides, Enterobius, vermicularis, Strongyloides, Stercoralis, Trichuristrichiura, Brugiamalayi, Dracunculus medinensis, Loa loa, Onchocerca volvulus, Wuchereria bancroftii).

(V) Virology:

1. Introduction
2. Nature and classification of viruses.
3. Morphology and replication of viruses.
4. DMA viruses:
 - (i) parvo virus
 - (ii) herpes virus, varicella virus, CMV, EBV.
 - (iii) hepadna virus (hepatitis virus)
 - (iv) pox virus- variola virus, vaccinia virus, molluscumcontagiosum etc.
5. RNA viruses:
 - (a) orthomyxo virus:
 - (i) entero virus
 - (ii) rhino virus
 - (iii) hepato virus

(b) paramyxovirus- rubeola virus, mumps virus, Influenza virus etc.

(c) phabdo virus

(d) rubella virus (gentian measles)

(e) corona virus

(f) retro virus

(g) yellow fever virus

(h) dengue, Vhikungunya virus.

(i) Miscellaneous virus:

(i) arena virus

(ii) corona virus

(iii) rota virus

(iv) bacteriophages

(VI) Clinical microbiology: (1) Clinically important micro organisms (2) Immunoprophylaxis, (3) Antibiotic Sensitivity Test (ABST).

(VII) Diagnostic procedures in microbiology: (1) Examination of blood and stool (2) Immunological examinations (3) Culture methods (4) Animal inoculation.

(VIII) Infection and Disease: (I) Pathogenicity, mechanism and control (2) Disinfection and sterilization (3) Antimicrobial chemotherapy (4) Microbial Pathogenicity.

(d) Histopathology:

1. Teaching of histopathological features with the help of slides of common pathological conditions from each system.

1. Teaching of gross pathological specimens for each system.

2. Histopathological techniques, e.g. fixation, embedding, sectioning and staining by common dyes and stains.

3. Frozen sections and its importance.

4. Electron microscopy; phase contrast microscopy.

B. Practical or clinical;

(1) Clinical and Chemical Pathology: estimation of haemoglobin (by acidometer) count of Red Blood Cells and White Blood Cells, bleeding time, clotting time, blood grouping, staining of thin and thick films, differential counts, blood examination for parasites, erythrocyte sedimentation rate.

(2) Urine examination, physical, chemical microscopical, quantity of albumin and sugar.

(3) Examination of Faeces: physical, chemical (occult blood) and microscopical for ova and protozoa.

(4) Methods of sterilization, preparation of a media, use of microscope, gram and acid fast stains, motility preparation, gram positive and negative coed and bacilli, special stains for coryne bacterium gram and acid fast stains of pus and sputum.

(5) Preparation of common culture medias, e.g. nutrient agar, blood agar, Robertson's Cooked Meal media (RCM) and Mac conkey's media.

(6) Widal test demonstration.

(7) Exposure to latest equipment viz. auto-analyzer, cell counter, glucometer.

(8) Histopathology

(a) Demonstration of common slides from each system.

(b) Demonstration of gross pathological specimens.

(c) Practical or clinical demonstration of histopathological techniques, i.e. fixation, embedding.

(d) Sectioning, staining by common dyes and stain, frozen section and its importance

(e) Electron microscopy; phase contrast microscopy.

C. Examination:

1. Theory:

1.1	Number of papers – 02	
1.2	Marks: Paper I-100, Paper II-100	
1.3	Contents	
1.3.1	Paper-I: Section A- General Pathology	50 marks
	Section B- Systemic Pathology	50 marks

1.3.1. Paper-II: Section A-

Bacteriology	25 marks
Fungi and Parasites	25 marks

Section B-

Virology	20 Marks
Clinical Microbiology and Diagnostic procedure	10 Marks
Microbiological control and mechanism of Pathogenicity	10 Marks
General Topics Immuno-pathology	10 Marks

2. Practical including viva voce or oral:

2.1.		Marks 100
2.2	Distribution of marks	
2.2.1	Practical	15
2.2.2	Spotting	20 (4 spotting)
2.2.3	Histopathological slides	10 (2 slides)
2.2.4	Journal or practical record	05
2.2.5.	Viva voce (oral)	50
	Total	100

(Including 5 marks for interpretation of routine pathological reports)

FORENSIC MEDICINE AND TOXICOLOGY

Instructions:

(a) Medico-legal examination is the statutory duty of every registered medical practitioner, whether he is in private practice or engaged in Government sector and in the present scenario of growing consumerism in medical practice, the teaching of Forensic Medicine and Toxicology to the students is highly essential.

(b) This learning shall enable the students to be well-informed about medico-legal responsibility in medical practice and he shall also be able to make observation and infer conclusion by logical deduction to set enquire on the right track in criminal matters and connected medico-legal problems.

(c) The students shall also acquire knowledge of laws in relation to medical practice medical negligence and code of medical ethics and they shall also be capable of identification, diagnosis and treatment of the common poisonings in their acute and chronic state and also dealing with their medico-legal aspects.

(d) For such purposes, students shall be taken to visit district court and hospitals to observe court proceedings and post-mortem as per Annexure 'B'.

I. Forensic Medicine

A. Theory:

1. Introduction

- (a) Definition of forensic medicine
- (b) History of forensic medicine in India. -
- (c) Medical ethics and etiquette.
- (d) Duties of registered medical practitioner in medico-legal cases.

2. Legal procedure

- (a) Inquests, courts in India, legal procedure.
- (b) Medical evidences in courts, dying declaration, dying deposition, including medical certificates, and medico-legal reports.

3. Personal identification

- (a) Determination of age and sex in living and dead; race, religion.
- (b) Dactylography, DNA finger printing, foot print.
- (c) Medico-legal importance of bones, scars and teeth, tattoo marks, handwriting, anthropometry.
- (d) Examination of biological stains and hair.

4. Death and its medico-legal importance

- (a) Death and its types, their medico-legal importance
- (b) Signs of death (1) immediate, (2) early, (3) late and their medico-legal importance
- (c) Asphyxial death (mechanical asphyxia and drowning).
- (d) Deaths from starvation, cold and heat etc.

5. Injury and its medico-legal importance

Mechanical, thermal, firearm, regional, transportation and traffic injuries; injuries from radiation, electrocution and lightning.

6. Forensic psychiatry

- (a) Definition, delusion, delirium, illusion, hallucinations; impulse and mania, classification of Insanity.
- (b) Development of insanity, diagnosis, admission to mental asylum.

7. Post-mortem examination (autopsy)

- (a) Purpose, procedure, legal bindings; difference between pathological and medico-legal autopsies.
- (b) External examination, internal examination of adult, foetus and skeletal remains.

8. Impotence and sterility

Impotence, Sterility, Sterilization, Artificial Insemination, Test Tube Baby, Surrogate mother.

9. Virginity, defloration; pregnancy and delivery.

10. Abortion and infanticide;

- (a) Abortion: different methods, complication, accidents following criminal abortion, MTP.
- (b) Infant death, legal definition, battered baby syndrome, cot death, legitimacy.

11. Sexual Offences

Rape, incest, sodomy, sadism, masochism, tribadism, bestiality, buccal coitus and other sexual perversions.

II. Toxicology

1. General Toxicology

- (a) Forensic Toxicology and Poisons
- (b) Diagnosis of poisoning in living and dead,
- (c) General principles of management of poisoning,
- (d) Medico-legal aspects of poisons,
- (e) Antidotes and types.

2. Clinical toxicology

- (a) Types of Poisons:
 - (i) Corrosive poisons (Mineral acids, Caustic alkalis, Organic acids, Vegetable acids).
 - (ii) Irritant poisons (Organic poisons - Vegetable, and animal; Inorganic poisons - metallic and non-metallic, Mechanical poisons)
 - (iii) Asphyxiant poisons (Carbon monoxide, Carbon dioxide, Hydrogen sulphide and some war gases).
 - (iv) Neurotic poisons (Opium, Nux vomica, Alcohol, Fuels like kerosene and petroleum products, Cannabis indica, Dhatura, Anaesthetics, Sedatives and Hypnotics, Agrochemical compounds, Belladonna, Hyoscyamus, Curare, Conium)
 - (v) Cardiac poisons (Digitalis purpurea, Oleander, Aconite, Nicotine)
 - (vi) Miscellaneous poisons (Analgesics and Antipyretics, Antihistamines, Tranquillizers, antidepressants, Stimulants, Hallucinogens, Street drugs etc.)

III. Legislations relating to medical profession

- (a) the Homoeopathy Central Council Act, 1973 (59 of 1973);
- (b) the Consumer Protection Act, 1986 (68 of 1986);
- (c) the Workmen's compensation Act, 1923 (8 of 1923);
- (d) the Employees State Insurance Act, 1948 (34 of 1948);
- (e) the Medical Termination of Pregnancy Act, 1971 (34 of 1971);
- (f) the Mental Health Act, 1987 (14 of 1987)
- (g) the Indian Evidence Act, 1872 (1 of 1872);
- (h) the Prohibition of Child Marriage Act, 2006 (6 of 2007);
- (i) the Personal Injuries Act, 1963 (37 of 1963)
- (j) the Drugs and Cosmetics Act, 1940 (23 of 1940) and the rules made therein;
- (k) the Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954 (21 of 1954);
- (l) the Transplantation of Human Organs Act, 1994 (42 of 1994);
- (m) the Pre-natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994 (57 of 1994);
- (n) the Homoeopathic Practitioners (Professional Conduct, Etiquette and Code of Ethics) Regulations, 1982;
- (o) the Drugs Control Act, 1950 (26 of 1950);
- (p) the Medicine and Toiletry Preparations (Excise Duties) Act, 1955 (16 of 1955);
- (q) the Indian Penal Code (45 of 1860) and the Criminal Procedure Code (2 of 1974) {relevant provisions}
- (r) the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 (1 of 1996);
- (s) The Clinical Establishment (Registration and Regulation) Act, 2010 (23 of 2010).

B. Practical:

1. Demonstration:

- (a) Weapons
- (b) Organic and inorganic poisons
- (c) poisonous plants
- (d) Charts, diagrams, photographs, models, x-ray films of medico-legal importance
- (e) Record of incidences reported in newspapers or magazines and their explanation of medico-legal importance.
- (f) Attending demonstration of ten medico-legal autopsies.

2. Certificate Writing

Various certificates like sickness certificate, physical fitness certificate, birth certificate, death certificate, injury certificate, rape certificate, chemical analyzer (Regional Forensic Laboratory), certificate for alcohol consumption, writing post-mortem examination report.

C. Examination:

1. Theory:

1.1.	Number of papers	01
1.2.	Marks	100

2. Practical including viva voce or oral:

2.1.	Practical including viva or oral	Marks 100
2.2	Distribution of marks	
2.2.1	Medico-legal aspect of 4 specimens	40
2.2.2	Journal or practical records	10
2.2.3	Viva voce/(oral)	50
	Total	100

SURGERY

Instructions:

- I. (a) Homoeopathy as a science needs clear application on part of the physician to decide about the best course of action(s) required to restore the sick, to health.
- (b) Knowledge about surgical disorders is required to be grasped so that the Homoeopathic Physician is able to:-
 - (1) Diagnose common surgical conditions.
 - (2) Institute homoeopathic medical treatment wherever possible.
 - (3) Organise Pre and Post-operative Homoeopathic medicinal care besides surgical intervention with the consent of the surgeon.
- II. For the above conceptual clarity and to achieve the aforesaid objectives, an effective co-ordination between the treating surgeons and homoeopathic physicians is required keeping in view the holistic care of the patients and it will also facilitate the physician in individualizing the patient, necessary for homoeopathic treatment and management.
- III. The study shall start in Second B.H.M.S. and complete Third B.H.M.S. and examination shall be conducted in Third B.H.M.S.
- IV. (a) Following is a plan to achieve the above and it takes into account about the Second and Third year B.H.M.S. syllabus and respective stage of development.
- (b) Throughout the whole period of study, the attention of the students should be directed by the teachers of this subject to the importance of its preventive aspects.
- V. There shall be periodical inter-departmental seminars, to improve the academic knowledge, skill and efficiency of the students and the study shall include training on,-
 - (a) Principles of surgery,
 - (b) Fundamentals of examination of a patient with surgical problems
 - (c) Use of common instruments for examination of a patient.
 - (d) Physiotherapy measures.
 - (e) Applied study of radio-diagnostics.
 - (f) Knowledge of causation, manifestations, management and prognosis of surgical disorders.
 - (g) Miasmatic background of surgical disorders, wherever applicable.
 - (h) Bedside clinical procedures.
 - (i) Correlation of applied aspects, with factors which can modify the course of illness, including application of medicinal and non-medicinal measures.
 - (j) Role of homoeopathic treatment in pseudo-surgical and true surgical diseases.

SECOND B.H.M.S.

A. Theory:

(a) General Surgery

1. Introduction to surgery and basic surgical principles.
2. Fluid, electrolytes and acid-base balance.
3. Haemorrhage, haemostasis and blood transfusion.
4. Boil, abscess, carbuncle, cellulitis and erysipelas.
5. Acute and chronic infections, tumors, cysts, ulcers, sinus and fistula.
6. Injuries of various types; preliminary management of head injury
7. Wounds, tissue repair, scars and wound infections.
8. Special infections (Tuberculosis, Syphilis, Acquired Immuno Deficiency Syndrome, Actinomycosis, Leprosy).
9. Burn
10. Shock
11. Nutrition
12. Pre-operative and post-operative care.
13. General management, surgical management and homoeopathic therapeutics of the above topics will be covered.

Examination: There will be no examination in the subject in Second B.H.M.S.

THIRD B.H.M.S.

A. Theory:

(b) Systemic Surgery:-

1. Diseases of blood vessels, lymphatics and peripheral nerves
2. Diseases of glands
3. Diseases of extremities
4. Diseases of thorax and abdomen
5. Diseases of alimentary tract
6. Diseases of liver, spleen, gall bladder and bile duct.
7. Diseases of abdominal wall, umbilicus, hernias.
8. Diseases of heart and pericardium.
9. Diseases of urogenital system.
10. Diseases of the bones, cranium, vertebral column, fractures and dislocations.
11. Diseases of the joints.
12. Diseases of the muscles, tendons and fascia.

B. Ear -

1. Applied anatomy and applied physiology of ear
2. Examination of ear
3. Diseases of external, middle and inner ear

C. Nose

1. Applied anatomy and physiology of nose and paranasal sinuses.
2. Examination of nose and paranasal sinuses
3. Diseases of. nose and paranasal sinuses

D. Throat

1. Applied Anatomy and applied Physiology of pharynx, larynx, tracheobronchial tree, oesophagus
2. Examination of pharynx, larynx, tracheobronchial tree, oesophagus
3. Diseases of Throat (external and internal)
4. Diseases of oesophagus.

E. Ophthalmology

1. Applied Anatomy, Physiology of eye
2. Examination of eye.
3. Diseases of eyelids, eyelashes and lacrimal drainage system.
4. Diseases of Eyes including injury related problems.

F. Dentistry

1. Applied anatomy, physiology of teeth and gums;
2. Milestones related to teething.
3. Examination of Oral cavity.
4. Diseases of gums
5. Diseases of teeth
6. Problems of dentition

General management, surgical management and homoeopathic therapeutics of the above topics will be covered. Practical or clinical: (To be taught in Second and Third B.H.M.S.)

1. Every student shall prepare and submit twenty complete histories of surgical cases, ten each in the Second and Third B.H.M.S. classes respectively.
2. Demonstration of surgical Instruments, X-rays, specimens etc.
3. Clinical examinations in Surgery.

4. Management of common surgical procedures and emergency procedures as stated below:

- (a) Wounds
- (b) Abscesses: incision and drainage.
- (c) Dressings and plasters.
- (d) Suturing of various types.
- (e) Pre-operative and post-operative care.
- (f) Management of shock.
- (g) Management of acute haemorrhage.
- (h) Management of acute injury cases.
- (i) Preliminary management of a head Injury case.

Examination:

It will be conducted in Third B.H.M.S (not in Second B.H.M.S.).

1. Theory:

1.1.	Number of papers-02
1.2.	Marks: Paper I-100, Paper II-100

1.3. Contents:

1.3.1. Paper-I:

Section -1- General Surgery	50 marks
Section -2 - Homoeopathic Therapeutics related to General Surgery	50 marks

1.3.2. Paper-II

Section-1-Systemic Surgery	25 marks
(i) ENT	10 marks
(ii) Ophthalmology	10 marks
(iii) Dentistry	05 marks
Section-2: - Homoeopathic Therapeutics related to Systemic Surgery	25 marks
(i) ENT Homoeopathic Therapeutics	10 marks
(ii) Ophthalmology Homoeopathic Therapeutics	10 marks
(iii) Dentistry Homoeopathic Therapeutics	05 marks

2. Practical including viva voce or oral:

2.1.		Marks 200
2.2	Distribution of marks	
2.2.1	One long case	40
2.2.2	Identification of instruments, X-rays	30
2.2.3	Practical records, case records or journal	30
2.2.4.	Viva voce (oral)	100
	Total	200

GYNAECOLOGY AND OBSTETRICS

Instructions:

- I. (a) Homoeopathy adopts the same attitude towards this subject as it does towards Medicine and Surgery, but while dealing with Gynaecology and Obstetrical cases, a Homoeopathic physician must be trained in special clinical methods of investigation for diagnosing local conditions and individualizing cases, the surgical intervention either as a life saving measure or for removing mechanical obstacles, if necessary, as well as their management by using homoeopathic medicines and other auxiliary methods of treatment.
- (b) Pregnancy is the best time to eradicate genetic dyscrasias in women and this should be specially stressed and students shall also be instructed in the care of new born.
- (c) The fact that the mother and child form a single biological unit and that this peculiar close physiological relationship persists for at least the first two years of the child's life should be particularly emphasized.
- II. A course of instructions in the principles and practice of gynaecology and obstetrics and infant hygiene and care including the applied anatomy and physiology of pregnancy and labour, will be given.
- III. Examinations and investigations in gynecological and obstetrical cases shall be stressed and scope of homoeopathy in this subject shall be taught in details.
- IV. The study shall start in Second B.H.M.S and shall be completed in Third B.H.M.S. and examinations will be held in Third B.H.M.S and following topics shall be taught, namely:-

SECOND B.H.M.S.

A. Theory:

1. Gynaecology

- (a) A review of the applied anatomy of female reproductive systems-development and malformations.
- (b) A review of the applied physiology of female reproductive systems-puberty, menstruation and menopause.
- (c) Gynecological examination and diagnosis.
- (d) Developmental anomalies.
- (e) Uterine displacements.
- (f) Sex and intersexuality.
- (g) General Management and therapeutics of the above listed topics in Gynaecology.

2. Obstetrics

- (a) Fundamentals of reproduction
- (b) Development of the intrauterine pregnancy-placenta and foetus.
- (c) Diagnosis of pregnancy-investigations and examination.
- (d) Antenatal care.
- (e) Vomiting in pregnancy.
- (f) Preterm labour and post maturity.
- (g) Normal labour and Puerperium.
- (h) Induction of labour.
- (i) Postnatal and puerperal care.
- (j) Care of the new born.
- (k) Management and therapeutics of the above listed topics in obstetrics.

THIRD B.H.M.S

1. Gynaecology

- (a) Infections and ulcerations of the female genital organs.
- (b) Injuries of the genital tract.
- (c) Disorders of menstruation.
- (d) Menorrhagia and dysfunctional uterine bleeding.
- (e) Disorders of female genital tract.
- (f) Diseases of breasts.
- (g) Sexually transmitted diseases.
- (h) Endometriosis and adenomyosis.
- (i) Infertility and sterility.
- (j) Non-malignant growths.
- (k) Malignancy.
- (l) Chemotherapy caused complications.
- (m) Management and therapeutics of the above listed topics in gynecology.

2. Obstetrics

- (a) High risk labour, mal-positions and mal-presentations, twins, prolapse of cord and limbs, abnormalities in the action of the uterus, abnormal conditions of soft part contracted pelvis, obstructed labour, complications of 3rd stage of labour, injuries of birth canal, fetal anomalies.
- (b) Abnormal pregnancies-abortion, molar pregnancy, diseases of placenta and membranes, toxemia of pregnancy, ante partum hemorrhages, multiple pregnancy, protracted gestation, ectopic pregnancy, intrauterine growth retardation, pregnancy in Rh negative woman, intrauterine fetal death, still birth;
- (c) Common disorders and systemic diseases associated with pregnancy.
- (d) Pre-natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994.
- (e) Common obstetrical operations-medical termination of pregnancy, criminal abortion, caesarean section, episiotomy.
- (f) Emergency obstetric care.
- (g) Population dynamics and control of conception;
- (h) Infant care - Neonatal hygiene, Breast feeding, Artificial feeding, Management of premature child, Asphyxia, Birth injuries, Common disorders of newborn.
- (i) Reproductive and child health care (a) safe motherhood and child survival (b) Risk approach - MCH care (c) Maternal mortality-and morbidity:'. (d) Perinatal mortality and morbidity (e) Diseases of foetus and newborn.
- (j) Medico-legal aspects in obstetrics.
- (k) Homoeopathic Management and Therapeutics of the above listed clinical Conditions in Obstetrics.

B. Practical or clinical:

Practical or clinical classes shall be taken on the following topics both In Second and Third B.H.M.S.

- (a) Gynaecological case taking
- (b) Obstetrical case taking
- (c) Gynaecological examination of the patient
- (d) Obstetrical examination of the patient including antenatal, intranatal and post- natal care
- (e) Bed side-training
- (f) Adequate grasp over Homoeopathic principles and management
- (g) Identification of Instruments arid models.

Record of ten cases each in gynaecology and obstetrics.

C.Examination:

1. Theory:.

1.1.	Number of papers - 02
1.2.	Marks: Paper 1-100, Paper 11-100
1.3.	Contents:
1.3.1.	Paper –I: Gynaecology and homoeopathic therapeutics
1.3.2.	Paper-II: Obstetrics, infant care and homoeopathic therapeutics

2. Practical including viva voce or oral:

2.1.		Marks 200
2.2	Distribution of marks	
2.2.1	One long case	30
2.2.2	Practical records, case records, journal	30
2.2.3	Identification of instruments, models and specimens	40
2.2.4.	Viva voce (oral)	100
	Total	200

PRACTICE OF MEDICINE

Instructions:

- I. (a) Homoeopathy has a distinct approach to the concept of disease.
- (b) It recognizes an ailing individual by studying him as a whole rather than in terms of sick parts and emphasizes the study of the man, his state of health, state of illness.
- II. The study of the above concept of individualization is essential with the a following background so that the striking features which are characteristic to the individual become clear, in contrast to the common picture of the respective disease conditions, namely:-
- (1) Correlation of the disease conditions with basics of anatomy, physiology and, biochemistry and pathology.
 - (2) Knowledge of causation, manifestations, diagnosis (including differential, diagnosis), prognosis and management of diseases,
 - (3) Application of knowledge of organon of medicine and homoeopathic philosophy in dealing with the disease conditions.
 - (4) Comprehension of applied part.
 - (5) Sound clinical training at bedside to be able to apply the knowledge and clinical skill accurately.
 - (6) Adequate knowledge to ensure that rational investigations are utilised.
- III. (a) The emphasis shall be on study of man in respect of health, disposition, diathesis, disease, taking all predisposing and precipitating factors, i.e. fundamental cause, maintaining cause and exciting cause;
- (b) Hahnemann's theory of chronic miasms provides us an evolutionary understanding of the chronic diseases: psora, sycosis, syphilis and acute manifestations of chronic diseases and evolution of the natural disease shall be comprehended in the light of theory of chronic miasms.
- IV. (a) The teaching shall include homoeopathic therapeutics or management in respect of all topics and clinical methods of examination of patient as a whole will be given due-stress during the training.
- (b) A thorough study of the above areas will enable a homoeopathic physician to comprehend the practical aspects of medicine.
- (c) He shall be trained as a sound clinician with adequate ability of differentiation, sharp observation and conceptual clarity about diseases by taking help of all latest diagnostic techniques, viz. X-ray, ultrasound, electrocardiogram, and commonly performed laboratory investigations.
- (d) Rational assessment of prognosis and general management of different disease conditions are also to be focused.
- V. Study of subject. - The study of the subject will be done in two years in Third B.H.M.S and Fourth B.H.M.S, but examination shall be conducted at the end of Fourth B.H.M.S.

Syllabus & Marks Distribution IIIrd BHMS

Theory:

1. Applied anatomy and applied physiology of the respective system as stated below.
2. Respiratory diseases.
3. Diseases of digestive system and peritoneum.
4. Diseases concerning liver, gall-bladder and pancreas.
5. Genetic Factors (co-relating diseases with the concept of chronic miasms).
6. Immunological factors in diseases with concept of susceptibility (including HIV, Hepatitis-B)
7. Disorders due to chemical and physical agents and to climatic and environmental factors.
8. Knowledge of clinical examination of respective systems.
9. Water and electrolyte balance - disorders of.

Sr. No	Topics	Must Know	Desirable to Know	Nice to Know
I	Respiratory Diseases			
1	Upper respiratory tract infections	Definition, Etiopathogenesis, C/F, Investigations, D/D & Hom therapeutics		Rhinoscopy
2	Bronchial Asthma	Definition, Etiopathogenesis, Pathology, C/F, Investigations, D/D & Hom therapeutics	Pulmonary Function test	
3	Chronic Obstructive Lung Disease	Definition, Etiopathogenesis, Pathology, C/F, Investigations, D/D, Complications & Hom therapeutics		
4	Pneumonia	Definition, Etiopathogenesis, Pathology, Types, C/F, Investigations, D/D, Complications & Hom therapeutics		
5	Bronchiectasis	Definition, Etiology, Pathology, C/F, Investigations & Hom therapeutics	D/D	
6	Lung abscess	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom therapeutics	D/D	
7	Pulmonary Tuberculosis	Definition, Etiopathogenesis, C/F, D/D, Diagnosis, Complications & Hom therapeutics		Epidemiology
8	Tropical pulmonary eosinophilia	Definition, Etiopathogenesis, C/F, D/D, Diagnosis, Complications & Hom		Epidemiology

		therapeutics		
9	Occupational Lung Disorders	Definition, Etiopathogenesis, C/F, Diagnosis & Hom therapeutics	D/D & Complications	
10	Sarcoidosis		Definition, Etiopathogenesis, C/F, D/D, Diagnosis, Complications & Hom therapeutics	
11	Pulmonary Thromboembolism	Definition, Etiopathogenesis, C/F, Diagnosis, Complications & Hom therapeutics	D/D & General manamangement	
12	Pleurisy & Pleural Effusion	Definition, Etiopathogenesis, C/F, D/D, Diagnosis, Complications & Hom therapeutics		Pleural Tapping
13	Pneumothorax	Definition, Etiopathogenesis, C/F, D/D, Diagnosis, Complications & Hom therapeutics	General management	Surgical management
14	Bronchial carcinomas	Definition, Etiology, Pathology, C/F, D/D, Diagnosis, Complications & Hom therapeutics		
15	Interstitial lung diseases		Definition, Etiopathogenesis, C/F, D/D, Diagnosis, Complications & Hom therapeutics	
16	Cystic fibrosis of lung			Basics/Associated syndromes.
II	Diseases of Digestive System & Peritoneum			
1	Disorders of Mouth & Salivary glands	Definition, Etiopathogenesis, C/F, D/D, Diagnosis, Complications & Hom therapeutics		Imaging studies
2	Esophageal disorders(GERD, ACHLASIA)		Definition, Etiopathogenesis, C/F, D/D, Diagnosis, Complications & Hom therapeutics	Dietary management
3	Peptic Ulcers	Definition, Etiopathogenesis, Pathology, Types, C/F, Investigations, Complications, D/D, General management & Hom therapeutics	Dietary management	Endoscopic changes, & Surgical management
4	Gastritis	Definition, Etiopathogenesis, Pathology, Types, C/F, Investigations, Complication, D/D, General management & Hom therapeutics	Dietary management	Endoscopic changes

5	GI Bleeding		Causes, Manifestations, D/D, Complications & Hom therapeutics	
6	Diarrhoea	Definition, Etiopathogenesis, C/F, Investigations, Complications, General management & Hom therapeutics	Dietary management	Endoscopic changes & Sigmoidoscopy
7	Constipation	Definition, Etiopathogenesis, C/F, Investigations, Complications, General management & Hom therapeutics	Dietary management	Endoscopic changes & Sigmoidoscopy
8	Malabsorption Syndrome		Definition, Etiopathogenesis, Pathology, Types, C/F, Investigations, Complication, D/D, General management & Hom therapeutics	Intestinal Biopsy & Dietary management
9	Irritable Bowel Syndrome	Definition, Etiopathogenesis, C/F, Investigations, Complication, D/D, General management & Hom therapeutics	Dietary management	
10	Inflammatory Bowel Diseases	Definition, Etiopathogenesis, Pathology, Types, C/F, Investigations, Complications, D/D & Hom therapeutics	Dietary management	Sigmoidoscopy
11	Abdominal Tuberculosis		Definition, Etiopathogenesis, Pathology, C/F, Investigations, Complications, D/D & Hom therapeutics	
12	Peritonitis	Definition, Etiopathogenesis, C/F, Investigations, Complications, D/D & Hom therapeutics		Enzyme study
13	Neoplasia of the bowel	Definition, Etiology, Pathology, Types, C/F, Investigations, Complications, D/D & Hom therapeutics		Imaging studies
14	Anorectal disorders		Definition, Etiology, Pathology, C/F, Investigations, Complications, D/D & Hom therapeutics	
15	Diverticulitis		Definition, Etiopathogenesis, C/F, Investigations,	

			Complications, D/D & Hom therapeutics	
III	Diseases concerning Liver, Gall-bladder & Pancreas			
1	Viral Hepatitis	Definition, Etiopathogenesis, C/F, Investigations, Complications, D/D & Hom therapeutics		Serological studies
2	Alcoholic Liver Diseases	Definition, Causes, Types, Pathology, C/F, Investigations, Complications, D/D & Hom therapeutics		Liver transplantation
3	Cirrhosis of Liver	Definition, Causes, Types, Pathology, C/F, Investigations, Complications D/D & Hom therapeutics		Histological changes
4	Portal Hypertension	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom therapeutics		
5	Liver Failure		Definition, Etiopathogenesis, C/F, Invest, Complications & Hom Therapeutics	Liver transplantation
6	Liver abscess		Definition, Causes, Pathology, C/F, Investigations, Complications & Hom therapeutics	
7	Gallstones	Definition, Etiopathogenesis, C/F, D/D, Investigations, Complications & Hom therapeutics		
8	Cholecystitis		Definition, Etiopathogenesis, C/F, D/D, Investigations, Complications & Hom therapeutics	
9	Pancreatitis		Definition, Etiopathogenesis, Types, C/F, Investigations, Complications, D/D & Hom therapeutics	
10	LFT	Reference ranges and interpretations.		
11	Ascites	Definition, Etiopathogenesis, C/F, D/D, Investigations, Complications & Hom therapeutics		
12	Pregnancy and Liver			Consequences

	Diseases			
13	Parasitic Diseases of the Liver		Types, Etiopathogenesis, Pathology, C/F, Diagnosis, prognosis, Hom therapeutics	Diagnostics and treatment
14	Inherited Metabolic Disorder of the Liver		Types, Causes, Pathology, C/F, Diagnosis, Prognosis & Hom therapeutics	
15	Hepatocellular carcinoma	Types, Etiology, Pathology, C/F, Diagnosis, Prognosis & Hom therapeutics		
IV	Genetic factors(co-relating diseases with concept of chronic miasms)			
1	Down's Syndrome	Definition, Causes, C/F & Diagnosis	Concept of Miasm & Hom Therapeutics.	Scope & limitations of Hom & Genetic Testing/ counselling
2	Turner's & Klinfilter's Syndrome	Definition, Causes C/F & Diagnosis	Concept of Miasm & Hom Therapeutics.	Scope & limitations of Hom & Genetic Testing/ counselling
3	Cystic fibrosis Huntington's disease & Marfan's syndrome		Etiopathogenesis, C/F, Diagnosis, Concept of Miasm & Hom therapeutics.	Scope & limitations of Hom & Genetic Testing/ counselling
4	Poly cystic kidney disease		Etiopathogenesis, C/F & Diagnosis, Concept of Miasm & Hom therapeutics.	Scope & limitations of Hom & Genetic Testing/ counselling
V	Immunological factors in disease with concept of susceptibility (Including HIV, Hepatitis-B)			
1	Homoeopathic relation of immunity & Susceptibility	Homoeopathic relation of immunity & Susceptibility		
2	Hypersensitivity reactions	Types & manifestations of Hypersensitivity reactions		
3	Autoimmune diseases		Types & manifestations of Autoimmune diseases	Autoantibody studies
4	HIV	Etiopathogenesis, C/F, Complications & Diagnosis with miasmatic & Homoeopathic management		
5	Hepatitis-B	Etiopathogenesis, C/F, Complications & Diagnosis with miasmatic & Homoeopathic management		
6	Transplantations			Basic

				considerations and host tissue defences.
VI	Disorders due to Chemical & Physical agents & to Climatic & environmental factors			
1	Diseases due to Chemical & Physical agents		Etiopathogenesis & Manifestations of diseases due to Chemical & Physical agents	
2	Disease due to Climatic & Environmental factors		Etiopathogenesis & Manifestations of disease due to Climatic & Environmental factors	
VII	Water & Electrolyte balance – disorders of			
1	Hypo & Hypernatraemia	Causes, Manifestations, Diagnosis General management & Hom Therapeutics		Scope & Limitations of Homoeopathy
2	Hypo & Hyperkalaemia	Causes, Manifestations, Diagnosis General management & Hom Therapeutics		Scope & Limitations of Homoeopathy
3	Hypo & Hyperphosphataemia		Causes, Manifestations, Diagnosis, General management & Hom Therapeutics	Scope & Limitations of Homoeopathy
4	Metabolic Acidosis & Alkalosis	Causes, Manifestations, Diagnosis, General management & Hom Therapeutics		
5	Respiratory Acidosis & Alkalosis	Causes, Manifestations, Diagnosis, General management & Hom Therapeutics		

SYLLABUS & MARKS DISTRIBUTION IVTH BHMS

A Theory:

1. Nutritional and metabolic diseases
2. Diseases of haemopoietic system.
3. Endocrinal diseases.
4. Infectious diseases.
5. Diseases of cardiovascular system.
6. Diseases of urogenital Tract.
7. Disease of CNS and peripheral nervous system.
8. Psychiatric disorders.
9. Diseases of locomotor system (connective tissue, bones and joints disorders)
10. Diseases of skin and sexually transmitted diseases.
11. Tropical diseases.
12. Paediatric disorders.
13. Geriatric disorders.
14. Applied anatomy and applied physiology of different organ and systems relating to specific diseases.
15. Knowledge of clinical examination of respective systems.
 - (a) General management and homoeopathic therapeutics for all the topics to be covered in Third B.H.M.S and Fourth B.H.M.S shall be taught simultaneously and the emphasis shall be on study of man in respect of health, disposition, diathesis, disease, taking all predisposing and precipitating factors, i.e. fundamental cause, maintaining cause and exciting cause.
 - (b) Study of therapeutics does not mean simply list of specifics for the clinical conditions but teaching of applied materia medica which shall be stressed upon.

Sr No	Topics	Must Know	Desirable to Know	Nice to Know
I	Nutritional & Metabolic Diseases			
1	Protein Energy Malnutrition	Definition, Etiopathogenesis, Types, C/F, Investigations & Hom Therapeutics.	Complications	Dietary management
2	Fat soluble vitamins	C/F of Deficiency and Hypervitaminosis & Diagnosis.	Daily requirement & Role of Hom in deficiency disorders	
3	Water Soluble vitamins	C/F of Deficiency and Hypervitaminosis & Diagnosis.	Daily requirement & Role of Hom in deficiency disorders	
4	Obesity	Types, Complications & Hom management	Nutritional Assessment	
5	Wilson's disease/Haemochrom		Definition, Etiopathogenesis, C/F,	Copper metabolism&

	atosis/ porphyrias.		Investigations & Complications	Iron metabolism
6	Amyloidosis		Definition, Etiopathogenesis, Types, C/F & Investigations.	complications
II	Diseases of Hematopoietic system			
1	Anemia	Definition, Causes, Classification, C/F, Investigations, Complications, General management & Hom Therapeutics		Parenteral therapy
2	Iron deficiency anemia	Definition, Etiopathogenesis, C/F, Investigations, Complications, General management & Hom Therapeutics		Iron metabolism
3	Megaloblastic anemia	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics		Metabolism of Vit B12 & Folate
4	Aplastic anemia	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics		Scope & limitations of
5	Hemolytic anemia/thalassemia	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics		Blood transfusion, Scope & limitations of Homoeopathy
6	Leukemia	Definition, Etiopathogenesis, Types, C/F, Investigations, Complications, D/D, & Hom Therapeutics		Bone marrow Transplantation
7	Lymphomas / Burkitt's lymphoma	Definition, Etiopathogenesis, Types C/F, Investigations, Complications & Hom Therapeutics	Staging (TNM)	Scope & limitations of Homoeopathy
8	Disorders due to deficiency of Clotting factors	Definition, Etiopathogenesis, C/F, & Investigations of Hemophilia-A, Hemophilia-B & Von- wilbrand disease & Hom Therapeutics		Scope & limitations of Homoeopathy
9	Platelet Disorders	Definition, Types, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics.		
10	Multiple myelomas.	Definition, Types, Etiopathogenesis, C/F, Investigations & Complications & Hom Therapeutics.	Staging (TNM)	

11	Hypersplenism		Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics.	
12	Polycythemia vera		Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics.	
III	Endocrinal Diseases			
1	Disorders of Growth hormone	Etiopathogenesis, S/S & Investigations of GH Deficiency & Excess	Homoeopathic Therapeutics	
2	Diabetes insipidus	Etiopathogenesis, S/S, Investigations & Hom Therapeutics.		
3	Goitre	Definition, Types, Etiopathogenesis, C/F, Investigations, D/D & Hom Therapeutics		
4	Hypothyroidism	Definition, Etiopathogenesis, C/F, Investigations, D/D, Complications & Hom Therapeutics	Congenital hypothyroidism	Hormonal assay
5	Hyperthyroidism	Definition, Etiopathogenesis, C/F, Investigations, D/D, Complications & Hom Therapeutics		Radioactive iodine ablation/ Basics of CA Thyroid.
6	Hypo & Hyper Parathyroidism	Definition, Etiopathogenesis, C/F, Investigations & Hom Therapeutics		Calcium metabolism
7	Disorders of Adrenal Gland	Definition, types, Etiopathogenesis, C/F, Investigations & Hom Therapeutics		Functions of Glucocorticoids
8	Diabetes Mellitus	Definition, Causes, Classification, Pathogenesis, C/F, Investigations, Complications, General management & Hom Therapeutics	GTT & Hb1ac	
IV	Infectious Diseases			
1	Bacterial infections- Typhoid Fever, Bacillary Dysentery, Cholera, Diphtheria, Brucellosis, Tuberculosis, Pertusis, Tetanus, Septicemia,	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics	Vaccination.	Culture study of bacteria

2	Viral infections - Herpes infections, Swine flu, Japanese Encephalitis, Rabies, Mumps, Measles, Rubella, Poliomyelitis.	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics	Vaccination.	Serological studies
3	Parasitic infestations: Amoebiasis, giardiasis,	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics		
4	Fungal infections – Madura foot, cryptococcosis		Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics	
5	Spirochetes – syphilis, leptospirosis.	Definition, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics		
V	Diseases of Cardiovascular System			
1	Acute circulatory failure (shock)	Definition, Etiopathogenesis, Types, C/F, Investigations, D/D, General management & Hom Therapeutics	Complications	
2	Heart failure	Definition, Etiopathogenesis, Types, C/F, Investigations, D/D, Complications General management & Hom Therapeutics		
3	Ischemic heart disease	Definition, Etiopathogenesis, Types, C/F, Investigations, D/D, Complications, General management & Hom Therapeutics		Complications, CABG, PTCA, Stent & Stress tests.
4	Acute Rheumatic fever	Definition, Etiopathogenesis, Pathology, C/F, D/D, Investigations, Complications, General management & Hom Therapeutics		
5	Valvular heart diseases	Definition, Etiopathogenesis, Types, Hemodynamics, C/F, Investigations, D/D, General management & Hom Therapeutics	Complications	Surgical management
6	Infective Endocarditis	Definition, Etiopathogenesis, Types, C/F, Investigations, D/D, General management & Hom Therapeutics	Complications	
7	Hypertension	Definition, Etiopathogenesis, Types, C/F, Investigations, General management & Hom		

		Therapeutics		
8	Cardiomyopathies		Definition, Etiopathogenesis, Types, C/F, Investigations & Hom Therapeutics	
9	Arrhythmias	Definition, Etiopathogenesis, Types, C/F, General management & Hom Therapeutics	ECG Changes	
10	Cor-pulmonale and pulmonary hypertension.	Definition, Etiopathogenesis, C/F, Investigations, Complications, General management & Hom Therapeutics	Scope & limitation of Homoeopathy	
11	Congenital heart diseases- ASD, VSD, COA, PDA, TOF	Definition, Etiopathogenesis, Haemodynamics, C/F, Investigations, Complications, General management & Hom Therapeutics	Scope & limitation of Homoeopathy & Surgical management	
12	Diseases of Pericardium	Definition, Etiopathogenesis, Types, C/F, Investigations, General management & Hom Therapeutics	D/D	Pericardiocentesis
VI	Diseases of Urogenital tract			
1	Urinary Tract Infections	Definition, Types, Etiopathogenesis, C/F, Investigations, Complications, General management & Hom Therapeutics		Culture & sensitivity.
2	Nephrotic Syndrome	Definition, Etiopathogenesis, C/F, Investigations, General management & Hom Therapeutics		
3	Glomerulopathies	Definition, Etiopathogenesis, Pathology, Types, C/F, Investigations, General management & Hom Therapeutics		
4.	Renal failure	Definition, Types, Etiopathogenesis, C/F, Investigations, Complications & Hom Therapeutics	Dialysis – types & indications.	Renal Transplantation
5	Nephrolithiasis/obstructive uropathy.	Definition, Etiopathogenesis, Types, C/F, Investigations, General management & Hom Therapeutics		Surgical intervention
6	Tumors of Genito urinary tract		Types, Causes, Pathology, C/F, Investigations, Complications & Hom Therapeutics.	

VII Diseases of Central Nervous System & Peripheral Nervous System				
1	Headache	Definition, Etiopathogenesis, Types, C/F, D/D, General management & Hom Therapeutics	Investigations & Complications of secondary headache	
2	Epilepsy	Definition, Etiopathogenesis, Classification, C/F, Investigations, D/D, Complications, General management & Hom Therapeutics		EEG
3	Cranial nerves disorders	Causes, C/F, Investigations, D/D, General management & Hom Therapeutics of Trigeminal neuralgia, Facial nerve palsy, Bulbar / Pseudo bulbar palsy	Causes, C/F, General management & Hom Therapeutics of other cranial nerve lesions.	
4	Meningitis- bacterial, viral	Definition, Etiopathogenesis, C/F, Investigations D/D, general management & Hom Therapeutics		
5	Viral infections of CNS		Definition, Etiopathogenesis, C/F, Investigations, D/D, Complications & Hom Therapeutics	
6	Neurosyphilis	Definition, Etiopathogenesis, C/F, Investigations, Complications, General management & Hom Therapeutics		
7	Movement disorders		Causes & Manifestations of different types of movement disorders	
8	Parkinsonism	Definition, Etiopathogenesis, C/F, Investigations, General management & Hom Therapeutics		Degenerative pathology of Basal ganglia
9	Myasthenia gravis	Definition, Etiopathogenesis, C/F, Investigations, General management & Hom Therapeutics		
10	Peripheral Neuropathies	Definition, Etiopathogenesis, Classification, C/F, General management & Hom Therapeutics		Nerve conduction studies
11	Cerebellar disorders	Definition, Etiopathogenesis, Classification, C/F, Investigations, D/D, General management & Hom Therapeutics		Scope & limitation of Homoeopathy

12	Motor Neuron diseases	Definition, Etiopathogenesis, Types, C/F, Investigations, General management & Hom Therapeutics		Scope & limitation of Homoeopathy
13	Disorders of muscles (muscular dystrophies)	Definition, Etiopathogenesis, Types, C/F, Investigations, General management & Hom Therapeutics		Scope & limitation of Homoeopathy
14	Cerebrovascular diseases	Definition, Etiopathogenesis, Types, C/F, Investigations, D/D, Complications, General management & Hom Therapeutics		MRI study
15	Alzheimer's diseases	Definition, Etiopathogenesis, C/F, D/D, Investigations & Hom Therapeutics		
16	Coma	Definition, Causes, levels of consciousness, Complications, Clinical approach, General management & Hom Therapeutics		Scope & limitation of Homoeopathy
17	Multiple sclerosis		Definition, Etiopathogenesis, C/F, Investigations, D/D, Complications, General management & Hom Therapeutics	Scope & limitation of Homoeopathy
18	Spinal cord diseases (syringomyelia, brown sequard syndrome, cauda equina syndrome)		Definition, Etiopathogenesis, C/F, Investigations, D/D, Complications, General management & Hom Therapeutics	Scope & limitation of Homoeopathy
19	Tumors of CNS		Definition, Causes, Pathology, C/F, Investigations, D/D, Complications, General management & Hom Therapeutics	
VIII	Psychiatric Disorders			
1	Basic considerations of Psychiatry	Clinical approach, Classification, Psycho therapy and Hahnemannian classification		
2	Organic Brain syndromes Delirium and dementia	Etiopathogenesis, C/F, General management, & Hom Therapeutics		
3	Mood disorders	Etiology, Types, C/F, Diagnosis, General management & Hom Therapeutics		

4	Schizophrenia	Definition, Causes, Types, C/F, General management & Hom Therapeutics		
5	Anxiety disorders	Definition, Causes, Classification, C/F, General management & Hom Therapeutics		
6	Somatoform disorders	Definition, Causes, Types, C/F, General management & Hom Therapeutics		
7	Personality disorders	Definition, Causes, Types, C/F, General management & Hom Therapeutics		
8	Substance Abuse	Effects of alcohol, dependence and withdrawal, General management & Hom Therapeutics	Manifestations and Homoeopathic Therapeutics of Cannabis, opioids & nicotine abuse	
IX	Diseases of Locomotor System(connective tissue, Bones& joint disorders)			
1	Osteoarthritis	Definition, Etiopathogenesis, C/F, Investigations, General management, & Hom Therapeutics	Complications	Joint exercise & Arthroscopy
2	Rheumatoid arthritis	Definition, Etiology, Pathology, Immunopathogenesis, C/F, Investigations, General management, & Hom Therapeutics	Complications	
3	Gout	Definition, Etiopathogenesis, C/F, Investigations, General management, & Hom Therapeutics		Metabolism of Purine
4	Ankylosing Spondylitis	Definition, Etiopathology, C/F, Investigations, General management, & Hom Therapeutics	Complications	
5	Reiter's Syndrome		Definition, Etiopathogenesis, C/F, Investigations & Hom management	
6	Systemic Lupus Erythematosus	Definition, Etiopathogenesis, C/F, Investigations, Complications, General management & Hom Therapeutics		ANA profile
7	Systemic Vasculitis		Definition, Etiopathogenesis, C/F, Investigations, General management & Hom Therapeutics	
8	Sjogren's Syndrome		Definition,	

	& Behcet's disease		Etiopathogenesis, S/S, Investigations & Hom Therapeutics	
9	Rickets & Osteomalacia	Definition, Etiopathogenesis, C/F, Investigations, General management & Hom Therapeutics	Vit D Dosage and Complications	
10	Osteoporosis	Definition, Etiopathogenesis, C/F, Investigations, General management & Hom Therapeutics		Bone density study
11	Paget's disease		Definition, Etiopathogenesis, C/F, Complications & Investigations & Hom Therapeutics	Scope & limitations of Homoeopathy
12	Cervical And lumbar Spondylosis	Definition, Etiopathology, C/F, Investigations, Complications, General management, & Hom Therapeutics		MRI study
13.	Osteomyelitis	Definition, Etiopathology, Types, C/F, Investigations, General management & Hom Therapeutics		
X	Diseases of Skin & Sexually Transmitted Diseases			
1	Bacterial infections	Etiopathogenesis, S/S, Investigations, General management & Hom Therapeutics		
2	Fungal infections	Etiopathogenesis, S/S, Investigations, General management & Hom Therapeutics		
3	Viral infection	Etiopathogenesis, S/S, Investigations, General management & Hom Therapeutics		
4	Scabies	Etiopathogenesis, S/S, Investigations, General management & Hom Therapeutics		
5	Eczema	Definition, Etiopathogenesis, Types, S/S, Investigations, General management & Hom Therapeutics		
6	Acne	Definition, Etiopathogenesis, Types, S/S, Investigations, General management & Hom Therapeutics		
7	Urticaria and	Definition, Etiopathogenesis,		

	Angioedema	S/S, Investigations, General management & Hom Therapeutics		
8	Psoriasis	Definition, Etiopathogenesis, Types, S/S, Complications, Investigations, General management & Hom Therapeutics		
9	Lichen Planus		Definition, Etiopathogenesis, S/S, Investigations, Complications & Hom Therapeutics	
10	Pigment disorders	Definition, Etiopathogenesis, Types, S/S, Investigations & Hom Therapeutics of Hypopigmentation disorders	Etiopathogenesis, Various Types, S/S, Invest & Hom Therapeutics of Hypopigmentation disorders	
11	Hair & Nail disorders	Etiopathogenesis, S/S & Investigations of Hair & Nail disorders		
12	Syphilis/ HIV/Gonorrhoea	Definition, Types, Etiopathogenesis, S/S, Investigations, Complication & Hom Therapeutics		
13	Vesiculo bullous disorders	Definition, Etiopathogenesis, S/S, Investigations, Complications, General management & Hom Therapeutics		
XI	Tropical diseases			
1	Malaria	Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics		Epidemiology
2	Chikungunya	Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics		Epidemiology
3	Dengue	Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics		Epidemiology
4	Leprosy	Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics		Epidemiology

5	Ankylostomiasis		Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics	Epidemiology
6	Elephantiasis	Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics		Epidemiology
7	Schistosomiasis		Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics	
8	Leishmaniasis		Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics	
9	Trachoma		Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics	
10	Chagas Disease		Definition, Etiopathogenesis, S/S, Investigations, Complications, D/D, General management & Hom Therapeutics	
XII	Paediatric disorders			
1	Disorders of Growth & Development (Failure to thrive, Enuresis, Autistic, MR and delayed milestones)	Causes, C/F, General management & Hom Therapeutics		
2	Behavioral disorders(ADHD)	Causes, C/F, General management & Hom Therapeutics		
3	Diseases of New born infants(Neonatal jaundice & Neonatal seizures)	Etiopathogenesis, Manifestations, Diagnosis & Homoeopathic therapeutics		
4	Hydrocephalus	Etiopathogenesis, Types C/F, General management & Hom Therapeutics		

5	Immunity & Immunization	General & Homoeopathic concept of Immunity, Immunization Schedule & Homoeopathic Prophylaxis	Vaccine types	
6	Diarrhoeal Disorders in Children	Etiopathogenesis, Manifestation, Diagnosis, D/D General management & Homoeopathic Therapeutics		
7	Indian childhood Cirrhosis		Etiopathogenesis, Manifestation, Diagnosis, Complications & Homoeopathic Therapeutics	
8	Cerebral Palsy	Etiopathogenesis, Manifestation, Diagnosis & Homoeopathic Therapeutics		
9	Convulsive disorders in Children	Etiopathogenesis, Manifestation, Diagnosis & Homoeopathic Therapeutics		
10	Common Helminthic infection(Ascaris Lumbricoides, Enterobius vermicularis & Echinococcosis)	Etiopathogenesis, Manifestation, Diagnosis & Homoeopathic Therapeutics		
11	Inborn errors of metabolism (Aminoaciduria, Lysosomal storage disorders)		Etiopathogenesis, Manifestation, Diagnosis & Homoeopathic Therapeutics	
XIII	Geriatric Disorders			
1	Geriatric care	General approach, Geriatric counseling, Reassurance		
2	Common Geriatric problems (Depression, Dementia & Insomnia)	Causes, S/S, General management & Hom Therapeutics		
3	Gait disorders	Causes, S/S, General management & Hom Therapeutics		
4	Elder abuse	Causes, S/S, General management & Hom Therapeutics		

Practical or clinical:

- (a) Each candidate shall submit of twenty complete case records (ten in Third B.H.M.S and ten in Fourth B.H.M.S).
- (b) The examination procedure will include one long case and one short case to be prepared. During clinical training, each student has to be given adequate exposure to,-
1. Comprehensive case taking following Hahnemann's instructions;
 2. physical examinations (general, systemic and regional);
 3. laboratory investigations required for diagnosis of disease conditions.
 4. differential diagnosis and provisional diagnosis and interpretation of Investigation reports.
 5. Selection of similimum and general management.

Examination:**1. Theory:**

1.1	Number of papers - 02
1.2.	Marks.: Paper I- 100, Paper II-100
1.3.	Contents:
1.3.1	Paper-1: Topics of Third B.H.M.S with Homoeopathic Therapeutics
1,3,2.	Paper-II: Topics of Fourth B.H.M.S with Homoeopathic Therapeutics

2. Practical including viva voce or oral:

2.1.		Marks 200
2.2	Distribution of marks	
2.2.1	One long case	20
2.2.2	One short case	20
2.2.3	Practical records, case records, journal	30
2.2.4.	Identification of specimens (X-ray, E.C.G., etc.)	30
2.2.5	Viva voce (oral)	100
	Total	200

Note: The case reports of the students carried out during the course shall also be considered for the oral examination,

REPERTORY

Instructions:

I. (a) Repertorisation is not the end but the means to arrive at the similimum with, the help of Materia Medica, based on sound knowledge of Homoeopathic Philosophy.

(b) Homoeopathic materia medica is an encyclopedia of symptoms. No mind can memorize all the symptoms or all the drugs with their gradations.

(c) The repertory is an index and catalogue of the symptoms of the materia medica, neatly arranged in a practical or clinical form, with the relative gradation of drugs, which facilitates quick selection of indicated remedy and it may be difficult to practice Homoeopathy without the aid of repertories.

II. (a) Each repertory has been compiled on distinct philosophical base, which determines its structure.

(b) In order to explore and derive full advantage of each repertory, it is important to grasp thoroughly its conceptual base and construction and this will help student to learn scope, limitations and adaptability of each repertory.

THIRD B.H.M.S.

A. Theory:

1. Repertory: Definition, Need, Scope and Limitations.
2. Classification of Repertories
3. Study of different Repertories (Kent, Boenninghausen, Boger-Boenninghausen):
 - (a) History
 - (b) Philosophical background
 - (c) Structure
 - (d) Concept of repertorisation.
 - (e) Adaptability
 - (f) Scope
 - (g) Limitation(s)
4. Gradation of Remedies by different authors.
5. Methods and techniques of repertorisation. Steps of repertorisation.
6. Terms and language of repertories (Rubrics) cross references in other repertories and materia medica.
7. Conversion of symptoms into rubrics and repertorisation using different repertories.
8. Repertory - its relation with organon of medicine and materia medica.
9. Case taking and related topics:
 - (a) Case taking.
 - (b) Difficulties of case taking, particularly in a chronic case.
 - (c) Types of symptoms, their understanding and importance.
 - (d) Importance of pathology in disease diagnosis and individualization in relation to study of repertory.
10. Case processing
 - (a) analysis and evaluation of symptoms
 - (b) miasmatic assessment
 - (c) totality of symptoms or conceptual image of the patient
 - (d) repertorial totality
 - (e) selection of rubrics
 - (f) repertorial technique and results
 - (g) repertorial analysis

B. Practical or clinical:

1. Record of five cases each of surgery, Gynaecology and obstetrics worked out by using Kent's repertory.
2. Rubrics hunting from Kent's & Boenninghausen's repertories.

Note: There will be no Examination in the subject in Third B.H.M.S.

FOURTH B.H.M.S

A. Theory:

1. Comparative study of different repertories (like Kent's Repertory, Boenninghausen's Therapeutic Pocket Book and Boger- Boenninghausen's Characteristic Repertories, A Synoptic Key to Materia Medica).
2. Card repertories and other mechanical aided repertories- History, Types and Use.
3. Concordance repertories (Gentry and Knerr)
4. Clinical Repertories (William Boericke etc.)
5. An introduction to modern thematic repertories- (Synthetic, Synthesis and Complete Repertory and Murphy's Repertory)
6. Regional repertories
7. Role of computers in repertorisation and different softwares.

B. Practical or clinical:

Students shall maintain the following records, namely:-

1. Five acute and five chronic cases (each of medicine, surgery and obstetrics and gynaecology) using Kent's Repertory.
2. Five cases (pertaining to medicine) using Boenninghausen's therapeutics pocket book.
3. Five cases (pertaining to medicine) using Boger-Boenninghausen's characteristics repertory.
4. Five cases to be cross checked on repertories using homoeopathic softwares.

C. Examination:

There will be examination of repertory only in Fourth B.H.M.S (not in III BHMS).

1. Theory:

1.1.	Number of papers	01
1.2.	Marks	100

2. Practical including viva voce or oral:

2.1.	Marks	Marks 100
2.2	Distribution of marks	
2.2.1	One long case	30
2.2.2	One short case	10
2.2.3	Practical record or journal	10
2.2.4.	Viva voce (oral)	50
	Total	100

COMMUNITY MEDICINE

Instructions:

- I. (a) Physician's function is not limited merely prescribing homoeopathic medicines for curative purpose, but he has wider role to play in the community.
- (b) He has to be well conversant with the national health problems of rural as well as urban areas, so that he can be assigned responsibilities to play an effective role not only in the field of curative but also preventive and social medicine including family planning.
- II. This subject is of utmost importance and throughout the period of study attention of the student should be directed towards the importance of preventive medicine and the measures for the promotion of positive health.
- III. (a) During teaching, focus should be laid on community medicine concept, man and society, aim and scope of preventive and social medicine, social causes of disease and social problems of the sick, relation of economic factors and environment in health and disease.
- (b) Instructions in this course shall be given by lectures, practicals, seminars, group discussions, demonstration and field studies.

THIRD B.H.M.S.

A. Theory:

1. Man and Medicine
2. Concept of health and disease in conventional medicine and homoeopathy.
3. Nutrition and health
 - (a) Food and nutrition
 - (b) Food in relation to health and disease
 - (c) Balanced diet.
 - (d) Nutritional deficiencies, and Nutritional survey
 - (e) Food Processing
 - (f) Pasteurization of milk
 - (g) Adulteration of food.
 - (h) Food Poisoning
4. Environment and health
 - (a) Air, light and sunshine, radiation.
 - (b) effect of climate
 - (c) comfort zone
 - (d) personal hygiene
 - (e) physical exercise
 - (f) sanitation of fair and festivals
 - (g) disinfection and sterilization
 - (h) atmospheric pollution and purification of air
 - (i) air borne diseases
5. Water
 - (a) distribution of water, uses, impurities and purification
 - (b) standards of drinking water
 - (c) water borne diseases
 - (d) excreta disposal
 - (e) Disposal of deceased.
 - (f) Disposal of refuse.
 - (g) medical entomology- insecticides, disinfection, Insects in relation to disease, Insect control,
6. Occupational health
7. Preventive medicine in pediatrics and geriatrics

FOURTH B.H.M.S .

A. Theory:

1. Epidemiology

- (a) Principles and methods of epidemiology
- (b) Epidemiology of communicable diseases:
 - General principles of prevention and control of communicable diseases.
- (c) Communicable diseases: their description, mode of spread and method of prevention.
- (d) Protozoan and helminthic infections - life cycle of protozoa and helminthes, their prevention.
- (e) Epidemiology of non-communicable diseases: general principles of prevention and control of non-communicable diseases
- (f) Screening of diseases.

2. Bio-statistics

- (a) Need of biostatistics in medicine
- (b) Elementary statistical methods.
- (c) Sample size calculation
- (d) Sampling methods
- (e) Test of significance
- (f) Presentation of data
- (g) Vital statistics

3. Demography and Family Planning, Population control; contraceptive practices, National Family Planning Programme.

4. Health education and health communication

5. Health care of community.

6. International Health

7. Mental Health.

8. Maternal and Child Health

9. School Health Services

10. National Health Programs of India including Rashtriya Bal Chikitsa Karyakram.

11. Hospital waste management

12. Disaster management

13. Study of aphorisms of organon of medicine and other homoeopathic literatures, relevant to above topics including prophylaxis.

B. Practicals:

1. Milk dairy
2. Primary Health Centre
3. Infectious Diseases Hospital
4. Industrial unit
5. Sewage treatment plant
6. Water purification plant

Note:

1. For field visits, Annexure 'B' has to be kept in view.
2. Students are to maintain practical records or journals in support of above practical or field visits.
3. Reports of the above field visits are to be submitted by the students.
4. Each student has to maintain records of at least ten¹ infectious diseases.

C. Examination:

There will be examination of the subject only in Fourth B.H.M.S (and not in III BHMS). Besides theory examination there shall be a practical-or clinical examination including viva-voce as per following distribution of marks-

1. Theory -

1.1.	Number of papers - 01.
1.2.	Marks: 100

2. Practical including viva-voce oral.

2.1.		Marks 100
2.2	Distribution of marks	
2.2.1	Spotting	30
2.2.3	Journal or practical records (including field visit records)	20
2.2.3	Viva voce (oral)	50
	Total	100

BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE
Katraj-Dhankawadi, Pune – 43.

SUBJECT – HOMOEOPATHIC PHARMACY

I- BHMS

3 hours

Marks : 100

Section-I and Section – II, Q.1 and Q.5 are Compulsory.

They are for 20 marks. Then from remaining 3 questions from each section 15 marks each. 6 Students have to write any 2,

Q.No.	Section – I	Marks
1.	Short notes [any 4 out of -5 marks each]	20
2.	a] and b]	7,8
3.	a] and b]	7,8
4.	a] and b]	7,8
Section – II		
5.	Short notes [any 4 out of -5 marks each]	20
6.	a] and b]	7,8
7.	a] and b]	7,8
8.	a] and b]	7,8

PRACTICAL/ORALS

Table No.	Contents	Marks
E1	Table Viva	50
E2	Spotting	20
E2	Journal	10
E2	Herberium	05
E2	Practical with Viva	15
	Total	100

Total 100 marks exam. Divided in above headings

E1 --- Examiner – 1,

E2 --- Examiner - 2

Ist B.H.M.S. Anatomy

THEORY.

Number of Papers	02
Paper – I	100 marks
Paper – II	100 marks
Total	200 marks

Distribution of portion for Theory

Paper-I	Paper-II
1. Upper Limb	1. Lower Limb
2. Head, Neck, Face	2. Thorax
3. Brain	3. Abdomen
4. General Embryology	4. Special Embryology
	5. Histology

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HOMOEOPATHIC MEDICAL COLLEGE
KATRAJ-DHANKAWADI, PUNE – 43.
Ist B.H.M.S.
ANATOMY PAPER - I**

Date-

Time-

Day –

Marks – 100

Instructions –

1. All questions are **Compulsory**.
2. Figures to the right indicate **Full Marks**.
3. Each section to be written in the **SEPARATE Answer Book**
4. Draw neat labeled diagrams wherever necessary.

SECTION - I

Q. 1		Write short notes on Any Four of the following	[20]
	a	Head/Face	
	b	Neck	
	c	Brain	
	d	General Anatomy	
	e	General Anatomy	
Q.2		Write answer in one or two sentences	[10]
	a	Head/Face	
	b	Neck	
	c	Brain	
	d	General Anatomy	
	e	General Anatomy	
Q.3		Head, Face OR Neck	[10]
Q.4		Brain	[10]
		SECTION - II	
Q. 5		Write short notes on Any Four of the following	[20]
	a	Upper Limb	
	b	Upper Limb	
	c	General Embryology	
	d	General Embryology	
	e	General Embryology	
Q.6		Write answer in one or two sentences	[10]
	a	Upper Limb	
	b	Upper Limb	
	c	General Embryology	
	d	General Embryology	
	e	General Embryology	
Q.7		Long Question on Upper Limb OR Upper Limb	[10]
Q.8		Long Question on Upper limb OR Embryology	[10]

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KATRAJ-DHANKAWADI, PUNE – 43.
Ist B.H.M.S.
ANATOMY PAPER -II

Date-
Day –

Time-
Marks – 100

Instructions –

1. All questions are **Compulsory**.
2. Figures to the right indicate **Full Marks**.
3. Each section to be written in the **SEPARATE Answer Book**
4. Draw neat labeled diagrams wherever necessary.

SECTION - I

Q. 1		Write short notes on Any Four of the following	[20]
	A	Thorax	
	B	Thorax	
	C	Thorax	
	D	Lower Limb	
	E	Lower Limb	
Q.2		Write answer in one or two sentences	[10]
	A	Thorax	
	B	Thorax	
	C	Thorax	
	D	Lower Limb	
	E	Lower Limb	
Q.3		Long Question on Lower Limb OR Lower Limb	[10]
Q.4		Long Question on Thorax	[10]
		SECTION - II	
Q. 5		Write short notes on Any Four of the following	[20]
	A	Abdomen	
	B	Abdomen/Pelvis	
	C	Histology	
	D	Histology	
	E	Special Embryology	
Q.6		Write answer in one or two sentences	[10]
	A	Abdomen	
	B	Abdomen/Pelvis	
	C	Special Embryology	
	D	Special Embryology	
	E	Special Embryology	
Q.7		Long Question on Abdomen OR Pelvis	[10]
Q.8		Long Question on Abdomen /Pelvis	[10]

KATRAJ-DHANKAWADI, PUNE – 43.**Anatomy Viva/ Practical Exam**

* Table – I

1]	Upper Limb [soft parts]	10
2]	Lower limb [soft parts]	10
3]	Abdomen / pelvis [soft parts]	30
		50 Marks

* Table – II

1]	Head, Neck, Face, [soft parts]	20
2]	Brain [soft parts]	10
3]	Thorax [soft parts]	20
		50 Marks

* Table – III

1]	Skull Mandible, Ribs, Vertebrae/Sternum, Pelvis	20
2]	Upper limb [Bones]	10
3]	Lower limb [Bones]	10
		40 Marks

* Table – IV

1]	Embryology	10
2]	Histology	05
3]	Radiology	05
4]	Surface + Living Anatomy	10
		30 Marks

* Journal	10
* Spotting	20
	30 Marks

Total – 200

**PHYSIOLOGY
ASSESSMENT AND EVALUATION**

(A) Theory

Number of Papers : **02** . Marks : [**Paper-I 100,Paper-II 100**]

Paper-I	Paper-II
1. General physiology Biophysics.	1.Endocrinology
2.Blood & body fluids, lymph, RE system	2.CNS
3.Cardiovascular system	3.Digestive system & metabolism
4.Respiratory system	4.Biochemistry. Nutrition & diet
5. Excretory system , skin & body temperature	5.Reproductive system
6. Nerve muscle physiology	6.Special senses

(B) Practical including Viva-Voce

Total Marks	200
Viva-Voce (orals)	100 marks.
Experiments, spotting and journal	100 marks
Distribution of Experiments, spotting and journal marks	
Experiments 1]Hematology 2]Biochemistry 3]Clinical physiology	50mks Total 20 marks. 20 marks. 10 marks
Spotting Instruments, graphs and clinical questionnaire	30marks
Journal Hematology and clinical physiology. Biochemistry.	20marks

HOMOEOPATHIC MEDICAL COLLEGE

KATRAJ-DHANKAWADI,PUNE-4

BHMS-I

PHYSIOLOGY INCLUDING BIOCHEMISTRY-PAPER-I

Instructions-

1. All questions are compulsory
2. Figures to the right indicate Full Marks

Marks: 100

Time:- 3 hours

Section-I

[CVS ,Blood and body fluids, lymphatic's , Respiratory system]

Q		Answer in one or two sentences(any 5 out of 6)	2 marks x 5 = 10 marks
	1		
	2		
	3		
	4		
	5		
	6		
Q		Write short notes on (any 4 out of 5)	5 marks x 4 = 20 marks
	1		
	2		
	3		
	4		
	5		
Q		Solve any two out of three	10 marks x 2 = 20 marks
	1		
	2		
	3		

Section-II

[General Physiology, Biophysics, Excretory system, Skin. Body temp. Nerve muscle physiology.]

Q		Answer in one or two sentences(any 5 out of 6)	2 marks x 5 = 10 marks
	1		
	2		
	3		
	4		
	5		
	6		
Q		Write short notes on (any 4 out of 5)	5 marks x 4 = 20 marks
	1		
	2		
	3		
	4		
	5		
Q		Solve any two out of three	10 marks x 2 = 20 marks
	1		
	2		
	3		

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE
KATRAJ-DHANKAWADI,PUNE-43**

BHMS-I
PHYSIOLOGY INCLUDING BIOCHEMISTRY-PAPER-II

Instructions-

1. All questions are compulsory
2. Figures to the right indicate Full Marks

Marks:-100

Time-3 hrs

Section-I

[CNS, Endocrinology, Reproductive system, Special senses.]

Q-1		Answer in one or two sentences(any 5 out of 6)	2mksX5=10marks
	1		
	2		
	3		
	4		
	5		
	6		
Q-2		Write short notes on (any 4 out of 5)	5mksX4=20marks
	1		
	2		
	3		
	4		
	5		
Q-3		Solve any two out of three(<i>Long answer question only</i>)	10mksX2=20marks
	1		
	2		
	3		

Section-II

[Alimentary system and Metabolism, Biochemistry, Balanced diet.]

Q-4		Answer in one or two sentences(any 5 out of 6)	2mksX5=10marks
	1		
	2		
	3		
	4		
	5		
	6		
Q-5		Write short notes on (any 4 out of 5)	5mksX4=20mks
	1		
	2		
	3		
	4		
	5		
Q-6		Solve any two out of three(<i>Long answer question only</i>)	10mksX2=20marks
	1		
	2		
	3		

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HOMOEOPATHIC MEDICAL COLLEGE
KATRAJ-DHANKAWADI, PUNE – 43.

**THEORY PAPER
PATHOLOGY AND MICROBIOLOGY
PAPER - I**

Date-
Day –

Time- 3 hours
Marks –100

Instructions –

1. All questions are **compulsory**.
2. Figures to the right indicate Full marks.
3. Write in each section in separate answer Book
4. Draw neat labeled diagrams Wherever necessary.

SECTION – A

Q.1	a	One full question on General Pathology	[10]
	b	Write Miasmatic background of above mention topic	[05]
Q.2		Write short notes [any three]	[15]
	a	On general pathology	
	b		
	c		
	d		
Q.3		Write short notes [any four]	[20]
	a	On general pathology	
	b		
	c		
	d		
	e		
SECTION – B			
Q.4	a	One full question on Systemic Pathology	[10]
	b	Write Miasmatic background of above mentioned topic	[05]
Q.5		Write macroscopic and microscopic appearance of the following organs [any three]	[15]
	a	Any four organs	
	b		
	c		
	d		
Q.6		Write short notes [any four]	[20]
	a	Any five short notes on systemic patholo	
	b		
	c		
	d		
	e		

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE
KATRAJ-DHANKAWADI, PUNE – 43.**

**THEORY PAPER
PATHOLOGY AND MICROBIOLOGY
PAPER - II**

Date- _____
Day – _____

Time- 3 hours
Marks –100

Instructions –

1. All questions are **compulsory**.
2. Figures to the right indicate Full marks.
3. Write in each section in separate answer Book
4. Draw neat 10beled diagrams Wherever necessary.

SECTION – A

Q. 1	A	One full question on Bacteriology	[10]
	B	One full question on Parasitology	[10]
Q.2		Write short notes [any three]	[15]
	A	Bacteriology and Parasitology	
	B		
	C		
	D		
Q.3		Write short notes [any three]	[15]
	A	Bacteriology and Parasitology	
	B		
	C		
	D		
	E		
SECTION – B			
Q.4	A	One full question on virology	[10]
	B	One full question on virology	[10]
Q. 5		Write short notes [any three]	[15]
	A	Clinical microbiology and diagnostic procedure Procedure /Microbiological control and mechanism of pathogenecity	
	B		
	C		
	D		
Q.6		Write short notes [any three]	[15]
	A	Clinical Microbiology and Immunopathology	
	B		
	C		
	D		
	E		

PATHOLOGY AND MICROBIOLOGY
PRACTICAL INCLUDING VIVA VOICE/ORAL

Marks – 100

Distribution of Marks

1]	Practical	Gram Stain Z N Stain Motility of Organism	[15]
2]	Spotting	4 – spots	[20]
3]	Histopathologica	2 – slides	[10]
4]	Journal and Practical Record		[05]
5]	Viva Voice [oral	Two examiners	[50]
6]		Each – 25 marks	
		Total –	100 marks

BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE
KATRAJ-DHANKAWADI, PUNE – 43.

THEORY PAPER
IIND B.H.M.S.
FORENSIC MEDICINE AND TOXICOLOGY

Date-
Day –

Time- 3 hours
Marks –100

Instructions –

- 1.All questions are **compulsory**.
- 2.Figures to the right indicate Full marks.
3. Write in each section in separate answer book.

Section – I

Q.1.A		10
B.		05
Q.2.A.		10
B.		05
Q.3.	Write short notes on any FOUR	20
1.		
2.		
3.		
4.		
5.		

Section – II

Q.4.A.		10
B.		05
Q.5.A.		10
B.		05
Q.6.	Write short notes on any FOUR	20
1.		
2.		
3.		
4.		
5.		

**BHARATI VIDYAPEETH DEEMED UNIVERSITY,
HOMEOPATHIC MEDICAL COLLEGE,**

SUBJECT- FORENSIC MEDICINE AND TOXICOLOGY

EXAMINATION PATTERN

Theory:

Number of papers	-	01
Marks	-	100
Section	-	Section – I – Jurisprudence – 50 Marks
	-	Section – II – Toxicology – 50 Marks

Practical including viva voce or oral:

	Marks: 100
Distribution of marks	
Medico-legal aspect of 4 specimens	40
Journal or practical records	10
Viva voce (oral)	50
Total	100

Subject	Written		Practical or Clinical including oral		Total	
	Full marks	Pass marks	Full marks	Pass marks	Full marks	Pass marks
Forensic Medicine & toxicology	100	50	100	50	200	100

SUBJECT – HOMOEOPATHIC MATERIA MEDICA
IInd BHMS

Day –
Date -

Total Marks -100 marks
Time – 3 hours.

Two sections of 50 marks each

Section – I, to be based on Ist BHMS syllabus

Section – II, to be based on IInd BHMS syllabus

- Instructions :**
1. All questions are compulsory.
 2. Figures to the right indicate full marks
 3. Each section to be answered in separate answer books
 4. Answers written in inappropriate section will not be assessed

Section-1

Question No.	Questions	Marks
1	Long question	10
2	Short notes(4 out of 5)	20
3A	Long question	10
B	Long question	10

Section-II

Question No.	Question	Marks
4A	Long question based on 6 topics in theory (give choice)	9
B	Long question- drug picture (give choice)	9
5	Short notes on drug indications (4 out of 5)	16
6	Comparisons (4 out of 5)	16

Practical and oral examination, marks : 100

Examiners : 02

1. Each examiner shall conduct the examination of not more than 50 marks.
2. One examiner shall be internal and other external.

Practical mark division.

Syllabus	Marks
Case taking and case processing of one long case i.e. analysis, evaluation and formation of totality with selection of medicine, potency and repetition schedule.	30
Case taking of one short case.	10
Journal.	10
Total	50

Viva voce(oral) : 50 marks. – On syllabus of Ist & IInd BHMS.

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE
KATRAJ-DHANKAWADI, PUNE – 43.**

Theory Paper

IInd B.H.M.S. [2015 Course]

ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY

Date-
Day –

Time- 3 hours
Marks –100

Instructions –

1. All questions are **compulsory**.
2. Figures to the right indicate Full marks.
3. Write each section in separate answer book.

1. THEORY

1.1.	No. of papers -01
1.2.	Marks: 100
1.3.	Distribution of marks:
1.3.1.	Logic-15 marks
1.3.2.	Psychology-15 marks
1.3.3.	Fundamentals of homoeopathy and aphorisms 1 to 104 - 50 marks
1.3.4.	Homoeopathic philosophy- 20 marks

THEORY

SECTION – I [1.3.3] [Organon]

Q.1	Compulsory question	a]	8 marks
		b]	7 marks
Q.2	Q. A or Q. B	a]	8 marks
		b]	7 marks
Q.3	Short notes [any 4] 5 Marks each	20 marks	

SECTION – II [1.3.1, 1.3.2.,1.3.4] [philosophy]

Q.4	Compulsory question	a]	8 marks
		b]	7 marks
Q.5	Q. A or Q. B	a]	8 marks
		b]	7 marks
Q.6	Short notes [any 4] 5 Marks each	20 marks	

PRACTICAL (IInd B.H.M.S)

MARKS : 100

Examiner : 02

2. Practical including viva voce or oral:

2.1.		Marks 100
2.2	Distribution of marks	
2.2.1	Case taking and case processing	40
2.2.2	Maintenance of practical record or journal	10
2.2.4	Viva voce (oral)	50
	Total	100

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE & HOSPITAL, PUNE
IIIRD BHMS**

**Dept of Surgery, ENT, Ophthal, Dentistry & Homoeopathic therapeutics
Paper I / I – Proper part (General surgery)**

Ques no.	Sub Ques no.	Question pattern	Marks
1	A	Write in brief Aetiology, Pathology, Clinical features, complications, Investigations in (disease condition)	6
	B	Short Question – Write the Conservative & Surgical mgt of..... (disease condition)	4
2	A	Differentiate between / Write in brief (disease condition)	6
	B	Short Question – Write the Conservative & Surgical mgt - of..... (disease condition)	4
3	A	Write in brief Aetiology, Pathology, Clinical features, complications, Investigations in of..... (disease condition)	6
	B	Short Question –Conservative & Surgical mgt of..... (disease condition)	4
4	A	Write in brief– a condition	6
	B	Short Question – Write the Conservative & Surgical mgt of..... (disease condition)	4
5		Two line answer	
	A		2
	B		2
	C		2
	D		2
	E		2

Paper I / II - Homoeopathic part (General Surgery)

Ques no.	Sub Ques no.	Question pattern	Marks
1	A	Homoeopathic approach in a case	6
	B	Indication of a remedy	4
2	A	Miasmatic cleavage in a case	6
	B	Indication of a remedy	4
3	A	Scope & Limitation of Homoeopathy in a case	6
	B	Indication of a remedy	4
4	A	Scope & Limitation of Homoeopathy in a case	6
	B	Indication of a remedy	4
5		Key note symptom of a remedy in	
	A		2
	B		2
	C		2
	D		2
	E		2

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE & HOSPITAL, PUNE.**

III BHMS

Dept of Surgery, ENT, Ophthal, Dentistry & Homoeopathic therapeutics

Paper II / I Proper part (Systemic surgery, ENT, Ophthal, Dentistry)

Que s no.	Sub Question no.	Question pattern	Mar ks
1	A	Write in brief Aetiology, Pathology, Clinical features, complications, Investigations in – a condition from - Systemic Surgery	6
	B	Short Question –Conservative & Surgical mgt - Systemic Surgery	4
2	A	Write in brief Aetiology, Pathology, Clinical features, complications, Investigations in – a condition from - Systemic Surgery	6
	B	Short Question – Conservative & Surgical mgt -Systemic Surgery	4
3	A	Write in brief Aetiology, Pathology, Clinical features, complications, Investigations in – a condition from - Ophthal	6
	B	Short Question – Conservative & Surgical mgt -Ophthal	4
4	A	Write in brief Aetiology, Pathology, Clinical features, complications, Investigations in – a condition from - ENT	6
	B	Short Question – Conservative & Surgical mgt -ENT	4
5		Two line answer	
	A	Dentistry	2
	B	Dentistry	2
	C	Systemic Surgery	2
	D	Systemic Surgery	2
	E	Systemic Surgery	2

Paper II / II Homoeopathic part (Systemic surgery, ENT, Ophthal, Dentistry)

Ques no.	Sub Question no.	Question pattern	Mar ks
1	A	Homoeopathic approach in a case –Systemic Surgery	6
	B	Indication of a remedy in the above case	4
2	A	Miasmatic cleavage in a case –ENT	6
	B	Indication of a remedy in the above case	4
3	A	Scope & Limitation of Homoeopathy in a case – Systemic Surgery	6
	B	Indication of a remedy in the above case	4
4	A	Scope & Limitation of Homoeopathy in a case -Ophthal	6
	B	Indication of a remedy in the above case	4
5		Key note symptom of a remedy in	
	A	Dentistry	2
	B	Dentistry	2
	C	Dentistry	2
	D	Systemic Surgery	2
	E	Systemic Surgery	2

BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE & HOSPITAL, PUNE.
Dept of Surgery, ENT, Ophthal, Dentistry & Homoeopathic therapeutics

Table 1		Table 2		Table 3		Table 4	
Headings	Marks	Headings	Marks	Headings	Marks	Headings	Marks
Long case				Proper		Homoeopathic	
Proper –		Instruments		Surgery		Surgery	
• Case taking	5	• Metal	10	• General	15	• General	15
• Examination	5	• Rubber	10	• Systemic	10	• Systemic	10
• Investigation	5	• X-rays	10				
• Diagnosis & Management	5						
Homoeopathic		Journal		• ENT	10	• ENT	10
• Scope	5	• Cases	25	• Ophthal	10	• Ophthal	10
• Limitations	5	• presentation	5	• Dentistry	05	• Dentistry	05
• Remedies	10						
Total	40		60		50		50

BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE,
Subject:- GYNAECOLOGY AND OBSTETRICS
PAPER I
GYNAECOLOGY AND HOMOEOPATHIC THERAPEUTICS
IIIrd BHMS

Day
Date

Total Mark-100
Time-3 hours

Two sections of 50 marks each
 Section- I to be based on CLINICAL syllabus
 Section- II to be based upon THERAPEUTICS syllabus

INSTRUCTION

- 1: All question are compulsory
- 2: Each section to be answered in separate answer book
- 3: Figures to right indicate full mark
- 4: Answer written in inappropriate section will not be assessed

SECTION I

QUESTION NO	QUESTION	MARKS
1A	Long question	10
1B	Long question	10

2	Short notes (4 out of 5)	20
3	Answer to the point	10

SECTION II

Q4A	Long question on homoeopathic approach	10
Q4B	Long question on homoeopathic approach	10
Q5	Indication of drugs in given 4 condition	20
Q6	Answer to the point	10

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE,
Subject:- GYNAECOLOGY AND OBSTETRICS
PAPER II**

**OBSTETRICS, NEONATOLOGY AND HOMOEOPATHIC THERAPEUTICS
IIIrd BHMS**

Day
Date

Total Mark-100
Time-3 hours

Two section of 50 marks each
Section- I to be based on CLINICAL syllabus
Section- II to be based upon THERAPEUTICS syllabus

INSTRUCTION

- 1: All question are compulsory
- 2:Each section to be answered in separate answer book
- 3:Figures to right indicate full mark
- 4:Answer written in inappropriate section will not be assessed _

SECTION I

QUESTION NO	QUESTION	MARKS
1A	Long question	10
1B	Long question	10

2	Short notes (4 out of 5)	20
3	Answer to the point	10

SECTION II

Q4A	Long question on homoeopathic approach	10
Q4B	Long question on homoeopathic approach	10
Q5	Indication of drugs in given 4 condition	20
Q6	Answer to the point	10

**BHARATI VIDYAPEETH DEEMED UNIVERCITY
HOMOEOPATHIC MEDICAL COLLEGE,
Subject:- GYNAECOLOGY AND OBSTETRICS**

PRCTICAL AND ORAL EXAMINATION

MARKS 200

EXAMINER 04

1. Each examiner shall conduct examination not more than 50 marks
2. Two examiner shall be internal and Two are external

One long case	30 MARKS
Practical Records , Case record, journal	30 MARKS
Identification of instruments, models and specimens	40MARKS
Viva voce [oral]	100MARKS
TOTAL	200 MARKS

Practical Mark division

Examiner 1	50 marks			
	Case taking	Diagnosi s and	Homp.manageme nt	Gynaecology clinical viva

		D.D		
	10	10	10	20
Examiner 2	50 marks			
	Instruments	models	specimens	Neonatology clinical viva
	20	15	05	10
Examiner 3	50 marks			
	Journal, Practical work	Obstetrics clinical viva		
	30	20		
Examiner 4	50 marks			
	Gynaecology Theraps viva	Obstetrics Theraps viva	Neonatology Theraps viva	
	20	20	10	
	30	20		

**SUBJECT – HOMOEOPATHIC MATERIA MEDICA
IIIrd BHMS**

Day –
Date -

Total Marks -100 marks
Time – 3 hours.

Two sections of 50 marks each

Section – I to be based on IInd BHMS syllabus.

Section – II to be based on IIIrd BHMS syllabus.

-
- Instructions :** 1. All questions are compulsory.
2. Figures to the right indicate full marks
3. Each section to be answered in separate answer books
4. Answers written in inappropriate section will not be assessed
-

Section-1

Question No.	Question	Marks
1A	General topic (give choice)	09
1B	Drug picture (give choice)	09
2	Short notes (4 out of 5)	16
3	Comparisons (4 out of 5)	16

Section-II

Question No.	Question	Marks
4A	General topic	09
4B	Drug picture (give choice)	09
5	Write as indicated (4 out of 5)	16
6	Short Notes (4 out of 5)	16

Practical and oral examination, marks : 100

Examiners : 02

1. Each examiner shall conduct the examination of not more than 50 marks.
2. One examiner shall be internal and other external.

Practical mark division.

Syllabus	Marks
Case taking and case processing of one long case i.e. analysis, evaluation and formation of totality with selection of medicine, potency and repetition schedule.	30
Case taking of one short case.	10
Journal.	10
Total	50

Viva voce(oral) : 50 Marks - On syllabus of Ist ,IInd & IIIrd BHMS.

BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE
Katraj-Dhankawadi, Pune – 43.
Theory Paper
IIIrd B.H.M.S.

ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY

Examination of Organon of Medicine shall consist of one Theory paper and one oral examination for III BHMS.

	Full Marks	Pass Marks
Written	100	50
[Practical & Oral]	100	50
Total	200	100

1. Theory:

1.1.	Number of papers – 01
1.2.	Marks: 100
1.3.	Distribution of Marks:
1.3.1.	Aphorisms 1 to 294 60 marks
	Homoeopathic philosophy: 40 marks

THEORY PAPER**Instructions –**

1. All questions are **compulsory**.
2. Figures to the right indicate Full marks.
3. Write each section in separate answer book

SECTION – I
2 sections of 50 marks each

Q.1	Compulsory question	a]	8 marks
		b]	7 marks
Q.2	Q. A or Q. B	a]	8 marks
		b]	7 marks
Q.3	Short notes [any 4] 5 Marks each	20 marks	

SECTION – II

Q.4	Compulsory question	a]	8 marks
		b]	7 marks
Q.5	Q. A or Q. B	a]	8 marks
		b]	7 marks
Q.6	Short notes [any 4] 5 Marks each	20 marks	

PRACTICAL EXAMINATIONS

MARKS : 100
Examiner : 02

2. Practical including viva voce or oral:

2.1.	Marks: 100'	<u>Marks</u>
2.2.	Distribution of marks;	
2.2.1.	Case taking and case processing	40
2.2.3.	Maintenance of practical record or journal	10
2.2.4.	Viva voce (oral)	50
	Total	100

**ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY
II/III /IV– BHMS**

BEDSIDE PATIENT ATTENDANCE

PRACTICAL EXAMINATION:

DAY DATE TIME 9.00 am onwards Batch

Sr. No	Exam Seat No.	Bed No	Name of the patient	Signature
1				
2				
3				
4				
5				
Onwards ↓ Upto 20				

Exam. Centre: _____

Signature of Examiners: 1] _____ 2] _____

3] _____ 4] _____

IV-BHMS
PRACTICE OF MEDICINE & HOMOEOPATHIC THERAPEUTICS

Exam pattern

Theory: -

Number of papers -02

Marks: - paper I-100, Paper II-100

Contents:-

Paper I: - Topics of third B.H.M.S. with Homeopathic therapeutics

Paper II: - Topics of fourth B.H.M.S. with Homeopathic therapeutics

Note :- it is expected from students that the management aspects of all the clinical conditions is homeopathic while studying and writing in the paper.

Subject	Theory		Practical and oral				Grand total	
	Max marks	Pass marks	Max practical marks	Max oral marks	Total	Pass marks	Max marks	Pass marks
Practice of medicine	200	100	100	100	200	100	400	200

A. Theory: 200 Marks

There shall be two papers, each carrying 100 marks and each paper of three hours duration. Both the papers are inclusive of therapeutics. The distribution of chapter wise marks in written paper may be as follows:

Paper I

Sr.No.	Name of the System	Weightage
1	Respiratory diseases	25 marks
2	Diseases of digestive system & peritoneum	25 marks
3	Diseases concerning liver, gall –bladder and pancreas	20 marks
4	Genetic factors(co-relating diseases with the concept of chronic miasms)	05 marks
5	Immunological factors in disease with concept of susceptibility(including HIV, Hepatitis B)	10 marks
6	Disorders due to chemical and physical agents and to climatic and environmental Factors	10 marks
7	Disorders of Water and electrolyte balance	05marks

Paper II

Sr.No.	Name of the System	Weightage
1	Nutritional and Metabolic diseases	05 marks
2	Diseases of haemopietic system	10 marks
3	Endocrinal diseases	10 marks
4	Infectious diseases	05 marks
5	Diseases of Cardiovascular system	10marks
6	Diseases of urogenital tract	10 marks
7	Diseases of the Central Nervous system and peripheral nervous system	10 marks
8	Psychiatric disorders:	05 marks
9	Diseases of the locomotor system (connective tissue, bones & joints disorders)	10marks
10	Diseases of Skin & sexually transmitted diseases:	10 marks
11	Tropical diseases	05 marks

12	Paediatric disorders	05 marks
13	Geriatric disorders	05 marks

Practical including viva voce or oral:

Total Marks: 200

Distribution of marks

Table 1:-50 marks

One long case – (20 marks)	
(Complete case writing- Bed side examination	10 marks
Clinical diagnosis and remedy selection -	10marks
Practical records, case records, journal -	
	30 marks

Table 2:- 50 marks

One short case - (20 marks)	
(Complete case writing- Bed side examination	10 marks
Clinical diagnosis and remedy selection -	10marks
Identification of specimens (X-Ray, E.C.G.)-	
	30 marks

Table 3:- 50 marks

Topics of third B.H.M.S. with Homeopathic therapeutics

Table 4:- 50 marks

Topics of fourth B.H.M.S. with Homeopathic therapeutics

INSTRUCTIONS FOR PAPER SETTING

- 1) Please give weightage to each system as prescribed while setting the question papers.
- 2) There is no separate section for therapeutics.
- 3) It is expected that therapeutics should be incorporated in the question itself wherever necessary.
- 4) As far as possible do not omit any system while setting the paper.

Subject	Theory		Practical and oral				Grand total	
	Max marks	Pass marks	Max practical marks	Max oral marks	Total	Pass marks	Max marks	Pass marks
Practice of medicine	200	100	100	100	200	100	400	200

**BHARATI VIDYPEETH UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE ,DHANKAWADI-43**

Paper Pattern Theory Examination

IV-BHMS

PRACTICE OF MEDICINE& HOMOEOPATHIC THERAPEUTICS

PAPER-I

Marks: 100

- Instructions:-**
- 1) Use separate answer sheet for each section .
 - 2) All questions compulsory.
 - 3) Internal options given whenever required.
 - 4) Marks on right indicate full marks

Section – I

Q. 1. Write short notes on [Any 4]	20
a)	
b)	
c)	
d)	
e)	
Q. 2. Write any two in details	10
a)	
b)	
c)	
Q. 3. Write in brief (any two)..	10
a)	
b)	
c)	
Q. 4. Give Homeopathic approach with two well indicated drugs.(for any one)	10
a)	
b)	

Section – II

Q. 1. Write short notes on [Any 4]	20
a)	
b)	
c)	
d)	
e)	
Q. 2. Write any two in details	10
a)	
b)	
c)	
Q. 3. Write in brief (any two).	10
a)	
b)	
c)	
Q. 4. Give Homeopathic approach with two well indicated drugs.(for any one)	10
a)	

b)

BHARATI VIDYPEETH UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE ,DHANKAWADI-43 .
Paper Pattern Theory Examination
IV-BHMS
PRACTICE OF MEDICINE& HOMOEOPATHICTHERAPEUTICS
PAPER-II

Marks: 100

Instructions:-

- 1) Use separate answer sheet for each section on.
- 2) All questions compulsory.
- 3) Internal options given whenever required.
- 4) Marks on right indicate full marks

Section – I

Q. 1. Write short notes on [Any 4]	20
a)	
b)	
c)	
d)	
e)	
Q. 2. Write any two in details	10
a)	
b)	
c)	
Q. 3. Write in brief (any two).	10
a)	
b)	
c)	
Q. 4. Give Homeopathic approach with two well indicated drugs.(for any one)	10
a)	
b)	

Section – II

Q. 1. Write short notes on [Any 4]	20
a)	
b)	
c)	
d)	
Q. 2. Write any two in details	10
a)	
b)	
c)	
Q. 3. Write in brief (any two).	10
a)	
b)	
c)	
Q. 4. Give Homeopathic approach with two well indicated drugs.(for any one)	10

a)
b)

Practical including viva voce or oral:

Total Marks: 200

Distribution of marks

Table 1:-50 marks

One long case – (20 marks)	
(Complete case writing- Bed side examination	10 marks,
Clinical diagnosis and remedy selection -	10marks,
Practical records, case records, journal -	30 marks

Table 2:- 50 marks

One short case - (20 marks)	
(Complete case writing- Bed side examination	10 marks,
Clinical diagnosis and remedy selection -	10marks,
Identification of specimens (X-Ray, E.C.G.)-	30 marks

Table 3:- 50 marks

Topics of third B.H.M.S. with Homeopathic therapeutics

Table 4:- 50 marks

Topics of fourth B.H.M.S. with Homeopathic therapeutics

INSTRUCTIONS FOR PAPER SETTING

- 5) Please give weightage to each system as prescribed while setting the question papers.
- 6) There is no separate section for therapeutics.
- 7) It is expected that therapeutics should be incorporated in the question itself wherever necessary.
- 8) As far as possible do not omit any system while setting the paper.

**SUBJECT – HOMOEOPATHIC MATERIA MEDICA
IVth BHMS**

Day –

Total Marks -100 marks each

Date -

Time – 3 hours each

No. of Papers : 02

Paper I –Syllabus of Ist, IInd and IIIrd BHMS - 100 Marks

Section I – Syllabus of Ist, IInd BHMS - 50 Marks

Section II – Syllabus of IIIrd BHMS - 50 Marks

Paper II – Section I & II - Syllabus of IVth BHMS - 100 Marks

- Instructions :**
1. All questions are compulsory.
 2. Figures to the right indicate full marks
 3. Each section to be answered in separate answer books
 4. Answers written in inappropriate section will not be assessed

Paper I and II- Pattern as below
Each section should be of 50 marks in both papers

Section-1

Question No.	Question	Marks
1A	General topic (give choice)/Group (give choice)	09
1B	Drug picture (give choice)	09
2	Short notes (4 out of 5)	16
3	Write as indicated (4 out of 5)	16

Section-II

Question No.	Question	Marks
4A	Group (give choice)	09
4B	Drug picture (give choice)	09
5	Write as indicated (4 out of 5)	16
6	Comparisons (4 out of 5)	16

Practical and oral examination, marks : 200

Examiners : 04

1. Each examiner shall conduct the examination of not more than 50 marks.
2. Two examiners shall be internal and other two shall be external.

Practical mark division.

Syllabus	Marks
Case taking and case processing of one long case i.e. analysis, evaluation and formation of totality with selection of medicine, potency and repetition schedule.	60
Case taking of one short case.	20
Journal.	20
Total	100

Viva voce(oral) : 100 Marks - On syllabus of Ist ,IInd, IIIrd & IVBHMS.

ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY

IV – BHMS

Examination of Organon of medicine with Homoeopathic philosophy shall consist of two theory papers and one practical examination for final BHMS examination.

The practical examination shall be on the Homoeopathic Orientation of cases in relation to miasmatic diagnosis, general management, posology, second prescription etc. for final BHMS examination.

Note; (1) Each student has to maintain records of twenty thoroughly worked out cases (ten chronic and ten acute cases).

(2) Each student shall present at least one case in the departmental symposium or seminar.

C. Examination:

	Full Marks	Pass Marks
Written [Theory]	200	100
Two papers	100 [2]	
[Practical & Oral]	100	50
Total [1 + 2]	300	150

THEORY PAPER

Instructions – [for both papers]

1. All questions are **compulsory**.
2. Figures to the right indicate Full marks.
3. Write each section in separate answer books.

PAPER – I
Aphorism 1-145 - 30marks
Aphorism 146-294 - 70 marks
Marks - 100
2 sections of 50 marks each **3 Hours**
SECTION – I

Q.1	Compulsory question	a]	8 marks
		b]	7 marks
Q.2	Q. A or Q. B	a]	8 marks
		b]	7 marks
Q.3	Short notes [any 4] 5 Marks each	20 marks	

SECTION – II

Q.4	Compulsory question	a]	8 marks
		b]	7 marks
Q.5	Q. A or Q. B	a]	8 marks
		b]	7 marks
Q.6	Short notes [any 4] 5 Marks each	20 marks	

PAPER – II

Marks - 100

IV-B.H.M.S.

3 Hours

Chronic Diseases - 50 marks
Homoeopathic Philosophy - 50 marks

SECTION – I

Q.1	Compulsory question	a]	8 marks
		b]	7 marks
Q.2	Q. A or Q. B	a]	8 marks
		b]	7 marks
Q.3	Short notes [any 4] 5 Marks each	20 marks	

SECTION – II

[Topic from Stuart Close and Roberts philosophy]

Q.4	Compulsory question	a]	8 marks
		b]	7 marks
Q.5	Q. A or Q. B	a]	8 marks
		b]	7 marks
Q.6	Short notes [any 4]	20 marks	

	5 Marks each	
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IV-B.H.M.S.

Marks : 100
Examiners : 04

PRACTICAL EXAMINATION:

DAY DATE TIME 9.00 am onwards Batch

QUESTIONS REGARDING CASE TAKING AT BEDSIDE:

Q.1 Investigate the given case [M/F – 1 to 20] under the following headings.

[A] CASES (02)

2. Practical including viva voce or oral:

2.1.		Marks 100
2.2	Distribution of marks	
2.2.1	Case taking and case processing of a long case	30
2.2.3	Case taking and case processing of a short case	10
2.2.3	Maintenance, of practical record, or journal	10
2.2.4	Viva voce (oral)	50
	Total	100

**ORGANON OF MEDICINE WITH HOMOEOPATHIC PHILOSOPHY
II/III /IV– BHMS**

BEDSIDE PATIENT ATTENDANCE

PRACTICAL EXAMINATION:

DAY DATE TIME 9.00 am onwards Batch

Sr. No	Exam Seat No.	Bed No	Name of the patient	Signature
1				
2				
3				
4				
5				
Onwards ↓ Upto 20				

Exam. Centre: _____

Signature of Examiners: 1] _____ 2] _____

3] _____ 4] _____

**BHARATI VIDYAPEETH DEEMED UNIVERSITY
HOMOEOPATHIC MEDICAL COLLEGE
KATRAJ-DHANKAWADI, PUNE – 43.
IVth B.H.M.S.
CASE TAKING AND REPERTORY**

Date-

Time-

Day –

Marks – 100

Instructions –

1. All questions are **Compulsory**.
2. Figures to the right indicate **Full Marks**.
3. Each section to be written in the **SEPARATE Answer Book**
4. Draw neat labeled diagrams wherever necessary.

Q. No.	Question Pattern	Marks
SECTION - I		
1	Short notes (Any Four) 5 marks each	20
2	Compulsory Question	10
3	Compulsory Question	10
4	A) Write in brief OR B) Write in brief	10
SECTION – II		
5	Short notes (Any Four) 5 marks each	20
6	Compulsory Question	10
7	Compulsory Question	10
8	A) Write in brief OR B) Write in brief	10

PRACTICAL EXAMINATION

- 2 Examiners - 1 External – 55 marks
- 1 Internal - 45 marks

External Examiner		Internal Examiner	
Topic	Marks	Topic	Marks
Chronic Case	30	Acute Case	10
		Journal	10
Table Viva and Rubric Hunting	25	Table Viva and Rubric Hunting	25
Total	55	Total	45

Subject	Written		Practical or Clinical including oral		Total	
	Full marks	Pass marks	Full marks	Pass marks	Full marks	Pass marks
Repertory	100	50	100	50	200	100

DEPT OF COMMUNITY MEDICINE Proposed Examination pattern 2015 course

There will be examination of the subject only in Fourth B.H.M.S (and not in III BHMS). Besides theory examination there shall be a practical-or clinical examination including viva-voce as per following distribution of marks-

1. Examination of this subject to be conducted in IV-B.H.M.S. at the end of course of study in Theory and Practical Training of Community.
2. Theory paper shall be comprised of two sections of 50 marks each and optional questions shall be available in each the section.
3. Some questions with Homoeopathic concept of prophylaxis, vaccination, immunology and personal hygiene may be asked in any of the sections.
4. Practical/ oral examination shall be on spotting and identification of the specimens and matters related to community medicine.

5. Marks :

Written		Practical		Total	
Full	Pass	Full	Pass	Full	Pass
100	50	100	50	100	50

THEORY PATTERN :**SECTION-I**

Question	Pattern	Marks	Remarks
1.	A) Short question	10/9 marks	Compulsory
	B) Short question	8/9 marks	Compulsory
2.	Short notes of 4 marks	16 marks	Internal option may be given
3.	Short notes of 4 marks	16 marks	Internal option may be given
4.	Short notes of 4 or 8 marks	16 marks	Internal option may be given

SECTION-II

Question	Pattern	Marks	Remarks
1.	A) Short question	10/9 marks	Compulsory
	B) Short question	8/9 marks	Compulsory
2.	Short notes of 4 marks	16 marks	Internal option may be given
3.	Short notes of 4 marks	16 marks	Internal option may be given
4.	Short notes of 4 or 8 marks	16 marks	Internal option may be given

Out of question 2, 3 and 4 student will be given option of writing any 02 questions. Question No.5 will be compulsory as described above. Out of remaining questions namely Q. 6, 7 and 8 students will be given option of writing any 02 questions.

PRACTICAL PATTERN :

02 Examiners

01 Internal – 25 marks

01 External- 25marks

2.Practical including viva-voce/oral;	
2.1. Marks: 100	
2.2. Distribution of marks	Marks
2.2.1 Spotting	30
2.2.2 Journal or Practical record (including field visit records)	20
2.2.3 Viva voce(oral)	50
Total	100

Note: Pass marks for theory and practical will be 50 each respectively.

DURATION

Course Duration	4 years
Weeks available per year	52 weeks
Vacation	8 weeks
Gazetted holidays	3 weeks
Examination (including preparatory)	4 weeks
Available weeks	37 weeks
Hours per week	40 hours
Practical	30 hours per week
Theory	10 hours per week
Internship practical	48 hours per week
Hours available per academic year	1480 (37 week x 40 hours)

COURSE OF INSTRUCTION

FIRST YEAR

SUBJECT	Theory(in hrs) (Class &lab)	Practical (in hrs) (Clinical)	(In hrs)
1.* English	60		
2. Anatomy	60		
3. Physiology	60		
4. Nutrition	60		
5. Biochemistry	30		
6. Nursing Foundation	265+200	450	
7. Psychology	60		
8. Introduction to computers	45		
9. ** Marathi / Regional language	30		
10. Library work / self study			50
11. Environment science	50		
Total Hours	920	450	50
Total hours = 1420 hrs			

**** Optional**

SECOND YEAR

Subject	Theory(in hrs) (class & lab)	Practical (in hrs) (clinical)	(In hrs)
1. Sociology	60		
2. Pharmacology	45		
3. Pathology	30		
4. Genetics	15		
5. Medical surgical nursing (adult including geriatric)-I	210	720	
6. Community health nursing I	90	135	
7. Microbiology	60		
8. Library work/self study			50
9. Co-curricular activities			35
Total Hours	510	855	85
Total hours = 1450			

THIRD YEAR

Subject	Theory (in hrs) (Class & lab)	Practical (in hrs) (clinical)	(In hrs)
1. Medical surgical nursing (Adult including geriatric)-II	120	270	
2. Child Health Nursing	90	270	
3. Mental Health Nursing	90	270	
4. Communication & Educational Technology	60+30		
5. Library work & Self study			50
6. Co-curricular activities			50
Total Hours	390	810	100
Total hours = 1300 hrs			

FOURTH YEAR

Subject	Theory(in hrs) (class & lab)	Practical (in hrs) (clinical)	(In hrs)
1. Midwifery & Obstetrical Nursing	90	360	
2. Community health nursing II	90	135	
3. Nursing Research	45	*	
4. Management of Nursing Service & Education	60+30		
Total Hours	315	495	
Total hours = 810 hrs			

*** Project work to be carried out during internship**

INTERN-SHIP (Integrated practice)

48 hours per week

Subject	Theory(in hrs) (class & lab)	Practical (in hrs) (clinical)	(In weeks)
1. Midwifery & Obstetrical Nursing		240	5
2. Community health Nursing II		195	4
3. Medical surgical Nursing (adult including geriatrics)		430	9
4. Child Health Nursing		145	3
5. Mental Health Nursing		95	2
6. Research project		45	1
Total Hours		1150	24
Total hours = 1150hrs			

NOTE: -

1. Internship means 8 hours of integrated clinical duties in which two weeks of evening and night shift duties are included.
2. Internship should be carried out as 8 hours per day at 48 hours per week.
3. Student during internship will be supervised by nursing teachers.
4. Fourth final examination to be held only after completion of internship.

SCHEME OF EXAMINATION

FIRST YEAR

Subject	ASSESSMENT			
	Hours	Internal	External	Total
Theory				
1. Anatomy & Physiology	3	25	75	100
2. Nutrition & Biochemistry	3	25	75	100
3. Nursing foundation	3	25	75	100
4. Psychology	3	25	75	100
5.English		25	75	100
6.Introduction to computers (Internal)		25	75	100
7. Marathi (Internal exam)	2		50	50
Practical & Viva				
1. Nursing Foundations		100	100	200

SECOND YEAR

Subject	ASSESSMENT			
	Hours	Internal	External	Total
Theory				
1. Sociology	3	25	75	100
2. Medical surgical nursing	3	25	75	100
3.Pharmacology, Pathology & Genetics	3	25	75	100
4. Community Health nursing- 1	3	25	75	100
5. Microbiology	3	25	75	100
Practical & Viva				
1. Medical surgical nursing-1		100	100	200

THIRD YEAR

SUBJECT	ASSESSMENT			
	Hours	Internal	External	Total
Theory				
1. Medical surgical nursing-II	3	25	75	100
2. Child Health Nursing	3	25	75	100
3. Mental Health Nursing	3	25	75	100
4. Communication & Educational Technology	3	25	75	100
Practical & Viva				
1. Medical surgical nursing II		50	50	100
2. Child Health Nursing		50	50	100
3. Mental Health Nursing		50	50	100

FOURTH YEAR

SUBJECT	ASSESSMENT			
	Hours	Internal	External	Total
Theory				
1. Midwifery & Obstetrical Nursing	3	25	75	100
2. Community health nursing II	3	25	75	100
3. Nursing Research & Statistics	3	25	75	100
4. Management of Nursing Service & Education	3	25	75	100
Practical & Viva				
1. Midwifery & Obstetrical Nursing -II	3	50	50	100
2. Community Health Nursing -II	3	50	50	100

NOTE:-

1. Anatomy and physiology-Question paper will consist of section A Anatomy of 37 marks & section B Physiology should be of 38 marks.
2. Nutrition & Biochemistry- Question Paper will consist of section A Nutrition of 45 marks & section B Biochemistry of 30 marks.
3. Pharmacology, Pathology & Genetics-section A Pharmacology with 38.Marks, section B Pathology of 25 marks & genetics with 12 marks.
4. Nursing research & statistics – Nursing research should be of 50 marks & statistics of 25 marks
5. Minimum pass marks shall be 40% for English only.
6. Theory and practical exam for introductions to computers to be conducted as college exams and marks to be sent to the university for inclusion in the mark sheet
7. Minimum pass marks shall be 50% in each of theory & practical paper separately.
8. The candidate must have minimum of 80% attendance (irrespective of the kind of absence.) In theory & practical in each subject for appearing of examination.
9. A candidate must have 100% attendance in each of the practical areas before award of the degree.
10. A candidate has to pass in theory & practical exam separately in each of the paper.
11. If the candidate fails in either theory or practical exam he/she has to reappear for both the papers (Theory & practical).
12. Maximum number of attempts permitted for each paper is 3 including first attempt.
13. Candidate shall not be permitted to the subsequent higher examination unless the candidate has passed the previous examination.
14. The maximum period to complete the course successfully should not exceed 8 years.
15. Maximum number of candidates for practical examination should not exceed 20 per day.
16. All practical examinations must be held in the respective clinical areas.
17. One internal & one external examiner should jointly conduct the practical exam for each student.
18. An examiner should be a lecturer or above in a college of nursing with M.Sc.(N) in concerned subject & minimum of 3 years of teaching experience. To be an examiner for nursing foundation course faculty having M.Sc.(N) with any shall be considered.
19. Student has to pass in internal assessment and university Exam separately with 50% marks each.

**B.Sc.
NURSING
FIRST YEAR**

ENGLISH

Placement- First Year

Time:-Theory-60 hours

Course Description: The course is designed to enable students to enhance ability to comprehend spoken and written English (and use English) required for effective communication in their professional work. Student will practice their skills in verbal and written English during clinical and classroom experiences.

UNIT	CONTENT	HOURS
UNIT-1	<ul style="list-style-type: none">• Review of Grammar• Remedial study of Grammar• Building Vocabulary• Phonetics• Public Speaking	10 hrs.
UNIT-2	* Read and comprehend prescribed course books	30 hrs.
UNIT-3	* Various forms of composition <ul style="list-style-type: none">- Letter writing- Note taking- Precise writing- Nurse notes- Anecdotal records- Diary writing- Reports on health problems etc.- Resume/CV	10 hrs.
UNIT-4	* Spoken English <ul style="list-style-type: none">- Oral report- Discussion- Debate- Telephonic conversation	6 hrs.
UNIT-5	* Listening comprehension <ul style="list-style-type: none">- Media, audio, video, speeches etc.	4 hrs.

ANATOMY

Placement- First Year

Time:- Theory-60 hours

Course Description: The course is designed to enable students to acquire Knowledge of normal structure of various human body system and understand the alteration in anatomical structures in disease in disease and practice of nursing.

UNIT	CONTENT	HOURS
UNIT-1	Introduction to Anatomical terms organization of the human body - Human cell structure - Tissues – definition, types, characteristics, classification, location, function and formation - Membranes and glands – classification and structure. - Alteration in disease Application and implementation in nursing	5 hrs.
UNIT-2	The Skeletal System - Bones- types, structure, axial & appendicular skeleton - Bone formation and growth - Description of bones - Joint – classification and structure Alteration in disease Application and implication in nursing	6 hrs.
UNIT-3	The Muscular System - Types and structure of muscles - Muscle group	7 hrs.

	Alteration in disease Application and implication in nursing	
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UNIT-4	<p>The Nervous System</p> <ul style="list-style-type: none"> - Structure of neurologia & neurons - Somatic nervous system Structure of brain, spinal chord, cranial nerves, peripheral nerves - Autonomic nervous system- (Sympathetic, parasympathetic) Structure & location <p>Alteration in disease Application and implication in nursing</p>	6 hrs.
UNIT-5	<p>The Sensory Organs</p> <ul style="list-style-type: none"> - Structure of skin, eye, ear, nose, tongue (Auditory and olfactory apparatus) <p>Alteration in disease Application and implication in nursing</p>	6 hrs.
UNIT-6	<p>Circulatory and Lymphatic system</p> <ul style="list-style-type: none"> - The circulatory system <ul style="list-style-type: none"> * Blood - Microscopic structure * Structure of heart * Structure of blood vessels- Arterial and venous system *Circulation: systemic, pulmonary, coronary. - Lymphatic system <ul style="list-style-type: none"> * Lymphatic vessels and lymph 	7 hrs.

	<ul style="list-style-type: none"> * Lymphatic tissues <ul style="list-style-type: none"> - Thymus gland - Lymph nodes - Lymphatic Nodules <p>Alteration in disease Application and implication in nursing</p>	
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UNIT-7	<p>The Respiratory System</p> <ul style="list-style-type: none"> - Structure of the organs of respiration - Muscles of respiration Intercostals and diaphragm <p>Alteration in disease Application and implication in nursing</p>	5 hrs.
UNIT-8	<p>The Digestive System</p> <ul style="list-style-type: none"> - Structure of alimentary tract and accessory organs of digestion <p>Alteration in disease Application and implication in nursing</p>	6 hrs.
UNIT-9	<p>The Excretory System (Urinary)</p> <ul style="list-style-type: none"> - Structure of organs of urinary - System: kidney, ureters, urinary bladder, urethra, structure of skin. <p>Alteration in disease Application and implication in nursing</p>	4 hrs.
UNIT-10	<p>The Endocrine System</p> <ul style="list-style-type: none"> - Structure of pituitary, pancreas, thyroid, parathyroid, thymus and adrenal glands <p>Alteration in disease</p>	4 hrs.

	Application and implication in nursing	
UNIT-11	The Reproductive System including Breast - Structure of female reproductive organs - Structure of male reproductive organs - Structure of breast	4 hrs.

PHYSIOLOGY

Placement- First Year

Time: Theory 60 hrs.

Course Description: The course is designed to assist the students to acquire Knowledge of the normal physiology of various human body systems and under stand the alteration in physiology disease and practice of nursing.

UNIT	CONTENT	HOURS
UNIT-1	Cell physiology * Tissue – formation, repair * Membranes & gland – functions Alteration in disease Application and implication in nursing	4 hrs.
UNIT-2	Skeleton System * Bone formation and growth * Bones – functions and movements of bones of axial & appendicular skeleton, bone healing * Joints and joint movements Alteration in disease Application and implication in nursing	4 hrs.
UNIT-3	Muscular System * Muscle movements, muscle tone, physiology of muscle contraction, levels and maintenance of posture Alteration in disease Application and implication in nursing	4 hrs.
UNIT-4	Nervous System * Function of neuralgia & neurons * Stimulus & nerve-impulse- definition and mechanism * Function of brain spinal cord. Cranial & spinal nerves * Cerebrospinal fluid-composition. Circulation and function * Reflex arc, reflex action and reflexes *Autonomic function - Pain: somatic, viscera land referred. - Autonomic learning and biofeedback Alteration in disease Application and implication in nursing	7 hrs.
UNIT-5	Circulatory System * Blood formation, composition, blood group, blood coagulation * Hemoglobin : structure, synthesis and breakdown, variation of molecules, estimation * Function of heart, conduction, cardiac cycle, circulation- principles control, factors influencing BP &	8 hrs.

	<p>Pulse</p> <p>Alteration in disease</p> <p>Application and implication in nursing</p>	
UNIT-6	<p>The Respiratory System</p> <ul style="list-style-type: none"> * Functions of respiratory system * Physiology of respiration * Pulmonary ventilation, volume * Mechanics of respiration * Gaseous exchange in lungs * Carriage of oxygen & carbon dioxide * Exchange of gases in tissues * Regulation of respiration <p>Alteration in disease</p> <p>Application and implication in nursing</p>	6 hrs.
UNIT-7	<p>The Digestive System</p> <ul style="list-style-type: none"> * Functions of organ of digestive tract. Movements of alimentary tract. Digestion in mouth stomach small intestine, large intestine, absorption of food, function of liver, gall bladder and pancreas. * Metabolism of carbohydrates, protein and fat. <p>Alteration in disease</p> <p>Application and implication in nursing</p>	6 hrs.
UNIT-8	<p>The Excretory System</p> <ul style="list-style-type: none"> * Function of Kidneys, ureters, urinary bladder & urethra. * Composition of urine * Mechanism of urine formation * Function of skin * Regulation of body temperature * fluid and electrolyte balance <p>Alteration in disease</p> <p>Application and implication in nursing</p>	5 hrs.
UNIT-9	<p>The Sensory organs</p> <ul style="list-style-type: none"> * Functions of skin, eye, ear, nose, tongue. <p>Alteration in disease</p> <p>Application and implication in nursing</p>	4 hrs.
UNIT-10	<p>The Endocrine System</p> <ul style="list-style-type: none"> * Function of Pituitary, pineal body, thymus, thyroid, parathyroid, pancreas, suprarenal, placenta & ovaries & testes. <p>Alteration in disease</p> <p>Application and implication in nursing</p>	5 hrs.
UNIT-11	<p>The Reproductive system</p> <ul style="list-style-type: none"> * Reproduction of cells-DNA. Mitosis, spermatogenesis, 	5 hrs

	<p>oogenesis</p> <ul style="list-style-type: none"> * Function of female reproductive organs: function of breast, female sexual cycle * Introduction of embryology * Function of male reproductive organs, male function in reproduction male fertility system. <p>Alteration in disease Application and implication in nursing</p>	
UNIT-12	<p>Lymphatic and Immunological system</p> <ul style="list-style-type: none"> • Circulation of lymph • Immunity - Formation of T-cells & B-cells - Types of immune response - Antigen - Cytokines - Antibodies 	

NUTRITION

Placement- First Year

Time: Theory 60 hrs

Course Description: The course is designed to assist the students to acquire knowledge of Nutrition for maintenance of optimal health at different stages of life and its application for practice of nursing.

UNIT	CONTENT	HOURS
UNIT-1	<p>Introduction</p> <ul style="list-style-type: none">• Nutrition<ul style="list-style-type: none">- History- Concepts <p>* Role of nutrition in maintaining health</p> <p>* Nutritional problem in India</p> <p>* Factors affecting food and nutrition: socio-economic, cultural, tradition, production, system of distribution, life style and food habits etc.</p> <p>* Role of food and its medicinal value</p> <p>* Classification of food</p> <p>* Food standards</p> <p>* Element of Nutrition : macro and micro</p> <p>* Calorie BMR</p>	4hrs
UNIT-2	<p>Carbohydrates</p> <ul style="list-style-type: none">• Classification• Caloric value• Recommended daily allowances• Dietary Sources• Functions• Digestion, absorption and storage, metabolism of carbohydrates• Malnutrition: Deficiencies and over consumption	2 hrs.
UNIT-3	<p>Fats</p> <ul style="list-style-type: none">* Classification* Caloric Value* Recommended daily allowances* Dietary sources* Functions* Digestion, absorption and storage, metabolism of fats* Malnutrition: Deficiencies and over consumption	2 hrs.
UNIT-4	<p>Proteins</p> <ul style="list-style-type: none">• Classification• Caloric value	2 hrs.

	<ul style="list-style-type: none"> • Recommended daily allowances • Dietary sources • Functions • Digestion, absorption and storage, metabolism of carbohydrates. • Malnutrition: Deficiencies and over consumption 	
UNIT-5	<p>Energy</p> <ul style="list-style-type: none"> * Unit of energy- Kcal * Energy requirements of different categories of people * Measurement of energy * Body mass index (BMI) & basic metabolism * Basal metabolic rate (BMR) – determine the factors affecting. 	3 hrs.
UNIT-6	<p>Vitamins</p> <ul style="list-style-type: none"> • Classification • Recommended daily allowance • Dietary sources • Functions • Absorption, synthesis, metabolism, storage and excretion • Deficiencies • Hypervitaminosis 	4 hrs.
UNIT-7	<p>Minerals</p> <ul style="list-style-type: none"> * Classification * Recommended daily allowance * Dietary sources * Functions * Absorption, synthesis, metabolism, storage and exertion * Deficiencies * Over composition and toxicity 	4 hrs.
UNIT-8	<p>Water and Electrolyte Balance</p> <ul style="list-style-type: none"> * Water :- Daily requirements, regulation of water, metabolism, distribution of body water * Electrolytes: Types, sources, composition of body fluids * Maintenance of Fluid & electrolyte balance * Over Hydration dehydration and water intoxication * Electrolyte Imbalance 	3 hrs.
UNIT-9	<p>Cookery rules and preservation of Nutrients</p> <ul style="list-style-type: none"> * Principles, methods of cooking and serving <p>Preservation of nutrients</p> <ul style="list-style-type: none"> * Safe food handling – toxicity * Storage of Food * Food Preservation, food additives and its principles * Preservation of food adulteration Act(PFA) 	5 hrs.

	<ul style="list-style-type: none"> * Food standards * Preparation of simple beverages of different types of 	
UNIT-10	<p>Balanced diet</p> <ul style="list-style-type: none"> * Elements * Food groups * Recommended daily allowance * Nutritive value of food * Calculation of balanced diet for different categories of people * Planning menu * Budgeting of food * Introduction to therapeutic diet: Naturopathy=Diet 	5 hrs.
UNIT-11	<p>Role of nurse nutritional programme</p> <ul style="list-style-type: none"> • National programme related to nutrition <ul style="list-style-type: none"> - Vitamin A deficiency programme - National iodine deficiency disorders (IDD) programme - Mid-day meal programme - Integrated child development scheme • National & International agencies working towards food/nutrition <ul style="list-style-type: none"> - NIPCCD, CARE, FAQ, NIN, CFTRI (Central food technology and research institute) etc. • Assessment of nutritional status • Nutrition education and role of nurse. 	

BIOCHEMISTRY

Placement-First Year

Time: Theory 30 hrs.

Course Description: The course is designed to assist the students to acquire knowledge of the normal biochemical composition and functioning of human body and understand the alteration in biochemistry in disease for practice for practice of nursing

UNIT	CONTENT	HOURS
UNIT-1	Introduction <ul style="list-style-type: none">• Definition and significance in nursing• Review of structure, composition and function of cell• Prokaryote and Eukaryote cell organization• Microscopy	3hrs.
UNIT-2	Structure and Function of Cell membrane <ul style="list-style-type: none">• Fluid mosaic model tight junction, cytoskeleton• Transport mechanism: diffusion, osmosis, filtration, active channel, sodium pump• Acid base balance- maintenance and diagnostic tests - PH buffers	6hrs
Unit -3	Composition and Metabolism of Carbohydrates <ul style="list-style-type: none">• Types structure, composition and uses• Monosaccharide, Disaccharides, Polysaccharides oligosaccharides• Metabolism - Pathways of Glucose <ul style="list-style-type: none">- Glycolysis- Gluconeogenesis Cori's cycle Tricarboxylic acid(TCA) cycle- Glycogenolysis- Pentose phosphate- Pathways (Hexose mono phosphate)- Regulation of blood glucose level Investigation & their interpretation	6hrs

Unit -4	<p>Composition and metabolism of lipids</p> <ul style="list-style-type: none"> • Types, structure, composition and uses of fatty acids Nomenclature Roles and prostaglandin's • Metabolism of Fatty acids <ul style="list-style-type: none"> -Breakdown -Synthesis • Metabolism of Triglycerols • Cholesterol metabolism <ul style="list-style-type: none"> * Biosynthesis and its regulation <ul style="list-style-type: none"> - Bile salts and bilirubin - Vitamin D -Steroid hormones • Lipoproteins and their functions <ul style="list-style-type: none"> - VLDLs- IDLs and HDLs - Transport of lipids - Arteriosclerosis <p>Investigation and their interpretation</p>	4hrs
Unit -5	<p>Composition and metabolism of Amino acids and proteins</p> <ul style="list-style-type: none"> * Types, structure, composition and uses acids and proteins * Metabolism of amino acids and proteins <ul style="list-style-type: none"> • Protein synthesis Targeting & glycosylation • Chemotherapy • Electrophoresis • Sequencing * Metabolism of Nitrogen <ul style="list-style-type: none"> • Fixation & assimilation • Urea cycle • Heme and chlorophylls * Enzymes and co-enzymes <ul style="list-style-type: none"> • Classification • Properties • Kinetics & inhibition • Control <p>Investigation and their interpretation</p>	6hrs
Unit -6	<p>Composition and Vitamins and minerals</p> <ul style="list-style-type: none"> * Vitamins & Minerals <ul style="list-style-type: none"> - Structure - Classification - Properties - Absorptions - Storage & transportations - Normal concentration investigation and their 	2hrs

	interpretation	
Unit -7	<p>Immunochemistry</p> <ul style="list-style-type: none"> - Immune response - Structure & Classification of immune response - Mechanism of antibody production - Antigen: HLA typing - Free radical & antioxidants - Specialized proteins: Collagen Elastin Keratin Myosin, Lens Protein - Electrophoretic and quantitative determinations of immunoglobins- ELISA etc <p>Investigation and their interpretation</p>	3hrs

NURSING FOUNDATION

Placement: First Year

**Theory-265hrs
Practical- 650hrs
(200lab and 450 clinical)**

Course Description: This course is designed to help the students to develop an understanding of the philosophy, objectives, theories and process of nursing in various supervised clinical setting. It is aimed at helping the students to acquire knowledge understanding and skill in techniques of nursing and practice them in supervised clinical setting

UNIT	CONTENT	HOURS
UNIT-1	<p>Introduction</p> <ul style="list-style-type: none">* Concept of health: Health – Illness continuum* Factors influencing health* Causes and risk factors for developing illness* Body defenses : Immunity and immunization* Illness & illness behavior* Impact of illness on patient and family* Health care services: health promotion and prevention primary care, diagnosis, treatment, rehabilitation and continuing care.* Health care team* Types of health care agencies* Hospitals; Types, organization and functions* Health promotion and level of disease prevention* Primary health care and its delivery: Role of nurse.	10 hrs.
UNIT-2	<p>Nursing as a profession</p> <ul style="list-style-type: none">* Definition and characteristics of a profession* Nursing<ul style="list-style-type: none">- Definition, concepts, philosophy, objectives.- Characteristics, nature and scope of nursing practice- Function of nurse- Qualities of nurse- Categories of nursing personnel- Nursing as a profession- History of nursing in India* Values : Definition, types, values clarification and values professional nursing: caring and advocacy* Ethics :<ul style="list-style-type: none">- Definition and ethical principles- Code of ethics and professional conduct for nurse.	16 hrs.
Unit -3	<p>Hospital admission and discharge</p> <ul style="list-style-type: none">* Admission to the hospital<ul style="list-style-type: none">- Unit and its preparation admission bed	4 hrs.

	<ul style="list-style-type: none"> - Admission procedure - Special considerations - Medico-legal issues - Roles and responsibilities of the nurse * Discharge from the hospital <ul style="list-style-type: none"> - Types: Planned discharge, LAMMA and abscond, referral And transfers - Discharge planning - Discharge procedure - Special consideration - Medico- legal issues - Roles and responsibilities of the nurse - Care of the unit after discharge 	
Unit -4	<p>Communication and the nurse patient relationship</p> <ul style="list-style-type: none"> * Communication: Levels, elements, types, modes, process, factors influencing communication. <ul style="list-style-type: none"> - Methods of effective communication <ul style="list-style-type: none"> # Attending skills # Rapport building skills # Empathy skill - Barriers to effective communication * Helping relationship (NPR): dimensions of helping relationships, phases of a helping relationship * Communicating effectively with patient, families and team members and maintain effective human relation with special reference to communicating with vulnerable group (children, woman, physically and mentally challenged and elderly) * Patient teaching: Importance purpose, process, role of nurse and integrating teaching in nursing process. 	10 hrs
Unit -5	<p>The Nursing process</p> <ul style="list-style-type: none"> * Critical thinking and nursing judgment <ul style="list-style-type: none"> - Critical thinking: Thinking and learning - Competencies, attitude for critical thinking, levels critical thinking in nursing * Nursing process overview: <ul style="list-style-type: none"> Application in practice <ul style="list-style-type: none"> - Nursing process format: INC, current format - Assessment <ul style="list-style-type: none"> # Collection of data: types, sources, methods - Nursing Diagnosis <ul style="list-style-type: none"> # Identification of client problems # Nursing diagnosis statement # Difference between medical and nursing diagnosis - Planning <ul style="list-style-type: none"> - Establishing goals and expected outcomes - Selection of intervention: Protocols and standing 	15 hrs

	<p>orders</p> <ul style="list-style-type: none"> - Writing the nursing care plan <p>* Implementation</p> <ul style="list-style-type: none"> - Implementing the plan of care <p>* Evaluation</p> <ul style="list-style-type: none"> - Outcome of care - Review and modify <p>* Documentation and reporting</p>	
Unit -6	<p>Documentation and reporting</p> <ul style="list-style-type: none"> * Documentation: purpose of recording and reporting * Communication within the health care team * Types of record: ward records, medical/nursing records * Common record-keeping forms, computerized documentation * Guidelines for reporting :Factual basis, accuracy , completeness, current ness, organization, confidentiality * Methods of recording. * Reporting change –of shift reports: transfer reports, incident reports * Minimizing legal liability through effective record keeping 	4hrs
Unit -7	<p>Vital sign</p> <ul style="list-style-type: none"> * Guidelines for taking signs: * Body temperature <ul style="list-style-type: none"> - Physiology, regulation .Factor affecting body Temperature. - Assessment of body temperature: sites, equipments and technique special considerations - Temperature alterations: Hyperthermia, heat stroke, hypothermia - Hot and cold applications * Pulse <ul style="list-style-type: none"> - Physiology and regulation, characteristics of the pulse, factors affecting pulse - Assessment of pulse: sites, location, equipment and technique, Special consideration - Alteration in pulse * Respiration <ul style="list-style-type: none"> - Physiology and regulation, mechanics of breathing <p>Characteristics of the respiration, factors affecting respiration</p> <ul style="list-style-type: none"> - Assessment of pulse: site, location, equipments and technique, special consideration - Alteration in pulse. * Respiration: <ul style="list-style-type: none"> - Physiology and regulation, mechanics of breathing, characteristics, Factors affecting respiration 	15hrs

	<ul style="list-style-type: none"> - Assessment of respiration: technique, special consideration - Alteration in respiration * Blood pressure <ul style="list-style-type: none"> - Physiology and regulation, characteristics of blood pressure, Factors affecting blood pressure. - Assessment of blood pressure: equipments, technique, special consideration. - Alteration in blood pressure * Reading of vital signs 	
UNIT 8	<p>Health assessment</p> <ul style="list-style-type: none"> # Purpose # Process of health assessment <ul style="list-style-type: none"> - Health history - Physical examination # Methods- inspection., palpation, percussion, auscultation olfaction # Preparation of examination; patient and unit # General assessment # Assessment of each body system # Recording of health assessment 	30 hrs
UNIT 9	<p>Machinery equipment and Linen</p> <ul style="list-style-type: none"> - Type Disposable and reusable – linen, rubber gods, glass ware, mental, plastics, furniture machinery <p>Introduction</p> <ul style="list-style-type: none"> - Indent - Maintenance - Inventory 	5hrs

UNIT 10	<p>Meeting needs of patient</p> <p>* Basic needs (Activity of daily living)</p> <ul style="list-style-type: none"> - Providing safe and clean environment - Physical- environment, temperature humidity, noise, ventilation, light, odors, pests control, reduction of physical hazards: Fire accidents - Safety devices restraints, side rails, airways, trapeze etc. - Role of nurse in providing safe and clean environment <p>* Hygiene - Factors influencing hygiene practices</p> <ul style="list-style-type: none"> - Hygienic care: care of the skin – bath and pressure points, feet and nail, oral cavity, hair care, eyes, ear and nose - Assessment, principles, types, equipments procedure, special considerations - Patient environment : Room equipment and linen, making patient beds - Types of beds and bed making - Comport:- - Factors influencing comport - Comport devices <p>* Physiological needs;</p> <p># Sleep & rest</p> <ul style="list-style-type: none"> - Physiology of sleep - Factors affecting Sleep - Promoting rest & sleep - Sleep disorders <p># Nutrition</p> <ul style="list-style-type: none"> - Importance - Factors affecting nutritional needs - Assessments of nutritional needs variables - meeting nutritional needs principles, equipments, procedure and special considerations <ul style="list-style-type: none"> * Oral * Central : Naso/ orgastric, gastrostomy * Parental <p>* Urinary elimination</p> <ul style="list-style-type: none"> - Review of physiology of urine elimination, composition and characteristics of urine - Factor influencing urination - Alteration in urinary elimination - Types & collection of urine specimen: observation, urine testing - Facilitating urine elimination : assessment, types, 	60hrs
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equipments, procedure and special considerations

- # Providing urinal & bed pan
- # Condom drainage
- # Perineal care
- # Catheterization
- # Care of urinary drainage
- # Care of urinary diversion
- # Bladder irrigation

*** Bowel elimination**

- Review of physiology of bowel elimination.

Composition and characteristics of feces.

- Factor influencing bowel elimination Alteration in bowel elimination

- Types & collection of feces specimen: observation
- Facilitating bowel elimination: assessment,

equipment, procedures and special considerations

- # Passing of flatus tube
- # Enemas
- # Suppositories
- # Sitz bath
- # Bowel wash
- # Care of ostomies

*** Mobility and immobility**

- Principles of body mechanics
- Maintenance of normal body alignment and

mobility

- Factors affecting body alignment and mobility
- Hazards associated with immobility
- Alteration in body alignment and mobility
- Nursing intervention for impaired body alignment

and mobility: assessment, types, devices used, method and special consideration, rehabilitation aspects

- # Range of motion exercises
- # Maintaining body alignment: positions
- # Moving
- # Lifting
- # Transferring
- # Walking
- # Restraints

*** Oxygenation**

- Review of cardiovascular and respiratory physiology
- Factors affecting oxygenation
- Alteration in oxygenation
- Nursing intervention in oxygenation: assessment,

types, equipments used, procedure and special consideration

- # Maintenance of patient airway
- # Oxygen administration
- # Suction
- # Inhalation: dry & moist
- # Chest physiotherapy and postural drainage
- # Pulse oxymetry
- # CPR- Basic life support

*** Fluid, electrolyte and acid-base balance**

- Review of physiological regulation of fluid

UNIT-11	<p>Infection control and clinical settings</p> <ul style="list-style-type: none"> * Infection control <ul style="list-style-type: none"> - Nature of infection - Chain of infection transmission - Defenses against infection: natural and acquired - Hospital acquired infection - Concept of asepsis: medical asepsis and surgical asepsis - Isolation precaution (barrier nursing) <ul style="list-style-type: none"> # Hand washing: simple, hand atisepsis and surgical antiseptis (scrub) # Isolation: source and protective # Personal protective equipments: types, uses and technique of wearing and removing # Decontamination of equipments and unit # Transportation of infected patients # Transmission based precautions * Biomedical waste management <ul style="list-style-type: none"> - Importance - Types of hospital waste - Hazards associated with hospital waste - Decontamination of hospital waste - Segregation and transportation and disposal 	20 hrs
UNIT-12	<p>Administration of Medication</p> <ul style="list-style-type: none"> * General principles/ considerations <ul style="list-style-type: none"> - Purpose of medications - Principles : 5 rights, special considerations, prescriptions, safety in administering medication and medication errors - Drug forms - Route of administration - Storage & maintenance of drug and nurses responsibility - Broad classification of drugs - Therapeutic effect, side effects, toxic effects, idiosyncratic reaction, allergic reaction, drug tolerance, drug interaction - Factors influencing drug action - Systems of drug measurements: metric system, apothecary system, households measurement, solution <ul style="list-style-type: none"> - Converting measurements units: Conversion within one system, conversion between system, dosage calculation - Terminologies and abbreviation used in prescription and medications. * Parenteral <ul style="list-style-type: none"> - General principles: decontamination of disposable syringes and needles 	40 hrs.

	<ul style="list-style-type: none"> - Types of parenteral therapies - Types of syringes, needles, canula and infusion sets - Protection from needles stick injuries: giving medication with the safety syringes - Routes of parenteral therapies <ul style="list-style-type: none"> # Intradermal: purpose, site, equipments, procedures, special consideration # Subcutaneous: purpose, site, equipments, procedure, special consideration # Intramuscular: purpose, site, equipments, procedure, special consideration # Intravenous: purpose, site, equipments, procedure, special consideration # Advanced techniques: epidural, intrathecal, intraosseous, intraperitoneal, intrapleural, intra arterial- role of nurse * Topical administration: purpose, site, equipments, procedure, special consideration <ul style="list-style-type: none"> - Application to skin - Application to mucus membrane # Direct application of liquids-Gargle and swabbing the throat <ul style="list-style-type: none"> # Insertion of drug into body cavity: Suppository/ medicated packing in rectum/ vagina # Instillation: Ear, eye, nasal, bladder and rectal # Irrigation : Ear, eye, bladder, vaginal and rectal # Spraying: Nose and throat * Inhalation: Nasal, oral, end tracheal / tracheal (steam, oxygen and medication) Purposes, types, equipments, procedure, special considerations <ul style="list-style-type: none"> - Recording and reporting of medication administered. 	
UNIT-13	<p>Meeting needs of pre-operative patients</p> <ul style="list-style-type: none"> * Definition and concept of pre operative nursing * Pre-operative phase <ul style="list-style-type: none"> - Preparation of patient for surgery * Intra operative <ul style="list-style-type: none"> - Operative theatre set up and environment - Role of nurse * Post operative phase <ul style="list-style-type: none"> - Recovery unit - Post operative room - Post operative care * Wounds: types, classification, wound healing process, factors affecting wound, complication of wound healing * Surgical asepsis * Care of wound ; types, equipments, procedure and special considerations 	10 hrs.

	<ul style="list-style-type: none"> - Dressing, suture care - Care of drainage - Application of bandages, binders, splints and slings - Heat and cold therapy 	
UNIT-14	<p>Meeting special needs of the patient</p> <ul style="list-style-type: none"> * Care of patient having alteration in <ul style="list-style-type: none"> - Temperature (hyper & hypothermia): Types, assessment, management - Sensorium (Unconsciousness); Assessment and management - Urinary elimination (retention & incontinence); Assessment and management - Functioning of sensory organs(visual & hearing impairment); Assessment and management - Communication method and special considerations - Mobility (physically challenged, cast); Assessment and management - Mental state (mentally challenged); Assessment and management - Communication methods and special considerations - Respiration (distress); Types, assessment, management - Comfort-(pain) nature, types, Factors influencing pain, coping , assessment& management * Treatment related to gastrointestinal system; naso-gastric suction, gastric irrigation, gastric analysis. 	15 hrs.
UNIT- 15	<p>Care of terminally ill patient</p> <ul style="list-style-type: none"> • Concepts of loss, grief, grieving process • Signs of clinical death • Care of dying patient, special considerations Advanced directives; euthanasia, will, dying declaration, organ donation etc. • Medic-legal issue • care of dead body • Equipment., procedure and care of unit • Autopsy • Embalming 	5hrs
UNIT- 16	<p>Professional nursing concepts and practices</p> <ul style="list-style-type: none"> • Conceptual and theoretical models of nursing practice introduction to models – holistic model, health belief Model, health promotion model etc. • Introduction to theories in nursing: peplum’s Henderson’s Orem. S Newman’s Roger’s and Roy’s • Linking theories with nursing process 	6hrs

Nursing Foundation practical

Placement: - First Year

Practical- 650hrs

(200 and 450 Clinical):

Course Description: This course is designed to help the students to develop an understanding of the philosophy, objectives, theories and process of nursing in various supervised clinical setting. It is aimed at helping the students to acquire knowledge, understanding and skills in techniques of nursing and practice them in supervised clinical settings

UNIT	CONTENT	HOURS
UNIT -1	<p>Hospital admission and discharge (III)</p> <ul style="list-style-type: none"> • Admission • Prepare unit for new patient • Prepare admission procedure <ul style="list-style-type: none"> New patient Transfer in • Prepare patient record <p>Discharge/Transfer out</p> <ul style="list-style-type: none"> • Gives discharge counseling • Perform discharge procedure (planned discharge, LAMMA and abscond, referrals and transfers) • Prepare records of discharge/transfer • Dismantle, and disinfect unit and equipment after discharge/transfer <p>Perform assessment</p> <ul style="list-style-type: none"> • History taking, nursing diagnosis, problem list, Prioritization goals & outcomes, selection of interventions • Write nursing care plan • Gives care as per the plan <p>Communication</p> <ul style="list-style-type: none"> • Use verbal and nonverbal communication techniques Prepare a plan for patient teaching session 	<p>200 450 Minimum practice time clinical area</p>

	<p>Write patient report</p> <ul style="list-style-type: none"> • change of shift reports, transfer reports , incident report etc • Presents patient report <p>Vital sign</p> <ul style="list-style-type: none"> • Measure, record and interpret alteration in body temperature pulse respiration and blood pressure Health assessment • Health history taking 	
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	<ul style="list-style-type: none"> • Perform assessment <ul style="list-style-type: none"> -General - Body systems • Use various methods of physical examination • Inspection palpation, Percussion Auscultation, Olfaction • Identification of system wise deviations <p>Prepare patient's Unit</p> <ul style="list-style-type: none"> • Prepare beds <ul style="list-style-type: none"> - Open closed, occupied operation amputation - Cardiac, Fracture, burn and Fowler's bed - Pain assessment and provision for comfort <p>Use comfort devices</p> <p>Hygienic care</p> <ul style="list-style-type: none"> • Oral hygiene • Bath and care of pressure points • Hair wash pediculosis Treatment <p>Feeding</p> <ul style="list-style-type: none"> • Oral, Eternal, Naso/orogastric gastrostomy and parenteral feeding • Naso- gastric insertion suction and irrigation <p>Assisting patient in urinary elimination</p> <ul style="list-style-type: none"> • Provides urinal/bed pan • Condom drainage • Catheterization • Care of urinary drainage <p>Bladder irrigation</p> <p>Assisting bowel elimination</p> <ul style="list-style-type: none"> • Insertion of Flatus tube • Enemas • Insertion of suppository <p>Bowel wash</p> <p>Body alignment and mobility:-</p> <ul style="list-style-type: none"> - Range of motion exercises 	
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	<ul style="list-style-type: none"> - Positioning Recumbent lateral fowlers, Sims, lithotomic, prone, trend burg position - Assist patient in moving lifting transferring, Walking - Rest rants <p>Oxygen administration</p> <p>Suctioning: Or pharyngeal, nasopharyngeal</p> <p>Chest physiotherapy and postural drainage</p> <p>Care of chest drainage</p> <p>CPR- Basic life support</p> <p>Intravenous therapy</p> <p>Blood and blood component therapy</p> <p>Collect/ assist for collection of specimen for investigation urine, sputum, faces, vomit us, blood and other body fluid</p> <p>Perform lab tests:</p> <ul style="list-style-type: none"> • Urine: sugar, albumin and acetone • Blood: sugar (with stripe/ glucometer) <p>Hot and cold application: Local and general sitz bath.</p> <p>Communicating and assisting self care of visually and hearing impaired patients</p> <p>Communicating and assisting self care of mentally challenged/ disturbed patients</p> <p>Recreational and divers ional therapies</p> <p>Caring of patient with alteration in sensation</p> <p>Infection control</p> <ul style="list-style-type: none"> * perform following procedures <ul style="list-style-type: none"> - Hand washing techniques - (Simple, hand antisepsis and surgical antisepsis) - Prepare isolation unit in lab/ward - Practice technique of wearing and removing personal protective equipments - Practice standard safety precaution (universal precautions) * Documentation of equipments and unit:- <ul style="list-style-type: none"> - Surgical asepsis # Sterilization # Handling sterilization equipment # Calculate strengths of lotions # Prepare lotion * Care of articles <p>Pre and post operative care</p> <ul style="list-style-type: none"> • Skin preparation for surgery: Local 	
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	<ul style="list-style-type: none"> • Preparation of post operative unit • Pre & Post operative teaching and counseling • Pre and post operative monitoring • Care of the wound • Dressing, suture care, care of drainage, application of bandage, binders, splint and sling • Bandaging of various body parts. <p>Administration of medications</p> <ul style="list-style-type: none"> • Administer medication in different forms and routes • Oral, sublingual and buccal • Parenteral: intradermal, subcutaneous, intramuscular etc. • Assist with the intravenous medication • Drug measurement and dose calculation • Preparation of lotion and solution • Administer topical applications • Insertion of drug into the body cavity: suppository & medicated packing etc. • Instillation of medicine and spray into Ear, eye, nose and throat • Irrigation: eye, ear, bladder, vagina and rectum • Inhalation: dry and moist <p>Care of dying patient</p> <ul style="list-style-type: none"> • Caring and packing of dead body • Counseling and supporting grieving relatives • Terminal care of the unit 	
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PSYCHOLOGY

Placement: First Year

Theory-60 hrs

Course Description: This course is designed to assist the students to acquire knowledge of fundamentals of psychology and develop an insight into behavior of self, and others Further it is aimed at helping them to practice the principles and mental hygiene for promoting mental health in nursing practice

UNIT	CONTENT	HOURS
UNIT -1	Introduction <ul style="list-style-type: none">• History and origin of science of psychology• Definition & scope of psychology• Relevance to nursing• Methods of psychology	2 hrs
UNIT -2	Biology of behavior <ul style="list-style-type: none">• Body of relationship- modulation process in health and illness• Genetics and behavior-Heredity and environment• Brain and behavior- Nervous system, neurons and synapse• Association cortex, Rt and Lt hemisphere• Psychology of sensation• Muscular and glandular controls of behavior• Nature of behavior of an organism/ integrated responses	4 hrs
UNIT -3	Cognitive process <ul style="list-style-type: none">• Attention: types, determinants, duration and degree, alteration• Perception: types, determinants, duration and degree, alteration• Learning: Nature, types, learner and learning, factors influencing, laws and theories, process, transfer, study habits• Memory: Meaning, types nature, factors influencing, development theories and methods of memorizing and forgetting• Thinking: types and levels, stages of development, relationship with language and communication• Intelligence: Meaning , classification, uses, theories• Attitude Concept, types, individual difference	20 hrs.

	<p>and variability</p> <ul style="list-style-type: none"> • Psychometric assessment of cognitive processes • Alteration in cognitive processes • Application 	
UNIT -4	<p>Motivation and Emotional process</p> <ul style="list-style-type: none"> • Motivation: Meaning, concept, types, theories, motives and behavior, conflicts and frustration conflict and resolution • Emotion and stress <ul style="list-style-type: none"> - Emotion: Definition , components, change in emotions, <p>Theories, emotions in health and illness</p> <ul style="list-style-type: none"> • Stress stressors cycle. Affect adaptation and coping • Attitude meaning nature. Development factors affecting <p>- Behavior and attitudes</p> <p>- Attitudinal Change</p> <ul style="list-style-type: none"> • Psychometric assessment of emotions and attitudes • Alteration in emotions • Application 	
UNIT – 5	<p>Personality</p> <ul style="list-style-type: none"> • Definition topography, types, theories • Psychometric assessment of personality • Alteration in personality • Application 	7hrs
UNIT – 6	<p>Developmental psychology</p> <ul style="list-style-type: none"> • Psychology of people at different stages from infancy to old age • Psychology of Vulnerable individual challenged, Women, sick • Psychology of groups 	7 hrs
UNIT – 7	<p>Mental Hygiene and Mental Health</p> <ul style="list-style-type: none"> • concept of Mental Hygiene and mental health • Characteristics of mentally healthy person • Warning signs of poor mental health • Promotive and preventive mental health – Strategies and Services • Ego defense mechanism and implication • Personal and social adjustment • Guidance and counseling • Role of nurse 	8 hrs
UNIT- 8	Psychological assessment and tests	4 hrs

	* Types, development, characteristics, principles, uses, interpretation and role of nurse in psychology assessment	
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INTRODUCTION TO COMPUTERS

Placement: First Year

Theory-45 hrs.

Course Description: This course is designed for students to develop basic understanding of uses of computers and its application in nursing.

UNIT	CONTENT	HOURS	
		Theory	Prac.
UNIT - 1	Introduction <ul style="list-style-type: none">• Concepts of computers• Hardware and software : trends and technology• Application of computers in nursing	3 hrs	----
UNIT - 2	<ul style="list-style-type: none">• Introduction to disk operating system<ul style="list-style-type: none">- DOS- Window (all version)• Introduction<ul style="list-style-type: none">- MS – word- MS – Excel with pictorial presentation- MS – Access- MS – Power point	6 hrs	20 hrs
UNIT - 3	<ul style="list-style-type: none">• Multimedia : types and uses• Computer aided teaching and testing	2 hrs	3 hrs
UNIT - 4	<ul style="list-style-type: none">• Use of internet :e-mail	1hrs	3 hrs
UNIT - 5	<ul style="list-style-type: none">• Statistical Package : types and their feature	2 hrs	2 hrs
UNIT - 6	<ul style="list-style-type: none">• Hospital management system : types and uses	1 hrs	2 hrs

B.Sc. Nursing

Second Year

SOCIOLOGY

Placement: Second Year

Theory-60 hrs.

Course Description: This course is designed to introduce the concept of sociology related to community and social institutions in India and its relationship with health. Illness and nursing

UNIT	CONTENT	HOURS
UNIT -1	Introduction <ul style="list-style-type: none">• Definition of sociology• Nature and scope of discipline• Importance and application of sociology in nursing	1hrs
UNIT -2	Individual and Society <ul style="list-style-type: none">• Society and community• Nature of Society• Difference between society and Community• Process of socialization and individualization• Personal disorganization	3hrs
UNIT -3	Culture <ul style="list-style-type: none">• Nature of Culture• Evolution of Culture• Diversity and uniformity of Culture• Culture and Civilization• Tran cultural Society• Influence on health and disease	3 hrs
UNIT – 4	Social groups and Process <ul style="list-style-type: none">• The meaning and Classification of groups• Primary and Secondary group• In –group V/s Out put, class Tribe, caste• Economic, Political, religious groups, mob, crowd, public and audience interaction and social process• Co-operation, competition, conflict• Accommodation assimilation and isolation	4hrs
UNIT – 5	Population <ul style="list-style-type: none">• Society and population	6 hrs.

	<ul style="list-style-type: none"> • Malthusian theory of population • Population explosion in India and its impact on health status • Family welfare programme 	
UNIT – 6	<p>Family and marriage</p> <ul style="list-style-type: none"> • Family Functions • Types- joint nuclear, blended and extended Family: characteristics • The modern family- changes, problems-dowry etc. Welfare services • Changes and legislation on family and marriage in India-Marriage acts. • Marriage: forms and function of marriage • Marriage and family problem in India. • Family, marriage and their influence on health and health practice 	5 hrs
UNIT-7	<p>Social Stratification</p> <ul style="list-style-type: none"> • Meaning and types of social stratification • The Indian caste system-origin and feature • Features of caste in India today • Social class system and status • Social mobility- Meaning and types • Race as a biological concept, criteria of racial classification • Salient feature of primary races- racism • Influence of class, caste and race on health and health practices 	7hrs
UNIT-8	<p>Types of communication in India (Rural, urban regional)</p> <ul style="list-style-type: none"> • Features of village community and characteristics of Indian villages – panchayat system , social dynamics • Community development project and planning • Changes in Indian rural life • Availability of health facilities in rural and its impact on health and health practice • Urban – community – features • The growth of cities ; urbanization and its impact on health and health practices • Major urban problems – urban slums • Region : problems and impact on health 	6 hrs
UNIT - 9	<p>Social change</p> <ul style="list-style-type: none"> • Nature and process of social change • Factors influencing social change: cultural 	4hrs

	<p>change, cultural lag.</p> <ul style="list-style-type: none"> • Introduction to theories of social change: linear, cyclical Marxi functional <p>Role of Nurse - change agents</p>	
UNIT – 10	<p>Social organization and social change</p> <ul style="list-style-type: none"> • Social organization : elements, types • Democratic and authoritian modes of participation Voluntary associations • Social system : definition and types of social system • Inter – relationship of institutions 	4 hrs
UNIT-11	<p>Social control</p> <ul style="list-style-type: none"> • Nature and process of social control • Political, legal, religion, educational economic , industrial and Technological system norms and values – Folkways & mores customs laws and fashion <p>Role of nurse</p>	2hrs
UNIT- 12	<p>Social Problems</p> <ul style="list-style-type: none"> • Social disorganization • Control and planning poverty housing illiteracy, food supplies prostitution rights of women and children ,venerable groups Elderly, handicapped, minority group , child labor, substance abuse, HIV/AIDS • Social welfare programme in India <p>Role of Nurse</p>	15hrs

Pharmacology

Placement: Second Year

Theory – 45Hrs.

Course Description: This course is designed to enable students to acquire understanding of pharmaco-dynamics, pharmacokinetic, principles and therapeutic and nursing implication

UNIT	CONTENT	HOURS
UNIT 1	<p>Introduction to pharmacology</p> <ul style="list-style-type: none">• Definition• Sources• Terminology used• Types, classification• Pharamacodynamics Action, therapeutic• Adverse toxic• Pharmacokinetics ablsorapti8on, interaction excretion• Review routes and principles of administration of drugs• Indian pharmacopoeia Legal issue• Rational use of drugs• Principles of therapeutics	3 Hrs
UNIT-2	<p>Chemotherapy</p> <ul style="list-style-type: none">• Pharmacology of commonly used<ul style="list-style-type: none">- Penicillin- Sources- Cephalosporins- Aminnoglycosides	6 Hrs

	<ul style="list-style-type: none"> - Macrolide and Broad spectrum antibiotics - Sulfonamides - Quinolones - Antamoebic - Antimalaria - Anthelmintics - Antiscabies agents - Antiviral and antifungal agents - Antitubercular drugs - Anti-leprosy - Anticancer drugs - Immunosuppressant <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p>	
UNIT- 3	<p>Pharmacology of commonly used antiseptics, disinfectants and insecticides</p> <p>Antiseptics: Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p> <ul style="list-style-type: none"> • Disinfectants • Insecticides 	2 hrs.
UNIT- 4	<p>Drug action on GI system</p> <ul style="list-style-type: none"> • pharmacology of commonly used - Antiemetics - Emetics - Purgatives - Antacids - Cholinergic - Fluid and electrolyte therapy - Anti-diarrhoeals - Histamines <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p>	2 hrs.
UNIT-5	<p>Drugs used on respiratory system</p> <p>* Pharmacology of commonly used</p> <ul style="list-style-type: none"> - Antiasthmatics - Mucolytics - Decongestants - Expectorants - antitussives - Bronchodilators - Antihistamines 	2 hrs.

	Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse	
UNIT- 6	<p>Drugs used in Urinary system</p> <ul style="list-style-type: none"> • Pharmacology of commonly used <ul style="list-style-type: none"> - Diuretics and ant diuretics - Urinary antiseptics - Cholinergic and anticholinergic - Acidifiers and alkalanizers <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p>	2 hrs.
UNIT-7	<p>Miscellaneous</p> <ul style="list-style-type: none"> • Drugs used in deaddiction • Drug used in CPR and emergency • Vitamins and minerals • Immunosuppressant • Antidotes • Antivenom • Vaccines and sera 	4 hrs.
UNIT- 8	<p>Drugs used on skin and mucus membranes</p> <ul style="list-style-type: none"> • Topical application for skin, eye, ear, nose, and buccal cavity Antipruritics <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effect, toxicity and role of nurse</p>	1 hrs.
UNIT- 9	<p>Drugs acting on nervous system</p> <ul style="list-style-type: none"> • Basic and applied pharmacology of commonly used • Analgesics <ul style="list-style-type: none"> # Non steroidal anti inflammatory drug (NSAID) • Antipyretics • Hypnotics and sedatives <ul style="list-style-type: none"> # Opiods # Non opiods # Tranquilizers # General and local anesthetics 	8 hrs.

	<p># Gases: oxygen, nitrous oxide, carbon dioxide</p> <ul style="list-style-type: none"> ● Cholinergic and anticholinergic <ul style="list-style-type: none"> - Muscle relaxants - Major Tranquilizers - Anti psychotics - Anticonvulsants - Adrenergics - Nonadnergics - Mood stablizers Acetylcholine - Stimulants <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effect, adverse effect, toxicity and role of nurse</p>	
UNIT- 10	<p>Cardiovascular drugs</p> <ul style="list-style-type: none"> ● Haematinics ● Cardio tonics ● Anti anginals ● Anti hypertensive and vasodilators ● Anti-arrhythmic ● Plasma exponders ● Coagulants and anticoagulants ● Antiplatelets and thrombolytics ● Hyplipidemics <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p>	5 hrs.
UNIT-11	<p>Drug use for hormonal disorders and supplementation, contraception and medical termination of pregnancy</p> <ul style="list-style-type: none"> ● Insulin and oral hypoglycemic ● Thyroid supplement and suppressants ● Steroids, antibolics ● Uterine stimulants and relaxants ● Oral contraceptives ● Other estrogen- progesterone preparation ● Corticotrophine & gonadotropines ● Adrenaline ● Prostaglandins ● Calcitonins ● Calcium salts ● Calcium regulators 	4 hrs.

	Composition, action, dosage, route, indications, contraindication, drug Interaction, side effects, adverse effects, toxicity and role of nurse	
UNIT- 12	Introduction to drug used in alternative systems of medicine * Ayurveda, Homeopathy, Unani & Sidha etc.	6hrs.

PATHOLOGY AND GENETICS

SECTION A – PATHOLOGY

**Placement; Second year
hours**

Time Theory – 30

Course Description; this course is designed to enable students to acquire knowledge of pathology of various disease conditions and apply this knowledge in practice of nursing

UNIT	CONTENT	TIME (HRS)	
UNIT - 1	INTRODUCTION <ul style="list-style-type: none"> • Importance of study of pathology • Definition of terms • Methods of technique • Cellular and tissue changes • Infiltration and regeneration • Inflammation and infection • Wound healing • Vascular changes 	Thr. 3	Pr

	<p>Cellular growth , Neoplasms</p> <ul style="list-style-type: none"> • Normal and cancer cell • Benign and Malignant growth • In situ carcinoma <p>Disturbances in fluid and electrolyte imbalance</p>		
UNIT -2	<p>Special pathology</p> <ul style="list-style-type: none"> • Pathological changes in disease conditions of various systems : • Respiratory tract Tuberculosis , Bronchitis, pleural effusion and pneumonia , Lung abscess Emphysema, Bronchiectasis. Bronchial asthma , Chronic Chronic obstructive pulmonary disease & tumors <p>Cardio – vascular System</p> <ul style="list-style-type: none"> • Pericardial effusion • Rheumatic heart disease • Infective endocarditic, atherosclerosis • Ischemia, infarction & aneurysm <p>Gastro Intestinal Tract</p> <ul style="list-style-type: none"> • Petic ulcer, typhoid • Carcinoma of GI tract-buccal, esophageal • Gastric and intestinal 	10	5

	<p>Liver Gall bladder & pancreas</p> <ul style="list-style-type: none"> • Hepatitis, Chronic, liver abscess, cirrhosis • Tumors of liver gall bladder and pancreas • Cholecystitis <p>Kidneys and Urinary Tract:</p> <ul style="list-style-type: none"> • Glumerulonephritis, Pyelonephritis • Calculi, renal failure, renal carcinoma & cystitis <p>Male genital systems</p> <ul style="list-style-type: none"> • Cryptorchidism, testicular atrophy • Prostatic hyperplasia carcinoma penis,& prostrate <p>Female genital system</p> <ul style="list-style-type: none"> • Fibroids • Carcinoma cervix and endometrium • Vesicular mole, Choriocarcinoma • Ectopic gestation 		
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	<ul style="list-style-type: none"> • Ovarian cyst & tumors <p>Cancer Breast</p> <p>Central Nervous System</p> <ul style="list-style-type: none"> • Hydrocephalus, Meningitis, Encephalitis • Vascular disorders- thrombosis, embolism • Stroke, paraplegia, Quadraplegia • Tumors, meningiomas- gliomas <p>Metastatic tumors</p> <p>Skeletal system</p> <ul style="list-style-type: none"> • Bone healing, osteoporosis, osteomyelitis <p>Arthritis & tumors</p>		
UNIT-3	<p>Clinical pathology</p> <ul style="list-style-type: none"> • Various blood and bone marrow test in assessment and monitoring of disease conditions • Hemoglobin • RBC, White cell & platelet counts • Bleeding time, clotting time and prothrombin time • Blood grouping and cross matching • Blood Chemistry • Blood culture • Serological and immunological test • Other blood test • Examination of bone marrow • Methods of collection of blood specimen for various clinical pathology, biochemistry, microbiology tests, <p>Inference and normal values</p>	4	3
UNIT 4	<p>Examination of body cavity fluids, transudates and exudates</p> <ul style="list-style-type: none"> • The laboratory tests used in CSF analysis • Examination of other body cavity fluids transudates and exudates sputum, wound discharge etc • Analysis of gastric and duodenal contents • Analysis of semen sperm count, motility and morphology and their importance in infertility 	2	1
UNIT- 5	<p>Urine and Faeces</p> <p># Urine</p> <ul style="list-style-type: none"> • Physical characteristics • Analysis • Culture and sensitivity 	1	1

	# Faeces <ul style="list-style-type: none"> • characteristics • Stool examination: occult blood, Ova, parasite and cyst, reducing substances etc. Methods of collection for various tests, inference and normal values		
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SECTION –B GENETICS

Placement: Second Year

Theory-15 hours

Course: Description: This course is designed to enable students to acquire understanding of Genetics, its role in causation and management of defects and diseases

UNIT	CONTENT	TIME (HRS)
UNIT -I	Introduction <ul style="list-style-type: none"> • Practical application of genetics in Nursing 	3

	<ul style="list-style-type: none"> • Impact of genetic condition on Families • Review of cellular division mitosis and meiosis • Characteristics and structure of genes • Chromosomes and sex determination • Chromosomal aberration patterns of inheritance <ul style="list-style-type: none"> # Medallion theory of inheritance # multiple allots and blood groups # Sex linked inheritance # Errors in transmission (Mutation) 	
UNIT- II	<p>Maternal, prenatal and genetic influence on development of defects and disease</p> <ul style="list-style-type: none"> • Condition affecting the mother genetic and infections • Consanguinity atopy • Prenatal nutrition and food allergies • Maternal age • Maternal drugs therapy • Prenatal testing and diagnoses • Effect of radiation, drugs and chemicals • Infertility • Spontaneous abortion • Neural tube defects and the role of folic acid in lowering the risk • Downs syndrome(Trisomy 21) 	3
UNIT- III	<p>Genetic testing in neonates and children</p> <ul style="list-style-type: none"> • Screening for <ul style="list-style-type: none"> # Congenital abnormalities # Development delay # Dysmorphism 	2
UNIT- IV	<p>Genetic conditions of adolescents and adults</p> <ul style="list-style-type: none"> • Cancer genetics Familial Cancer • Inborn errors of metabolism • Blood group alleles and hematological disorder • Genetic haemochromatosis • Huntington's disease • Mental illness 	2
UNIT V	<p>Services related to Genetics</p> <ul style="list-style-type: none"> • Genetic testing • Human genome project • Gene therapy • The Eugenics movement • Genetic Counseling • Legal and Ethical issues • Role of nurse 	5

**Medical and Surgical
(Adult including Geriatrics)**

Placement: Second Year

**Time: theory – 210 hours
Practical -720hours**

Course Description: - The purpose of this course is to acquire knowledge and develop proficiency in caring for patients with medical and surgical disorders in verities of health care settings and at home

UNIT	CONTENT	TIME(HRS)
UNIT – 1	<p>INTRODUCTION</p> <ul style="list-style-type: none"> • Introduction to medical surgical nursing – evolution and trends of medical and surgical nursing • Review of concepts of health and illness Disease – concepts. Diseases (ICD -10 or later version) Acute illness Chronic illness. Stages of illness. • Review of Concepts of comprehensive nursing care in medical surgical conditions based on nursing process. • Role of nurse patient and family in care of adult patient • Role and responsibilities of a nurse in of medical and surgical settings. Settings • Outpatient department • In - patient unit • Intensive care unit • Home and Community • Introduction to of Medical and surgical asepsis <ul style="list-style-type: none"> ▪ Inflammation and infection ▪ Wound healing ▪ Care of Surgical patient ▪ Pre-operative ▪ Intra-operative ▪ Post-operative 	15
UNIT- II	<p>Common signs and symptoms and management</p> <ul style="list-style-type: none"> • Fluid and electrolyte imbalance • Vomiting • Dyspnea and cough, respiratory obstruction • Fever • Shock • Unconsciousness, Syncope • Pain • Incontinence • Edema • Age related problem- Geriatric 	15
UNIT- III	<p>Nursing management of Patients (adults including elderly) with respiratory problems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of respiratory 	20

	<p>systems</p> <ul style="list-style-type: none"> • Nursing Assessment – History and physical assessment • Etiology, Pathophysiology, Clinical manifestations diagnosis, treatment modalities and medical - surgical, dietetics & nursing management of adults including elderly with. • Upper Respiratory tract infections • Bronchitis • Asthma • Emphysema • Empyema • Atelectasis • Chronic Obstructive Pulmonary Diseases(COPD) • Broncheectasis • Pneumonia • Pulmonary tuberculosis • Lung abscess • Pleural effusion • Cysts and tumors • Chest injuries • Respiratory arrest and insufficiency • Pulmonary embolism <p>Special therapies, alternative therapies Nursing procedures Drugs used in treatment of respiratory disorders</p>	
Unit- IV	<p>Nursing management of Patients (adults including elderly) with disorders of digestive systems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of digestive systems • Nursing Assessment – History and physical assessment • Etiology, Pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management ❑ Disorders of- oral cavity- lips, gums, tongue, salivary glands and teeth ❑ Oesophagus - inflammation, structure obstruction, bleeding and tumors. ❑ Stomach and Duodenum- hiatus hernia, gastritis, peptic ulcer, duodenum ulcer, bleeding, tumours, pyloric stenosis ❑ Small intestinal disorders-Colitis inflammation and infection, enteritis, obstruction, bleeding and tumour and perforation ❑ Large intestinal disorders- Colitis inflammation and infection, enteritis, obstruction, tumour and lump 	

	<ul style="list-style-type: none"> <input type="checkbox"/> Hernias <input type="checkbox"/> Appendix- inflammation, mass, abscess, rupture <input type="checkbox"/> Anal & Rectum, hemorrhoids, fissures and fistulas <input type="checkbox"/> Peritonitis/acute abdomen <input type="checkbox"/> Pancreas: inflammation, cyst, abscess and tumour. <input type="checkbox"/> Liver: inflammation, cyst, abscess, cirrhosis, portal hypertension, hepatic failure and tumour <input type="checkbox"/> Gall Bladder: inflammation, obstruction, stones and tumour. <p>Special therapies, alternative therapies Nursing procedures Drug used in treatment of disorders of digestive systems.</p>	
Unit V	<p>Nursing management of patients (adults including elderly) with blood and cardio vascular problems.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of blood and cardio vascular system. • Nursing Assessment- History and physical assessment • Etiology pathphysiology Clinical manifestations diagnosis treatment modalities and medical surgical dietetics & nursing management of , • Vascular system • Hypertension hypotension • Artherosclerosis • Raynaud's disease • Aneurysm and peripheral vascular disorder <p>Heart</p> <ul style="list-style-type: none"> • Coronary artery disease • Ischemic Heart Disease • Coronary arteriosclerosis • Angina pectoris • Myocardial infraction • Muscular disorders of the heart • Congenital and acquired • Rheumatic Heart diseases <p>Endocarditis, pericarditis/myocarditis</p> <ul style="list-style-type: none"> • Cardio Myopathies • Cardiac dysrhythmias, Heart Block • Congestive cardiac failure <ul style="list-style-type: none"> <input type="checkbox"/> Cor-pulmonale, pulmonary edema, cardiogenic shock cardiac tamponade • Cardiac emergencies and arrest • Cardio pulmonary Resuscitation (CPR) • Blood 	30

	<ul style="list-style-type: none"> <input type="checkbox"/> Anemia's <input type="checkbox"/> Polycythemia <input type="checkbox"/> Bleeding disorders, clotting factors defects and platelets defects <input type="checkbox"/> Thalassemia <input type="checkbox"/> Leukaemias <input type="checkbox"/> Leukopenias and agranulocytosis <input type="checkbox"/> Lymphomas <input type="checkbox"/> Myelomas • Special therapies <ul style="list-style-type: none"> <input type="checkbox"/> Blood transfusion, safety checks, procedure and requirements, management of adverse transfusion, reaction, records for blood transfusion <input type="checkbox"/> Management and counseling of blood donors phlebotomy procedure, and post donation management Blood bank functioning and hospital transfusion committee Bio safety and waste management in relation to Blood transfusion <input type="checkbox"/> Role of a nurse in organ donation, retrieval and banking Alternative therapies Nursing procedures Drug used in treatment of blood and cardio vascular disorders. 	
Unit-VI	<p>Nursing management of patients (adults including elderly) with Gento-Urinary problems.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of Gento-Urinary systems. • Nursing assessment-History and physical assessment • Etiology, pathophysiology clinical manifestations diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- • Nephritis • Nephrotic syndrome • Nephrosis • Renal calculus • Tumours • Acute renal failure • Chronic renal failure • End stage renal disease • Dialysis, renal transplant • Congenital disorders, urinary infections • Benign prostatic hypertrophy • Disorders of ureter, urinary bladder and urethra-inflammation, infection, structure, obstruction, tumour, prostrate <p>Special therapies, alternative therapies</p>	10

	<p>Nursing procedures</p> <p>Drug used in treatment of disorders of Gentic-Urinary systems</p>	
UNIT-VII	<p>Nursing management of disorders of male (adults including elderly) Reproductive system</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of male reproductive system • Nursing Assessment – History and physical assessment • Etiology, pathophysiology clinical manifestations diagnosis treatment modalities and medical, surgical dietetics & nursing management of male reproductive system • Congenital malformations , cryptorchidism • Hypospadiasis Epispadiasis • Infection • Testis and adjacent structures • Penis • Prostate inflammation, infection hypertrophy tumour • Sexual dysfunction • Infertility • Contraception • Breast gynaecomastia tumour • Climacteric Changes. Special theories alternative therapies • Nursing procedures • Drugs used in treatment of disorders of male reproductive system 	5
UNIT-VIII	<p>Nursing management of patients (adults including elderly) with disorders of endocrine systems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of endocrine system • Nursing Assessment -History and physical assessment Etiology, pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- <ul style="list-style-type: none"> <input type="checkbox"/> Disorders of Thyroid and parathyroid <input type="checkbox"/> Diabetes mellitus <input type="checkbox"/> Adrenal tumour <input type="checkbox"/> Pituitary disorders <p>Special therapies, alternative therapies</p> <p>Nursing procedures.</p> <p>Drugs used in treatment of disorders of endocrine systems</p>	15
UNIT-IX	<p>Nursing management of patients (adults including elderly)</p>	10

	<p>with disorders of integumentary system</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of integumentary system • Nursing Assessment History and physical assessment • Etiology, pathophysiology clinical manifestations, diagnosis treatment modalities and medical, surgical, dietetics & nursing management of skin and its appendages <ul style="list-style-type: none"> <input type="checkbox"/> Lesions and abrasions <input type="checkbox"/> Infection and infestations, Dermatitis <input type="checkbox"/> Dermatoses: Infectious and infectious “ Inflammatory Dermatoses” <input type="checkbox"/> Acne Vulgaris <input type="checkbox"/> Allergies and Eczema <input type="checkbox"/> Psoriasis <input type="checkbox"/> Malignant melanoma <input type="checkbox"/> Alopecia <p>Special therapies, alternative therapies Nursing procedures Drug used in treatment of disorders of integumentary system.</p>	
UNIT-X	<p>Nursing management of patients (adults including elderly) with disorders of musculoskeletal system</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of musculoskeletal system • Nursing Assessment- History and physical assessment. • Etiology, pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical dietetics & nursing management of <ul style="list-style-type: none"> <input type="checkbox"/> Muscles, Ligaments and joints- inflammation, infection, trauma <input type="checkbox"/> Bones- inflammation, infection, dislocation, fracture, tumour and trauma <input type="checkbox"/> Osteomalacia and osteoporosis <input type="checkbox"/> Arthritis <input type="checkbox"/> Congenital deformities <input type="checkbox"/> Spinal column- defects and deformities, tumour, prolapsed inter vertebral disc, pott’s spine <input type="checkbox"/> Paget’s disease <ul style="list-style-type: none"> • Amputation • Prosthesis • Transplant & replacement surgeries • Rehabilitation <p>Special therapies, alternative therapies Nursing procedures Drugs used in treatment of disorders of musculoskeletal</p>	15

	system.	
UNIT-XI	<p>Nursing management of patients (adults including elderly) with immunological system</p> <ul style="list-style-type: none"> • Review of immune system • Nursing Assessment- History and physical assessment • Etiology pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- <ul style="list-style-type: none"> <input type="checkbox"/> Immunodeficiency disorder <input type="checkbox"/> Primary immuno deficiency <input type="checkbox"/> Phagocytic dysfunction <input type="checkbox"/> B-cell and T- cell deficiency <input type="checkbox"/> Secondary immuno deficiency <input type="checkbox"/> Acquired immuno deficiency syndrome (AIDS) <input type="checkbox"/> Incidence of HIV & AIDS <input type="checkbox"/> Epidemiology <input type="checkbox"/> Transmission- Prevention of Transmission <input type="checkbox"/> Standard Safety Precautions <input type="checkbox"/> Role of nurse Counseling <input type="checkbox"/> Health education and home care consideration <input type="checkbox"/> National AIDS control proqramme – NACO various national and international agencies <input type="checkbox"/> Infection control program <input type="checkbox"/> Rehabilitation <p>Special therapies alternative therapies Nursing procedures Drugs used in treatment of disorders of Immunological system</p>	10
UNIT XII	Nursing management of patients (adults including elderly)	20

	<p>with communicable Disease</p> <ul style="list-style-type: none"> • Overview of infectious disease the infectious process • Nursing Assessment History and physical assessment • Epidemiology, infectious process clinical manifestations diagnosis treatment prevention and control eradication of common Communicable diseases <ul style="list-style-type: none"> <input type="checkbox"/> Tuberculosis <input type="checkbox"/> Diarrhoeal disease <input type="checkbox"/> Hepatitis A- E <input type="checkbox"/> Herpes <input type="checkbox"/> Chickenpox <input type="checkbox"/> Small pox <input type="checkbox"/> Typhoid <input type="checkbox"/> Meningitis <input type="checkbox"/> Gas gangrene <input type="checkbox"/> Leprosy <input type="checkbox"/> Dengue <input type="checkbox"/> Plague <input type="checkbox"/> Malaria <input type="checkbox"/> Diphtheria <input type="checkbox"/> Pertussis <input type="checkbox"/> Poliomyelitis <input type="checkbox"/> Measles <input type="checkbox"/> Filariasis <ul style="list-style-type: none"> <input type="checkbox"/> HIV AIDS <ul style="list-style-type: none"> • reproductive tract infection • Special infection control measures notification, isolation Quarantine, immunization, infection disease hospitals Special therapies, alternative therapies Nursing procedures Drugs used in treatment of communicable diseases 	
UNIT XIII	Preoperative nursing care	25

	<ul style="list-style-type: none"> • Organization and physical set- up of the operation theatre (OT) <ul style="list-style-type: none"> <input type="checkbox"/> Classification <input type="checkbox"/> O.T. DESIGN <input type="checkbox"/> Staffing <input type="checkbox"/> members of OT team <input type="checkbox"/> Duties and responsibilities of nurse in OT <input type="checkbox"/> Principles of health and operating room attire <input type="checkbox"/> Instrument <input type="checkbox"/> Suture and sutures material <input type="checkbox"/> equipments <input type="checkbox"/> O. T. tables and set for common surgical procedures <input type="checkbox"/> Position and draping for common surgical procedures <input type="checkbox"/> Scrubbing procedures <input type="checkbox"/> Gowning and gloving <input type="checkbox"/> Preparation of OT sets Monitoring the patient during surgical procedures • Maintenance of therapeutic environment in O T • Standard safety Measures <ul style="list-style-type: none"> <input type="checkbox"/> Infection control fumigation disinfections and sterilization <input type="checkbox"/> Biomedical waste management <input type="checkbox"/> Prevention of accidents and hazards in O T • Anesthesia <ul style="list-style-type: none"> <input type="checkbox"/> Types <input type="checkbox"/> Methods of administration <input type="checkbox"/> Effects and stages <input type="checkbox"/> Equipments <input type="checkbox"/> Drugs • Cardiopulmonary resuscitation (CPR) • Pain management techniques <ul style="list-style-type: none"> <input type="checkbox"/> Legal aspects 	
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MEDICAL SURGICAL NURSING

(Adult including geriatrics)- I

Practical

Placement: Second Year

times: 720 hours

AREA	SKILLS	DURATON (in Weeks)
General Medical Ward (Respiratory, Endocrine, Renal, Hematology)	<ul style="list-style-type: none"> • Assessment of the patient <ul style="list-style-type: none"> - Taking history - Perform general and specific Examination - Identify alteration and deviations • Practice Medical Surgical asepsis Standard safety Measures • Administer medications <ul style="list-style-type: none"> - Oral, IV M Subcutaneous • IV Therapy <ul style="list-style-type: none"> - IV Canulation - Maintenance and Monitoring • Oxygen therapy by different Methods • Mobilization • Chest Physiotherapy • Naso gastric Feeding • Assist in common diagnostic • Perform/Assist in therapeutic procedures • Blood and c component therapy • Throat suctioning • Collect specimen for common investigations • Maintain elimination <ul style="list-style-type: none"> - Catheterization - Bowel wash - Enema - Urinary drainage • Maintain intake output and documentation • Counsel land teach related to specific disease conditions 	6

General Surgical Ward (Gl Urinary,	<ul style="list-style-type: none"> • practice medical surgical asepsis • Standard safety Measures 	6
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CTVS)	<ul style="list-style-type: none"> • Pre- operative preparation of the patients • Post operative care <ul style="list-style-type: none"> - Receiving patient , assessment - Monitoring care • Care of wounds and drainage • Sutures removal • Ambulating and exerciser • Naso gastric aspiration • Care of chest drainage • Ostomy care <ul style="list-style-type: none"> - Gastrostomy - Colostomy - Entrostomy • Blood component and therapy • Practice Universal precaution 	
Cardiology Ward	<ul style="list-style-type: none"> • Physical examination of the cardio vascular system recoding and interpreting ECG • Monitoring of patient • Preparation and assisting in non- invasive and invasive diagnostic procedures • Administer cardiac drugs • Cardio pulmonary resuscitation • Teach patient and families • Practice medical and surgical asepsis standard safety measures 	2
Skin and Communicable disease ward	<ul style="list-style-type: none"> • Assessment of patient with skin disorders • Assist in diagnostic and therapeutic procedures • Administer topical medication • Practice medical and surgical asepsis standard safety measures • Use of personal protective equipment (PPE) • Give medicated baths • Counseling HIV positive patient • Teach prevention of infection disease 	1
Orthopedic Ward	<ul style="list-style-type: none"> • Assessment of orthopedic patient • Assist in application of plaster cast and removal of cast • Apply skin traction, buck's traction • Assist in application and removal of prosthesis • Physiotherapy and range of motion exercises (ROM) muscle strengthening exercises • Crutch maneuvering technique • Activities of daily living 	2

Operation theatre

- Ambulance
- Teach and counsel patients and families
- Scrubbing, gowing, gloving
- Identify instruments
- Suturing
- Material for common operations
- Disinfection, carbolization, Fumigation
- Preparation of instrument sets for common operations
- Sterilization of sharp and other instruments
- Prepare OT table depending upon the operation
- Positioning and monitoring of the patient
- Endotracheal intubation
- Assisting in minor and major operations
- Handling specimens
- Disposal of waste as per guidelines.

6

INTRENSHIP

TIME: 260 hrs. (9WEEKS)

ICU, CCU, CARDIAC. O T	<ul style="list-style-type: none"> • Assist in arterial Puncture for blood gas analysis • Perform ECG and interpret accordingly • Conduct and analysis Pulse toiletry • care with artificial airway • Assist in en tracheal incubation • Setting up ventilators • Drugs Sheet • Observation of special procedure in OT 	2
Neuro, ICU,ITU,OT	<ul style="list-style-type: none"> • Assess neurological status • Implement care to head injury spinal injury • Drug sheet • Pre and post operative care with neureo surgery patients 	2
Burns and plastic reconstructive surgery	<ul style="list-style-type: none"> • Nursing care 	2
OT, Laparoscopic Orthopedic, Eye, ENT		3

COMMUNITY HEALTH NUSING –I

Placement: Second Year

Theory- 90hrs

Practical – 135 hours

Course: description: This course is designed for students to appreciate principles of promotion and maintenance of health

UNIT	CONTENT	HOURS
UNIT- 1	Introduction <ul style="list-style-type: none"> • Community health nursing • Definition, concept and dimensions of health • Promotion of health • Maintenance of health 	2hrs
UNIT -2	Determinations of health <ul style="list-style-type: none"> • Eugenic • Environment <ul style="list-style-type: none"> - physical air, light ventilation, water, housing sanitation, disposal of waste, disposal of dead bodies forestation noise climate , communication infrastructure facilities and linkage - Acts regulating the environment: National pollution control board - Bacterial and viral agents, host carriers and immunity arthropods and rodents • food hygiene : Production, preservation, purchase, preparation, consumption • act Regulation food hygiene- prevention and food adulteration act, drug and cosmetic act • Socio-cultural <ul style="list-style-type: none"> - customs - Marriage system - Family structure - Status of special group females,. children elderly, challenged groups and sick persons • Life style • Hygiene • Physical activity <ul style="list-style-type: none"> - Recreation and sleep - Sexual life - Spiritual life philosophy 	20hrs

	<ul style="list-style-type: none"> - Self reliance - Dietary pattern - Education - Occupation • Financial management <ul style="list-style-type: none"> - Income - Budget - Purchasing power - Security 	
UNIT-3	<p>Epidemiology</p> <ul style="list-style-type: none"> • Definition: concept, aims, scope, uses and terminology used in epidemiology • Dynamics of disease transmission: epidemiological triad • Morbidity and mortality: measurements • Level of prevention • Methods of epidemiology <ul style="list-style-type: none"> - Descriptive - Analytical: Epidemic investigation - Experimental 	10 hrs.
UNIT-4	<p>Epidemiology and nursing management of common communicable disease</p> <ul style="list-style-type: none"> • Respiratory infection <ul style="list-style-type: none"> - Small pox - Chicken pox - Measles - Influenza - Rubella - ARI's and pneumonia - Mumps - Diphtheria - Mumps - Diphtheria - Whooping cough - Meningococcal meningitis - Tuberculosis - SARS • Intestinal infection <ul style="list-style-type: none"> - Poliomyelitis - Viral Hepatitis - Cholera - Diarrhoeal disease - Typhoid fever - Food poisoning - Amoebiasis 	25 hrs.

	<ul style="list-style-type: none"> - Hook worm infection - Ascariasis - Dracunculiasis • Arthropods infection <ul style="list-style-type: none"> - Dengue - Malaria - Filariasis • Zoonoses <p>Viral</p> <ul style="list-style-type: none"> - Rabies - Yellow fever - Japanese encephalitis - Kyasnur forest disease <ul style="list-style-type: none"> • Bacterial <ul style="list-style-type: none"> - Brucellosis - Plague - Human relationship - Anthrax - Leptospirosis • Rickettsial disease <ul style="list-style-type: none"> - Rickettsial zoo noses - Scrub typhus - Tick typhus - Q fever • Parastic Zoonoses <ul style="list-style-type: none"> - Taeniasis - Hydatid disease - Lsieshmaniasis • Surface infection <ul style="list-style-type: none"> - Trachoma - Tetanus - Leprosy - STD & RTI - Yaws - HIV/AIDS <p>Any other</p>	
UNIT-5	<p>Epidemiology and nursing management of non communicable disease</p> <ul style="list-style-type: none"> • Malnutrition: under nutrition, over nutrition, nutritional deficiencies • Anemia • Hypertension • Stroke • Rheumatic: heart disease • Coronary heart disease 	10 hrs.

	<ul style="list-style-type: none"> • Cancer • Diabetes mellitus • Blindness • Accidents • Mental illness • Obesity • Iodine deficiency • Fluorosis • Epilepsy 	
UNIT-6	<p>Demography</p> <ul style="list-style-type: none"> • Definition concept and scope • Method of collection analysis and interpretation of demographic data • Demographic rates and ratio 	6hrs
Unit -7	<p>Population and its control</p> <ul style="list-style-type: none"> • Population explosion and its impact on social, economic development of individual society and country • Population control: <ul style="list-style-type: none"> - Overall development : Women empowerment, social economic and educational devolvemnt - Limiting family size - Promotion of small family norm - Methods spacing (natural, biological chemical mechanical methods etc) - Terminal surgical methods - Emergency contraception 	17hrs

COMMUNITY HEALTH NURSING –I PRACTICAL

Placement: second Year

Practical 135 hours

AREAS	SKILLS	DURATION (in weeks)
Community Health nursing	<ul style="list-style-type: none">• Use techniques of interpersonal relation• Identification of health determinants of community• History taking• Physical examination• Collect specimens- sputum, malaria smear• Perform simple lab test at center blood for hemoglobin and sugar Urine for albumin and sugar• Administer vaccines and medications to adults• Counsel and teach individual family land community<ul style="list-style-type: none">- Nutrition- Hygiene- Self- health monitoring- Seeking health services- Healthy life style- Family welfare methods- Health promotion	2 weeks urban and 2 weeks rural

MICROBIOLOGY

Placement:

theory: 60 hrs (Theory 45+15 lab)

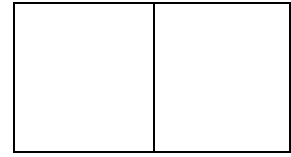
Course:- Description: This course is designed to enable students to acquire understanding of fundamentals for microbiology and identification of various microorganism . It also provides opportunities for practicing infection Control measures in Hospital and Community settings

UNIT	CONTENT	HOURS	
		Th.	Pr.
UNIT-1	Introduction <ul style="list-style-type: none">• Importance and relevance to nursing• Historical prospective• Concepts and terminology• Principles of microbiology	5hrs	----
UNIT 2	General Characteristics of microbes <ul style="list-style-type: none">• Structure and classification of microbes• Morphological types• Size and form of bacteria• Motility• Colonization• Growth and nutrition of Microbes<ul style="list-style-type: none">- Temperature Moisture	10hrs	5 hrs

	<ul style="list-style-type: none"> - Blood and body fluids • Laboratory methods for identification fo micro organisms • Staining techniques, gram staining acid fast staining hanging drop0 preparation • Culture various medias - 		
UNIT -3	<p>Infection control</p> <ul style="list-style-type: none"> • Infection Sources portals of entry and exist, transmission • Asepsis • Disinfection: Types and methods • Sterilization : Types and methods • Chemotherapy and antibiotics • Standard safety measures • Biomedical waste management • Role of nurse • Hospital acquired infection • Hospital infection control programme <ul style="list-style-type: none"> - Protocols collection of samples preparation of report and status for rate of infection in the unit / hospital nurse accountability continuing education etc. 	10 hrs	2hrs
UNIT -4	<p>Pathogenic organisms</p> <ul style="list-style-type: none"> • Micro organisms <ul style="list-style-type: none"> - Cocci - Gram positive and gram negative - Bacilli- Gram positive and gram negative - Spirochete - Mycoplasma - Rickettsiae - Chlamyaide • viruses • Fungi- Superficial and deep mycosi8s • Parasites • Rodents and victors <ul style="list-style-type: none"> Characteristics sources portal of entry, transmission of Infection identification of disease production organisms Collection handling and transportation of various specimens 	12hrs	4 hrs
		8 hrs	4 hrs
Unit -5	<p>Immunity</p> <ul style="list-style-type: none"> • Immunity- types, classification • Antigen and antibody reaction • Hypersensitivity- skin test • Serological test • Immunoprophylaxis 	8 hrs.	4 hrs.



- vaccines & sera- types and classification, storage and handling, cold chain
- Immunization for various disease
- Immunization schedule



B.SC.

NURSIG

THIRD YEAR

MEDICAL SURGICAL NURSING
(ADULT INCLUDING GERIATICS)- II

Placement: third Year

Theory – 12 hrs
Practical – 270 hours

Course description: the purpose of this course is to acquire knowledge and develop proficiency in caring for patient with medical surgical disorders in various health care settings and at home

UNIT	CONTENT	HOURS
UNIT-1	<p>Nursing management of patient with disorders of Ear, Nose and throat</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of the ear, nose and throat • Nursing assessment History and physical assessment • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of ear, nose and throat disorders <p style="padding-left: 40px;"># External ear deformities otalgia, foreign bodies and tumors</p> <p style="padding-left: 40px;"># Middle ear impacted wax, tympanic membrane perforation, otitis media, tumors</p> <p style="padding-left: 40px;"># Inner ear Meniere's disease, labyrinthitis, ototoxicity, tumors</p> <p style="padding-left: 40px;"># Upper airway infections: Common cold sinusitis, rhinitis, and adenoiditis, peritonsillar abscess, laryngitis</p> <ul style="list-style-type: none"> • Upper respiratory airway • Nasal obstruction, laryngeal obstruction, cancer of the larynx • Cancer of the oral cavity • Speech defects and speech therapy • Deafness • Prevention, control and rehabilitation • Hearing aids, implanted hearing devices <p>Special therapies Nursing procedures Drug used in treatment of disorders of ear, nose and throat. Role of nurse communication with hearing impaired and muteness</p>	15 hrs.
UNIT- 2	<p>Nursing management of patient with disorders of Eye</p> <ul style="list-style-type: none"> • Review of anatomy, physiology of the eye • Nursing management-history and physical assessment • Etiology, pathophysiology, clinical, diagnosis, treatment modalities and medical and surgical nursing management of the eye disorders <p style="padding-left: 40px;"># Refractive errors</p> <p style="padding-left: 40px;"># Eyelids- infection, tumors and deformities</p> <p style="padding-left: 40px;"># Conjunctiva- inflammation and infection, bleeding</p>	15 hrs.

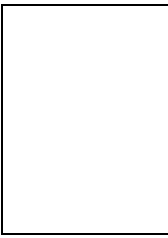
	<ul style="list-style-type: none"> # Cornea- inflammation and infection # Lens- cataract # Glaucoma # Disorders of posterior chamber and retina: retinal and vitreous problems # Retinal detachment # Ocular emergency and their prevention • Blindness • National blindness control program <ul style="list-style-type: none"> # Eye banking # Eye prostheses and rehabilitation <p>Role of a nurse- Communication with visually impaired patient, eye camps</p> <p>Special therapies</p> <p>Nursing procedures</p> <p>Drugs used in treatment of disorder of eye</p>	
UNIT-3	<p>Nursing management of patient with neurological disorders</p> <ul style="list-style-type: none"> # Review of anatomy and physiology of the neurological system • Nursing assessment- history and physical and neurological assessment and Glasgow coma scale • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of neurological disorders • Congenital malformation • Headache • Head injuries • Spinal injuries <ul style="list-style-type: none"> # Paraplegia # Hemiplegia # Quadraplegia • Spinal cord compression- herniation of in vertebral disc • Tumors of the brain and spinal cord • Intra cranial and cerebral aneurysms • Infection: <ul style="list-style-type: none"> # Meningitis, encephalitis, brain, abscess, neurocysticerosis • Movement disorders <ul style="list-style-type: none"> # Chorea # Seizures # Epilepsies • Cerebro vascular accidents (CVA) • Cranial, spinal neuropathies- Bells palsy trigeminal neuralgia • Peripheral Neuropathies Guillainbarr'e syndrome • Myasthenia gravis • Multiple sclerosis 	16 hrs.

	<ul style="list-style-type: none"> • Degenerative diseases <ul style="list-style-type: none"> #Delirium # Dementia # Alzheimer’s disease # Parkinson’s disease • Management of unconscious patient and a patient with stroke • Role of nurse in communicating with patient having neurological deficit • Rehabilitation of patient with neurological deficit • Role of nurse in long stay facility (institution) and at home special therapies • Nursing procedures • Drug used in treatment of neurological disorders. 	
UNIT-4	<p>Nursing management of patients with disorder of female reproductive system.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of female reproductive system. • Nursing assessment- History and physical assessment • Breast self examination • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of disorder of female reproductive system • Sexuality and reproductive health • Menstrual disorders: Dysmenorrhea, amenorrhea, premenstrual syndrome • Abnormal uterine bleeding: menorrhagia, metrorrhagia • Pelvic Inflammatory disease • Ovarian and fallopian tube disorders: infection, cysts, tumors • Uterine and cervical and disorders: endometriosis, polyps, fibroids, cervical and uterine tumors uterine displacement, cystocele/ urethrocele/ rectocele • Vaginal disorders: infection and discharges fistulas • Vulvular disorders: infection, cysts and tumors • Diseases of breasts: deformities, infection cysts and tumors • Menopause and hormonal replacement therapy • Infertility • Contraception: types, methods, risk and effectiveness <ul style="list-style-type: none"> # Barrier methods, intra uterine device, hormonal, post conceptional methods etc. # Terminal methods • Sterilization • Emergency contraception methods • Abortion- natural, medical and surgical abortion-MTP Act • Toxic shock syndrome • Injuries and trauma: Sexual Violence 	16 hrs.

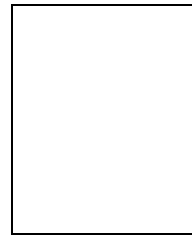
	<p>Special therapies Nursing procedures Drug used in treatment of gynecological disorders National family welfare programme</p>	
UNIT-5	<p>Nursing management of patient with burns, reconstructive and cosmetic surgery</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of the skin and connective tissues and various deformities • Nursing assessment- History and physical assessment and assessment of burns and fluid and electrolyte loss • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of burns and reconstructive and cosmetic surgery • Types of re-constructive and cosmetic surgery: for burns, congenital deformities, injuries and cosmetic purposes • Role of nurse • Legal aspects • Rehabilitation • Special therapies <ul style="list-style-type: none"> <input type="checkbox"/> Psychosocial aspects <p>Nursing procedures Drug used in treatment of burns, constructive and cosmetic surgery</p>	10 hrs.
UNIT-6	<p>Nursing management of patient with Oncological conditions</p> <ul style="list-style-type: none"> • Structure and characteristics of normal and cancer cells • Nursing assessment – history and physically assessment • Prevention, screening, early detections, warning sign of cancer • Epidemiology, etiology, classification, pathophysiology, staging, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of oncological condition • Common malignancies of various body system: oral, larynx, lung stomach, and colon, liver, leukemias, and lymphomas, breast, cervix, ovary, uterus, sarcoma, brain, renal, bladder, prostate etc. • Oncological emergencies • Modalities of treatment <ul style="list-style-type: none"> <input type="checkbox"/> Immunotherapy <input type="checkbox"/> Chemotherapy <input type="checkbox"/> Radiotherapy <input type="checkbox"/> Surgical intervention <input type="checkbox"/> Stem cell and bone marrow transplants <input type="checkbox"/> Gene therapy <input type="checkbox"/> Other forms of treatment • Psychological aspects of cancer 	10 hrs.

	<ul style="list-style-type: none"> • Rehabilitation • Palliative care: Symptoms and pain management, nutritional support • Home care • Hospice care • Stomal therapy • Special therapies <ul style="list-style-type: none"> <input type="checkbox"/> Psychosocial therapies * Nursing procedures 	
UNIT-7	<p>Nursing management of patient in EMERGENCY AND DISASTER</p> <p>Situations</p> <p>Disaster Nursing:</p> <ul style="list-style-type: none"> • Concepts and principals of disaster nursing • Causes and types of disaster: Natural and manmade <ul style="list-style-type: none"> <input type="checkbox"/> Earthquakes, floods, epidemics, cyclones <input type="checkbox"/> Fire, explosion, accidents <input type="checkbox"/> Violence, terrorism: biochemical, war • Policies related to emergency/ disaster management: Institutional, national state, institutional • Disaster preparedness: • Team, guidelines, protocols, equipments, resources • Co-ordination and involvement of : community, various Govt departments, non govt. organizations and international agencies • Role of nurse; working • Legal aspects of disaster nursing • Impact on health after effects: Post traumatic stress disorders • Rehabilitation: physical, psychosocial, financial relocation, Emergency nursing • Concept, priorities, principles and scope and scope and emergency nursing • Organization of emergency services: physical set-up, staffing, equipment and supplies, protocols, concepts of triage and role of triage nurse • Co-ordination and involvement of different departments and facilities • Nursing assessment-history and physical assessment • Etiology, classification, pathophysiology, staging, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of patient with medical and surgical emergency • Principles of emergency management • Common emergencies • Respiratory emergencies 	10 hrs.

	<ul style="list-style-type: none"> • Cardiac emergencies • Shock and hemorrhage • Pain • Poly-trauma, road accidents, crouch, injuries, wound • Bites • Poisoning; food, gas drug and chemical poisoning • Seizures • Thermal emergencies; heat stroke, and cold injuries • Pediatric emergencies • Obstetrical emergencies • Violence, abuse, sexual assault • Cardio pulmonary resuscitation • Crisis intervention • Role of nurse: communication and interpersonal relations • Medico legal aspects 	
UNIT-8	<p>Nursing care of the elderly</p> <ul style="list-style-type: none"> • Nursing assessment- history and physical assessment • Ageing • Demography: Myths and realities • Concepts and theories of ageing • Normal biological ageing • Age related body related changes • Psychosocial aspects of ageing • Medication and elderly • Stress and coping in elder patient • Common health problems and nursing management • Cardiovascular, respiratory, musculoskeletal • Endocrine, genitor-urinary, gastrointestinal • Neurological, skin and sensory organs <ul style="list-style-type: none"> <input type="checkbox"/> Psychosocial and sexual <input type="checkbox"/> Abuse of elderly • Role of nurse for care of elderly: ambulation, nutritional, communicational, psychosocial and spiritual • Role of family and formal and non formal caregivers • Use of aids and prosthesis (hearing aids, dentures) • Legal and ethical issues • Provision and programme for elderly, privileges, community Programs and health services * Home and institutional care 	10 hrs.
UNIT-9	<p>Nursing management of patients in critical care units</p> <ul style="list-style-type: none"> • Nursing assessment-history and physical assessment • Classification • Principles of critical care nursing • Organization: physical set-up, policies, staffing norms 	10 hrs.



- Protocols, equipment, ventilators, cardiac monitors, defibrillators
- Resuscitation equipments
- Infection control and protocols



**MEDICAL SURGICAL NURSING
(Adult and geriatrics)-II Practical**

Placement: Third year

**Time: Theory-120 hrs
Practical – 270 hrs.
Internship - 430 hrs.**

Areas	Skills to be developed	Duration (In weeks)
ENT	<ul style="list-style-type: none"> • Perform examination of ear, nose and throat • Assist with diagnostic procedures • Assist with therapeutic procedures • Instillation of drops • Perform/assist with irrigations • Apply ear bandage • Performs tracheotomy care • Teach patient and families 	1
Ophthalmology	<ul style="list-style-type: none"> • Perform examination of eye • Assist with diagnostic procedures • Assist with therapeutic procedures • Performs /assist with irrigations • Apply eye bandage • Apply eye drops/ointment • Assist with foreign body removal • Teach patient and families 	1
Neurology	<ul style="list-style-type: none"> • Perform neurological examination • Use Glasgow coma scale • Assist with diagnostic procedure • Assist with therapeutic procedures • Teach patient and families • Participate in rehabilitation program 	2
Gynecology ward	<ul style="list-style-type: none"> • Assist with gynecological examination • Assist with diagnostic procedure • Assist with therapeutic procedures 	1

	<ul style="list-style-type: none"> • Teach patient and families • Teach self Breast examination • Assist with PAP smear collection 	
Burns Unit	<ul style="list-style-type: none"> • Assessment of burns patient <ul style="list-style-type: none"> - Percentage of burns - Degree of burns • Fluid and electrolyte replacement therapy <ul style="list-style-type: none"> - Assess - Calculate - Replace - Record intake/output • Care of Burns wound <ul style="list-style-type: none"> - Bathing - Dressing • Perform active and passive exercises • Practice medical and surgical asepsis • Counsel and teach patient and families • Participate rehabilitation program 	1
Oncology	<ul style="list-style-type: none"> • Screen for common cancer-TNM classification • Assist with diagnostic procedures <ul style="list-style-type: none"> - Biopsies - Pap Smear - Bone- Marrow aspiration • Breast examination • Assist with therapeutic Procedures • Participates in various modalities of treatment <ul style="list-style-type: none"> - chemotherapy - radiotherapy - Pain management - Stomal therapy - Immuno therapy - Gene therapy - Alternative therapy • Participate in palliative care • Counsel and teach patient families • Self Breast examination • Warning signs • Participate in rehabilitation program 	2
Critical care unit	<ul style="list-style-type: none"> • monitoring of patients in ICU • Maintain flow sheets • Care of patient on ventilators • Perform end tracheal suction 	

	<ul style="list-style-type: none"> • Demonstration use of ventilators, Carries monitors etc. • Collect specimen and interprets ABG analysis • Assist in arterial puncture • Maintain CVP line • Pulse oximetry • CRP – ALS 	
	<ul style="list-style-type: none"> • Defibrillators • Pace makers • Bag-mask ventilation • Emergency tray trolley- Crash Cart • Administration of drugs <ul style="list-style-type: none"> - Infusion pump - Epidural - Intrathecal Intracardiac • Total parenteral therapy • Chest physiotherapy • Perform active and passive exercises • Counsel the patient and family in dealing with grieving and bereavement 	1
Casualty Emergency	<ul style="list-style-type: none"> • Practice triage • Assist with assessment examination investigations and their interpretation in emergency and disaster situations • Assist in legal procedures • In emergency unit • Participate in managing crowd • Counsel the patient and family in dealing with grieving and bereavement 	1

Placement: Internship

Time: 9 Weeks

Area	Skills	Duration
Medical Ward	Integrated Practice	2
Surgical ward		2
Critical care Unit /CCU		1
Casualty/Emergency		2
Operation theatre (ESye, ENT, Neuro)		2

Child Health Nursing
Placement: - Third Year

Time: Theory- 90hrs
Practical – 270 hrs
Internship

Course Description: This course is designed for developing an understanding of the modern approach to childcare identification prevention and nursing management of common health problems of neonates and children

Unit	Content	TIME (HRS)
1	Introduction Modern concepts of child care <ul style="list-style-type: none"> • Internationally accepted rights of the child • National policy and legislations in relation to child health and Welfare • Agencies related to welfare services to the children • Changing trends in hospital care preventive promotive and curative aspects of child health • Child morbidity and mortality rates 	15

	<ul style="list-style-type: none"> • Difference between an adult and child • Hospital environment for sick child • Impact of hospitalization on the child and family • Grief and bereavement • The role of a child health nurse in caring of a hospitalized child • Principles of pre and post operative care of infants and children • Child health nursing procedure 	
II	<p>The Healthy Child</p> <ul style="list-style-type: none"> • Principles of growth and development • Factors effecting growth and development • Growth and development from birth to adolescence • The needs of normal ender through the stages of developmental and parental guidance • Nutritional needs of children and infants: exclusive breast-feeding supplementary/ artificial feeding and Weaning • Baby friendly Hospital concept • Accidents causes and prevention • Value of play and selection of play material • Prevention immunization, immunization Program and cold chain • Preventive pediatrics • Care of under five and under five clinics/well baby clinics 	20
III	<p>Nursing care of neonates</p> <ul style="list-style-type: none"> • Nursing care of a normal newborn/essential newborn care • Neonatal resuscitation • Nursing management of a low birth weight baby • Kangaroo mother care • Nursing management of common neonatal disorder • Organization of neonatal unit • Identification and nursing management of common congenital malformations 	15
IV	<p>Integrated management of neonatal and childhood illness (IMNCI)</p>	10

V	<p>Nursing management in common childhood disease</p> <ul style="list-style-type: none"> • Nutritional deficiency disorders • Respiratory disorders and infections • Gastro intestinal infections infestations and congenital disorders • Cardiovascular problem congenital defects and rheumatic fever rheumatic heart disease • Genito-urinary disorder acute glomerular nephritis, Nephrotic syndrome, Wilm’s tumor, infection & congenital disorder • Neurological infections and disorder convulsions epilepsy meningitis hydrocephalus spina bifida • Hematological disorders: Anemia’s thalassemia, ITP, Leukemia hemophilia • Endocrine disorders Juvenile diabetes Mellitus • Orthopedic disorders club feet, hip dislocation and fracture • Disorder of skin eye and ears • Common communicable diseases in children, their identification, nursing management in hospital and home and prevention • Child health emergencies. Poisoning foreign bodies, hemorrhage, burns and drowning • Nursing care of infant and children with HIV/AIDS 	20
VI	<p>Management of behavioral and social problems in children</p> <ul style="list-style-type: none"> • Management of common behavioral disorders • management of common psychiatric problems • Management of challenged children Mentally, Physically, & Socially Challenged • Welfare services for challenged children in India • Child guidance clinics 	10

CHILD HEALTH NURSING PRACTICAL

Placement : Third Year

hours Fourth Year

hours(3weeks)

**Time – 27
Internship -145**

Areas	Skills	Duration (Weeks)
Pediatric Medicin Ward	<ul style="list-style-type: none">• Taking pediatric history• Physical examination and assessment of	3 wks

	<p>children</p> <ul style="list-style-type: none"> • Administer of oral I/M and I/V medicine/fluids • Calculation of fluid replacement • Prepare different strength not I/V Fluids • Apply restraints • Administer oxygen inhalation by different methods • Give baby bath • Feed children by katori spoon etc • Collect specimen for common investigation • Assist with common diagnostic procedure • Teaching mothers/parents <ul style="list-style-type: none"> <input type="checkbox"/> Malnutrition <input type="checkbox"/> Oral dehydration therapy <input type="checkbox"/> Feeding and Weaning <input type="checkbox"/> Immunization schedule <input type="checkbox"/> Play therapy <input type="checkbox"/> Enterostomy • Urinary catheterization and drainage • Feeding <ul style="list-style-type: none"> <input type="checkbox"/> Naso-gastric <input type="checkbox"/> Gastrostomy <input type="checkbox"/> Jejunostomy • Care of surgical wounds <ul style="list-style-type: none"> <input type="checkbox"/> Dressing <input type="checkbox"/> Suture removal 	
<p>Pediatric surgery ward</p>	<ul style="list-style-type: none"> • Calculate, prepare and administer I/V fluids • Do bowel wash • Care of ostomies <ul style="list-style-type: none"> <input type="checkbox"/> Colostomy irrigation <input type="checkbox"/> Ureterostomy <input type="checkbox"/> Gastrostomy <input type="checkbox"/> Enterostomy • Urinary catheterization and drainage • Feeding <ul style="list-style-type: none"> <input type="checkbox"/> Naso-gastric <input type="checkbox"/> Gastrostomy <input type="checkbox"/> Jejunostomy • Care of surgical wounds <ul style="list-style-type: none"> <input type="checkbox"/> Dressing <input type="checkbox"/> Suture removal 	<p>3 wks</p>

Pediatric OPD/Immunization	Assessment of children <input type="checkbox"/> Health assessment <input type="checkbox"/> Developmental assessment <input type="checkbox"/> Anthropometrics assessment <ul style="list-style-type: none"> • Immunization • Health/Nutrition education 	1 wks
Pediatric Medicine And surgical ICU	<ul style="list-style-type: none"> • Care of baby in incubator/ warmer • Care of child on ventilator • Endotracheal suction • Chest physiotherapy • Administer fluids with infusion pump • Total Parenteral nutrition • Phototherapy • Monitoring of babies • Cardio pulmonary resuscitation 	1+1 wks
	INTERNSHIP	
Pediatric Medicine WARD/ICU	Integrated practice	1 wks
Pediatric surgery ward/ICU	Integrated practice	1 wks
NICU	Integrated practice	1 wks

MENTAL HEALTH NURSING

Placement: Third Year

Theory-90 hrs

Practical-270 Hours

Internship-95 Hours (2 Weeks)

Course Description: This course is designed for developing an understanding of the modern approach to mental health, identification, prevention and nursing management of common mental problem with special emphasis on therapeutic intervention for individuals' family and community

UNIT	CONTENT	HOURS
UNIT-I	Introduction <ul style="list-style-type: none"> • Perspectives of mental health and mental health nursing: evaluation of mental health services, treatments and nursing practices • Prevalence and incidence of mental health problems and disorders • Mental health act. • National mental health policy • National mental health programme • Mental health team • Nature and scope of mental health nursing • Role and functions of mental health nurse in various settings and factor affecting the level of nursing practice • Concepts of normal and abnormal behavior 	5 hrs.
UNIT -2	Principles and concepts of mental health nursing <ul style="list-style-type: none"> • definition Mental health nursing and terminology used • classification of mental disorders CID • Review of personality development, defence mechanism • Maladaptive behavior of individuals and group stress crisis and disaster(s) • Etiology bio-psycho- social factors • Psychopathology of mental disorders review of structure and function of brain, limbic system and abnormal neuro transmission • Principles of mental health nursing • Standards of mental health nursing practices • Conceptual model and role of nurse <ul style="list-style-type: none"> <input type="checkbox"/> Existential model <input type="checkbox"/> Psycho-analytical model <input type="checkbox"/> Behavior model <input type="checkbox"/> Interpersonal model 	5 hrs
UNIT – 3	Assessment of mental health status	8 hrs

	<ul style="list-style-type: none"> • History taking • Mental health examination • Mini mental health examination • Neurological examination review • Investigations related blood ESEG,ECT,MRI • Psychological tests <p>Role and responsibilities of nurse</p>	
Unit -4	<p>Therapeutic communication and the nurse- patient relationship</p> <ul style="list-style-type: none"> • Therapeutic communication types techniques, characteristics • Types of relationship • Ethics and responsibilities • Element of nurse patient contract • Review of technique of IPR- Johari windows • Goals, phases, tasks therapeutic techniques • Therapeutic impasse and its intervention 	6hrs
Unit -5	<p>Treatment modalities and therapies used in mental disorders</p> <ul style="list-style-type: none"> • Psycho pharmacology • Psychological therapies Therapeutic community, Psycho therapy, Psychoanalytical cognitive and supportive, Family group, behavioral, play psycho drama, Music, dance recreational and light therapy, relaxation therapies Yoga mediation bio feedback • Alternative system of medicine • Occupational therapy • Physical therapy. Electro convulsive therapy • Geriatric considerations <p>Role of nurse in above therapies</p>	14hrs
Unit -6	<p>Nursing management of patient with Schizophrenia and other psychotic disorders</p> <ul style="list-style-type: none"> • Classification: ICD • Etiology, psycho-pathology, types, clinical manifestations, diagnosis • Nursing assessment- history and physical assessment and mental assessment • Treatment modalities and nursing management of patient with schizophrenia and other psychotic disorders • Geriatric considerations 	5 hrs.

	<ul style="list-style-type: none"> • Follow-up and home care and rehabilitation 	
Unit-7	<p>Nursing management of patient with mood disorders</p> <ul style="list-style-type: none"> • Mood disorders: Bipolar affective disorder, Mania depression and dysthymia etc. • Etiology, psycho-pathology, types, clinical manifestations, diagnosis • Nursing assessment- history and physical assessment • Treatment modalities and nursing management of patient with mood disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.
Unit-8	<p>Nursing management of patient with neurotic, stress related and somatization disorders.</p> <ul style="list-style-type: none"> • Anxiety disorders, phobias, dissociation and conversion disorders, post traumatic disorders • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment- History, physical and mental assessment • Treatment modalities and nursing management of patients with neurotic, stress related and somatization disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	8 hrs.
Unit-9	<p>Nursing management of patient with substance use and disorders</p> <ul style="list-style-type: none"> • Community used psychotropic substance: classification, forms, routes, action, intoxication and withdrawal • Etiology of dependence: tolerance, psychological and physical dependence, withdrawal syndrome, diagnosis • Nursing assessment- history, physical, mental assessment and drug assay • Treatment (detoxification, antagonist therapy and harm reduction) and nursing management of patient with substance abuse. • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.
Unit-10	<p>Nursing management of patient with personality, sexual and eating disorders</p>	4 hrs.

	<ul style="list-style-type: none"> • Classification of disorders • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment –history, physical, mental assessment • Treatment modalities and nursing management of patients with personality, sexual and eating disorders • Treatment modalities and nursing management 	
Unit-11	<p>Nursing management of childhood and adolescent disorders including mental deficiency</p> <ul style="list-style-type: none"> • Classification • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment – history, physical, mental assessment and IQ assessment • Treatment modalities and nursing management of childhood and adolescent disorders including mental deficiency • Follow-up and home care and rehabilitation 	6 hrs.
Unit-12	<p>Nursing management of organic brain disorders</p> <ul style="list-style-type: none"> • Classification ICD • Etiology, psycho-pathology, clinical manifestations, diagnosis and differential diagnosis(Parkinson’s and Alzheimer’s) • Nursing assessment-history, physical, mental assessment and neurological assessment • Treatment modalities and nursing management of organic brain disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.
Unit-13	<p>Psychiatric emergencies and crisis intervention</p> <ul style="list-style-type: none"> • Types of psychiatric emergencies and their management • Stress adaptation mode: stress and stressors, coping, resources and mechanism • Grief: Theories of grieving, process, principles, technique of counseling • Crisis intervention; principles, techniques and process • Geriatric considerations and responsibilities of nurse 	6 hrs.
Unit-14	<p>Legal issues in mental health nursing</p> <ul style="list-style-type: none"> • The mental health Act 1987: Act, section, articles and 	4 hrs.

Unit-15

- their implications etc.
- Indian lunacy act
 - Rights of mentally ill clients
 - Forensic psychiatry
 - Acts related to narcotic and psychotropic substance and illegal drug trafficking
 - Admission and discharge procedures
- Role and responsibilities of nurse
- Community mental health nursing
- Development of community mental health services:
 - National mental health programme
 - Institutionalization versus deinstitutionalization
 - Model of preventive psychiatry: levels of prevention
 - Mental health services available at the primary, secondary, tertiary levels including rehabilitation and role of nurse
 - Mental health agencies: government and voluntary national and international
 - Mental health nursing issues for special population: children, adolescence, women, elderly, victims of violence and abuse, handicapped, HIV/AIDS etc

Mental Health Nursing

Practical

Placement: Third year

Fourth year

Time practical-270 hrs (9 weeks)

Internship- 95 hrs (2 weeks)

Areas	Skills	Duration (in weeks)
Psychiatric OPD	<ul style="list-style-type: none"> • History taking • Perform mental status examination (MSE) • Assist in psychometric assessment • Perform neurological examination • Observe and assist in therapies • Teach patient and family members 	1
Child Guidance Clinic	<ul style="list-style-type: none"> • History taking • Assist in psychometric assessment • Observe and assist in various therapies • Teach family and significant others. 	1
Inpatient ward	<ul style="list-style-type: none"> • History taking • Perform mental status examination (MSE) • Perform neurological examination • Assist in psychometric assessment • Record therapeutic communication • Assist in Electro Convulsive therapy (ECT) • Participate in all therapies • Prepare patients for Activities of Daily Living (ADL) • Conduct admission and discharge counseling • Counsel and teach patient and families 	6
Community psychiatry	<ul style="list-style-type: none"> • Conduct case work • Identify individuals with mental health problems • Assist in mental health camps and clinics • Counsel and teach family members, patient and community 	
	Internship Skills	
Area		Duration
Psychiatry ward	Integrated practice	2 weeks

COMMUNICATION & EDUCATIONAL TECHNOLOGY

Placement: Third year

Time: Theory-90 hours

Course Description: This course is designed to help the students acquire an understanding of the principles and methods of communication and teaching it helps to develop skills in communicating effectively, maintaining effective interpersonal relations. Teaching individual and groups in clinical, community health and educational setting

UNIT	CONTENT	Time (Hrs)	Pr. (Hrs)
UNIT-1	Review of Communication process <ul style="list-style-type: none"> • Process; elements and channel • Facilitators • Barriers and methods of overcoming • Techniques 	5	
UNIT -II	Interpersonal relations <ul style="list-style-type: none"> • Purposes & types • Phases • Barriers an methods of overcoming • Johari Window 	5	
UNIT- III	Human relations <ul style="list-style-type: none"> • Understanding self • Social behavior, motivation social attitudes • Individual and groups • Groups and individual • Human relation in context of nursing • Group dynamics • Team work 	5	
UNIT- IV	Guidance and counseling <ul style="list-style-type: none"> • Definition • Purposes, scope and need • Basic principles • Organization of counseling services • Types of counseling approaches • Role and preparation of counselor • Issues for counseling in nursing Students and parishioners • Counseling process-steps & techniques tools of counselor • Managing disciplinary problems • Managing of crisis and referral 	10	5

<p>UNIT - VI</p>	<p>Principles of education and teaching learning process</p> <ul style="list-style-type: none"> • Education meaning philosophy aims functions and principles • Nature and characteristics of learning • Principles and maxims of teaching • Formulating objectives general and specific • Lesson planning • Classroom management 	<p>10</p>	
<p>UNIT- VI</p>	<p>Methods of teaching</p> <ul style="list-style-type: none"> • Lectures Demonstration, seminar, symposium, panel discussion, role play, project, field trip, workshop, exhibition programmed instructions computer assisted learning micro teaching problems based learning self instructional Module and simulation etc • Clinical teaching methods - case method nursing round and report bedside clinic conference (individual and group) Process recording 	<p>10</p>	<p>10</p>
<p>UNIT – VII</p>	<p>Educational Media</p> <ul style="list-style-type: none"> • Purposes and types of AV Aids Principles and sources and etc • Graphic aids chalk board chart graph poster flash cards flannel graph bulletin broad cartoon • Three dimensional aids, objects, specimens model puppets • Printed aids Pamphlet & leaflets • Projected aids slider overhead projector, Films TV. VCR, VCD, camera microscope, LCD • Audio aids: Tape recorder public address system, • Computer 	<p>10</p>	<p>8</p>
<p>UNIT- VIII</p>	<p>Assessment</p> <ul style="list-style-type: none"> • Purpose and scope of evaluation and assessment • Criteria for selection of assessments techniques an methods • Assessment of knowledge: Easy type question, short answer type question (SAQ), Multiple choice questions (MCQ) • Assessment of skills: observation Check list, Practical exam, Viva, objective structured clinical examination (OSCE) 	<p>5</p>	<p>7</p>

UNIT - IX

- Assessment of attitudes, attitudes scale
- Information, education and communication for health (IEC)**
- Health behavior and health education
 - Planning for health education
 - Health education with individual, group and communities
 - Communicating health messages
 - Methods and media for communicating health messages
 - Using mass media

5	

B.Sc. Nursing

Fourth Year

MIDWIFERY AND OBSTETRICAL NURSING

Placement: Fourth Year

Theory- 90 hrs.
Practical- 180 hrs.

Course Description: This course is designed for students to the concepts and principles of midwifery and obstetrical nursing. It helps them to acquire knowledge and skills in rendering nursing care to normal and high risk pregnant woman during antenatal, natal and postnatal periods in hospital and community setting it also helps to develop skills in managing normal and high risk neonates and participate in family welfare programme

UNIT	CONTENT	HOURS
UNIT-1	Introduction to midwifery and obstetrical nursing <ul style="list-style-type: none">• Introduction to concept of midwifery and obstetrical nursing• Trends in midwifery and obstetrical nursing<ul style="list-style-type: none"><input type="checkbox"/> Historical perspective and current trends<input type="checkbox"/> Legal and ethical aspects<input type="checkbox"/> Pre-conception care and preparing for parenthood<input type="checkbox"/> Role of nurse in midwifery and obstetrical care<input type="checkbox"/> National policy and legislation in relation to material health and welfare<ul style="list-style-type: none"><input type="checkbox"/> Maternal morbidity, mortality and fertility rates<input type="checkbox"/> Prenatal morbidity, mortality rates	3 hrs.
UNIT-2	Review of anatomy and physiology of female reproductive system and fetal development <ul style="list-style-type: none">• Female pelvis- general description of the bones joints, ligaments, planes of the pelvis diameters of the true pelvis	8 hrs.

	<p>important landmarks, variations in pelvic shapes</p> <ul style="list-style-type: none"> • Female organs of reproduction – external genitalia, internal genital organs and their anatomical relation, musculature blood supply, nerves, lymphatic, pelvic cellular tissue, pelvic peritoneum • Physiology of menstrual cycle • Human sexuality • Fetal development <ul style="list-style-type: none"> <input type="checkbox"/> Conception <input type="checkbox"/> Review of fertilization, implantation, development of the embryo and placement at term- functions, abnormalities, the fetal sac, amniotic fluid the umbilical chord <input type="checkbox"/> Fetal circulation, fetal skull, bones, sutures and measurements <p>* Review of genetics</p>	
<p>UNIT-3</p>	<p>Assessment and management of pregnancy (ante-natal)</p> <ul style="list-style-type: none"> • Normal pregnancy • Physiological changes during pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Reproductive system <input type="checkbox"/> Cardiovascular system <input type="checkbox"/> Respiratory system <input type="checkbox"/> Urinary system <input type="checkbox"/> Gastro intestinal system <input type="checkbox"/> Metabolic change <input type="checkbox"/> Skeletal change <input type="checkbox"/> Skin changes <input type="checkbox"/> Endocrine system <input type="checkbox"/> Psychological changes <input type="checkbox"/> Discomfort of pregnancy • Diagnosis of pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Signs <input type="checkbox"/> Differential diagnosis <input type="checkbox"/> Confirmatory tests • Ante natal care <ul style="list-style-type: none"> <input type="checkbox"/> Objectives <input type="checkbox"/> Assessment <ul style="list-style-type: none"> - History and physical examination - Antenatal examination - Signs of previous child birth 	<p>8 hrs.</p>

	<ul style="list-style-type: none"> <input type="checkbox"/> Relationship of fetus to uterus and pelvis lie attitude presentation. Position <input type="checkbox"/> per vaginal examination • Screening and assessment for high risk • Risk approach • History and physical examination • Modalities of diagnosis Invasive and non invasive ultrasonic cardio tomography, NST, CST • Antenatal preparation <ul style="list-style-type: none"> <input type="checkbox"/> Antenatal counseling <input type="checkbox"/> Antenatal exercises <input type="checkbox"/> Diet <input type="checkbox"/> Substance use <input type="checkbox"/> Education for childbirth <input type="checkbox"/> Husband and Families <input type="checkbox"/> Preparation for self confinement <input type="checkbox"/> Prevention from radiation • Psycho-social and cultural aspects <ul style="list-style-type: none"> <input type="checkbox"/> Adjustment to pregnancy <input type="checkbox"/> Unwed mother <input type="checkbox"/> Single parent <input type="checkbox"/> Teenage pregnancy <input type="checkbox"/> Sexual violence • Adoption 	
UNIT-4	<p>Assessment and management of intranatal period</p> <ul style="list-style-type: none"> • Physiology of labour • Management of labour • First stage <ul style="list-style-type: none"> <input type="checkbox"/> Signs and symptoms of onset of labour normal and abnormal <input type="checkbox"/> Duration <input type="checkbox"/> Preparation of <ul style="list-style-type: none"> # Labour room # Woman <input type="checkbox"/> Assessment and observation of woman in labour: Partogram- maternal and fetal monitoring <ul style="list-style-type: none"> <input type="checkbox"/> Active management of labour, induction of labour <input type="checkbox"/> Pain relief and comfort in labours • Second stage <ul style="list-style-type: none"> <input type="checkbox"/> Sign and symptoms: normal and abnormal <input type="checkbox"/> Duration <input type="checkbox"/> Conduct of delivery: principles and technique <input type="checkbox"/> Episiotomies (Only if required) <input type="checkbox"/> Receiving the new born - Neonatal resuscitation; initial steps and subsequent 	12 hrs

- resuscitation
 - Care of umbilical cord
 - Immediate assessment including screening for congenital anomalies
- Identification
- Bonding
- Initiate feeding
- Screening and transportation of the neonate
- * Third stage
 - Sign and symptoms: normal and abnormal
 - Duration
 - Method of placenta expulsion
 - Management : principles and technique
 - Examination of the placenta
 - Examination of perineum
- Maintaining records and reports
- Fourth stage

UNIT-5

Assessment and management of women during post natal period

- Normal puerperium: physiology duration
- Postnatal assessment and management
 - Promoting physical and emotional well being
 - Lactation management
 - Immunization
- Family dynamics after child
- Family welfare services, methods, counseling
- Follow-up
- Records and reports

UNIT-6

Assessment and management of normal neonates

- **Normal neonate:**
 - Physiological adaptation
 - Initial and daily assessment
 - Essential newborn care, thermal control
 - Breast feeding prevention of infections
- Immunization
- Minor disorders of newborn and its management
- Levels of neonatal care (level II, &III)
- At primary, secondary and tertiary levels
- Maintenance of reports and records

6 hrs.

<p>UNIT-7</p>	<p>High risk pregnancy – assessment and management</p> <ul style="list-style-type: none"> • Screening and assessment <ul style="list-style-type: none"> <input type="checkbox"/> Ultrasonic cardio tomography , NST CST, non invasive and invasive <input type="checkbox"/> Newer modalities of diagnosis • High risk approach • Levels of care primary secondary and tertiary levels • Disorders of pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Hyper-emesis, gravidarum bleeding in early pregnancy, abortion , ectopic <input type="checkbox"/> Pregnancy vesicular mole <input type="checkbox"/> Ante-partum hemorrhage • Uterine abnormality and displacement • Disease complicating pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Medical and surgical conditions <input type="checkbox"/> Infection, RTI(STD) UTI, HIV, TORCH <input type="checkbox"/> Gynecological diseases complicating pregnancy <input type="checkbox"/> Pregnancy induced hypertension and diabetes , toxemia of pregnancy hydramnios <input type="checkbox"/> Rh incompatibility <input type="checkbox"/> Mental pregnancy <input type="checkbox"/> Abnormalities of placenta and cord <input type="checkbox"/> Intra-uterine growth – retardation <input type="checkbox"/> Nursing management of mothers with high risk pregnancy <input type="checkbox"/> Maintenance of records and reports 	<p>10hrs</p>
<p>UNIT-8</p>	<p>Abnormal labour- assessment and management</p> <ul style="list-style-type: none"> • Disorders in labour <ul style="list-style-type: none"> <input type="checkbox"/> CPD and contracted pelvis <input type="checkbox"/> Malposition and Malpresentations <input type="checkbox"/> Premature labour, disorders of uterine action, precipitate labour, prolonged labor <input type="checkbox"/> complication of third stage Injuries to birth canal • Obstetrical emergencies and their management <ul style="list-style-type: none"> <input type="checkbox"/> Presentation and prolapse of cord, vasa praveia amniotic fluid emblems rupture of uterus shoulder dystocia obstetrical shock • Obstetrical procedures and operation <ul style="list-style-type: none"> <input type="checkbox"/> Introduction of labour, forceps vacuum version manual removal of placenta. Caesar ear. Section. destructive operation <p>* Nursing management of women undergoing obstetrical operation and procedures</p>	
<p>UNIT- 9</p>	<p>Abnormalities during postnatal period</p> <ul style="list-style-type: none"> • Assessment and management of woman with postnatal complications <ul style="list-style-type: none"> <input type="checkbox"/> Puerperal infection breast engorgement and infections and infection, UTI, thromboembolic disorders, post partum 	<p>4hrs</p>

	<p>hamburger, eclampsia and subinvolution</p> <ul style="list-style-type: none"> <input type="checkbox"/> Psychological complications : <ul style="list-style-type: none"> - Post partum blues - Post partum depression - Post partum psychosis 	
UNIT- 10	<p>Abnormalities during postnatal period</p> <ul style="list-style-type: none"> • Admission of neonates in the neonatal intensive care units protocols • Nursing management of : <ul style="list-style-type: none"> <input type="checkbox"/> Low birth weight babies <input type="checkbox"/> Infection <input type="checkbox"/> Respiratory problems <input type="checkbox"/> Hemolytic disorders <input type="checkbox"/> Birth injuries <input type="checkbox"/> Malformation • Monitoring of high risk neonates • Feeding of high risk neonates • Organization and management of neonatal intensive care units • Infection control in neonatal intensive care units • Maintenance of reports and records 	10hrs
UNIT – 11	<p>Pharamaco- therapeutics in obstetrics</p> <ul style="list-style-type: none"> • Indication, dosage, action contraindication and side effects of drugs • effect of drugs on pregnancy labour and puerperium • Nursing responsibilities in the admission of drugs in obstetric- oxytocin, anti-hypertensives, diuretics, laccolic agents, anticonvulsants: • Analgesics and anesthesia in obstetrics • Effect of maternal medication on fetus on fetus and neonate 	4 hrs
UNIT-12	<p>Family welfare programme</p> <ul style="list-style-type: none"> • Population trends and problems in India • Concept, aims importance and history of family welfare programme • National population dynamics policy and education • National family welfare programme RCH. ICDS. MCH. Safe motherhood • Organization and administration national state district block and village levels 	10hrs

	<ul style="list-style-type: none"> • A method of contraception's spacing. temporary and permanent, emergency contraception • Infertility and its management • Counseling for family welfare • Latest research in contraception • Maintenance of vital statistics • Role of nurse in Family welfare programme • Train supervision collaboration with other functionaries in community like ANMs, LHVs, Anganwadi workers TBA (Traditional birth Attendant Dai) 	
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**Midwifery and obstetrical
Nursing- Practical**

**Placement: Fourth year
(Third year)**

Time Practical-180 hrs

Internship-240

Area	Skills	Duration (in weeks)
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Antenatal clinical/OPD	<ul style="list-style-type: none"> * Antenatal history taking * Physical examination * Recording of weight and BP * Hb and urine testing for sugar and albumin * Antenatal examination-abdomen and breast * Immunization * Assessment of risk status * Teaching antenatal mother. * Maintenance of Antenatal records 	2
Labour room OT	<ul style="list-style-type: none"> * Assessment of woman in labour * Per vaginal examination and interpretation * Monitoring and caring of woman in labour * Maintenance of partograph * Conduct normal delivery * Newborn assessment and immediate care * Resuscitation of newborns * Assessment of risk status of newborn *Episiotomy and suturing * Maintenance of labour and birth record * arrange for and assist with Caesarean section and care for women and baby during caesarean * Arrange for and assist with MTP and other surgical procedures 	4
Postnatal ward	<ul style="list-style-type: none"> * Examination and assessment of mother and baby * Identification of deviations * Care of postnatal mother and baby * Perineal care * Lactation management *Breast feeding * Baby bath *Immunization * Teaching postnatal mother <ul style="list-style-type: none"> # Mother craft # Post natal care # Exercise # Immunization 	4

Newborn nursery	<ul style="list-style-type: none"> * Newborn assessment * Admission of neonates * Feeding of at risk neonates * Katori spoon * Paladi, tube feeding * Total parental nutrition * Thermal management of neonates- kangaroo mother care * Care of baby in incubator * Monitoring and care of neonates * Administering medications * Intravenous therapy * Assisting with exchange transfusion * Care of baby on ventilator * Photo therapy * Infection control, protocols in the nursery 	2
Family planning clinic	<ul style="list-style-type: none"> * Teaching and counseling of parents * Maintenance of neonatal records * counseling technique * Insertion of IUD * Teaching on use of family planning methods * Arrange for and assist with family planning operations * maintenance * Of record and reports 	1
	<ul style="list-style-type: none"> * Essential Requirements for registration as midwife - antenatal examination 30 - conducting normal deliveries in hospital/ home health center 20 - vaginal examination 5 - Episiotomy suturing 5 - Neonatal resuscitation 5 - Assist with caesarean Section 2 - witness Assist abnormal deliveries 5 - Postnatal cases nursed in hospital /home/health center 20 - Insertion of IUD 5 <p>NOTE: All casebooks must be certified by teacher on completion if essential requirements</p>	

Internship Obstetrical Nursing
Internship Duration 5 Weeks

Area	Skills	Duration (in weeks)
Labour Ward	* Integrated Practice	2
Noonatal intensive care unit/NICU		1
Antenatal		2

COMMUNITY HEALTH NURSING

Placement: Fourth year

**Theory-90 hrs.
Practical-135 hrs.**

Course Description: This course is designed for students to practice community health nursing for the individual, family and group at both urban and rural setting by using concept and principles of health and community health nursing

UNIT	CONTENT	HOURS
UNIT 1	Introduction • Definition concept and scope of community health and community health nursing	4 hrs

	<ul style="list-style-type: none"> • Historical development of <ul style="list-style-type: none"> <input type="checkbox"/> Community health <input type="checkbox"/> community health nursing <ul style="list-style-type: none"> - Pre-independence - Post independence 	
UNIT-2	<p>Health planning and policies and problems</p> <ul style="list-style-type: none"> • National health planning in India Five year plans • Various committees and commission on health and family welfare • <input type="checkbox"/> central council of health and family welfare(CCH & FW) <ul style="list-style-type: none"> <input type="checkbox"/> National health policies (1983,2002) <input type="checkbox"/> National health policy <input type="checkbox"/> Health problems in India 	6hrs
UNIT-3	<p>Delivery of community health services</p> <ul style="list-style-type: none"> • Planning budgeting and material management of SCS, PHC& CHC • Rural : organization staffing and functions of rural health services provided by government at: <ul style="list-style-type: none"> <input type="checkbox"/> Village <input type="checkbox"/> Sub centre <input type="checkbox"/> Primary health center <input type="checkbox"/> Community Health Center/Subdivision <input type="checkbox"/> Hospitals <input type="checkbox"/> District <input type="checkbox"/> State <input type="checkbox"/> Centre * Urban Organization staffing and function of urban health services <ul style="list-style-type: none"> <input type="checkbox"/> Slums <input type="checkbox"/> Dispensaries <input type="checkbox"/> Maternal and child health centers <input type="checkbox"/> Special clinics <input type="checkbox"/> Hospitals <input type="checkbox"/> Corporation Municipality board * Component's of health services <ul style="list-style-type: none"> <input type="checkbox"/> environmental sanitation <input type="checkbox"/> Health education <input type="checkbox"/> Vital statistics <input type="checkbox"/> MHC antenatal natal postnatal MTP act Female foeticide act, child adoption act <input type="checkbox"/> Family welfare <input type="checkbox"/> National health programme <input type="checkbox"/> School health services 	15 hrs

	<ul style="list-style-type: none"> <input type="checkbox"/> Occupational health <input type="checkbox"/> Defence services <input type="checkbox"/> Institutional services • System of medicine and health care <ul style="list-style-type: none"> <input type="checkbox"/> Indian system medicine and homeopathy <input type="checkbox"/> Alternative health care system like yoga meditation social and spiritual healing etc Referral system 	
UNIT-4	<p>Community health nursing approaches concepts and roles and responsibilities of nursing personnel</p> <ul style="list-style-type: none"> • Approaches <ul style="list-style-type: none"> <input type="checkbox"/> Nursing theories and nursing process <input type="checkbox"/> Epidemiological approach <input type="checkbox"/> Problem solving approach <input type="checkbox"/> Evidenced based approach <input type="checkbox"/> Empowering people to care for themselves • Concept of primary health care <ul style="list-style-type: none"> <input type="checkbox"/> Equitable distribution <input type="checkbox"/> Community participation <input type="checkbox"/> Focus on prevention <input type="checkbox"/> Use of appropriate technology <input type="checkbox"/> multi- sectorial • Roles and responsibilities of community health nursing personnel in <ul style="list-style-type: none"> <input type="checkbox"/> Family health services <input type="checkbox"/> Information education communication (INC) <input type="checkbox"/> Management information system (MIS) maintenance of records and reports. <input type="checkbox"/> Training and supervision of various categories of health workers <input type="checkbox"/> National health programmes <input type="checkbox"/> Environmental sanitation <input type="checkbox"/> Maternal and child health and family welfare <input type="checkbox"/> Treatment of minor ailments <input type="checkbox"/> School health services <input type="checkbox"/> Occupational health <input type="checkbox"/> Organization of clinics camps types preparation planning <input type="checkbox"/> Waste management in the centers clinics etc. • Home visit concept Principles. Process techniques bag technique and home visit 	25 hrs.
Unit - 5	<p>Assisting individuals and group to promote and maintain their health</p> <ul style="list-style-type: none"> • Empowerment for self care of individual families and group in 	15 hrs.

A Assessment of self and family

- Monitoring growth and development
 - Mile stones
 - Weight measurement
 - Social development
- Temperature and blood pressure monitoring
- Menstrual cycle
- Breast self examination and testicles
- Warning signs of various diseases
- Teats: Urine sugar and albumin, blood sugar

B Seek health service for

- Routine check – up
- Immunization
- Counseling
- Diagnosis
- Treatment
- Follow – up

C Maintenance of health records for self and family

D Continue medical care and follow – up in community for various disease and disabilities

E Carryout therapeutic procedures as prescribed / required for self and the family

F Waste management

G Sensitize and handle social issues affecting health and development for self and family

- Women empowerment
- Women and child abuse
- Abuse of elders
- Female foeticide
- Commercial sex worker
- Food adulteration
- Substance abuse

H Utilize community resources for self and family

- Trauma services
- Old age homes
- Orphanage
- Home of physically and mentally challenged individuals
- Homes for destitute

Unit - 6

National health and family welfare programmers and the role of a nurse

20 hrs.

- National ARI programmer
- Revised national tuberculosis programmer (RNTCP)
- National anti-malaria programme
- National filarial control programme
- National guinea worm eradication programme
- National leprosy eradication programme
- National AIDS control programme
- National STD control programme
- Iodine deficiency disorder programme
- Expanded programme of immunization
- National family welfare programme
- National water supply and sanitation programme
- Minimum need programme
- National diabetes control programme
- Polio eradication programme
- National cancer control programme
- Yaws eradication programme
- 20 pints programme
- ICDS programme
- Mid day meal applied nutritional programme
- Health schemes
 - ESI
 - CGHS
 - Health insurance

Unit - 7

- Health agencies
 - International – WHO, UNFPA, UNDP, World bank, FAO, UNICEF, DANDIA, European commission (EC) Red cross, USAID, UNESCO, Colombo plan, ILO, CARE etc.
 - National – Indian red cross society, Indian council for child welfare, Family planning association of India (FPAI), Tuberculosis association of India, Hindu kushwant singh, Central social welfare board, All India women’s conference, Blind association of India etc.

5 hrs.

**Community Health
Nursing – II – Practical**

Placement : Fourth Year

**Time : Practical – 135 hrs
Internship – 195 hrs**

Areas	Skills	Duration (In weeks)
Community Health Nursing	<ul style="list-style-type: none"> • Community health survey • Community diagnosis • Family care Home adaptation of common procedures • Home visit Bag technique • Organize and conduct clinics – antenatal Postnatal well baby clinic camps etc • Screen manage and referrals for <ul style="list-style-type: none"> <input type="checkbox"/> High risk mothers and neonates <input type="checkbox"/> Accidents and emergencies <input type="checkbox"/> Illness Physical and mental <input type="checkbox"/> Disabilities • Conduct delivery at home / center: episiotomy and suturing • Resuscitate newborn • School health programme <ul style="list-style-type: none"> <input type="checkbox"/> Screen manage, refer children • Collaborate with health and allied agencies • Train and supervise health workers • Provide family welfare services: insertion of IUD • Counsel and teach individual, family and community about: HIV, TB, Diabetes, Hypertension, Mantel health, adolescents, elderly health physically and mentally challenged individuals. • Collect and calculate Vital health statistics • Document and maintain <ul style="list-style-type: none"> <input type="checkbox"/> Individual family and administrative records <input type="checkbox"/> Write reports – center, disease, and national health programme/projects 	1 week for urban & 4 weeks for rural
Placement : Internship		Time :4 weeks
Areas	Skills	Duration
Urban	Provide comprehensive care to individual family and community	4 weeks

NOTE: During the rural posting they should stay in health centers under the supervision of teachers

Nursing Research and Statistics

**Placement: Fourth Year
Internship**

**Time: Theory- 45 hrs
Practical -45 hrs**

Course description: The course is designed to enable students to develop an understanding of basic concept of research process and statistics. It is further structured to conduct participate in needs based research studies in various setting and utilize the research findings to provide quality nursing care The burs foe practical will be utilized for conducting individual/ group research project

Unit	Content	Time (hrs)
I	Research and research Process Research and research Process <ul style="list-style-type: none">• Introduction and need for nursing research• Definition of Research and nursing research• Steps of scientific method• Characteristics of good research• Steps of Research process- overview	4
II	Research Problem/Question <ul style="list-style-type: none">• Identification of problem area• Problem statement• Criteria of a good research Problem• Writing objectives	3
III	Review of literature <ul style="list-style-type: none">• Location• Sources• On line search: CINHAL, COCHRANE etc.• Purposes• Methods of review	3
IV	Research approaches and designs <ul style="list-style-type: none">• Historical, survey and experimental• Qualitative and quantitative designs	4
V	Sampling and data collection <ul style="list-style-type: none">• Definition of populating sample• Sampling criteria, factors influencing sampling technique• Data why what from whom when and where to collect• Data collection methods and instruments<ul style="list-style-type: none"><input type="checkbox"/> Methods of collection<input type="checkbox"/> Questioning interviewing<input type="checkbox"/> Observation record and analysis and measurements<input type="checkbox"/> Types of instruments<input type="checkbox"/> Validates and reliability of the instruments	8

<p>VI</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Pilot study <input type="checkbox"/> Data collection procedure Analysis of data * Compilation, tabulation, Classification, Summarization, Presentation, interpretation of data 	<p>4</p>
<p>VII</p>	<p>Introduction to statistics</p> <ul style="list-style-type: none"> • Definition, use of statistics, scales of measurement • Frequency distribution and graphical presentation of data • Mean, Median, Mode, Standard Deviation • Normal probability and tests of significance • Co-efficient of correlation • Statistical packages and its application 	<p>15</p>
<p>VIII</p>	<p>Communication and utilization of Research</p> <ul style="list-style-type: none"> • Communication of research finding <input type="checkbox"/> Verbal report <input type="checkbox"/> Writing research report <input type="checkbox"/> Writing scientific article/paper <ul style="list-style-type: none"> - Critical review of published research - Utilization of research finding 	<p>4</p>

Management of Nursing Services and Education

Placement: fourth

Time: Theory 90mhrs

Course description: This course is designed to enable students to acquire understanding of management of clinical and community health nursing services nursing educational programmes this is also designed to enable students to acquire understanding of the professional responsibilities prospects and contribution to the growth of the profession

UNIT	CONTENT	TIME (HRS)	
		Th	Pr
I	Introduction to management in nursing <ul style="list-style-type: none"> • definition concepts and theories • functions of management • Principles of management • Role of nurse as a manager 	4	
II	Management process <ul style="list-style-type: none"> • Planning mission. Philosophy. objectives operation plan • Staffing philosophy, staffing study, norm activities patient classification system scheduling • Human resources management recruiting selecting deployment retaining promoting super annuation etc • Budgeting concept, principles, types, costs, benefit analysis, audit • Material management equipment supplies • Directing process (Leading) • Controlling Quality management • Program Evaluation Review Technique (PERT) Bench marking Activity plan (Gantt chart) 	5	
III	Management of nursing services in hospital and community <ul style="list-style-type: none"> • Hospital and patient care units including ward management • Emergency and disaster management • Human resources management <ul style="list-style-type: none"> □ Recruiting selecting deployment retaining promoting super annuation etc □ categories of nursing personnel including job description of all levels 	8	20

	<ul style="list-style-type: none"> <input type="checkbox"/> Patient/ population classification system <input type="checkbox"/> Care responsibilities • Staffing development and welfare Budgeting proposal projecting requirements for staff equipments and supplies for <ul style="list-style-type: none"> <input type="checkbox"/> Hospital and patient care units <input type="checkbox"/> Emergency and disaster management • Directing and leading delegations participatory management <ul style="list-style-type: none"> <input type="checkbox"/> Assignment rotation. Delegations <input type="checkbox"/> Supervision and guidance <input type="checkbox"/> Implement standards. Policies, procedures and practices <input type="checkbox"/> Staff development and welfare <input type="checkbox"/> Maintenance of discipline • controlling evaluation <input type="checkbox"/> Nursing <ul style="list-style-type: none"> - Rounds/Visits - Nursing protocols - Manuals <input type="checkbox"/> Quality assurance Model, documentation <input type="checkbox"/> Records and reports performance appraisal 		
IV	<p>Organizational behavior and human relations</p> <ul style="list-style-type: none"> • Concepts and theories of organizational behaviors • Review of channels of communication • Leadership styles • Review of motivation • Concept and theories • Group dynamics • Techniques of <ul style="list-style-type: none"> <input type="checkbox"/> Communication and <input type="checkbox"/> Interpersonal relationship <input type="checkbox"/> Human relation • Public relation in context of nursing • Relations with professional associations and employee union and collective bargaining 	5	
V	<p>In service education</p> <ul style="list-style-type: none"> • Nature and scope of in service education program • Organization of in service education • Principles of adult learning • Planning for in service education programme, technique, methods and evaluation of staff education program • Preparation of report 	5	5

VI	<p>Management of nursing educational institutions</p> <ul style="list-style-type: none"> • Establishment of nursing educational institutions INC norms and guidance's • Co-ordination with- <ul style="list-style-type: none"> <input type="checkbox"/> Regulatory bodies <input type="checkbox"/> Accreditation <input type="checkbox"/> Affiliation <ul style="list-style-type: none"> - Philosophy/objectives - Organization <input type="checkbox"/> Structure <input type="checkbox"/> Committees <ul style="list-style-type: none"> - Physical facilities <input type="checkbox"/> College/School <input type="checkbox"/> Hostel <ul style="list-style-type: none"> - Students <ul style="list-style-type: none"> # Selection # Admission # Guidance and counseling # Maintaining discipline - Faculty and staff <input type="checkbox"/> Selection <input type="checkbox"/> Recruitment <input type="checkbox"/> Job description <input type="checkbox"/> Placement <input type="checkbox"/> Performance appraisal <input type="checkbox"/> Development and welfare • Budgeting • Equipments and supplies audio visual equipment, laboratory equipment books journals etc. • Curriculum planning, implementation and evaluation • Clinical facilities • Transport facilities • Institutional records and reports- administrative faculty staff and students 	10	
VII	<p>Nursing as a profession</p> <p>Nursing as a profession</p> <ul style="list-style-type: none"> <input type="checkbox"/> Philosophy, nursing practice <input type="checkbox"/> aims and objectives <input type="checkbox"/> characteristics of a professional nurse <input type="checkbox"/> Regulatory bodies INC SNC Acts: constitution functions <input type="checkbox"/> current trends and issues in nursing <input type="checkbox"/> Professional ethics <input type="checkbox"/> code of ethics; INC,ICN <input type="checkbox"/> code of professional conduct4; INC ICN • Practice standards for Nursing , INC 	10	

VIII

- Consumer protection act
 - Legal aspects in nursing
 - Legal terms related to practice : registration and licensing
 - Laws related to nursing practice Breach and penalties
 - Malpractice and negligence

Professional Advancement

- Continuing education
- Career Opportunities
- Collective bargaining
- Membership with professional organization, National and International
- Participate in research activities
- Publication, Journals, newspapers etc.

3	

CONTENT

S. No.	Content
1	Philosophy
2	Aim
3	Objectives
4	Other Staff (Maximum Requirement)
5	Eligibility Criteria/Admission Requirements
6	Regulations for Examination
7	Guidelines for Dissertation
8	Duration
9	Scheme of Examination
	First Year
10	Nursing Education
11	Advance Nursing Practice
12	<i>Clinical Speciality – I</i>
	- Medical Surgical Nursing
	- Obstetric & Gynaecological Nursing
	- Child Health (Paediatric) Nursing
	- Mental Health (Psychiatric) Nursing
	- Community Health Nursing
13	Nursing Research & Statistics
	Second Year
14	Nursing Management
15	<i>Clinical Speciality –II</i>
	Medical Surgical Nursing
	- Cardio Vascular & Thoracic Nursing
	- Medical Surgical Nursing – Critical Care Nursing

	- Medical Surgical Nursing – Oncology Nursing
	- Medical Surgical Nursing - Neurosciences Nursing
	- Medical Surgical Nursing - Nephro- Urology Nursing
	- Medical Surgical Nursing -Orthopedic Nursing
	- Medical Surgical Nursing - Gastro Enterology Nursing
	- Obstetric & Gynaecological Nursing
	- Paediatric (Child Health) Nursing
	- Psychiatric (Mental Health) Nursing
	- Community Health Nursing
16	Annexure – I (Staffing Pattern Relaxed till 2012)

SYLLABUS AND REGULATIONS

M.Sc. (NURSING)



Published by

INDIAN NURSING COUNCIL

**8th floor, NBCC Center, Plot no. 2, Community
Center Okhla Phase-I, New Delhi – 110020**

Philosophy

National Health Policy(NHP) 2002 emphasizes the need to prepare nurses to function in super-speciality areas who are required in tertiary care institutions, entrusting some limited public health functions to nurses after providing adequate training, and increase the ratio of degree holding vis a vis diploma holding nurses.

It is observed that there is an acute shortage of nursing faculty in under graduate and post graduate nursing programme in India

Indian Nursing Council believes that:

Post Graduate programme is essential to prepare nurses to improve the quality of nursing education and practice in India. .

Post graduate programme in nursing builds upon and extends competence acquired at the graduate levels, emphasizes application of relevant theories into nursing practice, education, administration and development of research skills.

The programme prepares nurses for leadership position in nursing and health fields who can function as nurse specialists, consultants, educators, administrators and researchers in a wide variety of professional settings in meeting the National priorities and the changing needs of the society.

This programme provides the basis for the post masteral programme in nursing. Further the programme encourages accountability and commitment to life long learning which fosters improvement of quality care.

Aim

The aim of the postgraduate program in nursing is to prepare graduates to assume responsibilities as nurse specialists, consultants, educators, administrators in a wide variety of professional settings

Objectives

On Completion of the two year M.Sc Nursing programme, the graduate will be able to:-

1. Utilize /apply the concepts, theories and principles of nursing science
2. Demonstrate advance competence in practice of nursing
3. Practice as a nurse specialist.
4. Demonstrate leadership qualities and function effectively as nurse educator and manager.
5. Demonstrate skill in conducting nursing research, interpreting and utilizing the findings from health related research.

6. Demonstrate the ability to plan and effect change in nursing practice and in the health care delivery system.
7. Establish collaborative relationship with members of other disciplines
8. Demonstrate interest in continued learning for personal and professional advancement.

Other Staff (Minimum requirements)

(To be reviewed and revised and rationalized keeping in mind the mechanization and contract service)

- Ministerial
 - a) Administrative Officer 1
 - c) Office Superintendent 1
 - d) PA to Principal 1
 - e) Accountant/Cashier 1

- Upper Division Clerk 2

- Lower Division Clerk 2

- Store Keeper 1
 - a) Maintenance of stores 1
 - b) Classroom attendants 2
 - c) Sanitary staff As per the physical space
 - d) Security Staff As per the requirement

- Peons/Office attendants 4

- Library
 - a) Librarian 2
 - b) Library Attendants As per the requirement

- Hostel
 - a) Wardens 2
 - b) Cooks, Bearers, Sanitary Staff As per the requirement
 - c) Ayas /Peons As per the requirement
 - d) Security Staff As per the requirement
 - e) Gardeners & Dhobi (desirable) Depends on structural facilities

Eligibility Criteria/Admission Requirements:

1. The candidate should be a Registered Nurse and Registered midwife or equivalent with any State Nursing Registration Council.
2. The minimum education requirements shall be the passing of :
B.Sc. Nursing / B.Sc. Hons. Nursing / Post Basic B.Sc. Nursing with minimum of 55% aggregate marks.
3. The candidate should have undergone in B.Sc. Nursing / B.Sc. Hons. Nursing / Post Basic B.Sc. Nursing in an institution which is recognized by Indian Nursing Council.
4. Minimum one year of work experience after Basic B.Sc. Nursing.
5. Minimum one year of work experience prior or after Post Basic B.Sc. Nursing.
6. Candidate shall be medically fit.
7. 5% relaxation of marks for SC/ST candidates may be given.

Entrance/Selection test

Selection of the candidates should be based on the merit of the entrance examination held by University or competent authority.

Regulations for examination:

Eligibility for appearing for the examination:

75% of the attendance for theory and practicals. However 100% of attendance for practical before the award of degree

Classification of results:

- 50% pass in each of the theory and practical separately.
- 50-59% Second division
- 60-74% first division
- 75% and above is distinction
- For declaring the rank aggregate of 2 years marks to be considered

If the candidate fails in either practicals or theory paper he/she has to re-appear for both the papers (theory and practical)

Maximum no. of attempts per subject is three (3) inclusive of first attempt. The maximum period to complete the course successfully should not exceed 4 years

Candidate who fails in any subject, shall be permitted to continue the studies into the second year. However the candidate shall not be allowed to appear for the Second year examination till such time that he/she passes all subjects of the first year M.Sc nursing examination

Practicals

- 4 hours of practical examination per student.
- Maximum number of 10 students per day per speciality.
- The examination should be held in clinical area only for clinical specialities
- One internal and external should jointly conduct practical examination
- Examiner – Nursing faculty teaching respective speciality area in M.Sc nursing programme with minimum 3 years experience after M.Sc nursing.

Dissertation

Evaluation of the dissertation should be done by the examiner prior to viva
Duration: Viva-voce -minimum 30 minutes per student

Guidelines for Dissertation

Tentative Schedule for dissertation

S. No.	Activities	Scheduled Time
1.	Submission of the research proposal	End of 9 th month of 1 st year
2.	Submission of dissertation – Final	End of 9 th month of II nd Year

Note: - Administrative approval and ethical clearance should be obtained

A. Research Guides

a) *Qualification of Guide*

Main guide : Nursing faculty / nursing expert in the same clinical speciality holding Ph.D./M.Phil/M.Sc. Nursing with a minimum of 3 years experience in teaching in the Post Graduate Programme in Nursing.

Co-Guide : A Co-Guide is a nursing faculty/expert in the field of study (may be from outside the college but should be within the city.)

b) *Guide – Students Ratio*

Maximum of 1:4 (including as co-guide)

c) *Research Committee*

There should be a research committee in each college comprising of minimum 5 members chaired by the Principal, College of Nursing.

Duration

Duration of the course is 2 years for M.Sc. (N)

Available	52 weeks
Vacation	4 weeks
Examination	2 weeks
Gazetted holidays	3 weeks
Total weeks available	43 weeks
40 hours per week	1720 hours
Total hours for 2 years	3440 hours

Course of Instruction

	Theory (hrs)	Practical (hrs)
1st year		
Nursing education	150	150
Advance nursing practice	150	200
Nursing Research and statistics	150	100
*Clinical speciality –I	150	650

Total	600	1100
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II nd Year

Nursing Management	150	150
Nursing Research(Dissertation)		300
*Clinical Speciality-II	150	950
Total	300	1400

Educational visit 2 weeks

***Clinical Speciality** – Medical Surgical Nursing (Cardio Vascular & Thoracic Nursing, Critical care Nursing, Oncology Nursing, Neurosciences Nursing, Nephro-Urology Nursing, Orthopedic Nurisng, Gastro Enterology Nursing,)Obstetric & Gynaecological Nursing, Child Health (Paediatric) Nursing, Mental Health(Psychiatric) Nursing, Community Health Nursing, Psychiatric (Mental Health) Nursing etc.

Note: Students have to maintain log book for each activity during the course of study

Scheme of Examination

	Theory			Practical		
	Hours	Internal	External	Hours	Internal	External
1st year						
Nursing education	3	25	75		50	50
Advance nursing practice	3	25	75			
Nursing Research and statistics	3	25**	75*			
Clinical speciality -I	3	25	75		100	100
Total		100	300		150	150
II nd Year						
Nursing Management	3	25	75			
Dissertation & Viva					100	100
Clinical Speciality-II	3	25	75		100	100
Total		50	150		200	200

* Nursing research=50 and statistics=25

**Nursing research=15 and statistics=10

1. Minimum pass marks shall be 50 % in each of the Theory and practical papers separately.
2. A candidate must have minimum of 80% attendance (irrespective of the kind of absence) in theory and practical in each subject for appearing for examination.
3. A candidate must have 100% attendance in each of the practical areas before award of degree
4. A candidate has to pass in theory and practical exam separately in each of the paper.
5. If a candidate fails in either theory or practical paper he/she has to re-appear for both the papers (Theory and practical).
6. Maximum no. of attempts permitted for each paper is 3 including first attempt.

7. The maximum period to complete the course successfully should not exceed 4 (four) years
8. A candidate failing in more than two subjects will not be promoted to the IInd year.
9. No candidate shall be admitted to the subsequent IInd year examination unless the candidate has passed the Ist year examination.
10. Maximum number of candidates for all practical examination should not exceed 10 per day.
11. Provision of Supplementary examination should be made.
12. All practical examinations must be held in the respective clinical areas.
13. One internal and One external examiners(outside the University) should jointly conduct practical examination for each student
14. An examiner should be M.Sc (N) in concerned subject and have minimum of 3 (three) years post graduate teaching experience.
15. One internal and One external examiners(outside the University) should evaluate dissertation and jointly conduct viva-voce for each student
16. For Dissertation Internal examiner should be the guide and external examiner should be Nursing faculty / nursing expert in the same clinical speciality holding Ph.D./M.Phil/M.Sc. Nursing with a minimum of 3 years experience in guiding the research projects for Post Graduate students of Nursing.

Admission Strength

Annual admission strength for M.Sc (N) Programme should have prior sanction/permission from the Indian Nursing Council on the basis of clinical, physical facilities and teaching faculty.

Health Services

There should be provisions for the following health services for the students.

- (a) An annual medical examination.
- (b) Vaccination against Tetanus, hepatitis B or any other communicable disease as considered necessary.
- (c) Free medical care during illness and / provision of health insurance should be made.
- (d) A complete health record should be kept in respect of each individual students. The question of continuing the training of a student, with long term chronic illness, will be decided by the individual college.

CURRICULUM

NURSING EDUCATION

Placement : 1st Year

Hours of Instruction

Theory 150 Hours

Practical 150 Hours

Total : 300 Hours

Course Description

This course is designed to assist students to develop a broad understanding of Fundamental Principles, concepts, trends and issues related to education and nursing education. Further, it would provide opportunity to students to understand, appreciate and acquire skills in teaching and evaluation, curriculum development, implementation, maintenance of standards and accreditation of various nursing educational programs.

Objectives

At the end of the course, students will be able to :

1. Explain the aims of education, philosophies, trends in education and health: its impact on nursing education.
2. Describe the teaching learning process.
3. Prepare and utilize various instructional media and methods in teaching learning process.
4. Demonstrate competency in teaching, using various instructional strategies.
5. Critically analyze the existing nursing educational programs, their problems, issues and future trends.
6. Describe the process of curriculum development, and the need and methodology of curriculum change, innovation and integration.
7. Plan and conduct continuing nursing education programs.
8. Critically analyze the existing teacher preparation programs in nursing.
9. Demonstrate skill in guidance and counseling.
10. Describe the problems and issues related to administration of nursing curriculum including selection and organization of clinical experience.
11. Explain the development of standards and accreditation process in nursing education programs.
12. Identify research priorities in nursing education.
13. Discuss various models of collaboration in nursing education and services.

14. Explain the concept, principles, steps, tools and techniques of evaluation
15. Construct, administer and evaluate various tools for assessment of knowledge, skill, and attitude.

Course Content

Units	Hours		Course Content
	Theory	Practical	
I	10		<p>Introduction :</p> <ul style="list-style-type: none"> □ Education :Definition, aims, concepts, philosophies & their education implications, □ Impact of Social, economical, political & technological changes on education: <ul style="list-style-type: none"> • Professional education • Current trends and issues in education • Educational reforms and National Educational policy, various educational commissions-reports • Trends in development of nursing education in India
II	20	30	<p>Teaching – Learning Process</p> <ul style="list-style-type: none"> □ Concepts of teaching and learning: Definition, theories of teaching and learning, relationship between teaching and learning. □ Educational aims and objectives; types, domains, levels, elements and writing of educational objectives □ Competency based education(CBE) and outcome based education(OBE) □ Instructional design: Planning and designing the lesson, writing lesson plan : meaning, its need and importance, formats. □ Instruction strategies – Lecture, discussion, demonstration, simulation, laboratory, seminar, panel, symposium, problem solving, problem based learning (PBL), workshop, project, role- play(socio-drama), clinical teaching methods, programmed instruction, self directed learning(SDL), micro teaching, computer assisted instruction(CAI), computer assisted learning (CAL)

Units	Hours		Course Content
	Theory	Practical	
III	10	10	Instructional media and methods <ul style="list-style-type: none"> □ Key concepts in the selection and use of media in education □ Developing learning resource material using different media □ Instructional aids – types, uses, selection, preparation, utilization. □ Teacher's role in procuring and managing instructional Aids – Project and non-projected aids, multi media, video-tele conferencing etc
IV	10		Measurement and evaluation: <ul style="list-style-type: none"> □ Concept and nature of measurement and evaluation, meaning, process, purposes, problems in evaluation and measurement. □ Principles of assessment, formative and summative assessment- internal assessment external examination, advantages and disadvantages. □ Criterion and norm referenced evaluation,
V	12	10	Standardized and non-standardized tests : <ul style="list-style-type: none"> □ Meaning, characteristics, objectivity, validity, reliability, usability, norms, construction of tests- <ul style="list-style-type: none"> • Essay, short answer questions and multiple choice questions. • Rating scales, checklist, OSCE/OSPE(Objective structured clinical/practical examination) • Differential scales, and summated scales, sociometry, anecdotal record, attitude scale, critical incident technique □ Question bank-preparation, validation, moderation by panel, utilization □ Developing a system for maintaining confidentiality
VI	8	5	Administration, Scoring and Reporting <ul style="list-style-type: none"> □ Administering a test; scoring, grading versus marks □ Objective tests, scoring essay test, methods of scoring, Item analysis.
VII	12	6	Standardized Tools <ul style="list-style-type: none"> □ Tests of intelligence aptitude, interest, personality, achievement, socio-economic status scale, tests for special mental and physical abilities and disabilities.

Units	Hours		Course Content
	Theory	Practical	
VIII	5	6	Nursing Educational programs <ul style="list-style-type: none"> □ Perspectives of nursing education: Global and national. □ Patterns of nursing education and training programmes in India. Non-university and University programs: ANM, GNM, Basic B.Sc. Nursing, Post Certificate B.Sc. Nursing, M.Sc(N) programs, M.Phil and Ph.D) in Nursing, post basic diploma programs, nurse practitioner programs.
IX	12	25	Continuing Education in Nursing <ul style="list-style-type: none"> □ Concepts – Definition, importance, need scope, principles of adult learning, assessments of learning needs, priorities, resources. □ Program planning, implementation and evaluation of continuing education programs. □ Research in continuing education. □ Distance education in nursing.
X	10	10	Curriculum Development <ul style="list-style-type: none"> □ Definition, curriculum determinants, process and steps of curriculum development, Curriculum models, Types and framework. □ Formulation of philosophy, objectives, selection and organization of learning experiences; master plan, course plan, unit plan. □ Evaluation strategies, process of curriculum change, role of students, faculty, administrators, statutory bodies and other stakeholders. □ Equivalency of courses: Transcripts, credit system.
XI	8	4	Teacher preparation <ul style="list-style-type: none"> □ Teacher – roles & responsibilities, functions, characteristics, competencies, qualities, □ Preparation of professional teacher □ Organizing professional aspects of teacher preparation programs □ Evaluation: self and peer □ Critical analysis of various programs of teacher education in India.

Units	Hours		Course Content
	Theory	Practical	
XII	10	5	Guidance and counseling <ul style="list-style-type: none"> □ Concept, principles, need, difference between guidance and counseling , trends and issues. □ Guidance and counseling services : diagnostic and remedial. □ Coordination and organization of services. □ Techniques of counseling : Interview, case work, characteristics of counselor, problems in counseling. □ Professional preparation and training for counseling.
XIII	15	10	Administration of Nursing Curriculum <ul style="list-style-type: none"> □ Role of curriculum coordinator – planning, implementation and evaluation. □ Evaluation of educational programs in nursing-course and program. □ Factors influencing faculty staff relationship and techniques of working together. □ Concept of faculty supervisor (dual) position. □ Curriculum research in nursing. □ Different models of collaboration between education and service
XIV	10		Management of nursing educational institutions <ul style="list-style-type: none"> □ Planning, organizing, staffing, budgeting, recruitment, discipline, public relation, performance appraisal, welfare services, library services, hostel,
XV	5	5	<ul style="list-style-type: none"> □ Development and maintenance of standards and accreditation in nursing education programs. □ Role of Indian Nursing Council, State Registration Nursing Councils, Boards and University. □ Role of Professional associations and unions.

Activities :

- Framing philosophy, aims and objectives.
- Lesson Planning.
- Micro teaching-2.
- Conduct practice teachings using different teaching strategies -10 (like lecture cum discussion, demonstration- lab method, field trips, seminars, project, role play, panel discussion, clinical methods etc)
- Preparation and utilization of instructional Aids using different media.
- Develop course plans, unit plans, rotation plans.
- Conduct a continuing education workshop.
- Annotated bibliography.
- Critical evaluation of any nursing education program offered by a selected institution.
- Planning and Organizing field visits.

- Educational visits.
- Field visits (INC/SNRC) to get familiar with recognition/registration process.
- Construct, administer and evaluate tools (objective & essay type test, observation checklist, rating scale etc)
- Observe and practice application of various non-standardized tests (intelligence, Aptitude, Personality, Sociometry, physical & mental disabilities tests.)

Methods of Teaching

- Lecture cum discussion
- Demonstration/ Return demonstration
- Seminar / Presentations
- Project work
- Field visits
- Workshop

Methods of evaluation

- Tests
- Presentation
- Project work
- Written assignments

Internal Assessment

Techniques	Weightage
Test- (2 tests)	50
Assignment	25
Seminar/presentation	25

	100

Practical – Internal assessment

Learning resource material	25
Practice Teaching	50
Conduct Workshop /Short Term Course	25

Practical – external assessment

Practice teaching- 1-	50
Preparation/use of learning resource material-1	25
Construction of tests/rotation plan.	25

ADVANCE NURSING PRACTICE

Placement: 1ST Year

Hours of Instruction
Theory 150 Hours
Practical 200 Hours
Total : 350 Hours

Course Description

The course is designed to develop an understanding of concepts and constructs of theoretical basis of advance nursing practice and critically analyze different theories of nursing and other disciplines.

Objectives:

At the end of the course the students will be able to:

1. Appreciate and analyze the development of nursing as a profession.
2. Describe ethical, legal, political and economic aspects of health care delivery and nursing practice.
3. Explain bio- psycho- social dynamics of health, life style and health care delivery system.
4. Discuss concepts, principles, theories, models, approaches relevant to nursing and their application.
5. Describe scope of nursing practice.
6. Provide holistic and competent nursing care following nursing process approach.
7. Identify latest trends in nursing and the basis of advance nursing practice.
8. Perform extended and expanded role of nurse.
9. Describe alternative modalities of nursing care.
10. Describe the concept of quality control in nursing.
11. Identify the scope of nursing research.
12. Use computer in patient care delivery system and nursing practice.
13. Appreciate importance of self development and professional advancement.

Course Content

Unit	Hours	Content
I	10	Nursing as a Profession <ul style="list-style-type: none"> □ History of development of nursing profession, characteristics, criteria of the profession, perspective of nursing profession-national, global □ Code of ethics(INC), code of professional conduct(INC), autonomy and accountability, assertiveness, visibility of nurses, legal considerations, □ Role of regulatory bodies □ Professional organizations and unions-self defense, individual and collective bargaining □ Educational preparations, continuing education, career opportunities, professional advancement & role and scope of nursing education. □ Role of research, leadership and management. □ Quality assurance in nursing (INC). □ Futuristic nursing.
II	5	Health care delivery <ul style="list-style-type: none"> □ Health care environment, economics, constraints, planning process, policies, political process vis a vis nursing profession. □ Health care delivery system- national, state, district and local level. □ Major stakeholders in the health care system-Government, non-govt, Industry and other professionals. □ Patterns of nursing care delivery in India. □ Health care delivery concerns, national health and family welfare programs, inter-sectoral coordination, role of non-governmental agencies. □ Information, education and communication (IEC). □ Tele-medicine.
III	10	Genetics <ul style="list-style-type: none"> □ Review of cellular division, mutation and law of inheritance, human genome project ,The Genomic era. □ Basic concepts of Genes, Chromosomes & DNA. □ Approaches to common genetic disorders. □ Genetic testing – basis of genetic diagnosis, Pre symptomatic and predisposition testing, Prenatal diagnosis & screening, Ethical, legal & psychosocial issues in genetic testing. □ Genetic counseling. □ Practical application of genetics in nursing.
IV	10	Epidemiology <ul style="list-style-type: none"> □ Scope, epidemiological approach and methods, □ Morbidity, mortality, □ Concepts of causation of diseases and their screening, □ Application of epidemiology in health care delivery, Health surveillance and health informatics □ Role of nurse

Unit	Hours	Content
V	20	<p>Bio-Psycho social pathology</p> <ul style="list-style-type: none"> □ Pathophysiology and Psychodynamics of disease causation □ Life processes, homeostatic mechanism, biological and psycho-social dynamics in causation of disease, life style □ Common problems: Oxygen insufficiency, fluid and electrolyte imbalance, nutritional problems, hemorrhage and shock, altered body temperature, unconsciousness, sleep pattern and its disturbances, pain, sensory deprivation. □ Treatment aspects: pharmacological and pre- post operative care aspects, □ Cardio pulmonary resuscitation. □ End of life Care □ Infection prevention (including HIV) and standard safety measures, bio-medical waste management. □ Role of nurse- Evidence based nursing practice; Best practices □ Innovations in nursing
VI	20	<p>Philosophy and Theories of Nursing</p> <ul style="list-style-type: none"> □ Values, Conceptual models, approaches. □ Nursing theories: Nightingale's, Henderson's, Roger's, Peplau's, Abdella's, Lewine's, Orem's, Johnson's, King's, Neuman's, Roy's, Watson's, etc and their applications, □ Health belief models, communication and management, etc □ Concept of Self health. □ Evidence based practice model.
VIII	10	<p>Nursing process approach</p> <ul style="list-style-type: none"> □ Health Assessment- illness status of patients/clients (Individuals, family, community), Identification of health-illness problems, health behaviors, signs and symptoms of clients. □ Methods of collection, analysis and utilization of data relevant to nursing process. □ Formulation of nursing care plans, health goals, implementation, modification and evaluation of care.
IX	30	<p>Psychological aspects and Human relations</p> <ul style="list-style-type: none"> □ Human behavior, Life processes & growth and development, personality development, defense mechanisms, □ Communication, interpersonal relationships, individual and group, group dynamics, and organizational behavior, □ Basic human needs, Growth and development, (Conception through preschool, School age through adolescence, Young & middle adult, and Older adult) □ Sexuality and sexual health. □ Stress and adaptation, crisis and its intervention, □ Coping with loss, death and grieving, □ Principles and techniques of Counseling.

Unit	Hours	Content
X	10	<p>Nursing practice</p> <ul style="list-style-type: none"> □ Framework, scope and trends. □ Alternative modalities of care, alternative systems of health and complimentary therapies. □ Extended and expanded role of the nurse, in promotive, preventive, curative and restorative health care delivery system in community and institutions. □ Health promotion and primary health care. □ Independent practice issues,- Independent nurse-midwifery practitioner. □ Collaboration issues and models-within and outside nursing. □ Models of Prevention, □ Family nursing, Home nursing, □ Gender sensitive issues and women empowerment. □ Disaster nursing. □ Geriatric considerations in nursing. □ Evidence based nursing practice- Best practices □ Trans-cultural nursing.
XI	25	<p>Computer applications for patient care delivery system and nursing practice</p> <ul style="list-style-type: none"> □ Use of computers in teaching, learning, research and nursing practice. □ Windows, MS office: Word, Excel, Power Point, □ Internet, literature search, □ Statistical packages, □ Hospital management information system: softwares.

Practical

Clinical posting in the following areas:

- Specialty area- in-patient unit - 2 weeks
- Community health center/PHC - 2 weeks
- Emergency/ICU - 2 weeks

Activities

- Prepare Case studies with nursing process approach and theoretical basis
- Presentation of comparative picture of theories
- Family case- work using model of prevention
- Annotated bibliography
- Report of field visits (5)

Methods of Teaching

- Lecture cum discussion
- Seminar
- Panel discussion
- Debate
- Case Presentations
- Exposure to scientific conferences
- Field visits

Methods of evaluation :

- Tests
- Presentation
- Seminar
- Written assignments

Advance nursing Procedures

Definition, Indication and nursing implications;

- CPR, TPN, Hemodynamic monitoring, Endotracheal intubation, Tracheostoma, mechanical ventilation, Pacemaker, Hemodialysis, Peritoneal dialysis, LP, BT Pleural and abdominal paracentesis OT techniques, Health assessment, Triage, Pulse oxymetry

Internal Assessment

Techniques	Weightage
Test- (2 tests)	50
Assignment	25
Seminar/presentation	25

	100

CLINICAL SPECIALITY – I

MEDICAL SURGICAL NURSING

Placement: 1st Year

Hours of instruction
Theory: 150 Hours
Practical: 650 Hours
Total : 800 Hours

Course Description

This course is common for the students undergoing clinical speciality-II in neuro science nursing/cardiovascular & thoracic nursing/critical care nursing/oncology nursing/orthopaedic and rehabilitation nursing/nephro & urology nursing, gastroenterology nursing/ geriatric nursing.

It is designed to assist students in developing expertise and in depth knowledge in the field of medical Surgical Nursing. It will help students to appreciate the patient as a holistic individual and develop skill to function as a specialized Medical-Surgical Nurse. It will further enable the student to function as educator, manager and researcher in the field of Medical – Surgical Nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends & issues in the field of Medical – Surgical Nursing as a speciality.
2. Apply concepts & theories related to health promotion.
3. Appreciate the client as a holistic individual.
4. Perform physical, psychosocial assessment of Medical – Surgical patients.
5. Apply Nursing process in providing care to patients.
6. Integrate the concept of family centered nursing care with associated disorder such as genetic, congenital and long-term illness.
7. Recognize and manage emergencies with Medical- Surgical patients.
8. Describe various recent technologies & treatment modalities in the management of critically ill patients.
9. Appreciate the legal & ethical issues relevant to Medical – Surgical Nursing.
10. Prepare a design for layout and management of Medical – Surgical Units.

11. Appreciate the role of alternative systems of Medicine in care of patients.
12. Incorporate evidence based Nursing practice and identify the areas of research in the field of Medical – Surgical Nursing.
13. Recognize the role of Nurse practitioner as a member of the Medical – Surgical health team.
14. Teach Medical – Surgical Nursing to undergraduate nursing students & in-service nurses.

COURSE CONTENT:

Unit	Hours	Content
I	5	<p>Introduction:</p> <ul style="list-style-type: none"> □ Historical development of Medical- Surgical Nursing in India. □ Current status of health and disease burden in India. □ Current concept of health. □ Trends & issues in Medical – Surgical Nursing. □ Ethical & cultural issues in Medical – Surgical Nursing. □ Rights of patients. □ National health policy, special laws & ordinances relating to older people. □ National goals. □ Five year plans. □ National health programs related to adult health.
II	20	<p>Health Assessment of patients</p> <ul style="list-style-type: none"> □ History taking. □ Physical examination of various systems. □ Nutritional assessment. □ Related investigations and diagnostic assessment.
III	5	<p>Care in hospital settings:</p> <ul style="list-style-type: none"> □ Ambulatory care. □ Acute and Critical care. □ Long term care. □ Home Health Care. □ Characteristics, care models, practice settings, interdisciplinary team. □ Hospitalization- effects of hospitalization on the patient & family. □ Stressors & reactions related to disease process. □ Nursing care using Nursing process approach.
IV	10	<p>Management of patients with disorders of Gastro intestinal tract</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders-etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment- History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.

Unit	Hours	Content
V	10	Management of patients with disorders of nervous system <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
VI	10	Management of patients with disorders of respiratory system <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
VII	10	Management of patients with disorders of cardio vascular system <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
VIII	5	Management of patients with disorders of blood <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies □ Evidence based nursing practice □ Rehabilitation and follow-up
IX	10	Management of patients with disorders of genito urinary system <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis.

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
X	10	<p>Management of patients with disorders of endocrine system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XI	10	<p>Management of patients with disorders of musculo-skeletal system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XII	8	<p>Management of patients with disorders of integumentary system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XIII	5	<p>Management of patients with disorders of Eye and ENT</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders-etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends.

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XIV	8	<p>Management of patients with disorders of reproductive system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XV	8	<p>Geriatric nursing</p> <ul style="list-style-type: none"> □ Nursing Assessment-History and Physical assessment. □ Ageing; □ Demography; Myths and realities. □ Concepts and theories of ageing. □ Cognitive Aspects of Ageing. □ Normal biological ageing. □ Age related body systems changes. □ Psychosocial Aspects of Aging. □ Medications and elderly. □ Stress & coping in older adults. □ Common Health Problems & Nursing Management; □ Psychosocial and Sexual. □ Abuse of elderly. □ Role of nurse for care of elderly: ambulation, nutritional, communicational, psychosocial and spiritual. □ Role of nurse for caregivers of elderly. □ Role of family and formal and non formal caregivers. □ Use of aids and prosthesis (hearing aids, dentures, □ Legal & Ethical Issues. □ Provisions and Programmes for elderly; privileges, Community Programs and health services; □ Home and institutional care. □ Issues, problems and trends.
XVI	8	<p>Management of patients with communicable and sexually transmitted diseases:</p> <ul style="list-style-type: none"> □ Review of immune system. □ Common Disorders of immune system – HIV/AIDS. □ Review of infectious disease process. □ Communicable Diseases- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends.

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XVII	8	<p>Emergency, trauma and multi-system organ failure</p> <ul style="list-style-type: none"> □ DIC (disseminated intravascular coagulation) □ Trauma, burns, poisoning □ Etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. <ul style="list-style-type: none"> • Treatment modalities and trends. • Nursing management. • Related research studies. • Evidence based nursing practice. • Rehabilitation and follow-up.

Practical

Total = 660 Hours
1 Week = 30 Hours

S.No.	Dept/Unit	No. of Week	Total Hours
	General Medical Ward	4	120 Hours
	General Surgical Ward	4	120 Hours
	ICUs	4	120 Hours
	Oncology	2	60 Hours
	Ortho	2	60 Hours
	Cardio	2	60 Hours
	Emergency Department	2	60 Hours
	Neuro	2	60 Hours
	Total	22 Weeks	660 Hours

Student Activities:

- Clinical presentations
- History taking
- Health Assessment
- Nutritional Assessment
- Health Education related to disease conditions
- Case studies
- Project work
- Field visits

CLINICAL SPECIALITY-I

OBSTETRIC AND GYNAECOLOGICAL NURSING

Placement : 1st year

Hours of Instruction
Theory : 150 Hours.
Practical : 650 Hours.
Total : 800 Hours.

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of Obstetric and Gynaecological Nursing. It will help students to appreciate the client as a holistic individual and develop skill to function as an independent midwifery practitioner. It will further enable the student to function as educator, manager, and researcher in the field of Obstetric and Gynaecological nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends in the field of midwifery, obstetrics and gynaecology as a speciality.
2. Describe the population dynamics and indicators of maternal and child health
3. Describe the concepts of biophysical, psychological and spiritual aspects of normal pregnancy, labor and puerperium.
4. Provide comprehensive nursing care to women during reproductive period and newborns.
5. Integrate the concepts of family centered nursing care and nursing process approach in obstetric and gynaecological nursing.
6. Identify and analyze the deviations from normal birth process and refer appropriately.
7. Describe the pharmacological agents, their effects during pregnancy, child birth, puerperium, lactation and the role of nurse
8. Counsel adolescents, women and families on issues pertaining to pregnancy, child birth and lactation
9. Describe the role of various types of complementary and alternative therapies in obstetric and gynaecological nursing.
10. Incorporate evidence based nursing practice and identify the areas of research in the field of obstetric and gynaecological nursing.
11. Describe the recent advancement in contraceptive technology and birth control measures
12. Appreciate the legal and ethical issues pertaining to obstetric and gynaecological nursing

Course Content

Units	Hours	Content
I	10	<p>Introduction</p> <ul style="list-style-type: none"> □ Historical and contemporary perspectives □ Epidemiological aspects of maternal and child health □ Magnitude of maternal and child health problems □ Issues of maternal and child health : Age, Gender, Sexuality, psycho Socio cultural factors □ Preventive obstetrics □ National health and family welfare programmes related to maternal and child health: health care delivery system- National Rural health mission, Role of NGO's □ Theories, models and approaches applied to midwifery practice □ Role and scope of midwifery practice: Independent Nurse midwifery practitioner □ Legal and Ethical issues: Code of ethics and standards of midwifery practice, standing orders □ Evidence based midwifery practice □ Research priorities in obstetric and gynaecological nursing.
II	15	<p>Human reproduction</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology of human reproductive system: male and female □ Hormonal cycles □ Embryology □ Genetics, teratology and counseling □ Clinical implications
III	25	<p>Pregnancy</p> <ul style="list-style-type: none"> □ Maternal adaptation : Physiological, psychosocial <ul style="list-style-type: none"> • Assessment – Maternal and foetal measures Maternal measures:History taking , examination-General,physical and obstetrical measure, identification of high risk, • Foetal measure- clinical parameters, biochemical- human estriol, Maternal Serum Alfa Feto Protein, Acetyl Choline esterase (AchE), Triple Test Aminocentesis, Cordocentesis, chorionic villus sampling (CVS)), • Biophysical- (US IMAGING, Foetal movement count, Ultra Sonography, Cardiotocography, cardiotomography, Non Stress Test(NST), Contraction stress test(CST), amnioscopy, foetoscopy, • Radiological examination, □ Interpretation of diagnostic tests and nursing implications □ Nursing management of the pregnant women, minor disorders of pregnancy and management, preparation for child birth and parenthood, importance of institutional delivery , choice of birth setting, importance and mobilizing of transportation, prenatal counseling, role of nurse and crisis intervention, identification of high risk pregnancy and refer □ Alternative/complementary therapies

Units	Hours	Content
IV	25	<p>Normal Labour and nursing management:</p> <ul style="list-style-type: none"> □ Essential factors of labour □ Stages and onset <p>First stage: Physiology of normal labour</p> <ul style="list-style-type: none"> • Use of partograph: Principles, use and critical analysis, evidence based studies • Analgesia and anaesthesia in labour • Nursing management <p>Second stage</p> <ul style="list-style-type: none"> • Physiology , intrapartum monitoring • Nursing management. • Resuscitation , immediate newborn care and initiate breast feeding (Guidelines of National neonatology forum of India) <p>Third stage</p> <ul style="list-style-type: none"> • Physiology and nursing management <p>Fourth stage – Observation, critical analysis and Nursing management.</p> <ul style="list-style-type: none"> • Various child birth practice: water birth, position change etc • Evidence based practice in relation to labour intervention <p>Role of nurse midwifery practitioner</p> <ul style="list-style-type: none"> • Alternative /complementary therapies
V	20	<p>Normal puerperium and nursing management</p> <ul style="list-style-type: none"> □ Physiology of puerperium □ Physiology of lactation, lactation management, exclusive breast feeding ,Baby friendly hospital initiative(BFHI) □ Assessment of postnatal women . □ Minor discomforts and complications of puerperium □ Management of mothers during puerperium: Postnatal exercises Rooming in, bonding, warm chain □ Evidence based studies <p>Role of nurse midwifery practitioner</p> <ul style="list-style-type: none"> • Alternative /complementary therapies
VI	20	<p>Normal Newborn</p> <ul style="list-style-type: none"> □ Physiology and characteristics of normal newborn □ Physical and Behavioural assessment of newborn □ Needs of newborn □ Essential newborn care: Exclusive breast feeding, Immunization, Hygiene measures, Newborn nutrition □ Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU □ Observation and care of newborn □ Parenting process

Units	Hours	Content
VII	10	<p>Pharmacodynamics in obstetrics</p> <ul style="list-style-type: none"> □ Drugs used in pregnancy, labour, post partum and newborn □ Calculation of drug dose and administration □ Effects of drugs used □ Anaesthesia and analgesia in obstetrics □ Roles and responsibilities of midwifery nurse practitioner □ Standing orders and protocols and use of selected life saving drugs and interventions of obstetric emergencies approved by the MOHFW
VIII	10	<p>Family welfare services</p> <ul style="list-style-type: none"> □ Population dynamics □ Demography trends: vital statistics, calculation of indicators especially maternal and neonatal mortality rates and problems and other health problems □ Recent advancement in contraceptive technology □ Role of nurses in family welfare programmes in all settings □ Role of independent nurse midwifery practitioner □ Family life education □ Evidence based studies □ Information, Education and Communication(IEC) □ Management information and evaluation system(MIES) □ Teaching and supervision of health team members
IX	5	<p>Infertility</p> <ul style="list-style-type: none"> □ Primary and secondary causes □ Diagnostic procedures □ Counseling: ethical and legal aspects of assisted reproductive technology(ART) □ Recent advancement in infertility management. □ Adoption procedures <p>Role of nurses in infertility management.</p>
X	5	<p>Menopause</p> <ul style="list-style-type: none"> □ Physiological, psychological and social aspects □ Hormone Replacement Therapy □ Surgical menopause □ Counseling and guidance <p>Role of midwifery nurse practitioner</p>
XI	5	<p>Abortion</p> <ul style="list-style-type: none"> □ Types, causes □ Legislations, Clinical rights and professional responsibility □ Abortion procedures □ Complications □ Nursing management <p>Role of midwifery nurse practitioner</p>

Practical

Total = 660 Hours
1 week = 30 Hours

S.No.	Deptt./Unit	No. of Week	Total Hours
1	Anetenatal Wards & OPDs	4	120
2	Labour Room	5	150
3	Postnatal Ward	2	60
4	Family Planning Clinics	2	60
5	PHC/Rural maternity settings	4	120
6	Gynae	2	60
7	Maternity OT	2	60
8	NICU	1	30
	Total	22 Weeks	660Hours

Procedures observed

- Diagnostic investigations : amniocentesis, chorionic villi sampling
- Infertility management: artificial reproduction : artificial insemination, invitro fertilization, and related procedures

Procedures assisted

- Medical termination of pregnancy,

Procedures performed

- Antenatal assessment-20
- Postnatal assessment-20
- Assessment during labour : use of partograph - 20
- Per vaginal examination-20
- Conduct of normal delivery-20
- Episiotomy and suturing-10
- Setting up of delivery areas
- Insertion of intra uterine devices(copper T)

Others

- Identification of high risk women and referral
- Health education: to women and their families
- Motivation of couples for planned parenthood

CLINICAL SPECIALTY –I

CHILD HEALTH (PAEDIATRIC) NURSING

Placement : 1st Year

Hours of Instruction
Theory 150 Hours
Practical 650 Hours
Total : 800 Hours

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of Pediatric Nursing. It will help students to appreciate the child as a holistic individual and develop skill to function as neonatal and pediatric nurse specialist. It will further enable the student to function as educator, manager, and researcher in the field of Paediatric nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the history and developments in the field of pediatrics and pediatric nursing as a specialty
2. Apply the concepts of growth and development in providing care to the pediatric clients and their families.
3. Appreciate the child as a holistic individual
4. Perform physical, developmental, and nutritional assessment of pediatric clients
5. Apply nursing process in providing nursing care to neonates & children
6. Integrate the concept of family centered pediatric nursing care with related areas such as genetic disorders, congenital malformations and long term illness.
7. Recognize and manage emergencies in neonates
8. Describe various recent technologies and treatment modalities in the management of high risk neonates
9. Appreciate the legal and ethical issues pertaining to pediatric and neonatal nursing
10. Prepare a design for layout and management of neonatal units
11. Incorporate evidence based nursing practice and identify the areas of research in the field of pediatric/neonatal nursing
12. Recognize the role of pediatric nurse practitioner and as a member of the pediatric and neonatal health team
13. Teach pediatric nursing to undergraduate students & in-service nurses

Course Content

Unit	Hours	Content
I	10	Introduction <ul style="list-style-type: none"> □ Historical development of Pediatrics and Pediatric Nursing in India; □ Current status of child health in India; □ Trends in Pediatrics and Pediatric Nursing, □ Ethical and cultural issues in pediatric care □ Rights of children □ National health policy for children, special laws and ordinances relating to children. □ National goals, □ Five year plans, □ National health programs related to child health.
II	10 Hrs	Assessment of pediatric clients <ul style="list-style-type: none"> □ History taking □ Developmental assessment □ Physical assessment □ Nutritional assessment □ Family assessment
III	10	Hospitalized child <ul style="list-style-type: none"> □ Meaning of hospitalization of the child, preparation for hospitalization, effects of hospitalization on the child and family □ Stressors and reactions related to developmental stages, play activities for ill hospitalized child. □ Nursing care of hospitalized child and family -principles and practices
IV	15	Pre-natal Pediatrics <ul style="list-style-type: none"> □ Embryological and fetal development, Prenatal factors influencing growth and development of fetus, □ Genetic patterns of common pediatric disorders, chromosomal aberrations, genetic assessment and counseling legal and ethical aspects of genetic, screening and counseling role of nurse in genetic counseling, □ Importance of prenatal care and role of pediatric nurse.
V	15	Growth and Development of children <ul style="list-style-type: none"> □ Principles of growth and development, □ Concepts and theories of growth and development, □ Developmental tasks and special needs from infancy to adolescence, developmental milestones, □ Assessment of growth and development of pediatric clients, □ Factors affecting growth and development.
VI	15	Behavioral Pediatrics and Pediatric Nursing <ul style="list-style-type: none"> □ Parent child relationship, □ Basic behavioral pediatric principles and specific behavioral pediatric concepts/disorders- maternal deprivation, failure

Unit	Hours	Content
		<p>to thrive, child abuse, the battered child,</p> <ul style="list-style-type: none"> □ Common behavioral problems and their management, □ Child guidance clinic.
VII	15	<p>Preventive Pediatrics and Pediatric Nursing</p> <ul style="list-style-type: none"> □ Concept, aims and scope of preventive pediatrics, □ Maternal health and its influence on child health antenatal aspects of preventive pediatrics, □ Immunization, expanded program on immunization/ universal immunization program and cold chain, □ Nutrition and nutritional requirements of children, changing patterns of feeding, baby- friendly hospital initiative and exclusive breast feeding, □ Health education, nutritional education for children □ Nutritional programs □ National and international organizations related to child health, <p>Role of pediatric nurse in the hospital and community.</p>
VIII	30	<p>Neonatal Nursing</p> <ul style="list-style-type: none"> □ New born baby- profile and characteristics of the new born, □ Assessment of the new born, □ Nursing care of the new born at birth, care of the new born and family, □ High risk newborn- pre term and term neonate and growth retarded babies, □ Identification and classification of neonates with infections, HIV & AIDS, Ophthalmia neonatorum, congenital syphilis. □ High risk new born- Identification, classification and nursing management □ Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU.
IX	30	<p>IMNCI (Integrated management of neonatal and childhood illnesses)</p>

Practical

Total = 660Hours
1 Week = 30Hours

S.No.	Deptt./Unit	No. of Week	Total Hours
1	Pediatric Medicine Ward	4	120 Hours
2	Pediatric Surgery Ward	4	120 Hours
3	Labor Room/Maternity Ward	2	60 Hours
4	Pediatric OPD	2	60 Hours
5	NICU	4	120 Hours
6	Creche	1	30 Hours
7	Child Guidance Clinic	1	30 Hours
8	Community	4	120 Hours
	Total	22 Weeks	660 Hours

Student Activities

- Clinical presentations
- Growth & developmental assessment
- Assessment & prescription of nursing interventions for sick children
- Health education related to disease conditions
- Nutritional assessment
- Project work
- Field visits

CLINICAL SPECIALITY – I

MENTAL HEALTH (PSYCHIATRIC) NURSING

Placement : 1st Year

Hours of Instruction
Theory 150 hours
Practical 650 hours
Total : 800 hours

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of Psychiatric Nursing. It will help students to appreciate the client as a holistic individual and develop skill to function psychiatric nurse specialist . It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends and issues in the field of psychiatry and psychiatric nursing.
2. Explain the dynamics of personality development and human behaviour.
3. Describe the concepts of psychobiology in mental disorders and its implications for psychiatric nursing
4. Demonstrate therapeutic communications skills in all interactions
5. Demonstrate the role of psychiatric nurse practitioner in various therapeutic modalities
6. Establish and maintain therapeutic relationship with individual and groups
7. Uses assertive techniques in personal and professional actions
8. Promotes self-esteem of clients, others and self
9. Apply the nursing process approach in caring for patients with mental disorders
10. Describe the psychopharmacological agents, their effects and nurses role
11. Recognize the role of psychiatric nurse practitioner and as a member of the psychiatric and mental health team
12. Describe various types of alternative system of medicines used in psychiatric settings
13. Incorporate evidence based nursing practice and identify the areas of research in the field of psychiatric nursing

Course Content

Units	Hours	Content
I	15	<p>Introduction</p> <ul style="list-style-type: none"> □ Mental Health and Mental Illness □ Historical perspectives □ Trends, issues and magnitude □ Contemporary practices □ Mental health laws/Acts □ National mental health program -National mental health authority, state mental health authority □ Human rights of mentally ill □ Mental Health/ Mental Illness Continuum □ Classification of mental illnesses-ICD, DSM □ Standards of Psychiatric nursing □ Challenges and Scope of psychiatric nursing □ Multi-disciplinary team and role of nurse <p>Role of psychiatric nurse- extended and expanded</p>
II	10	<p>Concepts of Psychobiology</p> <ul style="list-style-type: none"> □ The Nervous System: <ul style="list-style-type: none"> • An Anatomical Review • The Brain and limbic system • Nerve Tissue • Autonomic Nervous system • Neurotransmitters □ Neuroendocrinology <ul style="list-style-type: none"> • Pituitary, Thyroid Gland • Circadian Rhythms □ Genetics □ Neuro psychiatric disorders □ Psychoimmunology <ul style="list-style-type: none"> • Normal Immune response • Implications for psychiatric Illness □ Implications for Nursing
III	10	<p>Theories of Personality Development and relevance to nursing practice</p> <ul style="list-style-type: none"> □ Psychoanalytic Theory- Freud's □ Interpersonal Theory-Sullivan's □ Theory of Psychosocial Development-Erikson's □ Theory of object relations □ Cognitive Development Theory □ Theory of Moral Development □ A Nursing Model-Hildegard E.Peplau
IV	5	<p>Stress and its management</p> <ul style="list-style-type: none"> □ An introduction to the concepts of stress □ Psychological Adaptation to stress □ Stress as a Biological Response. □ Stress as an Environmental Event.

Units	Hours	Content
		<ul style="list-style-type: none"> □ Stress as Transaction between the Individual and the Environment. □ Stress management.
V	10	<p>Therapeutic communication and interpersonal relationship</p> <ul style="list-style-type: none"> □ Review communication process, factors affecting communication □ Communication with individuals and in groups □ Techniques of therapeutic communication-touch therapy □ Barrier of communication with specific reference to psychopathology □ Therapeutic attitudes □ Dynamics of a therapeutic Nurse-client relationship; Therapeutic use of self Gaining self-awareness □ Therapeutic nurse-patient relationship its phases ; Conditions essential to development of a therapeutic relationship □ Therapeutic impasse and its management
VI	10	<p>Assertive Training</p> <ul style="list-style-type: none"> □ Assertive Communication □ Basic Human Rights □ Response Patterns <ul style="list-style-type: none"> • (Nonassertive Behavior • Assertive Behavior • Aggressive Behavior • Passive-Aggressive Behavior) □ Behavioral Components of Assertive Behavior □ Techniques that Promote Assertive Behavior □ Thought-Stopping Techniques Method <p>Role of The Nurse</p>
VII	10	<p>Promoting Self-Esteem</p> <ul style="list-style-type: none"> □ Components of Self-Concept □ The Development of Self-Esteem □ The Manifestations of Low-Self-Esteem □ Boundaries <p>Role of The Nurse</p>
	5	<p>Women and Mental Health</p> <ul style="list-style-type: none"> ∥ Normal reaction to conception, pregnancy and puerperium ∥ Problems related to conception, pregnancy and puerperium and its management. • Counselling – Premarital, marital and genetic

Units	Hours	Content
VIII	10	<p>The nursing process in psychiatric/mental health nursing</p> <ul style="list-style-type: none"> □ Mental health assessment- History taking, mental status examination □ Physical and neurological examination □ Psychometric assessment □ Investigations, Diagnosis and Differential diagnosis □ Interpretation of investigations □ Nurse's role □ Nursing case management <ul style="list-style-type: none"> □ Critical pathways of care □ Documentation <ul style="list-style-type: none"> □ Problem-oriented recording □ Focus charting □ The PIE method
IX	35	<p>Psycho social and physical therapies</p> <ul style="list-style-type: none"> □ Individual therapy □ Behavioural Therapy- Relaxation therapy, cognitive therapy, positive- negative reinforcement, bio-feedback, guided imagery, ab-reactive therapy □ Group Therapy □ Family Therapy □ Milieu Therapy □ The Therapeutic Community □ Occupational therapy □ Recreational therapy □ Play therapy □ Music therapy □ Light therapy □ Color therapy □ Aroma therapy
XI	5	<p>Electroconvulsive Therapy</p> <ul style="list-style-type: none"> □ Historical Perspectives □ Indications □ Contraindications □ Mechanisms of Action □ Side Effects □ Risks Associated with Electroconvulsive Therapy □ The Role of The Nurse in Electroconvulsive Therapy
X	10	<p>Psychopharmacology</p> <ul style="list-style-type: none"> □ Historical Perspectives □ Role of a Nurse in Psychopharmacological Therapy <ul style="list-style-type: none"> • Antianxiety Agents • Antidepressants Agents • Mood stabilizers • Antipsychotics • Sedative-Hypnotics • Central Nervous System Stimulants □ Future developments

Units	Hours	Content
XII	15	<p>Alternative systems of medicine in mental health</p> <ul style="list-style-type: none"> □ Types of Therapies <ul style="list-style-type: none"> • Herbal Medicine • Unani • Siddha • Homeopathic • Acupressure and Acupuncture • Diet and Nutrition • Chiropractic Medicine • Therapeutic Touch and Massage • Yoga • Pet Therapy

Practical

Total = 660 Hours
1 Week = 30 Hours

S.No.	Area of Posting	No. of Week	Total Hours
1	Acute Psychiatric Ward	4	120 Hours
2	Chronic Psychiatric ward	4	120 Hours
3	Psychiatric Emergency Unit	2	60 Hours
4	O.P.D	2	60 Hours
5	Family Psychiatric Unit	2	60 Hours
6	Community Mental Health Unit	4	120 Hours
7	Rehabilitation / Occupational Therapy Unit/Half way home / Day care centre	4	120 Hours
	Total	22 Weeks	660 Hours

Student Activities

- History taking
- Mental health assessment
- Psychometric assessment
- Personality assessment
- Process recording
- Therapies- Group Therapy
- Family Therapy
- Psychotherapy
- Milieu Therapy
- The Therapeutic Community
- Occupational therapy
- Recreational therapy
- Play therapy
- music therapy
- Pet therapy
- Counselling
- Assisted ECT
- Assisted EEG
- Case studies
- Case presentation
- Project work
- Socio and psycho drama
- Field visits

CLINICAL SPECIALITY- I

COMMUNITY HEALTH NURSING

Placement : 1st Year

Hours of Instructions
Theory 150 hours
Practical 650 hours
Total 800 hours

Course Description

The course is designed to assist students in developing expertise and in-depth understanding in the field of Community Health Nursing. It would help students to appreciate holistic life style of individuals, families & groups and develop skills to function as Community Health Nurse specialist/practitioner. It would further enable student to function as an educator, manager and researcher in the field of Community Health nursing.

Objectives

At the end of the course, the student will be able to:

1. Appreciate the history and development in the field of Community Health and Community Health Nursing.
2. Appreciate role of individuals and families in promoting health of the Community.
3. Perform physical, developmental and nutritional assessment of individuals, families and groups.
4. Apply the concepts of promotive, preventive, curative and rehabilitative aspects of health while providing care to the people.
5. Apply nursing process approach while providing care to individuals, families, groups and community.
6. Integrate the concepts of family centered nursing approach while providing care to the community.
7. Recognize and participate in the management of emergencies, epidemics and disasters.
8. Apply recent technologies and care modalities while delivering community health nursing care.
9. Appreciate legal and ethical issues pertaining to community health nursing care.
10. Conduct community health nursing care projects.
11. Participate in planning, implementation and evaluation of various national health and family welfare programmes at local, state and the national level.
12. Incorporate evidence based nursing practice and identify the areas of research in the community settings.

13. Participate effectively as a member of Community Health team.
14. Coordinate and collaborate with various agencies operating in the community by using inter-sectoral approach.
15. Teach community health nursing to undergraduates, in-service nurses and the community health workers.
16. Demonstrate leadership and managerial abilities in community health nursing practice

Course Content

Unit	Hours	Content
I	10	Introduction <ul style="list-style-type: none"> □ Historical development of Community Health and Community health Nursing- World and India, various health and family welfare committees □ Current status, trends and challenges of Community Health Nursing □ Health status of the Community-community diagnosis □ Scope of Community health Nursing practice □ Ethical and legal issues □ Socio-cultural issues in Community health Nursing □ National Policies, plans and programmes <ul style="list-style-type: none"> • National health policy • National Population policy • National Health and welfare Programmes • National Health goals/ indicators/ Millennium developmental goals(MDG)/ Strategies • Planning process: Five year plans • National Rural Health Mission • Panchayat raj institutions
II	10	Health <ul style="list-style-type: none"> □ Concepts, issues □ Determinants □ Measurements □ Alternate systems for health promotion and management of health problems □ Health economics □ Health technology □ Genetics and health □ Waste disposal □ Eco system
III	15	Population dynamics and control <ul style="list-style-type: none"> □ Demography □ Transition and theories of population □ National population policy □ National population programmes □ Population control and related programmes □ Methods of family limiting and spacing □ Research, Census, National Family Health Survey

Unit	Hours	Content
IV	30	<p>Community health Nursing</p> <ul style="list-style-type: none"> □ Philosophy, Aims, Objectives, Concepts, Scope, Principles, Functions □ Community health Nursing theories and models □ Quality assurance: Community health Nursing standards, competencies, Monitoring community health nursing, nursing audits □ Family nursing and Family centered nursing approach □ Family health nursing process <ul style="list-style-type: none"> ○ Family health assessment ○ Diagnosis ○ Planning ○ Intervention ○ Evaluation □ Nursing care for special groups: children, adolescents, adults, women, elderly, physically and mentally challenged- Urban and rural population at large □ Community nutrition □ Concept, role and responsibilities of community health Nurse practitioners/nurse midwifery practitioners-decision making skills, professionalism, legal issues
V	45	<p>Maternal and neonatal care</p> <ul style="list-style-type: none"> □ IMNCI(Integrated Management of Neonatal And Childhood Illnesses) module □ Skilled Birth Attendant (SBA) module
VI	15	<ul style="list-style-type: none"> □ Disaster nursing (INC module on Reaching out: Nursing Care in emergencies)
VII	10	<p>Information, education and communication</p> <ul style="list-style-type: none"> □ IEC/BCC: Principles and strategies □ Communication Skills □ Management information and evaluation system: Records and reports □ Information technology □ Tele-medicine and tele-nursing □ Journalism □ Mass media □ Folk media
VIII	15	<p>Health care delivery system: Urban, rural, tribal and difficult areas</p> <ul style="list-style-type: none"> □ Health organization: National, State, District, CHC, PHC, Sub Centre, Village - Functions, Staffing, pattern of assistance, layout, drugs, equipments and supplies,Roles and Responsibilities of DPHNO □ Critical review of functioning of various levels, evaluation studies, recommendations and nursing perspectives □ Alternative systems of medicine □ Training and supervision of health workers

Unit	Hours	Content
		<ul style="list-style-type: none">□ Health agencies: NGO's, Roles and functions□ Inter-sectoral coordination□ Public private partnership□ Challenges of health care delivery system

Practical

Total = 660 Hours
1 Week = 30 Hours

S.No.	Deptt./Unit	No. of Week	Total Hours
1	Sub-centre, PHC, CHC	12	360 Hours
2	District family welfare bureau	1	30 Hours
3	Urban centers	6	180 Hours
4	Field visits	3	90 Hours
	Total	22 Weeks	660 Hours

Student Activities

- Identification of community leaders and resource persons (community mapping)
- Community health survey
- Community health nursing process- individual, family and special groups and community
- Counseling
- Health education – campaign, exhibition, folk media, preparation of IEC materials
- Organising and participating in special clinics/camps and national health and welfare programmes-Organise atleast one health and family welfare mela/fair (all stalls of national health and family welfare activities should be included)
- Estimation of Vital health statistics -Exercise
- Drill for disaster preparedness
- Organise atleast one in-service education to ANM's/LHV/PHN/HW
- Nutrition – Exercise on nutritional assessment on dietary planning, demonstration and education for various age groups
- Filling up of Records, reports and registers maintained at SC/PHC/CHC
- Assist women in self breast examination
- Conduct antenatal examination
- Conduct vaginal examination
- Conduct deliveries
- Post natal visits
- Perform Episiotomy and suturing
- Prepare Pap smear
- Conduct Insertion/Removal of IUD
- Blood Slide preparation
- Field visits
- Maintenance of log book for various activities

NURSING RESEARCH AND STATISTICS

Placement: 1st Year

Hours of Instruction
Theory 150 Hours
Practical 100 Hours
Total : 250 Hours

Part-A : Nursing Research

Theory 100 Hours
Practical 50 Hours
Total : 150 Hours

Course Description:

The course is designed to assist the students to acquire an understanding of the research methodology and statistical methods as a basis for identifying research problem, planning and implementing a research plan. It will further enable the students to evaluate research studies and utilize research findings to improve quality of nursing practice, education and management.

General Objectives:

At the end of the course, the students will be able to:

1. Define basic research terms and concepts.
2. Review literature utilizing various sources
3. Describe research methodology
4. Develop a research proposal.
5. Conduct a research study.
6. Communicate research findings
7. Utilize research findings
8. Critically evaluate nursing research studies.
9. Write scientific paper for publication.

Content Outline

Unit	Hours		Course Content
	Theory	Practical	
I	10		Introduction: <ul style="list-style-type: none"> □ Methods of acquiring knowledge – problem solving and scientific method. □ Research – Definition, characteristics, purposes, kinds of research □ Historical Evolution of research in nursing □ Basic research terms □ Scope of nursing research: areas, problems in nursing, health and social research □ Concept of evidence based practice □ Ethics in research □ Overview of Research process
II	5	5	Review of Literature <ul style="list-style-type: none"> □ Importance, purposes, sources, criteria for selection of resources and steps in reviewing literature.
III	12		Research Approaches and designs <ul style="list-style-type: none"> □ Type: Quantitative and Qualitative □ Historical, survey and experimental –Characteristics, types advantages and disadvantages □ Qualitative: Phenomenology, grounded theory, ethnography
IV	10	5	Research problem: <ul style="list-style-type: none"> □ Identification of research problem □ Formulation of problem statement and research objectives □ Definition of terms □ Assumptions and delimitations □ Identification of variables □ Hypothesis – definition, formulation and types.
V	5	5	Developing theoretical/conceptual framework. <ul style="list-style-type: none"> □ Theories: Nature, characteristics, Purpose and uses □ Using, testing and developing conceptual framework, models and theories.
VI	6		Sampling <ul style="list-style-type: none"> □ Population and sample □ Factors influencing sampling □ Sampling techniques □ Sample size □ Probability and sampling error □ Problems of sampling

Unit	Hours		Course Content
	Theory	Practical	
VII	20	10	Tools and methods of Data collection: <ul style="list-style-type: none"> □ Concepts of data collection □ Data sources, methods/techniques quantitative and qualitative. □ Tools for data collection – types, characteristics and their development □ Validity and reliability of tools □ Procedure for data collection
VIII	5		Implementing research plan <ul style="list-style-type: none"> □ Pilot Study, review research plan (design)., planning for data collection, administration of tool/interventions, collection of data
IX	10	10	Analysis and interpretation of data <ul style="list-style-type: none"> □ Plan for data analysis: quantitative and qualitative □ Preparing data for computer analysis and presentation. □ Statistical analysis □ Interpretation of data □ Conclusion and generalizations □ Summary and discussion
X	10		Reporting and utilizing research findings: <ul style="list-style-type: none"> □ Communication of research results; oral and written □ Writing research report purposes, methods and style- vancouver, American Psychological Association(APA), Campbell etc □ Writing scientific articles for publication: purposes & style
XI	3	8	Critical analysis of research reports and articles
XII	4	7	Developing and presenting a research proposal

Activities:

- Annotated Bibliography of research reports and articles.
- Review of literature of selected topic and reporting
- Formulation of problem statement, objective and hypothesis
- Developing theoretical/ conceptual framework.
- Preparation of a sample research tool
- Analysis and interpretation of given data
- Developing and presenting research proposal
- Journal club presentation
- Critical evaluation of selected research studies
- Writing a scientific paper.

Method of Teaching

- Lecture-cum-discussion
- Seminar/Presentations
- Project
- Class room exercises
- Journal club

Methods of Evaluation

- Quiz, Tests (Term)
- Assignments/Term paper
- Presentations
- Project work

Internal Assessment

Techniques	Weightage (15marks)
Term Test(2 tests)	40%
Assignment	20%
Presentation	20%
Project work	20%
Total	100%

Part –B : Statistics

Hours of Instruction
Theory 50 Hours
Practical 50 Hours
Total : 100 Hours

Course Description

At the end of the course, the students will be able to develop an understanding of the statistical methods and apply them in conducting research studies in nursing.

General Objectives

At the end of the course the students will be able to:

1. Explain the basic concepts related to statistics
2. Describe the scope of statistics in health and nursing
3. Organize, tabulate and present data meaningfully.
4. Use descriptive and inferential statistics to predict results.
5. Draw conclusions of the study and predict statistical significance of the results.
6. Describe vital health statistics and their use in health related research.
7. Use statistical packages for data analysis

Unit	Hours		Course Content
	Theory	Practical	
I	7	4	Introduction: <ul style="list-style-type: none">□ Concepts, types, significance and scope of statistics, meaning of data,□ sample, parameter□ type and levels of data and their measurement□ Organization and presentation of data – Tabulation of data;□ Frequency distribution□ Graphical and tabular presentations.
II	4	4	Measures of central tendency: <ul style="list-style-type: none">□ Mean, Median, Mode
III	4	5	Measures of variability; <ul style="list-style-type: none">□ Range, Percentiles, average deviation, quartile deviation, standard deviation
IV	3	2	Normal Distribution: <ul style="list-style-type: none">□ Probability, characteristics and application of normal probability curve; sampling error.

Unit	Hours		Course Content
	Theory	Practical	
V	6	8	Measures of relationship: <ul style="list-style-type: none"> □ Correlation – need and meaning □ Rank order correlation; □ Scatter diagram method □ Product moment correlation □ Simple linear regression analysis and prediction.
VI	5	2	Designs and meaning: <ul style="list-style-type: none"> □ Experimental designs □ Comparison in pairs, randomized block design, Latin squares.
VII	8	10	Significance of Statistic and Significance of difference between two Statistics (Testing hypothesis) <ul style="list-style-type: none"> □ Non parametric test – Chi-square test, Sign, median test, Mann Whitney test. □ Parametric test – ‘t’ test, ANOVA, MANOVA,ANCOVA
VIII	5	5	Use of statistical methods in psychology and education: <ul style="list-style-type: none"> □ Scaling – Z Score, Z Scaling □ Standard Score and T Score □ Reliability of test Scores: test-retest method, parallel forms, split half method.
IX	4	2	Application of statistics in health: <ul style="list-style-type: none"> □ Ratios, Rates, Trends □ Vital health statistics – Birth and death rates. □ Measures related to fertility, morbidity and mortality
X	4	8	Use of Computers for data analysis <ul style="list-style-type: none"> □ Use of statistical package.

Activities

- Exercises on organization and tabulation of data,
- Graphical and tabular presentation of data
- Calculation of descriptive and inferential statistics(chi square, t-test, correlation)
- Practice in using statistical package
- Computing vital health statistics

Methods of Teaching:

- Lecture-cum-discussion
- Demonstration – on data organization, tabulation, calculation of statistics, use of statistical package, Classroom exercises, organization and tabulation of data,

- Computing Descriptive and inferential statistics; vital and health statistics and use of computer for data entry and analysis using statistical package.

Methods of Evaluation

- Test, Classroom statistical exercises.

Internal Assessment

Techniques

Weightage 10 marks

Test – (2 tests)

100%

NURSING MANAGEMENT

Placement : II Year

Hours of Instruction
Theory 150 Hours
Practical 150 Hours
Total : 300 Hours

Course Description

This course is designed to assist students to develop a broad understanding of Principles, concepts, trends and issues related to nursing management. Further, it would provide opportunity to students to understand, appreciate and acquire skills in planning, supervision and management of nursing services at different levels to provide quality nursing services.

Objectives

At the end of the course, students will be able to:

1. Describe the philosophy and objectives of the health care institutions at various levels.
2. Identify trends and issues in nursing
3. Discuss the public administration, health care administration vis a vis nursing administration
4. Describe the principles of administration applied to nursing
5. Explain the organization of health and nursing services at the various levels/institutions.
6. Collaborate and co-ordinate with various agencies by using multi-sectoral approach
7. Discuss the planning, supervision and management of nursing workforce for various health care settings.
8. Discuss various collaborative models between nursing education and nursing service to improve the quality of nursing care
9. Identify and analyse legal and ethical issues in nursing administration
10. Describe the process of quality assurance in nursing services.
11. Demonstrate leadership in nursing at various levels

Course Content

Unit	Hours	Content
I	10	<p>Introduction</p> <ul style="list-style-type: none"> □ Philosophy, purpose, elements, principles and scope of administration □ Indian Constitution, Indian Administrative system vis a vis health care delivery system: National, State and Local □ Organisation and functions of nursing services and education at National, State , District and institutions: Hospital and Community □ Planning process: Five year plans, Various Committee Reports on health, State and National Health policies, national population policy, national policy on AYUSH and plans,
II	10	<p>Management</p> <ul style="list-style-type: none"> □ Functions of administration □ Planning and control □ Co-ordination and delegation □ Decision making – decentralization basic goals of decentralization. □ Concept of management <p>Nursing management</p> <ul style="list-style-type: none"> □ Concept, types, principles and techniques □ Vision and Mission Statements □ Philosophy, aims and objective □ Current trends and issues in Nursing Administration □ Theories and models <p>Application to nursing service and education</p>
III	15	<p>Planning</p> <ul style="list-style-type: none"> □ Planning process: Concept, Principles, Institutional policies □ Mission, philosophy, objectives, □ Strategic planning □ Operational plans □ Management plans □ Programme evaluation and review technique(PERT), Gantt chart, Management by objectives(MBO) □ Planning new venture □ Planning for change □ Innovations in nursing <p>Application to nursing service and education</p>
IV	15	<p>Organisation</p> <ul style="list-style-type: none"> □ Concept , principles, objectives, Types and theories, Minimum requirements for organisation, Developing an organizational Structure, levels, organizational Effectiveness and organizational Climate, □ Organising nursing services and patient care: Methods of patient assignment- Advantages and disadvantages, primary nursing care, □ Planning and Organising: hospital, unit and ancillary services(specifically central sterile supply department, laundry, kitchen, laboratory services, emergency etc)

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Disaster management: plan, resources, drill, etc <p>Application to nursing service and education</p>
V	15	<p>Human Resource for health</p> <ul style="list-style-type: none"> □ Staffing <ul style="list-style-type: none"> • Philosophy • Norms: Staff inspection unit(SIU), Bajaj Committee, High power committee, Indian nursing council (INC) • Estimation of nursing staff requirement- activity analysis • Various research studies □ Recruitment: credentialing, selection, placement, promotion □ Retention □ Personnel policies □ Termination □ Staff development programme □ Duties and responsibilities of various category of nursing personnel <p>Applications to nursing service and education</p>
VI	15	<p>Directing</p> <ul style="list-style-type: none"> □ Roles and functions □ Motivation: Intrinsic, extrinsic, Creating motivating climate, Motivational theories □ Communication : process, types, strategies, Interpersonal communication, channels, barriers, problems, Confidentiality, Public relations □ Delegation; common delegation errors □ Managing conflict: process, management, negotiation, consensus □ Collective bargaining: health care labour laws, unions, professional associations, role of nurse manager □ Occupational health and safety <p>Application to nursing service and education</p>
VII	10	<p>Material management</p> <ul style="list-style-type: none"> □ Concepts, principles and procedures □ Planning and procurement procedures : Specifications □ ABC analysis, □ VED (very important and essential daily use) analysis □ Planning equipments and supplies for nursing care: unit and hospital □ Inventory control □ Condemnation <p>Application to nursing service and education</p>
VIII	15	<p>Controlling</p> <ul style="list-style-type: none"> □ Quality assurance – Continuous Quality Improvement <ul style="list-style-type: none"> • Standards • Models • Nursing audit

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Performance appraisal: Tools, confidential reports, formats, Management, interviews □ Supervision and management: concepts and principles □ Discipline: service rules, self discipline, constructive versus destructive discipline, problem employees, disciplinary proceedings-enquiry etc □ Self evaluation or peer evaluation, patient satisfaction, utilization review <p>Application to nursing service and education</p>
IX	15	<p>Fiscal planning</p> <ul style="list-style-type: none"> □ Steps □ Plan and non-plan, zero budgeting, mid-term appraisal, capital and revenue □ Budget estimate, revised estimate, performance budget □ Audit □ Cost effectiveness □ Cost accounting □ Critical pathways □ Health care reforms □ Health economics □ Health insurance □ Budgeting for various units and levels <p>Application to nursing service and education</p>
X	10	<p>Nursing informatics</p> <ul style="list-style-type: none"> □ Trends □ General purpose □ Use of computers in hospital and community □ Patient record system □ Nursing records and reports □ Management information and evaluation system (MIES) □ E- nursing, Telemedicine, telenursing □ Electronic medical records
XI	10	<p>Leadership</p> <ul style="list-style-type: none"> □ Concepts, Types, Theories □ Styles □ Manager behaviour □ Leader behaviour □ Effective leader: Characteristics, skills □ Group dynamics □ Power and politics □ lobbying □ Critical thinking and decision making □ Stress management <p>Applications to nursing service and education</p>

Unit	Hours	Content
XII	10	<p>Legal and ethical issues</p> <p>Laws and ethics</p> <ul style="list-style-type: none"> □ Ethical committee □ Code of ethics and professional conduct □ Legal system: Types of law, tort law, and liabilities □ Legal issues in nursing: negligence, malpractice, invasion of privacy, defamation of character □ Patient care issues, management issues, employment issues □ Medico legal issues □ Nursing regulatory mechanisms: licensure, renewal, accreditation □ Patients rights, Consumer protection act(CPA) □ Rights of special groups: children, women, HIV, handicap, ageing □ Professional responsibility and accountability □ Infection control □ Standard safety measures

PRACTICALS

1. Prepare prototype personal files for staff nurses, faculty and cumulative records
2. Preparation of budget estimate, Revised estimate and performance budget
3. Plan and conduct staff development programme
4. Preparation of Organisation Chart
5. Developing nursing standards/protocols for various units
6. Design a layout plan for speciality units /hospital, community and educational institutions
7. Preparation of job description of various categories of nursing personnel
8. Prepare a list of equipments and supplies for speciality units
9. Assess and prepare staffing requirement for hospitals, community and educational institutions
10. Plan of action for recruitment process
11. Prepare a vision and mission statement for hospital, community and educational institutions
12. Prepare a plan of action for performance appraisal
13. Identify the problems of the speciality units and develop plan of action by using problem solving approach
14. Plan a duty roster for speciality units/hospital, community and educational institutions
15. Prepare: anecdotes, incident reports, day and night reports, handing and taking over reports, enquiry reports, nurses notes, Official letters, curriculum vitae, presentations etc

16. Prepare a plan for disaster management
17. Group work
18. Field appraisal report

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING

SUB SPECIALITY – CARDIO VASCULAR AND THORACIC NURSING

Placement : II year

Hours of Instruction
Theory : 150 hours.
Practical : 950 hours.
Total : 1100 hours.

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of cardiovascular and thoracic nursing. It will help students to develop advanced skills for nursing intervention in various cardio medical and surgical conditions. It will enable the student to function as Cardio vascular and Thoracic Nurse practitioner/specialist. It will further enable the student to function as educator, manager and researcher in the field of cardio vascular and thoracic nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate trends and issues related to cardio vascular and thoracic Nursing.
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of cardio vascular and thoracic conditions
3. Participate in national health programs for health promotion, prevention and rehabilitation of patients with cardio vascular and thoracic conditions
4. Perform physical, psychosocial & spiritual assessment
5. Assist in various diagnostic, therapeutic and surgical procedures
6. Apply nursing process in providing comprehensive care to patients with cardio vascular and thoracic conditions
7. Demonstrate advance skills/competence in managing patients with cardio vascular and thoracic conditions including Advance Cardiac Life Support.
8. Describe the various drugs used in cardio vascular and thoracic conditions and nurses responsibility
9. Demonstrate skill in handling various equipments/gadgets used for critical care of cardio vascular and thoracic patients
10. Appreciate team work & coordinate activities related to patient care.
11. Practice infection control measures.
12. Identify emergencies and complications & take appropriate measures

13. Discuss the legal and ethical issues in cardio vascular and thoracic nursing
14. Assist patients and their family to cope with emotional distress, grief, anxiety and spiritual needs.
15. Appreciate the role of alternative system of medicine in care of patient
16. Incorporate evidence based nursing practice and identify the areas of research in the field of cardio vascular and thoracic nursing
17. Identify the sources of stress and manage burnout syndrome among health care providers.
18. Teach and supervise nurses and allied health workers.
19. Design a layout of ICCU and ICTU and develop standards for cardio vascular and thoracic nursing practice.

Content Outline

Unit	Hours	Content
I	5	Introduction <ul style="list-style-type: none"> □ Historical development, trends and issues in the field of cardiology. □ Cardio vascular and thoracic conditions – major health problem. □ Concepts, principles and nursing perspectives □ Ethical and legal issues □ Evidence based nursing and its application in cardio vascular and thoracic nursing(to be incorporated in all the units)
II	5	Epidemiology <ul style="list-style-type: none"> □ Risk factors: hereditary, psycho social factors, hypertension, smoking, obesity, diabetes mellitus etc □ Health promotion, disease prevention, Life style modification □ National health programs related to cardio vascular and thoracic conditions □ Alternate system of medicine □ Complementary therapies
III	5	Review of anatomy and physiology of cardio vascular and respiratory system <ul style="list-style-type: none"> □ Review of anatomy and physiology of heart, lung, thoracic cavity and blood vessels. Embryology of heart and lung. □ Coronary circulation □ Hemodynamics and electro physiology of heart. □ Bio-chemistry of blood in relation to cardio pulmonary function.
IV	20	Assessment and Diagnostic Measures: <ul style="list-style-type: none"> □ History taking □ Physical assessment <ul style="list-style-type: none"> • Heart rate variability: Mechanisms , measurements, pattern, factors, impact of interventions on HRV □ Diagnostic tests <ul style="list-style-type: none"> • Hemodynamic monitoring: Technical aspects, monitoring, functional hemodynamic indices, ventricular function indices,

Unit	Hours	Content
		<p>output measurements (Arterial and swan Ganz monitoring). Blood gases and its significance, oxygen supply and demand</p> <ul style="list-style-type: none"> • Radiologic examination of the chest: interpretation, chest film findings • Electro cardiography(ECG) : electrical conduction through the heart, basic electrocardiography, 12 lead electrocardiogram, axis determination <ul style="list-style-type: none"> - ECG changes in: intraventricular conduction abnormalities- Arrhythmias, ischemia, injury and infarction, atrial and ventricular enlargement, electrolyte imbalance, • Echocardiography: technical aspects, special techniques, echocardiography of cardiac structures in health and disease, newer techniques • Nuclear and other imaging studies of the heart: Magnetic Resonance Imaging. • Cardio electrophysiology procedures: diagnostic studies, interventional and catheter ablation, nursing care • Exercise testing: indications and objectives, safety and personnel, pretest considerations, selection, interpretation, test termination, recovery period • Cardiac catheterization: indications, contraindications, patient preparation, procedure, interpretation of data • Pulmonary function test: Bronchoscopy and graphies • Interpretation of diagnostic measures • Nurse’s role in diagnostic tests <p>□ Laboratory tests using blood: Blood specimen collection, Cardiac markers, Blood lipids, Hematologic studies, Blood cultures, Coagulation studies, Arterial blood gases, Blood Chemistries, cardiac enzyme studies, Serum Concentration of Selected drugs.</p> <p>□ Interpretation and role of nurse</p>
V	25	<p>Cardiac disorders and nursing management:</p> <p>□ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of:</p> <ul style="list-style-type: none"> • Hypertension • Coronary Artery Disease. • Angina of various types. • Cardiomegaly • Myocardial Infarction, Congestive cardiac failure • Heart Failure, Pulmonary Edema, Shock. • Rheumatic heart disease and other Valvular Diseases • Inflammatory Heart Diseases, Infective Endocarditis, Myocarditis, Pericarditis. • Cardiomyopathy, dilated, restrictive, hypertrophic. • Arrhythmias, heart block <p>Associated illnesses</p>

Unit	Hours	Content
VI	10	<p>Altered pulmonary conditions</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of: <ul style="list-style-type: none"> • Bronchitis • Bronchial asthma • Bronchiectasis • Pneumonias • Lung abscess, lung tumour • Pulmonary tuberculosis, fibrosis, pneumoconiosis etc • Pleuritis, effusion • Pneumo, haemo and pyothorax • Interstitial Lung Disease • Cystic fibrosis • Acute and Chronic obstructive pulmonary disease (conditions leading to) • Cor pulmonale • Acute respiratory failure • Adult respiratory distress syndrome • Pulmonary embolism • Pulmonary Hypertension
VII	10	<p>Vascular disorders and nursing management</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of: <ul style="list-style-type: none"> • Disorders of arteries • Disorders of the aorta • Aortic Aneurysms, • Aortic dissection • Raynaud's phenomenon • Peripheral arterial disease of the lower extremities • Venous thrombosis • Varicose veins • Chronic venous insufficiency and venous leg ulcers • Pulmonary embolism
VIII	10	<p>Cardio thoracic emergency interventions</p> <ul style="list-style-type: none"> □ CPR- BLS and ALS □ Use of ventilator, defibrillator , pacemaker □ Post resuscitation care. □ Care of the critically ill patients □ Psychosocial and spiritual aspects of care □ Stress management; ICU psychosis □ Role of nurse
IX	10	<p>Nursing care of a patient with obstructive airway</p> <ul style="list-style-type: none"> □ Assessment □ Use of artificial airway □ Endotracheal intubation, tracheostomy and its care □ Complication, minimum cuff leak, securing tubes <p>Oxygen delivery systems.</p> <ul style="list-style-type: none"> □ Nasal Cannula

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Oxygen mask, Venturi mask □ Partial rebreathing bag □ Bi-PAP and C-PAP masks □ Uses, advantages, disadvantages, nursing implications of each. <p>Mechanical Ventilation</p> <ul style="list-style-type: none"> □ Principles of mechanical ventilation □ Types of mechanical ventilation and ventilators. □ Modes of ventilation, advantage, disadvantage, complications. □ PEEP therapy, indications, physiology, and complications. Weaning off the ventilator. □ Nursing assessment and interventions of ventilated patient.
X	10	<p>Congenital Heart Diseases,</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of: <ul style="list-style-type: none"> • Embryological development of heart. • Classification – cyanotic and acyanotic heart disease. • Tetralogy of Fallots. • Atrial Septal Defect, Ventricular Septal Defect., Eisenmenger’s complex. • Patent ductus arteriosus, AP window • Truncus Arteriosus. • Transposition of great arteries. • Total Anomaly of Pulmonary Venous Connection. • Pulmonary stenosis, atresia. • Coarctation of aorta. • Ebstein’s anomaly • Double outlet right ventricle, Single ventricle, Hypoplastic left heart syndrome.
XI	10	<p>Pharmacology</p> <ul style="list-style-type: none"> □ Review □ Pharmacokinetics □ Analgesics/Anti inflammatory agents □ Antibiotics, antiseptics □ Drug reaction & toxicity □ Drugs used in cardiac emergencies □ Blood and blood components <ul style="list-style-type: none"> • Antithrombolytic agents • Inotropic agents • Beta-blocking agents • Calcium channel blockers. • Vaso constrictors • Vaso dilators • ACE inhibitors. • Anticoagulents • Antiarrhythmic drugs. • Anti hypertensives • Diuretics • Sedatives and tranquilizers. • Digitalis.

Unit	Hours	Content
		<ul style="list-style-type: none"> • Antilipemics □ Principles of drug administration, role and responsibilities of nurses and care of drugs
XII	20	<p>Nursing Care of patient undergoing cardio thoracic surgery</p> <ul style="list-style-type: none"> □ Indications, selection of patient □ Preoperative assessment and preparation; counselling. □ Intraoperative care: Principles of open heart surgery, equipment, anaesthesia, cardiopulmonary by pass. □ Surgical procedures for Coronary Artery Bypass Grafting, recent advances and types of grafts, Valve replacement or reconstruction, cardiac transplant, Palliative surgery and different Stents, vascular surgery, other recent advances. □ Thoracic surgery: lobectomy, pneumonectomy, tumour excision etc □ Immediate postoperative care : assessment, post operative problems and interventions : Bleeding, Cardiac tamponade, Low cardiac output, Infarction, Pericardial effusion, Pleural effusion, Pneumothorax, Haemothorax, Coagulopathy, Thermal imbalance, Inadequate., ventilation/perfusion, Neurological problems, renal problems, Psychological problems. □ Chest physiotherapy □ Nursing interventions- life style modification, complementary therapy/alternative systems of medicine. □ Intermediate and late post operative care after CABG, valve surgery, others. <p>Follow up care</p>
XIII	5	<p>Cardiac rehabilitation</p> <ul style="list-style-type: none"> □ Process □ Physical evaluation □ Life style modification □ Physical conditioning for cardiovascular efficiency through exercise □ Counseling □ Follow up care
XIV	5	<p>Intensive Coronary Care Unit/intensive cardio thoracic unit:</p> <ul style="list-style-type: none"> □ Quality assurance <ul style="list-style-type: none"> • Standards, Protocols, Policies, Procedures • Infection control; Standard safety measures • Nursing audit • Design of ICCU/ICTU • Staffing; cardiac team • Burn out syndrome □ Nurse's role in the management of I.C.C.U and ICTU. □ Mobile coronary care unit. □ Planning inservice educational programme and teaching

Practicals

Total – 960 Hours
1 Weeks = 30 Hours

S.No.	Deptt/ Unit	No. of Week	Total Hours
1	Cardio thoracic -Medical	4	120 Hours
	-Surgical	4	120 Hours
2.	OTs (Cardiac and thoracic)	4	120 Hours
3.	Casualty	2	60 Hours
4.	Diagnostic labs including cath lab	2	60 Hours
5.	ICCU	4	120 Hours
6.	ICU	4	120 Hours
7.	CCU	4	120 Hours
8.	Paediatric Intensive	2	60 Hours
9.	OPD	2	60 Hours
	Total	32 Weeks	960 Hours

Essential Nursing Skills

Procedures Observed

1. Echo cardiogram
2. Ultrasound
3. Monitoring JVP , CVP
4. CT SCAN
5. MRI
6. Pet SCAN
7. Angiography
8. Cardiac cathetrisation
9. Angioplasty
10. Various Surgeries
11. Any other

I. Procedures Assisted

1. Arterial blood gas analysis
2. Thoracentesis
3. Lung biopsy
4. Computer assisted tomography (CAT Scan)
5. M.R.I.
6. Pulmonary angiography
7. Bronchoscopy
8. Pulmonary function test
9. ET tube insertion
10. Tracheostomy tube insertion
11. Cardiac catheterisation
12. Angiogram
13. Defibrillation
14. Treadmill test

15. Echo cardiography
16. Doppler ultrasound
17. Cardiac surgery
18. Insertion of chest tube
19. CVP Monitoring
20. Measuring pulmonary artery pressure by Swan-Ganz Catheter
21. Cardiac Pacing

II. Procedures Performed

1. Preparation of assessment tool for CT client (Cardiac, thoracic and vascular).
2. ECG – Recording, Reading, Identification of abnormalities
3. Oxygen therapy – Cylinder, central supply,
Catheter, nasal canula, mask, tent
Through ET and Tracheostomy tube
Manual resuscitation bag
4. Mechanical ventilation
5. Spirometer
6. Tuberculen skin test
7. Aerosal therapy
8. Nebulizer therapy
9. Water seal drainage
10. Chest physiotherapy including – Breathing Exercises
Coughing Exercises
Percussion & Vibration
11. Suctioning – Oropharyngeal, nasotracheal, Endotracheal
Through tracheostomy tube
12. Artificial airway cuff maintenance
13. CPR
14. Care of client on ventilator
15. Identification of different – Arrhythmias
Abnormal pulses, respirations
B.P. Variation
Heart sounds
Breath sounds
16. Pulse oxymetry
17. Introduction of intracath
18. Bolus I.V. Injection
19. Life line
20. Maintenance of “Heplock”
21. Subcutaneous of Heparin
22. Obtaining leg measurements to detect early swelling in thrombophlebetes
23. Identification of Homans signs
24. Buerger – Allen exercises

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING - CRITICAL CARE NURSING

Placement: II Year

Hours of instruction

Theory: 150 hours

Practical: 950 hours

Total : 1100 hours

Course Description

This course is designed to assist students in developing expertise and in-depth knowledge in the field of Critical care Nursing. It will help students to develop advanced skills for nursing intervention in caring for critically ill patients. It will enable the student to function as critical care nurse practitioner/ specialist. It will further enable the student to function as educator, manager and researcher in the field of Critical Care Nursing.

Objectives

At the end of the course the students will be able to

1. Appreciate trends and issues related to Critical Care Nursing.
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of critically ill patients
3. Describe the various drugs used in critical care and nurses responsibility
4. Perform physical, psychosocial & spiritual assessment
5. Demonstrate advance skills/competence in managing critically ill patients including Advance Cardiac Life Support.
6. Demonstrate skill in handling various equipments/gadgets used for critical care
7. Provide comprehensive care to critically ill patients.
8. Appreciate team work & coordinate activities related to patient care.
9. Practice infection control measures.
10. Assess and manage pain .
11. Identify complications & take appropriate measures.
12. Discuss the legal and ethical issues in critical care nursing
13. Assist patients and their family to cope with emotional distress, spiritual, grief and anxiety
14. Assist in various diagnostic, therapeutic and surgical procedures
15. Incorporate evidence based nursing practice and identify the areas of research in the field of critical care nursing

16. Identify the sources of stress and manage burnout syndrome among health care providers.
17. Teach and supervise nurses and allied health workers.
18. Design a layout of ICU and develop standards for critical care nursing practice.

Course Content

Unit	Hours	Content
I	5	Introduction to Critical Care Nursing <ul style="list-style-type: none"> □ Historical review- Progressive patient care(PPC) □ Review of anatomy and physiology of vital organs, fluid and electrolyte balance □ Concepts of critical care nursing □ Principles of critical care nursing □ Scope of critical care nursing □ Critical care unit set up including equipments supplies, use and care of various type of monitors & ventilators □ Flow sheets
II	10	Concept of Holistic care applied to critical care nursing practice <ul style="list-style-type: none"> □ Impact of critical care environment on patients:- <ul style="list-style-type: none"> • Risk factors, Assessment of patients, Critical care psychosis, prevention & nursing care for patients affected with psychophysiological & psychosocial problems of critical care unit, Caring for the patient's family, family teaching □ The dynamics of healing in critical care unit:-therapeutic touch, Relaxation, Music therapy, Guided Imagery, acupressure □ Stress and burnout syndrome among health team members
III	14	Review <ul style="list-style-type: none"> □ Pharmacokinetics □ Analgesics/Anti inflammatory agents □ Antibiotics, antiseptics □ Drug reaction & toxicity □ Drugs used in critical care unit (inclusive of ionotropic, life saving drugs) □ Drugs used in various body systems □ IV fluids and electrolytes □ Blood and blood components □ Principles of drug administration, role of nurses and care of drugs
IV	5	Pain Management <ul style="list-style-type: none"> □ Pain & Sedation in Critically ill patients □ Theories of pain, Types of pain, Pain assessment, Systemic responses to pain □ pain management-pharmacological and non-pharmacological measures □ Placebo effect

Unit	Hours	Content
V	5	<p>Infection control in intensive care unit</p> <ul style="list-style-type: none"> □ Nosocomial infection in intensive care unit; methyl resistant staphylococcus aureus (MRSA), Disinfection, Sterilization, Standard safety measures, Prophylaxis for staff
VI	10	<p>Gastrointestinal System</p> <ul style="list-style-type: none"> □ Causes, Pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: Medical, Surgical and Nursing management of:-Acute Gastrointestinal Bleeding, Abdominal injury, Hepatic Disorders:-Fulminant hepatic failure, Hepatic encephalopathy, Acute Pancreatitis, Acute intestinal obstruction, perforative peritonitis
VII	10	<p>Renal System</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: Medical, Surgical and Nursing management of:-Acute Renal Failure, Chronic Renal Failure, Acute tubular necrosis, Bladder trauma □ Management Modalities: Hemodialysis, Peritoneal Dialysis, Continuous Ambulatory Peritoneal Dialysis, Continuous arterio venous hemodialysis, Renal Transplant,
VIII	10	<p>Nervous System</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: Medical, Surgical and Nursing management of:-Common Neurological Disorders:-Cerebrovascular disease, Cerebrovascular accident, Seizure disorders, GuilleinBarre-Syndrome, Myasthenia Gravis, Coma, Persistent vegetative state, Encephalopathy, Head injury, Spinal Cord injury □ Management Modalities: Assessment of Intracranial pressure, Management of intracranial hypertension, Craniotomy □ Problems associated with neurological disorders: Thermo regulation, Unconsciousness, Herniation syndrome
IX	5	<p>Endocrine System</p> <ul style="list-style-type: none"> □ Causes, Pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: Medical, Surgical and Nursing Management of :-Hypoglycemia, Diabetic Ketoacidosis, Thyroid crisis, Myxoedema, Adrenal crisis, Syndrome of Inappropriate/ hypersecretion of Antidiuretic Hormone (SIADH)
X	15	<p>Management of other Emergency Conditions</p> <ul style="list-style-type: none"> □ Mechanism of injury, Thoracic injuries, Abdominal injuries, pelvic fractures, complications of trauma, Head injuries □ Shock: Shock syndrome, Hypovolemic, Cardiogenic, Anaphylactic, Neurogenic and Septic shock □ Systemic inflammatory Response: The inflammatory response, Multiple organ dysfunction syndrome □ Disseminated Intravascular Coagulation □ Drug Overdose and Poisoning, □ Acquired Immunodeficiency Syndrome (AIDS)

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Ophthalmic: Eye injuries, Glaucoma, retinal detachment □ Ear Nose Throat: Foreign bodies, stridor, bleeding, quincy, acute allergic conditions □ Psychiatric emergencies;, suicide, □ crisis intervention
XI	20	<p>Cardiovascular emergencies</p> <ul style="list-style-type: none"> □ Principles of Nursing in caring for patient's with Cardiovascular disorders □ Assessment: Cardiovascular system: Heart sounds, Diagnostic studies:- Cardiac enzymes studies, Electrocardiographic monitoring, Holter monitoring, Stress test. Echo cardiography, Coronary angiography, Nuclear medicine studies □ Causes, Pathophysiology, Clinical types, Clinical features, Diagnostic Prognosis, Management : Medical, Surgical & Nursing management of:-Hypertensive crisis, Coronary artery disease, Acute Myocardial infarction, Cardiomyopathy, Deep vein thrombosis, Valvular diseases, Heart block, Cardiac arrhythmias & conduction disturbances, Aneurysms, Endocarditis, Heart failure Cardio pulmonary resuscitation BCLS/ ACLS □ Management Modalities: Thrombolytic therapy, Pacemaker – temporary & permanent, Percutaneous transluminal coronary angioplasty, Cardioversion, Intra Aortic Balloon pump monitoring, Defibrillations, Cardiac surgeries, Coronary Artery Bypass Grafts (CABG/MICAS), Valvular surgeries, Heart Transplantation, Autologous blood transfusion, Radiofrequency Catheter Ablation
XII	15	<p>Respiratory System</p> <ul style="list-style-type: none"> □ Acid-base balance & imbalance □ Assesment : History & Physical Examination □ Diagnostic Tests:Pulse Oximetry, End –Tidal Carbon Dioxide Monitoring, Arterial blood gas studies, chest radiography, pulmonary Angiography, Bronchoscopy, Pulmonary function Test, Ventilation perfusion scan, Lung ventilation scan □ Causes Pathophysiology, Clinical types, Clinical features, Prognosis, Management: Medical, Surgical and Nursing management of Common pulmonary disorders:-Pneumonia, Status asthmaticus, interstitial drug disease, Pleural effusion, Chronic obstructive pulmonary disease, Pulmonary tuberculosis, Pulmonary edema, Atelectasis, Pulmonary embolism, Acute respiratory failure, Acute respiratory distress syndrome (ARDS), Chest Trauma Haemothorax, Pneumothorax □ Management Modalities:-Airway Management □ Ventilatory Management:-Invasive, non- invasive, long term mechanical ventilations □ Bronchial Hygiene:-Nebulization, deep breathing exercise, chest physiotherapy, postural drainage, Inter Costal Drainage, Thoracic surgeries

Unit	Hours	Content
XIII	7	<p>Burns</p> <ul style="list-style-type: none"> □ Clinical types, classification, pathophysiology, clinical features, assessment, diagnosis, prognosis, Management: Medical, Surgical & Nursing management of burns □ Fluid and electrolyte therapy – calculation of fluids and its administration □ Pain management □ Wound care □ Infection control □ Prevention and management of burn complications □ Grafts and flaps □ Reconstructive surgery □ Rehabilitation
XIV	5	<p>Obstetrical Emergencies</p> <ul style="list-style-type: none"> □ Causes, Pathophysiology, Clinical types, clinical features, diagnostic Prognosis, Management: Medical, Surgical and Nursing management of :Antepartum haemorrhage, Preeclampsia, eclampsia, Obstructed labour and ruptured uterus, Post partum haemorrhage, Peurperal sepsis, Obstetrical shock
XV	10	<p>Neonatal Paediatric emergencies</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Neonatal emergencies □ Asphyxia Neonatarum, Pathological Jaundice in Neonates, Neonatal seizures, Metabolic disorders, Intra cranial Hemorrhage, Neonatal Sepsis, RDS/HMD (Respiratory Distress Syndrome/Hyaline Membrane Disease), Congenital disorders:- <ul style="list-style-type: none"> • Cyanotic heart disease, tracheo oesophageal fistula, congenital hypertropic pyloric stenosis, imperforate anus • Pediatric emergencies □ Dehydration, Acute broncho pneumonia, Acute respiratory distress syndrome, Poisoning, Foreign bodies, seizures, traumas, Status asthmaticus
XVI	2	<p>Legal and ethical issues in critical care-Nurse's role</p> <ul style="list-style-type: none"> □ Brain death □ Organ donation & Counselling □ Do Not Resuscitate(DNR) □ Euthanasia □ Living will
XVII	2	<p>Quality assurance</p> <ul style="list-style-type: none"> □ Standards, Protocols, Policies, Procedures □ Infection control; Standard safety measures □ Nursing audit □ Staffing □ Design of ICU/CCU

Practical

Total = 960 Hours
1 Week = 30 Hours

S.No.	Deptt./Unit	No. of Week	Total Hours
3	Burns ICU	2	60 Hours
5	Medical ICU	8	240 Hours
6	Surgical ICU	12	360 Hours
9	CCU	2	60 Hours
10	Emergency Department	3	90 Hours
12	Dialysis Unit	1	30 Hours
13	Transplant Room	2	60 Hours
14	Paediatric/ NICU	2	60 Hours
	Total	32 Weeks	960 Hours

ESSENTIAL CRITICAL CARE NURSING SKILLS

I. Procedures Observed

1. CT Scan
2. MRI
3. EEG
4. Hemodialysis
5. Endoscopic Retrograde cholangio Pancreaticogram(ERCP)
6. Heart/ Neuro/GI./ Renal Surgeries

II. Procedures Assisted

1. Advanced life support system
2. Basic cardiac life support
3. Arterial line/arterial pressure monitoring/blood taking
4. Arterial blood gas
5. ECG recording
6. Blood transfusion
7. IV cannulation therapy
8. Arterial Catheterization
9. Chest tube insertion
10. Endotracheal intubations
11. Ventilation

12. Insertion of central line/cvp line
13. Connecting lines for dialysis

III. Procedure Performed

1. Airway management
 - a. Application of oropharyngeal airway
 - b. Oxygen therapy
 - c. CPAP (Continuous Positive Airway pressure)
 - d. Care of tracheostomy
 - e. Endotracheal extubation
2. Cardiopulmonary resuscitation, Basic cardiac life support, ECG
3. Monitoring of critically ill patients – clinically with monitors, capillary refill time (CRT) assessment of jaundice, ECG.
4. Gastric lavage
5. Assessment of critically ill patients
 - Identification & assessment of risk factors, Glasgow coma scale, and dolls eye movement, arterial pressure monitoring, cardiac output/pulmonary artery pressure monitoring, and detection of life threatening abnormalities
6. Admission & discharge of critically ill patients
7. Nutritional needs – gastrostomy feeds, pharyngeal feeds, jejunostomy feeds, TPN, formula preparation & patient education.
8. Assessment of patient for alteration in blood sugar levels monitoring blood sugar levels periodically & administering insulin periodically.
9. Administration of drugs: IM, IV injection, IV cannulation & fixation of infusion pump, calculation of dosages, use of insulin syringes/tuberculin, monitoring fluid therapy, blood administration.
10. Setting up dialysis machine and starting, monitoring and closing dialysis
11. Procedures for prevention of infections:
 - Hand washing, disinfection & sterilization surveillance, and fumigation universal precautions.
12. Collection of specimen.
13. Setting, use & maintenance of basic equipment, ventilator, O2 analyzer, monitoring equipment, transducers, defibrillator, infusion & syringe pumps, centrifuge machine.

IV Other Procedures:

CLINICAL SPECIALITY-II

MEDICAL SURGICAL NURSING- ONCOLOGY NURSING

Placement : II Year

Hours of Instruction
Theory : 150 hours
Practicals : 950 hours
Total : 1100 hours

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of oncology Nursing. It will help students to develop advanced skills for nursing intervention in various oncological conditions. It will enable the student to function as oncology nurse practitioner/specialist and provide quality care. It will further enable the student to function as educator, manager, and researcher in the field of oncology nursing

Objectives

1. Explain the prevention, screening and early detection of cancer
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of oncological disorders of various body systems
3. Describe the psychosocial effects of cancer on patients and families.
4. Demonstrate skill in administering/ assisting in various treatment modalities used for patients with cancer
5. Apply nursing process in providing holistic care to patients with cancer.
6. Apply specific concepts of pain management
7. Appreciate the care of death and dying patients and value of bereavement support.
8. Describe the philosophy, concept and various dimensions of palliative care
9. Appreciate the role of alternative systems of medicine in care of cancer patients
10. Appreciate the legal & ethical issues relevant to oncology nursing
11. Recognize and manage Oncological emergencies
12. Counsel the patients with cancer and their families
13. Incorporate evidence based nursing practice and identify the areas of research in the field of oncology nursing
14. Recognize the role of oncology nurse practitioner as a member of oncology team
15. Collaborate with other agencies and utilize resources in caring for cancer patients.

16. Teach and supervise nurses and allied health workers.
17. Design a layout and develop standards for management of oncology units/hospitals and nursing care.

Content outline

Unit	Hours.	Content
I	4	<p>Introduction</p> <ul style="list-style-type: none"> □ Epidemiology-Incidence, Prevalence – Global, National, State and Local □ Disease burden, concept of cancer, risk factors □ Historical perspectives □ Trends and issues □ Principles of cancer management □ Roles and responsibilities of oncology nurse
II	5	<p>The Nature of Cancer</p> <ul style="list-style-type: none"> □ Normal cell biology □ The Immune system □ Pathological and pathophysiological changes in tissues <ul style="list-style-type: none"> • Biology of the cancer cell • Clone formation Transformation • Tumor stem lines • Structure of a solid tumor • Products produced by the tumor • Systemic effects of tumor growth
III	4	<p>Etiology of Cancer</p> <ul style="list-style-type: none"> □ Carcinogenesis, □ Theories of cancer causation □ Risk factors □ Carcinogens – genetic factors, chemical carcinogens, radiation, viruses, Immune system failure, rapid tissue proliferation □ Hormone changes, diet, emotional factors.
IV	10	<p>Diagnostic Evaluation</p> <ul style="list-style-type: none"> □ Health assessment: History taking, physical examination, □ Staging and grading of tumors, □ TNM Classification □ Common diagnostic tests <ul style="list-style-type: none"> • Blood investigation: Haemetological, Bio-chemical, Tumor markers, Hormonal assay • Cytology:Fine needle aspiration cytology(FNAC) • Histopathology: Biopsy • Radiological assessment: MRI, Ultrasound, Computed tomography, Mammography, Positron emission tomography(PET), Radio nuclide imaging, Functional metabolism imaging • Endoscopies <p>Nurses responsibilities in diagnostic measures</p>

Unit	Hours.	Content
V	10	<p>Levels of prevention and care</p> <ul style="list-style-type: none"> □ Primary prevention – Guidelines for cancer detection, general measures, Warning signs of cancer, □ Self examination-Oral, Breast, Testicular □ Secondary prevention – early diagnosis. □ Screening □ Tertiary prevention – disability limitation, □ Rehabilitation :Mobility , Speech, Bowel and bladder, Ostomies etc □ Patient and family education, □ Discharge instruction, follow-up care and use of community resources.
VI	25	<p>Cancer Treatment Modalities and Nurse’s Role</p> <ul style="list-style-type: none"> □ Surgery <ul style="list-style-type: none"> • Principles of surgical oncology • Current surgical strategy, • Determining surgical risk • Special surgical techniques • Pre-intra-postoperative nursing care • Acute and chronic surgical complications • Future directions and advances □ Chemotherapy <ul style="list-style-type: none"> • Principles and classification of chemotherapeutics • Pharmacology of antineoplastic drugs- Mechanism of action, Absorption, protein binding, Bio-transformation, excretion, common side effects, drug toxicity • Calculating drug doses, • Therapeutic response to chemotherapy-Tumor variables, drug resistance, • Safety precautions □ Radiation Therapy <ul style="list-style-type: none"> • Physics of radiotherapy • Types of ionizing rays • Radiation equipments:Linear accelerator, cobalt, Implants,Isotopes, • Types of therapies: Oral, Brachy therapy, tele therapy, selectron therapy • Effects of radiation on the body tissue, • Radiation biology – cell damage hypoxic cells, alteration of tumor kinetics. • Approaches to radiation therapy – • External radiotherapy • Internal radiotherapy – unsealed, • Sealed sources. • Effectiveness of radiotherapy-Radiosensitivity, treatment effects • Complications of radiotherapy • Radiation safety: Standards of Bhaba Atomic Research Centre(BARC)

Unit	Hours.	Content
		<ul style="list-style-type: none"> □ Bone Marrow Transplantation/Stem Cell Transplantation <ul style="list-style-type: none"> • Types, indications, transplantation procedure, complications and nursing management • Types and donor sources • Preparation and care of donor and recipient • Bone marrow bank • Legal and ethical issues □ Immunotherapy (Biotherapy) <ul style="list-style-type: none"> • Concepts and principles • Classification of agents • Treatment and applications □ Gene Therapy <ul style="list-style-type: none"> • Current Concepts and practices □ Alternative and Complementary Therapies <ul style="list-style-type: none"> • Current practices
VII	10	<ul style="list-style-type: none"> □ Pain management:- Theories, types and <ul style="list-style-type: none"> • Nature of cancer pain • Pathophysiology of pain • Pain threshold □ Assessment of pain <ul style="list-style-type: none"> • Principles of cancer pain control • Pharmacological: Opioid and non-opioid analgesic therapy • Patient controlled analgesia(PCA) • Other invasive techniques of pain control • Recent developments in Cancer pain □ Non- Pharmacological pain relief technique- <ul style="list-style-type: none"> • Complementary therapies(Music, massage, meditation, relaxation techniques, biofeed back etc) • Psychological intervention in pain control • Alternative system of medicines <p>Role of nurse</p>
VIII	5	<p>Palliative care</p> <ul style="list-style-type: none"> □ Definition and scope, philosophy □ Concept and elements of palliative care □ Global and Indian perspective of palliative care □ Quality of life issues □ Communication skill □ Nursing perspective of palliative care and its elements □ Home care □ Hospice care <p>Role of nurse in palliative care</p>

Unit	Hours.	Content
IX	2	<ul style="list-style-type: none"> □ Infection control: <ul style="list-style-type: none"> • Process of infection, risk of hospitalization, nosocomial infections- prevention and control of infection in acute, long term care facility and community based care • Standard safety measures
X	30	<p>Nursing Care of Patients With Specific Malignant Disorders</p> <ul style="list-style-type: none"> □ Malignancies of G.I. system-oral, oesophagus, stomach, rectal, liver & pancreas, care of ostomies/stoma □ Respiratory malignancies □ Genito urinary system malignancies- prostate Bladder, renal testicular malignancies, □ Gynecological malignancies-cervix, uterus, ovary □ Hematological malignancies-Lymphomas, Leukemias. □ Malignancies of musculoskeletal system □ Endocrine malignancies □ Skin □ Head and Neck -brain tumors □ Other malignancies – Breast cancer, AIDS related Malignancies (Kaposi's Sarcoma)
XI	10	<p>Paediatric malignancies</p> <ul style="list-style-type: none"> □ Leukemia, Lymphoma, Neuro- blastoma □ Wilm’s tumor, Soft tissue sarcoma, Retinoblastoma □ Nursing Management of children with Paediatric Malignancies
XII	15	<p>Nursing Management of Physiological Conditions and Symptoms Of Cancer Patient</p> <ul style="list-style-type: none"> □ <u>Nutrition</u>: - effects of cancer on nutritional Status and its consequences:-Anemia, Cachexia, Xerostomia, mucositis, Dysphagia , nausea and vomiting, constipation, diarrhoea, electrolyte imbalances, taste alterations □ Impaired mobility: Decubitus ulcer, pathologic fractures, thrombophlebitis, pulmonary embolism, contractures, footdrop <p>Other symptoms</p> <ul style="list-style-type: none"> □ Dyspepsia & hiccup, dyspnoea □ intestinal obstruction, □ Fungating wounds □ Anxiety & depression, insomnia □ Lymph edema <p>Impact of cancer on sexuality:</p> <ul style="list-style-type: none"> □ Effects of radiotherapy/ chemotherapy/ surgery on sexuality of the cancer patient □ Nursing management of cancer patients experiencing sexual dysfunction □ Sexual counseling

Unit	Hours.	Content
XIII	10	<p>Cancer Emergencies</p> <ul style="list-style-type: none"> □ Disseminated intravascular coagulation(DIC), □ Malignant pleural effusion □ Neoplastic cardiac tamponade and septic shock spinal cord compression □ Superior venacava syndrome □ Metabolic emergency: hyper and hypo calcemia □ Surgical emergency □ Urological emergency □ Hemorrhage □ Organ obstruction □ Brain metastasis □ Nurses role in managing oncologic emergencies
XIV	8	<p>Psycho-Social Aspects of Nursing Care</p> <ul style="list-style-type: none"> □ Psychological responses of patients with cancer □ Psychosocial assessment – □ Crisis intervention, coping mechanisms □ Stress management, spiritual/cultural care and needs □ Counseling: individual and family □ Maximizing quality of life of patient and family <p>Ethical, moral and legal issues-</p> <ul style="list-style-type: none"> □ End of life care □ Grief and grieving process □ Bereavement support □ Care of Nurses who care for the dying.
XV	2	<p>Layout and Design of an oncology institution/ ward, OPD, chemotherapy unit, Bone marrow transplantation unit, Pain clinic etc</p> <ul style="list-style-type: none"> □ Practice Standards of oncology nursing <ul style="list-style-type: none"> • Policies and Procedures □ Establishing Standing orders and Protocols <p>Quality Assurance Programme in oncology units</p> <ul style="list-style-type: none"> □ Nursing audit

Clinical Experience

S. No.	Deptt./ Unit	No. of Week	Total Hours
1	Medical Oncology ward	6	180 Hours
2	Surgical Oncology ward	6	180 Hours
3	Bone marrow transplantation Unit	2	60 Hours
4	Operation Theatre	2	60 Hours
5	Radiotherapy Unit	2	60 Hours
6	Chemotherapy Unit	4	120 Hours
7	Out patient department and pain clinic	2	60 Hours
8	Pediatric Oncology ward	2	60 Hours
9	Palliative Care ward	2	60 Hours
10	Community oncology	2	60 Hours
11	Hospice	1	30 Hours
12	Other field visits	1	30 Hours
	Total	32 Weeks	960 Hours

Procedures Observed

1. CT Scan
2. MRI
3. PET Scan(Positron Emission Tomography)
4. Ultra sound
5. Mammography
6. Radio Nuclide Imaging
7. Bone Scan
8. Thyroid Function Test
9. Functional and Metabolic Imaging
10. Transportation of radioactive materials
11. Others

Procedures Assisted

1. IV cannulation – Open method
2. Chemotherapy
3. Radiotherapy – Brachytherapy – Low Density Radiation, High Density Radiation.
4. Interstitial implantation
5. Bio-therapy and Gene therapy
6. Teletherapy – Treatment planning
7. Bone marrow aspiration and biopsy
8. Biopsy – tissue
9. FNAC – Fine Needle Aspiration Cytology and biopsy

10. Advance Cardiac life support
11. Endotracheal intubation
12. Defibrillation Ventilation
13. Tracheostomy
14. Thoracentesis
15. Paracentesis
16. Lumbar Puncture
17. Arterial Blood Gas
18. Nerve Block
19. Chest tube insertion
20. Intercostal drainage
21. CVP monitoring

Procedure Performed

1. Screening for cancer
2. Assessment of pain
3. Assessment of Nutritional status
4. Care of Tracheostomy
5. Endotracheal intubation
6. Gastric gavage
7. Pap smear
8. IV cannulation
9. Care of surgical flaps
10. Care of ostomies
11. Blood transfusion and component therapy
12. Counseling
13. Practice standard safety measures
14. Care of dead body and mortuary formalities

Other procedures

(As per the institutional protocol):

1. Alternative therapies

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING- NEUROSCIENCES NURSING

Placement : II Years

Hours of Instruction
Theory – 150 Hours
Practical- 950 Hours
Total : 1100 Hours

Course Description

This course is designed to assist students in developing expertise and in-depth knowledge in the field of neurology and neurosurgical Nursing. It will help students to develop advanced skills for nursing intervention in caring for patients with neurological and neurosurgical disorders. It will enable the student to function as neuroscience nurse practitioner/ specialist. It will further enable the student to function as educator, manager and researcher in the field of neurology and neurosurgical Nursing.

Objectives

At the end of the course the students will be able to

1. Appreciate trends and issues related to neurology and neurosurgical Nursing.
2. Review the anatomy and physiology of nervous system
3. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of patients with neurological and neurosurgical disorders
4. Perform neurological assessment and assist in diagnostic procedures
5. Describe the concepts and principles of neuroscience nursing
6. Describe the various drugs used in neurosciences and nurses responsibility
7. Assist in various therapeutic and surgical procedures in neuroscience nursing
8. Demonstrate advance skills/competence in managing patients with neurological and neurosurgical disorder following nursing process approach
9. Identify psychosocial problems of patients with disabilities and assist patients and their family to cope with emotional distress, spiritual, grief and anxiety
10. Participate in preventive, promotive and rehabilitative services for neurological and neurosurgical patients.
11. Explain the legal and ethical issues related to brain death, organ transplantation and practice of neuroscience nursing
12. Incorporate evidence based nursing practice and identify the areas of research in the field of neuroscience nursing

13. Organise and conduct inservice education program for nursing personnel.
14. Develop standards of care for quality assurance in neuroscience nursing practice
15. Identify the sources of stress and manage burnout syndrome among health care providers.
16. Teach and supervise nurses and allied health workers.
17. Plan and develop physical layout of neuro intensive care unit

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> □ Introduction to neuroscience(neurological and neurosurgical) nursing <ul style="list-style-type: none"> • History-Development in neurological and neurosurgical nursing, Service & education • Emerging trends and issues in neurology and neuro surgery and its implication to nursing. • neurological and neurosurgical problems – • Concepts, principles and nursing perspectives • Ethical and legal issues • Evidence based nursing and its application in neurological and neurosurgical nursing
II	5	<p>Epidemiology</p> <ul style="list-style-type: none"> □ Major health problems- □ Risk factors associated with neurological conditions- Hereditary, Psychosocial factors, smoking, alcoholism, dietary habits, cultural and ethnic considerations, occupational and infections. □ Health promotion, disease prevention, life style modification and its implications to nursing <p>Alternate system of medicine / complementary therapies</p>
III	10	<p>Review of Anatomy and physiology</p> <ul style="list-style-type: none"> □ Embryology □ Structure and functions of Nervous system- CNS, ANS, cerebral circulation , cranial and spinal nerves and reflexes, motor and sensory functions □ Sensory organs

Unit	Hours	Content
IV	15	<p>Assessment and diagnostic measures</p> <ul style="list-style-type: none"> □ Assessment <ul style="list-style-type: none"> • History taking • Physical assessment, psychosocial assessment • Neurological assessments, Glasgow coma scale interpretation & its relevance to nursing. • Common assessment abnormalities □ Diagnostic measures <ul style="list-style-type: none"> • Cerebro spinal fluid analysis • Radiological studies-Skull and spine X-ray Cerebral Angiography, CT Scan, Single Photon Emission Computer Tomography(SPECT), MRI (Magnetic Resonance Imaging), MRA, MRS, Functional MRI, Myelography, PET (Positron Emission Test), Interventional radiology. • Electorgraphic studies- Electro encephalo graphy, MEG, EMG, video EEG, • Nerve conduction studies-Evoked potentials, visual evoked potentials, brain stem auditory evoked potentials, somatosensory evoked potentials • Ultrasound studies-Carotid duplex, transcranial Doppler sonography, • Immunological studies • Biopsies – muscle, nerve and Brain. <p>Interpretation of diagnostic measures</p> <p>Nurse’s role in diagnostic tests</p>
V	5	<p>Meeting Nutritional needs of neurological patients</p> <ul style="list-style-type: none"> □ Basic nutritional requirements □ Metabolic changes following injury and starvation □ Nutritional assessment □ Common neurological problems that interfere with nutrition and strategies for meeting their nutritional needs □ Special metabolic and electrolyte imbalances □ Chronic fatigue syndrome
VI	5	<p>Drugs used in neurological and neurosurgical disorders</p> <ul style="list-style-type: none"> □ Classification □ Indications, contraindications, actions and effects, toxic effects <p>Role of nurse</p>

Unit	Hours	Content
VII	10	<p>Traumatic conditions.</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Cranio cerebral injuries. • Spinal & Spinal cord injuries. • Peripheral nerve injuries. • Unconsciousness
VIII	10	<p>Cerebro vascular disorders.</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Stroke & arterio venous thrombosis. • Haemorrhagic embolus. • Cerebro vascular accidents. • Intracranial aneurysm. • Subarchnoid Haemorrhage. • Arterio venous fistula. • Brain tumours □ Diseases of cranial nerves;Trigiminal neuralgia, Facial palsy, Bulbar palsy.
IX	10	<p>Degenerating and demyelinating disorders</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Motor neuron diseases. • Movement disorders- Tics, dystonia, chorea, wilson’s disease, essential tremors • Dementia. • Parkinson’s disease. • Multiple sclerosis. • Alzemier’s
X	10	<p>Neuro infections</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of Neuro infections <ul style="list-style-type: none"> • Meningitis-types • Encephalitis. • Poliomyelitis. • Parasitic infections. • Bacterial infections • Neurosyphilis. • HIV & AIDS. • Brain abscess.

Unit	Hours	Content
XI	10	<p>Paroxysmal disorders.</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Epilepsy and seizures. • Status epilepticus. • Syncope. • Menier’s syndrome. • Cephalgia.
XII	10	<p>Developmental disorders.</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Hydrocephalus. • Craniosynostosis. • spina bifida- Meningocele, Meningomyelocele encephalocele • syringomyelia. • Cerebro vascular system anomalies. • Cerebral palsies. • Down’s syndrome
XIII	10	<p>Neuro muscular disorders.</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Polyneuritis – G B Syndrome. • Muscular dystrophy. • Myasthenia gravis. • Trigeminal neuralgia. • Bell’s palsy. • Menier’s disease • Carpal tunnel syndrome • Peripheral neuropathies
XIV	5	<p>Neoplasms – surgical conditions.</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Space occupying lesions -types • Common tumors of CNS,
XV	5	<p>Other disorders</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of □ Metabolic disorders- diabetes, insipidus, metabolic encephalopathy □ Sleep disorders □ Auto immune disorders- multiple sclerosis, inflammatory myopathies

Unit	Hours	Content
XVI	10	<p>Neuro emergencies</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Increased intracranial pressure • Unconscious • Herniation syndrome • Seizures • Severe head injuries • Spinal injuries • Cerebro vascular accidents
XVII	5	<p>Rehabilitation.</p> <ul style="list-style-type: none"> □ Concept and Principles of Rehabilitation. □ Factors affecting quality of life and coping □ Rehabilitation in acute care setting, and following stroke, head injury and degenerative disorders of brain □ Physiotherapy. □ Counselling □ Care giver's role <p>Speech & Language.-Neurogenic communication disorders, Speech therapy</p>
XVIII	5	<p>Ethical and legal issues in neuroscience nursing</p> <ul style="list-style-type: none"> □ Brain death and organ transplantation □ Euthanasia □ Negligence and malpractice □ Nosocomial infections
XIX	5	<ul style="list-style-type: none"> □ Quality assurance in neurological nursing practice □ Role of advance practitioner in neurological nursing □ Professional practice standards □ Quality control in neurologic nursing □ Nursing audit □ Neuro ICU <ul style="list-style-type: none"> • Philosophy, aims and objectives • Policies, staffing pattern, design and physical plan of neuroICU • Team approach, functions • Psychosocial aspects in relation to staff and clients of neuro ICU, • In-service education

Practical

Total = 960 Hours

1 Week = 30 Hours

S.No.	AREA OF POSTING	No. of Week	Total Hours
1	O.P.D.	2	60
2	Casualty	2	60
3	Diagnostics	2	60
4	Neuro psychiatry	1	30
5	Neuro Medical wards	4	120
6	Paediatric Neuro ward	2	60
7	Neuro surgical wards	4	120
8	Head Injury ward	3	90
9	ICU- neuro medicine	4	120
10	I.C.U.- neuro surgical	4	120
11	Rehabilitation	2	60
12	Operation Theatre	2	60
	Total	32 Weeks	960 Hours

ESSENTIAL NEURO NURSING SKILLS

I. Procedures Observed

1. CT scan
2. MRI
3. PET
4. EEG
5. EMG
6. Sleep pattern studies/Therapy
7. Radiographical studies
8. Neuro surgeries
9. Nerve conduction studies
10. Ultrasound studies
11. Any other

II. Procedures Assisted

1. Advanced Cardiac life support
2. Lumbar Puncture
3. Biopsies – muscle, nerve and Brain
4. Arterial Blood Gas
5. ECG Recording
6. Blood transfusion
7. IV cannulation – open method

8. Endotracheal intubation
9. Ventilation
10. Tracheostomy
11. ICP monitoring
12. Gama Knife
13. Cereberal angiography
14. Myelography
15. Neuro surgeries

III. Procedures Performed:

1. Airway management
 - a. Application of Oro Pharyngeal Airway
 - b. Care of Tracheostomy
 - c. Conduct Endotracheal Intubation
 - d. use of AMBU bag, artificial respirators
 - e. Setting of Ventilators and Care of patients on ventilators
2. Cardio Pulmonary Resuscitation -Defibrillation
3. Neurological assessment -Glasgow coma scale
4. Gastric Lavage
5. IV Cannulation
6. Administration of emergency IV Drugs, fluid
7. Care of patients with incontinence, bladder training
Catheterization
8. Care of patients on traction related to the neurological conditions
9. Blood Administration.
10. Muscle strengthening exercises
11. Guidance and counseling
12. Monitoring – management and care of monitors.

IV. Other Procedures:

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING- NEPHRO-UROLOGY NURSING

Placement : II Year

Hour of Instruction
Theory : 150 Hours
Practical : 950 Hours
Total : 1100 Hours

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of Nephro and urological Nursing. It will help students to develop advanced skills for nursing intervention in various nephro and urological conditions. It will enable the student to function as nephro and urology nurse practitioner/specialist and provide quality care. It will further enable the student to function as educator, manager, and researcher in the field of nephro and urology nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate trends and issues related to **nephro and urological** nursing
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of **nephro and urological** conditions
3. Perform physical, psychosocial & spiritual assessment
4. Assist in various diagnostic, therapeutic and surgical interventions
5. Provide comprehensive nursing care to patients with **nephro and urological conditions**
6. Describe the various drugs used in **nephro and urological** conditions and nurses responsibility
7. Demonstrate skill in handling various equipments/gadgets used for patients with **nephro and urological** conditions
8. Appreciate team work & coordinate activities related to patient care.
9. Practice infection control measures.
10. Identify emergencies and complications & take appropriate measures
11. Assist patients and their family to cope with emotional distress, grief, anxiety and spiritual needs
12. Discuss the legal and ethical issues in **nephro and urological** nursing
13. Identify the sources of stress and manage burnout syndrome among health care providers

14. Appreciate the role of alternative system of medicine in the care of patient
15. Incorporate evidence based nursing practice and identify the areas of research in the field of **nephro and urological** nursing
16. Teach and supervise nurses and allied health workers.
17. Design a layout of kidney transplant unit and dialysis unit
18. Develop standards of nephro urological nursing practice

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> □ Historical development: trends and issues in the field of nephro and urological nursing. □ nephro and urological problems □ Concepts, principles and nursing perspectives □ Ethical and legal issues □ Evidence based nursing and its application in nephro and urological nursing(to be incorporated in all the units)
II	5	<p>Epidemiology</p> <ul style="list-style-type: none"> □ Major health problems- urinary dysfunction, urinary tract infections, Glomerular disorders, obstructive disorders and other urinary disorders □ Risk factors associated with nephro and urological conditions conditions- Hereditary, Psychosocial factors, smoking, alcoholism, dietary habits, cultural and ethnic considerations □ Health promotion, disease prevention, life style modification and its implications to nursing <p>Alternate system of medicine / complementary therapies</p>
III	5	<p>Review of anatomy and physiology of urinary system</p> <ul style="list-style-type: none"> □ Embryology □ Structure and functions □ Renal circulation □ Physiology of urine formation □ Fluid and electrolyte balance □ Acid base balance □ Immunology specific to kidney
IV	20	<p>Assessment and diagnostic measures</p> <ul style="list-style-type: none"> □ History taking □ Physical assessment, psychosocial assessment □ Common assessment abnormalities-dysurea, frequency, enuresis, urgency, hesitancy, hematuria, pain, retention, burning on urination, pneumaturia, incontinence, nocturia, polyurea, anuria, oliguria, □ Diagnostic tests-urine studies, blood chemistry, radiological procedures-KUB, IVP, nephrotomogram, retrograde pyelogram, renal arteriogram, renal ultrasound, CT scan, MRI, cystogram, renal

Unit	Hours	Content
		<p>scan, biopsy, endoscopy-cystoscopy, urodynamics studies-cystometrogram, urinary flow study, sphincter electromyography, voiding pressure flow study, videourodynamics, Whitaker study</p> <p>Interpretation of diagnostic measures</p> <p>Nurse's role in diagnostic tests</p>
V	5	<p>Renal immunopathy/Immunopathology</p> <ul style="list-style-type: none"> □ General Concept of immunopathology □ Immune mechanism of glomerular vascular disease □ Role of mediator systems in glomerular vascular disease
VI	15	<p>Urological Disorders and Nursing Management</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical, surgical and nursing management of □ Urinary tract infections- pyelonephritis, lower urinary tract infections, □ Disorders for ureters, bladder and urethra □ Urinary tract infections- □ Urinary dysfunctions- urinary retention, urinary incontinence, urinary reflux, □ Bladder disorders- neoplasms, calculi, neurogenic bladder, trauma, congenital abnormalities □ Benign prostatic hypertrophy(BPH) □ Ureteral disorders: ureteritis, ureteral trauma, congenital anomalies of ureters □ Urethral disorders- tumours, trauma, congenital anomalies of ureters,
VII	25	<p>Glomerular disorders and nursing management</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical, surgical and nursing management of □ Glomerular nephritis- chronic, acute, nephritic syndrome □ Acute Renal failure and chronic renal failure. □ Renal calculi □ Renal tumours-benign and malignant □ Renal trauma □ Renal abscess □ Diabetic nephropathy □ Vascular disorders □ Renal tuberculosis □ Polycystic □ Congenital disorders □ Hereditary renal disorders
VIII	10	<ul style="list-style-type: none"> □ Management of Renal emergencies □ Anuria □ Acute Renal failure □ Poisoning □ Trauma □ Urine retention

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Acute graft rejection □ Hematuria □ Nurse's role
IX	10	Drugs used in urinary disorders <ul style="list-style-type: none"> □ Classification □ Indications, contraindications, actions and effects, toxic effects □ Role of nurse
X	10	Dialysis <ul style="list-style-type: none"> □ Dialysis- Historical, types, Principles, goals <ul style="list-style-type: none"> • Hemodialysis- vascular access sites- temporary and permanent • Peritoneal dialysis □ Dialysis Procedures- steps, equipments, maintenance, □ Role of nurse- pre dialysis, intra and post dialysis □ Complications- □ Counseling □ patient education □ Records and reports
XI	10	<ul style="list-style-type: none"> □ Kidney transplantation □ Nursing management of a patient with Kidney transplantation □ Kidney transplantations- a historical review □ Immunology of graft rejections □ The recipient of a renal transplant □ Renal preservations □ Human Leucocytic Antigen(HLA) typing matching and cross matching in renal transplantation □ Surgical techniques of renal transplantations □ Chronic renal transplant rejection □ Complication after KTP: Vascular and lymphatic, Urological, cardiovascular, liver and neurological, infectious complication □ KTP in children and management of pediatric patient with KTP □ KTP in developing countries □ Results of KTP □ Work up of donor and recipient for renal transplant □ Psychological aspect of KTP and organ donations □ Ethics in transplants □ Cadaveric transplantation
XII	5	<ul style="list-style-type: none"> □ Rehabilitation of patient with nephrological problems □ Risk factors and prevention □ Rehabilitation of patients on dialysis and after kidney transplant □ Rehabilitation of patients after urinary diversions □ Family and patient teaching
XIII	10	Pediatric urinary disorders <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical and nursing management of children with Renal Diseases -UTI, ureteral reflux, glomerulo nephritis, nephrotic syndrome infantile nephrosis, cystic kidneys, familial factors in renal diseases in childhood, Haemolytic uraemic

Unit	Hours	Content
		syndrome. Benign recurrent haematuria, nephropathy, wilms' tumour
XIV	5	Critical care units- dialysis , KTP unit <ul style="list-style-type: none"> □ Philosophy, aims and objectives □ Policies, staffing pattern, design and physical plan of Dialysis and KTP units □ Team approach, functions □ Psychosocial aspects in relation to staff and clients of ICU, dialysis unit □ In-service education □ Ethical and legal issues
XV	5	<ul style="list-style-type: none"> □ Quality assurance in nephrological nursing practice □ Role of advance practioner in nephrological nursing □ Professional practice standards □ Quality control in nephrological nursing □ Nursing audit

Practicals

Total = 960 Hours
1 Week = 30 Hours

S. No.	Deptt./ Unit	No. of Week	Total Hours
1	Nephrology Ward	6	180 Hours
2	Pediatrics	2	60 Hours
3	Critical Care Unit	2	60 Hours
4	Urology Ward	6	180 Hours
5	Dialysis Unit	4	120 Hours
6	Kidney Transplantation Unit	2	60 Hours
7	URO OT	2	60 Hours
8	Emergency Wards	2	60 Hours
9	Uro Nephro OPDs	4	120 Hours
10	Diagnostic Labs	2	60 Hours
	Total	32 Weeks	960 Hours

Procedures observed

I. Procedures Observed

1. CT Scan
2. MRI
3. Radiographic studies
4. Urodynamics
5. Hemodialysis
6. Renal Surgeries

II. Procedures Assisted

1. Blood transfusion
2. I V cannulation therapy
3. Arterial Catheterization
4. Insertion of central line/cvp line
5. Connecting lines for dialysis
6. Peritoneal dialysis
7. Renal biopsy
8. Endoscopies- Bladder, urethra

III. Procedure Performed

1. Health assessment
2. Insertion of urethral and suprapubic catheters
3. Urine analysis

4. Catheterisation
5. Peritoneal dialysis
6. Bladder irrigation
7. Care of ostomies
8. Care of urinary drainage
9. Bladder training
10. Care of vascular access
11. Setting up dialysis machine and starting, monitoring and closing dialysis
12. Procedures for prevention of infections:
13. Hand washing, disinfection & sterilization surveillance, and fumigation universal precautions.
14. Collection of specimen.
15. Administration of drugs: IM, IV injection, IV cannulation & fixation of infusion pump, calculation of dosages, blood administration. monitoring -fluid therapy, electrolyte imbalance,
16. Nutritional needs , diet therapy & patient education.
17. Counselling

IV. OTHER PROCEDURES:

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING - ORTHOPEDIC NURSING

Placement : II Year

Hours of Instruction
Theory : 150 Hours
Practical : 950 Hours
Total : 1100 Hours

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of orthopedic nursing. It will help students to develop advanced skills for nursing intervention in various orthopedic conditions. It will enable the student to function as orthopedic nurse practitioner/specialist providing quality care. It will further enable the student to function as educator, manager, and researcher in the field of orthopedic nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate the history and developments in the field of orthopedic nursing
2. Identify the psycho-social needs of the patient while providing holistic care.
3. Perform physical and psychological assessment of patients with orthopedic conditions and disabilities.
4. Describe various disease conditions and their management
5. Discuss various diagnostic tests required in orthopedic conditions
6. Apply nursing process in providing care to patients with orthopedic conditions and those requiring rehabilitation.
7. Recognize and manage orthopedic emergencies.
8. Describe recent technologies and treatment modalities in the management of patients with orthopedic conditions and those requiring rehabilitation.
9. Integrate the concept of family centered, long term care and community based rehabilitation to patients with orthopedic conditions.
10. Counsel the patients and their families with orthopedic conditions
11. Describe various orthotic and prosthetic appliances
12. Appreciate the legal and ethical issues pertaining to patients with orthopedic conditions and those requiring rehabilitation.
13. Appreciate the role of alternative system of medicine in care of patients with orthopedic conditions

14. Incorporate evidence based nursing practice and identify the areas of research in the field of orthopedic nursing.
15. Recognize the role of orthopedic nurse practitioner and as a member of the orthopedic and rehabilitation team.
16. Teach orthopedic nursing to undergraduate students and in-service nurses.
17. Prepare a design and layout of orthopedic and rehabilitative units.

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> □ Historical perspectives – History and trends in orthopedic nursing □ Definition and scope of orthopedic nursing □ Anatomy and physiology of Musculo-skeletal system □ Posture, Body landmarks Skeletal system Muscular system. Nervous system - Main nerves □ Healing of - Injury, bone injury, □ Repair of ligaments □ Systemic response to injury □ Ergonomics, Body mechanics, biomechanical measures □ Orthopedic team
II	8	<p>Assessment of Orthopedic Patient</p> <ul style="list-style-type: none"> □ Health Assessment: History, physical examination- Inspection, palpation, movement, Measurement, muscle strength Testing. □ Diagnostic studies – Radiological studies, Muscle enzymes, serologic studies
III	10	<p>Care of patients with devices</p> <ul style="list-style-type: none"> □ Splints, braces, various types of plaster cast □ Various types of tractions, □ Various types of orthopedic beds and mattresses □ Comfort devices □ Implants in orthopedic □ Prosthetics and Orthotics
IV	15	<p>Injuries</p> <p>Trauma & Injuries</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, management, medical surgical and nursing management of : <ul style="list-style-type: none"> • Early management of Trauma • Fractures • Injuries of the □ Shoulder and arm □ Elbow, fore arm, wrist, hand □ Hip, thigh, knee, leg, ankle, foot □ Spine

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Head injury □ Chest injury <ul style="list-style-type: none"> • Polytrauma • Nerve injuries • Vascular injuries • Soft tissue injuries • Sports injuries • Amputation
V	8	<p>Infections of Bones and Joints</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, management, medical surgical and nursing management of : <ul style="list-style-type: none"> • Tuberculosis • Osteomyelitis • Arthritis • Leprosy
VI	5	<p>Bone Tumours</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, management, medical surgical and nursing management of: <ul style="list-style-type: none"> • Bone tumors – Benign, Malignant and metastatic • Different types of therapies for tumors
VII	10	<p>Deformities</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis – medical surgical and nursing management of: Scoliosis, Kyphosis, Lordosis □ Congenital disorders: Congenital dislocation of hip(CDH), Dislocation of patella, knee, □ Varus and valgus deformities, □ Deformities of digits, □ Congenital torticollis. □ Meningocele, meningomyelocele, spina bifida, □ Chromosomal disorders. □ Computer related deformities
VIII	5	<p>Disorders of the spine</p> <ul style="list-style-type: none"> □ Intervertebral disc prolapse, Fracture of the spine □ Low back disorder – Low back pain, PND, spinal stenosis, spondylosis
IX	5	<p>Nutritional/Metabolic and Endocrine Disorders</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, medical surgical and nursing management of: <ul style="list-style-type: none"> • Rickets, • Scurvy, • Hyper vitaminosis A and D, • Osteomalacia,

Unit	Hours	Content
		<ul style="list-style-type: none"> • Osteoporosis • Paget's disease, • gout, • Gigantism, • Dwarfism, • Acromegaly. • Therapeutic diets for various orthopedic disorders
X	8	<p>Neuro-Muscular Disorders:</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, medical surgical and nursing management of: <ul style="list-style-type: none"> • Poliomyelitis, Cerebral Palsy • Myasthenia gravis • Spina bifida. • Peripheral nerve lesion, • Paraplegia, Hemiplegia, Quadriplegia. • Muscular dystrophy
XI	8	<p>Chronic/Degenerative Diseases of Joints and Autoimmune Disorders:</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis – medical surgical and nursing management of: <ul style="list-style-type: none"> • Osteo Arthritis • Rheumatoid Arthritis • Ankylosing spondylitis. • Spinal disorders. • Systemic Lupus Erythematosus
XII	5	<p>Orthopedic Disorders in Children:</p> <ul style="list-style-type: none"> □ General and special consideration on pediatric orthopedics □ Genetic disorders □ Congenital anomalies □ Growth disorders □ Genetic counseling □ Nurses role in genetic counseling
XIII	5	<p>Geriatric Problems</p> <ul style="list-style-type: none"> □ Geriatric population, types of disabilities, causes, treatment and Management – Hospitalization, rest, physiotherapy, involvement of family members, social opportunities. □ Care at home – involvement of family and community, follow up care and rehabilitation
XIV	6	<p>Pharmacokinetics</p> <ul style="list-style-type: none"> □ Principles of drug administration □ Analgesics and anti inflammatory agents □ Antibiotics, Antiseptics, □ Drugs used in orthopedics and neuromuscular disorders □ Blood and blood components □ Care of drugs and nurses role

Unit	Hours	Content
XV	30	<p>Nurses Role in Orthopedic Conditions</p> <ul style="list-style-type: none"> □ Gait analysis □ Urodynamic studies □ Prevention of physical deformities □ Alteration of body temperature regulatory system and immune systems □ Immobilization – cast, splints, braces and tractions □ Prevention and care of problems related to immobility □ Altered sleep patterns □ Impaired communication □ Self care and activities of daily living □ Bladder and bowel rehabilitation □ Sensory function rehabilitation □ Psychological reaction related to disabilities and disorders. □ Coping of individual and family with disabilities and disorders □ Maintaining sexuality □ Spirituality – A rehabilitative prospective <p>Orthopedic Reconstructive Surgeries</p> <ul style="list-style-type: none"> □ Replacement surgeries – Hip, Knee, Shoulder □ Spine surgeries □ Grafts and flaps surgery □ Deformity correction. <p>Physiotherapy</p> <ul style="list-style-type: none"> □ Concepts, Principles, purpose, <ul style="list-style-type: none"> • Mobilization – Exercises: types, re-education in walking: Crutch walking, wheel chair, Transfer techniques, • Types of gaits: Non-weight bearing, partial weight bearing, four point crutch, tripod, walking with sticks, calipers • Forms of therapies: Hydrotherapy, electrotherapy, wax bath, heat therapy, ice, helio therapy, radiant heat, • Chest physiotherapy
XVI	8	<p>Rehabilitation</p> <ul style="list-style-type: none"> □ Principles of rehabilitation, definition, philosophy, process, □ Various types of therapies □ Special therapies and alternative therapies □ Rehabilitation counseling □ Preventive and restorative measures. □ Community based rehabilitation (CBR) □ Challenges in rehabilitation. □ Role of the nurse in rehabilitation, □ Legal and ethical issues in rehabilitation nursing □ Occupational therapy
XVII	5	<p>National Policies and Programmes</p> <ul style="list-style-type: none"> □ National programmes for rehabilitation of persons with disability - National Institutes, artificial limbs manufacturing Corporation, District Rehabilitation Centers and their schemes □ Regional rehabilitation centers etc.

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Public policy in rehabilitation nursing □ The persons with disabilities act 1995, □ Mental rehabilitation and Multiple disabilities act 1992, □ The National Trust Rules 1999 and 2000 □ Rehabilitation Council of India □ Legal and ethical aspects in orthopedic nursing □ Rehabilitation health team and different categories of team members.
XVIII	4	<p>Quality assurance</p> <ul style="list-style-type: none"> □ Standards, Protocols, Policies, Procedures □ Nursing audit □ Staffing □ Design of orthopedic, physiotherapy and rehabilitation unit

Practicals

1. Clinical practice in Orthopedic, physiotherapy and Rehabilitation Units.
2. Application of tractions and plaster casts and removal of tractions and plaster casts and other appliances.
3. Apply Theories and Nursing Process in the management of patients with orthopedic conditions.
4. Provide various types of physical and rehabilitative therapies
5. Provide health education on related disease conditions.
6. Unit management and plan - designing

Clinical Experience

Total = 960 Hours
1 Week = 30 Hours

S. No.	Deptt./Unit	No. of Week	Total Hours
1	Orthopedic Ward	8	240 Hours
2	Orthopedic Operation theatre	4	120 Hours
3	Neurosurgical Ward	2	60 Hours
4	Orthopedic O.P.D.	4	120 Hours
5	Casualty/Emergency and Trauma	4	120 Hours
6	Rehabilitation Units	2	60 Hours
7	Physiotherapy Unit	4	120 Hours
8	Paediatric /paediatric surgery unit	2	60 Hours
9	Field Visit	2	60 Hours
	Total	32 Weeks	960 Hours

Procedures Observed

1. X Ray
2. Ultrasound
3. MRI
4. C T Scan/bone scan
5. Arthroscopy
6. Electrothermally – assisted capsule shift or ETAC (Thermal capsulorrhaphy)
7. Fluoroscopy
8. Electromyography
9. Myelography
10. Discography
11. Others

Procedures Assisted

1. Blood Transfusion
2. IV cannulation and therapy
3. Ventilation
4. Various types of tractions
5. Orthopedic surgeries – Arthrocentesis, Arthroscopy, Bone lengthening, Arthrodesis, grafting, Fractures fixation, reconstructive, reimplantation, replantation, spinal decompression, transplantation of bone, muscle or articular cartilage, autografting, allografting.
6. Injection – Intra articular, intra osseous.
7. Advance Life Support

Peocedures Performed

1. Interpretation of X ray films.
2. Application and removal of splints, casts, and braces.
3. Care of tractions – skin and skeletal traction, pin site care.
4. Cold therapy.
5. Heat therapy
6. Hydrotherapy
7. Therapeutic exercises
8. Use of TENS (Transcutaneous electrical nerve stimulation)
9. Techniques of transportation
10. Crutch walking, walkers, wheel chair.
11. Use of devices for activities of daily living and prevention of deformities.
12. Administration of drugs: IV injection, IV cannulation, and Blood transfusion.
13. Procedures for prevention of infections: disinfection and sterilization, surveillence, fumigation.
14. Special skin/ part preparations for orthopedic surgeries.
15. Surgical dressings – Debridement.
16. Bladder and bowel training

Other Procedures

CLINICAL SPECIALITY - II

MEDICAL SURGICAL NURSING - GASTRO ENTEROLOGY NURSING

Placement : II Year

Hours of Instruction

Theory : 150 hrs.
Practical : 950 hrs.
Total : 1100 hrs.

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of gastro enterology Nursing. It will help students to develop advanced skills for nursing intervention in various gastro enterology conditions. It will enable the student to function as gastro enterology nurse practitioner/specialist and provide quality care. It will further enable the student to function as educator, manager, and researcher in the field of gastro enterology nursing

Objectives

At the end of the course the students will be able to

1. Appreciate trends and issues related to gastro enterology nursing
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of gastrointestinal conditions
3. Participate in national health programs for health promotion, prevention and rehabilitation of patients with gastrointestinal conditions
4. Perform physical, psychosocial & spiritual assessment
5. Assist in various diagnostic, therapeutic and surgical procedures
6. Provide comprehensive care to patients with gastrointestinal conditions
7. Describe the various drugs used in gastrointestinal conditions and nurses responsibility
8. Demonstrate skill in handling various equipments/gadgets used for patients with gastrointestinal conditions
9. Appreciate team work & coordinate activities related to patient care.
10. Practice infection control measures.
11. Identify emergencies and complications & take appropriate measures
12. Assist patients and their family to cope with emotional distress, grief, anxiety and spiritual needs
13. Discuss the legal and ethical issues in GE nursing

14. Identify the sources of stress and manage burnout syndrome among health care providers
15. Appreciate the role of alternative system of medicine in care of patient
16. Incorporate evidence based nursing practice and identify the areas of research in the field of gastrointestinal nursing
17. Teach and supervise nurses and allied health workers.
18. Design a layout of Gastro enterology intensive care unit (GEICU) , liver care/transplant unit

Course Content

Unit	Hours	Content
I	5	Introduction <ul style="list-style-type: none"> □ Historical development: trends and issues in the field of gastro enterology. □ Gastro enterological problems □ Concepts, principles and nursing perspectives □ Ethical and legal issues □ Evidence based nursing and its application in gastrointestinal nursing(to be incorporated in all the units)
II	5	Epidemiology <ul style="list-style-type: none"> □ Risk factors associated with GE conditions- Hereditary, Psychosocial factors, smoking, alcoholism, dietary habits, cultural and ethnic considerations □ Health promotion, disease prevention, life style modification and its implications to nursing □ National health programmes related to gastro enterology □ Alternate system of medicine / complementary therapies
III	5	Review of anatomy and physiology of gastrointestinal system <ul style="list-style-type: none"> □ Gastrointestinal system □ Liver, biliary and pancreas □ Gerontologic considerations □ Embryology of GI system □ Immunology specific to GI system
IV	15	Assessment and diagnostic measures <ul style="list-style-type: none"> □ History taking □ Physical assessment, psychosocial assessment □ Diagnostic tests <ul style="list-style-type: none"> • Radiological studies:Upper GIT- barium swallow, lower GIT- Barrium enema, • Ultra sound: • Computed tomography • MRI • Cholangiography: Percutaneous transheptic Cholangiogram(PTC) • Magnetic Resonance Cholangio pancreatography (MRCP) • Nuclear imaging scans(scintigraphy) • Endoscopy

Unit	Hours	Content
		<ul style="list-style-type: none"> • Colonoscopy • Proctosigmoidoscopy • Endoscopic Retrograde Cholangio pancreatography (ERCP) • Endoscopic ultrasound • Peritonoscopy(Laproscopy) • Gastric emptying studies • Blood chemistries: Serum amylase, serum lipase • Liver biopsy • Miscellaneous tests:Gastric analysis, fecal analysis • Liver function tests: Bile formation and excretion, dye excretion test, Protein metabolism, haemostatic functions- prothrombin vitamin K production, serum enzyme tests,Lipid metabolism- serum cholesterol <p>Interpretation of diagnostic measures</p> <p>Nurse's role in diagnostic tests</p>
V	25	<p>Gastro intestinal disorders and nursing management</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical and nursing management of <ul style="list-style-type: none"> • Disorders of the mouth:Dental caries,Peridontal disease,Acute tooth infection, Stomatitis, Thrush (moniliasis),Gingivitis, Leukoplakia, Inflammation of the parotid gland, Obstruction to the flow of saliva,Fracture of the jaw • Disorders of the oesophagus: Reflux oesophagitis, Oesophageal achalasia, Oesoophageal varices, Hiatus hernia, Diverticulum • Disorders of the stomach and duodenum: Gastritis, Peptic ulcer, Dumping of the stomach, Food poisoning, idiopathic gastroparesis, Aerophagia and belching syndrome, Ideopathic cyclic nausea and vomiting, Rumination syndrome, Functional dyspepsia, Chronic Non specific (functional) abdominal pain • Disorders of the small intestine <ul style="list-style-type: none"> – Malabsorption syndrome – tropical sprue – Gluten – sensitive enteropathy (Coeliac disease) – Inflammatory diseases of intestines and abdomen,,: appendicitis, Peritonities, Intestinal obstruction, Abdominal TB, Gastrointestinal polyposis syndrome – Chronic inflammatory bowel disease, Ulcerative colites, crohn's disease – Infestations and infections – Worm infestations, Typhoid, Leptospirosis – Solitary rectal ulcer syndrome – Alteration in bowel elimination (diarrhoea, constipation, fecal impaction, fecal incontinence, Irritable bowel syndrome, Chronic idiopathic constipation, Functional diarrhoea <p>Anorectal Conditions: Hemorrhoids, Anal fissure, Anal fistula, Abscess, Strictures, Rectal prolapse, Pruritis ani, Perianal disease, Anal condylomas, Warts</p>

Unit	Hours	Content
VI	15	<p>Disorder of liver, pancreas gall bladder and nursing management</p> <ul style="list-style-type: none"> □ Disorders of liver biliary tract : □ Viral Hepatitis – A, B, C, D & E □ Toxic hepatitis <ul style="list-style-type: none"> • Cirrhosis of liver, liver failure, Liver transplantation • Non cirrhotic portal fibrosis • Liver abscess,; • Parasitic and other cysts of the liver • Disorders of the Gall Bladder and Bile Duct: □ Cholecystitis □ Cholelithiasis □ Choledocholithiasis □ Disorders of the pancreas: Pancreatitis, □ Benign tumors of islet cells □ Disorders of the Peritoneum <ul style="list-style-type: none"> • Infections of the peritoneum □ Surgical peritonitis □ Spontaneous bacterial peritonitis □ Tuberculosis peritonitis □ Disorders of the Diaphragm <ul style="list-style-type: none"> • Diaphragmatic hernia • Congenital hernias • Paralysis of diaphragm • Tumors of the diaphragm □ Hiccups
VII	15	<p>Gastro intestinal emergencies and nursing interventions</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical and nursing management of: <ul style="list-style-type: none"> • Esophageal varices, • Ulcer perforation, • Acute cholecystitis • Diverticulitis • Fulminant hepatic failure • Biliary obstruction • Bowel obstruction • Gastroenteritis • Intussusception • Acute intestinal obstruction, perforation • Acute pancreatitis • Cirrhosis of liver complications • Liver , spleen, stomach pancreatic, mesenteric, bowel and greater vessel injuries • Acute appendicitis /peritonitis • Acute abdomen • Food poisoning
VIII	15	<ul style="list-style-type: none"> □ Congenital Anomalies of Esophagus <ul style="list-style-type: none"> • Esophageal atresia • Tracheo esophageal fistula

Unit	Hours	Content
		<ul style="list-style-type: none"> • Esophageal stenosis • Esophageal duplications • Dysphagia – Lusoria – aberrant right subclavian artery compressing esophagus • Esophageal rings – schalzkiring • Esophageal webs <p>□ Congenital Anomalies of Stomach</p> <ul style="list-style-type: none"> • Gastric atresia • Micro gastia • Gastric diverticulum • Gastric duplication • Gastric teratoma • Gastric volvulus • Infantile hypertrophic pyloric stenosis • Adult hypertrophic pyloric stenosis <p>□ Congenital Anomalies of Duodenal</p> <ul style="list-style-type: none"> • Duodenal Atresia or stenosis • Annular pancreas • Duodenal duplication cysts • Malrotation and mid gut volvulus <p>□ Developmental anomalies of the intestine:</p> <ul style="list-style-type: none"> • Abdominal wall defects (omphalocele and Gastroschisis) • Meckel’s diverticulum • Intestinal atresia <p>□ Hirschsprung’s disease</p>
IX	15	<p>Pharmo Kinetics</p> <ul style="list-style-type: none"> □ Drugs used in GIT □ Principles of administration □ Roles responsibilities of nurses □ Drugs in Peptic ulcer disease □ Proton Pump inhibitors □ H₂ Receptor Antagonists □ Cytoprotective Agents: □ Drugs used in Diarrhea □ Drugs used in constipation □ Drugs used in Inflammatory Bowel Disease □ Aminosalicylates □ Corticosteroids □ Immunomodulators □ chemotherapy □ Antibiotics □ Antiemetics: □ Anticholinergics □ Antihistaminics □ Antihelminthics □ Vitamin Supplements

Unit	Hours	Content
X	10	Nutrition and nutritional problems related to GI system <ul style="list-style-type: none"> □ Nutritional assessment and nursing interventions □ Therapeutic diets □ Adverse reactions between drugs and various foods □ Malnutrition- etiology , clinical manifestations and management □ Tube feeding, parenteral nutrition, total parenteral nutrition □ Obesity- etiology, clinical manifestations and management □ Eating disorders- anorexia nervosa, bulimia nervosa □ Recent advances in nutrition
XI	15	Malignant disorders of gastro intestinal system <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical, other modalities and nursing management of: <ul style="list-style-type: none"> • Malignancy of oral cavity ,Lip,Tongue,buccal mucosa, oropharynx, Salivary gland • Esophageal , Gastric , Carcinoma of bowel - Small bowel, Colorectal and Anal carcinoma, • Liver, biliary tract and Pancreatic carcinoma
XII	5	Administration and management of GE unit <ul style="list-style-type: none"> □ Design & layout □ Staffing, □ Equipment, supplies, □ Infection control; Standard safety measures □ Quality Assurance:-Nursing audit –records /reports, Norms, policies and protocols □ Practice standards
XIII	5	Education and training in GE care <ul style="list-style-type: none"> □ Staff orientation, training and development, □ In-service education program, <ul style="list-style-type: none"> • Clinical teaching programs

Practicals

Total = 960 Hours
1 Week = 30 Hours

S.No.	Deptt./Unit	No. of Week	Total Hours
1	Diagnostic labs	2	60 Hours
2	Emergency and casualty	3	90 Hours
3	Liver transplant unit	1	30 Hours
4	GE Medical Ward	6	180 Hours
5	GE Surgical Ward	8	240 Hours
6	OT	2	60 Hours
7	ICU	4	120 Hours
8	Pediatric gastroenterology	2	60 Hours
9	Oncology	2	60 Hours
10	GE OPD	2	60 Hours
	Total	32 Weeks	960 Hours

Procedures Assisted

1. Endoscopy room – Upper G.I. Endoscopy (Diagnostic and therapeutic).
2. Sigmoidoscopy
3. Colonoscopy
4. Polypectomy
5. Endoscopic retrograde cholangio pancreatography (ERCP)
6. Liver biopsy
7. Percutaneous catheter drainage (PCD) of Pseudocyst pancreas
8. Abdominal paracentesis
9. Percutaneous aspiration of liver abscess
10. GE Lab : PT, HbsAg, Markers – A, B, C virus, CBP, ESR, Stool Test

Procedures Performed

1. History and Physical assessment
2. RT intubation / extubation / aspiration/suction
3. Gastric lavage and gavage
4. Bowel wash
5. Therapeutic Diets
6. Ostomy feeding
7. Stoma care
8. Monitoring vital parameters
9. Plan of inservice education programme for nursing staff and Class-IV employees
10. Counseling

CLINICAL SPECIALITY – II

OBSTETRIC AND GYNAECOLOGICAL NURSING

Placement - II Year

Hours of Instruction	
Theory:	150 hrs
Practical	950 hrs
Total	1100 hrs

Course Description

This course is designed to assist the student in developing expertise and in-depth understanding in the field of Obstetric and gynecological Nursing .It will help the student to develop advanced nursing skills for nursing interventions in various obstetrical and gynecological conditions. It will further enable the students to function as midwifery nurse practitioner/ specialist, educator, manager and researcher in the field of obstetric and gynecological nursing.

Objectives

At the end of the course, the student will be able to:

1. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of women with obstetric and gynaecological conditions
2. Perform physical, psychosocial, cultural & spiritual assessment
3. Demonstrate competence in caring for women with obstetrical and gynaecological conditions
4. Demonstrate competence in caring for high risk newborn.
5. Identify and Manage obstetrical and neonatal emergencies as per protocol.
6. Practice infection control measures
7. Utilize recent technology and various diagnostic, therapeutic modalities in the management of obstetrical , gynecological and neonatal care.
8. Demonstrate skill in handling various equipments/gadgets used for obstetrical, gynaecological and neonatal care
9. Teach and supervise nurses and allied health workers.
10. Design a layout of speciality units of obstetrics and gynecology
11. Develop standards for obstetrical and gynaecological nursing practice.
12. Counsel women and families
13. Incorporate evidence based nursing practice and identify the areas of research in the field of obstetrical and gynaecological nursing
14. Function as independent midwifery nurse practitioner

Contents Outline

Unit	Hours	Content
I	25	<p>Management of problems of women during pregnancy</p> <ul style="list-style-type: none"> □ Risk approach of obstetrical nursing care , concept & goals. □ Screening of high-risk pregnancy, newer modalities of diagnosis. □ Nursing Management of Pregnancies at risk-due to obstetrical complication <ul style="list-style-type: none"> • Pernicious Vomiting. • Bleeding in early pregnancy, abortion, ectopic pregnancy, and gestational trophoblastic diseases. • Hemorrhage during late pregnancy, ante partum hemorrhage, Placenta praevia, abruptio placenta. • Hypertensive disorders in pregnancy, pre-eclampsia, eclampsia, Hemolysis Elevated liver enzyme Low Platelet count (HELLP) • Iso-immune diseases. Rh and ABO incompatibility • Hematological problems in pregnancy. • Hydramnios-oligohydramnios • Prolonged pregnancy- post term, post maturity. • Multiple pregnancies. • Intra uterine infection & pain during pregnancy. • Intra Uterine Growth Retardation(IUGR), Premature Rupture of Membrane(PROM), intra uterine death
II	15	<p>Pregnancies at risk-due to pre-existing health problems</p> <ul style="list-style-type: none"> □ Metabolic conditions. □ Anemia and nutritional deficiencies □ Hepatitis □ Cardio-vascular disease. □ Thyroid diseases. □ Epilepsy. □ Essential hypertension □ Chronic renal failure. □ Tropical diseases. □ Psychiatric disorders □ Infections Toxoplasmosis Rubella Cytomegalo virus Herpes (TORCH); Reproductive Tract Infection(RTI);STD; HIV/AIDS, Vaginal infections; Leprosy, Tuberculosis □ Other risk factors: Age- Adolescents, elderly; unwed mothers, sexual abuse, substance use □ Pregnancies complicating with tumors, uterine anomalies, prolapse, ovarian cyst
III	15	<p>Abnormal labour, pre-term labour & obstetrical emergencies</p> <ul style="list-style-type: none"> □ Etiology, pathophysiology and nursing management of <ul style="list-style-type: none"> • Uncoordinated uterine actions, Atony of uterus, precipitate labour, prolonged labour. • Abnormal lie, presentation, position compound presentation.

		<ul style="list-style-type: none"> • Contracted pelvis-CPD; dystocia. • Obstetrical emergencies Obstetrical shock, vasa praevia, inversion of uterus, amniotic fluid embolism, rupture uterus, presentation and prolapse cord. • Augmentation of labour. Medical and surgical induction. • Version • Manual removal of placenta. • Obstetrical operation: Forceps delivery, Ventouse, Caesarian section, Destructive operations • Genital tract injuries-Third degree perineal tear, VVF, RVF <p>□ Complications of third stage of labour:</p> <ul style="list-style-type: none"> • Post partum Hemorrhage. • Retained placenta.
IV	10	<p>post partum complications</p> <p>□ Nursing management of</p> <ul style="list-style-type: none"> • Puerperal infections, puerperal sepsis, urinary complications, puerperal venous thrombosis and pulmonary embolism • Sub involution of uterus, Breast conditions, Thrombophlebitis • Psychological complications, post partum blues, depression, psychosis
V	25	<p>High Risk Newborn</p> <p>□ Concept, goals, assessment, principles.</p> <p>□ Nursing management of</p> <ul style="list-style-type: none"> • Pre-term, small for gestational age, post-mature infant, and baby of diabetic and substance use mothers. • Respiratory conditions, Asphyxia neonatorum, neonatal apnoea meconium aspiration syndrome, pneumo thorax, pneumo mediastinum • Icterus neonatorum. • Birth injuries. • Hypoxic ischaemic encephelopathy • Congenital anomalies. • Neonatal seizures. • Neonatal hypocalcaemia, hypoglycemia, hypomagnesaemia. • Neonatal heart diseases. • Neonatal hemolytic diseases • Neonatal infections, neonatal sepsis, ophthalmia neonatorum, congenital syphilis, HIV/AIDS • Advanced neonatal procedures. • Calculation of fluid requirements. • Hematological conditions – erythroblastosis fetalis, hemorrhagic disorder in the newborn • Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU

VI	15	<p>HIV/AIDS</p> <ul style="list-style-type: none"> □ HIV positive mother and her baby □ Epidemiology □ Screening □ Parent to child transmission(PTCT) □ Prophylaxis for mother and baby □ Standard safety measures □ Counseling □ Breast feeding issues □ National policies and guidelines □ Issues: Legal,ethical, Psychosocial and rehabilitation <p>Role of nurse</p>
VII	25	<p>Gynecological problems and nursing management</p> <ul style="list-style-type: none"> □ Gynecological assessment □ Gynecological procedures □ Etiology, pathophysiology, diagnosis and nursing management of <ul style="list-style-type: none"> • Menstrual irregularities • Diseases of genital tract • Genital tract infections • Uterine displacement • Genital prolapse • Genital injuries • Uterine malformation • Uterine fibroid, ovarian tumors, Breast carcinoma, Pelvic inflammatory diseases, reproductive tract malignancies, hysterectomy – vaginal and abdominal. • Sexual abuse, rape, trauma , assault
VIII	5	<p>Administration and management of obstetrical and gynaecological unit</p> <ul style="list-style-type: none"> □ Design & layout □ Staffing, □ Equipment, supplies, □ Infection control; Standard safety measures □ Quality Assurance:-Obstetric auditing –records /reports, Norms, policies and protocols □ Practice standards for obstetrical and gynaecological unit
IX	5	<p>Education and training in obstetrical and gynaecological care</p> <ul style="list-style-type: none"> □ Staff orientation, training and development, □ In-service education program, □ Clinical teaching programs.

Practicals

Total = 960 Hours
1 Week = 30 Hours

S.No.	Deptt./ Unit	No. of Week	Total Hours
1	Antenatal OPD including Infertility clinics/Reproductive medicine, Family welfare and post partum clinic / PTCT	6	180 Hours
2	Antenatal and Postnatal ward	6	180 Hours
3	Labour room	4	120 Hours
4	Neonatal Intensive Care Unit	3	90 Hours
5	Obstetric/Gynae Operation Theatre	3	90 Hours
6	Gynae Ward	4	120 Hours
7	CHC, PHC, SC	6	180 Hours
	Total	32 Weeks	960 Hours

Essential Obstetrical And Gynecological Skills

Procedure Observed

- Assisted Reproductive Technology procedures
- Ultra sonography
- Specific laboratory tests.
- Amniocentesis.
- Cervical & vaginal cytology.
- Fetoscopy.
- Hysteroscopy.
- MRI.
- Surgical diathermy.
- Cryosurgery.

Procedures Assisted

- Operative delivery
- Abnormal deliveries-Forceps application, Ventouse, Breech
- Exchange blood transfusion
- Culdoscopy.
- Cystoscopy
- Tuboscopy
- Laparoscopy.
- Endometrial Biopsy
- Tubal patent test
- Chemotherapy
- Radiation therapy
- Medical Termination of Pregnancy.
- Dilatation and Curettage

Procedures Performed

- History taking.
- Physical Examination-General
- Antenatal assessment. – 20
- Pelvic examination
- Assessment of risk status.
- Assessment of Intra uterine foetal well-being.kick chart and foetal movement chart, Doppler assessment, Non Stress Test, Contraction stress test(Oxytocin challenge test)
- Universal precautions- Disposal of biomedical waste.
- Per Vaginal examination and interpretation (early pregnancy, labour, post partum).
- Utilization of Partograph
- Medical & Surgical induction(Artificial rupture of membranes).
- Vacuum extraction
- Conduct of delivery.
- Prescription and administration of fluids and electrolytes through intravenous route.
- Application of outlet forceps, delivery of breach – Burns Marshall, Loveset manoeuvre
- Repair of tears and Episiotomy suturing.
- Vacuum extraction
- controlled cord traction, Manual removal of placenta, placental examination,
- Manual vacuum aspiration
- Postnatal assessment.- 20
- Management of breast engorgement
- Thrombophlebitis (white leg)
- Postnatal counseling.
- Reposition of inversion of uterus.
- Laboratory tests: Blood- Hb, Sugar, Urine-albumin,sugar
- Breast care, breast exam, and drainage breast abscess.
- Postnatal exercise.
- Assessment –New born assessment; physical and neurological, Apgar score, high-risk newborn, Monitoring neonates; Clinically and With monitors, Capillary refill time, Assessment of jaundice, danger signs
- Anthropometric measurement
- Neonatal resuscitation
- Gastric Lavage
- Care of newborn in multi channel monitor and ventilator.
- Care of newborn in radiant warmer and incubator.
- Kangaroo mother care.
- Assisting mother with exclusive Breast-feeding
- Feeding technique: Katori, spoon, naso/orogastric, Total Parenteral nutrition
- Assesment, calculation and administration of fluids and medications:
 - Oral
 - I.D.
 - I.M.
 - I.V.- Securing IV line, infusion pump

- Administration of drug per rectum
- Capillary blood sample collection.
- Oxygen therapy.
- Phototherapy.
- Chest physiotherapy.
- counseling – Parental, bereavment, family planning, infertility etc
- Setting of operation theatre.
- Trolley and table set up for Obstetrical & gynaecological operations.
- Pap smear.
- Vaginal smear.
- Insertion of pessaries,
- Insertion of IUD and removal.
- Teaching skills
- communication skills
- Prepare referral slips
- Pre transport stabilization
- Networking with other stake holders

CLINICAL SPECIALTY –II
PEDIATRIC (CHILD HEALTH) NURSING

Placement : II Year

Hours of Instruction
Theory 150 hours
Practical 950 hours
Total : 1100 hours

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of Pediatric Nursing. It will help students to develop advanced skills for nursing intervention in various pediatric medical and surgical conditions. It will enable the student to function as pediatric nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Paediatric nursing

Objectives

At the end of the course the students will be able to:

1. Apply the nursing process in the care of ill infants to pre adolescents in hospital and community
2. Demonstrate advanced skills/competence in nursing management of children with medical and surgical problems
3. Recognize and manage emergencies in children
4. Provide nursing care to critically ill children
5. Utilize the recent technology and various treatment modalities in the management of high risk children
6. Prepare a design for layout and describe standards for management of pediatric units/hospitals
7. Identify areas of research in the field of pediatric nursing

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> □ Current principles, practices and trends in Pediatric Nursing □ Role of pediatric nurse in various settings -Expanded and extended
II	35	<ul style="list-style-type: none"> □ Pathophysiology, assessment(including interpretation of various invasive and non-invasive diagnostic procedures), treatment modalities and nursing intervention in selected pediatric medical disorders <ul style="list-style-type: none"> • Child with respiratory disorders: <ul style="list-style-type: none"> - Upper respiratory tract: choanal atresia, tonsillitis, epistaxis, aspiration. - Lower respiratory tract: Broncheolitis, Bronchopneumonia, Asthma, cystic fibrosis • Child with gastro-intestinal disorders: <ul style="list-style-type: none"> - Diarrheal diseases, gastro-esophageal reflux. - Hepatic disorders: Hepatitis, Indian childhood cirrhosis, liver transplantation. - Malabsorption syndrome, Malnutrition • Child with renal/ urinary tract disorders: Nephrotic syndrome, Nephritis, Hydronephrosis, hemolytic-uremic syndrome, kidney transplantation • Child with cardio-vascular disorders: <ul style="list-style-type: none"> - Acquired: Rheumatic fever, Rheumatic heart disease, - Congenital: Cynotic and acynotic • Child with endocrine/metabolic disorders: Diabetes insipidus, Diabetes Mellitus – IDDM, NIDDM, hyper and hypo thyroidism, phenylketonuria, galactosemia • Child with Neurological disorders: Convulsions, Meningitis, encephalitis, guillian- Barre syndrome • Child with oncological disorders: Leukemias, Lymphomas, Wilms’ tumor, nephroblastomas, neuroblastomas, Rhabdomyosarcoma, retinoblastoma, hepatoblastoma, bone tumors • Child with blood disorders: Anemias, thalassemias, hemophilia, polycythemia, thrombocytopenia, and disseminated intravascular coagulation • Child with skin disorders • Common Eye and ENT disorders • Common Communicable diseases
III	35	<ul style="list-style-type: none"> □ Assessment(including interpretation of various invasive and non-invasive diagnostic procedures), treatment modalities including cosmetic surgery and nursing interventions in selected pediatric surgical problems/ Disorders <ul style="list-style-type: none"> • Gastrointestinal system: Cleft lip, cleft palate and conditions requiring plastic surgery, Tracheo esophageal fistula/atresia, Hirschsprungs’ disease/megacolon, malrotation, intestinal obstruction, duodenal atresia,

		<p>gastrochisis, exomphalus, anorectal malformation, omphalocele, diaphragmatic hernia</p> <ul style="list-style-type: none"> • Anomalies of the nervous system: Spina bifida, Meningocele, Myelomeningocele, hydrocephalus • Anomalies of the genito-urinary system: Hypospadias, Epispadias, Undescended testes, Exstrophy bladder • Anomalies of the skeletal system • Eye and ENT disorders • Nursing management of the child with traumatic injuries: General principles of managing Pediatric trauma <ul style="list-style-type: none"> - Head injury, abdominal injury, poisoning, foreign body obstruction, burns - & Bites • Child with oncological disorders: Solid tumors of childhood, Nephroblastoma, Neuro blastoma, Hodgkin's/Non Hodgkin's Lymphoma, Hepatoblastoma, Rhabdomyosarcoma • Management of stomas, catheters and tubes • Management of wounds and drainages
IV	10	<p>Intensive care for pediatric clients</p> <ul style="list-style-type: none"> □ Resuscitation, stabilization & monitoring of pediatric patients □ Anatomical & physiological basis of critical illness in infancy and childhood □ Care of child requiring long-term ventilation □ Nutritional needs of critically ill child □ Legal and ethical issues in pediatric intensive care □ Intensive care procedures, equipment and techniques □ Documentation
V	20	<p>High Risk Newborn</p> <ul style="list-style-type: none"> □ Concept, goals, assessment, principles. □ Nursing management of <ul style="list-style-type: none"> • Post-mature infant, and baby of diabetic and substance use mothers. • Respiratory conditions, Asphyxia neonatorum, neonatal apnoea meconium aspiration syndrome, pneumo thorax, pneumo mediastinum • Icterus neonatorum. • Birth injuries. • Hypoxic ischaemic encephelopathy • Congenital anomalies. • Neonatal seizures. • Neonatal hypocalcaemia, hypoglycemia, hypomagnesaemia. • Neonatal heart diseases. • Neonatal hemolytic diseases • Neonatal infections, neonatal sepsis, ophthalmia neonatorum, congenital syphilis, HIV/AIDS • Advanced neonatal procedures. • Calculation of fluid requirements.

		<ul style="list-style-type: none"> • Hematological conditions – erythroblastosis fetalis, hemorrhagic disorder in the newborn • Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU
VI	10	Developmental disturbances and implications for nursing <ul style="list-style-type: none"> □ Adjustment reaction to school, □ Learning disabilities □ Habit disorders, speech disorders, □ Conduct disorders, □ Early infantile autism, Attention deficit hyperactive disorders (ADHD), depression and childhood schizophrenia.
VII	10	Challenged child and implications for nursing <ul style="list-style-type: none"> □ Physically challenged, causes, features, early detection & management □ Cerebral palsied child, □ Mentally challenged child. □ Training & rehabilitation of challenged children
VIII	5	Crisis and nursing intervention <ul style="list-style-type: none"> □ The hospitalized child, □ Terminal illness & death during childhood □ Nursing intervention-counseling
IX	5	Drugs used in Pediatrics <ul style="list-style-type: none"> □ Criteria for dose calculation □ Administration of drugs, oxygen and blood □ Drug interactions □ Adverse effects and their management
X	10	Administration and management of pediatric care unit <ul style="list-style-type: none"> □ Design & layout □ Staffing, □ Equipment, supplies, □ Norms, policies and protocols □ Practice standards for pediatric care unit □ Documentation
XI	5	Education and training in Pediatric care <ul style="list-style-type: none"> □ Staff orientation, training and development, □ In-service education program, □ Clinical teaching programs.

Practical

Total = 960 Hours
1 Week = 30 Hours

- Field visits:

S. No.	Deptt./ Unit	No. of Week	Total Hours
1	Pediatric medicine ICU	4	120 Hours
2	Pediatric surgical ICU	4	120 Hours
3	NICU	4	120 Hours
4	Pediatric OT	2	60 Hours
5	Pediatric medicine ward	6	180 Hours
6	Pediatric surgery ward	6	180 Hours
7	Emergency/Casualty	4	120 Hours
8	Field visits*	2	60 Hours
	Total	32	960 Hours

*Child care center, Anganwadi, play school, Special schools for challenged children, Juvenile court, UNICEF, Orphanage, Creche, SOS village

Essential

I. Procedures Observed:

- Echo cardiogram
- Ultrasound head
- ROP screening (Retinopathy of prematurity)
- Any other

II. Procedures Assisted

- Advanced neonatal life support
- Lumbar Puncture
- Arterial Blood Gas
- ECG Recording
- Umbilical catheterization – arterial and venous
- Arterial B P monitoring
- Blood transfusion- exchange transfusion full and partial
- IV cannulation & therapy
- Arterial catheterization
- Chest tube insertion
- Endotracheal intubation
- Ventilation
- Insertion of long line
- Assist in surgery

III. Procedures Performed:

- Airway Management
 - Application of Oro Pharyngeal Airway
 - Oxygen therapy
 - CPAP(Continuous Positive Airway Pressure)
 - Care of Tracheostomy
 - Endotracheal Intubation
- Neonatal Resuscitation
- Monitoring of Neonates – clinically & with monitors, CRT(Capillary Refill Time), assessment of jaundice, ECG
- Gastric Lavage
- Setting of Ventilators
- Phototherapy
- Assessment of Neonates: Identification & assessment of risk factors, APGAR Score, gestation age, Anthropometric assessment, Weighing the baby, Newborn examination, detection of life threatening congenital abnormalities,
- Admission & discharge of neonates
- Feeding - management of breast feeding, artificial feeding, expression of breast milk, OG(Orogastric) tube insertion, gavage feeding, TPN, Breast feeding counseling
- Thermoregulation- Axillary temperature, Kangaroo Mother Care (KMC), Use of Radiant warmer, incubators, management of thermoregulation & control
- Administration of Drugs: I/M, IV injection, IV Cannulation & fixation infusion pump, Calculation of dosages, Neonatal formulation of drugs, use of tuberculin/ insulin syringes, Monitoring fluid therapy, Blood administration.
- Procedures for prevention of infections: Hand washing, disinfections & sterilization, surveillance, fumigation
- Collection of specimens
- Setting, Use & maintenance of basic equipment: Ventilator, O₂ analyzer, monitoring equipment, Photo therapy unit, Flux meter, Infusion pump, Radiant warmer, incubator, Centrifuge machine, Bilimeter, Refractometer, laminar flow

IV. Other Procedures:

CLINICAL SPECIALITY - II

PSYCHIATRIC (MENTAL HEALTH) NURSING

Placement: II Year

Hours of Instruction
Theory 150 hrs
Practical 950 hrs
Total : 1100 Hours

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of Psychiatric Nursing. It will help students to develop advanced skills for nursing intervention in various psychiatric conditions. It will enable the student to function as psychiatric nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric nursing

Objectives

At the end of the course the students will be able to:

1. Apply the nursing process in the care of patients with mental disorders in hospital and community
2. Demonstrate advanced skills/competence in nursing management of patients with mental disorders
3. Identify and care for special groups like children, adolescents, women, elderly, abused and neglected, people living with HIV/AIDS.
4. Identify and manage psychiatric emergencies.
5. Provide nursing care to critically ill patients with mental disorders
6. Utilize the recent technology and various treatment modalities in the management of patients with mental disorders
7. Demonstrate skills in carrying out crisis intervention.
8. Appreciate the legal and ethical issues pertaining to psychiatric nursing.
9. Identify areas of research in the field of psychiatric nursing.
10. Prepare a design for layout and describe standards for management of Psychiatric units/emergency units/hospitals
11. Teach psychiatric nursing to undergraduate students & in-service nurses.

Course Content

Unit	Hours	Content
I	2	Principles and practice of Psychiatric nursing <ul style="list-style-type: none"> □ Review
II	10	Crisis Intervention <ul style="list-style-type: none"> □ Crisis, Definition □ Phases In The Development of A Crisis □ Types of Crisis; Dispositional , Anticipated Life Transitions Traumatic Stress, Maturation/ Development , Reflecting Psychopathology □ Psychiatric Emergencies and their management □ Grief and grief reaction □ Crisis Intervention; Phases □ Post traumatic stress disorder (PTSD) □ Role of the Nurse
III	4	Anger/ Aggression Management <ul style="list-style-type: none"> □ Anger and Aggression, Types, Predisposing Factors □ Management □ Role of The Nurse
IV	5	The Suicidal Client <ul style="list-style-type: none"> □ Epidemiological Factors □ Risk Factors <ul style="list-style-type: none"> • Predisposing Factors: Theories of Suicide-Psychological, Sociological ,Biological □ Nursing Management
V	5	Disorders of Infancy, Childhood, and Adolescence <ul style="list-style-type: none"> □ Mentally Challenged □ Autistic Disorders □ Attention-Deficit/Hyperactivity Disorder □ Conduct Disorders, behavioural disorders □ Oppositional Defiant Disorder □ Tourette's Disorders □ Separation Anxiety Disorder □ Psychopharmacological Intervention and Nursing Management
VI	5	Delirium, Dementia, and Amnestic Disorders <ul style="list-style-type: none"> □ Delirium □ Dementia □ Amnesia □ Psychopharmacological Intervention and Nursing Management
VII	10	Substance-Related Disorders <ul style="list-style-type: none"> □ Substance-Use Disorders □ Substance-Induced Disorders □ Classes Of Psychoactive Substances □ Predisposing Factors

Unit	Hours	Content
		<ul style="list-style-type: none"> □ The Dynamics Of Substance-Related Disorders □ The Impaired Nurse □ Codependency □ Treatment Modalities For Substance-Related Disorders and Nursing Management
VIII	10	<p>Schizophrenia and Other Psychotic Disorders (Check ICD10)</p> <ul style="list-style-type: none"> □ Nature of the Disorder □ Predisposing Factors □ Schizophrenia -Types <ul style="list-style-type: none"> • Disorganized Schizophrenia • Catatonic Schizophrenia • Paranoid Schizophrenia • Undifferentiated Schizophrenia • Residual Schizophrenia □ Other Psychotic disorders <ul style="list-style-type: none"> • Schizoaffective Disorder • Brief Psychotic Disorder • Schizophreniform Disorder • Psychotic Disorder Due to a General Medical Condition • Substance-Induced Psychotic Disorder □ Treatment and Nursing Management
IX	8	<p>Mood Disorders</p> <ul style="list-style-type: none"> □ Historical Perspective □ Epidemiology □ The Grief Response □ Maladaptive Responses To Loss □ Types Of Mood Disorders □ Depressive disorders □ Bipolar disorders □ Treatment and Nursing Management
X	8	<p>Anxiety Disorders</p> <ul style="list-style-type: none"> □ Historical Aspects □ Epidemiological Statistics □ How Much is too Much? □ Types <ul style="list-style-type: none"> • Panic Disorder • Generalized Anxiety Disorder • Phobias • Obsessive-Compulsive Disorder • Posttraumatic Stress Disorder • Anxiety Disorder Due to a General Medical Condition • Substance-Induced Anxiety Disorder □ Treatment Modalities □ Psychopharmacology & Nursing Management
XI	5	<p>Somatoform And Sleep Disorders</p> <ul style="list-style-type: none"> □ Somatoform Disorders □ Historical Aspects

Unit	Hours	Content
		<ul style="list-style-type: none"> • Epidemiological Statistics • Pain Disorder • Hypochondriasis • Conversion Disorder • Body Dysmorphic Disorder □ Sleep Disorder □ Treatment Modalities and Nursing Management
XII	4	Dissociative Disorders and Management <ul style="list-style-type: none"> □ Historical Aspects □ Epidemiological Statistics □ Application of the Nursing Management □ Treatment Modalities and Nursing Management
XIII	4	Sexual And Gender Identity Disorders <ul style="list-style-type: none"> □ Development Of Human Sexuality □ Sexual Disorders □ Variation In Sexual Orientation □ Nursing Management
XIV	4	Eating Disorders <ul style="list-style-type: none"> □ Epidemiological Factors □ Predisposing Factors : Anorexia Nervosa And Bulimia Nervosa obesity □ Psychopharmacology □ Treatment & Nursing Management
XV	4	Adjustment and Impulse Control Disorders <ul style="list-style-type: none"> □ Historical and Epidemiological Factors <ul style="list-style-type: none"> • Adjustment Disorders • Impulse Control Disorders □ Treatment & Nursing Management
XVI	4	Medical Conditions due to Psychological Factors <ul style="list-style-type: none"> □ Asthma □ Cancer □ Coronary Heart Disease □ Peptic Ulcer □ Essential Hypertension □ Migraine Headache □ Rheumatoid Arthritis □ Ulcerative Colitis □ Treatment & Nursing Management
XVII	8	Personality Disorders <ul style="list-style-type: none"> □ Historical perspectives □ Types Of Personality Disorders <ul style="list-style-type: none"> • Paranoid Personality Disorder • Schizoid Personality Disorder • Antisocial Personality Disorder • Borderline Personality Disorder

Unit	Hours	Content
		<ul style="list-style-type: none"> • Histrionic Personality Disorder • Narcissitic Personality Disorder • Avoidance Personality Disorder • Dependent Personality Disorder • Obsessive-Compulsive Personality Disorder • Passive-Aggressive Personality Disorders <ul style="list-style-type: none"> □ Identification, diagnostic, symptoms □ Psychopharmacology □ Treatment & Nursing Management
XVIII	8	<p>The Aging Individual</p> <ul style="list-style-type: none"> □ Epidemiological Statistics □ Biological Theories □ Biological Aspects of Aging □ Psychological Aspects of Aging □ Memory Functioning □ Socio-cultural aspects of aging □ Sexual aspects of aging □ Special Concerns of the Elderly Population □ Psychiatric problems among elderly population □ Treatment & Nursing Management
XIX	5	<p>The person living with HIV Disease</p> <ul style="list-style-type: none"> □ Psychological problems of individual HIV/AIDS □ Counseling □ Treatment & Nursing Management
XX	5	<p>Problems Related to Abuse or Neglect</p> <ul style="list-style-type: none"> □ Vulnerable groups, Women, Children, elderly, psychiatric patients, under privileged, challenged □ Predisposing Factors □ Treatment & Nursing management- Counseling
XXI	7	<p>Community Mental Health Nursing</p> <ul style="list-style-type: none"> □ National Mental Health Program- Community mental health program □ The Changing Focus of care □ The Public Health Model □ The Role of the Nurse □ Case Management □ The community as Client <ul style="list-style-type: none"> • Primary Prevention • Populations at Risk • Secondary prevention • Tertiary Prevention □ Community based rehabilitation
XXII	5	<p>Ethical and Legal Issues in Psychiatric/Mental Health Nursing</p> <ul style="list-style-type: none"> □ Ethical Considerations □ Legal Consideration

Unit	Hours	Content
		<ul style="list-style-type: none"> • Nurse Practice Acts • Types of Law • Classification within Statutory and Common Law • Legal Issues in Psychiatric/Mental Health Nursing • Nursing Liability
XXIII	5	<p>Psychosocial rehabilitation</p> <ul style="list-style-type: none"> □ Principles of rehabilitation □ Disability assessment □ Day care centers □ Half way homes □ Reintegration into the community □ Training and support to care givers □ Sheltered workshops □ Correctional homes
XXIV	5	<p>Counseling</p> <ul style="list-style-type: none"> □ Liaison psychiatric nursing □ Terminal illnesses-Counseling □ Post partum psychosis-treatment, care and counseling □ Death dying- Counseling □ Treatment, care and counseling – <ul style="list-style-type: none"> • Unwed mothers • HIV and AIDS
XXV	5	<p>Administration and management of psychiatric units including emergency units</p> <ul style="list-style-type: none"> □ Design & layout □ Staffing, □ Equipment, supplies, □ Norms, policies and protocols □ Quality assurance □ Practice standards for psychiatric nursing □ Documentation
XXVI	5	<p>Education and training in psychiatric care</p> <ul style="list-style-type: none"> □ Staff orientation, training and development, □ In-service education program, □ Clinical teaching programs.

Practicals

Total = 960 Hours

1 Week = 30 Hours

S.No.	Area of Posting	No. of Week	Total Hours
1	Acute Psychiatric Ward	4	120 Hours
2	Chronic Psychiatric Ward	4	120 Hours
3	De-addiction Unit	4	120 Hours
4	Psychiatric Emergency Unit	4	120 Hours
5	O.P.D (Neuro and psychiatric)	3	90 Hours
6	Child Psychiatric Unit and child guidance clinic	2	60 Hours
7	Post natal ward	1	30 Hours
8	Family Psychiatric Unit	2	60 Hours
9	Field visits	2	60 Hours
10	Rehabilitation	2	60 Hours
11	Community Mental Health Unit	4	120 Hours
	Total	32 Weeks	960 Hours

Essential Psychiatric nursing skills

Procedures Observed

1. Psychometric tests
2. Personality tests
3. Family therapy
4. Assisted
5. CT
6. MRI
7. Behavioral therapy.

Procedures Performed

1. Mental status examination
2. Participating in various therapies – Physical; ECT,
3. Administration of Oral, IM, IV psychotropic drugs
4. Interviewing skills
5. Counseling skills
6. Communication skills
7. Psychoeducation
8. Interpersonal relationship skills
9. Community Survey for identifying mental health problems
10. Rehabilitation therapy
11. Health education and life skills training.
12. Supportive psychotherapeutic skills
13. Group therapy
14. Milieu therapy
15. Social/Recreational therapy.
16. Occupational therapy.

CLINICAL SPECIALITY – II

COMMUNITY HEALTH NURSING

Placement : II Year

Hours of Instruction
Theory- 150 hours
Practicals- 950 hours
Total- 1100 hrs

Course Description

This course is designed to assist students in developing expertise and in-depth understanding in the field of community health nursing. It will help students to develop advanced skills for nursing intervention in various aspects of community health care settings. It will enable the student to function as community health Nurse practitioner/specialist. It will further enable the student to function as educator, manager and researcher in the field of community health nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate trends and issues related to community health Nursing- reproductive and child health, school health, Occupational health, international health, rehabilitation, geriatric and mental health.
2. Apply epidemiological concepts and principles in community health nursing practice
3. Perform community health assessment and plan health programmes
4. Describe the various components of Reproductive and child health programme.
5. Demonstrate leadership abilities in organizing community health nursing services by using inter-sectoral approach.
6. Describe the role and responsibilities of community health nurse in various national health and family welfare programmes
7. Participate in the implementation of various national health and family welfare programme
8. Demonstrate competencies in providing family centered nursing care independently
9. Participate/Conduct research for new insights and innovative solutions to health problems
10. Teach and supervise nurses and allied health workers.
11. Design a layout of sub center/Primary health center/Community health centre and develop standards for community health nursing practice.

Content Outlines

Unit	Hours	Content
I	20	<p>Epidemiology</p> <ul style="list-style-type: none"> □ Introduction <ul style="list-style-type: none"> • Concept, scope, definition, trends, History and development of modern Epidemiology • Contribution of epidemiology • Implications □ Epidemiological methods □ Measurement of health and disease: □ Health policies □ Epidemiological approaches <ul style="list-style-type: none"> • Study of disease causatives • Health promotion • Levels of prevention □ Epidemiology of <ul style="list-style-type: none"> • Communicable diseases • Non-communicable diseases □ Emerging and re-emerging diseases Epidemics □ National Integrated disease Surveillance Programme □ Health information system □ Epidemiology study and reports □ Role of Community health nurse
Unit II	40	<p>National Health and Family Welfare Programmes</p> <ul style="list-style-type: none"> □ Objectives, Organisation/manpower/resources, Activities, Goals, inter-sectoral approach, implementation, item/purpose, role and responsibilities of community health nurse: <ul style="list-style-type: none"> • National Vector Borne Disease Control Programm (NVBDPC) • National Filaria Control Programme • National Leprosy Eradication Programme • Revised national TB Control Programme • National Programme for Control of Blindness • National Iodine Deficiency disorders Control Progeramme • National Mental Health Programme • National AIDS Control Programme • National Cancer Control Programme • RCH I and II • Non-communicable disease programmes • NRHM <ul style="list-style-type: none"> - Health Schemes: <ul style="list-style-type: none"> * ESI * CGHS * Health Insurance

Unit	Hours	Content
III	15	<p>School Health</p> <ul style="list-style-type: none"> □ Introduction: definition, concepts, objectives,. □ Health assessment, Screening, identification, referral and follow up, □ Safe environment □ Services, programmes and plans- first aid, treatment of minor ailments □ Inter-sectoral coordination □ Adolescent health □ Disaster, disaster preparedness, and management □ Guidance and counseling □ School health records - maintenance and its importance □ Roles and responsibilities of community health nurse
IV	15	<p>International health</p> <ul style="list-style-type: none"> □ Global burden of disease □ Global health rules to halt disease spread □ Global health priorities and programmes □ International quarantine □ Health tourism □ International cooperation and assistance □ International travel and trade □ Health and food legislation, laws, adulteration of food □ Disaster management □ Migration □ International health agencies –World Health organizations, World health assembly, UNICEF, UNFPA, SIDA, US AID, DANIDA, DFID. AusAID etc □ International health issues and problems □ International nursing practice standards □ International health vis-a vis national health □ International health days and their significance
V	15	<p>Education and administration</p> <ul style="list-style-type: none"> □ Quality assurance □ Standards, Protocols, Policies, Procedures □ Infection control; Standard safety measures □ Nursing audit □ Design of Sub-Centre/Primary Health Centre/Community health center □ Staffing; Supervision and monitoring-Performance appraisal □ Budgeting □ Material management □ Role and responsibilities of different categories of personnel in community health □ Referral chain- community outreach services □ Transportation □ Public relations □ Planning in-service educational programme and teaching

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Training of various categories of health workers- preparation of manuals
VI	10	<p>Geriatric</p> <ul style="list-style-type: none"> □ Concept, trends, problems and issues □ Aging process, and changes □ Theories of ageing □ Health problems and needs □ Psycho-physiological stressors and disorders □ Myths and facts of aging □ Health assessment □ Home for aged-various agencies □ Rehabilitation of elderly □ Care of elderly □ Elderly abuse □ Training and supervision of care givers □ Government welfare measures Programmes for elderly- Role of NGOs □ Roles and responsibilities of Geriatric nurse in the community
VII	10	<p>Rehabilitation</p> <ul style="list-style-type: none"> □ Introduction: Concepts, principles, trends, issues, □ Rehabilitation team □ Models, Methods □ Community based rehabilitation □ Ethical issues □ Rehabilitation Council of India □ Disability and rehabilitation- Use of various prosthetic devices □ Psychosocial rehabilitation □ Rehabilitation of chronic diseases □ Restorative rehabilitation □ Vocational rehabilitation □ Role of voluntary organizations □ Guidance and counseling □ Welfare measures □ Role and responsibilities of community health nurse
Unit VIII	10	<p>Community mental health</p> <ul style="list-style-type: none"> □ Magnitude, trends and issues □ National Mental Health Program- Community mental health program □ The Changing Focus of care □ The Public Health Model □ Case Management- Collaborative care □ Crisis intervention □ Welfare agencies □ Population at Risk □ The community as Client <ul style="list-style-type: none"> • Primary Prevention

Unit	Hours	Content
		<ul style="list-style-type: none"> • Secondary prevention • Tertiary Prevention □ Community based rehabilitation □ Human rights of mentally ill □ Substance use □ Mentally challenged groups □ Role of community health nurse
IX	15	<p>Occupational health</p> <ul style="list-style-type: none"> □ Introduction: Trends, issues, Definition, Aims, Objectives, Workplace safety □ Ergonomics and Ergonomic solutions □ Occupational environment- Physical, social, Decision making, Critical thinking □ Occupational hazards for different categories of people- physical, chemical, biological, mechanical, , Accidents, □ Occupational diseases and disorders □ Measures for Health promotion of workers; Prevention and control of occupational diseases, disability limitations and rehabilitation □ Women and occupational health □ Occupational education and counseling □ Violence at workplace □ Child labour □ Disaster preparedness and management □ Legal issues: Legislation, Labour unions, ILO and WHO recommendations, Factories act, ESI act □ Role of Community health nurse, Occupational health team

Practical

Total = 960 Hours
1 Week = 30 Hours

S.No.	Deptt./Unit	No. of Week	Total Hours
1	Urban and Rural community	17	510 Hours
2	School Health	3	90 Hours
3	International health	2	60 Hours
4	Administration(SC/PHC/CHC)	2	60 Hours
5	Occupational health	2	60 Hours
6	Community Mental Health	2	60 Hours
7	Home for aged and Hospice	2	60 Hours
8	Rehabilitation	2	60 Hours
	Total	32 Weeks	960 Hours

Categorisation of practical activities

Observed

- MCH office and DPHNO
- CHC/ First Referral Unit(FRU)
- Child guidance clinic
- Institute/Unit for mentally challenged
- District TB centre
- AIDS control society
- Filariasis clinic
- RCH clinic
- STD clinic
- Leprosy clinic
- Community based rehabilitation unit
- Cancer centers
- Palliative care
- Home of old age
- Mental health units
- De-addiction centres
- School health services
- Industry
- Selected industrial health centers
- ESI unit
- Municipality/ corporation office

Assisted

- Laparoscopic sterilization
- Vasectomy
- All clinics related to RCH
- Monitoring of national health and family welfare programmes

Performed

- Conduct various clinics
- School health assessment.
- Health survey.
- Health assessment
- Drug administration as per the protocols
- Treatment of minor ailments
- Investigating outbreak of epidemic.
- Screening for leprosy, TB and non-communicable disease
- Presumptive and radical treatment for Malaria.
- Counselling
- Report writing
- Referrals
- Writing a project proposal
- Material management- requisition for indent, condemnation, inventory maintenance,
- Training and Supervision of various categories of personnel
- Liaison with NGO's

STAFFING PATTERN RELAXED TILL 2012

Qualifications & Experience Of Teachers Of College Of Nursing

Sr. No.	Post, Qualification & Experience
1	Professor-cum-Principal - Masters Degree in Nursing - 10 years of experience and minimum of 5 years of teaching experience_ <i>Desirable : Independent published work of high standard / doctorate degree / M.Phil.</i>
2	Professor-cum-Vice Principal - Masters Degree in Nursing - 10 years of experience and minimum of 5 years of teaching experience_ <i>Desirable : Independent published work of high standard / doctorate degree / M.Phil.</i>
3	Reader / Associate Professor - Master Degree in Nursing. - 7 years of experience and minimum of 3 years teaching experience <i>Desirable : Independent published work of high standard / doctorate degree / M.Phil.</i>
4	Assistant Professor /Lecturer - Master Degree in Nursing. - 3 years experience

Pay scales- as per UGC scales

SYLLABI AND REGULATIONS P.B.B.Sc.
NURSING

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PHILOSOPHY

Indian Nursing Council believes that, **Health** is a state of well-being that enables a person to lead a psychologically, socially and economically productive life.

Nursing contributes to the health services in vital and significant way in the health care delivery system. It organizes national health goals and is committed to participate in the implementation of National Health policies and programmes. It aims at identifying health needs of the people , planning and providing quality care in collaboration with other health professionals and community groups.

Scope of nursing practice encompasses provision of promotive, preventive, curative and rehabilitative aspects of care to people across their life span in wide variety of health care settings. Practice of Nursing is based upon application of basic concepts and principles derived from the physical, biological, behavioral sciences.

Undergraduate nursing program at the post basic level is a broad based education within an academic framework, which builds upon the skills and competencies acquired at the diploma level. It is specifically directed to the upgrading of critical thinking skills, competencies & standards required for practice of professional nursing and midwifery as envisaged in National Health Policy 2002.

The teachers have the responsibility to be role models and create learning environment that enables students to acquire inquiry driven, self directed learning and foster attitude of life long learning.

Under graduate nursing education program at the post basic level prepares its graduates to become exemplary citizen by adhering to code of ethics and professional conduct at all times in fulfilling personal, social and professional obligations so as to respond to national aspirations.

AIMS :

The aim of the undergraduate nursing program at the post basic level is to upgrade the diploma (GNM) nurses to:

assume responsibilities as professional, competent nurses and midwives at basic level in providing promotive, preventive, curative and rehabilitative services.

make independent decisions in nursing situations, protect the rights of and facilitate individuals and groups in pursuit of health, function in the hospital, community nursing services, and conduct research studies in the areas of nursing practice. They are also expected to assume the role of teacher, supervisor, manager in a clinical/public health setting.

OBJECTIVES :

On completion of B.Sc. Nursing (Post-Basic) degree programme the graduates will be able to:

1. Assess health status, identify nursing needs, plan, implement and evaluate nursing care for patients / clients that contribute to health of individuals, families and communities.
2. Demonstrate competency in techniques of nursing based on concepts and principles from selected areas of nursing, physical, biological and behavioral sciences.
3. Participate as members of health team in the promotive, preventive, curative and restorative health care delivery system of the country.
4. Demonstrate skills in communication and interpersonal relationship.
5. Demonstrate leadership qualities and decision-making abilities in various situations.
6. Demonstrate skills in teaching to individuals and groups in community health settings.
7. Demonstrate managerial skills in community health settings.
8. Practice ethical values in their personal and professional life.
9. Participate in research activities and utilize research findings in improving nursing practice.
10. Recognize the need for continued learning for their personal and professional development.

COURSE OF STUDY :

Sr. No.	Subject	Theory Hours	Practical Hours	Total Hours
1st Year				
1.	Nursing Foundation	45	030	075
2.	Nutrition & Dietetics	30	015	045
3.	Biochemistry & Biophysics	60	-	060
4.	Psychology	60	015	075
5.	Maternal Nursing	60	240	300
6.	Child Health Nursing	60	240	300
7.	Microbiology	60	030	090
8.	Medical & Surgical Nursing	90	270	270
9.	English (Qualifying)	60	-	060
Total		525	840	1215

Note: Hindi/local language as per the need of the institution.

2nd Year

10.	Sociology	60	-	060
11.	Community Health Nursing	60	240	300
12.	Mental Health Nursing	60	240	300
1.	Introduction to Nursing Education	60	075	135
2.	Introduction to Nursing Administration	60	180	240
3.	Introduction to Nursing Research & Statistics	45	120	165
Total		345	855	1200

SCHEME OF EXAMINATION:

1st Year

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
Theory					
1.	Nursing Foundation	2	15	35	050
2.	Nutrition & Dietetics	2	15	35	050
3.	Biochemistry & Biophysics	3	25	75	100
4.	Psychology	3	25	75	100
5.	Microbiology	3	25	75	100
6.	Maternal Nursing	3	25	75	100
7.	Child Health Nursing	3	25	75	100
8.	Medical & Surgical Nursing	3	25	75	100
9.	* English (Qualifying)	--	100 College level qualifying exam, minimum passing Marks 33%.		100
Practicals					
1.	Medical & Surgical Nursing		50	50	100
2.	Child Health Nursing		50	50	100
3.	Maternal Nursing		50	50	100

Note: * College level qualifying exam to appear in University Examination, minimum passing Marks 33%

2nd Year

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
Theory					
10.	Sociology	3	25	75	100
11.	Community Health Nursing	3	25	75	100
12.	Mental Health Nursing	3	25	75	100
13.	Introduction to Nursing Education	3	25	75	100
14.	Introduction to Nursing Service Administration	3	25	75	100
15.	** Introduction to Nursing Research Statistics	2	50 College level qualifying exam, minimum passing Marks 50%		050
Practicals					
4.	Community Health Nursing		50	50	100
5.	Mental Health Nursing		50	50	100
6.	** Introduction to Nursing Research Statistics		50 (Research Project) College level qualifying exam, minimum passing Marks 50%		050

Note: **** College level qualifying exam to appear in University Examination, minimum passing Marks 50%. (Not University Examination)**

N.B.:

1. Teaching of Anatomy, Physiology, Pharmacology and Pathology will be integrated with clinical subjects.
2. A minimum of 80% attendance in theory and practical/clinicals in each clinical area is essential before award of degree.
3. 100 % attendance in practical / clinicals in each clinical area is essential before award of degree.
4. 50% of minimum marks in each theory and practical paper separately is required for passing.
5. Examination in the 'English' subject of 1st year P.B.B.Sc. Nursing course will be a college level Internal Assessment Qualifying Examination with minimum passing of 33% Marks. Student who fails or student who secures less than 33% Marks in the 'English' subject will not become eligible to appear in any subject of the University's final examination. Marks of 'English' subject are to be send to the University along with Internal Assessment Marks of other subjects for inclusion in the Mark Sheet.
6. Examination in the 'Introduction to Nursing Research and Statistics' subject of 2nd year P.B.B.Sc. Nursing course will be a college level Internal Assessment Qualifying Examination with minimum passing of 50% Marks. Student who fails or student who secure less than 50% Marks each i.e. independently in the Internal Assessment (Theory) Head and independently in the Internal Assessment (Practical) Head of the 'Introduction to Nursing Research and Statistics' subject will not become eligible to appear in any subject of the University's final examination. Marks of 'Introduction to Nursing Research and Statistics' subject are to be send to the University along with Internal Assessment Marks of other subjects for inclusion in the Mark Sheet.

IST YEAR
POST BASIC B.Sc NURSING
SYLLABUS

NURSING FOUNDATION

Placement: Ist Year

**Time Allotted: Theory : 45 Hrs
Practical : 30 Hrs**

COURSE DESCRIPTION :

This course will help students to develop an understanding of the philosophy, objectives and responsibilities of nursing as a profession. The purpose of the course is to orient to the current concepts involved in the practice of nursing and developments in the nursing profession.

OBJECTIVES : At the end of the course, the students will

1. Identify professional aspects of nursing
2. Explain theories of nursing
3. Identify ethical aspects of nursing profession
4. Utilise steps of nursing process
5. Identify the role of the nurse in various levels of health services
6. Appreciate the significance or quality assurance in nursing.
7. Explain current trends in health and nursing

COURSE CONTENTS :

UNIT I	DEVELOPMENT OF NURSING AS A PROFESSION	6 hrs
	<ul style="list-style-type: none">- Philosophy- Objectives and responsibilities of a graduate nurse- Trends influencing nursing practice- Expanded role of the nurse- Development of nursing education in India and trends in nursing education- Professional organizations, career planning- Code of ethics & professional conduct for nurses.	
UNIT II	CONCEPTS OF HEALTH & ILLNESS	12 hrs
	<ul style="list-style-type: none">- Concepts of health and illness, effects on the person- Stress and adaptation- Health care concepts and nursing care concept- Developmental concepts, needs, roles and problems of the developmental stages of individual – newborn, infant, toddler, pre-adolescent, adolescent, adulthood, middle-age, old age.	

UNIT III	THEORY OF NURSING PRACTICE	5 hrs
	<ul style="list-style-type: none"> - Meta paradigm of nursing – characterized by four central concepts i.e. Nurse, Person (client/patient). Health and Environment. Nursing Theory; <ul style="list-style-type: none"> - Florence Nightingale - Virginia Henderson - Betty Neumen - Dorothea Orem - Martha Rogers etc. 	
UNIT IV	NURSING PROCESS	10 hrs
	<ul style="list-style-type: none"> - Nursing Process - Nursing diagnosis – Definitions, concepts, statements, types, interpretation - Planning: techniques for planning care, types of care plans. - Implementation: different approaches to care, organisations and implementation of care, recording. - Evaluation: tools for evaluation, process of evaluation. 	
UNIT V	QUALITY ASSURANCE	6 hrs
	<ul style="list-style-type: none"> - Quality assurance: nursing standards, nursing audit, total quality management - Role of council and professional bodies in maintenance of standards. 	
UNIT VI	APPROACHES TO HEALTH CARE	6 hrs
	<ul style="list-style-type: none"> - Primary health care concepts: <ul style="list-style-type: none"> - community oriented nursing - holistic nursing - primary nursing - family oriented nursing concepts: <ul style="list-style-type: none"> - Problem oriented nursing - Progressive patient care - Team nursing 	
PRACTICUM : Teaching Learning Activities -		30 Hrs.
	Nursing process application.	
	<ul style="list-style-type: none"> - Select one patient and write nursing care plan. 	20 Hrs.
	<ul style="list-style-type: none"> - Select one client from OPD / Community / Peer Group and write nursing care plan. 	10 Hrs.

EVALUATION:

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
1.	Nursing Foundation Theory	2	15	35	050

Internal Assessment: 15 Marks

(Out of 15 Marks to be send to the University)

Mid-Term: 25 Marks

Prelim: 35 Marks

Total: 60 Marks

(60 Marks from mid-term & prelim (Theory) to be converted into 15 Marks)

External Assessment (Theory): 35 Marks

(University Examination)

REFERENCES :

1. Kozier B, Erb, G & Oliver, R : Fundamentals of Nursing ;4th ed. California, Addison Wesley., 1991
2. Perry, A.G. & Potter, P.A.: Basic nursing essentials of practice; 5th ed. St. Louis, Mosby, 2003
3. Potter, P.A. & Perry, A.G.: Fundamentals of nursing; 5th ed. Mosby Harcott (India) Pvt. Ltd.
4. Beverly Witler Dugas : Introduction to patient care ; 4th ed., Saunders, 2002
5. White, Lois: Foundations of nursing caring for the whole person; U.S.A. Delmer Thompson Learning,
6. Luckmann, J & Sorensen, K.C.: Basic nursing: a psychophysiologic approach ; 3rd ed., W. B. Saunders, 2002
7. Park, J.E. :Text book of preventive and social medicine ; 17th ed., Banarasidas Bhanot, 2003

NUTRITION & DIETETICS

Placement: Ist Year

Time Allotted Theory : 30 Hrs.

Practical : 15 Hrs.

COURSE DESCRIPTION :

This course is designed to provide the students with a wide knowledge of dietetics in Indian setting, that the practice of teaching optimum and realistic dietary planning can become an integral part of nursing practice.

OBJECTIVES : At the end of the course, the students will

1. Explain the principles and practices of nutrition and dietetics.
2. Plan therapeutic diets in different settings
3. Identify nutritional needs of different age groups and plan diet accordingly.
4. Prepare meals using different methods utilizing cookery rules.

COURSE CONTENTS :

UNIT I INTRODUCTION TO NUTRITION AND DIETETICS 8 Hrs

- Balanced diet, factors on which it depends.
- Factors to be considered in planning
- Guides available for planning
- Food Hygiene, preparation and preservation
- Review of nutrients – micro & macro

UNIT II INFANT AND CHILD NUTRITION 8 Hrs

- Feeding of normal infants: factors to be considered in planning, nutritional requirements
- Supplementary feeding of infants: Advantage and method of introduction.
- Weaning effects on mother and child.
- Psychology of infant and child feeding.
- Feeding the sick child. Diet in diseases of infancy and childhood.
- Deficiency – malnutrition, under nutrition, other nutrients deficiency.
- Feeding pre-school child: nutritional needs, factors to be considered in planning diets. Problems in feeding.

UNIT III INTRODUCTION TO DIET THERAPY 8 Hrs

- Introduction
- Routine hospital diets.
- Therapeutic diet under each unit i.e. Cardiovascular diseases, Gastrointestinal diseases, Renal disorders, Endocrine and metabolic disorders,
- Allergy, Infections and fevers,
- Pre and post operative stage,
- Deficiency diseases and malnutrition, overweight and underweight

UNIT IV COMMUNITY NUTRITION**6 Hrs**

- Need for community nutrition programme.
- Nutritional needs for special groups: infant, child, adolescent,
- Pregnant and lactating mother and old people.
- Substitutes for non-vegetarian foods.
- Selection of cheap and nutritious foods. Nutrition education needs and methods.
- Methods of assessing nutritional status of individual / group / community.
- Current nutritional problems and national programmes (mid day meal etc.)

PRACTICUM :

- I Methods of cooking and cookery rules.
1. Simple preparation of beverages, soups, cereals and pulses, eggs, vegetables, meat, multipurpose food snacks.
 2. Menu Plans.
- II Preparation of supplementary food for infants.
1. Food for toddlers.
 2. Low cost nutritious dishes for vulnerable groups.
 3. Dietary case study of patient on special diet and planning of low cost dietary instructions for home adaptations.
 4. Planning of therapeutic diets.

EVALUATION :

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
2.	Nutrition & Dietetics Theory	2	15	35	050

Internal Assessment: 15 Marks

(Out of 15 Marks to be send to the University.)

Mid-Term: 25 Marks

Prelim: 35 Marks

Total: 60 Marks

(60 Marks from mid-term & prelim (Theory) to be converted into 15 Marks)

External Assessment (Theory): 35 Marks**(University Examination)****REFERENCES:**

- 1) Clinical dietetics and Nutrition, Antia 4th ed.
- 2) Nutritive value of Indian foods, Gopalan, 1st ed.
- 3) Krause's Food, Nutrition & diet Therapy, Mahan, 11th ed.
- 4) Nutrition & diet therapy, Williams
- 5) Clinical Dietetics & Nutrition, Philip.

BIOCHEMISTRY & BIOPHYSICS

SECTION – A

BIOCHEMISTRY

Placement: Ist Year

Time Allotted Theory : 30 Hrs

Practical :

COURSE DESCRIPTION :

The broad goal of teaching Biochemistry to Nursing students is to enable them to understand, the chemical processes taking place in the human body in health and disease. This will help them to increase the quality of patient care.

OBJECTIVES : At the end of the course, the students will

1. Identify the basic principles of Biochemistry
2. Understand and grasp the basic outline of chemistry and properties of important biomolecules like glucose, urea, etc
3. Summarize the working of enzymes and their importance as diagnostic tools for the clinician.
4. Describe the mechanisms involved in maintenance of body fluids along with electrolytes.
5. Be able to understand the concepts of laboratory medicine, which involves learning about physiological levels of important biomolecules and the underlying cause of change in these levels in disease states.

COURSE CONTENTS

UNIT I	INTRODUCTION	2 hrs
-	Introduction: importance of Biochemistry in Nursing	
-	Study of cell and its various components	
UNIT II	WATER AND ELECTROLYTES	2 hrs
-	Distribution of water and its functions in human body (ECF & ICF)	
-	Water & Fluid balance	
-	Electrolyte Distribution and its functions in body	
-	Dehydration causes and consequences	
-	Electrolyte imbalance – causes, hypo and hypernatremia and kalemia	
UNIT III	ENZYMES	05 hrs
-	Definition and Mechanism of action	
-	Factors affecting enzyme activities	
-	Enzymes in clinical diagnosis and its applications	
-	Precautions for handling specimens for enzymes estimation	
-	Digestion and Absorption of carbohydrates, proteins and lipids.	
-	Factors influencing the digestion and absorption	
-	Mal absorption syndrome	

UNIT IV CARBOHYDRATES 05 hrs

- Elementary outline of Electron transport chain (ETC) and Biological Oxidation
- Elementary consideration of Mono, di and polysaccharides
- Fate of glucose in the body including-gluconeogenesis, glycogenesis, glycolysis, glycogenolysis. Storage of glucose.
- Outline and Importance of TCA Cycle (Kreb's cycle)
- Regulation of blood glucose levels. Glucose Tolerance test (GTT) Hyperglycemia, Hypoglycemia.

UNIT V PROTEINS – AMINO ACIDS & HARMONES 05 hrs

- Protein Chemistry
- Essential amino acids, properties and functions
- Important polypeptides
- Plasma Proteins and their functions
- Nucleic acids- DNA, RNA
- Biosynthesis of proteins in the cells and Role of nucleic acids in protein synthesis
- Nitrogenous constituents of Urine, blood their origin Urea cycle and Nitrogen balance. Uric Acid formation, gout.

UNIT VI LIPIDS 06 hrs

- Biological Importance of important lipids and their functions
- Cholesterol and Lipoproteins
- Sources occurrence and distribution
- Blood levels and Metabolism
- Biosynthesis of fats and storage of fats (B-oxidation)
- Role of liver in fat metabolism Fatty liver, its causes and prevention
- Goal of lipid metabolism in Atherosclerosis and Heart diseases
- Ketone body formation and its utilization.
- Causes and detection of ketosis

UNIT VII INTER-RELATIONSHIP IN METABOLISM 05 hrs

- Carbohydrates, Lipids, a Protein, minerals metabolism
- Nutrition calorie value of food, BMR, SDA, Balance Diet

REFERENCES

1. Anthikad, 'J' : Biochemistry for nurses ;New Delhi : Jaypee Brothers
2. Dandekar S.P. : Medical biochemistry (based on MCI guidelines) ;New Delhi : Jaypee Brothers
3. Das, Debajyoti : Biochemistry; New ed.; Calcutta, Academic publishers
4. Hodkinson M: Clinical biochemistry of the elderly; London: Churchill Livingstone, 1984
5. Malhotra, V. : Biochemistry for students; New Delhi: Jaypee Brothers, 1985
6. Nath, R.L.: Practice of biochemistry in clinical medicine, 1976
7. U Satyanarayana : Biochemistry; Books and Allied Ltd.
8. Eastham Duncan Robert: Biochemical values in clinical medicine; 8th ed.: John Cought and Sons Ltd., 1977

SECTION – B

BIOPHYSICS

Placement: Ist Year

**Time Allotted Theory : 30 Hrs
Practical :**

COURSE DESCRIPTION :

The broad goal of teaching Biophysics to nursing students is to enable them to understand the application of physics principles while providing nursing care to the patients.

COURSE CONTENTS :

UNIT I	INTRODUCTION	2 hrs
-	Introduction: Concepts of unit and measurements Fundamental and derived units	
-	Unit length, weight, mass, time.	
UNIT II	MOTION	2 hrs
-	Vector and scalar motion, speed, velocity and acceleration	
-	Newton's law of motion	
UNIT III	GRAVITY	3 hrs
-	Gravity: Specific gravity , centre of gravity, principles of gravity.	
-	Effect of gravitational forces on human body.	
-	Application of principles of gravity in nursing	
UNIT IV	FORCE WORK & ENERGIES	3 hrs
-	Force, work, Energy: Their units of measurement.	
-	Type and transformation of energy, forces of the body, Static forces.	
-	Principles of machines, friction and body mechanics.	
-	Simple mechanics – lever and body mechanics, pulley and traction, incline plane, screw.	
-	Application of these principles in nursing.	
UNIT V	HEAT	3 hrs
-	Heat : Nature, measurement, transfer of heat	
-	Effects of heat on matter	
-	Relative humidity, specific heat	
-	Temperature scales	
-	Regulation of body temperature	
-	Use of heat for sterilization	
-	Application of these principles in nursing	

UNIT VI	LIGHT	3 hrs
	<ul style="list-style-type: none"> - Light: Laws of reflection - Focusing elements of the eye, defective vision and its correction, use of lenses - Relationship between energy, frequency and wavelength of light - Biological effects of light - Use of light in therapy - Application of these principles in nursing 	
UNIT VII	PRESSURES	3 hrs
	<ul style="list-style-type: none"> - Pressures: Atmospheric pressure, hydrostatic pressure, osmotic pressure - Measurements of pressures in the body <ul style="list-style-type: none"> - Arterial and venous blood pressures - Ocular pressure - Intracranial pressure - applications of these principles in nursing 	
UNIT VIII	SOUND	2 hrs
	<ul style="list-style-type: none"> - Sound: Frequency, Velocity and Intensity - Vocalisation and hearing - Use of ultrasound. Noise pollution and its prevention - Application of these principles in nursing 	
UNIT IX	ELECTRICITY	5 hrs
	<ul style="list-style-type: none"> - Electricity and Electromagnetism : Name of Electricity, Voltage, Current, Resistance and their Units. - Flow of electricity in solids, electrolytes , gases and vacuum. - Electricity and human body - ECG, EEG, EMG, ECT - Pace makers and defibrillation - Magnetism and electricity - M.R.I. Scanning, CAT Scan 	
UNIT X	NUCLEAR PHYSICS	2 hrs
	<ul style="list-style-type: none"> - Atomic Energy : Structure of Atom, Isotopes and Isobars. - Radioactivity : Use of radioactive isotopes - Radiation protection units and limits, instruments used for detection of ionising radiation. X-rays. 	
UNIT XI	ELECTRONICS	2 hrs
	<ul style="list-style-type: none"> - Principles of Electronics: Common electronic equipments used in patient care. 	

PRACTICUM :

- Experiments and Tests should be demonstrated wherever applicable.

EVALUATION:

Paper	Subject Biochemistry & Biophysics	Duration	Internal Assessment	External Assessment	Total Marks
3.	Theory	3	25	75	100

Internal Assessment: 25 Marks
(Out of 25 Marks to be send to the University)

	Section - A Biochemistry	Section – B Biophysics	Total Marks
Mid-Term	25	25	--
Prelim	37	38	--
Total	62	63	125
Average out of	13	12	25

(62 Marks from Biochemistry (mid-term & prelim) to be converted into 13 Marks and 63 Marks from Biophysics (mid-term & prelim) to be converted into 12 Marks)

External Assessment (Theory): 75 Marks
(University Examination)

Section A: Biochemistry: 37 Marks
Section B: Biophysics: 38 Marks
Total Marks: 75 Marks

REFERENCES :

- 1) Flitter, H.H.(1989): An introduction to physics in nursing; 7th edition Delhi, All India Traveller Book seller. (Original American ed. Pub. by C.V.Mosby, St.Louis).
- 2) Sackheim, S.M.(1962): Practical Physics for nurses; 2nd ed. Philadelphia, W.B. Saunders Co.
- 3) Stearns, H.O.(1962): Fundamentals of physics and Applications; 2nd ed. New York, Macmillan Co.
- 4) T.N.A.I. (1966): Physics and Chemistry; Laboratory Manual for Student Nurses; 3rd ed. New Delhi, T.N.A.I.
- 5) Waters, M.(1958): Elementary physics for Nurses; 6th ed London, Faber and fabor.
- 6) KIGOUR, O.F.G.(1978): An Introduction to the physical aspects of Nursing Sciences; 3rd ed. London, William Heinemann Medical Books Ltd.
- 7) Nordmark, M.t and Rahweder, A.W.(1959): Science Principles in Nursing; Philadelphia, J.B. Lippincott.

PSYCHOLOGY

Placement: Ist Year

**Time Allotted Theory : 60 Hrs
Practical : 15 Hrs**

COURSE DESCRIPTION :

This course is designed to orient students with regards to psychological principles, and widen their knowledge of the fundamentals of psychology. The course offers students an opportunity to understand the psychodynamics of patient behavior and to apply theoretical concepts in practical settings.

OBJECTIVES : The course aims towards the developing students skills in –

- Understanding herself and others
- Analysing her own thought and behavior patterns
- Using psychological principles to improve her efficiency in nursing care
- Applying psychological principles while performing nursing duties
- Distinguishing psychological processes during health and sickness
- Planning nursing care with regards to psychological needs and concerns
- Participating in psychological assessment of patients

COURSE CONTENTS

UNIT I	INTRODUCTION TO PSYCHOLOGY	3 hrs
	<ul style="list-style-type: none">- Definition, history and scope- Branches and methods- Relationship with other subjects- Psychology and the student nurse- Habits and skills	
UNIT II	SENSATION, ATTENTION AND PERCEPTION	6 hrs
	<ul style="list-style-type: none">- Sensation – Definition and sensory processes- Problems in sensation- Attention – Definition, characteristics and types- Factors affecting attention- Distraction and sustaining attention- Perception – Definition and characteristics- Perception of form, depth and movement- Types and difficulties in perception- Problems and nursing care	
UNIT III	LEARNING	5 hrs
	<ul style="list-style-type: none">- Definition, nature and conditioning theories- Learning process, laws and types and factors- Learning during health and sickness	

UNIT IV	MEMORY AND FORGETTING	5 hrs
	<ul style="list-style-type: none"> - Memory – Definition and nature - Memory models and factors affecting memory - Methods to improve memory - Forgetting – Definition, explanation of forgetting - Memory during health and sickness - Forgetting during health and sickness 	
UNIT V	MOTIVATION	6 hrs
	<ul style="list-style-type: none"> - Definition, nature and theories - Needs and motives – Biological and social - Frustration and conflicts - Types of conflicts - Self actualization - Application in nursing care 	
UNIT VI	EMOTION	5 hrs
	<ul style="list-style-type: none"> - Definition and meaning, theories - Expressions and perceptions - Emotions in sickness, nursing care 	
UNIT VII	ATTITUDES	5 hrs
	<ul style="list-style-type: none"> - Definition and nature, theories - Factors influencing attitude formation - Role of attitudes in health and sickness 	
UNIT VIII	INTELLIGENCE AND ABILITIES	6 hrs
	<ul style="list-style-type: none"> - Definitions and nature, theories - Psychological testing and measurement - Mental retardation and IQ - Intelligence and abilities during sickness 	
UNIT IX	PERSONALITY	7 hrs
	<ul style="list-style-type: none"> - Definition, nature, factors influencing personality - Theories of personality development - Defence mechanism - Psychological problems - Personality disorders and nursing 	
UNIT X	INDIVIDUAL DIFFERENCE	4 hrs
	<ul style="list-style-type: none"> - Definition and significance - Heredity and environment - Role in health and sickness - Implications in nursing 	

UNIT XI PSYCHOLOGICAL ASPECTS OF NURSING 5 hrs

- Behaviour during sickness
- Understanding the client
- Psychological approach in nursing care
- Psychological needs of child, adolescent, adult, aged
Chronically ill and attendants

UNIT XII MENTAL HYGIENE 3 hrs

- Concepts and meaning of mental hygiene
- Characteristics of a mentally healthy person
- Factors influencing mental health

All theory topic lectures will be covered through interactive sessions with students.

PRACTICUM :

A 3 Experiments 9 hrs

- Attention
- Memory
- Learning

B 2 Psychological Tests (Rating Scales) 4 hrs

- Hardiness
- Positive Thinking

C Case Study 2 hrs

Discussion of a case with identification of expressed emotions, psychological needs, sources of conflict and attitudes expressed

Practicum will be recorded in a journal and will be scored as part of internal Assessment.

EVALUATION :

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
4.	Theory	3	25	75	100

Internal Assessment:

Theory: 15 Marks

Practicum Assignment: 10 Marks

Total: 25 Marks

(Out of 25 Marks to be send to the University)

Mid-Term: 50 Marks

Prelim: 75 Marks

Total: 125 Marks

(125 Marks from mid-term & prelim (Theory) to be converted into 15 Marks)

Practicum Assignments: 10 Marks

External Assessment: 75 Marks

(University Examination)

REFERENCES :

1. Bhatia, B.D. and Craig, M: Elements of psychology and mental hygiene for nurses; Chennai : Orient Longman Pvt. Ltd
2. Dandekar, W.N. : Fundamentals of experimental psychology ; Kolhapur : Moghe Prakashan
3. Hurlock, E. : Developmental psychology ; Singapore :Tata McGraw Hill Book Co.,
4. McGhee, A : Psychology as applied to nursing ; London : Churchill Livingstone
5. Morgan, C.T. and King, R.A.: Introduction to psychology ; Singapore : McGraw Hill Book Co.,

MICROBIOLOGY

Placement: Ist Year

**Time Allotted Theory : 60 Hrs
Practical : 30 Hrs**

COURSE DESCRIPTION :

This course reorients the students to the fundamentals of Microbiology and its various sub-divisions. It provides opportunities to gain skill in handling and use of microscope for identifying various micro-organisms. It also provides opportunities for safe handling of materials containing harmful bacteria and methods of destroying microorganisms.

OBJECTIVES : After the course the students will develop

1. Identify common disease causing organisms
2. Basic principles of Microbiology & its significance in health & disease
3. Handling of infective specimens
4. Various methods of sterilization & disinfection
5. Role of nurse in hospital infection control system.

COURSE CONTENTS :

UNIT I	INTRODUCTION	3 hrs
	<ul style="list-style-type: none">- General Microbiology : History, (Fracostoriues of Verona to the Latest Nobe Laureates short note on Pasteur and Koch) and Introduction (Why to study the subject?)- Microscope (Types – dissecting to Electron measuring scale upto nanometer)	
UNIT II	GENERAL MICROBIOLOGY	3 hrs
	<ul style="list-style-type: none">- Morphology and Physiology (Size, Shape, struct., spore, flagella, capsule)- Staining (demonstration) Gram's + Z N's + Motility	
UNIT III	BACTERIAL GROWTH REQUIREMENT	5 hrs
	<ul style="list-style-type: none">- Growth requirement of Bacteria + Bacteria growth curve- Cultural media different- Collection processing of sample and bacteria	
UNIT IV	STERILIZATION & DISINFECTION	5 hrs
	<ul style="list-style-type: none">- Sterilization + Disinfections- Sterilization demo of instruments, Different disinfectants dilute- Hospital infection control Biosafety + Fumigation and role of nurse- Bacterial genetics (emphasis to drug resistance) Host parasite relationship	

UNIT V	SYSTEMIC BACTERIOLOGY	10 hrs
	(Morpho, growth requirements, diseases caused vaccine epideo)	
-	Pyogenic cocci causing diseases Staphylococci	
-	Streptococci and Pneumococci and Neisseria	
-	Salmonella + Shigella	
-	E coli diarrhea + Cholera + Pseudomonas	
-	C. diphtheria + Chlamydia	
-	Anaerobes intro. + C. welchii	
-	C. tetani + nonsporing anaerobes mention diseases	
-	Tuberculosis	
-	Leprosy + Aty	
-	Spirocheate + Leptospira	
-	Chlamydia	
-	Demo different morphology of bacteria G + C, G + B, GNC, GNB	
-	Demo of organism Spore, Capsule, fungi, AFB	
UNIT VI	SYSTEMIC MYCOLOGY	5 hrs
-	Fungi intro., Dermatophytes	
-	Mycetophytes	
-	Mycetoma, Rhino, Crypto	
-	Candida and Lab. Diagnosis of fungal infections	
UNIT VII	IMMUNOLOGY	5 hrs
-	Immunity	
-	Antigen	
-	Antibody	
-	Ag X Ab reaction sererogical	
-	Immune Response	
-	Hypersensitivity	
UNIT VIII	SYSTEMATIC PARASITOLOGY	10 hrs
-	Intro classification and some terms	
-	Amoeba + Giardia	
-	Trichomonas + Leishmania	
-	Malaria + Toxoplasma	
-	Cestodes (Taenia sodium and saginata E. granuloses)	
-	Intestinal Nematodes	
-	Tissue Nematodes	
-	Vectors	
-	Diff. Parasites and vectors stool preparation demo	
UNIT IX	SYSTEMATIC VIROLOGY	8 hrs
-	Gen. Prop. Cultivation classification	
-	Herpes virus	
-	Picorna virus	

- Measles, Mumps, Chicken pox
- Ortho and Arbo (Dengue)
- Rhabdo virus
- Hepatitis virus
- HIV and AIDS

UNIT X CLINICAL MICROBIOLOGY

6 hrs

- PUO, UTI, STD, Wound infection
- Micro – organism transmitted through food
- Food poisoning, food born infection

PRACTICUM :

- Each student will practice in laboratory as indicated in each unit of the courses outline. While giving nursing care in the wards they will practice collection and processing of specimens, prevention and control of hospital infections. Sterilization, immunisation, chemotherapy and maintenance of personal and environmental hygiene. Observation visit to incinerator, posting in CSSD and infection control department.

EVALUATION :

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
5.	Microbiology Theory	3	25	75	100

Internal Assessment:

Theory: 15 Marks

Journal Assignment: 10 Marks

Total: 25 Marks

(Out of 25 Marks to be send to the University)

Mid-Term: 50 Marks

Prelim: 75 Marks

Total: 125 Marks

(125 Marks from mid-term & prelim (Theory) to be converted into 15 Marks)

Journal Assignments: 10 Marks

External Assessment (Theory): 75 Marks

(University Examination

REFERENCES :

- 1) Ananthnarayan : Textbook of Microbiology
- 2) Chakravarti : Textbook of Microbiology
- 3) Chattergey K.D. : Text book of Parasitology
- 4) Panikar : Textbook of Parasitology
- 5) Konemen : Textbook of Medical Microbiology
- 6) Marion E. Wilson : Microbiology in Nursing Practice.

MATERNAL NURSING

Placement: Ist Year

**Time Allotted Theory : 60 Hrs
Practical : 240**

COURSE DESCRIPTION :

The course is designed to widen the student's knowledge of obstetrics during pregnancy, labour and puerperium. It also helps to acquire knowledge and to develop skill in rendering optimum nursing care to a child bearing mother in a hospital or in community and help in the management of common gynaecological problems.

OBJECTIVES : At the end of the course, the student will be able to :

1. Describe the physiology of pregnancy, labour, and puerperium.
2. Manage normal pregnancy, labour and puerperium.
3. Explain the physiology of lactation, and advice on management of breast feeding.
4. Provide pre- and post operative nursing care in obstetric conditions.
5. Identify and manage high risk pregnancy including appropriate referrals.
6. Propagate the concept and motivate acceptance of family planning methods.
7. Teach , guide and supervise auxiliary midwifery personnel.

COURSE CONTENT

UNIT I	INTRODUCTION AND HISTORICAL REVIEW	5 hrs.
-	(a) Early history of midwifery and evolution of obstetrics Maternity care and practices in various culture across the world. Expanded role of the nurse in maternity and gynaecology.	
-	(b) Safe motherhood initiative Maternal mortality, morbidity and perinatal mortality. Legislation related to maternal benefits, MTP acts, incentives and Family planning. Family welfare programme.	
 UNIT II	 ANATOMY AND PHYSIOLOGY OF FEMALE REPRODUCTIVE SYSTEM	 6 hrs.
-	Review of anatomy and physiology of female reproductive system.	
-	Female pelvis and foetal skull.	
-	Menstrual cycle	
-	Human reproduction, gametogenesis, fertilization, embryo.	
-	Placenta, foetal membrane, liquor amnii, umbilical	
-	The foetus, foetal growth, foetal physiology, foetal circulation.	

UNIT III	NORMAL PREGNANCY	8 hrs.
	<ul style="list-style-type: none"> - Physiological changes during pregnancy - Diagnosis of pregnancy and antenatal care - Antenatal assessment of foetal well being. - Physiology of normal labour - Mechanism of normal labour. - Management of I, II, and III stages of labour. - Physiology of puerperium. - Physiology of lactation and breast feeding - Management of normal puerperium 	
UNIT IV	NEW BORN BABY	6 hrs.
	<ul style="list-style-type: none"> - Resuscitation and immediate care of newborn.including SGA & LGA - Normal characteristics and essential care of newborn. - Asphyxia Neonatarum, respiratory distress - Jaundice in newborn - Birth injuries, congenital anomalies, infection in newborn, and vomiting in newborn. - Still birth – incidence, causes and prevention. - Care of low birth weight babies in labour room and nursery / NICU. 	
UNIT V	MEDICAL DISORDERS IN PREGNANCY	5 hrs.
	<ul style="list-style-type: none"> - Hypertensive disorders – Pregnancy induced hypertension, Eclampsia. - Anaemia in pregnancy - Diabetes mellitus in pregnancy - Heart diseases - Renal disorders in pregnancy - Jaundice in pregnancy - Pulmonary TB - Pregnancy with STD, HIV / AIDS. 	
UNIT VI	HIGH RISK PREGNANCY	10 hrs.
	<ul style="list-style-type: none"> - Abortion - Hydatiform mole - Ectopic pregnancy - Medical termination of pregnancy - Antepartum haemorrhage – Placenta previa, Abruption placenta - Vomiting in pregnancy - Pregnancy in Rh negative women - Multiple pregnancy, hydramnios - Preterm labour - Premature rupture of membrane 	

	<ul style="list-style-type: none"> - IUGR, postdatism - Pregnancy with previous caesarean section - Fibroid with pregnancy - Ovarian tumour with pregnancy 	
UNIT VII	HIGH RISK LABOUR	3 hrs.
	<ul style="list-style-type: none"> - Abnormal presentation – Unstable lie, Occipitoposterior, face and brow presentation - Breech presentation, compound presentation - Abnormal uterine action in labour and active management of labour - Contracted pelvis and CPD - Obstructed labour, rupture of uterus, injuries of maternal birth canal, cord prolapse. 	
UNIT VIII	ABNORMALITIES OF PUERPERIUM	4 hrs.
	<ul style="list-style-type: none"> - Puerperial pyrexia and sepsis - Post partum haemorrhage - Breast complications – Breast engorgement, breast abscess, acute mastitis - Psychiatric disorders in puerperium 	
UNIT IX	OBSTETRICAL EMERGENCIES & OPERATIVE OBSTETRICS	3 hrs.
	<ul style="list-style-type: none"> - Uterine rupture, cervical tear - D & E , S & E - Use of instruments – Ephysiotomy Forcep, Vacuum - Caesarean section 	
UNIT X	PHARMACOTHERAPEUTICS	2 hrs.
	<ul style="list-style-type: none"> - Oxytocics, Prostaglandins – use in obstetrics - Anaesthesia and analgesics used in obstetrics 	
UNIT XI	SPECIAL INVESTIGATIONS IN OBSTETRICS	2 hrs.
	<ul style="list-style-type: none"> - USG, NST, CTG - Radiography 	
UNIT XII	CURRENT TRENDS IN REPRODUCTIVE HEALTH(RCH)	4 hrs.
	<ul style="list-style-type: none"> - Infertility, genetic counseling - Unwanted pregnancy - Unwed mother - Advances in obstetrics and maternity care. 	
UNIT XIII	GYNAECOLOGICAL NURSING	4 hrs.
	<ul style="list-style-type: none"> - Common Gynaecological Problems 	

- Cervical erosions, Carcinoma
- Fibroids, Uterine and Cervical Prolaps
- Uterine Inversion etc

PRACTICUM : Practice following Procedures

- Antenatal, Postnatal & per vaginal exam.
- Conduct normal delivery (For male candidates minimum conduct of 5 deliveries)
- Motivation of Planned Parenthood, advice on family planning methods.
- Assist in various diagnostic & therapeutic procedure including IUD insertion & removal.
- Follow Nursing process in providing care to 3-6 patients.

PRACTICUM / CLINICAL EXPERIENCE : **TOTAL HOURS : 240**

- Antenatal OPD or ANC Ward : **hours : 50**
- Labour Room : **hours : 60**
- Post natal ward/ OPD : **hours : 50**
- Gynaecology ward : **hours : 30**
- OPD, Family Planning clinics & visits : **hours : 30**
- Operation Theatre : **hours : 20**

EVALUATION:

Paper	Subject Maternal Nursing	Duration	Internal Assessment	External Assessment	Total Marks
6.	Theory	3	25	75	100
1.	Practical		50	50	100

Internal Assessment:

Theory: 25 Marks
Practical: 50 Marks
Total: 75 Marks

Details as follows:

Internal Assessment (Theory): 25 Marks

(Out of 25 Marks to be sent to the University)

Mid-Term: 50 Marks

Prelim: 75 Marks

Total: 125 Marks

(125 Marks from mid-term & prelim (Theory) to be converted into 25 Marks)

Internal Assessment (Practical): 50 Marks

(Out of 50 Marks to be sent to the University)

Details as follows:

1. Mid-Term Exam:

050 Marks

2.	Preliminary Exam:	050 Marks
3.	Clinical Evaluation & Clinical Assignment:	500 Marks
	i) Case study: Two (50marks each):	100 Marks
	ii) Case presentation: One:	050 Marks
	iii) Clinical evaluation (100 marks each):	300 Marks
	ANC/ LABOUR ROOM/ PNC	
	iv) Group Health teaching (One):	025 Marks
	v) Nursing care Plan (Gyanae: One):	025 Marks
	Total Marks:	600 Marks
	(600 Marks from Practical to be converted into 50 Marks for Internal Assessment (Practical))	

External Assessment (Theory): 75 Marks (University Examination)
External Assessment (Practical): 50 Marks (University Examination)

REFERENCES

1. Myles Text Book of Midwives , Eds; Diane M. Fraser and Margaret A. Cooper
14th Ed , Churchill Livingstone.
2. D.C. Dutta Text Book of Obstetrics including Perinatology and Contraception 6th
Edition , 2004 New Central Book Agency.
3. Hawkins and Bourne , Shaws Textbook of Gynaecology, Eds; V.G Padubidri and
Shirish N Daftary, 13th ed, Reed Elsevier India.
4. S S Ratnam, K Bhasker Rao and S Arulkumaran, Obstetrics and Gynaecology for
Postgraduates , Vol 1 and Vol 2, Orient Longman Ltd 1994
5. lower milk, perry, Bobak:”Maternity and women’s Health Care” 6th ed.; 1997.
C.V Mosby.
6. C.S.Dawn: Textbook for obstretics & neonatology 12th edition.

CHILD HEALTH NURSING

Placement: Ist Year

Time Allotted Theory : 60hrs

Practical : 240hrs

COURSE DESCRIPTION :

This course is aimed at developing an understanding of the modern approach to child care, the principles of child health nursing and the common problems of neonates and children in health and sickness.

OBJECTIVES : At the end of the course, the students will be able to:-

1. Explain the modern concept of child care and the principles of child health nursing.
2. Describe the normal growth and development of children in various age groups.
3. Explain the physiological response of body to disease conditions in children.
4. Identify the health needs and problems of neonates and children, plan and implement appropriate nursing interventions.
5. Identify the various preventive, promotive and rehabilitative aspects of child care and apply them in providing nursing care to children in the hospital and in the community.

COURSE CONTENT

UNIT I	INTRODUCTION TO CHILD HEALTH NURSING	8 hrs.
	<ul style="list-style-type: none">- Modern concept of child care- Internationally accepted rights of the child.- Changing trends in hospital care, preventive, promotive and curative aspects of child health Child morbidity and mortality rates- National policy and legislation's in relation to child health and welfare.- National programmes related to child health and welfare.- Differences between adult and child- Hospital environment for a sick child and role of a paediatric nurse in caring for the hospitalized child- Principles of pre and post operative care of infants and children- Paediatric nursing procedures Prepn of child for diagnostic tests, collection of specimens, calculation and administration of oral and parenteral medication, feeding, adm of oxygen, nebulisation ,collection of specimens ,exchange transfusion, restraints	
UNIT II	THE HEALTHY CHILD	12 hrs.
	<ul style="list-style-type: none">- Growth & development ---. Principles & factors affecting growth & development.- Assessment of growth and development	

- Growth & development from birth to adolescence, needs of normal children through stages of development and parental guidance.
- Nutritional needs of infants and children principles of paediatric nutrition
 - Breast feeding
 - Artificial feeding & Weaning
- Infancy ,toddler, pre schooler, school age child and adolescents.
- Role of play in children - Need, importance and value of play, selection of play material and nurse's role.
- Preventive immunization

UNIT III CARE OF THE NEWBORN. 4 hrs.

- Characteristics and care of a newborn.
- Asphyxia neonatorum & neonatal resuscitation.
- Low birth weight infants
- Nursing management of common neonatal disorders.
 - Neonatal jaundice & photo therapy
 - Neonatal sepsis & hypoglycemia
 - Organization of Neonatal units, Prevention & Control of infection
 - Critical care concept in child health

UNIT IV NURSING MANAGEMENT OF COMMON CHILDHOOD ILLNESS. 32 hrs.

- (a) **Nutritional deficiency disorders.**
 - Protein energy malnutrition
 - Vitamin deficiency disorders (Rickets, scurvy, Vit A deficiency disorders)
- (b) **Respiratory diseases & disorders .**
 - Acute bronchitis & Bronchiolitis
 - Pneumonia
 - Branchial Asthama
- (c) **Disorders of the gastro-intestinal system.**
 - Acute gastroenteritis
 - Tracheo esophageal fistula
 - Cleft lip and palate
 - Hypertrophic Pyloric Stenosis
 - Hirschsprung's disease & Intestinal Obstruction
 - Anorectal anomalies
- (d) **Cardiovascular system**
 - Rheumatic fever
 - Congenital heart diseases
 - Congestive cardiac failure
- (e) **Disorders of Genito urinary System**
 - Acute glomerulo nephritis
 - Nephrotic Syndrome
 - Wilm's tumour & Congenital disorders
- (f) **Neurological disorders**
 - Convulsions in children & Epilepsy

- Meningitis & Encephalitis
- Hydrocephalus, Meningocele and meningocele
- (g) **Haematological disorders**
 - Anaemia & Thalassemia
 - Idiopathic thrombocytic Purpura & Hemophilia
 - Leukaemia
- (h) **Endocrine Disorders**
 - Juvenile Diabetes Mellitus
- (i) **Orthopaedic Disorders**
 - CTEV (Club foot) , Congenital hip dislocation
 - Fractures
- (j) **Disorders of Skin, Eye & ENT**
 - Skin** : Eczema, urticaria, scabies, pediculosis, worm infestations
 - Eye & ENT** : Tonsillitis, Deafness, Otorrhoea, Otitis Media, Cong Cataract, hypertelorism
- (k) **Communicable Diseases in Children**
 - Measles/rubella, Chicken pox
 - Diphtheria, whooping cough
 - Tetanus, Poliomyelitis
 - AIDS
 - Tuberculosis
- (m) **Paediatric Emergencies**
 - Accidents, Poisoning ,Stings & Bites
 - Foreign bodies, Haemorrhage & Drowning Burns

**UNIT V MANAGEMENT OF BEHAVIOURAL PROBLEMS
IN CHILDREN CHILDHOOD ILLNESS.**

04 hrs.

- Enuresis, Encoprecis, temper tantrums somnambulism, juvenile delinquency, speech defects, tics, pica, antisocial behaviour
- **Management of challenged children**
Need for early diagnosis ,treatment and rehabilitation of Mentally challenged – Mental retardation
- Physically challenged – Cerebral palsy
Socially challenged – Child abuse & child labour

PRACTICUM

The students will :-

1. Be posted in paediatric medical and surgical ward, OPD in hospital, health centre and neonatal unit..
2. Visit a centre for handicapped children and child welfare centre and write observation report.
3. Write an observation study of normal children of various age groups in home/nursery school/creche.
4. Follow nursing process in providing care to 3-6 children.
5. Write at least two nursing care studies and do a presentation.
6. Give two planned health teachings, one in hospital and one in OPD/health centre.
7. Practice the following nursing procedures :
Taking pediatric history

Physical assessment of children
 Baby bath
 Feeding – spoon & vati, nezogastric feeding.
 Restraining
 Calculation of dosage of drugs and administration of medications and injections & Intra Venous Infusion.
 Collection of specimens
 Enema. bowel wash. colostomy irrigation
 Steam and Oxygen inhalation
 Preparation to assist with diagnostic tests and operations
 Examination/Assessment of a newborn
 Neonatal resuscitation
 Care of a baby in incubator and on ventilator
 Photo therapy
 Assist in exchange transfusion and other therapeutic procedures

CLINICAL EXPERIENCE :

Total Hours : 240

- Pediatric Medical **hours : 60**
- Pediatric Surgical **hours : 60**
- Intensive Pediatric Critical Unit **hours : 30**
- NICU **hours : 30**
- OPDs including (CWC, CGC) **hours : 30**
- Visits – (various agencies: i.e., crèches, schools, nursery, Special schools & handicapped, etc.) **hours : 30**

EVALUATION :

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
7.	Theory	3	25	75	100
2.	Practical		50	50	100

Internal Assessment:

Theory: 25 Marks
Practical: 50 Marks
Total: 75 Marks

Details as follows:

Internal Assessment (Theory): 25 Marks

(Out of 25 Marks to be send to the University)

Mid-Term: 50 Marks

Prelim: 75 Marks

Total: 125 Marks

(125 Marks from mid-term & prelim (Theory) to be converted into 25 Marks)

Internal assessment (Practicum): 50 Marks

(Out of 50 Marks to be send to the University)

Practical Exam

1) Mid-Term exam

050 Marks

2) Prelim	050 Marks
3) Clinical Evaluation & Clinical Assignment:	500 Marks
i) Case study (two): (One Paediatric Medical & One paediatric surgical-50 marks each)	100 Marks
ii) Case presentation (one)	050 Marks
iii) Clinical evaluation of compressive nursing care- (One paediatric medical, One paediatric surgical & One NICU-100 Marks each)	300 Marks
iv) Health teaching	025 Marks
v) Assessment of growth and development (Preterm baby, Infant, Toddler, Preschooler, and schooler (Marks 20 each).	100 Marks
Total:	675 Marks
(675 Marks from Practicum to be converted into 50 Marks)	

External Assessment: 125 Marks
(University Exam)

Theory:	75 Marks
Practical:	50 Marks
Total:	125 Marks

REFERENCES:

1. Marlow Dorothy and Redding. Text book of Paediatric Nursing. 6th edition Hartcourt India Ltd, New Delhi, 2001.
2. Wong Dona et al. Whaley and Wongs Nursing care of Infants and children. 6th edition. Mosby Company, Philadelphia, 2000.
3. Black G Florence and Wright. Essential of Paediatric Nursing. JB Lippincott & Co. Philadelphia.
4. Parthasarathy et al. IAP Text book of Paediatrics. 1st edition Jaypee Brothers, New Delhi-2000.
5. Ghai OP et al. Ghai's Essentials of Paediatrics. 5th edition. Mehta Offset works, New Delhi, 2000
6. Vishwanathan and Desai. Achar's Text book of Paediatrics. 3rd edition. Orient Langman. Chennai, 1999.

MEDICAL –SURGICAL NURSING

Placement : Ist Year.

Allotted Theory: 90hrs.

Practical: 270hrs.

COURSE DESCRIPTION :

The purpose of this course is to widen the students' knowledge and develop proficiency in caring for patients with Medical Surgical problems. This course includes review of relevant anatomy & physiology, pathophysiology in Medical Surgical disorders & the nursing management of these conditions.

OBJECTIVES : At the end of the course, the F.Y.B.Sc. Nursing students will-

1. explain relevant Anatomy & Physiology of various systems of the body.
2. explain etiology, pathophysiology & manifestations of various disorders.
3. explain the actions, side-effects & nursing implications in administering drugs for various disorders.
4. discuss the recent advancement in the investigations, treatment & care of patients with Medical Surgical conditions.
5. develop skill in giving comprehensive nursing care to patients following the steps of nursing process.
6. assist the patients & their families in identifying & meeting their own health needs.
7. provide planned & incidental health education on various aspects related to disorder & relevant care.
8. appreciate the role of the nurse in the Medical Surgical health team.

COURSE CONTENTS :

UNIT I INTRODUCTION TO MEDICAL SURGICAL NURSING 4 hrs

- Introduction to medical surgical nursing.
- Review of concepts of comprehensive nursing care in medical surgical conditions.
- Nurse, patient & his/her family
- Functions of nurse in the outpatient department.
- Intensive care units. * Staff requirement. Client's needs & nsg. care.

UNIT II NURSING MANAGEMENT OF PATIENTS WITH SPECIFIC PROBLEMS 10 hrs

- Fluid & electrolyte imbalance.
- Dyspnoea, cough & respiratory obstruction.
- Fever & nursing care.
- Shock & nursing care.
- Unconsciousness & nursing care.
- Pain perception & nursing care.

- Chest injuries, resp. arrest & insufficiency
- Special respiratory therapies & drugs used in the management.

UNIT VI NURSING MANAGEMENT OF CLIENTS WITH GENITO-URINARY PROBLEMS. 05 hrs.

- Review of anatomy & physiology of the genito-urinary system & assessment of clients with genito-urinary problems.
- Pathophysiology & management of-
 - congenital disorders, urinary infections.
 - nephritis, renal calculi.
 - acute renal failure, chronic renal failure, end stage renal disease.
 - special procedures : dialysis, renal transplant.
 - benign prostatic hypertrophy.
 - drugs used in the management of these patients.

UNIT VII NURSING MANAGEMENT OF CLIENTS WITH PROBLEMS OF THE DIGESTIVE SYSTEMS 10 hrs.

- Review of anatomy & physiology of gastro-intestinal system & accessory organs& assessment of clients with gastro-intestinal tract disorders.
- Pathophysiology, diagnostic procedures & management of -
 - gastro-intestinal bleeding.
 - peptic ulcer.
 - acute abdomen.
 - infections, colitis, diarrhoea, dysentery & mal-absorption syndrome.
 - cholecystitis.
 - hepatitis, hepatic coma & cirrhosis of liver, portal hypertension.
 - pancreatitis.
 - tumours, hernias, fistulas, fissures, haemorrhoids.
 - drugs used in the management of these patients.

UNIT VIII NURSING MANAGEMENT OF PATIENTS WITH ENDOCRINE PROBLEMS. 5 hrs

- Review of anatomy & physiology & assessment of clients with endocrine disorders.
- Pathophysiology, diagnostic procedures & management of -
 - thyroid disorders.
 - diabetes mellitus, diabetes insipidus.
 - adrenal tumours, pituitary disorders.
 - drugs used, diagnostic procedures & nursing management of patient with above problems.

UNIT IX NURSING MANAGEMENT OF PATIENTS WITH MUSCULO-

SKELETAL PROBLEMS.**5 hrs.**

- Review of anatomy, physiology & assessment of patients with musculo-skeletal disorders.
- Osteomalacia, osteoporosis, osteomyelitis, bursitis.
- Fractures, dislocation & trauma.
- Prolapsed disc.
- Prosthesis & rehabilitation.
- Transplant & replacement surgeries.

UNIT X NURSING MANAGEMENT OF PATIENTS WITH DISORDERS OF FEMALE REPRODUCTIVE TRACT. 3 hrs.

- Disorders of menstruation & inf. of genital tract. *Benign & malignant tumours of genital tract & RVF & VVF. * Climacteric changes & associated problems.

UNIT XI NURSING MANAGEMENT OF PATIENTS WITH ONCOLOGICAL DISORDERS. 5 hrs.

- Types of neoplasms & related pathophysiology, diagnostic procedures, modalities of treatment & nurses' role.
- Special therapies : chemotherapy & radiotherapy & nsg. care.
- Preventive measures, other therapies.

UNIT XII NURSING MANAGEMENT OF PATIENTS WITH BURNS & RECONSTRUCTIVE SURGERIES. 3 hrs.

- Pathophysiology, assessment & nursing management of patients with burns.
- Nursing management of patients with reconstructive surgeries.

UNIT XIII NURSING MANAGEMENT OF PATIENTS WITH COMMUNICABLE DISEASES, STDS & HIV/AIDS. 5 hrs.

- Nursing management of patients with common communicable diseases & STDs.
- Nursing management of patients with immunological disorders including HIV/AIDS.

UNIT XIV NURSING MANAGEMENT OF PATIENTS WITH DISEASES OF EYE,EAR,NOSE,THROAT & SKIN. 5 hrs.

- Assessment & nursing management of patients with eye disorders.
(eye injuries, cataract, inf., blindness)
- Assessment & nursing management of patients with ear disorders (deafness).
- Assessment & nursing management of patients with nose & throat disorders. (DNS, tonsillitis).

- Assessment & nursing management of patients with skin disorders.
(fungal inf., herpes, psoriasis etc)

UNIT XV NURSING MANAGEMENT OF PATIENTS WITH BLOOD DISORDERS. 5 hrs.

- Review of anatomy & physiology of blood & blood products.
- Pathophysiology, diagnostic procedures & management of blood disorders.
 - anaemia, leukaemia.
 - bleeding disorders, haemophilia, purpura etc.
 - blood transfusion, safety checks, procedure & requirements, management of adverse transfusion reaction, records for blood transfusion.
 - management & counseling of blood donors, phlebotomy procedure, & post-donation management.
 - blood bank functioning & hospital transfusion committee. Biosafety & waste management in relation to blood transfusion.

UNIT XVI NURSING IN EMERGENCIES. 3 hrs.

- Cardiac emergencies. (included in unit iv)
- Trauma.
- poisoning.
- crisis mgt :thyroid, hypertensive, & adrenal crisis included in unit viii & iv.

PRACTILUM/CLINICAL EXPERIENC S :

Total hrs. 270.

1. Medical unit	hrs.25.
2. Surgical Uni	hrs.25.
3. Cardiology Unit	hrs.30.
4. Neurology Unit	hrs.30.
5. Intensive care Unit	hrs.35.
6. Critical care Unit	hrs.35.
7. Burns Unit	hrs.15.
8. Orthopaedic Unit	hrs.15.
9. Ophthalmic Unit	hrs.10.
10. Ear, Nose Throat Unit	hrs.10.
11. Artificial Kidney Dylasis	hrs.15.
12. Onchology Unit	hrs.10.
13. Skin ward	hrs.10
14. General OPD	hrs.05.

EVALUATION :

Paper	Subject Medical & Surgical Nursing	Duration	Internal Assessment	External Assessment	Total Marks
8.	Theory	3	25	75	100
3.	Practicals		50	50	100

Internal Assessment:

Theory:	25 Marks
Practical:	50 Marks
Total:	75 Marks

Details as follows:

Internal Assessment (Theory): 25 Marks

(Out of 25 Marks to be send to the University)

Mid-Term: 50 Marks

Prelim: 75 Marks

Total: 125 Mark

(125 Marks from mid-term & prelim (Theory) to be converted into 25 Marks)

Internal Assessment (Practical): 50 Marks

(Out of 50 Marks to be send to the University)

Practical Exam

Mid-Term Exam 050 Marks

Prelim 050 Marks

3) Clinical Evaluation & Clinical Assignment: 600 Marks

1. Case Study (Two) (50 Marks Each) 100 Marks

(One Medical & One Surgical Nursing)

2. Case Presentation (Two) (50 Marks Each) 100 Marks

(any specialty i.e., ENT/Ophthalmology/Skin/Burns.)

3. Nursing care plans (25 marks each) 100 Marks

i.e., Neurology/Orthopedic/Cardiology/Onchology.

4. Clinical Evaluation Comprehensive Nursing Care-300 Marks

(100 marks each) i.e., medical Nursing, Surgical Nursing,

Critical Care Units

Total: 700 Marks

(700 Marks from practical to be converted into 50 Marks)

External Assessment: 125 Marks (University Examination)

Theory : 75 Marks

Practical: 50 Marks

REFERENCES:

1. LongPhipps. Casseyer. Medical Surgical Nursing. A Nursing process approach. Pub. Mosby co. 1993
2. Lewis, Collier, Heitcemper. Medical Surgical Assessment& management of clinical problems.
3. Brunner & Suddharth. Medical Surgical Nursing Pub. J.B.Lippincott co.
4. Luckmann& Sorensen. Medical Surgical Nursing A phscho physiologic approach. Pub. W.B. Saunders co.
5. Joyce M. Black, E.M. Jacobs; Medical, Surgical Nursing, Clinical Management for continuity of care; 5th ed. ; 1997; by W.B. Saunders company.(part I&II).

ENGLISH

Placement: Ist Year

Time Allotted: Theory – 60 Hrs

COURSE DESCRIPTION :

This course is designed to help the student understand and usage of English language required for their professional work.

OBJECTIVES : After the course the students will develop

1. Ability to speak and write grammatically correct English
2. Effective skill in reading and understanding the English language
3. Skill in reporting

COURSE CONTENTS :

UNIT I

15 hrs.

- Remedial study of Grammer
- Review of grammer, vocabulary and effective use of dictionary
- Prepare task oriented seminars
- Symposia and panel discussion

UNIT II

10 hrs.

- The ability to understand selected passage and express meaning in one's own words.
- Reading and comprehension of the prescribed books

UNIT III

20 hrs.

- The study of various forms of composition
- Note taking
- Diary
- Nurses notes, anecdotal records
- Writing of summary
- Nurses reports on health problems

The students will submit one sample of each item from her own practical experience.

UNIT IV

15 hrs.

- Verbal communication
- Oral reports
- Summarization of discussion
- Debate
- Listening comprehension – Film, Cassette and Radio

PRACTICUM :

- The clinical experience in the wards and bed side nursing will provide opportunity for students to fulfill the objectives of learning language.
- Assignment on writing and conversation through participation in discussion, debates, seminars and symposia. The students will gain further skills in task oriented communication.

EVALUATION :

Paper	Subject * English (Qualifying)	Duration	Internal Assessment	External Assessment	Total Marks
9.	Theory	--	100 College level qualifying exam, minimum passing Marks 33%.		100

*** College level qualifying exam to appear in University Examination, minimum passing Marks 33%.**

Internal Assessment: 100 Marks

(Out of 100 Marks to be send to the University along with Internal Assessment Marks of other subjects for inclusion in the Mark Sheet.)

Mid-Term:	50 Marks
Prelim:	50 Marks
Total:	100 Mark

REFERENCES :

Some extracts from the book “ How to Win Friends & Influence People” – Dale Carnegie .

IInd YEAR

POST BASIC B.Sc NURSING

SYLLABUS

SOCIOLOGY

Placement: IInd Year

Time Allotted: Theory : 60 Hrs

COURSE DESCRIPTION :

This course is to reorient students to sociology related to community of social institutions in India and its relationship with health, illness and nursing.

OBJECTIVES : At the end of the course, the student will

- describe sociological concepts applicable to nursing
- determine role of sociology in nursing as related to social institutes in India.
- Develop positive attitudes towards individual family and community.

COURSE CONTENTS :

UNIT I	INTRODUCTION OF SOCIOLOGY TO NURSING	5 hrs
	<ul style="list-style-type: none">- Behavioural sciences, social sciences, arts and sciences-meaning , fields and scope, their relationship with nursing- Concepts of social development and indicators of health, role of nurse as a social scientist and change agent in health for all.- Development of medical sociology – meaning, fields, scope, sociology and nursing methodology of sociology, sociology as science.- Meaning, definition, scope and significance of sociology, contribution of August Comte, Durkheim, Max Weber, Maciver to the development of sociology. Contribution of Indian sociologists such as Radhakamal Mukherjee, Ghurye, Kapadlam Srinivas.- Individual and society, their relationship with each other approaches to study their interdependent atomism and holism and contract theory.	
UNIT II	FUNDAMENTAL CONCEPTS IN SOCIOLOGY	15 hrs
	<ul style="list-style-type: none">- Concepts its meaning, utility –primary concepts in sociology – institutions, association, organisation-meanings, definitions, functions, comparison- Groups – types, classification, meanings, definitions, characteristics of primary and secondary groups. Their comparison, ingroup, outgroup, reference group- Social groups crowds-features, characteristics type, nature, formation of crowd, public, audience as a group, public opinion, nation, race- Society- development of society from primitive, slavery, feudal, capitalist to complex. Relevance of societal knowledge to health workers.- Human society and animal society comparison uniqueness of Human society language, adaptation of man to nature, environment, ecology from primitive to modern development with reference to health practices.- Indian society-its peculiarities – tribal community, rural community and comparison, pachayat raj-doctrin of karma dharma artha and kama, moksa, ashram in traditional hindu society.- Status and role – type, function, characteristics of status and role, relationship between status and role, doctor’s role, nurses role, patients role.- Concepts of structure and functions – elements definitions-meanings of structure and function, interdependence, social dysfunction causes- Social system – definition, meanings characteristics, prerequisite of social system, type of social system- Social stratification – features, significance (or functions) and functional necessities if stratification forms of stratification – caste and class	

- Caste system unique feature of Indian social system, nature of caste system, hierarchy, segmental division, restrictions or taboos, civil and religious disabilities, limited choice of occupation, endogamy advantage maintaining partly of genes Dr. G.S. Gurye's contribution
- Class system – division three-upper, middle, lower, features, characteristics Karl Marx's theory of class formation, distinction between class and caste.

UNIT III SOCIAL INSTITUTIONS 10 hrs

- Social institutions – features, functions (role) meanings, definitions-distinction between institutions and community, institutions and association, institutions and society, various social institutions
- Norms as social institutions, meanings, definitions, characteristics, classifications of norms – mores, taboos, customs, folkways, fashion-fads, laws institutionalize
- Marriage as institution, definition, meanings, nature, type, characteristics, forms of marriage, functions of marriage
- Family as institution-meaning definitions, types, characteristics, functions or roles of family a basic unit or group of society
- Family traditional and modern, Indian family, role of women in traditional and modern family, divorce, family problems, problem family.
- Role of family in health, illness and diseases, family and nurse, role of family in the context of women's and children's health in India from girl, marriage, oldage.
- Religion institution, definition, meanings, basic components – a system of beliefs and rituals, ancient and modern concepts. Indian set up religion Hindu, Jain, Buddhism Islam, Christianity.
- Economic as Institution – meanings, definitions stages of economic life- food gathering, pastoral, agricultural, industrial
- Education Institutions – definitions, meanings, functions, roles, history of education and developments
- Politics as institutions – definitions, meanings, functions, roles, changing pattern, emperor, democracy, govt. and role of state in health. Public health.

UNIT IV CULTURE 5 hrs

- Planning-definitions of culture in sociology and anthropological, components, characteristics, origin and development of culture.
- Nature and functions of culture-variability ethnocentrism in culture-culture and health behavior.
- Culture and personality, culture and civilization, cultural lag
- Culture and society, patterns of culture, inventions and discovery

UNIT V SOCIAL INTERACTION 5 hrs

- Social interactions – meanings, factors, influencing interaction, definition, Importance
- Social process – meaning, definitions, co-operation, competition, conflicts, accommodation, assimilation, revolution and war.
- Concepts of social control meaning definition type of social control socialization, religion and sanctions, agencies of social control family, peer groups, schools, neighborhood, communication. Adult socialization, realization.

UNIT VI SOCIAL CHANGE AND PROGRESS**5 hrs**

- Social change, meanings, definitions, factors influencing social change. Causes of social change, theories, type – planned and natural.
- Social change in India
- Dr. M.N. Srinivas's concept of sanskritization, westernization and modernization.
- Education, urbanization, industrialization, development of transportation and communication.
- Factors affecting social change – demographic, technological, agricultural development, economic, cultural, planned change

UNIT VII DISORGANISATION AND SOCIAL PROBLEMS**15 hrs**

- Meaning and definition of organization and disorganization, causes of disorganization, types of disorganization – individual, family, community, effect of disorganization on Individual, family and community
- Disorganization in the Society causes, type of crime, health related problems
- Juvenile delinquency meaning, causes, children act, Government remedial measures and NGO role in the management problem. Child abuse, child labour, related health problems.
- Prostitution – meaning, history, type, causes welfare steps, health related problems.
- Alcohol drug and substance abuse causes history, impact on adolescent, family. Health related problems
- Poverty, unemployment, history causes Remedial measures, Health related problems
- Beggary meaning, causes, history Remedial measures and health related problems.
- Population growth and related problems- population explosion and causes, consequences of rapid growth, remedies to control the growth. Eg. Population education, contraceptive, motivation, women's education
- Visit to available social agency

EVALUATION :

Paper	Subject Sociology	Duration	Internal Assessment	External Assessment	Total Marks
10.	Theory	3	25	75	100

Internal Assessment: 25 Marks**Theory: 15 Marks****Clinical Assignment: 10 Marks****Total: 25 Marks**

(Out of 25 Marks to be send to the University)

Internal Assessment (Theory): 15 Marks

Mid-Term: 50 Marks

Prelim: 75 Marks

Total: 125 Marks

(125 Marks from mid-term & prelim to be converted into 15 Marks)

Clinical Assignments: 10 Marks**External Assessment (Theory): 75 Marks
(University Examination)**

REFERENCES :

1. MacIver & Page : Society; India : Macmillan, 1964
2. MacIver & Page : Society: An introductory analysis; London, 1956
3. Murdock: Social structure; New york,1944
4. Fairchild, H.P.:Dictionary of sociology; New York, 1944
5. Barnes, H.E. : Social institutions; New York, 1946
6. Mamoria, C.B.: Social problems and social disorganization in India; Mumbai, 2003
7. Manelkar, R.K.: Sociology for nurses; Mumbai, 2002

COMMUNITY HEALTH NURSING

Placement : IInd year

Time Allotted Theory : 60 Hrs.

Practical : 240 Hrs.

COURSE DESCRIPTION:

The course enables the students to acquire knowledge and understanding of the changing concepts of comprehensive community health nursing practice, the national health care delivery system and to participate in the delivery of community health nursing practice.

This course also broadens the understanding in public health nursing administration, responsibility of nurse for early case finding, health assessment and health education based on principles of primary health care, Nursing process approach and comprehensive nursing care to the individual, family and community.

OBJECTIVES : At the end of the course the student will

- 1) Explain the concept of various factors contributing the health of individual family and community.
- 2) Explain and analyze health need of individual family and community based on factors contributing to health and illness
- 3) Describe national health care delivery system.
- 4) Describes epidemiological methods and principles of prevention and control of illness in the community.
- 5) Study implementation of national programmes and role of CHN in prevention and control of diseases.
- 6) Identify the role of personnel working in the community health setup and appreciate the integrated approach to community health.
- 7) Plan the work of community health nurse and supervise the health workers.
- 8) Study concept of public health administration and role of nurse as manager and supervisor.

COURSE CONTENT :

UNIT I	COMMUNITY HEALTH AND COMMUNITY HEALTH NURSING	8 hrs.
-	Changing concepts of health	
-	Determinants of health	
-	Introduction to community health & CH Nursing	
-	Principles of working in a community.	
-	Primary health care - concepts and principles.	
-	Role of nurse in promoting primary health care.	
-	Health for all - concepts strategy for HFA.	
-	Community health assessment and diagnosis.	
UNIT II	FAMILY HEALTH CARE & SERVICES	10 hrs.
-	Concepts, Objectives scope & Principles of family health services.	
-	Family as a unit of community health service.	
-	Factors influencing family health and high-risk families.	
-	Family Health assessment, Health risk families.	

- Principles and technique of home visits.
- Nursing process in family & community health care. Establishing working relationship with the family.
- Working with families in relation to prevention of disease and promotion of health.
- Care of Sick, & care of physically handicapped and mentally retarded at home
- Family health records.

UNIT III HEALTH ADMINISTRATION IN INDIA. 10 hrs.

- Health care delivery system in India.
- Health planning, National health policy and Five Years plan
- Organization and administration of health services at central, state, district level and Rural Health Services (Panchayati Raj).
- Monitoring and evaluation and health services
- System of medicines.
- Centrally sponsored health schemes.
- Role of voluntary health organization & International Health agencies.
- Health team concept, Public health legislation.
- Community Health Nursing Administration.
- Role of health personnel in community health Practice.
- Training Programmes for various health workers.
- Management and supervision in community health nursing practice.

UNIT IV HEALTH EDUCATION (IEC Information, Education, Communication) 5 hrs.

- Aims, concepts and scope of health education.
- Communication and health education.
- Methods and media for health education in community.
- Planning for health education and role of nurse in I.E.C.
- Central Health Education Bureau.

UNIT V ROLE OF NURSE IN NATIONAL HEALTH PROGRAMMES. 15 hrs.

- Development of community health services in India.
- Major health problem in India.
- National health programme for communicable and Non-communicable disease.
- Maternal and child health programme.
- Nutritional programme.
- Family welfare
- School health Programme.
- Occupational Health Programme.
- Disaster Management.
- As a health team members.
- Records and reports in Community health.

UNIT VI EPIDEMIOLOGY. 7 hrs.

- Epidemiology - Definition, Concepts, aims, objectives and methods and Principles.
- Epidemiology - Theories and Models.
- Application of Epidemiological Principles in community health.
- Monitoring and surveillance.
- Levels of prevention of disease

UNIT VII BIO STATISTICS AND VITAL STATISTICS.**5 hrs.**

- Introduction, definition and scope, legislation.
- Report, recording and compiling of vital statistics at the local State, National and International level.
- Definitions and methods of computing vital statistics.
- Methods of presenting data.
- Management Information System.

PRACTICUM

- Each students will prepare to community profile
- The students will be allotted families to give comprehensive nursing care through nursing process approach in Urban / Rural area.
- The students will participate in activities of Primary Health Center, Sub Centre, Community Health Centres, MCH Centre etc.
- Visit to the selected Health and Welfare agencies.
- To plan and conduct Health Education Programmes – individual/ groups/ community/Mass Health Education and Health Exhibition, to prepare simple A.V. AIDS.
- To supervise students and other health workers in the community settings.
- Students will be posted atleast 2 weeks for rural community health experience.
- To conduct simple family health survey analyze the data collected (Community dignosis)
- To write two family health care studies in urban and rural area. (One in each)

CLINICAL EXPERIENCE :**TOTAL HOURS : 240**

I)	<u>Urban Public Health Experience</u>	hours 160
	- Family oriented Health care	hours 40
	- Community Assessment / Community dignosis (Family Health Survey)	hours 30
	- School Health Programme	hours 20
	- Health Education	hours 20
	- Urban Public Health Centres (Various Clinics)	hours 30
	- Educational Visits	hours 30
II)	<u>Rural Public Health Experience</u>	hours 80 (2 weeks)
	1. Participation in Primary Health Care PHC, SC, R.H., etc.	hours 30
	2. Family oriented Health care	hours 10
	3. Public Health Administration	hours10
	4. Visits to various Health agencies (Zilha Parishad, D.T.C. District Training Centre, Community Health Centre)	hours 20
	5. Health Education Programme	hours 10

EVALUATION :

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
11.	Community Health Nursing Theory	3	25	75	100
4.	Community Health Nursing Practicals		50	50	100

Internal Assessment:

Theory:	25 Marks
Practical:	50 Marks
Total:	75 Marks

Details as follows:

Internal Assessment (Theory): 25 Marks

(Out of 25 Marks to be send to the University)

Mid-Term:	50 Marks
Prelim:	75 Marks
Total:	125 Mark

(125 Marks from mid-term & prelim (Theory) to be converted into 25 Marks)

Internal Assessment (Practical): 50 Marks**Practical Exam:**

Mid-Term Exam:	050
Marks	
Prelim Exam:	050 Marks

Clinical Evaluation & Clinical Assignment: 325 Marks

1. Clinical Evaluation (family oriented care Urban Area)	100 Marks
2. Community Health Survey & Community diagnosis	025 Marks
3. Family Health Care Study (Urban & Rural settings) (50 marks each)	100 Marks
4. School Health Programme	025 Marks
5. Health Education	025 Marks
6. Rural Public Health (as per guideline):	050 Marks
Total:	425

Marks

(425 Marks from Practical to be converted into 50 Marks)

External Assessment: 125 Marks**(University Examination)**

Theory:	75 Marks
Practical:	50 Marks

REFERENCES

1. Basvanthappa B. T. – Community Health Nursing 2002.
2. Park J. E. - Preventive and social Medicine 17 edition 2003
3. Stanhope - Community Nursing and promoting Health of the aggregate families and Individuals - IInd edition 1988
4. Stanhope - Community Health Nursing process and practice for practitioner IVth Edition 1962
5. Stanhope Routh- Community Health Nursing Workbook, Family as a client, New Delhi 1982
6. Spradely and Barbara – Community Health Nursing
7. Mahajan B. K. – Textbook of Preventive and Social Medicine, IInd edition 1995.
8. Najoo Kotwal – Revised by TNAi “ Public Health Manual “ 1989

MENTAL HEALTH NURSING

Placement: IInd Year

Time Allotted Theory : 60 hrs.

Practical : 240 hrs.

COURSE DESCRIPTION

This course enables the students to recognize and appreciate the causes, symptoms and process of abnormal human behavior.

It also introduces the student to the present day treatment modalities in the light of psychological, social and cultural factors affecting human behavior.

This course helps the student to learn principles of mental health and psychiatric nursing and to develop skills in the management of the mentally ill in hospital and community.

OBJECTIVES : At the end of course, the student will

1. Identify and describe the philosophy and principles of mental health nursing.
2. Describe the historical development of mental health and psychiatric nursing.
3. Classify mental disorders.
4. Develop skills in history taking and performing mental status examination.
5. Describe etiological factors, psycho-pathology, clinical features, diagnostic criteria and treatment methods used for mental disorders.
6. Manage the patients with various mental disorders.
7. Communicate therapeutically with patients and their families.
8. Identify role of the nurse in preventive psychiatry.
9. Identify the legal aspects in practice of mental health and psychiatric nursing.

COURSE CONTENTS

UNIT-I	INTRODUCTION AND HISTORICAL DEVELOPMENT	5hrs.
-	Review of the concept of mental health and illness & mental mechanisms.	
-	History of psychiatry	
-	Historical development of mental health nursing.	
-	Philosophy, principles of mental health and psychiatric nursing.	
-	Theoretical approaches to Psychiatric Nursing.	
-	Concept of normal and abnormal behavior.	
-	Role and qualities of mental health and psychiatric nurse	
-	Mental health team and functions of team members.	
-	Legal aspects in psychiatry and mental health services.	
UNIT II	CLASSIFICATION AND ASSESSMENT OF MENTAL DISORDERS	5 hrs.
-	Terminologies used in Psychiatry	
-	Classification of mental disorders- ICD-10 classification	
-	Etiological factors and psychopathology of mental disorders	
-	History taking and mental status examination.	
UNIT III	THERAPEUTIC COMMUNICATION	4 hrs.
-	Communication process	
-	Interview skill	
-	Therapeutic communication techniques.	
-	Nurse patient Relationship.	
-	Therapeutic impasse and it's management	
-	process recording.	

UNIT IV	MANAGEMENT OF MENTAL DISORDERS	20 hrs.
-	Etiological factors, psychopathology, types, clinical features diagnostic criteria, treatment and nursing management of patient with following disorders.	
-	<u>Neurotic Disorders:</u>	
	- Anxiety disorders - General & Panic	
	- Depressive Neurosis	
	- Obsessive Compulsive Neurosis.	
	- Phobic Neurosis	
	- Hypochondriacal Neurosis.	
	- Stress related and Somatoform disorders	
	- Hysteric disorder.	
-	<u>Psychotic Disorders:</u>	
	- Schizophrenic disorders	
	- Affective disorders	
-	Organic Brain Syndromes – acute & chronic	
-	Epileptic disorders	
-	Sleep disorders	
-	Psychosomatic disorders	
-	Personality disorders	
-	Sexual Disorders	
-	Disorders of childhood:- Specific developmental disorders, Pervasive developmental disorders, Attention deficit disorders , Conduct disorders, Enuresis & Encopresis, Speech Disorders, Habit disorders, other disorders.	
-	Adolescent disorders –Attention deficit hyper activity disorder, conduct disorder, substance abuse, depression and suicide, eating disorders, running away.	
UNIT V	MANAGEMENT OF PATIENT WITH SUBSTANCE USE DISORDERS	3 hrs
-	Substance use and misuse	
-	Dependence, intoxication and withdrawal	
	- Classification of psychoactive substances	
	- Etiological & contributory factors	
	- Psychopathology	
	- Clinical features	
	- Diagnostic criteria	
-	Treatment and nursing management of patient with substance use disorders.	
-	Preventive and rehabilitative aspects in substance abuse.	
UNIT-VI	MANAGEMENT OF MENTAL SUB-NORMALITY / MENTALLY CHALLENGED-	2hrs
-	Classification of mental sub-normality	
-	Etiological factors	
-	Psychopathology	
-	Psychometric assessment	
-	Diagnostic criteria and management of sub-normality	
UNIT VII	PSYCHIATRIC EMERGENCIES	4 hrs.
-	Types of emergencies	
-	Psychopathology, Clinical feature, Assessment and diagnosis, Treatment and nursing management of patient with psychiatric emergencies such as-	
-	Suicide, Stupor & Catatonic syndrome, Aggression, other psychiatric emergencies	
-	Crisis Intervention therapy	
UNIT VIII	THERAPEUTIC MODALITIES-	12 hrs.
-	Principles, indication, contraindications and role of nurse in various treatment	

method:

- Pharmacotherapy
- Therapeutic community and Milieu therapy
- Psychotherapy- psychoanalysis, Behavior therapy, Cognitive Therapy, Supportive Therapy, Hypnosis, Abreaction, Relaxation Therapies, Biofeedback.
- Group therapy
- Family therapy
- Occupational Therapy
- Electro convulsive therapy
- Other miscellaneous therapies.

UNIT IX PREVENTIVE PSYCHIATRY- 5 hrs.

- Model of prevention
- Role of nurse in preventive psychiatry
- Psychiatric social worker
- Community mental health nursing
- Community mental health Services and agencies
- National mental health programme

PRACTICUM

The student will be provided opportunity to:

- Observe, record and report the behavior of their selected patients.
- Record the process of interaction.
- Assess the nursing needs of their selected patients. Plan and implement the nursing intervention.
- Counsel the attendant and family members of patient.
- Participate in the activities of psychiatric team
- Conduct an awareness programme on preventive Psychiatry
- Write observation reports after a field visit to the following places:
 - Child guidance clinic
 - School/special School (for mentally subnormal)
 - Mental Hospital
 - Community mental health center
 - De-addiction center.

CLINICAL EXPERIENCES Total Hours. : 240 hrs

- | | |
|---|------------------|
| 1. Psychiatric ward male & female | hours 120 |
| 2. Psychiatric OPD | hours 30 |
| 3. De-addiction center | hours 30 |
| 4. Various departments
(ECT, CGC, Occupational Therapy, Behavioral Therapy, Psychotherapy) | hours 25 |
| 5. Visit to Mental Hospital | hours 10 |
| 6. Community Mental Health (Visit to Rehabilitation centers) | hours 25 |

EVALUATION:

Paper	Subject Mental Health Nursing	Duration	Internal Assessment	External Assessment	Total Marks
12.	Theory	3	25	75	100
5.	Practicals		50	50	100

Internal Assessment:

Theory:	25 Marks
Practical:	50 Marks
Total:	75 Marks

Details as follows:

Internal Assessment (Theory): 25 Marks

(Out of 25 Marks to be send to the University)

Mid-Term: 50 Marks

Prelim: 75 Marks

Total: 125 Mark

(125 Marks from mid-term & prelim (Theory) to be converted into 25 Marks)

Internal Assessment (Practical): 50 Marks

(Out of 50 Marks to be send to the University)

Mid-Term Exam

050 Marks

Prelim Exam

050 Marks

Clinical Evaluation & Clinical Assignment:

625 Marks

1. History taking: Two (50 marks each) 100 Marks

2. MSE: Two (50 marks each) 100 Marks

3. Process Recording: Two (25 marks each) 050 Marks

4. Nursing Care Plan: Two (50 marks each) 100 Marks

5. Clinical performance evaluation 100 Marks

(Male or female ward)

6. Case Study: One 050 Marks

7. Case Presentation: One 050 Marks

8. Drugs study 050 Marks

9. Health Education: One 025 Marks

Total: 725 Marks

(725 Marks from practical to be converted into 50 Marks)

External Assessment: 125 Marks

(University Examination)

Theory: 75 Marks

Practical 50 Mark

REFERENCES:-

1. Principles and Practice of Psychiatric Nursing – By Stuart and Luraia
2. Comprehensive Psychiatric Nursing – Jidith Haber
3. Community Psychiatry – Kaplan
4. Psychiatric Nursing – Mary Townsend
5. A Short text book of Psychiatry – Neeraj Ahooja
6. A text book of Psychiatric Nursing – Bimla Kapoor
7. Lippincott's Manual of Psychiatric Nursing Care Plan.
8. Psychiatric Mental Health Nursing – Barbara Schoen Johnson, Lippincot company.
9. Mental Health Nursing – Mosby's Review Series – Paulette D. Rollant, Denise B. Deppoliti.
10. A Guide to Mental Health Nursing & Psychiatric Nursing – Sreevani, Jaypee Brothers Publication.
11. Question Bank Mental Health Nursing for U.G. Nursing students - Sreevani, Jaypee Brothers Publication.
12. Psychosocial Nursing for General Patient Care, 2nd Ed.-02 – Gorman, Jaypee Brothers Publication.

INTRODUCTION TO NURSING EDUCATION

Placement– IIInd Year

Time allotted Theory : 60 hrs

Practical : 75 hrs

COURSE DESCRIPTION :-

This course introduces the students to Principles and concepts of Education, curriculum development and methods and media of teaching. It also describes the step the steps in curriculum development and implementation of educational programme in Nursing.

OBEJCTIVES: At the end of the course, the students will

1. Describe the philosophy and principles of education
2. Describe the process of a nursing curriculum development
3. Explain the teaching learning process
4. Develop the ability to teach, using various methods and media
5. Describe the process of assessment
6. Describe the administrative aspects of school of nursing, College of Nursing
7. Develop basic skills in counseling and guidance
8. Participate in planning and organizing an in-service education programme

COURSE CONTENTS

UNIT I	INTRODUCTION TO EDUCATION	5 hrs.
	<ul style="list-style-type: none">- Meaning, aims, function and principles- Philosophy of education- Factors influencing development of philosophy of Nursing education- Nursing profession –Definition, concept, importance and characteristics of nursing profession- Development of nursing education in India before and after independence- Nursing education programmes in India – Basic, Post Certificate, Degree, post graduation and Ph. D.- High power committee recommendations for nursing education- Qualities, role and responsibilities of a nursing teacher	
UNIT II	NURSING CURRICULUM DEVELOPMENT	8 hrs.
	<ul style="list-style-type: none">- Organization of Nursing Curriculum- Development of Nursing Curriculum.- Curriculum types- Curriculum Committee- Curriculum planning- Formulating philosophy and objectives.- Selecting learning experiences and clinical components of nursing education.- Evaluation of curriculum.	
UNIT III	TEACHING LEARNING PROCESS	5 hrs.
	<ul style="list-style-type: none">- Meaning of education, aims, functions and- principles of teaching	

- Objective structured clinical examination.
- Assessment of attitudes
- Setting of question paper
- Scoring of Answer paper
- Reforms in nursing Educational system

UNIT VII MANAGEMENT OF SCHOOL OF NURSING 8 hrs

- Planning and organizing of school of Nursing
- Recruitment of teaching staff
- Budget facilities for the school
- Students selection and admission procedure
- Administrative planning for students
- Welfare service for students
- Maintainance of school Records
- Preparation of annual reports
- INC guidelines for school of nursing

UNIT VIII GUIDANCE AND COUNSELLING 5 hrs

- Definition and basic principles
- Organization of guidance & counseling
- Counseling process
- Managing disciplinary problems
- Management of crisis

UNIT IX IN SERVICE EDUCATION 5 hrs

- Introduction to nature and scope of in-service education programmes
- Principles of adult learning
- Planning for in-service programme
- Techniques and methods of staff education programme
- Evaluation of in-service programme

PRACTICUM

1. Practice Teaching : 5
 Theory Teaching : 3
 Clinical Teaching : 2
2. Visits to Nursing colleges and schools
3. To prepare different types of teaching Aids.
4. To prepare rotation plans
5. Study various Nursing Programme syllabus
6. To plan, organize and conduct 'one' service education programme

CLINICAL EXPERIENCES Total Hours. : 75 hrs

- | | |
|--|-----------------|
| - Practice Teaching (Theory + Practical) | hours 20 |
| - Prepare Teaching Aids | hours 10 |
| - Attending peer group Teaching | hours 05 |
| - Preparing rotation plan | hours 05 |
| - Study various Nursing Programme | hours 10 |
| - Plan inservice education Programme | hours 05 |
| - Visiting Nursing Schools and Colleges | hours 20 |

EVALUATION:

Paper	Subject Introduction to Nursing Education	Duration	Internal Assessment	External Assessment	Total Marks
13.	Theory	3	25	75	100

	<u>Internal Assessment:</u>
Theory:	15 Marks
Clinical Assignment:	10 Marks
Total:	25 Marks

Details as follows:

Internal Assessment (Theory): 15 Marks

(Out of 15 Marks to be send to the University)

Mid-Term: 50 Marks

Prelim: 75 Marks

Total: 125 Mark

(125 Marks from mid-term & prelim (Theory) to be converted into 15 Marks)

Clinical Assignment: 10 Marks

Practice Teaching (100 Marks Each)

 Theory – 2: 200 Marks

Clinical – 1: 100 Marks

Total: 300 Marks

(300 Marks from Clinical Assignment to be converted into 10 Marks)

External Assessment (Theory): 75 Marks

(University Examination)

REFERENCES

1. Bevis oliva Em, Curriculum Building In Nursing – A Process, 3rd ed; St. Louis; C.V.Mosby Co. 1982
2. Basavanthappa B.T. Nursing education, 1st ed. New Delhi : Jaypee Brothers, 2003
3. Bhatia, Kamala & Bhatia B. The Principles and methods of teaching. New Delhi, Seema offset, 1977
4. Heidgerken Loretta, Teaching and learning in Schools of Nursing – Principles and Methods, 5thed New Delhi: J.B. Lippincott, 2003
5. Hinchiff Sue, The Practitioner As a teacher 2nd ed. Harcourt Brace & Company Ltd. 1999
6. Indian Nursing council guide for School of Nursing in India, Revised 2nd ed. New Delhi 2001
7. Syllaby of various Nursing courses.

INTRODUCTION TO NURSING SERVICE ADMINISTRATION

Placement : IInd Year

Time Allotted : Theory : 60 hours

Practical : 180 hours

COURSE DESCRIPTION :

This course is designated to give an opportunity to the students to gain an understanding of the principles of administration and its application to nursing service. It is also intended to assist the students to develop an understanding of the need for professional leadership.

OBJECTIVES : At the end of the course , the student will enable the students to:-

- 1 Identify the Principles of administration.
- 2 Describe the Principles and techniques of supervision.
- 3 Explain the Principles and Methods of personnel management.
- 4 Explain the principles of Budgeting.
- 5 Organize and manage a Nursing Unit effectively.
- 6 Identify dynamics of Organizational behavior, styles and functions of effective leadership.

COURSE CONTENTS

UNIT I PRINCIPLE AND PRACTICE OF ADMINISTRATION 10 hrs.

- Significance, elements and Principles of Administration.
 - Planning
 - Organization
 - Staffing
 - Directing
 - Controlling
 - Coordinating
 - Reporting
 - Budgeting
- Administration and Organization of Hospital.
 - Definition, Aims, Functions & roles of the hospital
 - Classifications of Hospitals Health Team
 - Ethical and legal aspects of hospital administration
 - Policies of Hospital, different departments with special emphasis to the department of nursing office management
 - Nursing management
 - Responsibilities of nursing personnel , specially of ward sister,
 - Medico –legal aspects
 - Concept of cost effectiveness

UNIT II NURSING UNIT MANAGEMENT 10 hrs.

- Physical Lay out of a Nursing Unit
 - Necessary facilities
 - Factors affecting the quality of nursing care
 - Maintenance of a therapeutic environment
 - Administration of the nursing unit
 - Management of patient care
 - Maintenance of the Physical environment

- Delivery of patient care
- Assignment of duties and time plan
- Patient assignment
- Discharge Planning
- Safety measures, prevention of accidents and infections
- Maintenance of patients records and reports, legal responsibilities
- Maintenance of quality nursing care
- Nursing audit

UNIT III PERSONNEL MANAGEMENT 10 hrs.

- Significance of Personnel management Staff recruitment and selection process appointment, promotions, transfers, remunerations, retraining, terminating
 - personnel policies
 - Job specifications
 - Job description
 - Job Analysis
 - Staffing the unit
 - Staffing Philosophy
 - Staffing norms
 - Staffing Modules
 - Patient Classification System
 - Rotation plan
 - Leave planning
- Performance appraisal
 - Purposes of performance appraisal
 - Developing and using standards
 - Training
 - Feedback
- Career Counseling
- Staff welfare activities
- Management of Disciplinary problems
- Human resource development
- Health team approach
- Collective Bargaining, Conflicts and its solutions.

UNIT IV SUPERVISION 9 hrs.

- Definition, nature, need Philosophy and objectives of supervision
 - Principles of supervision
 - Tools and techniques of supervision
 - Staff Development
 - Orientation program
 - In service education
 - Continuing Education
 - Skill training
 - Assertiveness Training for assertiveness
 - Public speaking skills
 - Leadership development
 - Problem solving process
 - Evaluation
 - Nursing audit

UNIT V MATERIAL MANAGEMENT 9 hrs.

- Material management – concept, need
 - Principles of Material management
 - Quality control
 - Inventory
 - Care of equipments Stock keeping
 - Role of Nursing personnel in Material management

UNIT VI FINANCIAL MANAGEMENT 3 hrs.

- Budgeting - Nature and purposes of Budgeting
 - Types of Budget
 - Principles of Budgeting
 - Financial Audits

UNIT VII ORGANIZATIONAL BEHAVIOR 9 hrs.

- Organizational behavior
 - Group dynamics
 - Human relations
 - Morale Building
 - Organization Communication
 - Hospital Information system
 - Public relations in Hospitals
 - Leadership –Concepts, Manager behavior, Leader behavior Leadership – defined, Leadership Theories – Behavioral, Situational
 - Leadership styles and functions,
 - Transformational leadership
 - Qualities of a leader
 - Methods of reporting
 - Maintaining records and reports

PRACTICUM

- Observe the functioning of Nursing administration at various levels i.e., Institutions, departments and units.
- Each student will practice ward management under supervision
- Student will prepare rotation plan of the staff duties, write reports, give verbal reports of the ward and assist in the maintaining the inventory of the nursing unit
- Develop an Assessment tool for performance appraisal
- Visit Private and Government Hospital and write observation reports
- Student will present one seminar during administration experience.

Note : visits for Nursing administration and Nursing Education may be planned together.

CLINICAL EXPERIENCES Total Hours. : 180 hrs

- Ward Management **hours 90**
- ICU Management **hours 30**
- OPD / Departments **hours 30**
- Visits to hospitals and other agencies **hours 30**
(ie. Govt, Pvt or corporation and any other)

EVALUATION:

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
14.	Introduction to Nursing Service Administration Theory	3	25	75	100

Internal Assessment:

Theory:	15 Marks
Clinical Assignment:	10 Marks
Total:	25 Marks

Details as follows:

Internal Assessment (Theory): 15 Marks

(Out of 15 Marks to be send to the University)

Mid-Term:	50 Marks
Prelim:	75 Marks
Total:	125 Mark

(125 Marks from mid-term & prelim (Theory) to be converted into 15 Marks)

Clinical Assignment: 10 Marks

Practicum: Posting of ward management: 100 Marks

(100 Marks from Clinical Assignment to be converted into 10 Marks)

External Assessment (Theory): 75 Marks

(University Examination)

REFERENCES

1. B. T. Basvanthappa : Nursing Administration Edition Ist 2000 –
2. Jean Barret : i) Head Nurse – 1975
ii) Ward Management and Teaching
3. Goal : Hospital Administration
4. Koontz : Principles of Management IV th Edition 1968
5. Ann Marriner : Guide to Nursing Management
6. Keith Davis : Human relations at work the Dynamics of organizational behaviors 1967

INTRODUCTION TO NURSING RESEARCH STATISTICS

Placement : II nd Year

Time Allotted Theory : 45 hrs.

Practical : 120 hrs.

COURSE DESCRIPTION

This course is designed to assist the student to develop an understanding of the basic concepts principles of research and scientific inquiry including the identification of problem and steps in research methodology. This course also introduces the basic concepts, and principles of Statistical methods, the use of computers in conducting research project in groups and use the finding in nursing practice.

OBJECTIVES : At the end of course student will

- 1) Define the terms and concepts of nursing research.
- 2) Identify needs and scope of nursing research.
- 3) Be able to define research problems.
- 4) Locate and list sources of literature review including operational definition and conceptual framework.
- 5) Describe different approaches and research designs in nursing research.
- 6) Describe sample and sampling technique with special reference to survey method.
- 7) Develop tool for data collection.
- 8) Able to conduct pilot study to confirm reliability and validity of tool before data collection.
- 9) To enumerate steps of data analysis and present data summary in tabular form.
- 10) Use descriptive and co-relational statistics in data analysis.
- 11) Conduct group project and write report.
- 12) Use computer for research project.

COURSE CONTENT

SECTION : A

INTRODUCTION TO RESEARCH METHODOLOGY

UNIT I	INTRODUCTION	2 hrs.
	<ul style="list-style-type: none">- Research definition- Method of acquiring knowledge- Problem solving and scientific method- Research characteristics, purpose, scope- Steps in Research methodology.	
UNIT II	RESEARCH AND NURSING	4 hrs.
	<ul style="list-style-type: none">- Development of research in nursing- Purpose, scope and need of nursing research- Areas of nursing research i.e. practice, service, administration and education, health and social research- Ethics in research	
UNIT III	RESEARCH DESIGN	3 hrs.
	<ul style="list-style-type: none">- Overview of research process- Statement of the problem and research objectives- Definitions of terms variables, assumptions, operational definition, limitation, delimitation, hypothesis-definitions, formulation and types	

UNIT IV	REVIEW OF LITERATURE	2 hrs.
	<ul style="list-style-type: none"> - Search for library resources - Criteria for selection of resources - Practical application of review of literature 	
UNIT V	RESEARCH APPROACHES (CLASSIFICATION & TYPES)	4 hrs.
	<ul style="list-style-type: none"> - Non experimental - Survey - characteristics, types, advantages and disadvantages - Historical - sources of data, characteristics, advantages and disadvantages - Experimental - characteristics, types, advantages and disadvantages 	
UNIT VI	SAMPLE & SAMPLING TECHNIQUE	2 hrs.
	<ul style="list-style-type: none"> - Definition of population and sample - Sampling and randomness; kinds and size of samples - Probability and non probability sample 	
UNIT VII	METHODS OF COLLETING DATA	7 hrs.
	<ul style="list-style-type: none"> - Preparation of tools - Types of instruments for data collection <ul style="list-style-type: none"> - a) Questionnaire : Opinionnaire, Interview schedule - b) Observation : records, observation checklist, rating scales. <ul style="list-style-type: none"> - Machineries, video tapes, films, closed circuit T.V. etc. - c) Measurements : Physiological measurement, Physical, Chemical, Microbiological etc., Psychological measurement Psychomotor skill test, personality test, Intelligence test, Sociological test, Socio economic standard scale, Sociometry, Health status measurement - Characteristics of good research tool - Testing reliability and validity of tool 	
UNIT VIII	IMPLEMENTING RESEARCH PLAN	2 hrs.
	<ul style="list-style-type: none"> - Data collection procedure and conditions for administration of tool 	
UNIT IX	DATA ANALYSIS AND INTERPRETING	2 hrs.
	<ul style="list-style-type: none"> - Types of data, data organization, tabulation, analysis and summarization - Structure of statistical methods : interpretation and presentation of data 	
UNIT X	COMMUNICATION OF RESEARCH FINDING	2 hrs.
	<ul style="list-style-type: none"> - Writing research report - composition, organization and format - Application of results; critical analysis of research report and public 	

SECTION : B INTRODUCTION TO STATISTIC**UNIT XI DESCRIPTIVE STATISTIC 8 hrs.**

- Frequency distribution - types of measure - frequencies, class, interval, graphic methods of describing frequency
- Measures of central tendency - Mode, Median and Mean
- Measures of variability : range, Standard deviation
- Introduction to normal probability
- Correlation
- Computation by rank difference methods
- Uses of correlation co-efficient

UNIT XII BIOSTATISTIC 2 hrs.

- Crude rates and standardized rates, ratio and estimation of the trends.

UNIT XIII INTRODUCTION TO COMUTERS IN NURSING 5 hrs.

- Basics of hardware and software
- Windows application Word, Excel and Power Point
- Introduction to Database

Five hours of computer training may be given to students to impart computer literacy and knowledge in basic computer operation.

PRACTICUM Total Hrs. 120

- Selecting and conducting small group research project (The number of students in a group can be decided depending on the availability of Nursing faculty and interest of the students)
- Group studies may include, studying existing health problem and practices, Nursing procedures, Health records, patients records and survey of Nursing literature.

EVALUATION:

Paper	Subject	Duration	Internal Assessment	External Assessment	Total Marks
	** Introduction to Nursing Research Statistics				
15.	**Theory	2	50	College level qualifying exam, minimum passing Marks 50%	050
6.	**Research Project		50	College level qualifying exam, minimum passing Marks 50%	050

Note: **** College level qualifying exam to appear in University Examination, minimum passing Marks 50%. (Not University Examination)**

Internal Assessment: 100 Marks

(Out of 100 Marks to be send to the University) Theory - Mid-Term: 25 Marks
Theory – Prelim: 25 Marks
Practical – Research Project: 50 Mark

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BHARATI VIDYAPEETH DEEMED UNIVERSITY



COLLEGE OF NURSING

Syllabus

M.Sc. Nursing

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Philosophy

National Health Policy(NHP) 2002 emphasizes the need to prepare nurses to function in super-speciality areas who are required in tertiary care institutions, entrusting some limited public health functions to nurses after providing adequate training, and increase the ratio of degree holding vis a vis diploma holding nurses.

It is observed that there is an acute shortage of nursing faculty in under graduate and post graduate nursing programme in India Indian Nursing Council believes that:

Post Graduate programme is essential to prepare nurses to improve the quality of nursing education and practice in India.

Post graduate programme in nursing builds upon and extends competence acquired at the graduate levels, emphasizes application of relevant theories in to nursing practice, education, administration and development of research skills.

The programme prepares nurses for leadership position in nursing and health fields who can function as nurse specialists, consultants, educators, administrators and researchers in a wide variety of professional settings in meeting the National priorities and the changing needs of the society.

This programme provides the basis for the post masteral programme in nursing. Further the programme encourages accountability and commitment to life long learning which fosters improvement of quality care.

Aim

The aim of the postgraduate program in nursing is to prepare graduates to assume responsibilities as nurse specialists, consultants, educators, administrators in a wide variety of professional settings

Objectives

On Completion of the two year M.Sc Nursing programme, the graduate will be able to:-

1. Utilize/apply the concepts, theories and principles of nursing science
2. Demonstrate advance competence in practice of nursing
3. Practice as a nurse specialist.
4. Demonstrate leadership qualities and function effectively as

- nurse educator and manager.
5. Demonstrate skill in conducting nursing research, interpreting and utilizing the findings from health related research.
 6. Demonstrate the ability to plan and effect change in nursing practice and in the health care delivery system.
 7. Establish collaborative relationship with members of other disciplines
 8. Demonstrate interest in continued learning for personal and professional advancement.

Guidelines and Minimum Requirements for setting up of a College of Nursing

1. Any organization under the Central Government, State Government, Local body or a Private or Public Trust, Mission, Voluntary registered under Society Registration Act or a Company registered under company's act wishes to open a M.Sc. Nursing programme, should obtain the No Objection/Essentiality certificate from the State Government.
2. The Indian Nursing council on receipt of the proposal from the Institution to start nursing program, will undertake the **first inspection** to assess suitability with regard to physical infrastructure, clinical facility and teaching faculty in order to give permission to start the programme.
3. After the receipt of the permission to start the nursing programme from Indian Nursing Council, the institution shall obtain the approval from the State Nursing Council and University
4. Institution will admit the students only after taking approval of State Nursing Council and University.
5. The Indian Nursing Council will conduct inspection every year till the first batch completes the programme. Permission will be given year by year till the first batch completes
6. If the institution is recognized for B.Sc. (N) programme and if one batch has passed out after found suitable by INC, then the institution will be exempted from NOC/Essentiality certificate for M.Sc.(N) programme from the State Government.
7. **Super Speciality Hospital*** can start M.Sc.(N) programme, however they have to get NOC/Essentiality certificate from

respective State Government to start the M.Sc. (N) programme.
*Super Speciality Hospital are eligible to start M.Sc.(N) provided they have respective speciality beds

Cardio thoracic beds

□ 50-100 bedded Cardiac Hospital, which has CCU, ICCU and ICU units with own thoracic unit or affiliated thoracic unit.

Critical Care beds

□ 250-500 bedded Hospital, which has a 8-10 beds critical care beds & ICUs

OBG speciality beds

50 bedded parent hospital having:

- i. Mother and neonatal units
- ii. Case load of minimum 500 deliveries per year
- iii. 8-10 level II neonatal beds.
- iv. Affiliation with level III neonatal beds

Neuro speciality beds

□ Minimum of 50 bedded Neuro care institution with advanced diagnostic, therapeutic and state of the art clinical facilities

Oncology speciality beds

□ Regional Cancer centers/Cancer Hospitals having minimum 100 beds,with medical and surgical oncology units with chemotherapy, radiotherapy, palliative care, other diagnostic and supportive facilities.

Orthopaedic Speciality beds

□ 250-500 bedded Hospital, which has a 50 orthopaedic beds & rehabilitation units.

Psychiatric beds

□ Minimum of 50 bedded institutes of psychiatry and mental health having all types of patients (acute, chronic, adult psychiatric beds, child psychiatric beds and de-addiction facilities) , with advanced diagnostic, therapeutic and state of the art clinical facilities.

Paediatrics beds

□ 50-100 bedded paediatric Hospital/ unit with paediatric surgery and level II or III neonatal units

Gastroentrolgy beds

□ 50-100 bedded gastroentrolgy beds

Nephro-Urology speciality beds

□ 50-100 bedded nephro urology hospital with dialysis and kidney transplants, urosurgery

STAFFING PATTERN:

M.Sc. (N)

If parent hospital is super-speciality hospital like cardio-thoracic hospital/cancer with annual intake 10 M.Sc(N) in cardio thoracic/cancer

Professor cum coordinator 1

Reader / Associate Professor 1

Lecturer 2

The above faculty shall perform dual role

B.Sc.(N) and M.Sc.(N)

Annual intake of 60 students in B.Sc.(N) and 25 students for M.Sc.(N)programme

Professor-cum-Principal 1

Professor-cum-Vice Principal 1

Reader / Associate Professor 5

Lecturer 8

Tutor / Clinical Instructor 19

Total

34

One in each specialty and all the M.Sc(N) qualified teaching faculty will participate in all collegiate programmes.

Teacher Student Ratio = 1 : 10 for M.Sc.(N) programme.

QUALIFICATIONS & EXPERIENCE OF TEACHERS OF COLLEGE OF NURSING

Sr. No.	Post	Qualification & Experience
1	Professor-cum-Principal	- Masters Degree in Nursing - 14 years experience after M.Sc.(N)in College ofNursing - 3 years experience in administration (Years of experience is relaxable if suitable candidate is not available) (If a candidate is not available, minimum 5 years of experience in college of nursing, with an aggregate

of 14 years teaching perience)

Desirable : Independent published work of high standard / doctorate degree / M.Phil.

2 Professor-cum-Vice Principal

- Masters Degree in Nursing
- 14 years experience after M.Sc. N. in College of Nursing
- 3 years experience in administration (Years of experience is relaxable if suitable candidate is notavailable) (If a candidate is not available, minimum 5 years of experience in college of nursing, with an aggregate of 14 years teaching experience)

Desirable : Independent published work of high standard / doctorate degree / M.Phil.

3 Reader / Associate Professor

- Master Degree in Nursing.
- 10 years experience after M.Sc.(N) in a College of Nursing. (If a candidate is not available, 5 years of experience in College of Nursing with an aggregatesof 10 years . teaching experience

Desirable : Independent published work of high standard /doctorate degree / M.Phil.

4 Lecturer

- Master Degree in Nursing.
- 3 years teaching experience after M.Sc. (N)

Note: *Qualifications & Experience of Nursing Teaching faculty relaxed till 2012 & placed under Annexure - I*

External /Guest faculty may be arranged for the selected units in different subjects as required

NOTE:

1. No part time nursing faculty will be counted for calculating total

no. of faculty required for a college.

2. Irrespective of number of admissions, all faculty positions (Professor to Lecturer) must be filled.

3. For M.Sc.(N) programme appropriate number of M.Sc. faculty in each speciality be appointed subject to the condition that total number of teaching faculty ceiling is maintained.

4. All nursing teachers must possess a basic university or equivalent qualification as laid down in the schedules of the Indian Nursing Council Act, 1947. They shall be registered under the State Nursing Registration Act.

5. Nursing faculty in nursing college except tutor/clinical instructors must possess the requisite recognized postgraduate qualification in nursing subjects.

6. Holders of equivalent postgraduate qualifications, which may be approved by the Indian Nursing Council from time to time, may be considered to have the requisite recognized postgraduate qualification in the subject concerned.

7. All teachers of nursing other than Principal and Vice-Principal should spend at least 4 hours in the clinical area for clinical teaching and/or supervision of care every day.

Other Staff (Minimum requirements)

(To be reviewed and revised and rationalized keeping in mind the mechanization and contract service)

• Ministerial	
a) Administrative Officer	1
c) Office Superintendent	1
d) PA to Principal	1
e) Accountant/Cashier	1
• Upper Division Clerk	2
• Lower Division Clerk	2
• Store Keeper	1
a) Maintenance of stores	1
b) Classroom attendants	2
c) Sanitary staff	As per the physical space
d) Security Staff	As per the requirement

• Peons/Office attendants	4
• Library	
a) Librarian	2
b) Library Attendants	As per the requirement
• Hostel	
a) Wardens	2
b) Cooks, Bearers, Sanitary Staff	As per the requirement
c) Ayas /Peons	As per the requirement
d) Security Staff	As per the requirement
e) Gardeners & Dhobi (desirable)	Depends on structural facilities

Eligibility Criteria/Admission Requirements:

1. The candidate should be a Registered Nurse and Registered midwife or equivalent with any State Nursing Registration Council.
2. The minimum education requirements shall be the passing of :
B.Sc. Nursing / B.Sc. Hons. Nursing / Post Basic B.Sc. Nursing with minimum of 55% aggregate marks.
3. The candidate should have undergone in B.Sc. Nursing / B.Sc. Hons. Nursing / Post Basic B.Sc. Nursing in an institution which is recognized by Indian Nursing Council.
4. Minimum one year of work experience after Basic B.Sc. Nursing.
5. Minimum one year of work experience prior or after Post Basic B.Sc.Nursing.
6. Candidate shall be medically fit.
7. 5% relaxation of marks for SC/ST candidates may be given.

Entrance/Selection test

Selection of the candidates should be based on the merit of the entrance examination held by University or competent authority.

Regulations for examination:

Eligibility for appearing for the examination:

75% of the attendance for theory and practicals. However 100% of attendance for practical before the award of degree

Classification of results:

- 50% pass in each of the theory and practical separately.
- 50-59% Second division
- 60-74% first division
- 75% and above is distinction
- For declaring the rank aggregate of 2 years marks to be considered

If the candidate fails in either practicals or theory paper he/she has to reappear for both the papers (theory and practical)

Maximum no. of attempts per subject is three (3) inclusive of first attempt. The maximum period to complete the course successfully should not exceed 4 years

Candidate who fails in any subject, shall be permitted to continue the studies into the second year. However the candidate shall not be allowed to appear for the Second year examination till such time that he/she passes all subjects of the first year M.Sc nursing examination

Practicals

- 4 hours of practical examination per student.
- Maximum number of 10 students per day per speciality.
- The examination should be held in clinical area only for clinical specialities
- One internal and external should jointly conduct practical examination
- Examiner – Nursing faculty teaching respective speciality area in M.Sc nursing programme with minimum 3 years experience after M.Sc nursing.

Dissertation

Evaluation of the dissertation should be done by the examiner prior to viva

Duration: Viva-voce -minimum 30 minutes per student

Guidelines for Dissertation

Tentative Schedule for dissertation

S. No.	Activities	Scheduled Time
1.	Submission of the research proposal	End of 9 th month of 1 st year
2.	Submission of dissertation - final	End of 9 th month of 2 nd year

Note: - Administrative approval and ethical clearance should be obtained

A. Research Guides

a) *Qualification of Guide*

Main guide : Nursing faculty / nursing expert in the same clinical speciality holding Ph.D./M.Phil/M.Sc. Nursing with a minimum of 3 years experience in teaching in the Post Graduate Programme in Nursing.

Co-Guide : A Co-Guide is a nursing faculty/expert in the field of study (may be from outside the college but should be within the city.)

b) *Guide – Students Ratio*

Maximum of 1:4 (including as co-guide)

c) *Research Committee*

There should be a research committee in each college comprising of minimum 5 members chaired by the Principal, College of Nursing.

Duration

Duration of the course is 2 years for M.Sc. (N)

Available	52 weeks
Vacation	4 weeks
Examination	2 weeks
Gazetted holidays	3 weeks
Total weeks available	43 weeks
40 hours per week	1720 hours
Total hours for 2 years	3440 hours

Course of Instruction

	Theory (hrs)	Practical (hrs)
1st year		
Nursing education	150	150
Advance nursing practice	150	200
Nursing Research and statistics	150	100

*Clinical speciality	150	650
Total	600	1100
II nd Year		
Nursing Management	150	150
Nursing Research(Dissertation		300
*Clinical Speciality	150	950
Total	300	1400

Educational visit 2 weeks

***Clinical Speciality** – Medical Surgical Nursing (Cardio Vascular & Thoracic Nursing, Critical care Nursing, Oncology Nursing, Neurosciences Nursing, Nephro-Urology Nursing, Orthopedic Nursing, Gastro Enterology Nursing,)Obstetric & Gynaecological Nursing, Child Health (Paediatric) Nursing, Mental Health(Psychiatric) Nursing, Community Health Nursing, Psychiatric (Mental Health) Nursing etc.

Note: Students have to maintain log book for each activity during the course of study

Scheme of Examination

	Theory			Practical		
	Hours	Internal	External	Hours	Internal	External
1st year						
Nursing education	3	25	75		50	50
Advance nursing practice	3	25	75			
Nursing Research and statistics	3	25**	75*			
Clinical speciality	3	25	75		100	100
Total		100	300		150	150
II nd Year						
Nursing Management	3	25	75			
Dissertation & Viva					100	100
Clinical Speciality - II	3	25	75		100	100
Total		50	150		200	200

* Nursing research=50 and statistics=25

**Nursing research=15 and statistics=10

1. Minimum pass marks shall be 50 % in each of the Theory and practical papers separately.
2. A candidate must have minimum of 80% attendance (irrespective of the kind of absence) in theory and practical in each subject for appearing for examination.
3. A candidate must have 100% attendance in each of the practical areas before award of degree
4. A candidate has to pass in theory and practical exam separately in each of the paper.
5. If a candidate fails in either theory or practical paper he/she has to re-appear for both the papers (Theory and practical).
6. Maximum no. of attempts permitted for each paper is 3 including first attempt.
7. The maximum period to complete the course successfully should not exceed 4 (four) years
8. A candidate failing in more then two subjects will not be promoted to the IInd year.
9. No candidate shall be admitted to the subsequent IInd year examination unless the candidate has passed the Ist year examination.
10. Maximum number of candidates for all practical examination should not exceed 10 per day.
11. Provision of Supplementary examination should be made.
12. All practical examinations must be held in the respective clinical areas.
13. One internal and One external examiners(outside the University) should jointly conduct practical examination for each student
14. An examiner should be M.Sc (N) in concerned subject and have minimum of 3 (three) years post graduate teaching experience.
15. One internal and One external examiners(outside the University) should evaluate dissertation and jointly conduct viva-voce for each student
16. For Dissertation Internal examiner should be the guide and external examiner should be Nursing faculty / nursing expert in the same clinical speciality holding Ph.D./M.Phil/M.Sc. Nursing with a minimum of 3 years experience in guiding the research projects for Post Graduate students of Nursing.

Admission Strength

Annual admission strength for M.Sc (N) Programme should have prior sanction/permission from the Indian Nursing Council on the basis of clinical, physical facilities and teaching faculty.

Health Services

There should be provisions for the following health services for the students.

- (a) An annual medical examination.
- (b) Vaccination against Tetanus, hepatitis B or any other communicable disease as considered necessary.
- (c) Free medical care during illness and / provision of health insurance should be made.
- (d) A complete health record should be kept in respect of each individual students. The question of continuing the training of a student, with long term chronic illness, will be decided by the individual college.

CURRICULUM
NURSING EDUCATION

Placement : Ist Year

Hours of Instruction
Theory 150 Hours
Practical 150 Hours
Total : 300 Hours

Course Description

This course is designed to assist students to develop a broad understanding of Fundamental Principles, concepts, trends and issues related to education and nursing education. Further, it would provide opportunity to students to understand, appreciate and acquire skills in teaching and evaluation, curriculum development, implementation, maintenance of standards and accreditation of various nursing educational programs.

Objectives

At the end of the course, students will be able to :

1. Explain the aims of education, philosophies, trends in education and health: its impact on nursing education.
2. Describe the teaching learning process.
3. Prepare and utilize various instructional media and methods in teaching learning process.
4. Demonstrate competency in teaching, using various instructional strategies.
5. Critically analyze the existing nursing educational programs, their problems, issues and future trends.
6. Describe the process of curriculum development, and the need and methodology of curriculum change, innovation and integration.
7. Plan and conduct continuing nursing education programs.
8. Critically analyze the existing teacher preparation programs in nursing.
9. Demonstrate skill in guidance and counseling.
10. Describe the problems and issues related to administration of nursing curriculum including selection and organization of clinical experience.
11. Explain the development of standards and accreditation process in nursing education programs.
12. Identify research priorities in nursing education.

13. Discuss various models of collaboration in nursing education and services.
14. Explain the concept, principles, steps, tools and techniques of evaluation
15. Construct, administer and evaluate various tools for assessment of knowledge, skill, and attitude.

Course Content

Units	Hours		Course Content
	Theory	Practical	
I	10		<p>Introduction :</p> <ul style="list-style-type: none"> □ Education :Definition, aims, concepts, philosophies & their education implications, □ Impact of Social, economical, political & technological changes on education: <ul style="list-style-type: none"> • Professional education • Current trends and issues in education • Educational reforms and National Educational policy, various educational commissions-reports • Trends in development of nursing education in India
II	20	30	<p>Teaching – Learning Process</p> <ul style="list-style-type: none"> □ Concepts of teaching and learning: Definition, theories of teaching and learning, relationship between teaching and learning. □ Educational aims and objectives; types, domains, levels, elements and writing of educational objectives □ Competency based education(CBE) and outcome based education(OBE) □ Instructional design: Planning and designing the lesson, writing lesson plan : meaning, its need and importance, formats. □ Instruction strategies – Lecture, discussion, demonstration, simulation, laboratory, seminar, panel, symposium, problem solving, problem based learning (PBL), workshop, project, role- play (sociodrama), clinical teaching methods, programmed instruction, self directed learning(SDL), micro teaching, computer assisted instruction(CAI), computer assisted

			learning (CAL)
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Units	Hours		Course Content
	Theory	Practical	
III	10	10	<p>Instructional media and methods</p> <ul style="list-style-type: none"> <input type="checkbox"/> Key concepts in the selection and use of media in education <input type="checkbox"/> Developing learning resource material using different media <input type="checkbox"/> Instructional aids – types, uses, selection, preparation, utilization. <input type="checkbox"/> Teacher’s role in procuring and managing instructional Aids – Project and non-projected aids, multi media, video-tele conferencing etc
IV	10		<p>Measurement and evaluation:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Concept and nature of measurement and evaluation, meaning, process, purposes, problems in evaluation and measurement. <input type="checkbox"/> Principles of assessment, formative and summative assessment- internal assessment external examination, advantages and disadvantages. <input type="checkbox"/> Criterion and norm referenced evaluation,
V	12	10	<p>Standardized and non-standardized tests :</p> <ul style="list-style-type: none"> <input type="checkbox"/> Meaning, characteristics, objectivity, validity, reliability, usability, norms, construction of tests- <ul style="list-style-type: none"> • Essay, short answer questions and multiple choice questions. • Rating scales, checklist, OSCE/OSPE(Objective structured clinical/practical examination) • Differential scales, and summated scales, sociometry, anecdotal record, attitude scale, critical incident technique <input type="checkbox"/> Question bank-preparation, validation,

			<p>moderation by panel, utilization</p> <ul style="list-style-type: none"> <input type="checkbox"/> Developing a system for maintaining confidentiality
VI	8	5	<p>Administration, Scoring and Reporting</p> <ul style="list-style-type: none"> <input type="checkbox"/> Administering a test; scoring, grading versus marks <input type="checkbox"/> Objective tests, scoring essay test, methods of scoring, Item analysis.
VII	12	6	<p>Standardized Tools</p> <ul style="list-style-type: none"> <input type="checkbox"/> Tests of intelligence aptitude, interest, personality, achievement, socio-economic status scale, tests for special mental and physical abilities and disabilities.
VIII	5	6	<p>Nursing Educational programs</p> <ul style="list-style-type: none"> <input type="checkbox"/> Perspectives of nursing education: Global and national. <input type="checkbox"/> Patterns of nursing education and training programmes in India. Non-university and University programs: ANM, GNM, Basic B.Sc. Nursing, Post Certificate B.Sc. Nursing, M.Sc(N) programs, M.Phil and Ph.D) in Nursing, post basic diploma programs, nurse practitioner programs.
IX	12	25	<p>Continuing Education in Nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Concepts – Definition, importance, need scope, principles of adult learning, assessments of learning needs, priorities, resources. <input type="checkbox"/> Program planning, implementation and evaluation of continuing education programs. <input type="checkbox"/> Research in continuing education. <input type="checkbox"/> Distance education in nursing.
X	10	10	<p>Curriculum Development</p> <ul style="list-style-type: none"> <input type="checkbox"/> Definition, curriculum determinants, process and steps of curriculum development, Curriculum models, Types and framework. <input type="checkbox"/> Formulation of philosophy, objectives, selection and organization of learning experiences; master plan, course plan, unit plan.

			<input type="checkbox"/> Evaluation strategies, process of curriculum change, role of students, faculty, administrators, statutory bodies and other stakeholders. <input type="checkbox"/> Equivalency of courses: Transcripts, credit system.
XI	8	4	Teacher preparation <input type="checkbox"/> Teacher – roles & responsibilities, functions, characteristics, competencies, qualities, <input type="checkbox"/> Preparation of professional teacher <input type="checkbox"/> Organizing professional aspects of teacher preparation programs <input type="checkbox"/> Evaluation: self and peer <input type="checkbox"/> Critical analysis of various programs of teacher education in India.
XII	10	5	Guidance and counseling <input type="checkbox"/> Concept, principles, need, difference between guidance and counseling , trends and issues. <input type="checkbox"/> Guidance and counseling services: diagnostic and remedial. <input type="checkbox"/> Coordination and organization of services. <input type="checkbox"/> Techniques of counseling : Interview, case work, characteristics of counselor, problems in counseling. <input type="checkbox"/> Professional preparation and training for counseling.
XIII	15	10	Administration of Nursing Curriculum <input type="checkbox"/> Role of curriculum coordinator – planning, implementation and evaluation. <input type="checkbox"/> Evaluation of educational programs in nursing course and program. <input type="checkbox"/> Factors influencing faculty staff relationship and techniques of working together. <input type="checkbox"/> Concept of faculty supervisor (dual) position. <input type="checkbox"/> Curriculum research in nursing. <input type="checkbox"/> Different models of collaboration between education and service
XIV	10		Management of nursing educational institutions <input type="checkbox"/> Planning, organizing, staffing, budgeting,

			recruitment, discipline, public relation, performance appraisal, welfare services, library services, hostel,
XV	5	5	<input type="checkbox"/> Development and maintenance of standards and accreditation in nursing education programs. <input type="checkbox"/> Role of Indian Nursing Council, State Registration Nursing Councils, Boards and University. <input type="checkbox"/> Role of Professional associations and unions.

Activities :

- Framing philosophy, aims and objectives.
- Lesson Planning.
- Micro teaching-2.
- Conduct practice teachings using different teaching strategies -10 (like lecture cum discussion, demonstration- lab method, field trips, seminars, project, role play, panel discussion, clinical methods etc)
- Preparation and utilization of instructional Aids using different media.
- Develop course plans, unit plans, rotation plans.
- Conduct a continuing education workshop.
- Annotated bibliography.
- Critical evaluation of any nursing education program offered by a selected institution.
- Planning and Organizing field visits.
- Educational visits.
- Field visits (INC/SNRC) to get familiar with recognition/registration process.
- Construct, administer and evaluate tools (objective & essay type test, observation checklist, rating scale etc)
- Observe and practice application of various non-standardized tests (intelligence, Aptitude, Personality, Sociometry, physical & mental disabilities tests.)

Methods of Teaching

- Lecture cum discussion
- Demonstration/ Return demonstration
- Seminar / Presentations
- Project work
- Field visits
- Workshop

Methods of evaluation

- Tests
- Presentation
- Project work
- Written assignments

Internal Assessment

Techniques	Weightage
Test- (2 tests)	50
Assignment	25
Seminar/presentation	25

	100

Practical – Internal assessment

Learning resource material	25
Practice Teaching	50
Conduct Workshop /Short Term Course	25

Practical – external assessment

Practice teaching- 1-	50
Preparation/use of learning resource material-1	25
Construction of tests/rotation plan.	25

ADVANCE NURSING PRACTICE

Placement: 1ST Year

Hours of Instruction
Theory 150 Hours
Practical 200 Hours
Total : 350 Hours

Course Description

The course is designed to develop an understanding of concepts and constructs of theoretical basis of advance nursing practice and critically analyze different theories of nursing and other disciplines.

Objectives:

At the end of the course the students will be able to:

1. Appreciate and analyze the development of nursing as a profession.
2. Describe ethical, legal, political and economic aspects of health care delivery and nursing practice.
3. Explain bio- psycho- social dynamics of health, life style and health care delivery system.
4. Discuss concepts, principles, theories, models, approaches relevant to nursing and their application.
5. Describe scope of nursing practice.
6. Provide holistic and competent nursing care following nursing process approach.
7. Identify latest trends in nursing and the basis of advance nursing practice.
8. Perform extended and expanded role of nurse.
9. Describe alternative modalities of nursing care.
10. Describe the concept of quality control in nursing.
11. Identify the scope of nursing research.
12. Use computer in patient care delivery system and nursing practice.
13. Appreciate importance of self development and professional advancement.

Course Content

Unit	Hours	Content
I	10	<p>Nursing as a Profession</p> <ul style="list-style-type: none"> □ History of development of nursing profession, characteristics, criteria of the profession, perspective of nursing profession-national, global □ Code of ethics(INC), code of professional conduct (INC), autonomy and accountability, assertiveness, visibility of nurses, legal considerations, □ Role of regulatory bodies □ Professional organizations and unions-self defense, individual and collective bargaining □ Educational preparations, continuing education, career opportunities, professional advancement & role and scope of nursing education. □ Role of research, leadership and management. □ Quality assurance in nursing (INC). □ Futuristic nursing.
II	5	<p>Health care delivery</p> <ul style="list-style-type: none"> □ Health care environment, economics, constraints, planning process, policies, political process vis a vis nursing profession. □ Health care delivery system- national, state, district and local level. □ Major stakeholders in the health care system- Government, non-govt, Industry and other professionals. □ Patterns of nursing care delivery in India. □ Health care delivery concerns, national health and family welfare programs, inter-sectoral coordination, role of nongovernmental agencies. □ Information, education and communication (IEC). □ Tele-medicine.
III	10	Genetics

		<ul style="list-style-type: none"> <input type="checkbox"/> Review of cellular division, mutation and law of inheritance, human genome project ,The Genomic era. <input type="checkbox"/> Basic concepts of Genes, Chromosomes & DNA. <input type="checkbox"/> Approaches to common genetic disorders. <input type="checkbox"/> Genetic testing – basis of genetic diagnosis, Pre symptomatic and predisposition testing, Prenatal diagnosis & screening, Ethical, legal & psychosocial issues in genetic testing. <input type="checkbox"/> Genetic counseling. <input type="checkbox"/> Practical application of genetics in nursing.
IV	10	<p>Epidemiology</p> <ul style="list-style-type: none"> <input type="checkbox"/> Scope, epidemiological approach and methods, <input type="checkbox"/> Morbidity, mortality, <input type="checkbox"/> Concepts of causation of diseases and their screening, <input type="checkbox"/> Application of epidemiology in health care delivery, Health surveillance and health informatics <input type="checkbox"/> Role of nurse
V	20	<p>Bio-Psycho social pathology</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pathophysiology and Psychodynamics of disease causation <input type="checkbox"/> Life processes, homeostatic mechanism, biological and psycho-social dynamics in causation of disease, life style <input type="checkbox"/> Common problems: Oxygen insufficiency, fluid and electrolyte imbalance, nutritional problems, hemorrhage]and shock, altered body temperature, unconsciousness, sleep pattern and its disturbances, pain, sensory deprivation. <input type="checkbox"/> Treatment aspects: pharmacological and pre-post operative care aspects, <input type="checkbox"/> Cardio pulmonary resuscitation. <input type="checkbox"/> End of life Care <input type="checkbox"/> Infection prevention (including HIV) and standard safety measures, bio-medical waste management. <input type="checkbox"/> Role of nurse- Evidence based nursing practice; Best practices <input type="checkbox"/> Innovations in nursing
VI	20	<p>Philosophy and Theories of Nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Values, Conceptual models, approaches.

		<ul style="list-style-type: none"> <input type="checkbox"/> Nursing theories: Nightingale's, Henderson's, Roger's, Peplau's, Abdella's, Lewine's, Orem's, Johnson's, King's, Neuman's, Roy's, Watson parse, etc and their applications, <input type="checkbox"/> Health belief models, communication and management, etc <input type="checkbox"/> Concept of Self health. <input type="checkbox"/> Evidence based practice model.
VIII	10	<p>Nursing process approach</p> <ul style="list-style-type: none"> <input type="checkbox"/> Health Assessment- illness status of patients/clients(Individuals, family, community), Identification of healthillness problems, health behaviors, signs and symptoms of clients. <input type="checkbox"/> Methods of collection, analysis and utilization of data relevant to nursing process. <input type="checkbox"/> Formulation of nursing care plans, health goals, implementation, modification and evaluation of care.
IX	30	<p>Psychological aspects and Human relations</p> <ul style="list-style-type: none"> <input type="checkbox"/> Human behavior, Life processes & growth and development, personality development, defense mechanisms, <input type="checkbox"/> Communication, interpersonal relationships, individual and group, group dynamics, and organizational behavior, <input type="checkbox"/> Basic human needs, Growth and development, (Conception through preschool, School age through adolescence, Young & middle adult, and Older adult) <input type="checkbox"/> Sexuality and sexual health. <input type="checkbox"/> Stress and adaptation, crisis and its intervention, <input type="checkbox"/> Coping with loss, death and grieving, <input type="checkbox"/> Principles and techniques of Counseling
XI	25	<p>Computer applications for patient care delivery system and nursing practice</p> <ul style="list-style-type: none"> <input type="checkbox"/> Use of computers in teaching, learning, research and nursing practice. <input type="checkbox"/> Windows, MS office: Word, Excel, Power Point, <input type="checkbox"/> Internet, literature search, <input type="checkbox"/> Statistical packages, <input type="checkbox"/> Hospital management information system: softwares.

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.Practical

Clinical posting in the following areas:

- Specialty area- in-patient unit - 2 weeks
- Community health center/PHC - 2 weeks
- Emergency/ICU - 2 weeks

Activities

- Prepare Case studies with nursing process approach and theoretical basis
- Presentation of comparative picture of theories
- Family case- work using model of prevention
- Annotated bibliography
- Report of field visits (5)

Methods of Teaching

- Lecture cum discussion
- Seminar
- Panel discussion
- Debate
- Case Presentations
- Exposure to scientific conferences
- Field visits

Methods of evaluation :

- Tests
- Presentation
- Seminar
- Written assignments

Advance nursing Procedures

Definition, Indication and nursing implications;

- CPR, TPN, Hemodynamic monitoring, Endotracheal intubation, Tracheostoma, mechanical ventilation, Pacemaker, Hemodialysis, Peritoneal dialysis, LP, BT Pleural and abdominal paracentesis OT techniques, Health assessment, Triage, Pulse oxymetry

Internal Assessment

Techniques	Weightage
Test- (2 tests)	50
Assignment	25

Seminar/presentation	25

	100

CLINICAL SPECIALITY - I

MEDICAL SURGICAL NURSING

Placement: 1st Year

Hours of instruction

Theory: 150 Hours

Practical: 650 Hours

Total : 800 Hours

Course Description

This course is common for the students undergoing clinical speciality-II in neuro science nursing/cardiovascular & thoracic nursing/critical care nursing/oncology nursing/orthopaedic and rehabilitation nursing/nephro & urology nursing, gastroenterology nursing/ geriatric nursing.

It is designed to assist students in developing expertise and in depth knowledge in the field of medical Surgical Nursing. It will help students to appreciate the patient as a holistic individual and develop skill to function as a specialized Medical-Surgical Nurse. It will further enable the student to function as educator, manager and researcher in the field of Medical – Surgical Nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends & issues in the field of Medical – Surgical Nursing as a speciality.
2. Apply concepts & theories related to health promotion.
3. Appreciate the client as a holistic individual.
4. Perform physical, psychosocial assessment of Medical – Surgical patients.
5. Apply Nursing process in providing care to patients.
6. Integrate the concept of family centered nursing care with associated disorder such as genetic, congenital and long-term illness.
7. Recognize and manage emergencies with Medical- Surgical patients.
8. Describe various recent technologies & treatment modalities in the management of critically ill patients.

9. Appreciate the legal & ethical issues relevant to Medical – Surgical Nursing.
10. Prepare a design for layout and management of Medical – Surgical Units.
11. Appreciate the role of alternative systems of Medicine in care of patients.
12. Incorporate evidence based Nursing practice and identify the areas of research in the field of Medical – Surgical Nursing.
13. Recognize the role of Nurse practitioner as a member of the Medical – Surgical health team.
14. Teach Medical – Surgical Nursing to undergraduate nursing students & in-service nurses.

COURSE CONTENT:

Unit	Hours	Content
I	5	<p>Introduction:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical development of Medical- Surgical Nursing in India. <input type="checkbox"/> Current status of health and disease burden in India. <input type="checkbox"/> Current concept of health. <input type="checkbox"/> Trends & issues in Medical – Surgical Nursing. <input type="checkbox"/> Ethical & cultural issues in Medical – Surgical Nursing. <input type="checkbox"/> Rights of patients. <input type="checkbox"/> National health policy, special laws & ordinances relating to older people. <input type="checkbox"/> National goals. <input type="checkbox"/> Five year plans. <input type="checkbox"/> National health programs related to adult health
II	20	<p>Health Assessment of patients</p> <ul style="list-style-type: none"> <input type="checkbox"/> History taking. <input type="checkbox"/> Physical examination of various systems. <input type="checkbox"/> Nutritional assessment. <input type="checkbox"/> Related investigations and diagnostic assessment
III	5	<p>Care in hospital settings:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ambulatory care. <input type="checkbox"/> Acute and Critical care. <input type="checkbox"/> Long term care. <input type="checkbox"/> Home Health Care. <input type="checkbox"/> Characteristics, care models, practice settings, interdisciplinary team.

		<input type="checkbox"/> Hospitalization- effects of hospitalization on the patient & family. <input type="checkbox"/> Stressors & reactions related to disease process. <input type="checkbox"/> Nursing care using Nursing process approach.
Unit	Hours	Content
IV	10	Management of patients with disorders of Gastro intestinal tract <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders-etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment- History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
V	10	Management of patients with disorders of nervous system <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
VI	10	Management of patients with disorders of respiratory system <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic

VII	10	<p>assessment.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up. <p>Management of patients with disorders of cardio vascular system</p> <ul style="list-style-type: none"> <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
VIII	5	<p>Management of patients with disorders of blood</p> <ul style="list-style-type: none"> <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies <input type="checkbox"/> Evidence based nursing practice <input type="checkbox"/> Rehabilitation and follow-up
IX	10	<p>Management of patients with disorders of genito urinary system</p> <ul style="list-style-type: none"> <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends.

		<input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
X	10	Management of patients with disorders of endocrine system <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
XI	10	Management of patients with disorders of musculo-skeletal system <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
XII	8	Management of patients with disorders of integumentary system <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends.

		<input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
XIII	5	Management of patients with disorders of Eye and ENT <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders-etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
XIV	8	8 Management of patients with disorders of reproductive system <input type="checkbox"/> Review of anatomy and physiology. <input type="checkbox"/> Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <input type="checkbox"/> Nursing management. <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.
XV	8	Geriatric nursing <input type="checkbox"/> Nursing Assessment-History and Physical assessment. <input type="checkbox"/> Ageing; <input type="checkbox"/> Demography; Myths and realities. <input type="checkbox"/> Concepts and theories of ageing. <input type="checkbox"/> Cognitive Aspects of Ageing. <input type="checkbox"/> Normal biological ageing. <input type="checkbox"/> Age related body systems changes. <input type="checkbox"/> Psychosocial Aspects of Aging. <input type="checkbox"/> Medications and elderly. <input type="checkbox"/> Stress & coping in older adults.

		<ul style="list-style-type: none"> <input type="checkbox"/> Common Health Problems & Nursing Management; <input type="checkbox"/> Psychosocial and Sexual. <input type="checkbox"/> Abuse of elderly. <input type="checkbox"/> Role of nurse for care of elderly: ambulation, nutritional, communicational, psychosocial and spiritual. <input type="checkbox"/> Role of nurse for caregivers of elderly. <input type="checkbox"/> Role of family and formal and non formal caregivers. <input type="checkbox"/> Use of aids and prosthesis (hearing aids, dentures, <input type="checkbox"/> Legal & Ethical Issues. <input type="checkbox"/> Provisions and Programmes for elderly; privileges, Community Programs and health services; <input type="checkbox"/> Home and institutional care. <input type="checkbox"/> Issues, problems and trends.
XVI	8	<p>Management of patients with communicable and sexually transmitted diseases:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Review of immune system. <input type="checkbox"/> Common Disorders of immune system – HIV/AIDS. <input type="checkbox"/> Review of infectious disease process. <input type="checkbox"/> Communicable Diseases- etiology, Patho physiology, Clinical manifestations, complications, prognosis. <input type="checkbox"/> Health assessment-History taking, physical examination, investigation and diagnostic assessment. <input type="checkbox"/> Treatment modalities and trends. <p>Nursing management.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Related research studies. <input type="checkbox"/> Evidence based nursing practice. <input type="checkbox"/> Rehabilitation and follow-up.

Practical

Total = 660 Hours
1 Week = 30 Hours

S.No.	Dept/Unit	No. of Week	Total Hours
1.	General Medical Ward	4	120 Hours
2.	General Surgical Ward	4	120 Hours
3.	ICUs	4	120 Hours
4.	Oncology	2	60 Hours
5.	Ortho	2	60 Hours
6.	Cardio	2	60 Hours
7.	Emergency Department	2	60 Hours
8.	Neuro	2	60 Hours
	Total	22 Weeks	660 Hours

Student Activities:

- Clinical presentations
- History taking
- Health Assessment
- Nutritional Assessment
- Health Education related to disease conditions
- Case studies
- Project work
- Field visits

CLINICAL SPECIALITY-I
OBSTETRIC AND GYNAECOLOGICAL NURSING

Placement : 1st year

Hours of Instruction
Theory : 150 Hours.
Practical : 650 Hours.
Total : 800 Hours.

Course Description

This course is designed to assist students in developing expertise and in depth understanding in the field of Obstetric and Gynaecological Nursing. It will help students to appreciate the client as a holistic individual and develop skill to function as an independent midwifery practitioner. It will further enable the student to function as educator, manager, and researcher in the field of Obstetric and Gynecological nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends in the field of midwifery, obstetrics and gynaecology as a speciality.
2. Describe the population dynamics and indicators of maternal and child health
3. Describe the concepts of biophysical, psychological and spiritual aspects of normal pregnancy, labor and puerperium.
4. Provide comprehensive nursing care to women during reproductive period and newborns.
5. Integrate the concepts of family centered nursing care and nursing process approach in obstetric and gynaecological nursing.
6. Identify and analyze the deviations from normal birth process and refer appropriately.
7. Describe the pharmacological agents, their effects during pregnancy, child birth, puerperium, lactation and the role of nurse
8. Counsel adolescents, women and families on issues pertaining to pregnancy, child birth and lactation
9. Describe the role of various types of complementary and alternative therapies in obstetric and gynaecological nursing.
10. Incorporate evidence based nursing practice and identify the areas of research in the field of obstetric and gynaecological nursing.

11. Describe the recent advancement in contraceptive technology and birth control measures
12. Appreciate the legal and ethical issues pertaining to obstetric and gynaecological nursing

Course Content

Unit	Hours	Content
I	10	<p>Introduction:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical and contemporary perspectives <input type="checkbox"/> Epidemiological aspects of maternal and child health <input type="checkbox"/> Magnitude of maternal and child health problems <input type="checkbox"/> Issues of maternal and child health : Age, Gender, Sexuality, psycho Socio cultural factors <input type="checkbox"/> Preventive obstetrics <input type="checkbox"/> National health and family welfare programmes related to maternal and child health: health care delivery system- National Rural health mission, Role of NGO's <input type="checkbox"/> Theories, models and approaches applied to midwifery practice <input type="checkbox"/> Role and scope of midwifery practice: Independent Nurse midwifery practitioner <input type="checkbox"/> Legal and Ethical issues: Code of ethics and standards of midwifery practice, standing orders <input type="checkbox"/> Evidence based midwifery practice <input type="checkbox"/> Research priorities in obstetric and gynaecological nursing.
II	15	<p>Human reproduction</p> <ul style="list-style-type: none"> <input type="checkbox"/> Review of anatomy and physiology of human reproductive system: male and female <input type="checkbox"/> Hormonal cycles <input type="checkbox"/> Embryology <input type="checkbox"/> Genetics, teratology and counseling <input type="checkbox"/> Clinical implications.
III	25	<p>. Pregnancy</p> <ul style="list-style-type: none"> <input type="checkbox"/> Maternal adaptation : Physiological, psychosocial • Assessment – Maternal and foetal measures Maternal measures:History taking ,

		<p>examination-General,physical and obstetrical measure, identification of high risk,</p> <ul style="list-style-type: none"> • Foetal measure- clinical parameters, biochemical- human estriol, Maternal Serum Alfa Feto Protein, Acetyl Choline esterase (AchE), Triple Test Aminocentesis, Cordocentesis, chorionic villus sampling (CVS)), • Biophysical- (US IMAGING, Foetal movement count, Ultra Sonography, Cardiotocography, cardiotomography, Non Stress Test(NST), Contraction stress test(CST), amnioscopy, foetoscopy, • Radiological examination, <ul style="list-style-type: none"> <input type="checkbox"/> Interpretation of diagnostic tests and nursing implications <input type="checkbox"/> Nursing management of the pregnant women, minor disorders of pregnancy and management, preparation for child birth and parenthood, importance of institutional delivery , choice of birth setting, importance and mobilizing of transportation, prenatal counseling, role of nurse and crisis intervention, identification of high risk pregnancy and refer <input type="checkbox"/> Alternative/complementary therapies
IV	25	<p>Normal Labour and nursing management:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Essential factors of labour <input type="checkbox"/> Stages and onset <p>First stage: Physiology of normal labour</p> <ul style="list-style-type: none"> • Use of partograph: Principles, use and critical analysis, evidence based studies • Analgesia and anaesthesia in labour • Nursing management <p>Second stage</p> <ul style="list-style-type: none"> • Physiology , intrapartum monitoring • Nursing management. • Resuscitation , immediate newborn care and initiate breast feeding (Guidelines of National neonatology forum of India) <p>Third stage</p> <ul style="list-style-type: none"> • Physiology and nursing management <p>Fourth stage – Observation, critical analysis and Nursing management.</p> <ul style="list-style-type: none"> • Various child birth practice: water birth, position change etc

		<ul style="list-style-type: none"> • Evidence based practice in relation to labour intervention <p>Role of nurse midwifery practitioner</p> <ul style="list-style-type: none"> • Alternative/complementary therapies
V	20	<p>Normal puerperium and nursing management</p> <ul style="list-style-type: none"> <input type="checkbox"/> Physiology of puerperium <input type="checkbox"/> Physiology of lactation, lactation management, exclusive breast feeding , Baby friendly hospital initiative (BFHI) <input type="checkbox"/> Assessment of postnatal women . <input type="checkbox"/> Minor discomforts and complications of puerperium <input type="checkbox"/> Management of mothers during puerperium: Postnatal exercises Rooming in, bonding, warm chain <input type="checkbox"/> Evidence based studies. <p>Role of nurse midwifery practitioner</p> <ul style="list-style-type: none"> • Alternative/complementary therapies
VI	20	<p>Normal Newborn</p> <ul style="list-style-type: none"> <input type="checkbox"/> Physiology and characteristics of normal newborn <input type="checkbox"/> Physical and Behavioural assessment of newborn <input type="checkbox"/> Needs of newborn <input type="checkbox"/> Essential newborn care: Exclusive breast feeding, Immunization, Hygiene measures, Newborn nutrition <input type="checkbox"/> Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU <input type="checkbox"/> Observation and care of newborn <input type="checkbox"/> Parenting process
VII	10	<p>Pharmacodynamics in obstetrics</p> <ul style="list-style-type: none"> <input type="checkbox"/> Drugs used in pregnancy, labour, post partum and newborn <input type="checkbox"/> Calculation of drug dose and administration <input type="checkbox"/> Effects of drugs used <input type="checkbox"/> Anaesthesia and analgesia in obstetrics <input type="checkbox"/> Roles and responsibilities of midwifery nurse practitioner

		<input type="checkbox"/> Standing orders and protocols and use of selected life saving drugs and interventions of obstetric emergencies approved by the MOHFW
VIII	10	Family welfare services <ul style="list-style-type: none"> <input type="checkbox"/> Population dynamics <input type="checkbox"/> Demography trends: vital statistics, calculation of indicators especially maternal and neonatal mortality rates and problems and other health problems <input type="checkbox"/> Recent advancement in contraceptive technology <input type="checkbox"/> Role of nurses in family welfare programmes in all settings <input type="checkbox"/> Role of independent nurse midwifery practitioner <input type="checkbox"/> Family life education <input type="checkbox"/> Evidence based studies <input type="checkbox"/> Information, Education and Communication(IEC) <input type="checkbox"/> Management information and evaluation system(MIES) <input type="checkbox"/> Teaching and supervision of health team members
IX	5	Infertility <ul style="list-style-type: none"> <input type="checkbox"/> Primary and secondary causes <input type="checkbox"/> Diagnostic procedures <input type="checkbox"/> Counseling: ethical and legal aspects of assisted reproductive technology(ART) <input type="checkbox"/> Recent advancement in infertility management. <input type="checkbox"/> Adoption procedures Role of nurses in infertility management
X	5	Menopause <ul style="list-style-type: none"> <input type="checkbox"/> Physiological, psychological and social aspects <input type="checkbox"/> Hormone Replacement Therapy <input type="checkbox"/> Surgical menopause <input type="checkbox"/> Counseling and guidance Role of midwifery nurse practitioner
XI	5	Abortion <ul style="list-style-type: none"> <input type="checkbox"/> Types, causes <input type="checkbox"/> Legislations, Clinical rights and professional responsibility

		<input type="checkbox"/> Abortion procedures <input type="checkbox"/> Complications <input type="checkbox"/> Nursing management Role of midwifery nurse practitioner
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Practical

Total = 660 Hours
1 Week = 30 Hours

S.No.	Dept/Unit	No. of Week	Total Hours
1.	Anetenatal Wards & OPDs	4	120 Hours
2.	Labour Room	5	150 Hours
3.	Postnatal Ward	2	60 Hours
4	Family Planning Clinics	2	60 Hours
5.	PHC/Rural maternity settings	4	120 Hours
6.	Gynae	2	60 Hours
7.	Maternity OT	2	60 Hours
8.	NICU	1	30 Hours
	Total	22 Weeks	660 Hours

Procedures observed

- Diagnostic investigations : amniocentecis, chordocentecis, chorionic villi sampling
- Infertility management: artificial reproduction : artificial insemination, invitro fertilization, and related procedures

Procedures assisted

- Medical termination of pregnancy,

Procedures performed

- Antenatal assessment-20
- Postnatal assessment-20
- Assessment during labour : use of partograph - 20
- Per vaginal examination-20
- Conduct of normal delivery-20
- Episiotomy and suturing-10
- Setting up of delivery areas
- Insertion of intra uterine devices(copper T)

Others

- Identification of high risk women and referral

- Health education: to women and their families
- Motivation of couples for planned parenthood

CLINICAL SPECIALTY –I

CHILD HEALTH (PAEDIATRIC) NURSING

Placement : Ist Year

Hours of Instruction

Theory 150 Hours

Practical 650 Hours

Total : 800 Hours

Course Description

This course is designed to assist students in developing expertise and in depth understanding in the field of Pediatric Nursing. It will help students to appreciate the child as a holistic individual and develop skill to function as neonatal and pediatric nurse specialist. It will further enable the student to function as educator, manager, and researcher in the field of Paediatric nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the history and developments in the field of pediatrics and pediatric nursing as a specialty
2. Apply the concepts of growth and development in providing care to the pediatric clients and their families.
3. Appreciate the child as a holistic individual
4. Perform physical, developmental, and nutritional assessment of pediatric clients
5. Apply nursing process in providing nursing care to neonates & children
6. Integrate the concept of family centered pediatric nursing care with related areas such as genetic disorders, congenital malformations and long term illness.
7. Recognize and manage emergencies in neonates
8. Describe various recent technologies and treatment modalities in the management of high risk neonates
9. Appreciate the legal and ethical issues pertaining to pediatric and neonatal nursing
10. Prepare a design for layout and management of neonatal units
11. Incorporate evidence based nursing practice and identify the areas of research in the field of pediatric/neonatal nursing

12. Recognize the role of pediatric nurse practitioner and as a member of the pediatric and neonatal health team
13. Teach pediatric nursing to undergraduate students & in-service nurses

Course Content

Unit	Hours	Content
I	10	<p>Introduction:</p> <p>Historical development of Pediatrics and Pediatric Nursing in India;</p> <ul style="list-style-type: none"> <input type="checkbox"/> Current status of child health in India; <input type="checkbox"/> Trends in Pediatrics and Pediatric Nursing, <input type="checkbox"/> Ethical and cultural issues in pediatric care <input type="checkbox"/> Rights of children <input type="checkbox"/> National health policy for children, special laws and ordinances relating to children. <input type="checkbox"/> National goals, <input type="checkbox"/> Five year plans, <input type="checkbox"/> National health programs related to child health.
II	10	<p>Assessment of pediatric clients</p> <ul style="list-style-type: none"> <input type="checkbox"/> History taking <input type="checkbox"/> Developmental assessment <input type="checkbox"/> Physical assessment <input type="checkbox"/> Nutritional assessment <input type="checkbox"/> Family assessment
III	10	<p>Hospitalized child</p> <ul style="list-style-type: none"> <input type="checkbox"/> Meaning of hospitalization of the child, preparation for hospitalization, effects of hospitalization on the child and family <input type="checkbox"/> Stressors and reactions related to developmental stages, play activities for ill hospitalized child. <input type="checkbox"/> Nursing care of hospitalized child and family - principles and practices
IV	15	<p>Pre-natal Pediatrics</p> <ul style="list-style-type: none"> <input type="checkbox"/> Embryological and fetal development, Prenatal factors influencing growth and development of fetus, <input type="checkbox"/> Genetic patterns of common pediatric disorders, chromosomal aberrations, genetic assessment and counseling legal and ethical aspects of genetic,

		<p>screening and counseling role of nurse in genetic counseling,</p> <ul style="list-style-type: none"> <input type="checkbox"/> Importance of prenatal care and role of pediatric nurse.
V	15	<p>Growth and Development of children</p> <ul style="list-style-type: none"> <input type="checkbox"/> Principles of growth and development, <input type="checkbox"/> Concepts and theories of growth and development, <input type="checkbox"/> Developmental tasks and special needs from infancy to adolescence, developmental milestones, <input type="checkbox"/> Assessment of growth and development of pediatric clients, <input type="checkbox"/> Factors affecting growth and development.
VI	15	<p>Behavioral Pediatrics and Pediatric Nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Parent child relationship, <input type="checkbox"/> Basic behavioral pediatric principles and specific behavioral pediatric concepts/disorders-maternal deprivation, failure to thrive, child abuse, the battered child, <input type="checkbox"/> Common behavioral problems and their management, <input type="checkbox"/> Child guidance clinic.
VII	15	<p>Preventive Pediatrics and Pediatric Nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Concept, aims and scope of preventive pediatrics, <input type="checkbox"/> Maternal health and its influence on child health antenatal aspects of preventive pediatrics, <input type="checkbox"/> Immunization, expanded program on immunization/ universal immunization program and cold chain, <input type="checkbox"/> Nutrition and nutritional requirements of children, changing patterns of feeding, baby-friendly hospital initiative and exclusive breast feeding, <input type="checkbox"/> Health education, nutritional education for children <input type="checkbox"/> Nutritional programs <input type="checkbox"/> National and international organizations related to child health, Role of pediatric nurse in the hospital and community.
VIII	30	<p>Neonatal Nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> New born baby- profile and characteristics of

		<p>the new born,</p> <ul style="list-style-type: none"> □ Assessment of the new born, □ Nursing care of the new born at birth, care of the new born and family, □ High risk newborn- pre term and term neonate and growth retarded babies, □ Identification and classification of neonates with infections, HIV & AIDS, Ophthalmia neonatorum, congenital syphilis. □ High risk new born- Identification, classification and nursing management □ Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU.
IX	30	IMNCI (Integrated management of neonatal and childhood illnesses)

Practical

Total = 660 Hours
1 Week = 30 Hours

S.No.	Dept/Unit	No. of Week	Total Hours
1.	Pediatric Medicine Ward	4	120 Hours
2.	Pediatric Surgery Ward	4	120 Hours
3.	Labor Room/Maternity Ward	2	60 Hours
4	Pediatric OPD	2	60 Hours
5.	NICU	4	120 Hours
6.	Creche 1	1	30 Hours
7.	Child Guidance Clinic	1	30 Hours
8.	Community	4	120 Hours
	Total	22 Weeks	660 Hours

Student Activities

- Clinical presentations
- Growth & developmental assessment
- Assessment & prescription of nursing interventions for sick children
- Health education related to disease conditions
- Nutritional assessment

- Project work
- Field visits

CLINICAL SPECIALITY – I

MENTAL HEALTH (PSYCHIATRIC) NURSING

Placement : 1st Year

Hours of Instruction
 Theory 150 hours
 Practical 650 hours
 Total : 800 hours

Course Description

This course is designed to assist students in developing expertise and in depth understanding in the field of Psychiatric Nursing. It will help students to appreciate the client as a holistic individual and develop skill to function psychiatric nurse specialist . It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends and issues in the field of psychiatry and psychiatric nursing.
2. Explain the dynamics of personality development and human behaviour.
3. Describe the concepts of psychobiology in mental disorders and its implications for psychiatric nursing
4. Demonstrate therapeutic communications skills in all interactions
5. Demonstrate the role of psychiatric nurse practitioner in various therapeutic modalities
6. Establish and maintain therapeutic relationship with individual and groups
7. Uses assertive techniques in personal and professional actions
8. Promotes self-esteem of clients, others and self
9. Apply the nursing process approach in caring for patients with mental disorders
10. Describe the psychopharmacological agents, their effects and nurses role
11. Recognize the role of psychiatric nurse practitioner and as a member of the psychiatric and mental health team
12. Describe various types of alternative system of medicines used in psychiatric settings

13. Incorporate evidence based nursing practice and identify the areas of research in the field of psychiatric nursing

Course Content

Unit	Hours	Content
I	15	<p>Introduction</p> <ul style="list-style-type: none"> <input type="checkbox"/> Mental Health and Mental Illness <input type="checkbox"/> Historical perspectives <input type="checkbox"/> Trends, issues and magnitude <input type="checkbox"/> Contemporary practices <input type="checkbox"/> Mental health laws/Acts <input type="checkbox"/> National mental health program -National mental health authority, state mental health authority <input type="checkbox"/> Human rights of mentally ill <input type="checkbox"/> Mental Health/ Mental Illness Continuum <input type="checkbox"/> Classification of mental illnesses-ICD, DSM <input type="checkbox"/> Standards of Psychiatric nursing <input type="checkbox"/> Challenges and Scope of psychiatric nursing <input type="checkbox"/> Multi-disciplinary team and role of nurse <p>Role of psychiatric nurse- extended and expanded</p>
II	10	<p>Concepts of Psychobiology</p> <ul style="list-style-type: none"> <input type="checkbox"/> The Nervous System: <ul style="list-style-type: none"> • An Anatomical Review • The Brain and limbic system • Nerve Tissue • Autonomic Nervous system • Neurotransmitters <input type="checkbox"/> Neuroendocrinology <ul style="list-style-type: none"> • Pituitary, Thyroid Gland • Circadian Rhythms <input type="checkbox"/> Genetics <input type="checkbox"/> Neuro psychiatric disorders <input type="checkbox"/> Psychoimmunology <ul style="list-style-type: none"> • Normal Immune response • Implications for psychiatric Illness <input type="checkbox"/> Implications for Nursing
III	10	<p>Theories of Personality Development and relevance to nursing practice</p>

		<input type="checkbox"/> Psychoanalytic Theory- Freud's <input type="checkbox"/> Interpersonal Theory-Sullivan's <input type="checkbox"/> Theory of Psychosocial Development-Erikson's <input type="checkbox"/> Theory of object relations <input type="checkbox"/> Cognitive Development Theory <input type="checkbox"/> Theory of Moral Development <input type="checkbox"/> A Nursing Model-Hildegard E.Peplau
IV	5	Stress and its management <input type="checkbox"/> An introduction to the concepts of stress <input type="checkbox"/> Psychological Adaptation to stress <input type="checkbox"/> Stress as a Biological Response. <input type="checkbox"/> Stress as an Environmental Event. <input type="checkbox"/> Stress as Transaction between the Individual and the Environment. <input type="checkbox"/> Stress management
V	10	Therapeutic communication and interpersonal relationship <input type="checkbox"/> Review communication process, factors affecting communication <input type="checkbox"/> Communication with individuals and in groups <input type="checkbox"/> Techniques of therapeutic communication-touch therapy <input type="checkbox"/> Barrier of communication with specific reference to psychopathology <input type="checkbox"/> Therapeutic attitudes <input type="checkbox"/> Dynamics of a therapeutic Nurse-client relationship; Therapeutic use of self Gaining self-awareness <input type="checkbox"/> Therapeutic nurse-patient relationship its phases ; Conditions essential to development of a therapeutic relationship <input type="checkbox"/> Therapeutic impasse and its management
VI	10	Assertive Training <input type="checkbox"/> Assertive Communication <input type="checkbox"/> Basic Human Rights <input type="checkbox"/> Response Patterns <ul style="list-style-type: none"> • (Nonassertive Behavior • Assertive Behavior • Aggressive Behavior • Passive-Aggressive Behavior) <input type="checkbox"/> Behavioral Components of Assertive Behavior <input type="checkbox"/> Techniques that Promote Assertive Behavior <input type="checkbox"/> Thought-Stopping Techniques Method

		Role of The Nurse
VII	10 5	<p>Promoting Self-Esteem</p> <ul style="list-style-type: none"> <input type="checkbox"/> Components of Self-Concept <input type="checkbox"/> The Development of Self-Esteem <input type="checkbox"/> The Manifestations of Low-Self-Esteem <input type="checkbox"/> Boundaries <p>Role of The Nurse</p> <p>Women and Mental Health</p> <ul style="list-style-type: none"> • Normal reaction to conception, pregnancy and puerperium • Problems related to conception, pregnancy and puerperium and its management. • Counselling – Premarital, marital and genetic
VIII	10	<p>The nursing process in psychiatric/mental health nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Mental health assessment- History taking, mental status examination <input type="checkbox"/> Physical and neurological examination <input type="checkbox"/> Psychometric assessment <input type="checkbox"/> Investigations, Diagnosis and Differential diagnosis <input type="checkbox"/> Interpretation of investigations <input type="checkbox"/> Nurse's role <input type="checkbox"/> Nursing case management • Critical pathways of care <input type="checkbox"/> Documentation • Problem-oriented recording • Focus charting • The PIE method
IX	35	<p>Psycho social and physical therapies</p> <ul style="list-style-type: none"> <input type="checkbox"/> Individual therapy <input type="checkbox"/> Behavioural Therapy- Relaxation therapy, cognitive therapy, positive- negative reinforcement, bio-feedback, guided imagery, ab-reactive therapy <input type="checkbox"/> Group Therapy

		<input type="checkbox"/> Family Therapy <input type="checkbox"/> Milieu Therapy <input type="checkbox"/> The Therapeutic Community <input type="checkbox"/> Occupational therapy <input type="checkbox"/> Recreational therapy <input type="checkbox"/> Play therapy <input type="checkbox"/> Music therapy <input type="checkbox"/> Light therapy <input type="checkbox"/> Color therapy <input type="checkbox"/> Aroma therapy
X	5	Electroconvulsive Therapy <input type="checkbox"/> Historical Perspectives <input type="checkbox"/> Indications <input type="checkbox"/> Contraindications <input type="checkbox"/> Mechanisms of Action <input type="checkbox"/> Side Effects <input type="checkbox"/> Risks Associated with Electroconvulsive Therapy <input type="checkbox"/> The Role of The Nurse in Electroconvulsive Therapy
XI	10	Psychopharmacology <input type="checkbox"/> Historical Perspectives <input type="checkbox"/> Role of a Nurse in Psychopharmacological Therapy <ul style="list-style-type: none"> • Antianxiety Agents • Antidepressants Agents • Mood stabilizers • Antipsychotics • Sedative-Hypnotics • Central Nervous System Stimulants <input type="checkbox"/> Future developments
XII	15	Alternative systems of medicine in mental health <input type="checkbox"/> Types of Therapies <ul style="list-style-type: none"> • Herbal Medicine • Unani • Siddha • Homeopathic • Acupressure and Acupuncture • Diet and Nutrition • Chiropractic Medicine • Therapeutic Touch and Massage • Yoga • Pet Therapy

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Practical

Total = 660 Hours
1 Week = 30 Hours

S.No.	Dept/Unit	No. of Week	Total Hours
1.	Acute Psychiatric Ward	4	120 Hours
2.	Chronic Psychiatric ward	4	120 Hours
3.	Psychiatric Emergency Unit	2	60 Hours
4.	O.P.D	2	60 Hours
5.	Family Psychiatric Unit	2	60 Hours
6.	Community Mental Health Unit	4	120 Hours
7.	Rehabilitation / Occupational Therapy Unit/Half way home/ Day care centre	4	120 Hours
	Total	22 Weeks	660 Hours

Student Activities

- History taking
- Mental health assessment
- Psychometric assessment
- Personality assessment
- Process recording
- Therapies- Group Therapy
- Family Therapy
- Psychotherapy
- Milieu Therapy
- The Therapeutic Community
- Occupational therapy
- Recreational therapy

- Play therapy
- music therapy
- Pet therapy
- Counselling
- Assisted ECT
- Assisted EEG
- Case studies
- Case presentation
- Project work
- Socio and psycho drama
- Field visits

CLINICAL SPECIALITY- I

COMMUNITY HEALTH NURSING

Placement : 1st Year

Hours of Instructions
Theory 150 hours
Practical 650 hours
Total 800 hours

Course Description

The course is designed to assist students in developing expertise and indepth understanding in the field of Community Health Nursing. It would help students to appreciate holistic life style of individuals, families & groups and develop skills to function as Community Health Nurse specialist/practitioner. It would further enable student to function as an educator, manager and researcher in the field of Community Health nursing.

Objectives

At the end of the course, the student will be able to:

1. Appreciate the history and development in the field of Community Health and Community Health Nursing.
2. Appreciate role of individuals and families in promoting health of the Community.
3. Perform physical, developmental and nutritional assessment of individuals, families and groups.
4. Apply the concepts of promotive, preventive, curative and rehabilitative aspects of health while providing care to the people.
5. Apply nursing process approach while providing care to individuals, families, groups and community.
6. Integrate the concepts of family centered nursing approach while providing care to the community.

7. Recognize and participate in the management of emergencies, epidemics and disasters.
8. Apply recent technologies and care modalities while delivering community health nursing care.
9. Appreciate legal and ethical issues pertaining to community health nursing care.
10. Conduct community health nursing care projects.
11. Participate in planning, implementation and evaluation of various national health and family welfare programmes at local, state and the national level.
12. Incorporate evidence based nursing practice and identify the areas of research in the community settings.
13. Participate effectively as a member of Community Health team.
14. Coordinate and collaborate with various agencies operating in the community by using inter-sectoral approach.
15. Teach community health nursing to undergraduates, in-service nurses and the community health workers.
16. Demonstrate leadership and managerial abilities in community health nursing practice

Course Content

Unit	Hours	Content
I	10	<p>Introduction</p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical development of Community Health and Community health Nursing- World and India, various health and family welfare committees <input type="checkbox"/> Current status, trends and challenges of Community Health Nursing <input type="checkbox"/> Health status of the Community-community diagnosis <input type="checkbox"/> Scope of Community health Nursing practice <input type="checkbox"/> Ethical and legal issues <input type="checkbox"/> Socio-cultural issues in Community health Nursing <input type="checkbox"/> National Policies, plans and programmes <ul style="list-style-type: none"> • National health policy • National Population policy • National Health and welfare Programmes • National Health goals/ indicators/ Millennium developmental goals(MDG)/ Strategies • Planning process: Five year plans • National Rural Health Mission • Panchayat raj institutions

II	10	Health <ul style="list-style-type: none"> <input type="checkbox"/> Concepts, issues <input type="checkbox"/> Determinants <input type="checkbox"/> Measurements <input type="checkbox"/> Alternate systems for health promotion and management of health problems <input type="checkbox"/> Health economics <input type="checkbox"/> Health technology <input type="checkbox"/> Genetics and health <input type="checkbox"/> Waste disposal <input type="checkbox"/> Eco system
III	15	Population dynamics and control <ul style="list-style-type: none"> <input type="checkbox"/> Demography <input type="checkbox"/> Transition and theories of population <input type="checkbox"/> National population policy <input type="checkbox"/> National population programmes <input type="checkbox"/> Population control and related programmes <input type="checkbox"/> Methods of family limiting and spacing <input type="checkbox"/> Research, Census, National Family Health Survey
IV	30	Community health Nursing <ul style="list-style-type: none"> <input type="checkbox"/> Philosophy, Aims, Objectives, Concepts, Scope, Principles, Functions <input type="checkbox"/> Community health Nursing theories and models <input type="checkbox"/> Quality assurance: Community health Nursing standards, competencies, Monitoring community health nursing, nursing audits <input type="checkbox"/> Family nursing and Family centered nursing approach <input type="checkbox"/> Family health nursing process <ul style="list-style-type: none"> o Family health assessment o Diagnosis o Planning o Intervention o Evaluation <input type="checkbox"/> Nursing care for special groups: children, adolescents, adults, women, elderly, physically and mentally challenged- Urban and rural population at large <input type="checkbox"/> Community nutrition <input type="checkbox"/> Concept, role and responsibilities of community

		health Nurse practitioners/nurse midwifery practitioners-decision making skills, professionalism, legal issues
V	45	<p>Maternal and neonatal care</p> <ul style="list-style-type: none"> <input type="checkbox"/> IMNCI(Integrated Management of Neonatal And Childhood Illnesses) module <input type="checkbox"/> Skilled Birth Attendant (SBA) module
VI	15	<ul style="list-style-type: none"> <input type="checkbox"/> Disaster nursing (INC module on Reaching out: Nursing Care in emergencies)
VII	10	<p>Information, education and communication</p> <ul style="list-style-type: none"> <input type="checkbox"/> IEC/BCC: Principles and strategies <input type="checkbox"/> Communication Skills <input type="checkbox"/> Management information and evaluation system: Records and reports <input type="checkbox"/> Information technology <input type="checkbox"/> Tele-medicine and tele-nursing <input type="checkbox"/> Journalism <input type="checkbox"/> Mass media <input type="checkbox"/> Folk media
VIII	15	<p>Health care delivery system: Urban, rural, tribal and difficult areas</p> <ul style="list-style-type: none"> <input type="checkbox"/> Health organization: National, State, District, CHC, PHC, Sub Centre, Village - Functions, Staffing, pattern of assistance, layout, drugs, equipments and supplies, Roles and Responsibilities of DPHNO <input type="checkbox"/> Critical review of functioning of various levels, evaluation studies, recommendations and nursing perspectives <input type="checkbox"/> Alternative systems of medicine <input type="checkbox"/> Training and supervision of health workers <p>50</p> <ul style="list-style-type: none"> <input type="checkbox"/> Health agencies: NGO's, Roles and functions <input type="checkbox"/> Inter-sectoral coordination <input type="checkbox"/> Public private partnership <input type="checkbox"/> Challenges of health care delivery system

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Practical

Total = 660 Hours
1 Week = 30 Hours

S.No.	Dept/Unit	No. of Week	Total Hours
1.	Sub-centre, PHC, CHC	12	360 Hours
2.	District family welfare bureau	1	30 Hours
3.	Urban centers	6	180 Hours
4	Field visits	3	90 Hours
	Total	22 Weeks	660 Hours

Student Activities

- Identification of community leaders and resource persons (community mapping)
- Community health survey
- Community health nursing process- individual, family and special groups and community
- Counseling
- Health education – campaign, exhibition, folk media, preparation of IEC materials
- Organising and participating in special clinics/camps and national health and welfare programmes-Organise atleast one health and family welfare mela/fair (all stalls of national health and family welfare activities should be included)
- Estimation of Vital health statistics -Exercise
- Drill for disaster preparedness
- Organise atleast one in-service education to ANM's/LHV/PHN/HW
- Nutrition – Exercise on nutritional assessment on dietary planning, demonstration and education for various age groups
- Filling up of Records, reports and registers maintained at SC/PHC/CHC
- Assist women in self breast examination

- Conduct antenatal examination
- Conduct vaginal examination
- Conduct deliveries
- Post natal visits
- Perform Episiotomy and suturing
- Prepare Pap smear
- Conduct Insertion/Removal of IUD
- Blood Slide preparation
- Field visits
- Maintenance of log book for various activities

NURSING RESEARCH AND STATISTICS

Placement: 1st Year

Hours of Instruction
Theory 150 Hours
Practical 100 Hours
Total : 250 Hours

Part-A : Nursing Research

Theory 100 Hours
Practical 50 Hours
Total : 150 Hours

Course Description:

The course is designed to assist the students to acquire an understanding of the research methodology and statistical methods as a basis for identifying research problem, planning and implementing a research plan. It will further enable the students to evaluate research studies and utilize research findings to improve quality of nursing practice, education and management.

General Objectives:

At the end of the course, the students will be able to:

1. Define basic research terms and concepts.
2. Review literature utilizing various sources
3. Describe research methodology
4. Develop a research proposal.
5. Conduct a research study.
6. Communicate research findings
7. Utilize research findings

8. Critically evaluate nursing research studies.
9. Write scientific paper for publication.

Content Outline

Unit	Hours		Course Content
	Theory	Practical	
I	10		<p>Introduction</p> <ul style="list-style-type: none"> □ Methods of acquiring knowledge – problem solving and scientific method. □ Research – Definition, characteristics, purposes, kinds of research □ Historical Evolution of research in nursing □ Basic research terms □ Scope of nursing research: areas, problems in nursing, health and social research □ Concept of evidence based practice □ Ethics in research □ Overview of Research process
II	5	5	<p>Review of Literature</p> <ul style="list-style-type: none"> □ Importance, purposes, sources, criteria for selection of resources and steps in reviewing literature.
III	12		<p>Research Approaches and designs</p> <ul style="list-style-type: none"> □ Type: Quantitative and Qualitative □ Historical, survey and experimental – Characteristics, types advantages and disadvantages □ Qualitative: Phenomenology, grounded theory, ethnography
IV	10	5	<p>Research problem:</p> <ul style="list-style-type: none"> □ Identification of research problem □ Formulation of problem statement and research objectives

			<input type="checkbox"/> Definition of terms <input type="checkbox"/> Assumptions and delimitations <input type="checkbox"/> Identification of variables <input type="checkbox"/> Hypothesis – definition, formulation and types.
V	5	5	Developing theoretical/conceptual framework. <input type="checkbox"/> Theories: Nature, characteristics, Purpose and uses <input type="checkbox"/> Using, testing and developing conceptual framework, models and theories.
VI	6		Sampling <input type="checkbox"/> Population and sample <input type="checkbox"/> Factors influencing sampling <input type="checkbox"/> Sampling techniques <input type="checkbox"/> Sample size <input type="checkbox"/> Probability and sampling error <input type="checkbox"/> Problems of sampling
VII	20	10	Tools and methods of Data collection: <input type="checkbox"/> Concepts of data collection <input type="checkbox"/> Data sources, methods/techniques quantitative and qualitative. <input type="checkbox"/> Tools for data collection – types, characteristics and their development <input type="checkbox"/> Validity and reliability of tools <input type="checkbox"/> Procedure for data collection
VIII	5		Implementing research plan <input type="checkbox"/> Pilot Study, review research plan (design)., planning for data collection, administration of tool/interventions, collection of data
IX	10	10	Analysis and interpretation of data <input type="checkbox"/> Plan for data analysis: quantitative and qualitative <input type="checkbox"/> Preparing data for computer analysis and presentation. <input type="checkbox"/> Statistical analysis <input type="checkbox"/> Interpretation of data <input type="checkbox"/> Conclusion and generalizations <input type="checkbox"/> Summary and discussion
X	10		Reporting and utilizing research findings:

			<input type="checkbox"/> Communication of research results; oral and written <input type="checkbox"/> Writing research report purposes, methods and style Vancouver, American Psychological Association (APA), Campbell etc <input type="checkbox"/> Writing scientific articles for publication: purposes & style
XI	3	8	Critical analysis of research reports and articles
XII	4	7	Developing and presenting a research proposal

Activities:

- Annotated Bibliography of research reports and articles.
- Review of literature of selected topic and reporting
- Formulation of problem statement, objective and hypothesis
- Developing theoretical/conceptual framework.
- Preparation of a sample research tool
- Analysis and interpretation of given data
- Developing and presenting research proposal
- Journal club presentation
- Critical evaluation of selected research studies
- Writing a scientific paper.

Method of Teaching

- Lecture-cum-discussion
- Seminar/Presentations
- **Project**
- Class room exercises
- Journal club

Methods of Evaluation

- Quiz, Tests (Term)
- Assignments/Term paper
- Presentations
- Project work

Internal Assessment

Techniques	Weightage (15marks)
Term Test(2 tests)	40%
Assignment	20%

Presentation	20%
Project work	20%
Total	100%

Part –B : Statistics

Hours of Instruction
 Theory 50 Hours
 Practical 50 Hours
 Total : 100 Hours

Course Description

At the end of the course, the students will be able to develop an understanding of the statistical methods and apply them in conducting research studies in nursing.

General Objectives

At the end of the course the students will be able to:

1. Explain the basic concepts related to statistics
2. Describe the scope of statistics in health and nursing
3. Organize, tabulate and present data meaningfully.
4. Use descriptive and inferential statistics to predict results.
5. Draw conclusions of the study and predict statistical significance of the results.
6. Describe vital health statistics and their use in health related research.
7. Use statistical packages for data analysis

Content Outline

Unit	Hours		Course Content
	Theory	Practical	
I	7	4	Introduction <ul style="list-style-type: none"> <input type="checkbox"/> Concepts, types, significance and scope of statistics, meaning of data, <input type="checkbox"/> sample, parameter <input type="checkbox"/> type and levels of data and their measurement <input type="checkbox"/> Organization and presentation of data – Tabulation of data; <input type="checkbox"/> Frequency distribution <input type="checkbox"/> Graphical and tabular presentations.

II	4	4	. Measures of central tendency: <input type="checkbox"/> Mean, Median, Mode
III	4	5	Measures of variability; <input type="checkbox"/> Range, Percentiles, average deviation, quartile deviation, standard deviation
IV	3	2	Normal Distribution: <input type="checkbox"/> Probability, characteristics and application of normal probability curve; sampling error.
V	6	8	Measures of relationship: <input type="checkbox"/> Correlation – need and meaning <input type="checkbox"/> Rank order correlation; <input type="checkbox"/> Scatter diagram method <input type="checkbox"/> Product moment correlation <input type="checkbox"/> Simple linear regression analysis and prediction.
VI	5	2	Designs and meaning: <input type="checkbox"/> Experimental designs <input type="checkbox"/> Comparison in pairs, randomized block design, Latin squares.
VII	8	10	Significance of Statistic and Significance of difference between two Statistics (Testing hypothesis) <input type="checkbox"/> Non parametric test – Chi-square test, Sign, median test, Mann Whitney test. <input type="checkbox"/> Parametric test – ‘t’ test, ANOVA, MANOVA,ANCOVA
VIII	5	5	Use of statistical methods in psychology and education: <input type="checkbox"/> Scaling – Z Score, Z Scaling <input type="checkbox"/> Standard Score and T Score <input type="checkbox"/> Reliability of test Scores: test-retest method, parallel forms, split half method.
IX	4	2	Application of statistics in health: <input type="checkbox"/> Ratios, Rates, Trends <input type="checkbox"/> Vital health statistics – Birth and death rates. <input type="checkbox"/> Measures related to fertility, morbidity and mortality
X	4	8	Use of Computers for data analysis

			<input type="checkbox"/> Use of statistical package.
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Activities

- Exercises on organization and tabulation of data,
- Graphical and tabular presentation of data
- Calculation of descriptive and inferential statistics(chi square, t-test, correlation)
- Practice in using statistical package
- Computing vital health statistics

Methods of Teaching:

- Lecture-cum-discussion
- Demonstration – on data organization, tabulation, calculation of statistics, use of statistical package, Classroom exercises, organization and tabulation of data,
- Computing Descriptive and inferential statistics; vital and health statistics and use of computer for data entry and analysis using statistical package.

Methods of Evaluation

- Test, Classroom statistical exercises.

Internal Assessment

Techniques

Test – (2 tests)

Weightage 10 marks

100%

NURSING MANAGEMENT

Placement : II Year

Hours of Instruction
Theory 150 Hours
Practical 150 Hours
Total : 300 Hours

Course Description

This course is designed to assist students to develop a broad understanding of Principles, concepts, trends and issues related to nursing management. Further, it would provide opportunity to students to understand, appreciate and acquire skills in planning, supervision and management of nursing services at different levels to provide quality nursing services.

Objectives

At the end of the course, students will be able to:

1. Describe the philosophy and objectives of the health care institutions at various levels.
2. Identify trends and issues in nursing
3. Discuss the public administration, health care administration vis a vis nursing administration
4. Describe the principles of administration applied to nursing
5. Explain the organization of health and nursing services at the various levels/institutions.
6. Collaborate and co-ordinate with various agencies by using multisectoral approach
7. Discuss the planning, supervision and management of nursing workforce for various health care settings.
8. Discuss various collaborative models between nursing education and nursing service to improve the quality of nursing care
9. Identify and analyse legal and ethical issues in nursing administration
10. Describe the process of quality assurance in nursing services.
11. Demonstrate leadership in nursing at various levels

Course Content

Unit	Hours	Content
I	10	<p>Introduction</p> <ul style="list-style-type: none"> □ Philosophy, purpose, elements, principles and scope of administration □ Indian Constitution, Indian Administrative system vis a vis health care delivery system: National, State and Local □ Organisation and functions of nursing services and education at National, State , District and institutions: Hospital and Community □ Planning process: Five year plans, Various Committee Reports on health, State and National Health policies, national population policy, national policy on AYUSH and plans
II	10	<p>Management</p> <ul style="list-style-type: none"> □ Functions of administration □ Planning and control □ Co-ordination and delegation □ Decision making – decentralization basic goals of decentralization. □ Concept of management <p>Nursing management</p> <ul style="list-style-type: none"> □ Concept, types, principles and techniques □ Vision and Mission Statements □ Philosophy, aims and objective □ Current trends and issues in Nursing Administration □ Theories and models <p>Application to nursing service and education</p>
III	15	<p>Planning</p> <ul style="list-style-type: none"> □ Planning process: Concept, Principles, Institutional policies □ Mission, philosophy, objectives, □ Strategic planning

		<input type="checkbox"/> Operational plans <input type="checkbox"/> Management plans <input type="checkbox"/> Programme evaluation and review technique(PERT), Gantt chart, Management by objectives(MBO) <input type="checkbox"/> Planning new venture <input type="checkbox"/> Planning for change <input type="checkbox"/> Innovations in nursing Application to nursing service and education
IV	15	Organisation <input type="checkbox"/> Concept , principles, objectives, Types and theories, Minimum requirements for organisation, Developing an organizational Structure, levels, organizational Effectiveness and organizational Climate, <input type="checkbox"/> Organising nursing services and patient care: Methods of patient assignment- Advantages and disadvantages, primary nursing care, <input type="checkbox"/> Planning and Organising: hospital, unit and ancillary services(specifically central sterile supply department, laundry, kitchen, laboratory services, emergency etc) <input type="checkbox"/> Disaster management: plan, resources, drill, etc Application to nursing service and education
V	15	Human Resource for health <input type="checkbox"/> Staffing • Philosophy • Norms: Staff inspection unit(SIU), Bajaj Committee, High power committee, Indian nursing council (INC) • Estimation of nursing staff requirement- activity analysis • Various research studies <input type="checkbox"/> Recruitment: credentialing, selection, placement, promotion <input type="checkbox"/> Retention <input type="checkbox"/> Personnel policies <input type="checkbox"/> Termination <input type="checkbox"/> Staff development programme <input type="checkbox"/> Duties and responsibilities of various category of nursing personnel Applications to nursing service and education

VI	15	<p>Directing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Roles and functions <input type="checkbox"/> Motivation: Intrinsic, extrinsic, Creating motivating climate, Motivational theories <input type="checkbox"/> Communication : process, types, strategies, Interpersonal communication, channels, barriers, problems, Confidentiality, Public relations <input type="checkbox"/> Delegation; common delegation errors <input type="checkbox"/> Managing conflict: process, management, negotiation, consensus <input type="checkbox"/> Collective bargaining: health care labour laws, unions, professional associations, role of nurse manager <input type="checkbox"/> Occupational health and safety <p>Application to nursing service and education</p>
VII	10	<p>Material management</p> <ul style="list-style-type: none"> <input type="checkbox"/> Concepts, principles and procedures <input type="checkbox"/> Planning and procurement procedures : Specifications <input type="checkbox"/> ABC analysis, <input type="checkbox"/> VED (very important and essential daily use) analysis <input type="checkbox"/> Planning equipments and supplies for nursing care: unit and hospital <input type="checkbox"/> Inventory control <input type="checkbox"/> Condemnation <p>Application to nursing service and education</p>
VIII	15	<p>Controlling</p> <ul style="list-style-type: none"> <input type="checkbox"/> Quality assurance – Continuous Quality Improvement <ul style="list-style-type: none"> • Standards • Models • Nursing audit <input type="checkbox"/> Performance appraisal: Tools, confidential reports, formats, Management, interviews <input type="checkbox"/> Supervision and management: concepts and principles <input type="checkbox"/> Discipline: service rules, self discipline, constructive versus destructive discipline, problem employees, disciplinary proceedings, enquiry etc <input type="checkbox"/> Self evaluation or peer evaluation, patient satisfaction, utilization review

		Application to nursing service and education
IX	15	Fiscal planning <ul style="list-style-type: none"> <input type="checkbox"/> Steps <input type="checkbox"/> Plan and non-plan, zero budgeting, mid-term appraisal, capital and revenue <input type="checkbox"/> Budget estimate, revised estimate, performance budget <input type="checkbox"/> Audit <input type="checkbox"/> Cost effectiveness <input type="checkbox"/> Cost accounting <input type="checkbox"/> Critical pathways <input type="checkbox"/> Health care reforms <input type="checkbox"/> Health economics <input type="checkbox"/> Health insurance <input type="checkbox"/> Budgeting for various units and levels Application to nursing service and education
X	10	Nursing informatics <ul style="list-style-type: none"> <input type="checkbox"/> Trends <input type="checkbox"/> General purpose <input type="checkbox"/> Use of computers in hospital and community <input type="checkbox"/> Patient record system <input type="checkbox"/> Nursing records and reports <input type="checkbox"/> Management information and evaluation system (MIES) <input type="checkbox"/> E- nursing, Telemedicine, telenursing <input type="checkbox"/> Electronic medical records
XI	10	Leadership <ul style="list-style-type: none"> <input type="checkbox"/> Concepts, Types, Theories <input type="checkbox"/> Styles <input type="checkbox"/> Manager behaviour <input type="checkbox"/> Leader behaviour <input type="checkbox"/> Effective leader: Characteristics, skills <input type="checkbox"/> Group dynamics <input type="checkbox"/> Power and politics <input type="checkbox"/> lobbying <input type="checkbox"/> Critical thinking and decision making <input type="checkbox"/> Stress management Applications to nursing service and education
XII	10	Legal and ethical issues Laws and ethics <ul style="list-style-type: none"> <input type="checkbox"/> Ethical committee

		<input type="checkbox"/> Code of ethics and professional conduct <input type="checkbox"/> Legal system: Types of law, tort law, and liabilities <input type="checkbox"/> Legal issues in nursing: negligence, malpractice, invasion of privacy, defamation of character <input type="checkbox"/> Patient care issues, management issues, employment issues <input type="checkbox"/> Medico legal issues <input type="checkbox"/> Nursing regulatory mechanisms: licensure, renewal, accreditation <input type="checkbox"/> Patients rights, Consumer protection act(CPA) <input type="checkbox"/> Rights of special groups: children, women, HIV, handicap, ageing <input type="checkbox"/> Professional responsibility and accountability <input type="checkbox"/> Infection control <input type="checkbox"/> Standard safety measures
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PRACTICALS

1. Prepare prototype personal files for staff nurses, faculty and cumulative records
2. Preparation of budget estimate, Revised estimate and performance budget
3. Plan and conduct staff development programme
4. Preparation of Organisation Chart
5. Developing nursing standards/protocols for various units
6. Design a layout plan for speciality units /hospital, community and educational institutions
7. Preparation of job description of various categories of nursing personnel
8. Prepare a list of equipments and supplies for speciality units
9. Assess and prepare staffing requirement for hospitals, community and educational institutions
10. Plan of action for recruitment process
11. Prepare a vision and mission statement for hospital, community and educational institutions
12. Prepare a plan of action for performance appraisal
13. Identify the problems of the speciality units and develop plan of action by using problem solving approach
14. Plan a duty roster for speciality units/hospital, community and educational institutions

15. Prepare: anecdotes, incident reports, day and night reports, handing and taking over reports, enquiry reports, nurses notes, Official letters, curriculum vitae, presentations etc
16. Prepare a plan for disaster management
17. Group work
18. Field appraisal report

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING

SUB SPECIALITY – CARDIO VASCULAR AND THORACIC NURSING

Placement : II year

Hours of Instruction
 Theory : 150 hours.
 Practical : 950 hours.
 Total : 1100 hours.

Course Description

This course is designed to assist students in developing expertise and indepth understanding in the field of cardiovascular and thoracic nursing. It will help students to develop advanced skills for nursing intervention in various cardio medical and surgical conditions. It will enable the student to function as Cardio vascular and Thoracic Nurse practitioner/specialist. It will further enable the student to function as educator, manager and researcher in the field of cardio vascular and thoracic nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate trends and issues related to cardio vascular and thoracic Nursing.
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of cardio vascular and thoracic conditions
3. Participate in national health programs for health promotion, prevention and rehabilitation of patients with cardio vascular and thoracic conditions
4. Perform physical, psychosocial & spiritual assessment
5. Assist in various diagnostic, therapeutic and surgical procedures
6. Apply nursing process in providing comprehensive care to patients with cardio vascular and thoracic conditions

7. Demonstrate advance skills/competence in managing patients with cardio vascular and thoracic conditions including Advance Cardiac Life Support.
8. Describe the various drugs used in cardio vascular and thoracic conditions and nurses responsibility
9. Demonstrate skill in handling various equipments/gadgets used for critical care of cardio vascular and thoracic patients
10. Appreciate team work & coordinate activities related to patient care.
11. Practice infection control measures.
12. Identify emergencies and complications & take appropriate measures
13. Discuss the legal and ethical issues in cardio vascular and thoracic nursing
14. Assist patients and their family to cope with emotional distress, grief, anxiety and spiritual needs.
15. Appreciate the role of alternative system of medicine in care of patient
16. Incorporate evidence based nursing practice and identify the areas of research in the field of cardio vascular and thoracic nursing
17. Identify the sources of stress and manage burnout syndrome among health care providers.
18. Teach and supervise nurses and allied health workers.
19. Design a layout of ICCU and ICTU and develop standards for cardio vascular and thoracic nursing practice.

Course Content

Unit	Hours	Content
I	5	Introduction <ul style="list-style-type: none"> <input type="checkbox"/> Historical development, trends and issues in the field of cardiology. <input type="checkbox"/> Cardio vascular and thoracic conditions – major health problem. <input type="checkbox"/> Concepts, principles and nursing perspectives <input type="checkbox"/> Ethical and legal issues <input type="checkbox"/> Evidence based nursing and its application in cardio vascular and thoracic nursing(to be incorporated in all the units)
II	5	Epidemiology <ul style="list-style-type: none"> <input type="checkbox"/> Risk factors: hereditary, psycho social factors, hypertension, smoking, obesity, diabetes mellitus

		<p>etc</p> <ul style="list-style-type: none"> <input type="checkbox"/> Health promotion, disease prevention, Life style modification <input type="checkbox"/> National health programs related to cardio vascular and thoracic conditions <input type="checkbox"/> Alternate system of medicine <input type="checkbox"/> Complementary therapies
III	5	<p>Review of anatomy and physiology of cardio vascular and respiratory system</p> <ul style="list-style-type: none"> <input type="checkbox"/> Review of anatomy and physiology of heart, lung, thoracic cavity and blood vessels. Embryology of heart and lung. <input type="checkbox"/> Coronary circulation <input type="checkbox"/> Hemodynamics and electro physiology of heart. <input type="checkbox"/> Bio-chemistry of blood in relation to cardio pulmonary function.
IV	20	<p>Assessment and Diagnostic Measures:</p> <ul style="list-style-type: none"> <input type="checkbox"/> History taking <input type="checkbox"/> Physical assessment <ul style="list-style-type: none"> • Heart rate variability: Mechanisms , measurements, pattern, factors, impact of interventions on HRV <input type="checkbox"/> Diagnostic tests <ul style="list-style-type: none"> • Hemodynamic monitoring: Technical aspects, monitoring, functional hemodynamic indices, ventricular function indices, output measurements (Arterial and swan Ganz monitoring). Blood gases and its significance, oxygen supply and demand • Radiologic examination of the chest: interpretation, chest film findings • Electro cardiography(ECG) : electrical conduction through the heart, basic electrocardiography, 12 lead electrocardiogram, axis determination <ul style="list-style-type: none"> - ECG changes in: intraventricular conduction abnormalities- Arrhythmias, ischemia, injury and infarction, atrial and ventricular enlargement, electrolyte imbalance, • Echocardiography: technical aspects, special techniques, echocardiography of cardiac structures in health and disease, newer techniques • Nuclear and other imaging studies of the heart:

		<p>Magnetic Resonance Imaging.</p> <ul style="list-style-type: none"> • Cardio electrophysiology procedures: diagnostic studies, interventional and catheter ablation, nursing care • Exercise testing: indications and objectives, safety and personnel, pretest considerations, selection, interpretation, test termination, recovery period • Cardiac catheterization: indications, contraindications, patient preparation, procedure, interpretation of data • Pulmonary function test: Bronchoscopy and graphies • Interpretation of diagnostic measures • Nurse’s role in diagnostic tests <p>□ Laboratory tests using blood: Blood specimen collection, Cardiac markers, Blood lipids, Hematologic studies, Blood cultures, Coagulation studies, Arterial blood gases, Blood Chemistries, SScardiac enzyme studies, Serum Concentration of Selected drugs.</p> <p>□ Interpretation and role of nurse</p>
V	25	<p>Cardiac disorders and nursing management:</p> <p>□ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of:</p> <ul style="list-style-type: none"> • Hypertension • Coronary Artery Disease. • Angina of various types. • Cardiomegaly • Myocardial Infarction, Congestive cardiac failure • Heart Failure, Pulmonary Edema, Shock. • Rheumatic heart disease and other Valvular Diseases • Inflammatory Heart Diseases, Infective Endocarditis, Myocarditis, Pericarditis. • Cardiomyopathy, dilated, restrictive, hypertrophic. • Arrhythmias, heart block <p>Associated illnesses</p>
VI	10	<p>Altered pulmonary conditions</p> <p>□ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of:</p> <ul style="list-style-type: none"> • Bronchitis

		<ul style="list-style-type: none"> • Bronchial asthma • Bronchiectasis • Pneumonias • Lung abscess, lung tumour • Pulmonary tuberculosis, fibrosis, pneumoconiosis etc • Pleuritis, effusion • Pneumo, haemo and pyothorax • Interstitial Lung Disease • Cystic fibrosis • Acute and Chronic obstructive pulmonary disease (conditions leading to) <ul style="list-style-type: none"> • Cor pulmonale • Acute respiratory failure • Adult respiratory distress syndrome • Pulmonary embolism • Pulmonary Hypertension
VII	10	<p>Vascular disorders and nursing management</p> <p><input type="checkbox"/> Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of:</p> <ul style="list-style-type: none"> • Disorders of arteries • Disorders of the aorta • Aortic Aneurysms, • Aortic dissection • Raynaud’s phenomenon • Peripheral arterial disease of the lower extremities • Venous thrombosis • Varicose veins • Chronic venous insufficiency and venous leg ulcers • Pulmonary embolism
VIII	10	<p>Cardio thoracic emergency interventions</p> <p><input type="checkbox"/> CPR- BLS and ALS</p> <p><input type="checkbox"/> Use of ventilator, defibrillator , pacemaker</p> <p><input type="checkbox"/> Post resuscitation care.</p> <p><input type="checkbox"/> Care of the critically ill patients</p> <p><input type="checkbox"/> Psychosocial and spiritual aspects of care</p> <p><input type="checkbox"/> Stress management; ICU psychosis</p> <p><input type="checkbox"/> Role of nurse</p>
IX	10	<p>Nursing care of a patient with obstructive airway</p> <p><input type="checkbox"/> Assessment</p>

		<input type="checkbox"/> Use of artificial airway <input type="checkbox"/> Endotracheal intubation, tracheostomy and its care <input type="checkbox"/> Complication, minimum cuff leak, securing tubes Oxygen delivery systems. <input type="checkbox"/> Nasal Cannula <input type="checkbox"/> Oxygen mask, Venturi mask <input type="checkbox"/> Partial rebreathing bag <input type="checkbox"/> Bi-PAP and C-PAP masks <input type="checkbox"/> Uses, advantages, disadvantages, nursing implications of each. Mechanical Ventilation <input type="checkbox"/> Principles of mechanical ventilation <input type="checkbox"/> Types of mechanical ventilation and ventilators. <input type="checkbox"/> Modes of ventilation, advantage, disadvantage, complications. <input type="checkbox"/> PEEP therapy, indications, physiology, and complications. Weaning off the ventilator. <input type="checkbox"/> Nursing assessment and interventions of ventilated patient.
X	10	Congenital Heart Diseases, <input type="checkbox"/> Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of: <ul style="list-style-type: none"> • Embryological development of heart. • Classification – cyanotic and acyanotic heart disease. • Tetralogy of Fallots. • Atrial Septal Defect, Ventricular Septal Defect., Eisenmenger’s complex. • Patent ductus arteriosus, AP window • Truncus Arteriosus. • Transposition of great arteries. • Total Anomaly of Pulmonary Venous Connection. • Pulmonary stenosis, atresia. • Coarctation of aorta. • Ebstein’s anomaly • Double outlet right ventricle, Single ventricle, Hypoplastic left heart syndrome.
XI	10	Pharmacology <input type="checkbox"/> Review <input type="checkbox"/> Pharmacokinetics <input type="checkbox"/> Analgesics/Anti inflammatory agents

		<ul style="list-style-type: none"> <input type="checkbox"/> Antibiotics, antiseptics <input type="checkbox"/> Drug reaction & toxicity <input type="checkbox"/> Drugs used in cardiac emergencies <input type="checkbox"/> Blood and blood components • Antithrombolytic agents • Inotropic agents • Beta-blocking agents • Calcium channel blockers. • Vaso constrictors • Vaso dilators • ACE inhibitors. • Anticoagulents • Antiarrhythmic drugs. • Anti hypertensives • Diuretics • Sedatives and tranquilizers. • Digitalis. • Antilipemics <input type="checkbox"/> Principles of drug administration, role and responsibilities of nurses and care of drugs
XII	20	<p>Nursing Care of patient undergoing cardio thoracic surgery</p> <ul style="list-style-type: none"> <input type="checkbox"/> Indications, selection of patient <input type="checkbox"/> Preoperative assessment and preparation; counselling. <input type="checkbox"/> Intraoperative care: Principles of open heart surgery, equipment, anaesthesia, cardiopulmonary by pass. <input type="checkbox"/> Surgical procedures for Coronary Artery Bypass Grafting, recent advances and types of grafts, Valve replacement or reconstruction, cardiac transplant, Palliative surgery and different Stents, vascular surgery, other recent advances. <input type="checkbox"/> Thoracic surgery: lobectomy, pneumonectomy, tumour excision etc <input type="checkbox"/> Immediate postoperative care : assessment, post operative problems and interventions : Bleeding, Cardiac tamponade, Low cardiac output, Infarction, Pericardial effusion, Pleural effusion, Pneumothorax, Haemothorax, Coagulopathy, Thermal imbalance, Inadequate., ventilation/perfusion, Neurological problems, renal problems, Psychological problems. <input type="checkbox"/> Chest physiotherapy

		<input type="checkbox"/> Nursing interventions- life style modification, complementary therapy/alternative systems of medicine. <input type="checkbox"/> Intermediate and late post operative care after CABG, valve surgery, others. Follow up care
XIII	5	Cardiac rehabilitation <input type="checkbox"/> Process <input type="checkbox"/> Physical evaluation <input type="checkbox"/> Life style modification <input type="checkbox"/> Physical conditioning for cardiovascular efficiency through exercise <input type="checkbox"/> Counseling <input type="checkbox"/> Follow up care
XIV	5	Intensive Coronary Care Unit/intensive cardio thoracic unit: <input type="checkbox"/> Quality assurance <ul style="list-style-type: none"> • Standards, Protocols, Policies, Procedures • Infection control; Standard safety measures • Nursing audit • Design of ICCU/ICTU • Staffing; cardiac team • Burn out syndrome <input type="checkbox"/> Nurse's role in the management of I.C.C.U and ICTU. <input type="checkbox"/> Mobile coronary care unit. <input type="checkbox"/> Planning inservice educational programme and teaching

Practical

Total = 960 Hours
1 Week = 30 Hours

S.No.	Dept/Unit	No. of Week	Total Hours
1.	Cardio thoracic -Medical	4	120 Hours
	-Surgical	4	120 Hours
2.	OTs (Cardiac and thoracic)	4	120 Hours
3.	Casualty	2	60 Hours
4	Diagnostic labs including cath lab	2	60 Hours
	ICCU	4	120 Hours

	ICU	4	120 Hours
	CCU	4	120 Hours
	Paediatric Intensive	2	60 Hours
	OPD	2	60 Hours
	Total	32 Weeks	960 Hours

Essential Nursing Skills

Procedures Observed

1. Echo cardiogram
2. Ultrasound
3. Monitoring JVP , CVP
4. CT SCAN
5. MRI
6. Pet SCAN
7. Angiography
8. Cardiac cathetrisation
9. Angioplasty
10. Various Surgeries
11. Any other

I. Procedures Assisted

1. Arterial blood gas analysis
2. Thoracentesis
3. Lung biopsy
4. Computer assisted tomography (CAT Scan)
5. M.R.I.
6. Pulmonary angiography
7. Bronchoscopy
8. Pulmonary function test
9. ET tube insertion
10. Tracheostomy tube insertion
11. Cardiac catheterisation
12. Angiogram
13. Defibrillation
14. Treadmill test
15. Echo cardiography
16. Doppler ultrasound
17. Cardiac surgery
18. Insertion of chest tube
19. CVP Monitoring
20. Measuring pulmonary artery pressure by Swan-Ganz Catheter
21. Cardiac Pacing

II. Procedures Performed

1. Preparation of assessment tool for CT client (Cardiac, thoracic and vascular).
2. ECG – Recording, Reading, Identification of abnormalities
3. Oxygen therapy – Cylinder, central supply,
Catheter, nasal canula, mask, tent
Through ET and Tracheostomy tube
Manual resuscitation bag
4. Mechanical ventilation
5. Spirometer
6. Tuberculen skin test
7. Aerosal therapy
8. Nebulizer therapy
9. Water seal drainage
10. Chest physiotheray including – Breathing Exercises
Coughing Exercises
Percussion & Vibration
11. Suctioning – Oropharyngeal, nasotracheal, Endotracheal
Through tracheostomy tube
12. Artificial airway cuff maintenance
13. CPR
14. Care of client on ventilator
15. Identification of different – Arrhythmias
Abnormal pulses, respirations
B.P. Variation
Heart sounds
Breath sounds
16. Pulse oxymetry
17. Introduction of intracath
18. Bolus I.V. Injection
19. Life line
20. Maintenance of “Heplock”
21. Subcutaneous of Heparin
22. Obtaining leg measurements to detect early swelling in
thrombophlebetes
23. Identification of Homans signs
24. Buerger – Allen exercises

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING - CRITICAL CARE NURSING

Placement: II Year

Hours of instruction
Theory: 150 hours
Practical: 950 hours
Total : 1100 hours

Course Description

This course is designed to assist students in developing expertise and indepth knowledge in the field of Critical care Nursing. It will help students to develop advanced skills for nursing intervention in caring for critically ill patients. It will enable the student to function as critical care nurse practitioner/ specialist. It will further enable the student to function as educator, manager and researcher in the field of Critical Care Nursing.

Objectives

At the end of the course the students will be able to

1. Appreciate trends and issues related to Critical Care Nursing.
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of critically ill patients
3. Describe the various drugs used in critical care and nurses responsibility
4. Perform physical, psychosocial & spiritual assessment
5. Demonstrate advance skills/competence in managing critically ill patients including Advance Cardiac Life Support.
6. Demonstrate skill in handling various equipments/gadgets used for critical care
7. Provide comprehensive care to critically ill patients.
8. Appreciate team work & coordinate activities related to patient care.
9. Practice infection control measures.
10. Assess and manage pain .

11. Identify complications & take appropriate measures.
12. Discuss the legal and ethical issues in critical care nursing
13. Assist patients and their family to cope with emotional distress, spiritual, grief and anxiety
14. Assist in various diagnostic, therapeutic and surgical procedures
15. Incorporate evidence based nursing practice and identify the areas of research in the field of critical care nursing
16. Identify the sources of stress and manage burnout syndrome among health care providers.
17. Teach and supervise nurses and allied health workers.
18. Design a layout of ICU and develop standards for critical care nursing practice.

Course Content

Unit	Hours	Content
I	5	<p>Introduction to Critical Care Nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical review- Progressive patient care(PPC) <input type="checkbox"/> Review of anatomy and physiology of vital organs, fluid and electrolyte balance <input type="checkbox"/> Concepts of critical care nursing <input type="checkbox"/> Principles of critical care nursing <input type="checkbox"/> Scope of critical care nursing <input type="checkbox"/> Critical care unit set up including equipments supplies, use and care of various type of monitors & ventilators <input type="checkbox"/> Flow sheets
II	10	<p>Concept of Holistic care applied to critical care nursing practice</p> <ul style="list-style-type: none"> <input type="checkbox"/> Impact of critical care environment on patients:- <ul style="list-style-type: none"> • Risk factors, Assessment of patients, Critical care psychosis, prevention & nursing care for patients affected with psychophysiological & psychosocial problems of critical care unit, Caring for the patient's family, family teaching <input type="checkbox"/> The dynamics of healing in critical care unit:- therapeutic touch, Relaxation, Music therapy, Guided Imagery, acupressure <input type="checkbox"/> Stress and burnout syndrome among health team members
III	14	<p>Review</p> <ul style="list-style-type: none"> <input type="checkbox"/> Pharmacokinetics

		<input type="checkbox"/> Analgesics/Anti inflammatory agents <input type="checkbox"/> Antibiotics, antiseptics <input type="checkbox"/> Drug reaction & toxicity <input type="checkbox"/> Drugs used in critical care unit (inclusive of inotropic, life saving drugs) <input type="checkbox"/> Drugs used in various body systems <input type="checkbox"/> IV fluids and electrolytes <input type="checkbox"/> Blood and blood components <input type="checkbox"/> Principles of drug administration, role of nurses and care of drugs
IV	5	Pain Management <input type="checkbox"/> Pain & Sedation in Critically ill patients <input type="checkbox"/> Theories of pain, Types of pain, Pain assessment, Systemic responses to pain <input type="checkbox"/> pain management-pharmacological and non-pharmacological measures <input type="checkbox"/> Placebo effect
V	5	Infection control in intensive care unit <input type="checkbox"/> Nosocomial infection in intensive care unit; methyl resistant staphylococcus aureus (MRSA), Disinfection, Sterilization, Standard safety measures, Prophylaxis for staff
VI	10	Gastrointestinal System <input type="checkbox"/> Causes, Pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: Medical, Surgical and Nursing management of:-Acute Gastrointestinal Bleeding, Abdominal injury, Hepatic Disorders:-Fulminant hepatic failure, Hepatic encephalopathy, Acute Pancreatitis, Acute intestinal obstruction, perforative peritonitis
VII	10	Renal System <input type="checkbox"/> Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: Medical, Surgical and Nursing management of:- Acute Renal Failure, Chronic Renal Failure, Acute tubular necrosis, Bladder trauma <input type="checkbox"/> Management Modalities: Hemodialysis, Peritoneal Dialysis, Continuous Ambulatory Peritoneal Dialysis, Continuous arterio venous hemodialysis, Renal Transplant

VIII	10	<p>Nervous System</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: Medical, Surgical and Nursing management of:- Common Neurological Disorders:-Cerebrovascular disease, Cerebrovascular accident, Seizure disorders, GuilleinBarre-Syndrome, Myasthenia Gravis, Coma, Persistent vegetative state, Encephalopathy, Head injury, Spinal Cord injury □ Management Modalities: Assessment of Intracranial pressure, Management of intracranial hypertension, Craniotomy □ Problems associated with neurological disorders: Thermo regulation, Unconsciousness, Herniation syndrome
IX	5	<p>Endocrine System</p> <ul style="list-style-type: none"> □ Causes, Pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: Medical, Surgical and Nursing Management of :- Hypoglycemia, Diabetic Ketoacidosis, Thyroid crisis, Myxoedema, Adrenal crisis, Syndrome of Inappropriate/hypersecretion of Antidiuretic Hormone (SIADH)
X	15	<p>Management of other Emergency Conditions</p> <ul style="list-style-type: none"> □ Mechanism of injury, Thoracic injuries, Abdominal injuries, pelvic fractures, complications of trauma, Head injuries □ Shock: Shock syndrome, Hypovolemic, Cardiogenic, Anaphylactic, Neurogenic and Septic shock □ Systemic inflammatory Response: The inflammatory response, Multiple organ dysfunction syndrome □ Disseminated Intravascular Coagulation □ Drug Overdose and Poisoning, □ Acquired Immunodeficiency Syndrome (AIDS) □ Ophthalmic: Eye injuries, Glaucoma, retinal detachment □ Ear Nose Throat: Foreign bodies, stridor, bleeding, quincy, acute allergic conditions □ Psychiatric emergencies;, suicide, □ crisis intervention

XI	20	<p>Cardiovascular emergencies</p> <ul style="list-style-type: none"> □ Principles of Nursing in caring for patient's with Cardiovascular disorders □ Assessment: Cardiovascular system: Heart sounds, Diagnostic studies:- Cardiac enzymes studies, Electrocardiographic monitoring, Holter monitoring, Stress test. Echo cardiography, Coronary angiography, Nuclear medicine studies □ Causes, Pathophysiology, Clinical types, Clinical features, Diagnostic Prognosis, Management : Medical, Surgical & Nurisng management of:- Hypertensive crisis, Coronary artery disease, Acute Myocardial infarction, Cardiomyopathy, Deep vein thrombosis, Valvular diseases, Heart block, Cardiac arrhythmias & conduction disturbances, Aneurysms, Endocarditis, Heart failure Cardio pulmonary resuscitation BCLS/ ACLS □ Management Modalities: Thrombolytic therapy, Pacemaker – temporary & permanent, Percutaneous transluminal coronary angioplasty, Cardioversion, Intra Aortic Balloon pump monitoring, Defibrillations, Cardiac surgeries, Coronary Artery Bypass Grafts (CABG/MICAS), Valvular surgeries, Heart Transplantation, Autologous blood transfusion, Radiofrequency Catheter Ablation
XII	15	<p>Respiratory System</p> <ul style="list-style-type: none"> □ Acid-base balance & imbalance □ Assesment : History & Physical Examination □ Diagnostic Tests:Pulse Oximetry, End –Tidal Carbon Dioxide Monitoring, Arterial blood gas studies, chest radiography, pulmonary Angiography, Bronchoscopy, Pulmonary function Test, Ventilation perfusion scan, Lung ventilation scan □ Causes Pathophysiology, Clinical types, Clinical features, Prognosis, Management: Medical, Surgical and Nursing management of Common pulmonary disorders:-Pneumonia, Status asthmaticus, interstitial drug disease, Pleural effusion, Chronic obstructive pulmonary disease, Pulmonary tuberculosis, Pulmonary edema, Atelectasis, Pulmonary embolism, Acute respiratory failure, Acute respiratory distress syndrome (ARDS),

		<p>Chest Trauma Haemothorax, Pneumothorax</p> <ul style="list-style-type: none"> □ Management Modalities:-Airway Management □ Ventilatory Management:-Invasive, non- invasive, long term mechanical ventilations □ Bronchial Hygiene:-Nebulization, deep breathing exercise, chest physiotherapy, postural drainage, Inter Costal Drainage, Thoracic surgeries
XIII	7	<p>Burns</p> <ul style="list-style-type: none"> □ Clinical types, classification, pathophysiology, clinical features, assessment, diagnosis, prognosis, Management: Medical, Surgical & Nursing management of burns □ Fluid and electrolyte therapy – calculation of fluids and its administration □ Pain management □ Wound care □ Infection control □ Prevention and management of burn complications □ Grafts and flaps □ Reconstructive surgery □ Rehabilitation
XIV	5	<p>Obstetrical Emergencies</p> <ul style="list-style-type: none"> □ Causes, Pathophysiology, Clinical types, clinical features, diagnostic Prognosis, Management: Medical, Surgical and Nursing management of :Antepartum haemorrhage, Preeclampsia, eclampsia, Obstructed labour and ruptured uterus, Post partum haemorrhage, Puerperal sepsis, Obstetrical shock
XV	10	<p>Neonatal Paediatric emergencies</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Neonatal emergencies □ Asphyxia Neonatarum, Pathological Jaundice in Neonates, Neonatal seizures, Metabolic disorders, Intra cranial Hemorrhage, Neonatal Sepsis, RDS/HMD (Respiratory Distress Syndrome/Hyaline Membrane Disease), Congenital disorders:-

		<ul style="list-style-type: none"> • Cyanotic heart disease, tracheo oesophageal fistula, congenital hypertropic pyloric stenosis, imperforate anus • Pediatric emergencies <ul style="list-style-type: none"> <input type="checkbox"/> Dehydration, Acute broncho pneumonia, Acute respiratory distress syndrome, Poisoning, Foreign bodies, seizures, traumas, Status asthmaticus
XVI	2	Legal and ethical issues in critical care-Nurse's role <ul style="list-style-type: none"> <input type="checkbox"/> Brain death <input type="checkbox"/> Organ donation & Counselling <input type="checkbox"/> Do Not Resuscitate(DNR) <input type="checkbox"/> Euthanasia <input type="checkbox"/> Living will
XVII	2	Quality assurance <ul style="list-style-type: none"> <input type="checkbox"/> Standards, Protocols, Policies, Procedures <input type="checkbox"/> Infection control; Standard safety measures <input type="checkbox"/> Nursing audit <input type="checkbox"/> Staffing <input type="checkbox"/> Design of ICU/CCU

Practical

Total = 960 Hours
1 Week = 30 Hours

S.No.	Dept/Unit	No. of Week	Total Hours
1.	Burns ICU	2	60 Hours
2.	Medical ICU	8	240 Hours
3.	Surgical ICU	12	360 Hours
4.	CCU	2	60 Hours
5	Emergency Department	3	90 Hours
6.	Dialysis Unit	1	30 Hours
7.	Transplant Room	2	60 Hours
8.	Paediatric/ NICU	2	60 Hours
	Total	32 Weeks	960 Hours

ESSENTIAL CRITICAL CARE NURSING SKILLS

I. Procedures Observed

1. CT Scan
2. MRI
3. EEG
4. Hemodialysis
5. Endoscopic Retrograde cholangio Pancreaticogram(ERCP)
6. Heart/ Neuro/GI./ Renal Surgeries

II. Procedures Assisted

1. Advanced life support system
2. Basic cardiac life support
3. Arterial line/arterial pressure monitoring/blood taking
4. Arterial blood gas
5. ECG recording
6. Blood transfusion
7. IV cannulation therapy
8. Arterial Catheterization
9. Chest tube insertion
10. Endotracheal intubations
11. Ventilation
12. Insertion of central line/cvp line
13. Connecting lines for dialysis

III. Procedure Performed

1. Airway management
 - a. Application of oropharyngeal airway
 - b. Oxygen therapy
 - c. CPAP (Continuous Positive Airway pressure)
 - d. Care of tracheostomy
 - e. Endotracheal extubation
2. Cardiopulmonary resuscitation, Basic cardiac life support, ECG
3. Monitoring of critically ill patients – clinically with monitors, capillary refill time (CRT) assessment of jaundice, ECG.
4. Gastric lavage
5. Assessment of critically ill patients
Identification & assessment of risk factors, Glasgow coma scale,

and dolls eye movement, arterial pressure monitoring, cardiac output/pulmonary artery pressure monitoring, and detection of life threatening abnormalities

6. Admission & discharge of critically ill patients

7. Nutritional needs – gastrostomy feeds, pharyngeal feeds, jejunostomy feeds, TPN, formula preparation & patient education.

8. Assessment of patient for alteration in blood sugar levels monitoring blood sugar levels periodically & administering insulin periodically.

9. Administration of drugs: IM, IV injection, IV cannulation & fixation of infusion pump, calculation of dosages, use of insulin syringes/ tuberculin, monitoring fluid therapy, blood administration.

10. Setting up dialysis machine and starting, monitoring and closing dialysis

11. Procedures for prevention of infections:

Hand washing, disinfection & sterilization surveillance, and fumigation universal precautions.

12. Collection of specimen.

13. Setting, use & maintenance of basic equipment, ventilator, O2 analyzer, monitoring equipment, transducers, defibrillator, infusion & syringe pumps, centrifuge machine.

IV Other Procedures:

CLINICAL SPECIALITY-II

MEDICAL SURGICAL NURSING- ONCOLOGY NURSING

Placement : II Year

Hours of Instruction

Theory : 150 hours

Practicals : 950 hours

Total : 1100 hours

Course Description

This course is designed to assist students in developing expertise and indepth understanding in the field of oncology Nursing. It will help students to develop advanced skills for nursing intervention in various oncological conditions. It will enable the student to function as oncology nurse practitioner/specialist and provide quality care. It will further enable the student to function as educator, manager, and researcher in the field of oncology nursing

Objectives

1. Explain the prevention, screening and early detection of cancer
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of oncological disorders of various body systems
3. Describe the psychosocial effects of cancer on patients and families.
4. Demonstrate skill in administering/assisting in various treatment modalities used for patients with cancer
5. Apply nursing process in providing holistic care to patients with cancer.
6. Apply specific concepts of pain management
7. Appreciate the care of death and dying patients and value of bereavement support.
8. Describe the philosophy, concept and various dimensions of palliative care
9. Appreciate the role of alternative systems of medicine in care of cancer patients
10. Appreciate the legal & ethical issues relevant to oncology nursing

11. Recognize and manage Oncological emergencies
12. Counsel the patients with cancer and their families
13. Incorporate evidence based nursing practice and identify the areas of research in the field of oncology nursing
14. Recognize the role of oncology nurse practitioner as a member of oncology team
15. Collaborate with other agencies and utilize resources in caring for cancer patients.
16. Teach and supervise nurses and allied health workers.
17. Design a layout and develop standards for management of oncology units/hospitals and nursing care.

Course Content

Unit	Hours	Content
I	4	Introduction <ul style="list-style-type: none"> <input type="checkbox"/> Epidemiology-Incidence, Prevalence – Global, National, State and Local <input type="checkbox"/> Disease burden, concept of cancer, risk factors <input type="checkbox"/> Historical perspectives <input type="checkbox"/> Trends and issues <input type="checkbox"/> Principles of cancer management <input type="checkbox"/> Roles and responsibilities of oncology nurse
II	5	The Nature of Cancer <ul style="list-style-type: none"> <input type="checkbox"/> Normal cell biology <input type="checkbox"/> The Immune system <input type="checkbox"/> Pathological and pathophysiological changes in tissues • Biology of the cancer cell • Clone formation Transformation • Tumor stem lines • Structure of a solid tumor • Products produced by the tumor • Systemic effects of tumor growth
III	4	Etiology of Cancer <ul style="list-style-type: none"> <input type="checkbox"/> Carcinogenesis, <input type="checkbox"/> Theories of cancer causation <input type="checkbox"/> Risk factors <input type="checkbox"/> Carcinogens – genetic factors, chemical carcinogens, radiation, viruses, Immune system failure, rapid tissue proliferation <input type="checkbox"/> Hormone changes, diet, emotional factors.

<p>IV</p>	<p>10</p>	<p>Diagnostic Evaluation</p> <ul style="list-style-type: none"> <input type="checkbox"/> Health assessment: History taking, physical examination, <input type="checkbox"/> Staging and grading of tumors, <input type="checkbox"/> TNM Classification <input type="checkbox"/> Common diagnostic tests • Blood investigation: Haemetological, Bio-chemical, Tumor markers, Hormonal assay • Cytology:Fine needle aspiration cytology(FNAC) • Histopathology: Biopsy • Radiological assessment: MRI, Ultrasound, Computed tomography, Mammography, Positron emission tomography(PET), Radio nuclide imaging, Functional metabolism imaging • Endoscopies <p>Nurses responsibilities in diagnostic measures</p>
<p>V</p>	<p>10</p>	<p>Levels of prevention and care</p> <ul style="list-style-type: none"> <input type="checkbox"/> Primary prevention – Guidelines for cancer detection, general measures, Warning signs of cancer, <input type="checkbox"/> Self examination-Oral, Breast, Testicular <input type="checkbox"/> Secondary prevention – early diagnosis. <input type="checkbox"/> Screening <input type="checkbox"/> Tertiary prevention – disability limitation, <input type="checkbox"/> Rehabilitation :Mobility , Speech, Bowel and bladder, Ostomies etc <input type="checkbox"/> Patient and family education, <input type="checkbox"/> Discharge instruction, follow-up care and use of community resources.
<p>VI</p>	<p>25</p>	<p>Cancer Treatment Modalities and Nurse’s Role</p> <ul style="list-style-type: none"> <input type="checkbox"/> Surgery • Principles of surgical oncology • Current surgical strategy, • Determining surgical risk • Special surgical techniques • Pre-intra-postoperative nursing care • Acute and chronic surgical complications • Future directions and advances <input type="checkbox"/> Chemotherapy • Principles and classification of chemotherapeutics • Pharmacology of antineoplastic drugs- Mechanism of action, Absorption, protein binding, Bio-transformation, excretion, common side effects,

	<p>drug toxicity</p> <ul style="list-style-type: none"> • Calculating drug doses, • Therapeutic response to chemotherapy-Tumor variables, drug resistance, • Safety precautions <p>☐ Radiation Therapy</p> <ul style="list-style-type: none"> • Physics of radiotherapy • Types of ionizing rays • Radiation equipments:Linear accelerator, cobalt, Implants,Isotopes, • Types of therapies: Oral, Brachy therapy, tele therapy, selectron therapy • Effects of radiation on the body tissue, • Radiation biology – cell damage hypoxic cells, alteration of tumor kinetics. • Approaches to radiation therapy – • External radiotherapy • Internal radiotherapy – unsealed, • Sealed sources. • Effectiveness of radiotherapy-Radiosensitivity, treatment effects • Complications of radiotherapy • Radiation safety: Standards of Bhaba Atomic Research Centre(BARC) <p>☐ Bone Marrow Transplantation /Stem Cell Transplantation</p> <ul style="list-style-type: none"> • Types, indications, transplantation procedure, complications and nursing management • Types and donor sources • Preparation and care of donor and recipient • Bone marrow bank • Legal and ethical issues <p>☐ Immunotherapy (Biotherapy)</p> <ul style="list-style-type: none"> • Concepts and principles • Classification of agents • Treatment and applications <p>☐ Gene Therapy</p> <ul style="list-style-type: none"> • Current Concepts and practices <p>☐ Alternative and Complementary Therapies</p> <ul style="list-style-type: none"> • Current practices
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VII	10	<input type="checkbox"/> Pain management:- Theories, types and <ul style="list-style-type: none"> • Nature of cancer pain • Pathophysiology of pain • Pain threshold <input type="checkbox"/> Assessment of pain <ul style="list-style-type: none"> • Principles of cancer pain control • Pharmacological: Opioid and non-opioid analgesic therapy • Patient controlled analgesia(PCA) • Other invasive techniques of pain control • Recent developments in Cancer pain <input type="checkbox"/> Non- Pharmacological pain relief technique- <ul style="list-style-type: none"> • Complementary therapies(Music, massage, meditation, relaxation techniques, biofeed back etc) • Psychological intervention in pain control • Alternative system of medicines <p>Role of nurse</p>
VIII	5	Palliative care <ul style="list-style-type: none"> <input type="checkbox"/> Definition and scope, philosophy <input type="checkbox"/> Concept and elements of palliative care <input type="checkbox"/> Global and Indian perspective of palliative care <input type="checkbox"/> Quality of life issues <input type="checkbox"/> Communication skill <input type="checkbox"/> Nursing perspective of palliative care and its elements <input type="checkbox"/> Home care <input type="checkbox"/> Hospice care <p>Role of nurse in palliative care</p>
IX	2	<input type="checkbox"/> Infection control: <ul style="list-style-type: none"> • Process of infection, risk of hospitalization, nosocomial infections- prevention and control of infection in acute, long term care facility and community based care • Standard safety measures
X	30	Nursing Care of Patients With Specific Malignant Disorders <ul style="list-style-type: none"> <input type="checkbox"/> Malignancies of G.I. system-oral, oesophagus, stomach, rectal, liver & pancreas, care of ostomies/stoma <input type="checkbox"/> Respiratory malignancies <input type="checkbox"/> Genito urinary system malignancies- prostate Bladder, renal testicular malignancies,

		<input type="checkbox"/> Gynecological malignancies-cervix, uterus, ovary <input type="checkbox"/> Hematological malignancies-Lymphomas, Leukemias. <input type="checkbox"/> Malignancies of musculoskeletal system <input type="checkbox"/> Endocrine malignancies <input type="checkbox"/> Skin <input type="checkbox"/> Head and Neck -brain tumors <input type="checkbox"/> Other malignancies – Breast cancer, AIDS related Malignancies (Kaposi's Sarcoma)
XI	10	Paediatric malignancies <input type="checkbox"/> Leukemia, Lymphoma, Neuro- blastoma <input type="checkbox"/> Wilm's tumor, Soft tissue sarcoma, Retinoblastoma <input type="checkbox"/> Nursing Management of children with Paediatric Malignancies
XII	15	Nursing Management of Physiological Conditions and Symptoms Of Cancer Patient <input type="checkbox"/> Nutrition: - effects of cancer on nutritional Status and its consequences:-Anemia, Cachexia, Xerostomia, mucositis, Dysphagia , nausea and vomiting, constipation, diarrhoea, electrolyte imbalances, taste alterations <input type="checkbox"/> Impaired mobility: Decubitus ulcer, pathologic fractures, thrombophlebitis, pulmonary embolism, contractures, footdrop Other symptoms <input type="checkbox"/> Dyspepsia & hiccup, dyspnoea <input type="checkbox"/> intestinal obstruction, <input type="checkbox"/> Fungating wounds <input type="checkbox"/> Anxiety & depression, insomnia <input type="checkbox"/> Lymph edema Impact of cancer on sexuality: <input type="checkbox"/> Effects of radiotherapy/ chemotherapy/surgery on sexuality of the cancer patient <input type="checkbox"/> Nursing management of cancer patients experiencing sexual dysfunction <input type="checkbox"/> Sexual counseling
XIII	10	Cancer Emergencies <input type="checkbox"/> Disseminated intravascular coagulation(DIC), <input type="checkbox"/> Malignant pleural effusion <input type="checkbox"/> Neoplastic cardiac tamponade and septic shock <input type="checkbox"/> spinal cord compression <input type="checkbox"/> Superior venacava syndrome

		<input type="checkbox"/> Metabolic emergency: hyper and hypo calcemia <input type="checkbox"/> Surgical emergency <input type="checkbox"/> Urological emergency <input type="checkbox"/> Hemorrhage <input type="checkbox"/> Organ obstruction <input type="checkbox"/> Brain metastasis <input type="checkbox"/> Nurses role in managing oncologic emergencies
XIV	8	Psycho-Social Aspects of Nursing Care <input type="checkbox"/> Psychological responses of patients with cancer <input type="checkbox"/> Psychosocial assessment – <input type="checkbox"/> Crisis intervention, coping mechanisms <input type="checkbox"/> Stress management, spiritual/cultural care and needs <input type="checkbox"/> Counseling: individual and family <input type="checkbox"/> Maximizing quality of life of patient and family Ethical, moral and legal issues- <input type="checkbox"/> End of life care <input type="checkbox"/> Grief and grieving process <input type="checkbox"/> Bereavement support <input type="checkbox"/> Care of Nurses who care for the dying.
XV	2	Layout and Design of an oncology institution/ ward, OPD, chemotherapy unit, Bone marrow transplantation unit, Pain clinic etc <input type="checkbox"/> Practice Standards of oncology nursing • Policies and Procedures <input type="checkbox"/> Establishing Standing orders and Protocols Quality Assurance Programme in oncology units <input type="checkbox"/> Nursing audit

Clinical Experience

S.No.	Dept/Unit	No. of Week	Total Hours
1.	Medical Oncology ward	6	180Hours
2.	Surgical Oncology ward	6	180 Hours
3.	Bone marrow transplantation Unit	2	60 Hours
4.	Operation Theatre	2	60 Hours
5	Radiotherapy Unit	2	60 Hours
6.	Chemotherapy Unit	4	120 Hours
7.	Out patient department and pain clinic	2	60 Hours
8.	Pediatric Oncology ward	2	60 Hours
	Palliative Care ward	2	60 Hours
	Community oncology	2	60 Hours
	Hospice	1	30 Hours
	Other field visits	1	30 Hours
	Total	32 Weeks	960 Hours

Procedures Observed

1. CT Scan
2. MRI
3. PET Scan(Positron Emission Tomography)
4. Ultra sound
5. Mammography
6. Radio Nuclide Imaging
7. Bone Scan
8. Thyroid Function Test
9. Functional and Metabolic Imaging
10. Transportation of radioactive materials
11. Others

Procedures Assisted

1. IV cannulation – Open method
2. Chemotherapy
3. Radiotherapy – Brachytherapy – Low Density Radiation, High Density Radiation.
4. Interstitial implantation
5. Bio-therapy and Gene therapy
6. Teletherapy – Treatment planning
7. Bone marrow aspiration and biopsy
8. Biopsy – tissue
9. FNAC – Fine Needle Aspiration Cytology and biopsy
10. Advance Cardiac life support
11. Endotracheal intubation
12. Defibrillation Ventilation
13. Tracheostomy
14. Thoracentesis
15. Paracentesis
16. Lumbar Puncture
17. Arterial Blood Gas
18. Nerve Block
19. Chest tube insertion
20. Intercostal drainage
21. CVP monitoring

Procedure Performed

1. Screening for cancer
2. Assessment of pain
3. Assessment of Nutritional status
4. Care of Tracheostomy
5. Endotracheal intubation
6. Gastric gavage
7. Pap smear
8. IV cannulation
9. Care of surgical flaps
10. Care of ostomies
11. Blood transfusion and component therapy
12. Counseling
13. Practice standard safety measures
14. Care of dead body and mortuary formalities

Other procedures**(As per the institutional protocol):**

1. Alternative therapies

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING- NEUROSCIENCES NURSING

Placement : II Years

Hours of Instruction
Theory – 150 Hours
Practical- 950 Hours
Total : 1100 Hours

Course Description

This course is designed to assist students in developing expertise and indepth knowledge in the field of neurology and neurosurgical Nursing. It will help students to develop advanced skills for nursing intervention in caring for patients with neurological and neurosurgical disorders. It will enable the student to function as neuroscience nurse practitioner/ specialist. It will further enable the student to function as educator, manager and researcher in the field of neurology and neurosurgical Nursing.

Objectives

At the end of the course the students will be able to

1. Appreciate trends and issues related to neurology and neurosurgical Nursing.
2. Review the anatomy and physiology of nervous system
3. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of patients with neurological and neurosurgical disorders
4. Perform neurological assessment and assist in diagnostic procedures
5. Describe the concepts and principles of neuroscience nursing
6. Describe the various drugs used in neurosciences and nurses responsibility
7. Assist in various therapeutic and surgical procedures in neuroscience nursing

8. Demonstrate advance skills/competence in managing patients with neurological and neurosurgical disorder following nursing process approach
9. Identify psychosocial problems of patients with disabilities and assist patients and their family to cope with emotional distress, spiritual, grief and anxiety
10. Participate in preventive, promotive and rehabilitative services for neurological and neurosurgical patients.
11. Explain the legal and ethical issues related to brain death, organ transplantation and practice of neuroscience nursing
12. Incorporate evidence based nursing practice and identify the areas of research in the field of neuroscience nursing
13. Organise and conduct inservice education program for nursing personnel.
14. Develop standards of care for quality assurance in neuroscience nursing practice
15. Identify the sources of stress and manage burnout syndrome among health care providers.
16. Teach and supervise nurses and allied health workers.
17. Plan and develop physical layout of neuro intensive care unit

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> □ Introduction to neuroscience(neurological and neurosurgical) nursing • History-Development in neurological and neurosurgical nursing, Service & education • Emerging trends and issues in neurology and neuro surgery and its implication to nursing. • neurological and neurosurgical problems – • Concepts, principles and nursing perspectives • Ethical and legal issues • Evidence based nursing and its application in neurological and neurosurgical nursing
II	5	<p>Epidemiology</p> <ul style="list-style-type: none"> □ Major health problems- □ Risk factors associated with neurological conditions- Hereditary, Psychosocial factors, smoking, alcoholism, dietary habits, cultural and ethnic considerations, occupational and infections. □ Health promotion, disease prevention, life style

		modification and its implications to nursing Alternate system of medicine/complementary therapies
III	10	Review of Anatomy and physiology <ul style="list-style-type: none"> <input type="checkbox"/> Embryology <input type="checkbox"/> Structure and functions of Nervous system- CNS, ANS, cerebral circulation , cranial and spinal nerves and reflexes, motor and sensory functions <input type="checkbox"/> Sensory organs
IV	15	Assessment and diagnostic measures <ul style="list-style-type: none"> <input type="checkbox"/> Assessment <ul style="list-style-type: none"> • History taking • Physical assessment, psychosocial assessment • Neurological assessments, Glasgow coma scale interpretation & its relevance to nursing. • Common assessment abnormalities <input type="checkbox"/> Diagnostic measures <ul style="list-style-type: none"> • Cerebro spinal fluid analysis • Radiological studies-Skull and spine X-ray Cerebral Angiography, CT Scan, Single Photon Emission Computer Tomography(SPECT), MRI (Magnetic Resonance Imaging), MRA, MRS, Functional MRI, Myelography, PET (Positron Emission Test), Interventional radiology. • Electorgraphic studies- Electro encephalo graphy, MEG, EMG, video EEG, • Nerve conduction studies-Evoked potentials, visual evoked potentials, brain stem auditory evoked potentials, somatosensory evoked potentials • Ultrasound studies-Carotid duplex, transcranial Doppler sonography, • Immunological studies • Biopsies – muscle, nerve and Brain. Interpretation of diagnostic measures <p>Nurse’s role in diagnostic tests</p>
V	5	Meeting Nutritional needs of neurological patients <ul style="list-style-type: none"> <input type="checkbox"/> Basic nutritional requirements <input type="checkbox"/> Metabolic changes following injury and starvation <input type="checkbox"/> Nutritional assessment <input type="checkbox"/> Common neurological problems that interfere with nutrition and strategies for meeting their nutritional needs

		<input type="checkbox"/> Special metabolic and electrolyte imbalances <input type="checkbox"/> Chronic fatigue syndrome
VI	5	Drugs used in neurological and neurosurgical disorders <input type="checkbox"/> Classification <input type="checkbox"/> Indications, contraindications, actions and effects, toxic effects Role of nurse
VII	10	Traumatic conditions. <input type="checkbox"/> Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis, Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Cranio cerebral injuries. • Spinal & Spinal cord injuries. • Peripheral nerve injuries. • Unconsciousness
VIII	10	Cerebro vascular disorders. <input type="checkbox"/> Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Stroke & arterio venous thrombosis. • Haemorrhagic embolus. • Cerebro vascular accidents. • Intracranial aneurysm. • Subarchnoid Haemorrhage. • Arterio venous fistula. • Brain tumours <input type="checkbox"/> Diseases of cranial nerves;Trigiminal neuralgia, Facial palsy, Bulbar palsy.
IX	10	Degenerating and demyelinating disorders <input type="checkbox"/> Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of <ul style="list-style-type: none"> • Motor neuron diseases. • Movement disorders- Tics, dystonia, chorea, wilson's disease, essential tremors • Dementia. • Parkinson's disease.

		<ul style="list-style-type: none"> • Multiple sclerosis. • Alzemer's
X	10	<p>Neuro infections</p> <p>□ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of Neuro infections</p> <ul style="list-style-type: none"> • Meningitis-types • Encephalitis. • Poliomyelitis. • Parasitic infections. • Bacterial infections • Neurosyphilis. • HIV & AIDS. • Brain abscess.
XI	10	<p>Paroxysmal disorders.</p> <p>□ Causes, pathophysiology, Clinical types, Clinical features, diagnosis, Prognosis , Management: medical, surgical and Nursing management of</p> <ul style="list-style-type: none"> • Epilepsy and seizures. • Status epilepticus. • Syncope. • Menier's syndrome. • Cephalgia.
XII	10	<p>Developmental disorders.</p> <p>□ Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of</p> <ul style="list-style-type: none"> • Hydrocephalus. • Craniosynostosis. • spina bifida- Meningocele, Meningomyelocele encephalocele • syringomyelia. • Cerebro vascular system anomalies. • Cerebral palsies. • Down's syndrome
XIII	10	<p>Neuro muscular disorders.</p> <p>□ Causes, pathophysiology, Clinical types, Clinical</p>

		<p>features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of</p> <ul style="list-style-type: none"> • Polyneuritis – G B Syndrome. • Muscular dystrophy. • Myasthenia gravis. • Trigeminal neuralgia. • Bell’s palsy. • Menier’s disease • Carpal tunnel syndrome • Peripheral neuropathies
XIV	5	<p>Neoplasms – surgical conditions.</p> <p><input type="checkbox"/> Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of</p> <ul style="list-style-type: none"> • Space occupying lesions -types • Common tumors of CNS,
XV	5	<p>Other disorders</p> <p><input type="checkbox"/> Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of</p> <ul style="list-style-type: none"> <input type="checkbox"/> Metabolic disorders- diabetes, insipidus, metabolic encephalopathy <input type="checkbox"/> Sleep disorders <input type="checkbox"/> Auto immune disorders- multiple sclerosis, inflammatory myopathies
XVI	10	<p>Neuro emergencies</p> <p><input type="checkbox"/> Causes, pathophysiology, Clinical types, Clinical features, diagnostic, Prognosis , Management: medical, surgical and Nursing management of</p> <ul style="list-style-type: none"> • Increased intracranial pressure • Unconscious • Herniation syndrome • Seizures • Severe head injuries • Spinal injuries • Cerebro vascular accidents
XVII	5	<p>Rehabilitation.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Concept and Principles of Rehabilitation. <input type="checkbox"/> Factors affecting quality of life and coping <input type="checkbox"/> Rehabilitation in acute care setting, and following stroke, head

		<p>injury and degenerative disorders of brain</p> <ul style="list-style-type: none"> <input type="checkbox"/> Physiotherapy. <input type="checkbox"/> Counselling <input type="checkbox"/> Care giver's role <p>Speech & Language.-Neurogenic communication disorders, Speech therapy</p>
XVIII	5	<p>Ethical and legal issues in neuroscience nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Brain death and organ transplantation <input type="checkbox"/> Euthanasia <input type="checkbox"/> Negligence and malpractice <input type="checkbox"/> Nosocomial infections
XIX	5	<ul style="list-style-type: none"> <input type="checkbox"/> Quality assurance in neurological nursing practice <input type="checkbox"/> Role of advance practitioner in neurological nursing <input type="checkbox"/> Professional practice standards <input type="checkbox"/> Quality control in neurological nursing <input type="checkbox"/> Nursing audit <input type="checkbox"/> Neuro ICU • Philosophy, aims and objectives • Policies, staffing pattern, design and physical plan of neuro ICU • Team approach, functions • Psychosocial aspects in relation to staff and clients of neuro ICU, • In-service education

Practical

Total = 960 Hours
1 week = 30 Hours

S.No.	Area of Posting	No. of Week	Total Hours
1.	O.P.D.	2	60Hours
2.	Casualty	2	60Hours
3.	Diagnostics	2	60 Hours
4.	Neuro psychiatry	1	30 Hours
5	Neuro Medical wards	4	120 Hours
6.	Paediatric Neuro ward	2	60 Hours
7.	Neuro surgical wards	4	120 Hours

8.	Head Injury ward	3	90 Hours
9	ICU- neuro medicine	4	120 Hours
10	ICU- neuro surgical	4	120 Hours
11	Rehabilitation	2	60 Hours
12	Operation Theatre	2	60 Hours
	Total	32 Weeks	960 Hours

ESSENTIAL NEURO NURSING SKILLS

I. Procedures Observed

1. CT scan
2. MRI
3. PET
4. EEG
5. EMG
6. Sleep pattern studies/Therapy
7. Radiographical studies
8. Neuro surgeries
9. Nerve conduction studies
10. Ultrasound studies
11. Any other

II. Procedures Assisted

1. Advanced Cardiac life support
2. Lumbar Puncture
3. Biopsies – muscle, nerve and Brain
4. Arterial Blood Gas
5. ECG Recording
6. Blood transfusion
7. IV cannulation – open method
8. Endotracheal intubation
9. Ventilation
10. Tracheostomy
11. ICP monitoring
12. Gama Knife
13. Cereberal angiography
14. Myelography
15. Neuro surgeries

III. Procedures Performed:

1. Airway management
 - a. Application of Oro Pharyngeal Airway
 - b. Care of Tracheostomy
 - c. Conduct Endotracheal Intubation
 - d. use of AMBU bag, artificial respirators
 - e. Setting of Ventilators and Care of patients on ventilators
2. Cardio Pulmonary Resuscitation -Defibrillation
3. Neurological assessment -Glasgow coma scale
4. Gastric Lavage
5. IV Cannulation
6. Administration of emergency IV Drugs, fluid
7. Care of patients with incontinence, bladder training
Catheterization
8. Care of patients on traction related to the neurological conditions
9. Blood Administration.
10. Muscle strengthening exercises
11. Guidance and counseling
12. Monitoring – management and care of monitors.

IV. Other Procedures:

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING- NEPHRO-UROLOGY NURSING

Placement : II Year

Hour of Instruction

Theory : 150 Hours

Practical : 950 Hours

Total : 1100 Hours

Course Description

This course is designed to assist students in developing expertise and indepth understanding in the field of Nephro and urological Nursing. It will help students to develop advanced skills for nursing intervention in various nephro and urological conditions. It will enable the student to function as nephro and urology nurse practitioner/specialist and provide quality care. It will further enable the student to function as educator, manager, and researcher in the field of nephro and urology nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate trends and issues related to **nephro and urological** nursing
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of **nephro and urological** conditions
3. Perform physical, psychosocial & spiritual assessment
4. Assist in various diagnostic, therapeutic and surgical interventions
5. Provide comprehensive nursing care to patients with **nephro and urological conditions**
6. Describe the various drugs used in **nephro and urological** conditions and nurses responsibility

7. Demonstrate skill in handling various equipments/gadgets used for patients with **nephro and urological** conditions
8. Appreciate team work & coordinate activities related to patient care.
9. Practice infection control measures.
10. Identify emergencies and complications & take appropriate measures
11. Assist patients and their family to cope with emotional distress, grief, anxiety and spiritual needs
12. Discuss the legal and ethical issues in **nephro and urological** nursing
13. Identify the sources of stress and manage burnout syndrome among health care providers
14. Appreciate the role of alternative system of medicine in the care of patient
15. Incorporate evidence based nursing practice and identify the areas of research in the field of **nephro and urological** nursing
16. Teach and supervise nurses and allied health workers.
17. Design a layout of kidney transplant unit and dialysis unit
18. Develop standards of nephro urological nursing practice

Course Content

Unit	Hours	Content
I	5	Introduction <ul style="list-style-type: none"> <input type="checkbox"/> Historical development: trends and issues in the field of nephro and urological nursing. <input type="checkbox"/> nephro and urological problems <input type="checkbox"/> Concepts, principles and nursing perspectives <input type="checkbox"/> Ethical and legal issues <input type="checkbox"/> Evidence based nursing and its application in nephro and urological nursing(to be incorporated in all the units)
II	5	Epidemiology <ul style="list-style-type: none"> <input type="checkbox"/> Major health problems- urinary dysfunction, urinary tract infections, Glomerular disorders, obstructive disorders and other urinary disorders <input type="checkbox"/> Risk factors associated with nephro and urological conditions- Hereditary, Psychosocial factors, smoking, alcoholism, dietary habits, cultural and ethnic considerations <input type="checkbox"/> Health promotion, disease prevention, life style modification and its implications to nursing

		Alternate system of medicine/complementary therapies
III	5	Review of anatomy and physiology of urinary system <ul style="list-style-type: none"> <input type="checkbox"/> Embryology <input type="checkbox"/> Structure and functions <input type="checkbox"/> Renal circulation <input type="checkbox"/> Physiology of urine formation <input type="checkbox"/> Fluid and electrolyte balance <input type="checkbox"/> Acid base balance <input type="checkbox"/> Immunology specific to kidney
IV	20	Assessment and diagnostic measures <ul style="list-style-type: none"> <input type="checkbox"/> History taking <input type="checkbox"/> Physical assessment, psychosocial assessment <input type="checkbox"/> Common assessment abnormalities-dysurea, frequency, enuresis, urgency, hesitancy, hematuria, pain, retention, burning on urination, pneumaturia, incontinence, nocturia, polyurea, anuria, oliguria, <input type="checkbox"/> Diagnostic tests-urine studies, blood chemistry, radiological procedures-KUB, IVP,nephrotomogram, retrograde pyelogram, renal arteriogram, renalultrasound, CT scan, MRI, cystogram, renal scan, biopsy, endoscopy-cystoscopy, urodynamics studiescystometrogram, urinary flow study, sphincter electromyography, voiding pressure flow study, videourodynamics, Whitaker study Interpretation of diagnostic measures Nurse's role in diagnostic tests
V	5	Renal immunopathy/Immunopathology <ul style="list-style-type: none"> <input type="checkbox"/> General Concept of immunopathology <input type="checkbox"/> Immune mechanism of glomerular vascular disease <input type="checkbox"/> Role of mediator systems in glomerular vascular disease
VI	15	Urological Disorders and Nursing Management <ul style="list-style-type: none"> <input type="checkbox"/> Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical and nursing management of <input type="checkbox"/> Urinary tract infections- pyelonephritis, lower urinary tract infections,

		<ul style="list-style-type: none"> <input type="checkbox"/> Disorders for ureters, bladder and urethra <input type="checkbox"/> Urinary tract infections- <input type="checkbox"/> Urinary dysfunctions- urinary retention, urinary incontinence, urinary reflux, <input type="checkbox"/> Bladder disorders- neoplasms, calculi, neurogenic bladder, trauma, congenital abnormalities <input type="checkbox"/> Benign prostrate hypertrophy(BPH) <input type="checkbox"/> Ureteral disorders: ureteritis, ureteral trauma, congenital anomalies of ureters <input type="checkbox"/> Urethral disorders- tumours, trauma, congenital anomalies of ureters,
VII	25	<p>Glomerular disorders and nursing management</p> <ul style="list-style-type: none"> <input type="checkbox"/> Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical and nursing management of <input type="checkbox"/> Glomerular nephritis- chronic, acute , nephritic syndrome <input type="checkbox"/> Acute Renal failure and chronic renal failure. <input type="checkbox"/> Renal calculi <input type="checkbox"/> Renal tumours-benign and malignant <input type="checkbox"/> Renal trauma <input type="checkbox"/> Renal abscess <input type="checkbox"/> Diabetic nephropathy <input type="checkbox"/> Vascular disorders <input type="checkbox"/> Renal tuberculosis <input type="checkbox"/> Polycystic <input type="checkbox"/> Congenital disorders <input type="checkbox"/> Hereditary renal disorders
VIII	10	<ul style="list-style-type: none"> <input type="checkbox"/> Management of Renal emergencies <input type="checkbox"/> Anuria <input type="checkbox"/> Acute Renal failure <input type="checkbox"/> Poisoning <input type="checkbox"/> Trauma <input type="checkbox"/> Urine retention <input type="checkbox"/> Acute graft rejection <input type="checkbox"/> Hematuria <input type="checkbox"/> Nurse's role
IX	10	<p>Drugs used in urinary disorders</p> <ul style="list-style-type: none"> <input type="checkbox"/> Classification <input type="checkbox"/> Indications, contraindications, actions and effects, toxic effects

		<input type="checkbox"/> Role of nurse
X	10	Dialysis <ul style="list-style-type: none"> <input type="checkbox"/> Dialysis- Historical, types, Principles, goals • Hemodialysis- vascular access sites- temporary and permanent • Peritoneal dialysis <input type="checkbox"/> Dialysis Procedures- steps, equipments, maintenance, <input type="checkbox"/> Role of nurse- pre dialysis, intra and post dialysis <input type="checkbox"/> Complications- <input type="checkbox"/> Counseling <input type="checkbox"/> patient education <input type="checkbox"/> Records and reports
XI	10	<ul style="list-style-type: none"> <input type="checkbox"/> Kidney transplantation <input type="checkbox"/> Nursing management of a patient with Kidney transplantation <input type="checkbox"/> Kidney transplantations- a historical review <input type="checkbox"/> Immunology of graft rejections <input type="checkbox"/> The recipient of a renal transplant <input type="checkbox"/> Renal preservations <input type="checkbox"/> Human Leucocytic Antigen(HLA) typing matching and cross matching in renal transplantation <input type="checkbox"/> Surgical techniques of renal transplantations <input type="checkbox"/> Chronic renal transplant rejection <input type="checkbox"/> Complication after KTP: Vascular and lymphatic, Urological, cardiovascular, liver and neurological, infectious complication <input type="checkbox"/> KTP in children and management of pediatric patient with KTP <input type="checkbox"/> KTP in developing countries <input type="checkbox"/> Results of KTP <input type="checkbox"/> Work up of donor and recipient for renal transplant <input type="checkbox"/> Psychological aspect of KTP and organ donations <input type="checkbox"/> Ethics in transplants <input type="checkbox"/> Cadaveric transplantation
XII	5	<ul style="list-style-type: none"> <input type="checkbox"/> Rehabilitation of patient with nephrological problems <input type="checkbox"/> Risk factors and prevention <input type="checkbox"/> Rehabilitation of patients on dialysis and after

		kidney transplant <input type="checkbox"/> Rehabilitation of patients after urinary diversions <input type="checkbox"/> Family and patient teaching
XIII	10	Pediatric urinary disorders <input type="checkbox"/> Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical and nursing management of children with Renal Diseases -UTI, ureteral reflux, glomerulo nephritis, nephrotic syndrome infantile nephrosis, cystic kidneys, familial factors in renal diseases in childhood, Haemolytic uraemic syndrome. Benign recurrent haematuria, nephropathy, wilms' tumour
XIV	5	Critical care units- dialysis , KTP unit <input type="checkbox"/> Philosophy, aims and objectives <input type="checkbox"/> Policies, staffing pattern, design and physical plan of Dialysis and KTP units <input type="checkbox"/> Team approach, functions <input type="checkbox"/> Psychosocial aspects in relation to staff and clients of ICU, dialysis unit <input type="checkbox"/> In-service education <input type="checkbox"/> Ethical and legal issues
XV	5	<input type="checkbox"/> Quality assurance in nephrological nursing practice <input type="checkbox"/> Role of advance practioner in nephrological nursing <input type="checkbox"/> Professional practice standards <input type="checkbox"/> Quality control in nephrological nursing <input type="checkbox"/> Nursing audit

Practical

Total = 960 Hours
1 week = 30 Hours

S.No.	Deptt. /Unit	No. of Week	Total Hours
1.	Nephrology Ward	6	180Hours
2.	Pediatrics	2	60Hours
3.	Critical Care Unit	2	60 Hours
4.	Urology Ward	6	180 Hours
5	Dialysis Unit	4	120 Hours
6.	Kidney Transplantation Unit	2	60 Hours
7.	URO OT	2	60 Hours
8.	Emergency Wards	2	60 Hours
9	Uro Nephro OPDs	4	120 Hours
10	Diagnostic Labs	2	60 Hours
	Total	32 Weeks	960 Hours

I. Procedures Observed

1. CT Scan
2. MRI
3. Radiographic studies
4. Urodynamics
5. Hemodialysis
6. Renal Surgeries

II. Procedures Assisted

1. Blood transfusion
2. I V cannulation therapy
3. Arterial Catheterization

4. Insertion of central line/cvp line
5. Connecting lines for dialysis
6. Peritoneal dialysis
7. Renal biopsy
8. Endoscopies- Bladder, urethra

III. Procedure Performed

1. Health assessment
2. Insertion of urethral and suprapubic catheters
3. Urine analysis
4. Catheterisation
5. Peritoneal dialysis
6. Bladder irrigation
7. Care of ostomies
8. Care of urinary drainage
9. Bladder training
10. Care of vascular access
11. Setting up dialysis machine and starting, monitoring and closing dialysis
12. Procedures for prevention of infections:
13. Hand washing, disinfection & sterilization surveillance, and fumigation universal precautions.
14. Collection of specimen.
15. Administration of drugs: IM, IV injection, IV cannulation & fixation of infusion pump, calculation of dosages, blood administration. monitoring -fluid therapy, electrolyte imbalance,
16. Nutritional needs , diet therapy & patient education.
17. Counselling

IV. OTHER PROCEDURES:

CLINICAL SPECIALITY – II

MEDICAL SURGICAL NURSING - ORTHOPEDIC NURSING

Placement : II Year

Hours of Instruction
Theory : 150 Hours
Practical : 950 Hours
Total : 1100 Hours

Course Description

This course is designed to assist students in developing expertise and indepth understanding in the field of orthopedic nursing. It will help students to develop advanced skills for nursing intervention in various orthopedic conditions. It will enable the student to function as orthopedic nurse practitioner/specialist providing quality care. It will further enable the student to function as educator, manager, and researcher in the field of orthopedic nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate the history and developments in the field of orthopedic nursing
2. Identify the psycho-social needs of the patient while providing holistic care.
3. Perform physical and psychological assessment of patients with orthopedic conditions and disabilities.
4. Describe various disease conditions and their management
5. Discuss various diagnostic tests required in orthopedic conditions
6. Apply nursing process in providing care to patients with orthopedic conditions and those requiring rehabilitation.
7. Recognize and manage orthopedic emergencies.

8. Describe recent technologies and treatment modalities in the management of patients with orthopedic conditions and those requiring rehabilitation.
9. Integrate the concept of family centered, long term care and community based rehabilitation to patients with orthopedic conditions.
10. Counsel the patients and their families with orthopedic conditions
11. Describe various orthotic and prosthetic appliances
12. Appreciate the legal and ethical issues pertaining to patients with orthopedic conditions and those requiring rehabilitation.
13. Appreciate the role of alternative system of medicine in care of patients with orthopedic conditions
14. Incorporate evidence based nursing practice and identify the areas of research in the field of orthopedic nursing.
15. Recognize the role of orthopedic nurse practitioner and as a member of the orthopedic and rehabilitation team.
16. Teach orthopedic nursing to undergraduate students and in-service nurses.
17. Prepare a design and layout of orthopedic and rehabilitative units.

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical perspectives – History and trends in orthopedic nursing <input type="checkbox"/> Definition and scope of orthopedic nursing <input type="checkbox"/> Anatomy and physiology of Musculo-skeletal system <input type="checkbox"/> Posture, Body landmarks Skeletal system Muscular system. <p>Nervous system - Main nerves</p> <ul style="list-style-type: none"> <input type="checkbox"/> Healing of - Injury, bone injury, <input type="checkbox"/> Repair of ligaments <input type="checkbox"/> Systemic response to injury <input type="checkbox"/> Ergonomics, Body mechanics, biomechanical measures <input type="checkbox"/> Orthopedic team
II	8	<p>Assessment of Orthopedic Patient</p> <ul style="list-style-type: none"> <input type="checkbox"/> Health Assessment: History, physical examination- Inspection, palpation, movement, Measurement, muscle strength Testing.

		<input type="checkbox"/> Diagnostic studies – Radiological studies, Muscle enzymes, serologic studies
III	10	Care of patients with devices <ul style="list-style-type: none"> <input type="checkbox"/> Splints, braces, various types of plaster cast <input type="checkbox"/> Various types of tractions, <input type="checkbox"/> Various types of orthopedic beds and mattresses <input type="checkbox"/> Comfort devices <input type="checkbox"/> Implants in orthopedic <input type="checkbox"/> Prosthetics and Orthotics
IV	15	Injuries Trauma & Injuries <ul style="list-style-type: none"> <input type="checkbox"/> Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, management, medical surgical and nursing management of : <ul style="list-style-type: none"> • Early management of Trauma • Fractures • Injuries of the <ul style="list-style-type: none"> <input type="checkbox"/> Shoulder and arm <input type="checkbox"/> Elbow, fore arm, wrist, hand <input type="checkbox"/> Hip, thigh, knee, leg, ankle, foot <input type="checkbox"/> Spine <input type="checkbox"/> Head injury <input type="checkbox"/> Chest injury • Polytrauma • Nerve injuries • Vascular injuries • Soft tissue injuries • Sports injuries • Amputation
V	8	Infections of Bones and Joints <ul style="list-style-type: none"> <input type="checkbox"/> Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, management, medical surgical and nursing management of : <ul style="list-style-type: none"> • Tuberculosis • Osteomyelitis • Arthritis • Leprosy

VI	5	<p>Bone Tumours</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, management, medical surgical and nursing management of: <ul style="list-style-type: none"> • Bone tumors – Benign, Malignant and metastatic • Different types of therapies for tumors
VII	10	<p>Deformities</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis – medical surgical and nursing management of: Scoliosis, Kyphosis, Lordosis □ Congenital disorders: Congenital dislocation of hip (CDH), Dislocation of patella, knee, <ul style="list-style-type: none"> □ Varus and valgus deformities, □ Deformities of digits, □ Congenital torticollis. □ Meningocele, meningomyelocele, spina bifida, □ Chromosomal disorders. □ Computer related deformities
VIII	5	<p>Disorders of the spine</p> <ul style="list-style-type: none"> □ Intervertebral disc prolapse, Fracture of the spine □ Low back disorder – Low back pain, PND, spinal stenosis, spondylosis
IX	5	<p>Nutritional/Metabolic and Endocrine Disorders</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical features, diagnosis, prognosis, medical surgical and nursing management of: <ul style="list-style-type: none"> • Rickets, • Scurvy, • Hyper vitaminosis A and D, • Osteomalacia, • Osteoporosis • Paget's disease, • gout, • Gigantism, • Dwarfism, • Acromegaly. • Therapeutic diets for various orthopedic disorders
X	8	<p>Neuro-Muscular Disorders:</p> <ul style="list-style-type: none"> □ Causes, pathophysiology, clinical types, clinical

		<p>features, diagnosis, prognosis, medical surgical and nursing management of:</p> <ul style="list-style-type: none"> • Poliomyelitis, Cerebral Palsy • Myasthenia gravis • Spina bifida. • Peripheral nerve lesion, • Paraplegia, Hemiplegia, Quadriplegia. • Muscular dystrophy
XI	8	<p>Chronic/Degenerative Diseases of Joints and Autoimmune Disorders:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Causes, pathophysiology, clinical types, clinical features, <p>diagnosis, prognosis – medical surgical and nursing management of:</p> <ul style="list-style-type: none"> • Osteo Arthritis • Rheumatoid Arthritis • Ankylosing spondylitis. • Spinal disorders. • Systemic Lupus Erythematosus
XII	5	<p>Orthopedic Disorders in Children:</p> <ul style="list-style-type: none"> <input type="checkbox"/> General and special consideration on pediatric orthopedics <input type="checkbox"/> Genetic disorders <input type="checkbox"/> Congenital anomalies <input type="checkbox"/> Growth disorders <input type="checkbox"/> Genetic counseling <input type="checkbox"/> Nurses role in genetic counseling
XIII	5	<p>Geriatric Problems</p> <ul style="list-style-type: none"> <input type="checkbox"/> Geriatric population, types of disabilities, causes, treatment and Management – Hospitalization, rest, physiotherapy, involvement of family members, social opportunities. <input type="checkbox"/> Care at home – involvement of family and community, follow up care and rehabilitation
XIV	6	<p>Pharmacokinetics</p> <ul style="list-style-type: none"> <input type="checkbox"/> Principles of drug administration <input type="checkbox"/> Analgesics and anti inflammatory agents <input type="checkbox"/> Antibiotics, Antiseptics, <input type="checkbox"/> Drugs used in orthopedics and neuromuscular disorders

		<input type="checkbox"/> Blood and blood components <input type="checkbox"/> Care of drugs and nurses role
XV	30	<p>Nurses Role in Orthopedic Conditions</p> <input type="checkbox"/> Gait analysis <input type="checkbox"/> Urodynamic studies <input type="checkbox"/> Prevention of physical deformities <input type="checkbox"/> Alteration of body temperature regulatory system and immune systems <input type="checkbox"/> Immobilization – cast, splints, braces and tractions <input type="checkbox"/> Prevention and care of problems related to immobility <input type="checkbox"/> Altered sleep patterns <input type="checkbox"/> Impaired communication <input type="checkbox"/> Self care and activities of daily living <input type="checkbox"/> Bladder and bowel rehabilitation <input type="checkbox"/> Sensory function rehabilitation <input type="checkbox"/> Psychological reaction related to disabilities and disorders. <input type="checkbox"/> Coping of individual and family with disabilities and disorders <input type="checkbox"/> Maintaining sexuality <input type="checkbox"/> Spirituality – A rehabilitative prospective <p>Orthopedic Reconstructive Surgeries</p> <input type="checkbox"/> Replacement surgeries – Hip, Knee, Shoulder <input type="checkbox"/> Spine surgeries <input type="checkbox"/> Grafts and flaps surgery <input type="checkbox"/> Deformity correction. <p>Physiotherapy</p> <input type="checkbox"/> Concepts, Principles, purpose, <ul style="list-style-type: none"> • Mobilization – Exercises: types, re-education in walking: Crutch walking, wheel chair, Transfer techniques, • Types of gaits: Non-weight bearing, partial weight bearing, four point crutch, tripod, walking with sticks, calipers • Forms of therapies: Hydrotherapy, electrotherapy, wax bath, heat therapy, ice, helio therapy, radiant heat, • Chest physiotherapy
XVI	8	<p>Rehabilitation</p> <input type="checkbox"/> Principles of rehabilitation, definition, philosophy, process,

		<ul style="list-style-type: none"> <input type="checkbox"/> Various types of therapies <input type="checkbox"/> Special therapies and alternative therapies <input type="checkbox"/> Rehabilitation counseling <input type="checkbox"/> Preventive and restorative measures. <input type="checkbox"/> Community based rehabilitation (CBR) <input type="checkbox"/> Challenges in rehabilitation. <input type="checkbox"/> Role of the nurse in rehabilitation, <input type="checkbox"/> Legal and ethical issues in rehabilitation nursing <input type="checkbox"/> Occupational therapy
XVII	5	<p>National Policies and Programmes</p> <ul style="list-style-type: none"> <input type="checkbox"/> National programmes for rehabilitation of persons with disability National Institutes, artificial limbs manufacturing Corporation, District Rehabilitation Centers and their schemes <input type="checkbox"/> Regional rehabilitation centers etc. <input type="checkbox"/> Public policy in rehabilitation nursing <input type="checkbox"/> The persons with disabilities act 1995, <input type="checkbox"/> Mental rehabilitation and Multiple disabilities act 1992, <input type="checkbox"/> The National Trust Rules 1999 and 2000 <input type="checkbox"/> Rehabilitation Council of India <input type="checkbox"/> Legal and ethical aspects in orthopedic nursing <input type="checkbox"/> Rehabilitation health team and different categories of team members.
XVIII	4	<p>Quality assurance</p> <ul style="list-style-type: none"> <input type="checkbox"/> Standards, Protocols, Policies, Procedures <input type="checkbox"/> Nursing audit <input type="checkbox"/> Staffing <input type="checkbox"/> Design of orthopedic, physiotherapy and rehabilitation unit

Practicals

1. Clinical practice in Orthopedic, physiotherapy and Rehabilitation Units.
2. Application of tractions and plaster casts and removal of tractions and plaster casts and other appliances.
3. Apply Theories and Nursing Process in the management of patients with orthopedic conditions.
4. Provide various types of physical and rehabilitative therapies
5. Provide health education on related disease conditions.

6. Unit management and plan - designing

Clinical Experience

Total = 960 Hours
1 week = 30 Hours

S.No.	Deptt. /Unit	No. of Week	Total Hours
1.	Orthopedic Ward	8	240Hours
2.	Orthopedic Operation theatre	4	120Hours
3.	Neurosurgical Ward	2	60 Hours
4.	Orthopedic O.P.D.	4	120 Hours
5	Casualty/Emergency and Trauma	4	120 Hours
6.	Rehabilitation Units	2	60 Hours
7.	Physiotherapy Unit	4	120 Hours
8.	Paediatric /paediatric surgery unit	2	60 Hours
9	Field Visit	2	60 Hours
	Total	32 Weeks	960 Hours

Procedures Observed

1. X Ray
2. Ultrasound
3. MRI
4. C T Scan/bone scan
5. Arthroscopy
6. Electrothermally – assisted capsule shift or ETAC (Thermal capsulorrhaphy)

7. Fluoroscopy
8. Electromyography
9. Myelography
10. Discography
11. Others

Procedures Assisted

1. Blood Transfusion
2. IV cannulation and therapy
3. Ventilation
4. Various types of tractions
5. Orthopedic surgeries – Arthrocentesis, Arthroscopy, Bone lengthening, Arthrodesis, grafting, Fractures fixation, reconstructive, reimplantation, replantation, spinal decompression, transplantation of bone, muscle or articular cartilage, autografting, allografting.
6. Injection – Intra articular, intra osseous.
7. Advance Life Support

Procedures Performed

1. Interpretation of X ray films.
2. Application and removal of splints, casts, and braces.
3. Care of tractions – skin and skeletal traction, pin site care.
4. Cold therapy.
5. Heat therapy
6. Hydrotherapy
7. Therapeutic exercises
8. Use of TENS (Transcutaneous electrical nerve stimulation)
9. Techniques of transportation
10. Crutch walking, walkers, wheel chair.
11. Use of devices for activities of daily living and prevention of deformities.
12. Administration of drugs: IV injection, IV cannulation, and Blood transfusion.
13. Procedures for prevention of infections: disinfection and sterilization, surveillance, fumigation.
14. Special skin/ part preparations for orthopedic surgeries.
15. Surgical dressings – Debridement.
16. Bladder and bowel training

Other Procedures

CLINICAL SPECIALITY - II

MEDICAL SURGICAL NURSING - GASTRO ENTEROLOGY NURSING

Placement : II Year

Hours of Instruction

Theory : 150 hrs.

Practical : 950 hrs.

Total : 1100 hrs.

Course Description

This course is designed to assist students in developing expertise and indepth understanding in the field of gastro enterology Nursing. It will help students to develop advanced skills for nursing intervention in various gastro enterology conditions. It will enable the student to function as gastro enterology nurse practitioner/specialist and provide quality care. It will further enable the student to function as educator, manager, and researcher in the field of gastro enterology nursing

Objectives

At the end of the course the students will be able to

1. Appreciate trends and issues related to gastro enterology nursing
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of gastrointestinal conditions
3. Participate in national health programs for health promotion, prevention and rehabilitation of patients with gastrointestinal conditions
4. Perform physical, psychosocial & spiritual assessment
5. Assist in various diagnostic, therapeutic and surgical procedures
6. Provide comprehensive care to patients with gastrointestinal

conditions

7. Describe the various drugs used in gastrointestinal conditions and nurses responsibility
8. Demonstrate skill in handling various equipments/gadgets used for patients with gastrointestinal conditions
9. Appreciate team work & coordinate activities related to patient care.
10. Practice infection control measures.
11. Identify emergencies and complications & take appropriate measures
12. Assist patients and their family to cope with emotional distress, grief, anxiety and spiritual needs
13. Discuss the legal and ethical issues in GE nursing
14. Identify the sources of stress and manage burnout syndrome among health care providers
15. Appreciate the role of alternative system of medicine in care of patient
16. Incorporate evidence based nursing practice and identify the areas of research in the field of gastrointestinal nursing
17. Teach and supervise nurses and allied health workers.
18. Design a layout of Gastro enterology intensive care unit (GEICU) , liver care/transplant unit

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical development: trends and issues in the field of gastro enterology. <input type="checkbox"/> Gastro enterological problems <input type="checkbox"/> Concepts, principles and nursing perspectives <input type="checkbox"/> Ethical and legal issues <input type="checkbox"/> Evidence based nursing and its application in gastrointestinal nursing(to be incorporated in all the units)
II	5	<p>Epidemiology</p> <ul style="list-style-type: none"> <input type="checkbox"/> Risk factors associated with GE conditions- Hereditary, Psychosocial factors, smoking, alcoholism, dietary habits, cultural and ethnic considerations <input type="checkbox"/> Health promotion, disease prevention, life style modification and its implications to nursing <input type="checkbox"/> National health programmes related to gastro enterology

		<input type="checkbox"/> Alternate system of medicine/complementary therapies
III	5	Review of anatomy and physiology of gastrointestinal system <ul style="list-style-type: none"> <input type="checkbox"/> Gastrointestinal system <input type="checkbox"/> Liver, biliary and pancreas <input type="checkbox"/> Gerontologic considerations <input type="checkbox"/> Embryology of GI system <input type="checkbox"/> Immunology specific to GI system
IV	15	Assessment and diagnostic measures <ul style="list-style-type: none"> <input type="checkbox"/> History taking <input type="checkbox"/> Physical assessment, psychosocial assessment <input type="checkbox"/> Diagnostic tests <ul style="list-style-type: none"> • Radiological studies: Upper GIT- barium swallow, lower GIT Barium enema, • Ultra sound: • Computed tomography • MRI • Cholangiography: Percutaneous transhepatic Cholangiogram(PTC) • Magnetic Resonance Cholangio pancreatography (MRCP) • Nuclear imaging scans(scintigraphy) • Endoscopy • Colonoscopy • Proctosigmoidoscopy • Endoscopic Retrograde Cholangio pancreatography (ERCP) • Endoscopic ultrasound • Peritonoscopy(Laproscopy) • Gastric emptying studies • Blood chemistries: Serum amylase, serum lipase • Liver biopsy • Miscellaneous tests: Gastric analysis, fecal analysis • Liver function tests: Bile formation and excretion, dye excretion test, Protein metabolism, haemostatic functions- prothrombin vitamin K production, serum enzyme tests, Lipid metabolism serum Cholesterol Interpretation of diagnostic measures <p>Nurse's role in diagnostic tests</p>

V	25	<p>Gastro intestinal disorders and nursing management</p> <p>□ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical and nursing management of</p> <ul style="list-style-type: none"> • Disorders of the mouth: Dental caries, Peridontal disease, Acute tooth infection, Stomatitis, Thrush (moniliasis), Gingivitis, Leukoplakia, Inflammation of the parotid gland, Obstruction to the flow of saliva, Fracture of the jaw • Disorders of the oesophagus: Reflux oesophagitis, Oesophageal achalasia, Oesophageal varices, Hiatus hernia, Diverticulum • Disorders of the stomach and duodenum: Gastritis, Peptic ulcer, Dumping of the stomach, Food poisoning, idiopathic gastroparesis, Aerophagia and belching syndrome, Ideopathic cyclic nausea and vomiting, Rumination syndrome, Functional dyspepsia, Chronic Non specific (functional) abdominal pain • Disorders of the small intestine <ul style="list-style-type: none"> - Malabsorption syndrome – tropical sprue - Gluten – sensitive enteropathy (Coeliac disease) - Inflammatory diseases of intestines and abdomen,,: appendicitis, Peritonities, Intestinal obstruction, Abdominal TB, Gastrointestinal polyposis syndrome - Chronic inflammatory bowel disease, Ulcerative colites, crohn’s disease - Infestations and infections – Worm infestations, Typhoid, Leptospirosis - Solitary rectal ulcer syndrome - Alteration in bowel elimination (diarrhoea, constipation, fecal impaction, fecal incontinence, Irritable bowel syndrome, Chronic idiopathic constipation, Functional diarrhoea <p>Anorectal Conditions: Hemorrhoids, Anal fissure, Anal fistula, Abscess, Strictures, Rectal prolapse, Pruritis ani, Pelonidal disease, Anal condylomas, Warts</p>
VI	15	<p>Disorder of liver, pancreas gall bladder and nursing management</p> <p>□ Disorders of liver biliary tract :</p> <p>□ Viral Hepatitis – A, B, C, D & E</p>

		<ul style="list-style-type: none"> <input type="checkbox"/> Toxic hepatitis • Cirrhosis of liver, liver failure, Liver transplantation • Non cirrhotic portal fibrosis • Liver abscess,; • Parasitic and other cysts of the liver • Disorders of the Gall Bladder and Bile Duct: <ul style="list-style-type: none"> <input type="checkbox"/> Cholecystitis <input type="checkbox"/> Cholelithiasis <input type="checkbox"/> Choledocholithiasis <input type="checkbox"/> Disorders of the pancreas: Pancreatitis, <input type="checkbox"/> Benign tumors of islet cells <input type="checkbox"/> Disorders of the Peritoneum • Infections of the peritoneum <ul style="list-style-type: none"> <input type="checkbox"/> Surgical peritonitis <input type="checkbox"/> Spontaneous bacterial peritonitis <input type="checkbox"/> Tuberculosis peritonitis <input type="checkbox"/> Disorders of the Diaphragm <ul style="list-style-type: none"> • Diaphragmatic hernia • Congenital hernias • Paralysis of diaphragm • Tumors of the diaphragm <input type="checkbox"/> Hiccups
VII	15	<p>Gastro intestinal emergencies and nursing interventions</p> <ul style="list-style-type: none"> <input type="checkbox"/> Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical and nursing management of: <ul style="list-style-type: none"> • Esophageal varices, • Ulcer perforation, • Acute cholecystitis • Diverticulitis • Fulminant hepatic failure • Biliary obstruction • Bowel obstruction • Gastroenteritis • Intussusception • Acute intestinal obstruction, perforation • Acute pancreatitis • Cirrhosis of liver complications • Liver , spleen, stomach pancreatic, mesenteric, bowel and greater vessel injuries • Acute appendicitis /peritonitis • Acute abdomen

		<ul style="list-style-type: none"> • Food poisoning
VIII	15	<ul style="list-style-type: none"> <input type="checkbox"/> Congenital Anomalies of Esophagus <ul style="list-style-type: none"> • Esophageal atresia • Tracheo esophageal fistula • Esophageal stenosis • Esophageal duplications • Dysphagia – Lusoria – aberrant right subclavian artery compressing esophagus • Esophageal rings – schalzkiring • Esophageal webs <input type="checkbox"/> Congenital Anomalies of Stomach <ul style="list-style-type: none"> • Gastric atresia • Micro gastia • Gastric diverticulum • Gastric duplication • Gastric teratoma • Gastric volvulus • Infantile hypertrophic pyloric stenosis • Adult hypertrophic pyloric stenosis <input type="checkbox"/> Congenital Anomalies of Duodenal <ul style="list-style-type: none"> • Duodenal Atresia or stenosis • Annular pancreas • Duodenal duplication cysts • Malrotation and mid gut volvulus <input type="checkbox"/> Developmental anomalies of the intestine: <ul style="list-style-type: none"> • Abdominal wall defects (omphalocele and Gastroschisis) • Meckel’s diverticulum • Intestinal atresia <input type="checkbox"/> Hirschsprung’s disease
IX	15	<p>Pharmo Kinetics</p> <ul style="list-style-type: none"> <input type="checkbox"/> Drugs used in GIT <input type="checkbox"/> Principles of administration <input type="checkbox"/> Roles responsibilities of nurses <input type="checkbox"/> Drugs in Peptic ulcer disease <input type="checkbox"/> Proton Pump inhibitors <input type="checkbox"/> H₂ Receptor Antagonists <input type="checkbox"/> Cytoprotective Agents: <input type="checkbox"/> Drugs used in Diarrhea <input type="checkbox"/> Drugs used in constipation

		<input type="checkbox"/> Drugs used in Inflammatory Bowel Disease <input type="checkbox"/> Aminosalicylates <input type="checkbox"/> Corticosteroids <input type="checkbox"/> Immunomodulators <input type="checkbox"/> chemotherapy <input type="checkbox"/> Antibiotics <input type="checkbox"/> Antiemetics: <input type="checkbox"/> Anticholinergics <input type="checkbox"/> Antihistaminics <input type="checkbox"/> Anthelmintics <input type="checkbox"/> Vitamin Supplements
X	10	Nutrition and nutritional problems related to GI system <input type="checkbox"/> Nutritional assessment and nursing interventions <input type="checkbox"/> Therapeutic diets <input type="checkbox"/> Adverse reactions between drugs and various foods <input type="checkbox"/> Malnutrition- etiology , clinical manifestations and management <input type="checkbox"/> Tube feeding, parenteral nutrition, total parenteral nutrition <input type="checkbox"/> Obesity- etiology, clinical manifestations and management <input type="checkbox"/> Eating disorders- anorexia nervosa, bulimia nervosa <input type="checkbox"/> Recent advances in nutrition
XI	15	Malignant disorders of gastro intestinal system <input type="checkbox"/> Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, medical , surgical, other modalities and nursing management of: <ul style="list-style-type: none"> • Malignancy of oral cavity ,Lip, Tongue,buccal mucosa, oropharynx, Salivary gland • Esophageal , Gastric , Carcinoma of bowel - Small bowel, Colorectal and Anal carcinoma, • Liver, biliary tract and Pancreatic carcinoma
XII	5	Administration and management of GE unit <input type="checkbox"/> Design & layout <input type="checkbox"/> Staffing, <input type="checkbox"/> Equipment, supplies, <input type="checkbox"/> Infection control; Standard safety measures

		<input type="checkbox"/> Quality Assurance:-Nursing audit –records /reports, Norms, policies and protocols <input type="checkbox"/> Practice standards
XIII	5	Education and training in GE care <input type="checkbox"/> Staff orientation, training and development, <input type="checkbox"/> In-service education program, <ul style="list-style-type: none"> • Clinical teaching programs

Clinical Experience

Total = 960 Hours
1 week = 30 Hours

S.No.	Deptt. /Unit	No. of Week	Total Hours
1.	Diagnostic labs		240Hours
2.	Emergency and casualty		120Hours
3.	Liver transplant unit		60 Hours
4.	GE Medical Ward		120 Hours
5.	GE Surgical Ward		120 Hours
6.	OT		60 Hours
7.	ICU		120 Hours
8.	Pediatric gastroenterology		60 Hours
9.	Oncology		60 Hours
10.	GE OPD		
	Total	32 Weeks	960 Hours

Procedures Assisted

1. Endoscopy room – Upper G.I. Endoscopy (Diagnostic and therapeutic).
2. Sigmoidoscopy
3. Colonoscopy
4. Polypectomy
5. Endoscopic retrograde cholangio pancreatography (ERCP)

6. Liver biopsy
7. Percutaneous catheter drainage (PCD) of Pseudocyst pancreas
8. Abdominal paracentesis
9. Percutaneous aspiration of liver abscess
10. GE Lab : PT, HbsAg, Markers – A, B, C virus, CBP, ESR, Stool Test

Procedures Performed

1. History and Physical assessment
2. RT intubation / extubation / aspiration/suction
3. Gastric lavage and gavage
4. Bowel wash
5. Therapeutic Diets
6. Ostomy feeding
7. Stoma care
8. Monitoring vital parameters
9. Plan of inservice education programme for nursing staff and Class-IV employees
10. Counseling

CLINICAL SPECIALITY – II

OBSTETRIC AND GYNAECOLOGICAL NURSING

Placement - II Year

Hours of Instruction
 Theory: 150 hrs
 Practical 950 hrs
 Total 1100 hrs

Course Description

This course is designed to assist the student in developing expertise and indepth understanding in the field of Obstetric and gynecological Nursing .It will help the student to develop advanced nursing skills for nursing interventions in various obstetrical and gynecological conditions. It will further enable the students to function as midwifery nurse practitioner/ specialist, educator, manager and researcher in the field of obstetric and gynecological nursing.

Objectives

At the end of the course, the student will be able to:

1. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of women with obstetric and gynaecological conditions
2. Perform physical, psychosocial, cultural & spiritual assessment

3. Demonstrate competence in caring for women with obstetrical and gynaecological conditions
4. Demonstrate competence in caring for high risk newborn.
5. Identify and Manage obstetrical and neonatal emergencies as per protocol.
6. Practice infection control measures
7. Utilize recent technology and various diagnostic, therapeutic modalities in the management of obstetrical , gynecological and neonatal care.
8. Demonstrate skill in handling various equipments/gadgets used for obstetrical, gynaecological and neonatal care
9. Teach and supervise nurses and allied health workers.
10. Design a layout of speciality units of obstetrics and gynecology
11. Develop standards for obstetrical and gynaecological nursing practice.
12. Counsel women and families
13. Incorporate evidence based nursing practice and identify the areas of research in the field of obstetrical and gynaecological nursing
14. Function as independent midwifery nurse practitioner

Course Content

Unit	Hours	Content
I	25	<p>Management of problems of women during pregnancy</p> <ul style="list-style-type: none"> □ Risk approach of obstetrical nursing care , concept & goals. □ Screening of high-risk pregnancy, newer modalities of diagnosis. □ Nursing Management of Pregnancies at risk-due to obstetrical complication <ul style="list-style-type: none"> • Pernicious Vomiting. • Bleeding in early pregnancy, abortion, ectopic pregnancy, and gestational trophoblastic diseases. • Hemorrhage during late pregnancy, ante partum hemorrhage, Placenta praevia, abruptio placenta. • Hypertensive disorders in pregnancy, pre-eclampsia, eclampsia, Hemolysis Elevated liver enzyme Low Platelet count (HELLP) • Iso-immune diseases. Rh and ABO incompatibility • Hematological problems in pregnancy. • Hydramnios-oligohydramnios • Prolonged pregnancy- post term, post maturity. • Multiple pregnancies. • Intra uterine infection & pain during pregnancy.

		<ul style="list-style-type: none"> • Intra Uterine Growth Retardation(IUGR), Premature Rupture of Membrane(PROM), intra uterine death
II	15	<p>Pregnancies at risk-due to pre-existing health problems</p> <ul style="list-style-type: none"> <input type="checkbox"/> Metabolic conditions. <input type="checkbox"/> Anemia and nutritional deficiencies <input type="checkbox"/> Hepatitis <input type="checkbox"/> Cardio-vascular disease. <input type="checkbox"/> Thyroid diseases. <input type="checkbox"/> Epilepsy. <input type="checkbox"/> Essential hypertension <input type="checkbox"/> Chronic renal failure. <input type="checkbox"/> Tropical diseases. <input type="checkbox"/> Psychiatric disorders <input type="checkbox"/> Infections Toxoplasmosis Rubella Cytomegalo virus Herpes (TORCH); Reproductive Tract Infection(RTI);STD; HIV/AIDS, Vaginal infections; Leprosy, Tuberculosis <input type="checkbox"/> Other risk factors: Age- Adolescents, elderly; unwed mothers, sexual abuse, substance use <input type="checkbox"/> Pregnancies complicating with tumors, uterine anomalies, prolapse, ovarian cyst
III	15	<p>Abnormal labour, pre-term labour & obstetrical emergencies</p> <ul style="list-style-type: none"> <input type="checkbox"/> Etiology, pathophysiology and nursing management of <ul style="list-style-type: none"> • Uncoordinated uterine actions, Atony of uterus, precipitate labour, prolonged labour. • Abnormal lie, presentation, position compound presentation. • Contracted pelvis-CPD; dystocia. • Obstetrical emergencies Obstetrical shock, vasa praevia, inversion of uterus, amniotic fluid embolism, rupture uterus, presentation and prolapse cord. • Augmentation of labour. Medical and surgical induction. • Version • Manual removal of placenta. • Obstetrical operation: Forceps delivery, Ventouse, Caesarian section, Destructive operations • Genital tract injuries-Third degree perineal tear,

		<p>VVF, RVF</p> <ul style="list-style-type: none"> □ Complications of third stage of labour: <ul style="list-style-type: none"> • Post partum Hemorrhage. • Retained placenta.
IV	10	<p>post partum complications</p> <ul style="list-style-type: none"> □ Nursing management of <ul style="list-style-type: none"> • Puerperal infections, puerperal sepsis, urinary complications, puerperal venous thrombosis and pulmonary embolism • Sub involution of uterus, Breast conditions, Thrombophlebitis • Psychological complications, post partum blues, depression, psychosis
V	25	<p>High Risk Newborn</p> <ul style="list-style-type: none"> □ Concept, goals, assessment, principles. □ Nursing management of <ul style="list-style-type: none"> • Pre-term, small for gestational age, post-mature infant, and baby of diabetic and substance use mothers. • Respiratory conditions, Asphyxia neonatorum, neonatal apnoea meconium aspiration syndrome, pneumo thorax, pneumo mediastinum • Icterus neonatorum. • Birth injuries. • Hypoxic ischaemic encephelopathy • Congenital anomalies. • Neonatal seizures. • Neonatal hypocalcaemia, hypoglycemia, hypomagnesaemia. • Neonatal heart diseases. • Neonatal hemolytic diseases • Neonatal infections, neonatal sepsis, ophthalmia neonatorum, congenital syphilis, HIV/AIDS • Advanced neonatal procedures. • Calculation of fluid requirements. • Hematological conditions – erythroblastosis fetalis, hemorrhagic disorder in the newborn • Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU

VI	15	<p>HIV/AIDS</p> <ul style="list-style-type: none"> <input type="checkbox"/> HIV positive mother and her baby <input type="checkbox"/> Epidemiology <input type="checkbox"/> Screening <input type="checkbox"/> Parent to child transmission(PTCT) <input type="checkbox"/> Prophylaxis for mother and baby <input type="checkbox"/> Standard safety measures <input type="checkbox"/> Counseling <input type="checkbox"/> Breast feeding issues <input type="checkbox"/> National policies and guidelines <input type="checkbox"/> Issues: Legal,ethical, Psychosocial and rehabilitation <p>Role of nurse</p>
VII	25	<p>Gynecological problems and nursing management</p> <ul style="list-style-type: none"> <input type="checkbox"/> Gynecological assessment <input type="checkbox"/> Gynecological procedures <input type="checkbox"/> Etiology, pathophysiology, diagnosis and nursing management of <ul style="list-style-type: none"> • Menstrual irregularities • Diseases of genital tract • Genital tract infections • Uterine displacement • Genital prolapse • Genital injuries • Uterine malformation • Uterine fibroid, ovarian tumors, Breast carcinoma, Pelvic inflammatory diseases, reproductive tract malignancies, hysterectomy – vaginal and abdominal. • Sexual abuse, rape, trauma , assault
VIII	5	<p>Administration and management of obstetrical and gynaecological unit</p> <ul style="list-style-type: none"> <input type="checkbox"/> Design & layout <input type="checkbox"/> Staffing, <input type="checkbox"/> Equipment, supplies, <input type="checkbox"/> Infection control; Standard safety measures <input type="checkbox"/> Quality Assurance:-Obstetric auditing –records /reports, Norms, policies and protocols <input type="checkbox"/> Practice standards for obstetrical and gynaecological unit

IX	5	Essential Obstetrical And Gynecological Skills Procedure Observed <ul style="list-style-type: none"> • Assisted Reproductive Technology procedures • Ultra sonography • Specific laboratory tests. • Amniocentesis. • Cervical & vaginal cytology. • Fetoscopy. • Hysteroscopy. • MRI. • Surgical diathermy. • Cryosurgery.
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Clinical Experience

Total = 960 Hours
1 week = 30 Hours

S.No.	Deptt. /Unit	No. of Week	Total Hours
1.	Antenatal OPD including Infertility clinics/ Reproductive medicine, Family welfare and post partum clinic/ PTCT	6	180Hours
2.	Antenatal and Postnatal ward	6	180Hours
3.	Labour room	4	120 Hours
4.	Neonatal intensive Care Unit	3	90 Hours
5	Obstetric / Gynae Operation Theatre	3	90 Hours
6.	Gynae Ward	4	120 Hours
7.	CHC,PHC, Sc	6	180 Hours
	Total	32 Weeks	960 Hours

Procedures Assisted

- Operative delivery
- Abnormal deliveries-Forceps application, Ventouse, Breech
- Exchange blood transfusion
- Culdoscopy.
- Cystoscopy
- Tuboscopy
- Laparoscopy.
- Endometrial Biopsy
- Tubal patent test

- Chemotherapy
- Radiation therapy
- Medical Termination of Pregnancy.
- Dilatation and Curettage

Procedures Performed

- History taking.
- Physical Examination-General
- Antenatal assessment. – 20
- Pelvic examination
- Assessment of risk status.
- Assessment of Intra uterine foetal well-being.kick chart and foetal movement chart, Doppler assessment, Non Stress Test, Contraction stress test(Oxytocin challenge test)
- Universal precautions- Disposal of biomedical waste.
- Per Vaginal examination and interpretation (early pregnancy, labour, post partum).
- Utilization of Partograph
- Medical & Surgical induction(Artificial rupture of membranes).
- Vacuum extraction
- Conduct of delivery.
- Prescription and administration of fluids and electrolytes through intravenous route.
- Application of outlet forceps, delivery of breach – Burns Marshall, Loveset manoeuvre
- Repair of tears and Episiotomy suturing.
- Vacuum extraction
- controlled cord traction, Manual removal of placenta, placental examination,
- Manual vacuum aspiration
- Postnatal assessment.- 20
- Management of breast engorgement
- Thrombophlebitis (white leg)
- Postnatal counseling.
- Reposition of inversion of uterus.
- Laboratory tests: Blood- Hb, Sugar, Urine-albumin,sugar
- Breast care, breast exam, and drainage breast abscess.
- Postnatal exercise.
- Assessment –New born assessment; physical and neurological, Apgar score, high-risk newborn, Monitoring neonates; Clinically and With monitors, Capillary refill time, Assessment of jaundice, danger signs
- Anthropometric measurement
- Neonatal resuscitation
- Gastric Lavage
- Care of newborn in multi channel monitor and ventilator.

- Care of newborn in radiant warmer and incubator.
- Kangaroo mother care.
- Assisting mother with exclusive Breast-feeding
- Feeding technique: Katori, spoon, naso/orogastric, Total Parenteral nutrition
- Assesment, calculation and administration of fluids and medications:
 - Oral
 - I.D.
 - I.M.
 - I.V.- Securing IV line, infusion pump
- Administration of drug per rectum
- Capillary blood sample collection.
- Oxygen therapy.
- Phototherapy.
- Chest physiotherapy.
- counseling – Parental, bereavment, family planning, infertility etc
- Setting of operation theatre.
- Trolley and table set up for Obstetrical & gynaecological operations.
- Pap smear.
- Vaginal smear.
- Insertion of pessaries,
- Insertion of IUD and removal.
- Teaching skills
- communication skills
- Prepare referral slips
- Pre transport stabilization
- Networking with other stake holders

CLINICAL SPECIALTY -II

PEDIATRIC (CHILD HEALTH) NURSING

Placement : II Year

Hours of Instruction
Theory 150 hours
Practical 950 hours
Total : 1100 hours

Course Description

This course is designed to assist students in developing expertise and indepth understanding in the field of Pediatric Nursing. It will help students to develop advanced skills for nursing intervention in various pediatric medical and surgical conditions. It will enable the student to function as pediatric nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Paediatric nursing

Objectives

At the end of the course the students will be able to:

1. Apply the nursing process in the care of ill infants to pre adolescents in hospital and community
2. Demonstrate advanced skills/competence in nursing management of children with medical and surgical problems
3. Recognize and manage emergencies in children
4. Provide nursing care to critically ill children
5. Utilize the recent technology and various treatment modalities in the management of high risk children
6. Prepare a design for layout and describe standards for management of pediatric units/hospitals
7. Identify areas of research in the field of pediatric nursing

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> □ Current principles, practices and trends in Pediatric Nursing □ Role of pediatric nurse in various settings - Expanded and extended
II	35	<ul style="list-style-type: none"> □ Pathophysiology, assessment(including interpretation of various invasive and non-invasive diagnostic procedures), treatment modalities and nursing intervention in selected pediatric medical disorders • Child with respiratory disorders: <ul style="list-style-type: none"> - Upper respiratory tract: choanal atresia, tonsillitis, epistaxis, aspiration. - Lower respiratory tract: Broncheolitis, Bronchopneumonia, Asthma, cystic fibrosis • Child with gastro-intestinal disorders: <ul style="list-style-type: none"> - Diarrheal diseases, gastro-esophageal reflux. - Hepatic disorders: Hepatitis, Indian childhood cirrhosis, liver transplantation. - Malabsorption syndrome, Malnutrition • Child with renal/ urinary tract disorders: Nephrotic syndrome, Nephritis, Hydronephrosis, hemolytic-uremic syndrome, kidney transplantation • Child with cardio-vascular disorders: <ul style="list-style-type: none"> - Acquired: Rheumatic fever, Rheumatic heart disease, - Congenital: Cyanotic and acyanotic

		<ul style="list-style-type: none"> • Child with endocrine/metabolic disorders: Diabetes insipidus, Diabetes Mellitus – IDDM, NIDDM, hyper and hypo thyroidism, phenylketonuria, galactosemia • Child with Neurological disorders: Convulsions, Meningitis, encephalitis, guillian- Barre syndrome • Child with oncological disorders: Leukemias, Lymphomas, Wilms’ tumor, nephroblastomas, neuroblastomas, Rhabdomyosarcoma, retinoblastoma, hepatoblastoma, bone tumors • Child with blood disorders: Anemias, thalasseмии, hemophilia, polycythemia, thrombocytopenia, and disseminated intravascular coagulation • Child with skin disorders • Common Eye and ENT disorders • Common Communicable diseases
III	35	<p>□ Assessment(including interpretation of various invasive and non-invasive diagnostic procedures), treatment modalities including cosmetic surgery and nursing interventions in selected pediatric surgical problems/ Disorders</p> <ul style="list-style-type: none"> • Gastrointestinal system: Cleft lip, cleft palate and conditions requiring plastic surgery, Tracheo esophageal fistula/atresia, Hirschsprungs’ disease/megacolon, malrotation, intestinal obstruction, duodenal atresia, gastrochisis, exomphalus, anorectal malformation, omphalocele, diaphragmatic hernia • Anomalies of the nervous system: Spina bifida, Meningocele, Myelomeningocele, hydrocephalus • Anomalies of the genito-urinary system: Hypospadias, Epispadias, Undescended testes, Exstrophy bladder • Anomalies of the skeletal system • Eye and ENT disorders • Nursing management of the child with traumatic injuries: General principles of managing Pediatric trauma - Head injury, abdominal injury, poisoning, foreign body obstruction, burns - & Bites • Child with oncological disorders: Solid tumors of childhood, Nephroblastoma, Neuro blastoma, Hodgkin's/Non Hodgkin's Lymphoma,

		<p>Hepatoblastoma, Rhabdomyosarcoma</p> <ul style="list-style-type: none"> • Management of stomas, catheters and tubes • Management of wounds and drainages
IV	10	<p>Intensive care for pediatric clients</p> <ul style="list-style-type: none"> <input type="checkbox"/> Resuscitation, stabilization & monitoring of pediatric patients <input type="checkbox"/> Anatomical & physiological basis of critical illness in infancy and childhood <input type="checkbox"/> Care of child requiring long-term ventilation <input type="checkbox"/> Nutritional needs of critically ill child <input type="checkbox"/> Legal and ethical issues in pediatric intensive care <input type="checkbox"/> Intensive care procedures, equipment and techniques <input type="checkbox"/> Documentation
V	20	<p>High Risk Newborn</p> <ul style="list-style-type: none"> <input type="checkbox"/> Concept, goals, assessment, principles. <input type="checkbox"/> Nursing management of <ul style="list-style-type: none"> • Post-mature infant, and baby of diabetic and substance use mothers. • Respiratory conditions, Asphyxia neonatorum, neonatal apnoea meconium aspiration syndrome, pneumo thorax, pneumo mediastinum • Icterus neonatorum. • Birth injuries. • Hypoxic ischaemic encephelopathy • Congenital anomalies. • Neonatal seizures. • Neonatal hypocalcaemia, hypoglycemia, hypomagnesaemia. • Neonatal heart diseases. • Neonatal hemolytic diseases • Neonatal infections, neonatal sepsis, ophthalmia neonatorum, congenital syphilis, HIV/AIDS • Advanced neonatal procedures. • Calculation of fluid requirements. • Hematological conditions – erythroblastosis fetalis, hemorrhagic disorder in the newborn • Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU

VI	10	Developmental disturbances and implications for nursing <ul style="list-style-type: none"> <input type="checkbox"/> Adjustment reaction to school, <input type="checkbox"/> Learning disabilities <input type="checkbox"/> Habit disorders, speech disorders, <input type="checkbox"/> Conduct disorders, <input type="checkbox"/> Early infantile autism, Attention deficit hyperactive disorders (ADHD), depression and childhood schizophrenia
VII	10	Challenged child and implications for nursing <ul style="list-style-type: none"> <input type="checkbox"/> Physically challenged, causes, features, early detection & management <input type="checkbox"/> Cerebral palsied child, <input type="checkbox"/> Mentally challenged child. <input type="checkbox"/> Training & rehabilitation of challenged children
VIII	5	Crisis and nursing intervention <ul style="list-style-type: none"> <input type="checkbox"/> The hospitalized child, <input type="checkbox"/> Terminal illness & death during childhood <input type="checkbox"/> Nursing intervention-counseling
IX	5	Drugs used in Pediatrics <ul style="list-style-type: none"> <input type="checkbox"/> Criteria for dose calculation <input type="checkbox"/> Administration of drugs, oxygen and blood <input type="checkbox"/> Drug interactions <input type="checkbox"/> Adverse effects and their management
X	10	Administration and management of pediatric care unit <ul style="list-style-type: none"> <input type="checkbox"/> Design & layout <input type="checkbox"/> Staffing, <input type="checkbox"/> Equipment, supplies, <input type="checkbox"/> Norms, policies and protocols <input type="checkbox"/> Practice standards for pediatric care unit <input type="checkbox"/> Documentation
XI	5	Education and training in Pediatric care

		<input type="checkbox"/> Staff orientation, training and development, <input type="checkbox"/> In-service education program, <input type="checkbox"/> Clinical teaching programs.
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Practical

Total = 960 Hours
1 week = 30 Hours

Field visits:

S.No.	Deptt. /Unit	No. of Week	Total Hours
1.	Pediatric medicine ICU	4	120Hours
2.	Pediatric surgical ICU	4	120Hours
3.	NICU	4	120 Hours
4.	Pediatric OT	2	60 Hours
5	Pediatric medicine ward	6	180 Hours
6.	Pediatric surgery ward	6	180 Hours
7.	Emergency/Casualty	4	120 Hours
8.	Field visits*	2	60 Hours
	Total	32 Weeks	960 Hours

*Child care center, Anganwadi, play school, Special schools for challenged children, Juvenile court, UNICEF, Orphanage, Creche, SOS village

Essential

I. Procedures Observed:

- Echo cardiogram
- Ultrasound head
- ROP screening (Retinopathy of prematurity)

- Any other

II. Procedures Assisted

- Advanced neonatal life support
- Lumbar Puncture
- Arterial Blood Gas
- ECG Recording
- Umbilical catheterization – arterial and venous
- Arterial B P monitoring
- Blood transfusion- exchange transfusion full and partial
- IV cannulation & therapy
- Arterial catheterization
- Chest tube insertion
- Endotracheal intubation
- Ventilation
- Insertion of long line
- Assist in surgery

III. Procedures Performed:

- Airway Management
 - Application of Oro Pharyngeal Airway
 - Oxygen therapy
 - CPAP(Continuous Positive Airway Pressure)
 - Care of Tracheostomy
 - Endotracheal Intubation
- Neonatal Resuscitation
- Monitoring of Neonates – clinically & with monitors, CRT(Capillary Refill Time), assessment of jaundice, ECG
- Gastric Lavage
- Setting of Ventilators
- Phototherapy
- Assessment of Neonates: Identification & assessment of risk factors, APGAR Score, gestation age, Anthropometric assessment, Weighing the baby, Newborn examination, detection of life threatening congenital abnormalities,
- Admission & discharge of neonates
- Feeding - management of breast feeding, artificial feeding, expression of breast milk, OG(Orogastric) tube insertion, gavage feeding, TPN, Breast feeding counseling
- Thermoregulation- Axillary temperature, Kangaroo Mother Care (KMC), Use of Radiant warmer, incubators, management of thermoregulation & control
- Administration of Drugs: I/M, IV injection, IV Cannulation & fixation infusion pump, Calculation of dosages, Neonatal formulation of drugs, use of tuberculin/ insulin syringes,

Monitoring fluid therapy, Blood administration.

- Procedures for prevention of infections: Hand washing, disinfections & sterilization, surveillance, fumigation
- Collection of specimens
- Setting, Use & maintenance of basic equipment: Ventilator, O₂ analyzer, monitoring equipment, Photo therapy unit, Flux meter, Infusion pump, Radiant warmer, incubator, Centrifuge machine, Bilimeter, Refractometer, laminar flow

IV. Other Procedures:

CLINICAL SPECIALITY - II

PSYCHIATRIC (MENTAL HEALTH) NURSING

Placement: II Year

Hours of Instruction

Theory 150 hrs

Practical 950 hrs

Total : 1100 Hours

Course Description

This course is designed to assist students in developing expertise and indepth understanding in the field of Psychiatric Nursing. It will help students to develop advanced skills for nursing intervention in various psychiatric conditions. It will enable the student to function as psychiatric nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric nursing

Objectives

At the end of the course the students will be able to:

1. Apply the nursing process in the care of patients with mental disorders in hospital and community
2. Demonstrate advanced skills/competence in nursing management of patients with mental disorders
3. Identify and care for special groups like children, adolescents, women, elderly, abused and neglected, people living with HIV/AIDS.
4. Identify and manage psychiatric emergencies.
5. Provide nursing care to critically ill patients with mental disorders

6. Utilize the recent technology and various treatment modalities in the of patients with mental disorders
7. Demonstrate skills in carrying out crisis intervention.
8. Appreciate the legal and ethical issues pertaining to psychiatric nursing.
9. Identify areas of research in the field of psychiatric nursing.
10. Prepare a design for layout and describe standards for management of Psychiatric units/emergency units/hospitals
11. Teach psychiatric nursing to undergraduate students & in-service nurses.

Course Content

Unit	Hours	Content
I	2	Principles and practice of Psychiatric nursing <input type="checkbox"/> Review
II	10	Crisis Intervention <input type="checkbox"/> Crisis, Definition <input type="checkbox"/> Phases In The Development of A Crisis <input type="checkbox"/> Types of Crisis; Dispositional , Anticipated Life Transitions Traumatic Stress, Maturation/ Development , Reflecting Psychopathology <input type="checkbox"/> Psychiatric Emergencies and their management <input type="checkbox"/> Grief and grief reaction <input type="checkbox"/> Crisis Intervention; Phases <input type="checkbox"/> Post traumatic stress disorder (PTSD) <input type="checkbox"/> Role of the Nurse
III	4	Anger/ Aggression Management <input type="checkbox"/> Anger and Aggression, Types, Predisposing Factors <input type="checkbox"/> Management <input type="checkbox"/> Role of The Nurse
IV	5	The Suicidal Client <input type="checkbox"/> Epidemiological Factors <input type="checkbox"/> Risk Factors <ul style="list-style-type: none"> • Predisposing Factors: Theories of Suicide-

		Psychological, Sociological ,Biological <input type="checkbox"/> Nursing Management
V	5	Disorders of Infancy, Childhood, and Adolescence <input type="checkbox"/> Mentally Challenged <input type="checkbox"/> Autistic Disorders <input type="checkbox"/> Attention-Deficit/Hyperactivity Disorder <input type="checkbox"/> Conduct Disorders, behavioural disorders <input type="checkbox"/> Oppositional Defiant Disorder <input type="checkbox"/> Tourette’s Disorders <input type="checkbox"/> Separation Anxiety Disorder <input type="checkbox"/> Psychopharmacological Intervention and Nursing Management
VI	5	Delirium, Dementia, and Amnesic Disorders <input type="checkbox"/> Delirium <input type="checkbox"/> Dementia <input type="checkbox"/> Amnesia <input type="checkbox"/> Psychopharmacological Intervention and Nursing Management
VII	10	Substance-Related Disorders <input type="checkbox"/> Substance-Use Disorders <input type="checkbox"/> Substance-Induced Disorders <input type="checkbox"/> Classes Of Psychoactive Substances <input type="checkbox"/> Predisposing Factors <input type="checkbox"/> The Dynamics Of Substance-Related Disorders <input type="checkbox"/> The Impaired Nurse <input type="checkbox"/> Codependency <input type="checkbox"/> Treatment Modalities For Substance-Related Disorders and Nursing Management
VIII	10	Schizophrenia and Other Psychotic Disorders (Check ICD10) <input type="checkbox"/> Nature of the Disorder <input type="checkbox"/> Predisposing Factors <input type="checkbox"/> Schizophrenia -Types <input checked="" type="checkbox"/> Disorganized Schizophrenia <input checked="" type="checkbox"/> Catatonic Schizophrenia <input checked="" type="checkbox"/> Paranoid Schizophrenia <input checked="" type="checkbox"/> Undifferentiated Schizophrenia <input checked="" type="checkbox"/> Residual Schizophrenia <input type="checkbox"/> Other Psychotic disorders <input checked="" type="checkbox"/> Schizoaffective Disorder

		<ul style="list-style-type: none"> • Brief Psychotic Disorder • Schizophreniform Disorder • Psychotic Disorder Due to a General Medical Condition • Substance-Induced Psychotic Disorder <input type="checkbox"/> Treatment and Nursing Management
IX	8	<p>Mood Disorders</p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical Perspective <input type="checkbox"/> Epidemiology <input type="checkbox"/> The Grief Response <input type="checkbox"/> Maladaptive Responses To Loss <input type="checkbox"/> Types Of Mood Disorders <input type="checkbox"/> Depressive disorders <input type="checkbox"/> Bipolar disorders <input type="checkbox"/> Treatment and Nursing Management
X	8	<p>Anxiety Disorders</p> <ul style="list-style-type: none"> <input type="checkbox"/> Historical Aspects <input type="checkbox"/> Epidemiological Statistics <input type="checkbox"/> How Much is too Much? <input type="checkbox"/> Types • Panic Disorder • Generalized Anxiety Disorder • Phobias • Obsessive-Compulsive Disorder • Posttraumatic Stress Disorder • Anxiety Disorder Due to a General Medical Condition • Substance-Induced Anxiety Disorder <input type="checkbox"/> Treatment Modalities <input type="checkbox"/> Psychopharmacology & Nursing Management
XI	5	<p>Somatoform And Sleep Disorders</p> <ul style="list-style-type: none"> <input type="checkbox"/> Somatoform Disorders <input type="checkbox"/> Historical Aspects • Epidemiological Statistics • Pain Disorder • Hypochondriasis • Conversion Disorder • Body Dysmorphic Disorder <input type="checkbox"/> Sleep Disorder <input type="checkbox"/> Treatment Modalities and Nursing Management
XII	4	Dissociative Disorders and Management

		<input type="checkbox"/> Historical Aspects <input type="checkbox"/> Epidemiological Statistics <input type="checkbox"/> Application of the Nursing Management <input type="checkbox"/> Treatment Modalities and Nursing Management
XIII	4	Sexual And Gender Identity Disorders <input type="checkbox"/> Development Of Human Sexuality <input type="checkbox"/> Sexual Disorders <input type="checkbox"/> Variation In Sexual Orientation <input type="checkbox"/> Nursing Management
XIV	4	Eating Disorders <input type="checkbox"/> Epidemiological Factors <input type="checkbox"/> Predisposing Factors : Anorexia Nervosa And Bulimia Nervosa obesity <input type="checkbox"/> Psychopharmacology <input type="checkbox"/> Treatment & Nursing Management
XV	4	Adjustment and Impulse Control Disorders <input type="checkbox"/> Historical and Epidemiological Factors <ul style="list-style-type: none"> • Adjustment Disorders • Impulse Control Disorders <input type="checkbox"/> Treatment & Nursing Management
XVI	4	Medical Conditions due to Psychological Factors <input type="checkbox"/> Asthma <input type="checkbox"/> Cancer <input type="checkbox"/> Coronary Heart Disease <input type="checkbox"/> Peptic Ulcer <input type="checkbox"/> Essential Hypertension <input type="checkbox"/> Migraine Headache <input type="checkbox"/> Rheumatoid Arthritis <input type="checkbox"/> Ulcerative Colitis <input type="checkbox"/> Treatment & Nursing Management
XVII	8	Personality Disorders <input type="checkbox"/> Historical perspectives <input type="checkbox"/> Types Of Personality Disorders <ul style="list-style-type: none"> • Paranoid Personality Disorder • Schizoid Personality Disorder • Antisocial Personality Disorder • Borderline Personality Disorder • Histrionic Personality Disorder • Narcissitic Personality Disorder • Avoidance Personality Disorder • Dependent Personality Disorder

		<ul style="list-style-type: none"> • Obsessive-Compulsive Personality Disorder • Passive-Aggressive Personality Disorders <input type="checkbox"/> Identification, diagnostic, symptoms <input type="checkbox"/> Psychopharmacology <input type="checkbox"/> Treatment & Nursing Management
XVIII	8	<p>The Aging Individual</p> <ul style="list-style-type: none"> <input type="checkbox"/> Epidemiological Statistics <input type="checkbox"/> Biological Theories <input type="checkbox"/> Biological Aspects of Aging <input type="checkbox"/> Psychological Aspects of Aging <input type="checkbox"/> Memory Functioning <input type="checkbox"/> Socio-cultural aspects of aging <input type="checkbox"/> Sexual aspects of aging <input type="checkbox"/> Special Concerns of the Elderly Population <input type="checkbox"/> Psychiatric problems among elderly population <input type="checkbox"/> Treatment & Nursing Management
XIX	5	<p>The person living with HIV Disease</p> <ul style="list-style-type: none"> <input type="checkbox"/> Psychological problems of individual HIV/AIDS <input type="checkbox"/> Counseling <input type="checkbox"/> Treatment & Nursing Management
XX	5	<p>Problems Related to Abuse or Neglect</p> <ul style="list-style-type: none"> <input type="checkbox"/> Vulnerable groups, Women, Children, elderly, psychiatric patients, under privileged, challenged <input type="checkbox"/> Predisposing Factors <input type="checkbox"/> Treatment & Nursing management- Counseling
XXI	7	<p>Community Mental Health Nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> National Mental Health Program- Community mental health program <input type="checkbox"/> The Changing Focus of care <input type="checkbox"/> The Public Health Model <input type="checkbox"/> The Role of the Nurse <input type="checkbox"/> Case Management <input type="checkbox"/> The community as Client • Primary Prevention • Populations at Risk • Secondary prevention • Tertiary Prevention <input type="checkbox"/> Community based rehabilitation
XXII	5	<p>Ethical and Legal Issues in Psychiatric/Mental Health</p>

		<p>Nursing</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ethical Considerations <input type="checkbox"/> Legal Consideration • Nurse Practice Acts • Types of Law • Classification within Statutory and Common Law • Legal Issues in Psychiatric/Mental Health Nursing • Nursing Liability
XXIII	5	<p>Psychosocial rehabilitation</p> <ul style="list-style-type: none"> <input type="checkbox"/> Principles of rehabilitation <input type="checkbox"/> Disability assessment <input type="checkbox"/> Day care centers <input type="checkbox"/> Half way homes <input type="checkbox"/> Reintegration into the community <input type="checkbox"/> Training and support to care givers <input type="checkbox"/> Sheltered workshops <input type="checkbox"/> Correctional homes
XXIV	5	<p>Counseling</p> <ul style="list-style-type: none"> <input type="checkbox"/> Liaison psychiatric nursing <input type="checkbox"/> Terminal illnesses-Counseling <input type="checkbox"/> Post partum psychosis-treatment, care and counseling <input type="checkbox"/> Death dying- Counseling <input type="checkbox"/> Treatment, care and counseling – • Unwed mothers • HIV and AIDS
XXV	5	<p>Administration and management of psychiatric units including emergency units</p> <ul style="list-style-type: none"> <input type="checkbox"/> Design & layout <input type="checkbox"/> Staffing, <input type="checkbox"/> Equipment, supplies, <input type="checkbox"/> Norms, policies and protocols <input type="checkbox"/> Quality assurance <input type="checkbox"/> Practice standards for psychiatric nursing <input type="checkbox"/> Documentation
XXVI	5	<p>Education and training in psychiatric care</p> <ul style="list-style-type: none"> <input type="checkbox"/> Staff orientation, training and development, <input type="checkbox"/> In-service education program, <input type="checkbox"/> Clinical teaching programs.

Practical

Total = 960 Hours
1 week = 30 Hours

Field visits:

S.No.	Area of Posting	No. of Week	Total Hours
1.	Acute Psychiatric Ward	4	120Hours
2.	Chronic Psychiatric Ward	4	120Hours
3.	De-addiction Unit	4	120 Hours
4.	Psychiatric Emergency Unit	4	120 Hours
5	O.P.D (Neuro and psychiatric)	3	90 Hours
6.	Child Psychiatric Unit and child guidance clinic	2	60 Hours
7.	Post natal ward	1	30 Hours
8.	Family Psychiatric Unit	2	60 Hours
9.	Field visits	2	60 Hours
10.	Rehabilitation	2	60 Hours
11.	Community Mental Health Unit	4	120 Hours
	Total	32 Weeks	960 Hours

Essential Psychiatric nursing skills

Procedures Observed

1. Psychometric tests
2. Personality tests
3. Family therapy
4. Assisted
5. CT
6. MRI

7. Behavioral therapy.

Procedures Performed

1. Mental status examination
2. Participating in various therapies – Physical; ECT,
3. Administration of Oral, IM, IV psychotropic drugs
4. Interviewing skills
5. Counseling skills
6. Communication skills
7. Psychoeducation
8. Interpersonal relationship skills
9. Community Survey for identifying mental health problems
10. Rehabilitation therapy
11. Health education and life skills training.
12. Supportive psychotherapeutic skills
13. Group therapy
14. Milieu therapy
15. Social/Recreational therapy.
16. Occupational therapy.

CLINICAL SPECIALITY – II

COMMUNITY HEALTH NURSING

Placement : II Year

Hours of Instruction
Theory- 150 hours
Practicals- 950 hours
Total- 1100 hrs

Course Description

This course is designed to assist students in developing expertise and indepth understanding in the field of community health nursing. It will help students to develop advanced skills for nursing intervention in various aspects of community health care settings. It will enable the student to function as community health Nurse practitioner/specialist. It will further enable the student to function as educator, manager and researcher in the field of community health nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate trends and issues related to community health Nursing reproductive and child health, school health, Occupational health, international health, rehabilitation, geriatric and mental health.
2. Apply epidemiological concepts and principles in community health nursing practice
3. Perform community health assessment and plan health programmes

4. Describe the various components of Reproductive and child health programme.
5. Demonstrate leadership abilities in organizing community health nursing services by using inter-sectoral approach.
6. Describe the role and responsibilities of community health nurse in various national health and family welfare programmes
7. Participate in the implementation of various national health and family welfare programme
8. Demonstrate competencies in providing family centered nursing care independently
9. Participate/Conduct research for new insights and innovative solutions to health problems
10. Teach and supervise nurses and allied health workers.
11. Design a layout of sub center/Primary health center/Community health centre and develop standards for community health nursing practice.

Content Outlines

Unit	Hours	Content
I	20	<p>Epidemiology</p> <ul style="list-style-type: none"> <input type="checkbox"/> Introduction <ul style="list-style-type: none"> • Concept, scope, definition, trends, History and development of modern Epidemiology • Contribution of epidemiology • Implications <input type="checkbox"/> Epidemiological methods <input type="checkbox"/> Measurement of health and disease: <input type="checkbox"/> Health policies <input type="checkbox"/> Epidemiological approaches • Study of disease causatives • Health promotion • Levels of prevention <input type="checkbox"/> Epidemiology of <ul style="list-style-type: none"> • Communicable diseases • Non-communicable diseases <input type="checkbox"/> Emerging and re-emerging diseases Epidemics <input type="checkbox"/> National Integrated disease Surveillance Programme <input type="checkbox"/> Health information system <input type="checkbox"/> Epidemiology study and reports <input type="checkbox"/> Role of Community health nurse

II	40	<p>National Health and Family Welfare Programmes</p> <ul style="list-style-type: none"> <input type="checkbox"/> Objectives, Organisation/manpower/resources, Activities, Goals, inter-sectoral approach, implementation, item/purpose, role and responsibilities <p>of community health nurse:</p> <ul style="list-style-type: none"> • National Vector Borne Disease Control Programm (NVBDCP) • National Filaria Control Programme • National Leprosy Eradication Programme • Revised national TB Control Programme • National Programme for Control of Blindness • National Iodine Deficiency disorders Control Programme • National Mental Health Programme • National AIDS Control Programme • National Cancer Control Programme • RCH I and II • Non- communicable disease programmes • NRHM <p>- Health Schemes:</p> <ul style="list-style-type: none"> <input type="checkbox"/> ESI <input type="checkbox"/> CGHS <input type="checkbox"/> Health Insurance
III	15	<p>School Health</p> <ul style="list-style-type: none"> <input type="checkbox"/> Introduction: definition, concepts, objectives,. <input type="checkbox"/> Health assessment, Screening, identification, referral and follow up, <input type="checkbox"/> Safe environment <input type="checkbox"/> Services, programmes and plans- first aid, treatment of minor ailments <input type="checkbox"/> Inter-sectoral coordination <input type="checkbox"/> Adolescent health <input type="checkbox"/> Disaster, disaster preparedness, and management <input type="checkbox"/> Guidance and counseling <input type="checkbox"/> School health records - maintenance and its importance <input type="checkbox"/> Roles and responsibilities of community health nurse
IV	15	<p>International health</p> <ul style="list-style-type: none"> <input type="checkbox"/> Global burden of disease <input type="checkbox"/> Global health rules to halt disease spread

		<input type="checkbox"/> Global health priorities and programmes <input type="checkbox"/> International quarantine <input type="checkbox"/> Health tourism <input type="checkbox"/> International cooperation and assistance <input type="checkbox"/> International travel and trade <input type="checkbox"/> Health and food legislation, laws, adulteration of food <input type="checkbox"/> Disaster management <input type="checkbox"/> Migration <input type="checkbox"/> International health agencies –World Health organizations, World health assembly, UNICEF, UNFPA, SIDA, US AID, DANIDA, DFID. AusAID etc <input type="checkbox"/> International health issues and problems <input type="checkbox"/> International nursing practice standards <input type="checkbox"/> International health vis-a vis national health <input type="checkbox"/> International health days and their significance
V	15	Education and administration <input type="checkbox"/> Quality assurance <input type="checkbox"/> Standards, Protocols, Policies, Procedures <input type="checkbox"/> Infection control; Standard safety measures <input type="checkbox"/> Nursing audit <input type="checkbox"/> Design of Sub-Centre/Primary Health Centre/Community health center <input type="checkbox"/> Staffing; Supervision and monitoring-Performance appraisal <input type="checkbox"/> Budgeting <input type="checkbox"/> Material management <input type="checkbox"/> Role and responsibilities of different categories of personnel in community health <input type="checkbox"/> Referral chain- community outreach services <input type="checkbox"/> Transportation <input type="checkbox"/> Public relations <input type="checkbox"/> Planning in-service educational programme and teaching <input type="checkbox"/> Training of various categories of health workers preparation of manuals
VI	10	Geriatric <input type="checkbox"/> Concept, trends, problems and issues <input type="checkbox"/> Aging process, and changes <input type="checkbox"/> Theories of ageing <input type="checkbox"/> Health problems and needs <input type="checkbox"/> Psycho-physiological stressors and disorders <input type="checkbox"/> Myths and facts of aging

		<ul style="list-style-type: none"> <input type="checkbox"/> Health assessment <input type="checkbox"/> Home for aged-various agencies <input type="checkbox"/> Rehabilitation of elderly <input type="checkbox"/> Care of elderly <input type="checkbox"/> Elderly abuse <input type="checkbox"/> Training and supervision of care givers <input type="checkbox"/> Government welfare measures Programmes for elderly- Role of NGOs <input type="checkbox"/> Roles and responsibilities of Geriatric nurse in the community
VII	10	<p>Rehabilitation</p> <ul style="list-style-type: none"> <input type="checkbox"/> Introduction: Concepts, principles, trends, issues, <input type="checkbox"/> Rehabilitation team <input type="checkbox"/> Models, Methods <input type="checkbox"/> Community based rehabilitation <input type="checkbox"/> Ethical issues <input type="checkbox"/> Rehabilitation Council of India <input type="checkbox"/> Disability and rehabilitation- Use of various prosthetic devices <input type="checkbox"/> Psychosocial rehabilitation <input type="checkbox"/> Rehabilitation of chronic diseases <input type="checkbox"/> Restorative rehabilitation <input type="checkbox"/> Vocational rehabilitation <input type="checkbox"/> Role of voluntary organizations <input type="checkbox"/> Guidance and counseling <input type="checkbox"/> Welfare measures <input type="checkbox"/> Role and responsibilities of community health nurse
VIII	10	<p>Community mental health</p> <ul style="list-style-type: none"> <input type="checkbox"/> Magnitude, trends and issues <input type="checkbox"/> National Mental Health Program- Community mental health program <input type="checkbox"/> The Changing Focus of care <input type="checkbox"/> The Public Health Model <input type="checkbox"/> Case Management- Collaborative care <input type="checkbox"/> Crisis intervention <input type="checkbox"/> Welfare agencies <input type="checkbox"/> Population at Risk <input type="checkbox"/> The community as Client • Primary Prevention • Secondary prevention • Tertiary Prevention

		<input type="checkbox"/> Community based rehabilitation <input type="checkbox"/> Human rights of mentally ill <input type="checkbox"/> Substance use <input type="checkbox"/> Mentally challenged groups <input type="checkbox"/> Role of community health nurse
IX	15	Occupational health <input type="checkbox"/> Introduction: Trends, issues, Definition, Aims, Objectives, Workplace safety <input type="checkbox"/> Ergonomics and Ergonomic solutions <input type="checkbox"/> Occupational environment- Physical, social, Decision making, Critical thinking <input type="checkbox"/> Occupational hazards for different categories of people physical, chemical, biological, mechanical, , Accidents, <input type="checkbox"/> Occupational diseases and disorders <input type="checkbox"/> Measures for Health promotion of workers; Prevention and control of occupational diseases, disability limitations and rehabilitation <input type="checkbox"/> Women and occupational health <input type="checkbox"/> Occupational education and counseling <input type="checkbox"/> Violence at workplace <input type="checkbox"/> Child labour <input type="checkbox"/> Disaster preparedness and management <input type="checkbox"/> Legal issues: Legislation, Labour unions, ILO and WHO recommendations, Factories act, ESI act <input type="checkbox"/> Role of Community health nurse, Occupational health Team

Practical

Total = 960 Hours
1 week = 30 Hours

S.No.	Deptt./Unit	No. of Week	Total Hours
1.	Urban and Rural community	17	510Hours
2.	School Health	3	90Hours
3.	International health	2	60 Hours
4.	Administration(SC/PHC/CHC)	2	60 Hours
5	Occupational health	2	60 Hours
6.	Community Mental Health	2	60 Hours
7.	Home for aged and Hospice	2	60 Hours

8.	Rehabilitation	2	60 Hours
	Total	32 Weeks	960 Hours

Categorisation of practical activities

Observed

- MCH office and DPHNO
- CHC/ First Referral Unit(FRU)
- Child guidance clinic
- Institute/Unit for mentally challenged
- District TB centre
- AIDS control society
- Filariasis clinic
- RCH clinic
- STD clinic
- Leprosy clinic
- Community based rehabilitation unit
- Cancer centers
- Palliative care
- Home of old age
- Mental health units
- De-addiction centres
- School health services
- Industry
- Selected industrial health centers
- ESI unit
- Municipality/ corporation office

Assisted

- Laparoscopic sterilization
- Vasectomy
- All clinics related to RCH
- Monitoring of national health and family welfare programmes

Performed

- Conduct various clinics
- School health assessment.
- Health survey.
- Health assessment
- Drug administration as per the protocols
- Treatment of minor ailments
- Investigating outbreak of epidemic.
- Screening for leprosy, TB and non-communicable disease
- Presumptive and radical treatment for Malaria.
- Counselling

- Report writing
- Referrals
- Writing a project proposal
- Material management- requisition for indent, condemnation, inventory maintenance,
- Training and Supervision of various categories of personnel
- Liaison with NGO's



**BHARATI
VIDYAPEETH**
(Deemed to be
University)

**COLLEGE
OF
NURSING**

SYLLABUS

**POST BASIC
B.Sc.NURSING**

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BHARATI VIDYAPEETH DEEMED UNIVERSITY

INTRODUCTION

Bharati Vidyapeeth which is the parent body of Bharati Vidyapeeth Deemed University was established on 10 may 1964, by Dr. Patangrao Kadam with a wider objective of contributing to intellectual awakening and social cultural transformation through dynamic education. Under the imaginative, dynamic and socially committed leadership of the founder Dr. Patangrao Kadam, Bharati Vidyapeeth Deemed University has made astonishing stride in the field of education. The Vidyapeeth has so far established 156 educational institution imparting education to the student's right from pre-primary stage to post graduate stage and Ph.D.

The ministry of human resources development (Department of Education, Government of INDIA) on the recommendation of University Grant Commission, New Delhi through their notification No.

F. - 9-15/95 U.3 dated 26 April 1996 has declared the following institution of Bharati Vidyapeeth at Pune as to be Deemed University.

- 1) Bharati Vidyapeeth Medical College, Pune
- 2) Bharati Vidyapeeth Dental and Hospital, Pune.
- 3) Bharati Vidyapeeth College of Ayurved ,Pune
- 4) Bharati Vidyapeeth Homeopathic Medical College, Pune
- 5) Bharati Vidyapeeth College of Nursing, Pune.
- 6) Bharati Vidyapeeth Institute Yashwantrao Mohite College of Arts , Science and Commerce, Pune.
- 7) Bharati Vidyapeeth Institute New Law College, Pune.
- 8) Bharati Vidyapeeth Institute Social Science Center (M.S.W.), Pune
- 9) Bharati Vidyapeeth Institute Poona College of Pharmacy, Pune.
- 10) Bharati Vidyapeeth College of Engineering, Pune
- 11) Bharati Vidyapeeth Institute of Management & Entrepreneurship Development, Pune.
- 12) Bharati Vidyapeeth Institute Yashwantrao Chavan Institute of social science centre, Pune
- 13) Bharati Vidyapeeth Institute Research and Development Centre in Applied Chemistry, Pune.
- 14) Bharati Vidyapeeth Institute College of Physical Education, Pune.

- 15) Bharati Vidyapeeth Institute of Environment Education and Research, Pune.
- 16) Bharati Vidyapeeth Rajiv Gandhi Institute of Information Technology, Pune.
- 17) Interactive Research School in Health Affairs (IRSHA).
- 18) Bharati Vidyapeeth Medical College & Hospital, Sangli
- 19) Bharati Vidyapeeth Medical College & Hospital, Mumbai.
- 20) Bharati Vidyapeeth Institute of Management & Research, New Delhi.
- 21) Bharati Vidyapeeth College of Architecture, Pune.
- 22) Bharati Vidyapeeth Institute of Hotel Management & Catering Technology, Pune.
- 23) Bharati Vidyapeeth Yashwantrao Mohite Institute of Management, Karad.
- 24) Bharati Vidyapeeth Institute of Management, Kolhapur
- 25) Bharati Vidyapeeth Institute of Management & Rural Development Administration, Sangli.
- 26) Bharati Vidyapeeth Abhijit Kadam Institute of Management & Social Sciences, Solapur.
- 27) Bharati Vidyapeeth College of Engineering , New Delhi.
- 28) Bharati Vidyapeeth Deemed University Institute of Computer Application & Management, New Delhi.
- 29) Bharati Vidyapeeth Dental College & Hospital, Sangli.
- 30) Bharati Vidyapeeth Deemed University College of Nursing, Sangli.
- 31) Bharati Vidyapeeth Deemed University College of Nursing, Navi Mumbai.

The association of Indian universities has also accepted this university as its member.

This is probably the first only university having under its umbrella diversified disciplines of professional and non- professional categories such as Medicine, Dentistry, Nursing, Ayurvedic, Homeopathic Medicine, Science, Commerce, Law and Humanities.

The degrees and diplomas awarded by this university have the same status and recognition as those awarded by any Indian University recognized by the University Grant Commission, New Delhi. The University operates its educational programme in accordance with the rules, regulations and guidelines of various statutory Central Government Bodies like Medical Council of India, Dental council of India, Bar Council of India, Indian nursing Council, Central Council of Indian Medicine etc.

COLLEGE OF NURSING, PUNE

Bharati Vidyapeeth's College of Nursing was established in the year 1992 with prior permission of University of Pune to which it was having affiliation. It is now a constituent unit of Bharati Vidyapeeth University. This is the first college of nursing in the Non- Government sector in Pune. Adequate facilities for clinical studies have been provided and the college is Dhankawadi, Pune.

The college has been approved by the Government of India, UGC and Maharashtra nursing council. The college has been approved by the Government of India, UGC and Maharashtra nursing council. The college has separate Hostel facilities for Boys and Girls. The Curriculum and Syllabus is made and updated as per the Maharashtra nursing council, Indian nursing council and the need of society.

COLLEGE OF NURSING, SANGLI.

Bharati Vidyapeeth Deemed University's College of Nursing, Sangli started in 2007 at Bharati Vidyapeeth Deemed University campus, Wanlesswadi, Sangli. The college is a constituent unit of Bharati Vidyapeeth Deemed University & started with permission from Government of Maharashtra, Maharashtra nursing council and Indian nursing Council. The college has excellent physical Infrastructure & a well-qualified teaching faculty. Imparts hands on clinical practice to the students in 750 bedded parent Bharati Hospital and in Specialty Hospitals of Sangli, Miraj. The students are also given Community field experience in urban as well as Rural Setting. Apart from curricular the students are encouraged for participation in extracurricular activities & Sports competitions at University, State, National & international level. Students are assisted for Loan facility, Fee concessions, Minority Scholarship. The college has active NSS Unit which regularly conducts activities such as tree plantation, road safety rallies, prevention of addiction, save girl campaign, Rallies for prevention & management of HIV cases & adult education. The college is well equipped with nursing labs & has a digital library with adequate number of books, national & international journals. 70% of the Alumni are working in State Government hospitals, renowned hospitals and Abroad. The college has 30 – intake capacity of P.B.B.Sc. nursing.

COLLEGE OF NURSING, NAVI MUMBAI.

Bharati Vidyapeeth Deemed University's College of Nursing, Navi-Mumbai is started in 2009 at Bharati Vidyapeeth Deemed University Campus, Belapur. Navi Mumbai. The college is constituent unit of Bharati Vidyapeeth Deemed University Pune. And having affiliation of the same. The College has been started with permission from Government of Maharashtra, Maharashtra nursing council and Indian nursing Council. The college has 30 intake capacity for PB B.Sc. nursing programme.

PHILOSOPY OF BHARATI VIDYAPEETH

Bharati Vidyapeeth was established in May 1964 with the philosophy of contributing to the intellectual awakening and social transformation in different sphere including educational, social and cultural fields in India and more particularly in Maharashtra. Its activities have been geared to bring about all sides and welfare of different section in population including women, tribes and rural people.

Bharati Vidyapeeth Nursing Colleges also function within the frame work of Bharati Vidyapeeth philosophy.

ADMISSION REQUIREMENT:

- 1) Candidates must have passed higher secondary examination (10+2) along with GNM programme from the nursing institute recognized by Indian Nursing Council & State Nursing Council situated in India.
- 2) Candidate shall be medically fit.

Aims

The aim of the undergraduate nursing program at the post basic level is to upgrade the diploma (GNM) nurses to:

- Assume responsibilities as professional, competent nurses and midwives at basic level in providing promotive, preventive, curative, and rehabilitative services.
- Make independent decisions in nursing situations, protect the rights of and facilitate individuals and groups in pursuit of health. Function in the hospital, community nursing services, and conduct research studies in the

areas of nursing practice. They are also expected to assume the role of teacher, leader supervisor, and manager in a clinical / public health settings.

Objectives

On completion of B.Sc. Nursing (Post- Basic) degree programme the graduates will be able to:

1. Assess health status, identify nursing needs, plan, implement and evaluate Nursing care for patients/ clients that contribute to health of individuals, families and communities based on scientific principles and nursing process.
2. Demonstrate competency in techniques of nursing based on concepts and Principles from selected areas of nursing, physical, biological and behavioral sciences.
3. Develop team qualities to participate as members of health team in the promotive preventive, curative and restorative health care delivery system of the country.
4. Demonstrate skills in communication and interpersonal relationship as a professional nurse.
5. Demonstrate leadership qualities and decision making abilities in various situations.
6. Demonstrate basic skills in teaching to individuals and groups in community health settings.
7. Demonstrate managerial skills in community health settings.
8. Practice ethical values in their personal and professional life.
9. Participate in research activities and utilize research findings in improving nursing practice.
10. Recognize the need for continued learning for their personal and professional development.

Courses of Study

Sr.No.	Subject	Hours Theory	Hours Practical
First Year			
1.	Nursing Foundation	45	
2.	Nutrition & Dietetics	30	15
3.	Biochemistry & Biophysics	60	
4.	Psychology	60	15
5.	Maternal Nursing	60	240
6.	Child Health Nursing	60	240
7.	Microbiology	60	30
8.	Medical & Surgical Nursing	90	270
9.	English	60	---
Total		525	810

Note: Marathi Hindi / local language as per the need of the institution.

Second Year

1.	Sociology	60	
2.	Community Health Nursing	60	240
3.	Mental Health Nursing	60	240
4.	Introduction to Nursing Education	60	75
5.	Introduction to Nursing Administration	60	180
6.	Introduction to Nursing Research & Statistics	45	120
Total		345	855

Scheme of Examination

PAPER	SUBJECT	DURATION	INT.	EXT.	
TOTAL			ASST	ASST	
MARKS					
First Year					
1.	Nursing foundation	1.30 hrs	15	35	50
2.	Nutrition & Dietetics	1.30 hrs	15	35	50
3.	Biochemistry & Biophysics	3	25	75	100
4.	Psychology	3	25	75	100
5.	Microbiology	3	25	75	100
6.	Maternal Nursing	3	25	75	100
7.	Child Health Nursing	3	25	75	100
8.	Med. & Surgical Nursing	3	25	75	100
9.	English	3	25	75	100
Practical					
1.	Medical & Surgical Nursing		50	50	100
2.	Maternal Nursing		50	50	100
3.	Child Health Nursing		50	50	100
Second Year					
1.	Sociology	3	25	75	100
2.	Community Health Nursing	3	25	75	100
3.	Mental Health Nursing	3	25	75	100
4.	Introduction to Nursing	3	25	75	100
Education					
5.	Introduction to Nursing	3	25	75	100
Administration					
6.	Introduction to Nursing	2	50	---	50

Research & Statistics

Practical

1. Community Health Nursing	50	50	100
2. Mental Health Nursing	50	50	100
3. Research Project (Qualifying)	50	50	

Note: Qualifying Examination

College Examination (Not University Examination)

N.B.

1. Teaching of Anatomy, Physiology, Pharmacology and Pathology will be integrated with clinical subjects.
2. A minimum of 85% attendance in theory and 95% practical/ clinical in each subject is essential for appearing in the examination.
3. 100% attendance in practical/ clinical in each clinical area is essential before award of degree.
4. 50% of minimum marks in each theory and practical paper separately are required for passing.
5. A candidate has to secure minimum of 33 % in qualifying subject for passing.
6. The candidate has to pass in theory and practical exam separately in each of the paper.
7. If the candidate fails in either theory or practical exam he / she have to reappear for both (Theory & practical).
8. Biochemistry and Biophysics- question paper will consist of Section-I (Biochemistry) MCQ of 8 marks and 30 marks of long and short answer questions and Section-II (Biophysics) MCQ of 7 marks and 30 marks of long and short answer questions.
9. The maximum period to complete the course successfully is 4 years.

Nursing Foundation

Placement: First Year

Time Allotted: Theory – 45 Hrs

COURSE DESCRIPTION

This course will help students develop an understanding of the philosophy, objectives and responsibilities of nursing as a profession. The purpose of the course is to orient to the current concepts involved in the practice of nursing and developments in the nursing profession.

OBJECTIVES

At the end of the course, the students will

1. Identify professional aspects of nursing.
2. Explain theories of nursing.
3. Identify ethical aspects of nursing profession.
4. Utilize steps of nursing process.
5. Identify the role of the nurse in various levels of health services.
6. Appreciate the significance of quality assurance in nursing.
7. Explain current trends in health and nursing.

COURSE CONTENTS

UNIT I

- Development of nursing as a profession
 - Its philosophy
 - Objectives and responsibilities of a graduate nurse.
- Trends influencing nursing practice
- Expanded role of the nurse.
- Development of nursing education in India and trends in nursing education.
- Professional organizations, career planning.
- Code of ethics & professional conduct for nurses.

UNIT II

- Ethical, legal and other issues in nursing.
- Concepts of health wellness and illness, effects on the person.
- Stress and adaptation.
- Health care concept and nursing care concept.
- Developmental concept, needs, roles and problems of the developmental stages of individual – newborn, infant, toddler, pre-adolescent, adolescent, adulthood, middle-age, old age.

UNIT III

- Theory of nursing practice
- Meta paradigm of nursing – characterized by four central concepts i.e. Nurse, person (client/ patient), health and environment.

UNIT IV

- Nursing process.
- Assessment: Tools for assessment, methods, recording.
- Planning: Techniques for planning care, types of care plans.
- Implementation: Different approaches to care , organizations and implementation of care, recording.
- Evaluation: Tools for evaluation, process of evaluation.

UNIT V

- Quality assurance: nursing standards, nursing audit, total quality management
- Role of council and professional bodies in maintenance of standards.

UNIT VI

- Primary health care concept :
 - Community oriented nursing
 - Holistic nursing
 - Primary nursing
- Family oriented nursing concept:
 - problem oriented nursing
 - progressive patient care
 - team nursing

Nutrition & Dietetics

Placement: First Year

Time Allotted: Theory: 30 hrs

Practical: 15

hrs

COURSE DESCRIPTION

This course is designed to provide the students with a wide knowledge of dietetics in Indian setting, that the practice of teaching optimum and realistic dietary planning can become an integral part of nursing practice.

OBJECTIVES

At the end of the course, the student will

1. Explain the principles and practices of nutrition and dietetics.
2. Identify nutritional needs of different age groups and plan diet accordingly.

Plan therapeutic diets in different settings.

3. Plan therapeutic diets in different settings.
4. Prepare meals using different methods utilizing cookery rules.

COURSE CONTENTS

UNIT I

- Introduction to nutrition and dietetics.
- Balanced diet. Factors on which it depends.
- Factors to be considered in planning.
- Guides available for planning.
- Food Hygiene, preparation and preservation.
- Review of nutrients- micro & macro.

UNIT II

- Introduction to diet therapy.
- Hospital diets.
- Therapeutic diet under each unit i.e. cardiovascular diseases.

Gastrointestinal diseases, Renal disorders, Endocrine and metabolic disorders, Allergy, Infections and fevers, Pre and post operative stage, Deficiency diseases and malnutrition overweight and underweight.

UNIT III

- Infant and child Nutrition.

- Feeding of normal infants: feeding problems factors to be considered in planning
- Nutritional requirements.
- Supplementary feeding of infants: Advantage and method of introduction
- Weaning, effects on mother and child.
- Psychology of infant and child feeding.
- Feeding the sick child. Diet in diseases of infancy and childhood.
- Deficiency states – malnutrition and under nutrition.
- Feeding pre – school child: nutritional needs, factors to be considered in Planning diets. Problems in feeding.
- School lunch programme, Mid-day meal programme: Advantages, Need in India.

UNIT IV

- Community Nutrition: Need for community nutrition programme.
- Nutritional needs for special groups : Infant, child, adolescent, pregnant Woman, lactating mother and old people.
- Substitutes for non- vegetarian foods.
- Selection of cheap and nutritious foods, Nutrition education needs and Methods.
- Methods of assessing nutritional status of individual/ group/ community.
- Current nutritional problems and national programmes.

PRACTICUM

- I. Culinary guide practices Methods of cooking and cookery rules.
 1. Simple preparation of beverages, soups, cereals and pulses, eggs, Vegetables, meat.
 2. Menu Plans,
- II. Preparation of supplementary food for infants.
 1. Food for infants.
 2. Low cost nutritious dishes for vulnerable groups.
 3. Dietary case study of patient on special diet and planning of low cost Dietary instructions for home adaptations.
 4. Planning of therapeutic diets.

Biochemistry & Biophysics

Placement: First Year

Time: Allotted

Section A (Biochemistry) – Theory 30 hrs.

Section B (Biophysics) - Theory 30 hrs.

COURSE DESCRIPTION

This course introduces the basic principles of Biochemistry and Biophysics related to nursing.

OBJECTIVES

At the end of the course, the student will

1. Identify the basic principles of Biochemistry and Biophysics.
2. Synthesize the knowledge of these principles in various nursing situations.

Section A: Biochemistry

Theory – 30

hrs.

COURSE CONTENTS

UNIT I

- Introduction: Importance of Biochemistry in nursing.
- Study of cell and its various components.

UNIT II

- Water and Electrolytes: Water – Sources, property & functions in human Body.
- Water and fluid balance.
- Electrolytes of human body, functions, sources.

UNIT III

- Enzymes
 - Mechanism of action
 - Factors affecting enzyme activity
 - Diagnostic applications.
 - Precautions for handling specimens for enzyme estimation
- Digestion and absorption of carbohydrates, proteins and fats.
- Various factors influencing the digestion and absorption, mal-absorption syndrome.

UNIT IV

- Carbohydrates: Catabolism of carbohydrates for energy purposes.
- Mitochondrial oxidation and oxidation phosphorylation.
- Fats of glucose in the body, Storage of glucose in the body, glycogenesis, glycogenolysis and neoglucogensts, blood glucose and its regulation.
- Glucose tolerance test, hyperglycemia, hypoglycemia, glycemia.

UNIT V

- Protein: Amino acids, hormones.
- Essential amino acids. Biosynthesis of protein in the cells.
- Role of nucleic acid in protein synthesis.
- Nitrogenous constituents of Urine, Blood, and their origin- urea cycle, uric acid formation, gout.
- Plasma proteins and their functions.

UNIT VI

- Fat: Biosynthesis of fats and storage of fats in the body.
- Role of liver in fat metabolism
- Biological important lipids and their functions.
- Cholesterol and lipoprotein
 - Sources occurrence and distribution.
 - Blood level and metabolism.
 - Ketone bodies and utilization.
- Inter relationships in metabolism and cellular control of metabolic processes.

Section B : Biophysics

Theory : 30 hours

COURSE CONTESTS

UNIT I

- Introduction: Concepts of unit and measurements.
- Fundamental and derived units.
- Units of length, weight, mass, time.

UNIT II

- Vector and scalar motion, speed, velocity and acceleration.

UNIT III

- Gravity: Specific gravity, center of gravity, principles of gravity.
- Effects of gravitational forces on human body.
- Application of principles of gravity in nursing.

UNIT IV

- Force, Work, Energy: Their units of measurement.
- Type and transformation of energy, forces of the body, static forces.
- Principles of machines, friction and body mechanics.

- Simple mechanics- lever and body mechanics, pulley and traction.
Incline plane, screw.
- Application of these principles in nursing.

UNIT V

- Heat : Nature, measurement, transfer of heat
- Effects of heat on matter
- Relative humidity, specific heat
- Temperature scales.
- Regulation of body temperature
- Use of heat for sterilization
- Application of these principles in nursing

UNIT VI

- Light laws of reflection
- Focusing elements of the eye, defective vision and its correction, use of Lenses.
- Relationship between energy, frequency and wavelength of light.
- Biological effects of light.
- Use of light in therapy.
- Application of these principles in nursing.

UNIT VII

- Pressures: Atmospheric pressure, hydrostatic pressure, osmotic pressure.
- Measurements of pressures in the body.
 - Arterial and venous blood pressures
 - Ocular pressure
 - Intracranial pressure
 - Applications of these principles in nursing.

UNIT VIII

- Sound : Frequency, Velocity and Intensity
- Vocalization and hearing
- Use of ultrasound. Noise pollution and its prevention.
- Application of these principles in nursing.

UNIT IX

- Electricity and Electromagnetism : Nature of Electricity, voltage, Current, Resistance and their Units.
- Flow of electricity in solids, electrolytes, gases and vacuum.
- Electricity and human body.
- ECG, EEG, EMG, ECT.
- Pace makers and defibrillation.
- Magnetism and electricity.
- M.R.I. Scanning, CAT scan.

UNIT X

- Atomic Energy: Structure of Atom, Isotopes and Isobars.
- Radioactivity: Use of radioactive isotopes.
- Radiation protection units and limits, Instruments used for detection of ionizing radiation. X – Rays.

UNIT XI

- Principles of Electronics : Common electronic equipments used in patient Care.

Practicum

- Experiments and Tests should be demonstrated wherever applicable.

Psychology

Placement: First year

Time allotted: Theory 60 hrs.

Practical : 15 hrs.

COURSE DESCRIPTION

This course is designed to reorient and widen the student's knowledge of fundamentals of psychology. The student is offered an opportunity to apply the theoretical concepts in the clinical setting and thereby understand the psychodynamics of patient behavior. This course would also help the student to develop an insight into her own behavior.

OBJECTIVES

At the end of the course, the students will

1. Apply psychological principles while performing nursing duties.
2. Distinguish the psychological processes during health and sickness.
3. Analyze own behavior patterns.
4. Tabulate the psychological needs of the patients for planning nursing care.
5. Participate in psychometric assessment of the client.

COURSE CONTENTS

UNIT I

- Introduction: Definition of psychology, scope and methods of psychology.
- Relationship with other subjects.

UNIT II

- Sensation, Attention and Perception : Definitions
- Sensory processes : Normal and abnormal
- Attention and distraction: contributory factors.
- Characteristics of perception: normal and abnormal.

UNIT III

- Motivation : Definition and nature of motivation
- Biological and social motives
- Frustration and conflicts
- Self- actualization

UNIT IV

- Emotions: Definition of emotions, Expression and perception.
- Emotions in sickness.

UNIT V

- Personality: Definition, Constituents of personality.
- Personality in sickness and nursing

UNIT VI

- Psychological aspects of nursing
- Behavior and sickness. Psychological needs of
 - Child and adolescents
 - Adult
 - Aged
 - Attendants
 - Chronically ill individual

UNIT VII

- Individual differences.
- Significance of individual differences.
- Heredity and environment.
- Role of individual differences both in health and sickness.
- Implications of individual differences in nursing.

UNIT VIII

- Intelligence and Abilities : Definition
- Intelligence and abilities during sickness.
- Measurement of Intelligence and abilities.

UNIT IX

- Learning : Definition , Conditions of learning
- Laws of learning
- Learning during health and sickness.

UNIT X

- Memory and forgetting : Definition and nature of memory
- Memory during health and sickness.
- Forgetting during health and sickness.

UNIT XI

- Attitudes: Definition, Development and modification
- Role of attitudes in health and sickness.

UNIT XII

- Concept of mental hygiene & mental health.
- Characteristics of a mentally healthy person.

- Defense mechanisms

PRACTICUM

1. Simple experiments on i) Perception ii) Measuring thresholds iii) Reaction time.
2. Administration of psychological tests
3. Observation and recording data : i) Field observation ii) Interview
iii) Interview case study IV) Self- rating

Microbiology

Placement: First year

Time allotted: Theory 60 hrs.

Practical: 30 hrs.

COURSE DESCRIPTION

This course reorients the students to the fundamentals of Microbiology & its various sub-divisions. It provides opportunities to gain skill in handling and use of microscope for identifying various micro- organisms. It also provides opportunities for safe handling of materials containing harmful bacteria and methods of destroying microorganisms.

OBJECTIVES

At the end of the course, the students will

1. Identify common disease producing micro- organisms.
2. Explain the basic principles of microbiology and their significance in health and disease.
3. Demonstrate skill in handling specimens.
4. Explain various methods of dis- infection and sterilization.
5. Identify the role of the nurse in hospital infection control system.

COURSE CONTENTS

UNIT I

- Structure and Classification of Microbes.
- Morphological types
- Size and form of bacteria.
- Motility
- Classification of Micro- organisms.

Practical

- Use and care of microscope.
- Common examination: Smear Blood, Modules, and Yeasts.

UNIT II

- Identification of Micro- organisms.

- Discussion of laboratory methods.
- Diagnosis of bacterial diseases.

Practical

- Staining techniques- gram staining, acid fast staining.
- Hanging drop preparation.

UNIT III

- Growth and Nutrition of Microbes
- Temperature
- Moisture
- Blood

Practical

- Preparation of Media and culture techniques.
- Collection, handling and transportation of various specimens.

UNIT IV

- Destruction of Micro- organisms.
- Sterilization and disinfection
- Chemotherapy and antibiotics.
- Effects of heat and cold
- Hospital Infection control procedure & role of nurses.

Practical

Sterilization methods- Physical, Chemical and Mechanical.

UNIT V

- Disease producing micro- organisms.
- Gram positive bacilli.
- Tuberculosis and Leprosy
- Anaerobes
- Cocci
- Spirochete
- Rickettsiae

Practical - Identification and study of the following bacteria; Strepto-cocci. Pneumococci and Staphylococci. Corynebacteria, Spirochetes and gonococci, enteric bacteria. Posting in infection control department.

UNIT VI

- Pathogenic Fungi
- Dermatophytes
- Systemic Mycotic infection
- Laboratory diagnosis of Mycotic infection.

UNIT VII

- Immunity
- Immunity and hypersensitivity – Skin test
- Antigen and antibody reaction
- Immunization in disease.

Practical: Demonstration of serological methods.

UNIT VIII

- Parasites and Vectors.
- Characteristics and classification of parasites
- Protozoal infection including amoebiasis
- Helminthes infection
- Diagnosis of parasitic infection
- Vectors and diseases transmitted by them.

Practical: Identification of Parasites and Vectors.

UNIT IX

- Viruses.
- Classification and general character of viruses.
- Diseases caused by viruses in man and animal and their control.

UNIT X

- Micro – organisms transmitted through food.
- Food poisoning. Food borne infections.

PRACTICUM

Each Student will practice in the laboratory as indicated in each unit of the courses outline. While giving nursing care in the wards they will practice collection and processing of specimens. Prevention and control of hospital infections. Sterilization, immunization, chemotherapy and maintenance of personal and environmental hygiene. Observation visit to incinerator, posting in CSSD and infection control department.

Maternal Nursing

Placement: First year

Time allotted: Theory 60 hrs.

Practical: 240 hrs.

COURSE DESCRIPTION

This course is designed to widen the student's knowledge of obstetrics during pregnancy, labor and puerperium. It also helps to acquire knowledge and develop skill in rendering optimum nursing care to a child bearing mother in a hospital or community and help in the management of common gynecological problems.

OBJECTIVES

At the end of the course, the students will

1. Describe the physiology of pregnancy, labors and puerperium.
2. Manage normal pregnancy, labor and puerperium.
3. Explain the physiology of lactation and advice on management of breast feeding.
4. Be skilled in providing pre and post operative nursing care in obstetric conditions.
5. Identify and manage high risk pregnancy including appropriate referrals.
6. Propagate the concept and motivate acceptance of family planning methods.
7. Teach, guide and supervise auxiliary midwifery personnel.

COURSE CONTENTS

UNIT I

- Introduction and historical review
- Planned parenthood
- Maternal morbidity and mortality rates
- Legislations related to maternity benefits, MTP acts, incentives for family Planning etc.

UNIT II

- Review of the anatomy and physiology of female reproductive system.
- Menstrual Cycle & Disorders.
- Female (pelvis normal and contracted)
- Review of fetal development.

UNIT III

- Physiology and management of pregnancy, labor and puerperium.
- Signs and symptoms and diagnosis of pregnancy
- Antenatal care
- Pregnant women with HIV/ AIDS
- Management of common gynecological problems.

UNIT IV

- The New born baby.
- Care of the baby at birth including resuscitation
- Essential Newborn Care.
 - Feeding
 - Jaundice and infection
 - Small & large for date babies.
 - Intensive care of the new born.
 - Trauma and hemorrhage.

UNIT V

- Management of abnormal pregnancy, labor and puerperium.
- Abortion, ectopic pregnancy and vesicular mole.
- Pregnancy included hypertension, gestational diabetes, anemia, heart disease.

- Urinary infections, Ante partum hemorrhage
- Abnormal labor (malposition & malpresentation)
- Uterine inertia
- Disorders of puerperium
- Management of engorged breast, cracked nipples, breast abscess and mastitis
- Puerperal sepsis
- Post partum hemorrhage
- Inversion and prolapsed of uterus, obstetrical emergencies.
- Obstetrical operations i.e. forceps, vacuum, episiotomy, caesarean section.

UNIT VI

- Drugs in obstetrics.
- Effects of drugs during pregnancy. labor and puerperium on mother & Baby.

UNIT VII

- National Welfare Programmes for women
- National Family Welfare Programme.
- National family
- Problems associated with unwanted pregnancy
- Unwed mother.

PRACTICUM

1. The students will
 - a. Be posted in antenatal Clinic, MCH clinic, antenatal ward, labor room, postnatal ward, maternity OT, MTP room.
 - b. Visit welfare agencies for women and write observation report.
 - c. Follow nursing process in providing care to 3-6 patients.
 - d. Write at least two nursing care studies and do a presentation.
 - e. Give at least one planned health teaching to a group of mothers.
2. Practice following nursing procedures.
 - a. Antenatal & post natal examination, per vaginal exam.
 - b. Conduct normal delivery, stitching of episiotomy, (For male candidates Minimum conduct of 5 deliveries)
 - c. Motivation of family for adopting family planning methods.
 - d. Motivate family for Planned Parenthood.

e. Assist in various diagnostic and therapeutic procedures including IUD insertion and removal.

CHILD HEALTH NURSING

Placement: First year

Time allotted: Theory 60 hrs.

Practical: 240 hrs.

COURSE DESCRIPTION

This course is aimed at developing an understanding of the modern approach to childcare, the common health problems of children and neonates in health and sickness.

OBJECTIVES

At the end of the course, the students will

1. Explain the modern concept of child care and the principles of child health nursing.
2. Describe the normal growth and development of children at different ages.
3. Manage sick as well as healthy neonates and children.
4. Identify various aspects of preventive pediatric nursing and apply them in providing nursing care to children in hospital and community.

COURSE CONTENTS

UNIT I

- Introduction.
- Modern concept of child care
- Internationally accepted rights of the child

- National policy and legislations in relation to child health and welfare.
- National programmes related to child health and welfare.
- Changing trends in hospital care, preventive, promotive and curative aspects of child health.
- Child morbidity and mortality rates.
- Differences between an adult and child.
- Hospital environment for a sick child.
- The role of a pediatric nurse in caring for a hospitalized child.
- Principles of pre & post operative care of infants and children
- Pediatric nursing procedures.

UNIT II

- The healthy child
- Growth and development from birth to adolescence.
- The needs of normal children through the stages of development and parental guidance.
- Nutritional needs of children & infants breast- feeding. Supplementary/ feeding and weaning.
- Accidents, causes and prevention.
- Value of play and selection of play material
- Preventive immunization.

UNIT III

- Nursing care of a neonate.
- Nursing care of a normal newborn.
- Neonatal resuscitation
- Nursing management of a low birth weight baby
- Nursing management of common neonatal disorders.
- Organization of neonatal unit. Prevention of infections in the nursery.

UNIT IV

- Nursing management in common childhood diseases.
- Nutritional deficiency disorders.
- Respiratory disorders and infections.
- Gastrointestinal infections, infestations and congenital disorders.
- Cardio vascular problem- congenital defects and rheumatic fever.

- Genito- urinary disorder – Nephrotic syndrome. Wilms’ tumor, infection and congenital disorders.
- Neurological infections and disorders- convulsions, epilepsy, meningitis, Hydrocephalus, spin bifida.
- Hematological disorders- Anemia, Thalassemia, ITP, Lukemia, Hemophialia,
- Endocrine Disorders- Juvenile Diabetes Mellitus.
- Orthopedic disorders- club feet. Hip dislocation and fracture.
- Disorders of skin eye and ears.
- Common communicable diseases in children, their identification, nursing management in hospital and home and prevention.
- Pediatric emergencies- poisoning, foreign bodies, hemorrhage, burns and drowning.

UNIT V

- Management of behavior disorders in children.
- Management of challenged children:
 - Mentally challenged
 - Physically challenged
 - Socially challenged

PRACTICUM

The students will:-

1. Be posted in pediatric medical and surgical ward, OPD in hospital, health centre and neonatal unit.
2. Visit a centre for handicapped children and child welfare centre and write observation report.
3. Write an observation study of normal children of various age groups in home / nursery school/ crèche.
4. Follow nursing process in providing care to 3-6 children.
5. Write at least two nursing care studies and do a presentation.
6. Give two planned health teachings, one in hospital and one in OPD/ health centre.
7. Practice the following nursing procedures:
8. Taking pediatric history.
9. Physical assessment of children

10. Baby bath
11. Feeding
12. Restraining
13. Calculation of dosage of drugs and administration of medications and injections
14. Collection of specimens.
15. Enema, bowel wash, colostomy irrigation
16. Steam and Oxygen inhalation.
17. Preparation to assist with diagnostic tests and operations.
18. Examination / Assessment of a newborn.
19. Neonatal resuscitation
20. Care of a baby in incubator and on ventilator
21. Photo therapy
22. Assist in exchange transfusion and other therapeutic procedures.

Medical Surgical Nursing

Placement: First year

Time allotted: Theory 90 hrs.

Practical: 270 hrs.

COURSE DESCRIPTION

The purpose of this course is to widen the student's knowledge and develop proficiency in caring for patients with medical surgical problems. This course includes review of relevant anatomy and physiology, path physiology in medical – surgical disorders and the nursing management of these conditions.

OBJECTIVES

At the end of the course, the students will

1. Explain relevant Anatomy and Physiology of various systems of the body.
2. Explain path physiology of various disorders.
3. Explain the actions, side effects and nursing implications in administering drugs for various disorders.
4. Discuss the recent advancement in the treatment and care of patients with medical surgical conditions.

5. Develop skill in giving comprehensive nursing care to patients following the steps of nursing process.
6. Assist the patients and their families in identifying and meeting their own health needs.
7. Appreciate the role of the nurse in the medical surgical health team.

COURSE CONTENTS

UNIT I

- Introduction to medical surgical nursing.
- Review of concepts of comprehensive nursing care in medical surgical Conditions.
- Nurse, patient and his/ her family.
- Functions of nurse in the outpatient department.
- Intensive care unit.

UNIT II

- Nursing management of patient with specific problems.
 - Fluid and electrolyte imbalance.
 - Dyspnea and cough, respiratory obstruction.
 - Fever
 - Shock
 - Unconsciousness
 - Pain
 - Acute illness
 - Chronic illness
 - Terminal illness
 - Age related illness
 - Patient under going surgery
 - Incontinence

UNIT III

- Nursing management of patient with neurological and neurosurgical Conditions.
- Review of anatomy and physiology of the nervous system.
- Path physiology, diagnostic procedures and management of :

- Cerebro- vascular accident.
- Cranial, spinal and peripheral neuropathies.
- Head- ache and intractable pain.
- Epilepsy.
- Infectious and inflammatory diseases and trauma of the Nervous System.
- Common disorders of the system.
- Recent advances in diagnostic and treatment modalities.
- Drugs used in these disorders.
- Tumors of brain & spinal cord, congenital malformations, degenerative diseases.

UNIT IV

- Nursing management of patient with cardiovascular problems.
- Review of relevant anatomy and physiology of cardio vascular system.
- Pathophysiology, diagnostic procedures and management of
 - Ischemic Heart diseases.
 - Cardiac arrhythmias.
 - Congestive heart failure.
 - Rheumatic and other valvular heart diseases
 - Endocarditis, cardiomyopathies, congenital heart diseases, hypertension, heart block.
 - Cardiac emergencies: cardiac arrest, acute pulmonary edema, cardiac tamponade. Cardiogenic shock, aneurysms and peripherovascular disorders, recent advancement in cardiology.

UNIT V

- Nursing management of patient with respiratory problems.
- Review of anatomy and physiology of respiratory system, Pathophysiology, diagnostic procedures and management of upper respiratory tract infections.
 - Bronchitis
 - Asthma
 - Emphysema, Empyema, Atelectasis, COPD
 - Bronchiectasis
 - Pneumonia
 - Pulmonary tuberculosis
 - Lung abscess
 - Pleural effusion

- Tumors and Cysts
- Chest injuries
- Respiratory arrest and insufficiency
- Pulmonary embolism
- Drugs used in the management of these patients
- Special respiratory therapies.

UNIT VI

- Nursing management of patient with Genito- urinary problems.
- Review of anatomy and physiology of the genitor- urinary system.
 - Nephritis
 - Renal calculus
 - Acute renal failure
 - Chronic renal failure
 - End stage renal disease
- Special procedures, dialysis, renal transplant
- Drugs used in management of these patients
- Congenital disorders, urinary infections
- Benign prostate hypertrophy.

UNIT VII

- Nursing management of patients with problems of the digestive Systems.
- Review of anatomy and physiology of gastrointestinal system and accessory organs.
 - Pathophysiology, diagnostic procedures and management of
 - G.I. Bleeding
 - Peptic ulcer
 - Infections
 - Acute abdomen
 - Colitis, diarrhea, dysentery & mal- absorption syndrome.
 - Cholecystitis
 - Hepatitis, hepatic coma and cirrhosis of liver
 - Portal hypertension
 - Pancreatitis
 - Tumors, hernias, fistulas, fissures, hemorrhoids.
 - Drugs used in the management of these patients.

UNIT VIII

- Nursing management of patients with endocrine problems
- Review of anatomy and physiology and patho- physiology of patients

With

- Thyroid disorders
- Diabetes mellitus
- Diabetes insipid us
- Adrenal tumor
- Pituitary disorders.
- Diagnostic procedures.

Nursing management of patients with above problems.

Drugs used in endocrine problems.

UNIT IX

- Nursing management of patients with musculoskeletal problems.
- Review of anatomy and physiology and Pathophysiology
- Arthritis, osteomyelities, bursitis.
- Fractures, dislocation and trauma
- Prolapsed disc.
- Osteomalacia and osteoporosis
- Tumor
- Amputation

Diagnostic procedures

Nursing management of patients with above problems.

- Prosthesis and rehabilitation.
- Transplant & replacement surgeries.

UNIT X

- Nursing management of patients with disorders of female reproductive tract.
- Disorder of menstruation
- Infections of the genital tract
- R.V.F., V.V.F.
- Climacteric changes and associated problems.

UNIT XI

- Nursing management of patients with Oncological disorders.
- Types of neoplasm's and related Pathophysiology.
- Diagnostic procedures.

- Modalities of treatment and nurse's role.
- Special therapies – chemotherapy and radiotherapy.
- Preventive measures, other therapies.

UNIT XII

- Nursing management of patient with burns.
- Nursing management of patient with reconstructive surgeries.

UNIT XIII

- Nursing management of patients with common communicable diseases & STD's
- Nursing management of patients with immunological disorders including HIV / AIDS

UNIT XIV

- Nursing management of patients with diseases of eye, ear, nose, throat & Skin.

UNIT XV

- Nursing management of patients with blood disorders.
- Review of Anatomy & Physiology of Blood and Blood products.
- Patho- physiology, diagnostic procedures and management of blood Disorders-
 - Anemia
 - Leukemia
 - Bleeding disorders
 - Hemophilia
 - Purpura etc.
- Blood transfusion, safety checks, procedure and requirements, management Of adverse transfusion reaction, records for blood transfusion.
- Management and counseling of blood donors, phlebotomy procedure, and post donation management.
- Blood bank functioning and hospital transfusion committee.
- Bio – safety and waste management in relation to blood transfusion.

UNIT XVI

- Nursing in emergencies.

- Cardiac emergencies
- Trauma
- Poisoning
- Crisis management: Thyroid crisis, Hypertensive crisis, adrenal crisis.

PRACTICUM

- Students should rotate in the selected medical & surgical areas, like Cardio Thoracic, Neurology, Urology, Orthopedics, Gynecology, Oncology, Burns, and Reconstructive surgical units.
- The students should be given patient assignment. They have to practice patient centered comprehensive nursing
- Each student is required to give planned health teachings, conduct clinical Teaching, case presentation and drug study.

English

Placement: First year

Time allotted: Theory 60 hrs.

COURSE DESCRIPTION

The course is designed to help the student understand and usage of English language required for their professional work.

OBJECTIVES

After the course the students will develop

1. Ability to speak and write grammatically correct English
2. Effective skill in reading and understanding the English language.
3. Skill in reporting

COURSE CONTENTS

UNIT I

- Remedial Study of Grammar.
- Review of grammar, vocabulary and effective use of dictionary.
- Prepare task oriented seminars.
- Symposia and panel discussion.

UNIT II

- The ability to understand selected passage and express meaning in one's own words.
- Reading and comprehension of the prescribed books.

UNIT III

- The study of various forms of composition
 - Note taking
 - Diary
 - Nurses notes, anecdotal records
 - Writing of Summary
 - Nurses reports on health problems.

The students will submit one sample of each item from her own practical experience.

UNIT IV

- Verbal communication
- Oral reports
- Summarization of discussion
- Debate
- Listening comprehension – Film, Cassette and Radio.

PRACTICUM

- The clinical experience in the wards and bed side nursing will provide opportunity for students to fulfill the objectives of learning language.
- Assignment on writing and conversation through participation in discussion, debates, seminars and symposia, the students will gain further skills in task oriented communication.

Sociology

Placement: Second year

Time allotted: Theory 60 hrs.

COURSE DESCRIPTION

The course is to re-orient students to sociology related to community and social institution in India and its relationship with health, illness, and nursing.

OBJECTIVES

At the end of the course, the student will

1. Describe sociological concepts that are applicable to nursing.

2. Determine role of sociology in nursing as related to social Institutions in India.
3. Develop positive attitudes towards individual, family and community.

COURSE CONTENTS

UNIT I

- Introduction
- Importance of study of sociology in nursing, relationship of anthropology, Sociology, etc.

UNIT II

- Individual and the Society.
- Socialization
- Interdependence of the individual and society
- Personal disorganization.

UNIT III

- Culture
- Nature of culture
- Evolution of culture
- Diversity and uniformity of culture.

UNIT IV

- Social organization
- Social groups, crowds and public groups, nations, race.
- Social institutions: The family, marriage, education, religion, Arts, economic Organization, political organization.
- The urban & rural community in India : Ecology, Characteristics of the Village, characteristics of the town and city.
- Social stratification: Class and caste.

UNIT V

- Social process
- Process of Social Interaction : competition, conflict-war, cooperation, accommodation and assimilation.

UNIT VI

- Social change
- Nature and process of social change : Factors influencing cultural change, Cultural lag.

UNIT VII

- Social Problems
- Social disorganization, control & planning : poverty, population, housing, Illiteracy, food supplies, growth of urbanization, prostitution, minority groups, rights of women & children, child labor, child abuse, delinquency and crime, substance abuse.

Community Health Nursing

Placement: Second year
hrs.

Time Allotted: Theory 60

Practical – 240 hrs.

COURSE DESCRIPTION

The course enables the students to understand the national health care delivery system and to participate in the delivery of Community Health Nursing.

OBJECTIVES

At the end of the course, the student will

1. Explain the concepts of various factors contributing to health of individual, family and community.
2. Identify the role of community health nurse.
3. Describe national health care delivery system.
4. Describe epidemiological methods and principles of prevention and control of illness in the community.
5. Identify the role of personnel working in the community health setup.
6. Plan the work of community health nurse and supervise and train health workers.

COURSE CONTENTS

UNIT I

- Introduction
- Introduction to Community health- Concepts, Principles and elements of Primary Health Care.
- Introduction to community health nursing.
- Concepts of community health nursing- Community nursing process.
- Objectives, scope and principles of community health nursing.

UNIT II

- Family Health Services
- Concept, objectives, scope and principles
- Individual, family and community as a unit of service.
- Principles and techniques of home visiting.

- Establishing working relationship with the family.
- Working with families in relation to prevention of disease.
- Promotion of health.
- Care of the sick in the home, physically handicapped and mentally challenged.
- Surveillance and monitoring.

UNIT III

- Organization and administration of health services in India.
- National health policy.
- Health Care Delivery system in India.
- Health team concept.
 - Centre, State, district, urban health services, rural health services
 - System of medicines
 - Centrally sponsored health schemes
 - Role of voluntary health organizations and international health agencies.
 - Role of voluntary health personnel in the community
 - Public health legislation.

UNIT IV

- Health Education
 - Aims, concepts and scope of health education.
 - National plan for health education.
 - Communication techniques.
 - Methods and media for health education programmes.
 - Planning for health education and role of nurse

UNIT V

- Role of the community health nurse.
- National health programmes.
 - Maternal and child health programmes.

- Family welfare and school health services.
- Occupational health services.
- As a member of the health team.
- Training and supervision of health care workers.

UNIT VI

- Epidemiology
- Definition- Concepts, aims, objectives, methods, principles.
- Epidemiology – Theories and Models.
- Application of Epidemiology, principles and concepts in community health.

UNIT VII

- Bio-Statistics and Vital Statistics
- Introduction, definition and scope, legislation
- Report, recording and compiling of vital statistics at the local, state, national and international level.
- Definitions and methods of computing vital statistics.
- Methods of presenting data
- Management Information System.

PRACTICUM

- Each student will prepare a community profile.
- The students will be allotted families for gaining experience in identifying Family health needs, health counseling and guidance and family budgeting for optimum health.
- The students will participate in the activities of primary health centre.
- Sub – centre, MCH centre.
- Visits will be made to selected health and welfare agencies, water Purification plant and sewage disposal plant, Infectious disease hospital.
- Conduct health educational programmes for individual / groups/ community.

Mental Health Nursing

Placement: Second year

Time Allotted: Theory 60 hrs.

Practical – 240 hrs.

COURSE DESCRIPTION

The course enables the students to recognize and appreciate the causes, symptoms and process of abnormal human behavior. It also introduces the student to the present day treatment modalities in the light of psychological, social and cultural factors affecting human behavior. This course helps the student to learn principles of mental health and psychiatric nursing and to develop beginning skills in the management of the mentally ill in hospital and community.

OBJECTIVES

At the end of the course, the student will

1. Identify and describe the philosophy and principles of mental health nursing.
2. Describe the historical development of mental health and psychiatric nursing.
3. Classify mental disorders.
4. Develop skill in history taking and performing mental status examination.
5. Describe etiological factors, psycho- pathology, clinical features, diagnostic criteria and treatment methods used for mental disorders.
6. Manage the patients with various mental disorders.
7. Communicate therapeutically with patients and their families.
8. Identify role of the nurse in preventive psychiatry.
9. Identify the legal aspects in practice of mental health and psychiatric nursing.

COURSE CONTENTS

UNIT I

- Introduction and Historical Development
- History of psychiatry
- Historical development of mental health nursing.

- Philosophy, principles of mental health and psychiatric nursing.
- Concept of normal and abnormal behavior.
- Role and qualities of mental health and psychiatric nurse.
- Mental health team and functions of team members.
- Legal aspects in psychiatry and mental health services.

UNIT II

- Classification and assessment of mental disorders.
- Terminologies used in Psychiatry.
- Classification of mental disorders.
- Etiological factors and psychopathology of mental disorders.
- History taking and assessment methods for mental disorders.

UNIT III

- Therapeutic Communication
- Communication process
- Interview skills, therapeutic communication techniques. Nurse Patient Relationship, Therapeutic impasse and its management Process recording.

UNIT IV

- Management of mental Disorders.

Diagnostic criteria, treatment and nursing management of patient with following disorders:

- Neurotic Disorders : Anxiety Neurosis, Depressive Neurosis, Obsessive Compulsive Neurosis, Phobic Neurosis and Hypochondriacal Neurosis, Stress related and Somatoform Disorders.
- Psychotic disorders : Schizophrenic form, affective and organic Psychosis.
- Organic Brain Syndromes
- Psychosomatic disorders
- Personality disorders
- Disorders of childhood and adolescence.
-

UNIT V

- Management of patients with Substance use disorders
- Substance use and misuse.
- Dependence, intoxication and withdrawal.
- Classification of psychoactive substances
- Etiological & contributory factors
- Psychopathology
- Clinical features
- Diagnostic criteria.
- Treatment and nursing management of patient with substance use disorders.
- Preventive and rehabilitative aspects in substance abuse.

UNIT VI

- Management of mental sub- normality.
- Classification of mental sub- normality.
- Etiological factors, psychopathology, psychometric assessment, diagnostic Criteria and management of sub- normality.

UNIT VII

- Psychiatric Emergencies.
- Types of emergencies, psychopathology, clinical features, assessment and Diagnosis, treatment and nursing management of patient with psychiatric Emergencies.
- Crisis Intervention therapy.

UNIT VIII

- Therapeutic Modalities
- Principles, indication, contraindications and role of nurse in various Treatment methods:
 - Therapeutic community and Milieu therapy
 - Occupational therapy
 - Psychotherapy
 - Behavior therapy
 - Group therapy

- Family therapy
- Pharmacotherapy
- Electro convulsive therapy
- Other miscellaneous therapies.

UNIT IX

- Preventive psychiatry
- Model of prevention
- Role of nurse in preventive psychiatry
- Psychiatric social work.
- Community mental health nursing.
- Community mental health agencies
- National mental Health Programmes.

PRACTICUM

The student will be provided opportunity to:

- Observe, record and report the behavior of their selected patients
- Record the process of interaction.
- Assess the nursing needs of their selected patients, plan and implement the Nursing intervention.
- Counsel the attendant and family members of patient.
- Participate in the activities of psychiatric team.
- Write observation report after a field visit to the following places:
 - Child guidance clinic.
 - School/ Special Schools (For mentally subnormal)
 - Mental Hospital.
 - Community mental health centers.
 - De – addiction centre.

Introduction to Nursing Education

Placement: Second year

Time Allotted: Theory 60 hrs.
Practical – 75 hrs.

COURSE DESCRIPTION

The course introduces the students to principles and concepts of education, curriculum development and methods and media of teaching. It also describes the steps in curriculum development and implementation of educational programmes in nursing.

OBJECTIVES

At the end of the course, the student will

1. Describe the philosophy and principles of education.
2. Explain the teaching – learning process
3. Develop the ability to teach, using various methods and media.
4. Describe the process of assessment.
5. Describe the administrative aspects of school of nursing
6. Participate in planning and organizing an in- service education programme.
7. Develop basic skill of counseling and guidance.

COURSE CONTENTS

UNIT I

- Introduction to education
- Meaning of education, aims, function and principles.
- Philosophy of education
- Factors influencing development of philosophy of nursing education.

UNIT II

- Teaching learning process
- Nature and characteristics of learning.
- Principles and maxims of teaching.
- Formulating objectives.
- Lesson planning.

UNIT III

- Methods of teaching
 - Teaching methods
 - Lecture
 - Discussion
 - Demonstration
 - Group discussion
 - Project
 - Role play
 - Project
 - Role play
 - Panel discussion
 - Symposium
 - Seminar
 - Field trip
 - Workshop
 - Exhibition
 - Programmed instruction
 - Computer Assisted Learning.

Clinical teaching methods:

- Case methods
- Case presentation
- Nursing rounds and reports
- Bedside clinic
- Conference (individual and group)
- Recording of interaction process.

UNIT IV

- Educational media
- The communication process: factors affecting communication.
- Purposes and types of audio- visual aids.
- Graphics aid: Chalk – board, charts, graphs, posters, flash cards, flannel Graph/ khadigraph, bulletin, cartoon.
- Three dimensional aids: objects, specimen, models, puppets.
- Printed aids: slides, films and television, VCR, VCP, overhead projector, Camera, microscope.
- Audio – aids : tape recorder, public address system, computer.

UNIT V

- Methods of assessment
- Purpose and scope of evaluation and assessment.
- Criteria for selection of assessment techniques and methods.
- Assessment of knowledge: essay type question, SAQ (Short Answer Questions).
- MCQ (multiple choice questions).
- Assessment of skills: Observation, Check list, Practical Examination, Viva, Objective structured clinical examination.
- Assessment of attitude: Attitude scale.

UNIT VI

- Management of school of Nursing.
- Planning of School of nursing, organization.
- Recruitment of teaching staff, budget, facilities for the school, students Selection and admission procedure, administrative planning for students, Welfare services for students, maintenance of school records, preparation of Annual reports, INC guidelines for school of nursing.
- Curriculum Development.
 - Concept, Definition and meaning
 - Types of curriculum

- Levels of curriculum/ Approaches to curriculum
- Process/ steps in development of curriculum

- Rotation plan
- Clinical rotation

UNIT VII

- Guidance and Counseling Definition
- Basic principles of guidance and counseling
- Organization of guidance and counseling services
- Counseling process
- Managing disciplinary problems
- Management of crisis

UNIT VIII

- In – service education
- Introduction to nature and scope of in – service education programme.
- Principles of adult learning
- Planning for in service programme.
- Techniques, and methods of staff education programme
- Evaluation of in- service programme.

PRACTICUM

Each student should:

- Conduct five planned teaching using different methods and media.
- Prepare different types of teaching aids
- Plan, organize and conduct in service education programme.
- Conduct at least one counseling session.
- Prepare rotation plans.

Introduction to Nursing Service Administration

Placement: Second year
hrs.

Time Allotted: Theory 60

Practical – 180 hrs.

COURSE DESCRIPTION

The course is designed to give an opportunity to the student to gain an understanding of the principles of administration and its application to nursing service; it is also intended to assist the students to develop an understanding of professional leadership need.

OBJECTIVES

At the end of the course, the student will

1. Identify the principles of administration.
2. Describe the principles and techniques of supervision.
3. Explain the principles and methods of personnel management.
4. Explain the principles of budgeting
5. Organize and manage a nursing unit effectively.
6. Identify dynamics of organizational behavior. Styles and functions of effective leadership.

COURSE CONTENTS

UNIT – I

- Principles and Practice of administration
- Significance elements and principles of administration.
- Organization of Hospital – Definition, Aims, functions and

Classifications, health team.

- Policies of hospital, different departments with special emphasis to Department of nursing & office management.
- Responsibilities of the nursing personnel specially of ward sister, Medico Legal aspects, concept of cost effectiveness

- Planning
 - Planning process: Concept, principles, institutional policies
 - Mission, Philosophy, Objectives
 - Strategic Planning
 - Application to nursing service and education

UNIT – II

- Nursing unit Management
- Physical layout of a nursing unit and necessary facilities
- Factors affecting the quality of nursing care
- Maintenance of a therapeutic environment
- Administration of the unit management of patient care
- Maintenance of physical environment
- Assignment of duties and time plan
- Patient assignment, safety measures, prevention of accidents and Infections
- Maintenance of patient's records and reports, legal responsibilities
- Maintenance of quality nursing care, nursing audit

UNIT – III

- Personnel management
- Staff recruitment and selection, appointment, promotions, personnel Policies and job descriptions
- Job analysis
- Staffing the unit, staffing norms, rotation plan, leave planning, Performance appraisal, staff welfare and management of disciplinary Problems

UNIT – IV

- Supervision
- Principles of supervision, nature and objectives
- Tools and techniques of supervision
- Evaluation
- Nursing audit

- Staff development orientation program
- Skill training
- Leadership development
- Problem solving process

UNIT V

- Material Management
- Principles of material management
- Quality control
- Inventory, care of equipment, safekeeping
- Role of nursing personnel in material management

UNIT VI

- Financial Management
- Budgeting – Principles of budgeting, audit

UNIT VII

- Organizational Behavior
- Group dynamic and human relation, organizational communication
(Hospital Information System)
- Public relations, leadership styles and functions
- Methods of reporting
- Maintaining records and reports

PRACTICUM

- Observe the functioning of nursing administration at various level i.e.

Institution, department, unit.

- Each student will practice ward management under supervision.
- Student will prepare rotation plan of the staff, write reports, give verbal Reports of the ward and assist in maintaining the inventory of the nursing unit.
- Visit to private and government hospital and write observation reports.

Introduction to Nursing Research and Statistics

Placement: Second year
hrs.

Time Allotted: Theory 45

Practical – 120 hrs.

COURSE DESCRIPTION

The course is designed to assist the students to develop an understanding of basic concepts of research and statistics, use the findings of nursing research in nursing practice, apply the knowledge in conducting projects and solve problems related to nursing using scientific method.

OBJECTIVES

At the end of the course, the student will:

1. Define the terms and concepts of nursing research
2. Identify needs and scope of nursing research
3. Identify and define a research problem
4. Locate and list sources of literature for a specific study
5. Describe different research approaches, methods of data collection and sampling techniques with a special reference to survey method.
6. Develop tool for data collection.
7. Enumerate steps of data analysis and present data summary in tabular form.
8. Use descriptive and co- relational statistics in data analysis.
9. Conduct a group research project.

COURSE CONTENTS

A. INTRODUCTION TO RESEARCH METHODOLOGY

UNIT – I

- Steps of scientific methods
- Definition of research
- Need for nursing research
- Characteristics of good research, Research Process

UNIT II

- Statement of research problem.
- Statement of purpose and objectives.
- Definition of research terms.
- Review of literature.

UNIT III

- Research approaches: - historical, survey and experimental.

UNIT IV

- Sampling Techniques and methods of data collection.
- Sampling
- Instruments- questionnaire and Interview
- Observation schedule, records, measurements
- Reliability and validity of instruments.

UNIT V

- Analysis of Data : Tabulation
- Classification and summarization
- Presentation
- Interpretation of data.

UNIT VI

- Communication of research findings.
- Writing Report :
 - Organizing materials for writing
 - Format of the report
 - Use of computers

B. INTRODUCTION TO STATISTICS

UNIT VII

- Descriptive Statistics.
- Frequency Distribution – Types of measure – frequencies, class interval, Graphic methods of describing frequency
- Measures of Central Tendency – Mean, Median and Mode.
- Measures of Variability : Range, Standard deviation
- Introduction to normal probability.

UNIT VIII

- Correlation
- Computation by rank difference methods
- Uses of correlation co- efficient

UNIT IX

- Biostatistics : Crude rates and standardized rates , ratio and estimation of The trends

UNIT X

- Introduction to computers in nursing.
- Introduction to computers and disk- operating system.
- Introduction to word processing

- Introduction to data base
- Windows applications, word, excel, power point, multimedia.
- Use of statistical packages.
- Introduction to Internet & use of electronic mail
- Computer aided teaching & testing.

PRACTICUM

Students will conduct research project in small groups in selected areas of nursing and submit a report (group studies may include studying of existing health practices, improved practices of nursing (procedures), health records, patient records and survey of nursing literature.



**BHARATI
VIDYAPEETH**
(Deemed to be
University)

**COLLEGE
OF
NURSING**

SYLLABUS

**POST BASIC
B.Sc.NURSING**

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BHARATI VIDYAPEETH DEEMED UNIVERSITY

INTRODUCTION

Bharati Vidyapeeth which is the parent body of Bharati Vidyapeeth Deemed University was established on 10 may 1964, by Dr. Patangrao Kadam with a wider objective of contributing to intellectual awakening and social cultural transformation through dynamic education. Under the imaginative, dynamic and socially committed leadership of the founder Dr. Patangrao Kadam, Bharati Vidyapeeth Deemed University has made astonishing stride in the field of education. The Vidyapeeth has so far established 156 educational institution imparting education to the student's right from pre-primary stage to post graduate stage and Ph.D.

The ministry of human resources development (Department of Education, Government of INDIA) on the recommendation of University Grant Commission, New Delhi through their notification No.

F. - 9-15/95 U.3 dated 26 April 1996 has declared the following institution of Bharati Vidyapeeth at Pune as to be Deemed University.

- 1) Bharati Vidyapeeth Medical College, Pune
- 2) Bharati Vidyapeeth Dental and Hospital, Pune.
- 3) Bharati Vidyapeeth College of Ayurved ,Pune
- 4) Bharati Vidyapeeth Homeopathic Medical College, Pune
- 5) Bharati Vidyapeeth College of Nursing, Pune.
- 6) Bharati Vidyapeeth Institute Yashwantrao Mohite College of Arts , Science and Commerce, Pune.
- 7) Bharati Vidyapeeth Institute New Law College, Pune.
- 8) Bharati Vidyapeeth Institute Social Science Center (M.S.W.), Pune
- 9) Bharati Vidyapeeth Institute Poona College of Pharmacy, Pune.
- 10) Bharati Vidyapeeth College of Engineering, Pune
- 11) Bharati Vidyapeeth Institute of Management & Entrepreneurship Development, Pune.
- 12) Bharati Vidyapeeth Institute Yashwantrao Chavan Institute of social science centre, Pune
- 13) Bharati Vidyapeeth Institute Research and Development Centre in Applied Chemistry, Pune.
- 14) Bharati Vidyapeeth Institute College of Physical Education, Pune.

- 15) Bharati Vidyapeeth Institute of Environment Education and Research, Pune.
- 16) Bharati Vidyapeeth Rajiv Gandhi Institute of Information Technology, Pune.
- 17) Interactive Research School in Health Affairs (IRSHA).
- 18) Bharati Vidyapeeth Medical College & Hospital, Sangli
- 19) Bharati Vidyapeeth Medical College & Hospital, Mumbai.
- 20) Bharati Vidyapeeth Institute of Management & Research, New Delhi.
- 21) Bharati Vidyapeeth College of Architecture, Pune.
- 22) Bharati Vidyapeeth Institute of Hotel Management & Catering Technology, Pune.
- 23) Bharati Vidyapeeth Yashwantrao Mohite Institute of Management, Karad.
- 24) Bharati Vidyapeeth Institute of Management, Kolhapur
- 25) Bharati Vidyapeeth Institute of Management & Rural Development Administration, Sangli.
- 26) Bharati Vidyapeeth Abhijit Kadam Institute of Management & Social Sciences, Solapur.
- 27) Bharati Vidyapeeth College of Engineering , New Delhi.
- 28) Bharati Vidyapeeth Deemed University Institute of Computer Application & Management, New Delhi.
- 29) Bharati Vidyapeeth Dental College & Hospital, Sangli.
- 30) Bharati Vidyapeeth Deemed University College of Nursing, Sangli.
- 31) Bharati Vidyapeeth Deemed University College of Nursing, Navi Mumbai.

The association of Indian universities has also accepted this university as its member.

This is probably the first only university having under its umbrella diversified disciplines of professional and non- professional categories such as Medicine, Dentistry, Nursing, Ayurvedic, Homeopathic Medicine, Science, Commerce, Law and Humanities.

The degrees and diplomas awarded by this university have the same status and recognition as those awarded by any Indian University recognized by the University Grant Commission, New Delhi. The University operates its educational programme in accordance with the rules, regulations and guidelines of various statutory Central Government Bodies like Medical Council of India, Dental council of India, Bar Council of India, Indian nursing Council, Central Council of Indian Medicine etc.

COLLEGE OF NURSING, PUNE

Bharati Vidyapeeth's College of Nursing was established in the year 1992 with prior permission of University of Pune to which it was having affiliation. It is now a constituent unit of Bharati Vidyapeeth University. This is the first college of nursing in the Non- Government sector in Pune. Adequate facilities for clinical studies have been provided and the college is Dhankawadi, Pune.

The college has been approved by the Government of India, UGC and Maharashtra nursing council. The college has been approved by the Government of India, UGC and Maharashtra nursing council. The college has separate Hostel facilities for Boys and Girls. The Curriculum and Syllabus is made and updated as per the Maharashtra nursing council, Indian nursing council and the need of society.

COLLEGE OF NURSING, SANGLI.

Bharati Vidyapeeth Deemed University's College of Nursing, Sangli started in 2007 at Bharati Vidyapeeth Deemed University campus, Wanlesswadi, Sangli. The college is a constituent unit of Bharati Vidyapeeth Deemed University & started with permission from Government of Maharashtra, Maharashtra nursing council and Indian nursing Council. The college has excellent physical Infrastructure & a well-qualified teaching faculty. Imparts hands on clinical practice to the students in 750 bedded parent Bharati Hospital and in Specialty Hospitals of Sangli, Miraj. The students are also given Community field experience in urban as well as Rural Setting. Apart from curricular the students are encouraged for participation in extracurricular activities & Sports competitions at University, State, National & international level. Students are assisted for Loan facility, Fee concessions, Minority Scholarship. The college has active NSS Unit which regularly conducts activities such as tree plantation, road safety rallies, prevention of addiction, save girl campaign, Rallies for prevention & management of HIV cases & adult education. The college is well equipped with nursing labs & has a digital library with adequate number of books, national & international journals. 70% of the Alumni are working in State Government hospitals, renowned hospitals and Abroad. The college has 30 – intake capacity of P.B.B.Sc. nursing.

COLLEGE OF NURSING, NAVI MUMBAI.

Bharati Vidyapeeth Deemed University's College of Nursing, Navi-Mumbai is started in 2009 at Bharati Vidyapeeth Deemed University Campus, Belapur. Navi Mumbai. The college is constituent unit of Bharati Vidyapeeth Deemed University Pune. And having affiliation of the same. The College has been started with permission from Government of Maharashtra, Maharashtra nursing council and Indian nursing Council. The college has 30 intake capacity for PB B.Sc. nursing programme.

PHILOSOPY OF BHARATI VIDYAPEETH

Bharati Vidyapeeth was established in May 1964 with the philosophy of contributing to the intellectual awakening and social transformation in different sphere including educational, social and cultural fields in India and more particularly in Maharashtra. Its activities have been geared to bring about all sides and welfare of different section in population including women, tribes and rural people.

Bharati Vidyapeeth Nursing Colleges also function within the frame work of Bharati Vidyapeeth philosophy.

ADMISSION REQUIREMENT:

- 1) Candidates must have passed higher secondary examination (10+2) along with GNM programme from the nursing institute recognized by Indian Nursing Council & State Nursing Council situated in India.
- 2) Candidate shall be medically fit.

Aims

The aim of the undergraduate nursing program at the post basic level is to upgrade the diploma (GNM) nurses to:

- Assume responsibilities as professional, competent nurses and midwives at basic level in providing promotive, preventive, curative, and rehabilitative services.
- Make independent decisions in nursing situations, protect the rights of and facilitate individuals and groups in pursuit of health. Function in the hospital, community nursing services, and conduct research studies in the

areas of nursing practice. They are also expected to assume the role of teacher, leader supervisor, and manager in a clinical / public health settings.

Objectives

On completion of B.Sc. Nursing (Post- Basic) degree programme the graduates will be able to:

1. Assess health status, identify nursing needs, plan, implement and evaluate Nursing care for patients/ clients that contribute to health of individuals, families and communities based on scientific principles and nursing process.
2. Demonstrate competency in techniques of nursing based on concepts and Principles from selected areas of nursing, physical, biological and behavioral sciences.
3. Develop team qualities to participate as members of health team in the promotive preventive, curative and restorative health care delivery system of the country.
4. Demonstrate skills in communication and interpersonal relationship as a professional nurse.
5. Demonstrate leadership qualities and decision making abilities in various situations.
6. Demonstrate basic skills in teaching to individuals and groups in community health settings.
7. Demonstrate managerial skills in community health settings.
8. Practice ethical values in their personal and professional life.
9. Participate in research activities and utilize research findings in improving nursing practice.
10. Recognize the need for continued learning for their personal and professional development.

Courses of Study

Sr.No.	Subject	Hours Theory	Hours Practical
First Year			
1.	Nursing Foundation	45	
2.	Nutrition & Dietetics	30	15
3.	Biochemistry & Biophysics	60	
4.	Psychology	60	15
5.	Maternal Nursing	60	240
6.	Child Health Nursing	60	240
7.	Microbiology	60	30
8.	Medical & Surgical Nursing	90	270
9.	English	60	---
Total		525	810

Note: Marathi Hindi / local language as per the need of the institution.

Second Year

1.	Sociology	60	
2.	Community Health Nursing	60	240
3.	Mental Health Nursing	60	240
4.	Introduction to Nursing Education	60	75
5.	Introduction to Nursing Administration	60	180
6.	Introduction to Nursing Research & Statistics	45	120
Total		345	855

Scheme of Examination

PAPER	SUBJECT	DURATION	INT.	EXT.	
TOTAL			ASST	ASST	
MARKS					
First Year					
1.	Nursing foundation	1.30 hrs	15	35	50
2.	Nutrition & Dietetics	1.30 hrs	15	35	50
3.	Biochemistry & Biophysics	3	25	75	100
4.	Psychology	3	25	75	100
5.	Microbiology	3	25	75	100
6.	Maternal Nursing	3	25	75	100
7.	Child Health Nursing	3	25	75	100
8.	Med. & Surgical Nursing	3	25	75	100
9.	English	3	25	75	100
Practical					
1.	Medical & Surgical Nursing		50	50	100
2.	Maternal Nursing		50	50	100
3.	Child Health Nursing		50	50	100
Second Year					
1.	Sociology	3	25	75	100
2.	Community Health Nursing	3	25	75	100
3.	Mental Health Nursing	3	25	75	100
4.	Introduction to Nursing	3	25	75	100
Education					
5.	Introduction to Nursing	3	25	75	100
Administration					
6.	Introduction to Nursing	2	50	---	50

Research & Statistics

Practical

1. Community Health Nursing	50	50	100
2. Mental Health Nursing	50	50	100
3. Research Project (Qualifying)	50	50	

Note: Qualifying Examination

College Examination (Not University Examination)

N.B.

1. Teaching of Anatomy, Physiology, Pharmacology and Pathology will be integrated with clinical subjects.
2. A minimum of 85% attendance in theory and 95% practical/ clinical in each subject is essential for appearing in the examination.
3. 100% attendance in practical/ clinical in each clinical area is essential before award of degree.
4. 50% of minimum marks in each theory and practical paper separately are required for passing.
5. A candidate has to secure minimum of 33 % in qualifying subject for passing.
6. The candidate has to pass in theory and practical exam separately in each of the paper.
7. If the candidate fails in either theory or practical exam he / she have to reappear for both (Theory & practical).
8. Biochemistry and Biophysics- question paper will consist of Section-I (Biochemistry) MCQ of 8 marks and 30 marks of long and short answer questions and Section-II (Biophysics) MCQ of 7 marks and 30 marks of long and short answer questions.
9. The maximum period to complete the course successfully is 4 years.

Nursing Foundation

Placement: First Year

Time Allotted: Theory – 45 Hrs

COURSE DESCRIPTION

This course will help students develop an understanding of the philosophy, objectives and responsibilities of nursing as a profession. The purpose of the course is to orient to the current concepts involved in the practice of nursing and developments in the nursing profession.

OBJECTIVES

At the end of the course, the students will

1. Identify professional aspects of nursing.
2. Explain theories of nursing.
3. Identify ethical aspects of nursing profession.
4. Utilize steps of nursing process.
5. Identify the role of the nurse in various levels of health services.
6. Appreciate the significance of quality assurance in nursing.
7. Explain current trends in health and nursing.

COURSE CONTENTS

UNIT I

- Development of nursing as a profession
 - Its philosophy
 - Objectives and responsibilities of a graduate nurse.
- Trends influencing nursing practice
- Expanded role of the nurse.
- Development of nursing education in India and trends in nursing education.
- Professional organizations, career planning.
- Code of ethics & professional conduct for nurses.

UNIT II

- Ethical, legal and other issues in nursing.
- Concepts of health wellness and illness, effects on the person.
- Stress and adaptation.
- Health care concept and nursing care concept.
- Developmental concept, needs, roles and problems of the developmental stages of individual – newborn, infant, toddler, pre-adolescent, adolescent, adulthood, middle-age, old age.

UNIT III

- Theory of nursing practice
- Meta paradigm of nursing – characterized by four central concepts i.e. Nurse, person (client/ patient), health and environment.

UNIT IV

- Nursing process.
- Assessment: Tools for assessment, methods, recording.
- Planning: Techniques for planning care, types of care plans.
- Implementation: Different approaches to care , organizations and implementation of care, recording.
- Evaluation: Tools for evaluation, process of evaluation.

UNIT V

- Quality assurance: nursing standards, nursing audit, total quality management
- Role of council and professional bodies in maintenance of standards.

UNIT VI

- Primary health care concept :
 - Community oriented nursing
 - Holistic nursing
 - Primary nursing
- Family oriented nursing concept:
 - problem oriented nursing
 - progressive patient care
 - team nursing

Nutrition & Dietetics

Placement: First Year

Time Allotted: Theory: 30 hrs

Practical: 15

hrs

COURSE DESCRIPTION

This course is designed to provide the students with a wide knowledge of dietetics in Indian setting, that the practice of teaching optimum and realistic dietary planning can become an integral part of nursing practice.

OBJECTIVES

At the end of the course, the student will

1. Explain the principles and practices of nutrition and dietetics.
2. Identify nutritional needs of different age groups and plan diet accordingly.

Plan therapeutic diets in different settings.

3. Plan therapeutic diets in different settings.
4. Prepare meals using different methods utilizing cookery rules.

COURSE CONTENTS

UNIT I

- Introduction to nutrition and dietetics.
- Balanced diet. Factors on which it depends.
- Factors to be considered in planning.
- Guides available for planning.
- Food Hygiene, preparation and preservation.
- Review of nutrients- micro & macro.

UNIT II

- Introduction to diet therapy.
- Hospital diets.
- Therapeutic diet under each unit i.e. cardiovascular diseases.

Gastrointestinal diseases, Renal disorders, Endocrine and metabolic disorders, Allergy, Infections and fevers, Pre and post operative stage, Deficiency diseases and malnutrition overweight and underweight.

UNIT III

- Infant and child Nutrition.

- Feeding of normal infants: feeding problems factors to be considered in planning
- Nutritional requirements.
- Supplementary feeding of infants: Advantage and method of introduction
- Weaning, effects on mother and child.
- Psychology of infant and child feeding.
- Feeding the sick child. Diet in diseases of infancy and childhood.
- Deficiency states – malnutrition and under nutrition.
- Feeding pre – school child: nutritional needs, factors to be considered in Planning diets. Problems in feeding.
- School lunch programme, Mid-day meal programme: Advantages, Need in India.

UNIT IV

- Community Nutrition: Need for community nutrition programme.
- Nutritional needs for special groups : Infant, child, adolescent, pregnant Woman, lactating mother and old people.
- Substitutes for non- vegetarian foods.
- Selection of cheap and nutritious foods, Nutrition education needs and Methods.
- Methods of assessing nutritional status of individual/ group/ community.
- Current nutritional problems and national programmes.

PRACTICUM

- I. Culinary guide practices Methods of cooking and cookery rules.
 1. Simple preparation of beverages, soups, cereals and pulses, eggs, Vegetables, meat.
 2. Menu Plans,
- II. Preparation of supplementary food for infants.
 1. Food for infants.
 2. Low cost nutritious dishes for vulnerable groups.
 3. Dietary case study of patient on special diet and planning of low cost Dietary instructions for home adaptations.
 4. Planning of therapeutic diets.

Biochemistry & Biophysics

Placement: First Year

Time: Allotted

Section A (Biochemistry) – Theory 30 hrs.

Section B (Biophysics) - Theory 30 hrs.

COURSE DESCRIPTION

This course introduces the basic principles of Biochemistry and Biophysics related to nursing.

OBJECTIVES

At the end of the course, the student will

1. Identify the basic principles of Biochemistry and Biophysics.
2. Synthesize the knowledge of these principles in various nursing situations.

Section A: Biochemistry

Theory – 30

hrs.

COURSE CONTENTS

UNIT I

- Introduction: Importance of Biochemistry in nursing.
- Study of cell and its various components.

UNIT II

- Water and Electrolytes: Water – Sources, property & functions in human Body.
- Water and fluid balance.
- Electrolytes of human body, functions, sources.

UNIT III

- Enzymes
 - Mechanism of action
 - Factors affecting enzyme activity
 - Diagnostic applications.
 - Precautions for handling specimens for enzyme estimation
- Digestion and absorption of carbohydrates, proteins and fats.
- Various factors influencing the digestion and absorption, mal-absorption syndrome.

UNIT IV

- Carbohydrates: Catabolism of carbohydrates for energy purposes.
- Mitochondrial oxidation and oxidation phosphorylation.
- Fats of glucose in the body, Storage of glucose in the body, glycogenesis, glycogenolysis and neoglucogensts, blood glucose and its regulation.
- Glucose tolerance test, hyperglycemia, hypoglycemia, glycemia.

UNIT V

- Protein: Amino acids, hormones.
- Essential amino acids. Biosynthesis of protein in the cells.
- Role of nucleic acid in protein synthesis.
- Nitrogenous constituents of Urine, Blood, and their origin- urea cycle, uric acid formation, gout.
- Plasma proteins and their functions.

UNIT VI

- Fat: Biosynthesis of fats and storage of fats in the body.
- Role of liver in fat metabolism
- Biological important lipids and their functions.
- Cholesterol and lipoprotein
 - Sources occurrence and distribution.
 - Blood level and metabolism.
 - Ketone bodies and utilization.
- Inter relationships in metabolism and cellular control of metabolic processes.

Section B : Biophysics

Theory : 30 hours

COURSE CONTESTS

UNIT I

- Introduction: Concepts of unit and measurements.
- Fundamental and derived units.
- Units of length, weight, mass, time.

UNIT II

- Vector and scalar motion, speed, velocity and acceleration.

UNIT III

- Gravity: Specific gravity, center of gravity, principles of gravity.
- Effects of gravitational forces on human body.
- Application of principles of gravity in nursing.

UNIT IV

- Force, Work, Energy: Their units of measurement.
- Type and transformation of energy, forces of the body, static forces.
- Principles of machines, friction and body mechanics.

- Simple mechanics- lever and body mechanics, pulley and traction.
Incline plane, screw.
- Application of these principles in nursing.

UNIT V

- Heat : Nature, measurement, transfer of heat
- Effects of heat on matter
- Relative humidity, specific heat
- Temperature scales.
- Regulation of body temperature
- Use of heat for sterilization
- Application of these principles in nursing

UNIT VI

- Light laws of reflection
- Focusing elements of the eye, defective vision and its correction, use of Lenses.
- Relationship between energy, frequency and wavelength of light.
- Biological effects of light.
- Use of light in therapy.
- Application of these principles in nursing.

UNIT VII

- Pressures: Atmospheric pressure, hydrostatic pressure, osmotic pressure.
- Measurements of pressures in the body.
 - Arterial and venous blood pressures
 - Ocular pressure
 - Intracranial pressure
 - Applications of these principles in nursing.

UNIT VIII

- Sound : Frequency, Velocity and Intensity
- Vocalization and hearing
- Use of ultrasound. Noise pollution and its prevention.
- Application of these principles in nursing.

UNIT IX

- Electricity and Electromagnetism : Nature of Electricity, voltage, Current, Resistance and their Units.
- Flow of electricity in solids, electrolytes, gases and vacuum.
- Electricity and human body.
- ECG, EEG, EMG, ECT.
- Pace makers and defibrillation.
- Magnetism and electricity.
- M.R.I. Scanning, CAT scan.

UNIT X

- Atomic Energy: Structure of Atom, Isotopes and Isobars.
- Radioactivity: Use of radioactive isotopes.
- Radiation protection units and limits, Instruments used for detection of ionizing radiation. X – Rays.

UNIT XI

- Principles of Electronics : Common electronic equipments used in patient Care.

Practicum

- Experiments and Tests should be demonstrated wherever applicable.

Psychology

Placement: First year

Time allotted: Theory 60 hrs.

Practical : 15 hrs.

COURSE DESCRIPTION

This course is designed to reorient and widen the student's knowledge of fundamentals of psychology. The student is offered an opportunity to apply the theoretical concepts in the clinical setting and thereby understand the psychodynamics of patient behavior. This course would also help the student to develop an insight into her own behavior.

OBJECTIVES

At the end of the course, the students will

1. Apply psychological principles while performing nursing duties.
2. Distinguish the psychological processes during health and sickness.
3. Analyze own behavior patterns.
4. Tabulate the psychological needs of the patients for planning nursing care.
5. Participate in psychometric assessment of the client.

COURSE CONTENTS

UNIT I

- Introduction: Definition of psychology, scope and methods of psychology.
- Relationship with other subjects.

UNIT II

- Sensation, Attention and Perception : Definitions
- Sensory processes : Normal and abnormal
- Attention and distraction: contributory factors.
- Characteristics of perception: normal and abnormal.

UNIT III

- Motivation : Definition and nature of motivation
- Biological and social motives
- Frustration and conflicts
- Self- actualization

UNIT IV

- Emotions: Definition of emotions, Expression and perception.
- Emotions in sickness.

UNIT V

- Personality: Definition, Constituents of personality.
- Personality in sickness and nursing

UNIT VI

- Psychological aspects of nursing
- Behavior and sickness. Psychological needs of
 - Child and adolescents
 - Adult
 - Aged
 - Attendants
 - Chronically ill individual

UNIT VII

- Individual differences.
- Significance of individual differences.
- Heredity and environment.
- Role of individual differences both in health and sickness.
- Implications of individual differences in nursing.

UNIT VIII

- Intelligence and Abilities : Definition
- Intelligence and abilities during sickness.
- Measurement of Intelligence and abilities.

UNIT IX

- Learning : Definition , Conditions of learning
- Laws of learning
- Learning during health and sickness.

UNIT X

- Memory and forgetting : Definition and nature of memory
- Memory during health and sickness.
- Forgetting during health and sickness.

UNIT XI

- Attitudes: Definition, Development and modification
- Role of attitudes in health and sickness.

UNIT XII

- Concept of mental hygiene & mental health.
- Characteristics of a mentally healthy person.

- Defense mechanisms

PRACTICUM

1. Simple experiments on i) Perception ii) Measuring thresholds iii) Reaction time.
2. Administration of psychological tests
3. Observation and recording data : i) Field observation ii) Interview
iii) Interview case study IV) Self- rating

Microbiology

Placement: First year

Time allotted: Theory 60 hrs.

Practical: 30 hrs.

COURSE DESCRIPTION

This course reorients the students to the fundamentals of Microbiology & its various sub-divisions. It provides opportunities to gain skill in handling and use of microscope for identifying various micro- organisms. It also provides opportunities for safe handling of materials containing harmful bacteria and methods of destroying microorganisms.

OBJECTIVES

At the end of the course, the students will

1. Identify common disease producing micro- organisms.
2. Explain the basic principles of microbiology and their significance in health and disease.
3. Demonstrate skill in handling specimens.
4. Explain various methods of dis- infection and sterilization.
5. Identify the role of the nurse in hospital infection control system.

COURSE CONTENTS

UNIT I

- Structure and Classification of Microbes.
- Morphological types
- Size and form of bacteria.
- Motility
- Classification of Micro- organisms.

Practical

- Use and care of microscope.
- Common examination: Smear Blood, Modules, and Yeasts.

UNIT II

- Identification of Micro- organisms.

- Discussion of laboratory methods.
- Diagnosis of bacterial diseases.

Practical

- Staining techniques- gram staining, acid fast staining.
- Hanging drop preparation.

UNIT III

- Growth and Nutrition of Microbes
- Temperature
- Moisture
- Blood

Practical

- Preparation of Media and culture techniques.
- Collection, handling and transportation of various specimens.

UNIT IV

- Destruction of Micro- organisms.
- Sterilization and disinfection
- Chemotherapy and antibiotics.
- Effects of heat and cold
- Hospital Infection control procedure & role of nurses.

Practical

Sterilization methods- Physical, Chemical and Mechanical.

UNIT V

- Disease producing micro- organisms.
- Gram positive bacilli.
- Tuberculosis and Leprosy
- Anaerobes
- Cocci
- Spirochete
- Rickettsiae

Practical - Identification and study of the following bacteria; Strepto-cocci. Pneumococci and Staphylococci. Corynebacteria, Spirochetes and gonococci, enteric bacteria. Posting in infection control department.

UNIT VI

- Pathogenic Fungi
- Dermatophytes
- Systemic Mycotic infection
- Laboratory diagnosis of Mycotic infection.

UNIT VII

- Immunity
- Immunity and hypersensitivity – Skin test
- Antigen and antibody reaction
- Immunization in disease.

Practical: Demonstration of serological methods.

UNIT VIII

- Parasites and Vectors.
- Characteristics and classification of parasites
- Protozoal infection including amoebiasis
- Helminthes infection
- Diagnosis of parasitic infection
- Vectors and diseases transmitted by them.

Practical: Identification of Parasites and Vectors.

UNIT IX

- Viruses.
- Classification and general character of viruses.
- Diseases caused by viruses in man and animal and their control.

UNIT X

- Micro – organisms transmitted through food.
- Food poisoning. Food borne infections.

PRACTICUM

Each Student will practice in the laboratory as indicated in each unit of the courses outline. While giving nursing care in the wards they will practice collection and processing of specimens. Prevention and control of hospital infections. Sterilization, immunization, chemotherapy and maintenance of personal and environmental hygiene. Observation visit to incinerator, posting in CSSD and infection control department.

Maternal Nursing

Placement: First year

Time allotted: Theory 60 hrs.

Practical: 240 hrs.

COURSE DESCRIPTION

This course is designed to widen the student's knowledge of obstetrics during pregnancy, labor and puerperium. It also helps to acquire knowledge and develop skill in rendering optimum nursing care to a child bearing mother in a hospital or community and help in the management of common gynecological problems.

OBJECTIVES

At the end of the course, the students will

1. Describe the physiology of pregnancy, labors and puerperium.
2. Manage normal pregnancy, labor and puerperium.
3. Explain the physiology of lactation and advice on management of breast feeding.
4. Be skilled in providing pre and post operative nursing care in obstetric conditions.
5. Identify and manage high risk pregnancy including appropriate referrals.
6. Propagate the concept and motivate acceptance of family planning methods.
7. Teach, guide and supervise auxiliary midwifery personnel.

COURSE CONTENTS

UNIT I

- Introduction and historical review
- Planned parenthood
- Maternal morbidity and mortality rates
- Legislations related to maternity benefits, MTP acts, incentives for family Planning etc.

UNIT II

- Review of the anatomy and physiology of female reproductive system.
- Menstrual Cycle & Disorders.
- Female (pelvis normal and contracted)
- Review of fetal development.

UNIT III

- Physiology and management of pregnancy, labor and puerperium.
- Signs and symptoms and diagnosis of pregnancy
- Antenatal care
- Pregnant women with HIV/ AIDS
- Management of common gynecological problems.

UNIT IV

- The New born baby.
- Care of the baby at birth including resuscitation
- Essential Newborn Care.
- Feeding
- Jaundice and infection
- Small & large for date babies.
- Intensive care of the new born.
- Trauma and hemorrhage.

UNIT V

- Management of abnormal pregnancy, labor and puerperium.
- Abortion, ectopic pregnancy and vesicular mole.
- Pregnancy included hypertension, gestational diabetes, anemia, heart disease.

- Urinary infections, Ante partum hemorrhage
- Abnormal labor (malposition & malpresentation)
- Uterine inertia
- Disorders of puerperium
- Management of engorged breast, cracked nipples, breast abscess and mastitis
- Puerperal sepsis
- Post partum hemorrhage
- Inversion and prolapsed of uterus, obstetrical emergencies.
- Obstetrical operations i.e. forceps, vacuum, episiotomy, caesarean section.

UNIT VI

- Drugs in obstetrics.
- Effects of drugs during pregnancy. labor and puerperium on mother & Baby.

UNIT VII

- National Welfare Programmes for women
- National Family Welfare Programme.
- National family
- Problems associated with unwanted pregnancy
- Unwed mother.

PRACTICUM

1. The students will
 - a. Be posted in antenatal Clinic, MCH clinic, antenatal ward, labor room, postnatal ward, maternity OT, MTP room.
 - b. Visit welfare agencies for women and write observation report.
 - c. Follow nursing process in providing care to 3-6 patients.
 - d. Write at least two nursing care studies and do a presentation.
 - e. Give at least one planned health teaching to a group of mothers.
2. Practice following nursing procedures.
 - a. Antenatal & post natal examination, per vaginal exam.
 - b. Conduct normal delivery, stitching of episiotomy, (For male candidates Minimum conduct of 5 deliveries)
 - c. Motivation of family for adopting family planning methods.
 - d. Motivate family for Planned Parenthood.

e. Assist in various diagnostic and therapeutic procedures including IUD insertion and removal.

CHILD HEALTH NURSING

Placement: First year

Time allotted: Theory 60 hrs.

Practical: 240 hrs.

COURSE DESCRIPTION

This course is aimed at developing an understanding of the modern approach to childcare, the common health problems of children and neonates in health and sickness.

OBJECTIVES

At the end of the course, the students will

1. Explain the modern concept of child care and the principles of child health nursing.
2. Describe the normal growth and development of children at different ages.
3. Manage sick as well as healthy neonates and children.
4. Identify various aspects of preventive pediatric nursing and apply them in providing nursing care to children in hospital and community.

COURSE CONTENTS

UNIT I

- Introduction.
- Modern concept of child care
- Internationally accepted rights of the child

- National policy and legislations in relation to child health and welfare.
- National programmes related to child health and welfare.
- Changing trends in hospital care, preventive, promotive and curative aspects of child health.
- Child morbidity and mortality rates.
- Differences between an adult and child.
- Hospital environment for a sick child.
- The role of a pediatric nurse in caring for a hospitalized child.
- Principles of pre & post operative care of infants and children
- Pediatric nursing procedures.

UNIT II

- The healthy child
- Growth and development from birth to adolescence.
- The needs of normal children through the stages of development and parental guidance.
- Nutritional needs of children & infants breast- feeding. Supplementary/ feeding and weaning.
- Accidents, causes and prevention.
- Value of play and selection of play material
- Preventive immunization.

UNIT III

- Nursing care of a neonate.
- Nursing care of a normal newborn.
- Neonatal resuscitation
- Nursing management of a low birth weight baby
- Nursing management of common neonatal disorders.
- Organization of neonatal unit. Prevention of infections in the nursery.

UNIT IV

- Nursing management in common childhood diseases.
- Nutritional deficiency disorders.
- Respiratory disorders and infections.
- Gastrointestinal infections, infestations and congenital disorders.
- Cardio vascular problem- congenital defects and rheumatic fever.

- Genito- urinary disorder – Nephrotic syndrome. Wilms’ tumor, infection and congenital disorders.
- Neurological infections and disorders- convulsions, epilepsy, meningitis, Hydrocephalus, spin bifida.
- Hematological disorders- Anemia, Thalassemia, ITP, Lukemia, Hemophialia,
- Endocrine Disorders- Juvenile Diabetes Mellitus.
- Orthopedic disorders- club feet. Hip dislocation and fracture.
- Disorders of skin eye and ears.
- Common communicable diseases in children, their identification, nursing management in hospital and home and prevention.
- Pediatric emergencies- poisoning, foreign bodies, hemorrhage, burns and drowning.

UNIT V

- Management of behavior disorders in children.
- Management of challenged children:
 - Mentally challenged
 - Physically challenged
 - Socially challenged

PRACTICUM

The students will:-

1. Be posted in pediatric medical and surgical ward, OPD in hospital, health centre and neonatal unit.
2. Visit a centre for handicapped children and child welfare centre and write observation report.
3. Write an observation study of normal children of various age groups in home / nursery school/ crèche.
4. Follow nursing process in providing care to 3-6 children.
5. Write at least two nursing care studies and do a presentation.
6. Give two planned health teachings, one in hospital and one in OPD/ health centre.
7. Practice the following nursing procedures:
8. Taking pediatric history.
9. Physical assessment of children

10. Baby bath
11. Feeding
12. Restraining
13. Calculation of dosage of drugs and administration of medications and injections
14. Collection of specimens.
15. Enema, bowel wash, colostomy irrigation
16. Steam and Oxygen inhalation.
17. Preparation to assist with diagnostic tests and operations.
18. Examination / Assessment of a newborn.
19. Neonatal resuscitation
20. Care of a baby in incubator and on ventilator
21. Photo therapy
22. Assist in exchange transfusion and other therapeutic procedures.

Medical Surgical Nursing

Placement: First year

Time allotted: Theory 90 hrs.

Practical: 270 hrs.

COURSE DESCRIPTION

The purpose of this course is to widen the student's knowledge and develop proficiency in caring for patients with medical surgical problems. This course includes review of relevant anatomy and physiology, path physiology in medical – surgical disorders and the nursing management of these conditions.

OBJECTIVES

At the end of the course, the students will

1. Explain relevant Anatomy and Physiology of various systems of the body.
2. Explain path physiology of various disorders.
3. Explain the actions, side effects and nursing implications in administering drugs for various disorders.
4. Discuss the recent advancement in the treatment and care of patients with medical surgical conditions.

5. Develop skill in giving comprehensive nursing care to patients following the steps of nursing process.
6. Assist the patients and their families in identifying and meeting their own health needs.
7. Appreciate the role of the nurse in the medical surgical health team.

COURSE CONTENTS

UNIT I

- Introduction to medical surgical nursing.
- Review of concepts of comprehensive nursing care in medical surgical Conditions.
- Nurse, patient and his/ her family.
- Functions of nurse in the outpatient department.
- Intensive care unit.

UNIT II

- Nursing management of patient with specific problems.
 - Fluid and electrolyte imbalance.
 - Dyspnea and cough, respiratory obstruction.
 - Fever
 - Shock
 - Unconsciousness
 - Pain
 - Acute illness
 - Chronic illness
 - Terminal illness
 - Age related illness
 - Patient under going surgery
 - Incontinence

UNIT III

- Nursing management of patient with neurological and neurosurgical Conditions.
- Review of anatomy and physiology of the nervous system.
- Path physiology, diagnostic procedures and management of :

- Cerebro- vascular accident.
- Cranial, spinal and peripheral neuropathies.
- Head- ache and intractable pain.
- Epilepsy.
- Infectious and inflammatory diseases and trauma of the Nervous System.
- Common disorders of the system.
- Recent advances in diagnostic and treatment modalities.
- Drugs used in these disorders.
- Tumors of brain & spinal cord, congenital malformations, degenerative diseases.

UNIT IV

- Nursing management of patient with cardiovascular problems.
- Review of relevant anatomy and physiology of cardio vascular system.
- Pathophysiology, diagnostic procedures and management of
 - Ischemic Heart diseases.
 - Cardiac arrhythmias.
 - Congestive heart failure.
 - Rheumatic and other valvular heart diseases
 - Endocarditis, cardiomyopathies, congenital heart diseases, hypertension, heart block.
 - Cardiac emergencies: cardiac arrest, acute pulmonary edema, cardiac tamponade. Cardiogenic shock, aneurysms and peripherovascular disorders, recent advancement in cardiology.

UNIT V

- Nursing management of patient with respiratory problems.
- Review of anatomy and physiology of respiratory system, Pathophysiology, diagnostic procedures and management of upper respiratory tract infections.
 - Bronchitis
 - Asthma
 - Emphysema, Empyema, Atelectasis, COPD
 - Bronchiectasis
 - Pneumonia
 - Pulmonary tuberculosis
 - Lung abscess
 - Pleural effusion

- Tumors and Cysts
- Chest injuries
- Respiratory arrest and insufficiency
- Pulmonary embolism
- Drugs used in the management of these patients
- Special respiratory therapies.

UNIT VI

- Nursing management of patient with Genito- urinary problems.
- Review of anatomy and physiology of the genitor- urinary system.
 - Nephritis
 - Renal calculus
 - Acute renal failure
 - Chronic renal failure
 - End stage renal disease
- Special procedures, dialysis, renal transplant
- Drugs used in management of these patients
- Congenital disorders, urinary infections
- Benign prostate hypertrophy.

UNIT VII

- Nursing management of patients with problems of the digestive Systems.
- Review of anatomy and physiology of gastrointestinal system and accessory organs.
 - Pathophysiology, diagnostic procedures and management of
 - G.I. Bleeding
 - Peptic ulcer
 - Infections
 - Acute abdomen
 - Colitis, diarrhea, dysentery & mal- absorption syndrome.
 - Cholecystitis
 - Hepatitis, hepatic coma and cirrhosis of liver
 - Portal hypertension
 - Pancreatitis
 - Tumors, hernias, fistulas, fissures, hemorrhoids.
 - Drugs used in the management of these patients.

UNIT VIII

- Nursing management of patients with endocrine problems
- Review of anatomy and physiology and patho- physiology of patients

With

- Thyroid disorders
- Diabetes mellitus
- Diabetes insipid us
- Adrenal tumor
- Pituitary disorders.
- Diagnostic procedures.

Nursing management of patients with above problems.

Drugs used in endocrine problems.

UNIT IX

- Nursing management of patients with musculoskeletal problems.
- Review of anatomy and physiology and Pathophysiology
- Arthritis, osteomyelities, bursitis.
- Fractures, dislocation and trauma
- Prolapsed disc.
- Osteomalacia and osteoporosis
- Tumor
- Amputation

Diagnostic procedures

Nursing management of patients with above problems.

- Prosthesis and rehabilitation.
- Transplant & replacement surgeries.

UNIT X

- Nursing management of patients with disorders of female reproductive tract.
- Disorder of menstruation
- Infections of the genital tract
- R.V.F., V.V.F.
- Climacteric changes and associated problems.

UNIT XI

- Nursing management of patients with Oncological disorders.
- Types of neoplasm's and related Pathophysiology.
- Diagnostic procedures.

- Modalities of treatment and nurse's role.
- Special therapies – chemotherapy and radiotherapy.
- Preventive measures, other therapies.

UNIT XII

- Nursing management of patient with burns.
- Nursing management of patient with reconstructive surgeries.

UNIT XIII

- Nursing management of patients with common communicable diseases & STD's
- Nursing management of patients with immunological disorders including HIV / AIDS

UNIT XIV

- Nursing management of patients with diseases of eye, ear, nose, throat & Skin.

UNIT XV

- Nursing management of patients with blood disorders.
- Review of Anatomy & Physiology of Blood and Blood products.
- Patho- physiology, diagnostic procedures and management of blood Disorders-
 - Anemia
 - Leukemia
 - Bleeding disorders
 - Hemophilia
 - Purpura etc.
- Blood transfusion, safety checks, procedure and requirements, management Of adverse transfusion reaction, records for blood transfusion.
- Management and counseling of blood donors, phlebotomy procedure, and post donation management.
- Blood bank functioning and hospital transfusion committee.
- Bio – safety and waste management in relation to blood transfusion.

UNIT XVI

- Nursing in emergencies.

- Cardiac emergencies
- Trauma
- Poisoning
- Crisis management: Thyroid crisis, Hypertensive crisis, adrenal crisis.

PRACTICUM

- Students should rotate in the selected medical & surgical areas, like Cardio Thoracic. Neurology, Urology, Orthopedics, Gynecology, Oncology, Burns, and Reconstructive surgical units.
- The students should be given patient assignment. They have to practice patient centered comprehensive nursing
- Each student is required to give planned health teachings, conduct clinical Teaching, case presentation and drug study.

English

Placement: First year

Time allotted: Theory 60 hrs.

COURSE DESCRIPTION

The course is designed to help the student understand and usage of English language required for their professional work.

OBJECTIVES

After the course the students will develop

1. Ability to speak and write grammatically correct English
2. Effective skill in reading and understanding the English language.
3. Skill in reporting

COURSE CONTENTS

UNIT I

- Remedial Study of Grammar.
- Review of grammar, vocabulary and effective use of dictionary.
- Prepare task oriented seminars.
- Symposia and panel discussion.

UNIT II

- The ability to understand selected passage and express meaning in one's own words.
- Reading and comprehension of the prescribed books.

UNIT III

- The study of various forms of composition
 - Note taking
 - Diary
 - Nurses notes, anecdotal records
 - Writing of Summary
 - Nurses reports on health problems.

The students will submit one sample of each item from her own practical experience.

UNIT IV

- Verbal communication
- Oral reports
- Summarization of discussion
- Debate
- Listening comprehension – Film, Cassette and Radio.

PRACTICUM

- The clinical experience in the wards and bed side nursing will provide opportunity for students to fulfill the objectives of learning language.
- Assignment on writing and conversation through participation in discussion, debates, seminars and symposia, the students will gain further skills in task oriented communication.

Sociology

Placement: Second year

Time allotted: Theory 60 hrs.

COURSE DESCRIPTION

The course is to re-orient students to sociology related to community and social institution in India and its relationship with health, illness, and nursing.

OBJECTIVES

At the end of the course, the student will

1. Describe sociological concepts that are applicable to nursing.

2. Determine role of sociology in nursing as related to social Institutions in India.
3. Develop positive attitudes towards individual, family and community.

COURSE CONTENTS

UNIT I

- Introduction
- Importance of study of sociology in nursing, relationship of anthropology, Sociology, etc.

UNIT II

- Individual and the Society.
- Socialization
- Interdependence of the individual and society
- Personal disorganization.

UNIT III

- Culture
- Nature of culture
- Evolution of culture
- Diversity and uniformity of culture.

UNIT IV

- Social organization
- Social groups, crowds and public groups, nations, race.
- Social institutions: The family, marriage, education, religion, Arts, economic Organization, political organization.
- The urban & rural community in India : Ecology, Characteristics of the Village, characteristics of the town and city.
- Social stratification: Class and caste.

UNIT V

- Social process
- Process of Social Interaction : competition, conflict-war, cooperation, accommodation and assimilation.

UNIT VI

- Social change
- Nature and process of social change : Factors influencing cultural change, Cultural lag.

UNIT VII

- Social Problems
- Social disorganization, control & planning : poverty, population, housing, Illiteracy, food supplies, growth of urbanization, prostitution, minority groups, rights of women & children, child labor, child abuse, delinquency and crime, substance abuse.

Community Health Nursing

Placement: Second year
hrs.

Time Allotted: Theory 60

Practical – 240 hrs.

COURSE DESCRIPTION

The course enables the students to understand the national health care delivery system and to participate in the delivery of Community Health Nursing.

OBJECTIVES

At the end of the course, the student will

1. Explain the concepts of various factors contributing to health of individual, family and community.
2. Identify the role of community health nurse.
3. Describe national health care delivery system.
4. Describe epidemiological methods and principles of prevention and control of illness in the community.
5. Identify the role of personnel working in the community health setup.
6. Plan the work of community health nurse and supervise and train health workers.

COURSE CONTENTS

UNIT I

- Introduction
- Introduction to Community health- Concepts, Principles and elements of Primary Health Care.
- Introduction to community health nursing.
- Concepts of community health nursing- Community nursing process.
- Objectives, scope and principles of community health nursing.

UNIT II

- Family Health Services
- Concept, objectives, scope and principles
- Individual, family and community as a unit of service.
- Principles and techniques of home visiting.

- Establishing working relationship with the family.
- Working with families in relation to prevention of disease.
- Promotion of health.
- Care of the sick in the home, physically handicapped and mentally challenged.
- Surveillance and monitoring.

UNIT III

- Organization and administration of health services in India.
- National health policy.
- Health Care Delivery system in India.
- Health team concept.
 - Centre, State, district, urban health services, rural health services
 - System of medicines
 - Centrally sponsored health schemes
 - Role of voluntary health organizations and international health agencies.
 - Role of voluntary health personnel in the community
 - Public health legislation.

UNIT IV

- Health Education
 - Aims, concepts and scope of health education.
 - National plan for health education.
 - Communication techniques.
 - Methods and media for health education programmes.
 - Planning for health education and role of nurse

UNIT V

- Role of the community health nurse.
- National health programmes.
 - Maternal and child health programmes.

- Family welfare and school health services.
- Occupational health services.
- As a member of the health team.
- Training and supervision of health care workers.

UNIT VI

- Epidemiology
- Definition- Concepts, aims, objectives, methods, principles.
- Epidemiology – Theories and Models.
- Application of Epidemiology, principles and concepts in community health.

UNIT VII

- Bio-Statistics and Vital Statistics
- Introduction, definition and scope, legislation
- Report, recording and compiling of vital statistics at the local, state, national and international level.
- Definitions and methods of computing vital statistics.
- Methods of presenting data
- Management Information System.

PRACTICUM

- Each student will prepare a community profile.
- The students will be allotted families for gaining experience in identifying Family health needs, health counseling and guidance and family budgeting for optimum health.
- The students will participate in the activities of primary health centre.
- Sub – centre, MCH centre.
- Visits will be made to selected health and welfare agencies, water Purification plant and sewage disposal plant, Infectious disease hospital.
- Conduct health educational programmes for individual / groups/ community.

Mental Health Nursing

Placement: Second year

Time Allotted: Theory 60 hrs.

Practical – 240 hrs.

COURSE DESCRIPTION

The course enables the students to recognize and appreciate the causes, symptoms and process of abnormal human behavior. It also introduces the student to the present day treatment modalities in the light of psychological, social and cultural factors affecting human behavior. This course helps the student to learn principles of mental health and psychiatric nursing and to develop beginning skills in the management of the mentally ill in hospital and community.

OBJECTIVES

At the end of the course, the student will

1. Identify and describe the philosophy and principles of mental health nursing.
2. Describe the historical development of mental health and psychiatric nursing.
3. Classify mental disorders.
4. Develop skill in history taking and performing mental status examination.
5. Describe etiological factors, psycho- pathology, clinical features, diagnostic criteria and treatment methods used for mental disorders.
6. Manage the patients with various mental disorders.
7. Communicate therapeutically with patients and their families.
8. Identify role of the nurse in preventive psychiatry.
9. Identify the legal aspects in practice of mental health and psychiatric nursing.

COURSE CONTENTS

UNIT I

- Introduction and Historical Development
- History of psychiatry
- Historical development of mental health nursing.

- Philosophy, principles of mental health and psychiatric nursing.
- Concept of normal and abnormal behavior.
- Role and qualities of mental health and psychiatric nurse.
- Mental health team and functions of team members.
- Legal aspects in psychiatry and mental health services.

UNIT II

- Classification and assessment of mental disorders.
- Terminologies used in Psychiatry.
- Classification of mental disorders.
- Etiological factors and psychopathology of mental disorders.
- History taking and assessment methods for mental disorders.

UNIT III

- Therapeutic Communication
- Communication process
- Interview skills, therapeutic communication techniques. Nurse Patient Relationship, Therapeutic impasse and its management Process recording.

UNIT IV

- Management of mental Disorders.

Diagnostic criteria, treatment and nursing management of patient with following disorders:

- Neurotic Disorders : Anxiety Neurosis, Depressive Neurosis, Obsessive Compulsive Neurosis, Phobic Neurosis and Hypochondria cal Neurosis, Stress related and Somatoform Disorders.
- Psychotic disorders : Schizophrenic form, affective and organic Psychosis.
- Organic Brain Syndromes
- Psychosomatic disorders
- Personality disorders
- Disorders of childhood and adolescence.
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UNIT V

- Management of patients with Substance use disorders
- Substance use and misuse.
- Dependence, intoxication and withdrawal.
- Classification of psychoactive substances
- Etiological & contributory factors
- Psychopathology
- Clinical features
- Diagnostic criteria.
- Treatment and nursing management of patient with substance use disorders.
- Preventive and rehabilitative aspects in substance abuse.

UNIT VI

- Management of mental sub- normality.
- Classification of mental sub- normality.
- Etiological factors, psychopathology, psychometric assessment, diagnostic Criteria and management of sub- normality.

UNIT VII

- Psychiatric Emergencies.
- Types of emergencies, psychopathology, clinical features, assessment and Diagnosis, treatment and nursing management of patient with psychiatric Emergencies.
- Crisis Intervention therapy.

UNIT VIII

- Therapeutic Modalities
- Principles, indication, contraindications and role of nurse in various Treatment methods:
 - Therapeutic community and Milieu therapy
 - Occupational therapy
 - Psychotherapy
 - Behavior therapy
 - Group therapy

- Family therapy
- Pharmacotherapy
- Electro convulsive therapy
- Other miscellaneous therapies.

UNIT IX

- Preventive psychiatry
- Model of prevention
- Role of nurse in preventive psychiatry
- Psychiatric social work.
- Community mental health nursing.
- Community mental health agencies
- National mental Health Programmes.

PRACTICUM

The student will be provided opportunity to:

- Observe, record and report the behavior of their selected patients
- Record the process of interaction.
- Assess the nursing needs of their selected patients, plan and implement the Nursing intervention.
- Counsel the attendant and family members of patient.
- Participate in the activities of psychiatric team.
- Write observation report after a field visit to the following places:
 - Child guidance clinic.
 - School/ Special Schools (For mentally subnormal)
 - Mental Hospital.
 - Community mental health centers.
 - De – addiction centre.

Introduction to Nursing Education

Placement: Second year

Time Allotted: Theory 60 hrs.
Practical – 75 hrs.

COURSE DESCRIPTION

The course introduces the students to principles and concepts of education, curriculum development and methods and media of teaching. It also describes the steps in curriculum development and implementation of educational programmes in nursing.

OBJECTIVES

At the end of the course, the student will

1. Describe the philosophy and principles of education.
2. Explain the teaching – learning process
3. Develop the ability to teach, using various methods and media.
4. Describe the process of assessment.
5. Describe the administrative aspects of school of nursing
6. Participate in planning and organizing an in- service education programme.
7. Develop basic skill of counseling and guidance.

COURSE CONTENTS

UNIT I

- Introduction to education
- Meaning of education, aims, function and principles.
- Philosophy of education
- Factors influencing development of philosophy of nursing education.

UNIT II

- Teaching learning process
- Nature and characteristics of learning.
- Principles and maxims of teaching.
- Formulating objectives.
- Lesson planning.

UNIT III

- Methods of teaching
 - Teaching methods
 - Lecture
 - Discussion
 - Demonstration
 - Group discussion
 - Project
 - Role play
 - Project
 - Role play
 - Panel discussion
 - Symposium
 - Seminar
 - Field trip
 - Workshop
 - Exhibition
 - Programmed instruction
 - Computer Assisted Learning.

Clinical teaching methods:

- Case methods
- Case presentation
- Nursing rounds and reports
- Bedside clinic
- Conference (individual and group)
- Recording of interaction process.

UNIT IV

- Educational media
- The communication process: factors affecting communication.
- Purposes and types of audio- visual aids.
- Graphics aid: Chalk – board, charts, graphs, posters, flash cards, flannel Graph/ khadigraph, bulletin, cartoon.
- Three dimensional aids: objects, specimen, models, puppets.
- Printed aids: slides, films and television, VCR, VCP, overhead projector, Camera, microscope.
- Audio – aids : tape recorder, public address system, computer.

UNIT V

- Methods of assessment
- Purpose and scope of evaluation and assessment.
- Criteria for selection of assessment techniques and methods.
- Assessment of knowledge: essay type question, SAQ (Short Answer Questions).
- MCQ (multiple choice questions).
- Assessment of skills: Observation, Check list, Practical Examination, Viva, Objective structured clinical examination.
- Assessment of attitude: Attitude scale.

UNIT VI

- Management of school of Nursing.
- Planning of School of nursing, organization.
- Recruitment of teaching staff, budget, facilities for the school, students Selection and admission procedure, administrative planning for students, Welfare services for students, maintenance of school records, preparation of Annual reports, INC guidelines for school of nursing.
- Curriculum Development.
 - Concept, Definition and meaning
 - Types of curriculum

- Levels of curriculum/ Approaches to curriculum
- Process/ steps in development of curriculum

- Rotation plan
- Clinical rotation

UNIT VII

- Guidance and Counseling Definition
- Basic principles of guidance and counseling
- Organization of guidance and counseling services
- Counseling process
- Managing disciplinary problems
- Management of crisis

UNIT VIII

- In – service education
- Introduction to nature and scope of in – service education programme.
- Principles of adult learning
- Planning for in service programme.
- Techniques, and methods of staff education programme
- Evaluation of in- service programme.

PRACTICUM

Each student should:

- Conduct five planned teaching using different methods and media.
- Prepare different types of teaching aids
- Plan, organize and conduct in service education programme.
- Conduct at least one counseling session.
- Prepare rotation plans.

Introduction to Nursing Service Administration

Placement: Second year
hrs.

Time Allotted: Theory 60

Practical – 180 hrs.

COURSE DESCRIPTION

The course is designed to give an opportunity to the student to gain an understanding of the principles of administration and its application to nursing service; it is also intended to assist the students to develop an understanding of professional leadership need.

OBJECTIVES

At the end of the course, the student will

1. Identify the principles of administration.
2. Describe the principles and techniques of supervision.
3. Explain the principles and methods of personnel management.
4. Explain the principles of budgeting
5. Organize and manage a nursing unit effectively.
6. Identify dynamics of organizational behavior. Styles and functions of effective leadership.

COURSE CONTENTS

UNIT – I

- Principles and Practice of administration
- Significance elements and principles of administration.
- Organization of Hospital – Definition, Aims, functions and

Classifications, health team.

- Policies of hospital, different departments with special emphasis to Department of nursing & office management.
- Responsibilities of the nursing personnel specially of ward sister, Medico Legal aspects, concept of cost effectiveness

- Planning
 - Planning process: Concept, principles, institutional policies
 - Mission, Philosophy, Objectives
 - Strategic Planning
 - Application to nursing service and education

UNIT – II

- Nursing unit Management
- Physical layout of a nursing unit and necessary facilities
- Factors affecting the quality of nursing care
- Maintenance of a therapeutic environment
- Administration of the unit management of patient care
- Maintenance of physical environment
- Assignment of duties and time plan
- Patient assignment, safety measures, prevention of accidents and Infections
- Maintenance of patient's records and reports, legal responsibilities
- Maintenance of quality nursing care, nursing audit

UNIT – III

- Personnel management
- Staff recruitment and selection, appointment, promotions, personnel Policies and job descriptions
- Job analysis
- Staffing the unit, staffing norms, rotation plan, leave planning, Performance appraisal, staff welfare and management of disciplinary Problems

UNIT – IV

- Supervision
- Principles of supervision, nature and objectives
- Tools and techniques of supervision
- Evaluation
- Nursing audit

- Staff development orientation program
- Skill training
- Leadership development
- Problem solving process

UNIT V

- Material Management
- Principles of material management
- Quality control
- Inventory, care of equipment, safekeeping
- Role of nursing personnel in material management

UNIT VI

- Financial Management
- Budgeting – Principles of budgeting, audit

UNIT VII

- Organizational Behavior
- Group dynamic and human relation, organizational communication
(Hospital Information System)
- Public relations, leadership styles and functions
- Methods of reporting
- Maintaining records and reports

PRACTICUM

- Observe the functioning of nursing administration at various level i.e.

Institution, department, unit.

- Each student will practice ward management under supervision.
- Student will prepare rotation plan of the staff, write reports, give verbal Reports of the ward and assist in maintaining the inventory of the nursing unit.
- Visit to private and government hospital and write observation reports.

Introduction to Nursing Research and Statistics

Placement: Second year
hrs.

Time Allotted: Theory 45

Practical – 120 hrs.

COURSE DESCRIPTION

The course is designed to assist the students to develop an understanding of basic concepts of research and statistics, use the findings of nursing research in nursing practice, apply the knowledge in conducting projects and solve problems related to nursing using scientific method.

OBJECTIVES

At the end of the course, the student will:

1. Define the terms and concepts of nursing research
2. Identify needs and scope of nursing research
3. Identify and define a research problem
4. Locate and list sources of literature for a specific study
5. Describe different research approaches, methods of data collection and sampling techniques with a special reference to survey method.
6. Develop tool for data collection.
7. Enumerate steps of data analysis and present data summary in tabular form.
8. Use descriptive and co- relational statistics in data analysis.
9. Conduct a group research project.

COURSE CONTENTS

A. INTRODUCTION TO RESEARCH METHODOLOGY

UNIT – I

- Steps of scientific methods
- Definition of research
- Need for nursing research
- Characteristics of good research, Research Process

UNIT II

- Statement of research problem.
- Statement of purpose and objectives.
- Definition of research terms.
- Review of literature.

UNIT III

- Research approaches: - historical, survey and experimental.

UNIT IV

- Sampling Techniques and methods of data collection.
- Sampling
- Instruments- questionnaire and Interview
- Observation schedule, records, measurements
- Reliability and validity of instruments.

UNIT V

- Analysis of Data : Tabulation
- Classification and summarization
- Presentation
- Interpretation of data.

UNIT VI

- Communication of research findings.
- Writing Report :
 - Organizing materials for writing
 - Format of the report
 - Use of computers

B. INTRODUCTION TO STATISTICS

UNIT VII

- Descriptive Statistics.
- Frequency Distribution – Types of measure – frequencies, class interval, Graphic methods of describing frequency
- Measures of Central Tendency – Mean, Median and Mode.
- Measures of Variability : Range, Standard deviation
- Introduction to normal probability.

UNIT VIII

- Correlation
- Computation by rank difference methods
- Uses of correlation co- efficient

UNIT IX

- Biostatistics : Crude rates and standardized rates , ratio and estimation of The trends

UNIT X

- Introduction to computers in nursing.
- Introduction to computers and disk- operating system.
- Introduction to word processing

- Introduction to data base
- Windows applications, word, excel, power point, multimedia.
- Use of statistical packages.
- Introduction to Internet & use of electronic mail
- Computer aided teaching & testing.

PRACTICUM

Students will conduct research project in small groups in selected areas of nursing and submit a report (group studies may include studying of existing health practices, improved practices of nursing (procedures), health records, patient records and survey of nursing literature.



BHARATI VIDYAPEETH
(Deemed to be University)

COLLEGE OF NURSING

SYLLABUS

BASIC B.Sc. NURSING

BHARATI VIDYAPEETH

(Deemed to be University)

INTRODUCTION

Bharati Vidyapeeth, which is the recent body of Bharati Vidyapeeth University, was established on 10th May 1964 by Dr.Patangrao Kadam with a wider objective of contributing to intellectual awakening and social cultural transformation through dynamic education. Under the imaginative, dynamic and socially committed leadership of the founder Dr.Patangrao Kadam, Bharati Vidyapeeth has made astonishing strides in the field of education .The Vidyapeeth has so far has so far established 171 educational institutions imparting education to the students' right from pre-primary stage to post graduate stage and PhD

The Ministry of Human Resources Development Government of India on the recommendation of University Grant Commission accorded the status of Deemed University to 12 units of Bharati Vidyapeeth through their notification no.F.9-15/95 U.3 dated 26th April 1996 under the section of the University Grant Commission Act of 1956.

Subsequently, the Government of India on the recommendation of UGC and AICTE included three more institutions of Bharati Vidyapeeth within the ambit of Bharati Vidyapeeth University vide its notification no.F.9-15/95-4-3 dated 28th July 2000.

The University Grant Commission vide their letter no.F.No.3-2/90 CPP-1 dated 17 August 2002 have agreed to bring two more research institutions within the ambit of Bharati Vidyapeeth University.

Government of India has brought the following seven institutions of Bharati Vidyapeeth located in different cities within the purview of Bharati Vidyapeeth Deemed University as its constituents units vide their notification no.F.9-16/2004-U-3dt 25/02/2005.With the inclusion of these seven institutions located at different places Bharati Vidyapeeth Deemed University has now become a multi campus University.

Medical college at Sangli and a Dental College at Navi Mumbai have also been brought within the ambit of Bharati Vidyapeeth University by Ministry of Human Resource Development vide its notification No.F.9-7/2004-U3 dt.19/08/2004 .

In Feb 2005 once again Government of India vide notification No.F.9-16/2004-U3 dt.25 Feb 2005 brought seven more institutions under the ambit of Bharati Vidyapeeth University.

This is probably the first and only university having under its umbrella diversified disciplines of professional and non-professional categories such as medicine , Dentistry, Nursing, Ayurvedic and homeopathic medicine, Physical education , natural and physical sciences , social science ,commerce law and humanities.

The degree and diploma awarded by the Universities have the same status and recognition as those awarded by any other Indian University recognized by University Grant Commission, New Delhi .The universities operates its educational programmes in accordance with the rules, regulations and guidelines of various statutory Central Government Bodies like Medical Council of India, Dental Council of India, Bar Council Of India, Indian Nursing Council and Central Council of Indian Medicine.

COLLEGE OF NURSING, PUNE

Bharati Vidyapeeth College of Nursing was established in the year 1992 with prior permission of University of Pune to which it was having affiliation .It is now a constituent unit of this university. This is the first College of Nursing in the non- government sector in Pune. Adequate facilities for clinical studies have been provided and the college is attached to the hospital of Bharati Vidyapeeth Medical Foundation, Dhanakwadi, Pune.

The college has 65 intake capacities for B.Sc Nursing ,40 seats for P.B.B.Sc Nursing, & 25 seats for M.Sc Nursing

The college has approval of Government of Indian, UGC, Indian Nursing Council, and Maharashtra Nursing Council. The college has separate hostel facilities for Boys and Girls. The curriculum and syllabus is made and updated as per the present needs in the Maharashtra Nursing Council and the needs of society.

COLLEGE OF NURSING, SANGLI

Bharati Vidyapeeth University, College of Nursing, started in 2007 at Bharati Vidyapeeth University campus, Sangli. The constituent unit of Bharati Vidyapeeth University. The college has the permission from Maharashtra Nursing council Mumbai and Indian Nursing council New Delhi.

The college has 50 intake capacities for B.Sc Nursing & 30 seats for P.B.B.Sc Nursing.The college is equipped with Nursing Arts, Community Health & Nutrition laboratories, teaching aids & a departmental Library

The college has its own Medical college in the same campus, the students get exposure to the teaching of faculty members having expertise in Anatomy, Physiology, Biochemistry, Pathology & Microbiology & other subjects.

Similarly, the students also have access to the library of our Medical College, which has a very vast collection of reference books. The college also subscribes to journals and makes audio- video material & equipment available to the students.

Hostel facilities with modern amenities are available to our student on the campus. The atmosphere in the college is very congenial for professional growth.

COLLEGE OF NURSING, NAVI MUMBAI

Bharati Vidyapeeth Deemed University, being one of the largest networks of educational institutions, established the full-fledged Degree College of Nursing in Navi Mumbai since 2009. It offers a four year Course leading to the B.Sc. Nursing Degree and two year P.B.BSc. nursing course and is approved by Indian Nursing Council and Maharashtra Nursing Council. It is accredited with prestigious 'A' grade in 2004 and reaccredited with 'A' grade in 2011 by the NAAC Bangalore. The college started with the objectives of training the students to become competent nurses for first level positions in nursing, to provide quality care in hospitals and to community. The College has become the most preferred destination of students aspiring for a career in nursing from all over India.

Committed to excellence in Nursing Education, Clinical Practice and Community Service, this college offers undergraduate programme in Nursing. The college has been recognized by the Indian Nursing Council (INS), State Nursing Council (MNC), & UGC.

The college has excellent infrastructure such as well-structured spacious class rooms, continuously updated laboratories, national and international books, journal and e-journals and hostels with all necessary amenities and facilities.

The clinical teaching and training of students are conducted in the 392 bedded Navi Mumbai Municipal Corporation Hospital at Vashi. The students are also deputed for training to other reputed local hospitals in Mumbai such as Thane Regional Mental Hospital, TATA Cancer Hospital, and Wadia Hospital for specialized experience. The community Health experience is given in PHC at Wavanje village (Rural) and Juhugaon (Urban).

PHILOSOPHY OF BHARATI VIDYAPEETH

Bharati Vidyapeeth was established in May, 1964 with a philosophy of contributing to the intellectual awakening and social transformation in different spheres including educational, economic, social and cultural fields in India and more particularly in Maharashtra. The activities have been geared to bring about all sided progress and welfare of different section in population including women, tribal and the rural people.

Bharati Vidyapeeth Nursing College also functions within the framework of Bharati Vidyapeeth philosophy.

AIM:

To prepare first level of nurse manager who can take up the responsibility in the hospitals community and educational institutions and provided primary secondary and tertiary care.

OBJECTIVES:

After completion of four years BSc Nursing course

Students will be able to

1. Develop skill in providing quality care by using nursing process in different clinical settings
2. Render comprehensive care to families by using nursing process.
3. Take leadership role at first level management in nursing services and education.
4. Participate in promotion, preventive and restorative health care delivery system
5. Practice ethical value in nursing profession.
6. Aware of research methodology and capable of assisting in research project

ADMISSION REQUIREMENTS:

1. The minimum age for admission shall be 17 years on or before 31st December of the year of admission
2. Minimum educational requirement shall be passing of Higher secondary school certificate examination (12 years course), or Senior School Certificate examination (10+2), Pre-degree examination (1-2) or an equivalent with 12 years schooling from a recognized board or university with science (Physics, Chemistry, Biology) and English with minimum of 50% aggregate marks (PCBE).
3. Candidates shall be medically fit.

ENTRANCE SELECTION TEST:

Selection of the candidate shall be based on the merit of entrance examination held by University.

DURATION:

Duration of the course shall be of four years

VACATION:

7 weeks of vacation shall be given in each year.

AWARD OF CLASS

First class with distinction	Aggregate 70% and above
First class	Aggregate 60% and above but less than 70%
Higher second class	Aggregate 55% and above but less than 55%
Second class	Aggregate 55% and above but less than 55%
Fail	Less than 50%

The award of class will be based on aggregate marks obtained by a student in F.Y, S.Y, T.Y and Fourth year taken together.

DURATION

Course Duration	4 years
Weeks available per year	52 weeks
Vacation	8 weeks
Gazetted holidays	3 weeks
Examination (including preparatory)	4 weeks
Available weeks	37 weeks
Hours per week	40 hours
Practical	30 hours per week
Theory	10 hours per week
Internship practical	48 hours per week
Hours available per academic year	1480 (37 week x 40 hours)

COURSE OF INSTRUCTION

FIRST YEAR

SUBJECT	Theory(in hrs) (Class &lab)	Practical (in hrs) (Clinical)	(In hrs)
1.* English	60		
2. Anatomy	60		
3. Physiology	60		
4. Nutrition	60		
5. Biochemistry	30		
6. Nursing Foundation	265+200	450	
7. Psychology	60		
8. Introduction to computers	45		
9. ** Marathi / Regional language	30		
10. Library work / self study			50
Total Hours	870	450	50
Total hours = 1420 hrs			

**** Optional**

SECOND YEAR

Subject	Theory(in hrs) (class & lab)	Practical (in hrs) (clinical)	(In hrs)
1. Sociology	60		
2. Pharmacology	45		
3. Pathology	30		
4. Genetics	15		
5. Medical surgical nursing (adult including geriatric)-I	210	720	
6. Community health nursing I	90	135	
7. Microbiology	60		
9.Environmental Science	50		
8. Library work/self study			50
9. Co-curricular activities			35
Total Hours	560	855	85
Total hours = 1450			

THIRD YEAR

Subject	Theory(in hrs) (class & lab)	Practical (in hrs) (clinical)	(In hrs)
1. Medical surgical nursing (adult including geriatric)-II	120	270	
2. Child Health Nursing	90	270	
3. Mental Health Nursing	90	270	
4. Communication & Educational Technology	60+30		
5. Nursing Research & Statistics	45	*	
5. Library work & Self study			50
6. Co-curricular activities			50
Total Hours	435	810	100
Total hours = 1300 hrs			

*Project Work

FOURTH YEAR

Subject	Theory(in hrs) (class & lab)	Practical (in hrs) (clinical)	(In hrs)
1. Midwifery & Obstetrical Nursing	90	360	
2. Community health nursing II	90	135	
3. Management of Nursing Service & Education	60+30		
Total Hours	270	495	
Total hours = 810 hrs			

INTERN-SHIP (Integrated practice)

48 hours per week

Subject	Theory(in hrs) (class & lab)	Practical (in hrs) (clinical)	(In weeks)
1. Midwifery & Obstetrical Nursing		240	5
2. Community health Nursing II		195	4
3. Medical surgical Nursing (adult including geriatrics)		430	9
4. Child Health Nursing		145	3
5. Mental Health Nursing		95	2
Total Hours		1150	23
Total hours = 1150hrs			

NOTE: -

1. Internship means 8 hours of integrated clinical duties in which two weeks of evening and night shift duties are included.
2. Internship should be carried out as 8 hours per day at 48 hours per week.
3. Student during internship will be supervised by nursing teachers.
4. Fourth final examination to be held only after completion of internship.

SCHEME OF EXAMINATION

FIRST YEAR

Subject	ASSESSMENT				
	Theory	Hours	Internal	External	Total
1. Anatomy & Physiology		3	25	75	100
2. Nutrition & Biochemistry		3	25	75	100
3. Nursing foundation		3	25	75	100
4. Psychology		3	25	75	100
5.English			25	75	100
6.Introduction to computers (Internal)			25	75	100
7. Marathi (Internal exam)		2		50	50
Practical & Viva					
1. Nursing Foundations			100	100	200

SECOND YEAR

Subject	ASSESSMENT				
	Theory	Hours	Internal	External	Total
1. Sociology		3	25	75	100
2. Medical surgical nursing		3	25	75	100
3.Pharmacology, Pathology & Genetics		3	25	75	100
4. Community Health nursing- 1		3	25	75	100
5. Microbiology		3	25	75	100
Practical & Viva					
1. Medical surgical nursing-1			100	100	200

THIRD YEAR

SUBJECT	ASSESSMENT			
Theory	Hours	Internal	External	Total
1. Medical surgical nursing-II	3	25	75	100
2. Child Health Nursing	3	25	75	100
3. Mental Health Nursing	3	25	75	100
4. Nursing Research & Statistics	3	25	75	100
4. Communication & Educational Technology	3	25	75	100
Practical & Viva				
1. Medical surgical nursing II		50	50	100
2. Child Health Nursing		50	50	100
3. Mental Health Nursing		50	50	100

FOURTH YEAR

SUBJECT	ASSESSMENT			
Theory	Hours	Internal	External	Total
1. Midwifery & Obstetrical Nursing	3	25	75	100
2. Community health nursing II	3	25	75	100
4. Management of Nursing Service & Education	3	25	75	100
Practical & Viva				
1. Midwifery & Obstetrical Nursing -II	3	50	50	100
2. Community Health Nursing -II	3	50	50	100

NOTE:-

1. Anatomy and physiology-Question paper will consist of section I MCQ's – 15 (Anatomy & Physiology), Section II – 30 marks (Anatomy), Section III – 30 marks (Physiology)
2. Nutrition & Biochemistry- Question Paper will consist of section I MCQ's – 15 marks (Nutrition & Biochemistry), Section II – 35 marks (Nutrition) , Section III – 25 marks (Biochemistry)
Nutrition of 45 marks & section B Biochemistry of 30 marks.
3. **Pharmacology, Pathology & Genetics-section A Pharmacology with 38.Marks, section B Pathology of 25 marks & genetics with 12 marks.**
4. Nursing research & statistics – Nursing research should be of 50 marks & statistics of 25 marks
5. Minimum pass marks shall be 40% for English only.
6. Theory and practical exam for introductions to computers to be conducted as college exams and marks to be sent to the university for inclusion in the mark sheet
7. Minimum pass marks shall be 50% in each of theory & practical paper separately.
8. The candidate must have minimum of 80% attendance (irrespective of the kind of absence.) In theory & practical in each subject for appearing of examination.
9. A candidate must have 100% attendance in each of the practical areas before award of the degree.
10. A candidate has to pass in theory & practical exam separately in each of the paper.
11. If the candidate fails in either theory or practical exam he/she has to reappear for both the papers (Theory & practical).
12. Maximum number of attempts permitted for each paper is 3 including first attempt.
13. **Candidate shall not be permitted to the subsequent higher examination unless the candidate has passed the previous examination.**
14. The maximum period to complete the course successfully should not exceed 8 years.
15. Maximum number of candidates for practical examination should not exceed 20 per day.
16. All practical examinations must be held in the respective clinical areas.
17. One internal & one external examiner should jointly conduct the practical exam for each student.
18. An examiner should be a lecturer or above in a college of nursing with M.Sc.(N) in concerned subject & minimum of 3 years of teaching experience. To be an examiner for Nursing Foundation course faculty having M.Sc.(N) with any shall be considered.
19. Student has to pass in internal assessment and university Exam separately with 50% marks each.

**B.Sc.
NURSING
FIRST YEAR**

ENGLISH

Placement- First Year

Time:-Theory- 60 hours

Course Description: The course is designed to enable students to enhance ability to comprehend spoken and written English (and use English) required for effective communication in their professional work. Student will practice their skills in verbal and written English during clinical and classroom experiences.

UNIT	CONTENT	HOURS
UNIT-1	<ul style="list-style-type: none">• Review of Grammar• Remedial study of Grammar• Building Vocabulary• Phonetics• Public Speaking	10 hrs.
UNIT-2	* Read and comprehend prescribed course books	30 hrs.
UNIT-3	* Various forms of composition <ul style="list-style-type: none">- Letter writing- Note taking- Precise writing- Nurse notes- Anecdotal records- Diary writing- Reports on health problems etc.- Resume/CV	10 hrs.
UNIT-4	* Spoken English <ul style="list-style-type: none">- Oral report- Discussion- Debate- Telephonic conversation	6 hrs.
UNIT-5	* Listening comprehension <ul style="list-style-type: none">- Media, audio, video, speeches etc.	4 hrs.

ANATOMY

Placement- First Year

Time:- Theory-60 hours

Course Description: The course is designed to enable students to acquire Knowledge of normal structure of various human body system and understand the alteration in anatomical structures in disease in disease and practice of nursing.

UNIT	CONTENT	HOURS
UNIT-1	Introduction to Anatomical terms organization of the human body - Human cell structure - Tissues – definition, types, characteristics, classification, location, function and formation - Membranes and glands – classification and structure. - Alteration in disease Application and implementation in nursing	5 hrs.
UNIT-2	The Skeletal System - Bones- types, structure, axial & appendicular skeleton - Bone formation and growth - Description of bones - Joint – classification and structure Alteration in disease Application and implication in nursing	6 hrs.
UNIT-3	The Muscular System - Types and structure of muscles - Muscle group Alteration in disease Application and implication in nursing	7 hrs.
UNIT-4	The Nervous System - Structure of neurologia & neurons - Somatic nervous system Structure of brain, spinal chord, cranial nerves, peripheral nerves - Autonomic nervous system- (Sympathetic, parasympathetic) Structure & location Alteration in disease Application and implication in nursing	6 hrs.

UNIT-5	<p>The Sensory Organs</p> <ul style="list-style-type: none"> - Structure of skin, eye, ear, nose, tongue (Auditory and olfactory apparatus) <p>Alteration in disease Application and implication in nursing</p>	6 hrs.
UNIT-6	<p>Circulatory and Lymphatic system</p> <ul style="list-style-type: none"> - The circulatory system <ul style="list-style-type: none"> * Blood - Microscopic structure * Structure of heart * Structure of blood vessels- Arterial and venous system *Circulation: systemic, pulmonary, coronary. - Lymphatic system <ul style="list-style-type: none"> * Lymphatic vessels and lymph * Lymphatic tissues <ul style="list-style-type: none"> - Thymus gland - Lymph nodes 8 spleen - Lymphatic Nodules <p>Alteration in disease Application and implication in nursing</p>	7 hrs.
UNIT-7	<p>The Respiratory System</p> <ul style="list-style-type: none"> - Structure of the organs of respiration - Muscles of respiration Intercostals and diaphragm <p>Alteration in disease Application and implication in nursing</p>	5 hrs.
UNIT-8	<p>The Digestive System</p> <ul style="list-style-type: none"> - Structure of alimentary tract and accessory organs of digestion <p>Alteration in disease Application and implication in nursing</p>	6 hrs.
UNIT-9	<p>The Excretory System (Urinary)</p> <ul style="list-style-type: none"> - Structure of organs of urinary - System: kidney, ureters, urinary bladder, urethra, structure of skin. <p>Alteration in disease Application and implication in nursing</p>	4 hrs.

UNIT-10	<p>The Endocrine System</p> <ul style="list-style-type: none"> - Structure of pituitary, pancreas, thyroid, parathyroid, thymus and adrenal glands <p>Alteration in disease Application and implication in nursing</p>	4 hrs.
UNIT-11	<p>The Reproductive System including Breast</p> <ul style="list-style-type: none"> - Structure of female reproductive organs - Structure of male reproductive organs - Structure of breast <p>Alteration in disease Application and implication in nursing</p>	4 hrs.

PHYSIOLOGY

Placement- First Year

Time : Theory 60 hrs.

Course Description: The course is designed to assist the students to acquire Knowledge of the normal physiology of various human body systems and under stand the alteration in physiology disease and practice of nursing.

UNIT	CONTENT	HOURS
UNIT-1	Cell physiology * Tissue – formation, repair * Membranes & gland – functions Alteration in disease Application and implication in nursing	4 hrs.
UNIT-2	Skeleton System * Bone formation and growth * Bones – functions and movements of bones of axial & appendicular skeleton, bone healing * Joints and joint movements Alteration in disease Application and implication in nursing	4 hrs.
UNIT-3	Muscular System * Muscle movements, muscle tone, physiology of muscle contraction, levels and maintenance of posture Alteration in disease Application and implication in nursing	4 hrs.
UNIT-4	Nervous System * Function of neuralgia & neurons * Stimulus & nerve-impulse- definition and mechanism * Function of brain, spinal cord, Cranial & spinal nerves * Cerebrospinal fluid-composition. Circulation and function * Reflex arc, reflex action and reflexes *Autonomic function - Pain: somatic, visceral and referred. - Autonomic learning and biofeedback Alteration in disease Application and implication in nursing	7 hrs.

UNIT-5	Circulatory System * Blood formation, composition, blood group, blood coagulation * Hemoglobin : structure, synthesis and breakdown, variation of molecules, estimation * Function of heart, conduction, cardiac cycle, circulation- principles, control, factors influencing BP & Pulse Alteration in disease Application and implication in nursing	8 hrs.
UNIT-6	The Respiratory System * Functions of respiratory system * Physiology of respiration * Pulmonary ventilation, volume * Mechanics of respiration * Gaseous exchange in lungs * Carriage of oxygen & carbon dioxide * Exchange of gases in tissues * Regulation of respiration Alteration in disease Application and implication in nursing	6 hrs.
UNIT-7	The Digestive System * Functions of organ of digestive tract. Movements of alimentary tract. Digestion in mouth stomach small intestine, large intestine, absorption of food, function of liver, gall bladder and pancreas. * Metabolism of carbohydrates, protein and fat. Alteration in disease Application and implication in nursing	6 hrs.
UNIT-8	The Excretory System * Function of Kidneys, ureters, urinary bladder & urethra. * Composition of urine * Mechanism of urine formation * Function of skin * Regulation of body temperature * fluid and electrolyte balance Alteration in disease Application and implication in nursing	5 hrs.
UNIT-9	The Sensory organs * Functions of skin, eye, ear, nose, tongue. Alteration in disease Application and implication in nursing	4 hrs.

UNIT-10	<p>The Endocrine System</p> <ul style="list-style-type: none"> * Function of Pituitary, pineal body, thymus, thyroid, parathyroid, pancreas, suprarenal, placenta & ovaries & testes. <p>Alteration in disease</p> <p>Application and implication in nursing</p>	5 hrs.
UNIT-11	<p>The Reproductive system</p> <ul style="list-style-type: none"> * Reproduction of cells-DNA. Mitosis, spermatogenesis, oogenesis * Function of female reproductive organs: function of breast, female sexual cycle * Introduction of embryology * Function of male reproductive organs, male function in reproduction, male fertility system. <p>Alteration in disease</p> <p>Application and implication in nursing</p>	5 hrs
UNIT-12	<p>Lymphatic and Immunological system</p> <ul style="list-style-type: none"> • Circulation of lymph • Immunity - Formation of T-cells & B-cells - Types of immune response - Antigens - Cytokines - Antibodies 	

NUTRITION

Placement- First Year

Time: Theory 60 hrs

Course Description: The course is designed to assist the students to acquire knowledge of Nutrition for maintenance of optimal health at different stages of life and its application for practice of nursing.

UNIT	CONTENT	HOURS
UNIT-1	<p>Introduction</p> <ul style="list-style-type: none">• Nutrition<ul style="list-style-type: none">- History- Concepts <p>* Role of nutrition in maintaining health</p> <p>* Nutritional problem in India</p> <p>* National Nutritional Policy</p> <p>* Factors affecting food and nutrition: socio-economic, cultural, tradition, production, system of distribution, life style and food habits etc.</p> <p>* Role of food and its medicinal value</p> <p>* Classification of food</p> <p>* Food standards</p> <p>* Element of Nutrition : macro and micro</p> <p>* Calorie BMR</p>	4hrs
UNIT-2	<p>Carbohydrates</p> <ul style="list-style-type: none">• Classification• Caloric value• Recommended daily allowances• Dietary Sources• Functions• Digestion, absorption and storage, metabolism of carbohydrates• Malnutrition: Deficiencies and over consumption	2 hrs.
UNIT-3	<p>Fats</p> <ul style="list-style-type: none">* Classification* Caloric Value* Recommended daily allowances* Dietary sources* Functions* Digestion, absorption and storage, metabolism of fats* Malnutrition: Deficiencies and over consumption	2 hrs.

UNIT-4	<p>Proteins</p> <ul style="list-style-type: none"> • Classification • Caloric value • Recommended daily allowances • Dietary sources • Functions • Digestion, absorption and storage & metabolism • Malnutrition: Deficiencies and over consumption 	2 hrs.
UNIT-5	<p>Energy</p> <ul style="list-style-type: none"> * Unit of energy- Kcal * Energy requirements of different categories of people * Measurement of energy * Body mass index (BMI) & basic metabolism * Basal metabolic rate (BMR) – determine the factors affecting. 	3 hrs.
UNIT-6	<p>Vitamins</p> <ul style="list-style-type: none"> • Classification • Recommended daily allowance • Dietary sources • Functions • Absorption, synthesis, metabolism, storage and excretion • Deficiencies • Hypervitaminosis 	4 hrs.
UNIT-7	<p>Minerals</p> <ul style="list-style-type: none"> * Classification * Recommended daily allowance * Dietary sources * Functions * Absorption, synthesis, metabolism, storage and exertion * Deficiencies * Over composition and toxicity 	4 hrs.
UNIT-8	<p>Water and Electrolyte Balance</p> <ul style="list-style-type: none"> * Water :- Daily requirements, regulation of water, metabolism, distribution of body water * Electrolytes: Types, sources, composition of body fluids * Maintenance of Fluid & electrolyte balance * Over Hydration dehydration and water intoxication * Electrolyte Imbalance 	3 hrs.

UNIT-9	<p>Cookery rules and preservation of Nutrients</p> <ul style="list-style-type: none"> * Principles, methods of cooking and serving <p>Preservation of nutrients</p> <ul style="list-style-type: none"> * Safe food handling – toxicity * Storage of Food * Food Preservation, food additives and its principles * Preservation of food adulteration Act(PFA) * Food standards * Preparation of simple beverages of different types of food 	5 hrs.
UNIT-10	<p>Balanced diet</p> <ul style="list-style-type: none"> * Elements * Food groups * Recommended daily allowance * Nutritive value of food * Calculation of balanced diet for different categories of people * Planning menu * Budgeting of food * Introduction to therapeutic diet: Naturopathy=Diet 	5 hrs.
UNIT-11	<p>Role of nurse nutritional programme</p> <ul style="list-style-type: none"> • National programme related to nutrition <ul style="list-style-type: none"> - Vitamin A deficiency programme - National iodine deficiency disorders (IDD) programme - Mid-day meal programme - Integrated child development scheme • National & International agencies working to wards food/nutrition <ul style="list-style-type: none"> - NIPCCD, CARE, FAQ, NIN, CFTRI (Central food technology and research institute) etc. • Assessment of nutritional status • Nutrition education and role of nurse. 	

BIOCHEMISTRY
Placement-First Year

Time: Theory 30 hrs.

Course Description: The course is designed to assist the students to acquire knowledge of the normal biochemical composition and functioning of human body and understand the alteration in biochemistry in disease for practice for practice of nursing

UNIT	CONTENT	HOURS
UNIT-1	Introduction <ul style="list-style-type: none"> • Definition and significance in nursing • Review of structure, composition and function of cell • Prokaryote and Eukaryote cell organization • Microscopy 	3hrs.
UNIT-2	Structure and Function of Cell membrane <ul style="list-style-type: none"> • Fluid mosaic model tight junction, cytoskeleton • Transport mechanism: diffusion, osmosis, filtration, active channel, sodium pump • Acid base balance- maintenance and diagnostic tests - PH buffers 	6hrs
Unit -3	Composition and Metabolism of Carbohydrates <ul style="list-style-type: none"> • Types structure, composition and uses • Monosaccharide, Disaccharides, Polysaccharides oligosaccharides • Metabolism - Pathways of Glucose <ul style="list-style-type: none"> - Glycolysis - Gluconeogenesis Cori's cycle Tricarboxylic acid(TCA) cycle - Glycogenolysis - Pentose phosphate - Pathways (Hexose mono phosphate) - Regulation of blood glucose level Investigation & their interpretation	6hrs
Unit -4	Composition and metabolism of lipids <ul style="list-style-type: none"> • Types, structure , composition and uses of fatty acids Nomenclature Roles and prostaglandin's • Metabolism of Fatty acids <ul style="list-style-type: none"> -Breakdown -Synthesis • Metabolism of Triglycerols • Cholesterol metabolism <ul style="list-style-type: none"> * Biosynthesis and its regulation <ul style="list-style-type: none"> - Bile salts and bilirubin - Vitamin D -Steroid hormones • Lipoproteins and their functions <ul style="list-style-type: none"> - VLDLs- IDLIS and HDLs - Transport of lipids 	4hrs

	- Arteriosclerosis Investigation and their interpretation	
Unit -5	<p>Composition and metabolism of Amino acids and proteins</p> <p>* Types, structure, composition and uses acids and proteins</p> <p>* Metabolism of amino acids and proteins</p> <ul style="list-style-type: none"> • Protein synthesis Targeting & glycosylation • Chemotherapy • Electrophoresis • Sequencing <p>* Metabolism of Nitrogen</p> <ul style="list-style-type: none"> • Fixation & assimilation • Urea cycle • Hems and chlorophylls <p>* Enzymes and co-enzymes</p> <ul style="list-style-type: none"> • Classification • Properties • Kinetics & inhibition • Control <p>Investigation and their interpretation</p>	6hrs
Unit -6	<p>Composition and Vitamins and minerals</p> <p>* Vitamins & Minerals</p> <ul style="list-style-type: none"> - Structure - Classification - Properties - Absorptions - Storage & transportations - Normal concentration investigation and their interpretation 	2hrs
Unit -7	<p>Immunochemistry</p> <ul style="list-style-type: none"> - Immune response - Structure & Classification of immunoglobins response - Mechanism of antibody production - Antigen: HLA typing - Free radical & antioxidants - Specialized proteins: Collagen Elastin Keratin Myosin, Lens Protein - Electrophoretic and quantitative determinations of immunoglobins- ELISA etc <p>Investigation and their interpretation</p>	3hrs

NURSING FOUNDATION**Placement: First Year****Theory-265hrs
Practical- 650hrs
(200lab and 450 clinical)**

Course Description: This course is designed to help the students to develop an understanding of the philosophy, objectives, theories and process of nursing in various supervised clinical setting. It is aimed at helping the students to acquire knowledge understanding and skill in techniques of nursing and practice them in supervised clinical setting

UNIT	CONTENT	HOURS
UNIT-1	<p>Introduction</p> <ul style="list-style-type: none">* Concept of health: Health – Illness continuum* Factors influencing health* Causes and risk factors for developing illness* Body defenses : Immunity and immunization* Illness & illness behavior* Impact of illness on patient and family* Health care services: health promotion and prevention primary care, diagnosis, treatment, rehabilitation and continuing care.* Health care team* Types of health care agencies* Hospitals; Types, organization and functions* Health promotion and level of disease prevention* Primary health care and its delivery: Role of nurse.	10 hrs.
UNIT-2	<p>Nursing as a profession</p> <ul style="list-style-type: none">* Definition and characteristics of a profession* Nursing<ul style="list-style-type: none">- Definition, concepts, philosophy, objectives.- Characteristics, nature and scope of nursing practice- Function of nurse- Qualities of nurse- Categories of nursing personnel- Nursing as a profession- History of nursing in India* Values : Definition, types, values clarification and values professional nursing: caring and advocacy* Ethics :<ul style="list-style-type: none">- Definition and ethical principles- Code of ethics and professional conduct for nurse.	16 hrs.

Unit -3	<p>Hospital admission and discharge</p> <ul style="list-style-type: none"> * Admission to the hospital <ul style="list-style-type: none"> - Unit and its preparation admission bed - Admission procedure - Special considerations - Medico-legal issues - Roles and responsibilities of the nurse * Discharge from the hospital <ul style="list-style-type: none"> - Types: Planned discharge, lamma and abscond, referral <p>And transfers</p> <ul style="list-style-type: none"> - Discharge planning - Discharge procedure - Special consideration - Medico- legal issues - Roles and responsibilities of the nurse - Care of the unit after discharge 	4 hrs.
Unit -4	<p>Communication and the nurse patient relationship</p> <ul style="list-style-type: none"> * Communication: Levels, elements, types, modes, process, factors influencing communication. <ul style="list-style-type: none"> - Methods of effective communication <ul style="list-style-type: none"> # Attending skills # Rapport building skills # Empathy skill - Barriers to effective communication * Helping relationship (NPR): dimensions of helping relationships, phases of a helping relationship * Communicating effectively with patient, families and team members and maintain effective human relation with special reference to communicating with vulnerable group (children, woman, physically and mentally challenged and elderly) * Patient teaching: Importance purpose, process, role of nurse and integrating teaching in nursing process. 	10 hrs

Unit -5	<p>The Nursing process</p> <ul style="list-style-type: none"> * Critical thinking and nursing judgment <ul style="list-style-type: none"> - Critical thinking: Thinking and learning - Competencies, attitude for critical thinking, levels critical thinking in nursing * Nursing process overview: <ul style="list-style-type: none"> Application in practice <ul style="list-style-type: none"> - Nursing process format: INC, current format - Assessment <ul style="list-style-type: none"> # Collection of data: types, sources, methods - Nursing Diagnosis <ul style="list-style-type: none"> # Identification of client problems # Nursing diagnosis statement # Difference between medical and nursing diagnosis - Planning - Establishing goals and expected outcomes - Selection of intervention: Protocols and standing orders - Writing the nursing care plan * Implementation <ul style="list-style-type: none"> - Implementing the plan of care * Evaluation <ul style="list-style-type: none"> - Outcome of care - Review and modify * Documentation and reporting 	15 hrs
Unit -6	<p>Documentation and reporting</p> <ul style="list-style-type: none"> * Documentation: purpose of recording and reporting * Communication within the health care team * Types of record: ward records, medical/nursing records * Common record-keeping forms, computerized documentation * Guidelines for reporting :Factual basis, accuracy , completeness, current ness, organization, confidentiality * Methods of recording. * Reporting change –of shift reports: transfer reports, incident reports * Minimizing legal liability through effective record keeping 	4hrs

Unit -7	<p>Vital sign</p> <ul style="list-style-type: none"> *Guidelines for taking signs: *Body temperature <ul style="list-style-type: none"> -Physiology, regulation .Factor affecting body Temperature. - Assessment of body temperature: sites, equipments and technique special considerations - Temperature alterations: Hyperthermia, heat stroke, hypothermia - Hot and cold applications * Pulse <ul style="list-style-type: none"> - Physiology and regulation, characteristics of the pulse, factors affecting pulse - Assessment of pulse: sites, location, equipment and technique, Special consideration - Alteration in pulse * Respiration <ul style="list-style-type: none"> - Physiology and regulation, mechanics of breathing Characteristics of the respiration, factors affecting respiration - Assessment of pulse: site, location, equipments and technique, special consideration - Alteration in pulse. * Respiration: <ul style="list-style-type: none"> - Physiology and regulation, mechanics of breathing, characteristics, Factors affecting respiration - Assessment of respiration: technique, special consideration - Alteration in respiration * Blood pressure <ul style="list-style-type: none"> - Physiology and regulation, characteristics of blood pressure, Factors affecting blood pressure. - Assessment of blood pressure: equipments, technique, special consideration. - Alteration in blood pressure * Reading of vital signs 	15hrs
UNIT 8	<p>Health assessment</p> <ul style="list-style-type: none"> # Purpose # Process of health assessment <ul style="list-style-type: none"> - Health history - Physical examination # Methods- inspection., palpation, percussion, auscultation olfaction # Preparation of examination; patient and unit # General assessment # Assessment of each body system # Recording of health assessment 	30 hrs

UNIT 9	<p>Machinery equipment and Linen</p> <ul style="list-style-type: none"> - Type Disposable and reusable – linen, rubber gods, glass ware, mental, plastics, furniture machinery <p>Introduction</p> <ul style="list-style-type: none"> - Indent - Maintenance - Inventory 	5hrs
UNIT 10	<p>Meeting needs of patient</p> <p>* Basic needs (Activity of daily living)</p> <ul style="list-style-type: none"> - Providing safe and clean environment - Physical- environment, temperature humidity, noise, ventilation, light, odors, pests control, reduction of physical hazards: Fire accidents - Safety devices restraints, side rails, airways, trapeze etc. - Role of nurse in providing safe and clean environment <p>* Hygiene - Factors influencing hygiene practices</p> <ul style="list-style-type: none"> - Hygienic care: care of the skin – bath and pressure points, feet and nail, oral cavity, hair care, eyes, ear and nose - Assessment, principles, types, equipments procedure, special considerations - Patent environment : Room equipment and linen, making patient beds - Types of beds and bed making - Comport:- - Factors influencing comport - Comport devices <p>* Physiological needs;</p> <p># Sleep & rest</p> <ul style="list-style-type: none"> - Physiology of sleep - Factors affecting Sleep - Promoting rest & sleep - Sleep disorders <p># Nutrition</p> <ul style="list-style-type: none"> - Importance - Factors affecting nutritional needs - Assessments of nutritional needs variables - meeting nutritional needs principles, equipments, procedure and special considerations <p>* Oral</p> <p>* Central : Naso/ orgastric, gastrostomy</p> <p>* Parental</p>	60hrs

*** Urinary elimination**

- Review of physiology of urine elimination, composition and characteristics of urine
- Factor influencing urination
- Alteration in urinary elimination
- Types & collection of urine specimen: observation, urine testing
- Facilitating urine elimination : assessment, types, equipments, procedure and special considerations
 - # Providing urinal & bed pan
 - # Condom drainage
 - # Perineal care
 - # Catheterization
 - # Care of urinary drainage
 - # Care of urinary diversion
 - # Bladder irrigation

*** Bowel elimination**

- Review of physiology of bowel elimination. Composition and characteristics of feces.
- Factor influencing bowel elimination Alteration in bowel elimination
- Types & collection of feces specimen: observation
- Facilitating bowel elimination: assessment, equipment, procedures and special considerations
 - # Passing of flatus tube
 - # Enemas
 - # Suppositories
 - # Sitz bath
 - # Bowel wash
 - # Care of ostomies

*** Mobility and immobility**

- Principles of body mechanics
- Maintenance of normal body alignment and mobility
- Factors affecting body alignment and mobility
- Hazards associated with immobility
- Alteration in body alignment and mobility
- Nursing intervention for impaired body alignment and mobility: assessment , types, devices used, method and special consideration, rehabilitation aspects
 - # Range of motion exercises
 - # Maintaining body alignment: positions
 - # Moving
 - # Lifting
 - # Transferring
 - # Walking
 - # Restraints

*** Oxygenation**

- Review of cardiovascular and respiratory physiology
- Factors affecting oxygenation

	<ul style="list-style-type: none"> - Alteration in oxygenation - Nursing intervention in oxygenation: assessment, types, equipments used, procedure and special consideration <ul style="list-style-type: none"> # Maintenance of patient airway # Oxygen administration # Suction # Inhalation: dry & moist # Chest physiotherapy and postural drainage # Pulse oxymetry # CPR- Basic life support * Fluid, electrolyte and acid-base balance <ul style="list-style-type: none"> - Review of physiological regulation of fluid, electrolyte, and acid-base balances - Factors affecting fluid, electrolyte, and acid base balance - Nursing intervention in fluid, electrolyte, and acid base balances : assessment, types, equipments, procedure and special considerations <ul style="list-style-type: none"> # Measuring fluid intake & output # Correcting fluid & electrolyte balance <ul style="list-style-type: none"> \$ Replacement of fluids: oral and parental venipuncture, regulating IV flow rates, changing IV solutions and tubing. Changing IV dressing <ul style="list-style-type: none"> \$ Administering blood transfusion \$ Restriction of fluids * Psychological needs <ul style="list-style-type: none"> - Concepts of cultural diversity, stress and adaptation, self concept, sexuality, spiritual health, coping with loss, death & grieving <ul style="list-style-type: none"> - Assessment of psychological needs - Nursing intervention for psychological needs <ul style="list-style-type: none"> # Assist with coping and adaptation # Creating therapeutic environment - Recreational and divers ional therapies 	
UNIT-11	<p>Infection control and clinical settings</p> <ul style="list-style-type: none"> * Infection control <ul style="list-style-type: none"> - Nature of infection - Chain of infection transmission - Defenses against infection: natural and acquired - Hospital acquired infection - Concept of asepsis: medical asepsis and surgical asepsis <ul style="list-style-type: none"> - Isolation precaution (barrier nursing) <ul style="list-style-type: none"> # Hand washing: simple, hand atisepsis and surgical antiseptis (scrub) <ul style="list-style-type: none"> # Isolation: source and protective # Personal protective equipments: types, uses and technique of wearing and removing 	20 hrs

	<ul style="list-style-type: none"> # Decontamination of equipments and unit # Transportation of infected patients # Transmission based precautions * Biomedical waste management <ul style="list-style-type: none"> - Importance - Types of hospital waste - Hazards associated with hospital waste - Decontamination of hospital waste - Segregation and transportation and disposal 	
UNIT-12	<p>Administration of Medication</p> <ul style="list-style-type: none"> * General principles/ considerations <ul style="list-style-type: none"> - Purpose of medications - Principles : 5 rights, special considerations, prescriptions, safety in administering medication and medication errors - Drug forms - Route of administration - Storage & maintenance of drug and nurses responsibility - Broad classification of drugs - Therapeutic effect, side effects, toxic effects, idiosyncratic reaction, allergic reaction, drug tolerance, drug interaction - Factors influencing drug action - Systems of drug measurements: metric system, apothecary system, households measurement, solution <ul style="list-style-type: none"> - Converting measurements units: Conversion within one system, conversion between system, dosage calculation - Terminologies and abbreviation used in prescription and medications. * Parenteral <ul style="list-style-type: none"> - General principles: decontamination of disposable syringes and needles - Types of parenteral therapies - Types of syringes, needles, canula and infusion sets - Protection from needles stick injuries: giving medication with the safety syringes - Routes of parenteral therapies <ul style="list-style-type: none"> # Intradermal: purpose, site, equipments, procedures, special consideration # Subcutaneous: purpose, site, equipments, procedure, special consideration # Intramuscular: purpose, site, equipments, procedure, special consideration # Intravenous: purpose, site, equipments, procedure, special consideration # Advanced techniques: epidural, intrathecal, intraosseous, intraperitoneal, intrapleural, intra arterial- role of nurse 	40 hrs.

	<p>* Topical administration: purpose, site, equipments, procedure, special consideration</p> <ul style="list-style-type: none"> - Application to skin - Application to mucus membrane <p># Direct application of liquids-Gargle and swabbing the throat</p> <p># Insertion of drug into body cavity: Suppository/ medicated packing in rectum/ vagina</p> <p># Instillation: Ear, eye, nasal, bladder and rectal</p> <p># Irrigation : Ear, eye, bladder, vaginal and rectal</p> <p># Spraying: Nose and throat</p> <p>* Inhalation: Nasal, oral, end tracheal / tracheal (steam, oxygen and medication) Purposes, types, equipments, procedure, special considerations</p> <ul style="list-style-type: none"> - Recording and reporting of medication administered. 	
UNIT-13	<p>Meeting needs of pre-operative patients</p> <ul style="list-style-type: none"> * Definition and concept of pre operative nursing * Pre-operative phase <ul style="list-style-type: none"> - Preparation of patient for surgery * Intra operative <ul style="list-style-type: none"> - Operative theatre set up and environment - Role of nurse * Post operative phase <ul style="list-style-type: none"> - Recovery unit - Post operative room - Post operative care * Wounds: types, classification, wound healing process, factors affecting wound, complication of wound healing * Surgical asepsis * Care of wound ; types, equipments, procedure and special considerations <ul style="list-style-type: none"> - Dressing, suture care - Care of drainage - Application of bandages, binders, splints and slings - Heat and cold therapy 	10 hrs.
UNIT-14	<p>Meeting special needs of the patient</p> <ul style="list-style-type: none"> * Care of patient having alteration in <ul style="list-style-type: none"> - Temperature (hyper & hypothermia): Types, assessment, management - Sensorium (Unconsciousness); Assessment and management - Urinary elimination (retention & incontinence); Assessment and management - Functioning of sensory organs(visual & hearing impairment); Assessment and management - Communication method and special considerations - Mobility (physically challenged, cast); Assessment and management - Mental state (mentally challenged); Assessment and 	15 hrs.

	<p>management</p> <ul style="list-style-type: none"> - Communication methods and special considerations - Respiration (distress); Types, assessment, management - Comfort-(pain) nature, types, Factors influencing pain, coping , assessment& management <p>* Treatment related to gastrointestinal system; naso-gastric suction, gastric irrigation, gastric analysis.</p>	
UNIT- 15	<p>Care of terminally ill patient</p> <ul style="list-style-type: none"> • Concepts of loss, grief, grieving process • Signs of clinical death • Care of dying patient, special considerations Advanced directives; euthanasia, will, dying declaration, organ donation etc. • Medic-legal issue • care of dead body • Equipment., procedure and care of unit • Autopsy • Embalming 	5hrs
UNIT- 16	<p>Professional nursing concepts and practices</p> <ul style="list-style-type: none"> • Conceptual and theoretical models of nursing practice introduction to models – holistic model, health belief Model, health promotion model etc. • Introduction to theories in nursing: peplum’s Henderson’s Orem. S Newman’s Roger’s and Roy’s • Linking theories with nursing process 	6hrs

Nursing Foundation practical

Placement: - First Year

Practical- 650hrs
(200 and 450 Clinical):

Course Description: This course is designed to help the students to develop an understanding of the philosophy, objectives, theories and process of nursing in various supervised clinical setting. It is aimed at helping the students to acquire knowledge, understanding and skills in techniques of nursing and practice them in supervised clinical settings

UNIT	CONTENT	HOURS
UNIT -1	<p>Hospital admission and discharge (III)</p> <ul style="list-style-type: none"> • Admission • Prepare unit for new patient • Prepare admission procedure <ul style="list-style-type: none"> New patient Transfer in • Prepare patient record <p>Discharge/Transfer out</p> <ul style="list-style-type: none"> • Gives discharge counseling • Perform discharge procedure (planned discharge, lamma and abscond, referrals and transfers) • Prepare records of discharge/transfer • Dismantle, and disinfect unit and equipment after discharge/transfer <p>Perform assessment</p> <ul style="list-style-type: none"> • History taking, nursing diagnosis, problem list, Prioritization goals & outcomes, selection of interventions • Write nursing care plan • Gives care as per the plan <p>Communication</p> <ul style="list-style-type: none"> • Use verbal and nonverbal communication techniques Prepare a plan for patient teaching session <p>Write patient report</p> <ul style="list-style-type: none"> • change of shift reports, transfer reports , incident report etc • Presents patient report <p>Vital sign</p> <ul style="list-style-type: none"> • Measure, record and interpret alteration in body temperature pulse respiration and blood pressure Health assessment 	<p>200 450 Minimum practice time clinical area</p>

	<ul style="list-style-type: none"> • Health history taking 	
	<ul style="list-style-type: none"> • Perform assessment <ul style="list-style-type: none"> -General - Body systems • Use various methods of physical examination • Inspection palpation, Percussion Auscultation, Olfaction • Identification of system wise deviations <p>Prepare patient's Unit</p> <ul style="list-style-type: none"> • Prepare beds <ul style="list-style-type: none"> - Open closed, occupied operation amputation - Cardiac, Fracture, burn and Fowler's bed - Pain assessment and provision for comfort <p>Use comfort devices</p> <p>Hygienic care</p> <ul style="list-style-type: none"> • Oral hygiene • Bath and care of pressure points • Hair wash pediculosis Treatment <p>Feeding</p> <ul style="list-style-type: none"> • Oral, Eteral, Naso/orogastric gastrostomy and parenteral feeding • Naso- gastric insertion suction and irrigation <p>Assisting patient in urinary elimination</p> <ul style="list-style-type: none"> • Provides urinal/bed pan • Condom drainage • Catheterization • Care of urinary drainage <p>Bladder irrigation</p> <p>Assisting bowel elimination</p> <ul style="list-style-type: none"> • Insertion of Flatus tube • Enemas • Insertion of suppository <p>Bowel wash</p> <p>Body alignment and mobility:-</p> <ul style="list-style-type: none"> - Range of motion exercises - Positioning Recumbent lateral fowlers, Sims, lithotomic, prone, trend burg position - Assist patient in moving lifting transferring, Walking - Rest rants <p>Oxygen administration</p> <p>Suctioning: Or pharyngeal, nasopharyngeal</p> <p>Chest physiotherapy and postural drainage</p> <p>Care of chest drainage</p> <p>CPR- Basic life support</p> <p>Intravenous therapy</p> <p>Blood and blood component therapy</p>	

	<p>Collect/ assist for collection of specimen for investigation urine, sputum, faces, vomit us, blood and other body fluid</p> <p>Perform lab tests:</p> <ul style="list-style-type: none"> • Urine: sugar, albumin and acetone • Blood: sugar (with stripe/ Glucometer) <p>Hot and cold application: Local and general sitz bath.</p> <p>Communicating and assisting self care of visually and hearing impaired patients</p> <p>Communicating and assisting self care of mentally challenged/ disturbed patients</p> <p>Recreational and divers ional therapies</p> <p>Caring of patient with alteration in sensation</p> <p>Infection control</p> <ul style="list-style-type: none"> * perform following procedures <ul style="list-style-type: none"> - Hand washing techniques - (Simple, hand antiseptis and surgical antiseptis) - Prepare isolation unit in lab/ward - Practice technique of wearing and removing personal protective equipments - Practice standard safety precaution (universal precautions) * Documentation of equipments and unit:- <ul style="list-style-type: none"> - Surgical asepsis # Sterilization # Handling sterilization equipment # Calculate strengths of lotions # Prepare lotion * Care of articles <p>Pre and post operative care</p> <ul style="list-style-type: none"> • Skin preparation for surgery: Local • Preparation of post operative unit • Pre & Post operative teaching and counseling • Pre and post operative monitoring • Care of the wound • Dressing, suture care, care of drainage, application of bandage, binders, splint and sling • Bandaging of various body parts. <p>Administration of medications</p> <ul style="list-style-type: none"> • Administer medication in different forms and routes • Oral, sublingual and buccal • Parenteral: intradermal, subcutaneous, intramuscular etc. • Assist with the intravenous medication 	
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	<ul style="list-style-type: none"> • Drug measurement and dose calculation • Preparation of lotion and solution • Administer topical applications • Insertion of drug into the body cavity: suppository & medicated packing etc. • Instillation of medicine and spray into Ear, eye, nose and throat • Irrigation: eye, ear, bladder, vagina and rectum • Inhalation: dry and moist <p>Care of dying patient</p> <ul style="list-style-type: none"> • Caring and packing of dead body • Counseling and supporting grieving relatives • Terminal care of the unit 	
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PSYCHOLOGY**Placement: First Year****Theory-60 hrs**

Course Description: This course is designed to assist the students to acquire knowledge of fundamentals of psychology and develop an insight into behavior of self, and others Further it is aimed at helping them to practice the principles and mental hygiene for promoting mental health in nursing practice

UNIT	CONTENT	HOURS
UNIT -1	Introduction <ul style="list-style-type: none"> • History and origin of science of psychology • Definition & scope of psychology • Relevance to nursing • Methods of psychology 	2 hrs
UNIT -2	Biology of behavior <ul style="list-style-type: none"> • Body mind relationship- modulation process in health and illness • Genetics and behavior-Heredity and environment • Brain and behavior- Nervous system, neurons and synapse • Association cortex, Rt and Lt hemisphere • Psychology of sensation • Muscular and glandular controls of behavior • Nature of behavior of an organism/ integrated responses 	4 hrs
UNIT -3	Cognitive process <ul style="list-style-type: none"> • Attention: types, determinants, duration and degree, alteration • Perception meaning principles, factors affecting errors. • Perception: types, determinants, duration and degree, alteration • Learning: Nature, types, learner and learning, factors influencing, laws and theories, process, transfer, study habits • Memory: Meaning, types nature, factors influencing, development theories and methods of memorizing and forgetting • Thinking: types and levels, stages of development, relationship with language and 	20 hrs.

	<p>communication</p> <ul style="list-style-type: none"> • Intelligence: Meaning , classification, uses, theories • Attitude Concept, types, individual difference and variability • Psychometric assessment of cognitive processes • Alteration in cognitive processes • Application 	
UNIT -4	<p>Motivation and Emotional process</p> <ul style="list-style-type: none"> • Motivation: Meaning, concept, types, theories, motives and behavior, conflicts and frustration conflict and resolution • Emotion and stress <ul style="list-style-type: none"> - Emotion: Definition , components, change in emotions, <p>Theories, emotions in health and illness</p> <ul style="list-style-type: none"> • Stress stressors cycle. Affect, adaptation and coping • Attitude meaning nature. Development factors affecting - Behavior and attitudes - Attitudinal Change • Psychometric assessment of emotions and attitudes • Alteration in emotions • Application 	8hrs
UNIT – 5	<p>Personality</p> <ul style="list-style-type: none"> • Definition topography, types, theories • Psychometric assessment of personality • Alteration in personality • Application 	7hrs
UNIT – 6	<p>Developmental psychology</p> <ul style="list-style-type: none"> • Psychology of people at different stages from infancy to old age • Psychology of Vulnerable individual challenged, Women, sick • Psychology of groups 	7 hrs
UNIT – 7	<p>Mental Hygiene and Mental Health</p> <ul style="list-style-type: none"> • concept of Mental Hygiene and mental health • Characteristics of mentally healthy person • Warning signs of poor mental health • Promotive and preventive mental health – 	8 hrs

	<p>Strategies and Services</p> <ul style="list-style-type: none"> • Ego defense mechanism and implication • Personal and social adjustment • Guidance and counseling • Role of nurse 	
UNIT- 8	<p>Psychological assessment and tests</p> <p>* Types, development, characteristics, principles, uses, interpretation and role of nurse in psychology assessment</p>	4 hrs

INTRODUCTION TO COMPUTERS

Placement: First Year

Theory-45 hrs.

Course Description: This course is designed for students to develop basic understanding of uses of computers and its application in nursing.

UNIT	CONTENT	HOURS	
		Theory	Prac.
UNIT - 1	Introduction <ul style="list-style-type: none">• Concepts of computers• Hardware and software : trends and technology• Application of computers in nursing	3 hrs	----
UNIT - 2	<ul style="list-style-type: none">• Introduction to disk operating system<ul style="list-style-type: none">- DOS- Window (all version)• Introduction<ul style="list-style-type: none">- MS – word- MS – Excel with pictorial presentation- MS – Access- MS – Power point	6 hrs	20 hrs
UNIT - 3	<ul style="list-style-type: none">• Multimedia : types and uses• Computer aided teaching and testing	2 hrs	3 hrs
UNIT - 4	<ul style="list-style-type: none">• Use of internet :e-mail	1hrs	3 hrs
UNIT - 5	<ul style="list-style-type: none">• Statistical Package : types and their feature	2 hrs	2 hrs
UNIT - 6	<ul style="list-style-type: none">• Hospital management system : types and uses	1 hrs	2 hrs

B.Sc. Nursing

Second Year

SOCIOLOGY

Placement: Second Year

Theory-60 hrs.

Course Description: This course is designed to introduce the concept of sociology related to community and social institutions in India and its relationship with health. Illness and nursing

UNIT	CONTENT	HOURS
UNIT -1	Introduction <ul style="list-style-type: none">• Definition of sociology• Nature and scope of discipline• Importance and application of sociology in nursing	1hrs
UNIT -2	Individual and Society <ul style="list-style-type: none">• Society and community• Nature of Society• Difference between society and Community• Process of socialization and individualization• Personal disorganization	3hrs
UNIT -3	Culture <ul style="list-style-type: none">• Nature of Culture• Evolution of Culture• Diversity and uniformity of Culture• Culture and Civilization• Tran cultural Society• Influence on health and disease	3 hrs
UNIT - 4	Social groups and Process <ul style="list-style-type: none">• The meaning and Classification of groups• Primary and Secondary group• In –group V/s Out put, class Tribe, caste• Economic, Political, religious groups, mob, crowd, public and audience interaction and social process• Co-operation, competition, conflict• Accommodation assimilation and isolation	4hrs
UNIT – 5	Population <ul style="list-style-type: none">• Society and population• Malthusian theory of population• Population explosion in India and its impact on health status• Family welfare programme	6 hrs.

UNIT – 6	<p>Family and marriage</p> <ul style="list-style-type: none"> • Family Functions • Types- joint nuclear, blended and extended Family: characteristics • The modern family- changes, problems-dowry etc. Welfare services • Changes and legislation on family and marriage in India-Marriage acts. • Marriage: forms and function of marriage • Marriage and family problem in India. • Family, marriage and their influence on health and health practice 	5 hrs
UNIT-7	<p>Social Stratification</p> <ul style="list-style-type: none"> • Meaning and types of social stratification • The Indian caste system-origin and feature • Features of caste in India today • Social class system and status • Social mobility- Meaning and types • Race as a biological concept, criteria of racial classification • Salient feature of primary races- racism • Influence of class, caste and race on health and health practices 	7hrs
UNIT-8	<p>Types of communication in India (Rural, urban regional)</p> <ul style="list-style-type: none"> • Features of village community and characteristics of Indian villages – panchayat system , social dynamics • Community development project and planning • Changes in Indian rural life • Availability of health facilities in rural and its impact on health and health practice • Urban – community – features • The growth of cities ; urbanization and its impact on health and health practices • Major urban problems – urban slums • Region : problems and impact on health 	6 hrs
UNIT - 9	<p>Social change</p> <ul style="list-style-type: none"> • Nature and process of social change • Factors influencing social change: cultural change, cultural lag. • Introduction to theories of social change: linear, cyclical Marxi functional <p>Role of Nurse - change agents</p>	4hrs
UNIT – 10	<p>Social organization and social change</p> <ul style="list-style-type: none"> • Social organization : elements, types • Democratic and authoritian modes of participation Voluntary associations • Social system : definition and types of social system • Inter – relationship of institutions 	4 hrs

UNIT-11	<p>Social control</p> <ul style="list-style-type: none"> • Nature and process of social control • Political, legal, religion, educational economic , industrial and Technological system norms and values – Folkways & mores customs laws and fashion <p>Role of nurse</p>	2hrs
UNIT- 12	<p>Social Problems</p> <ul style="list-style-type: none"> • Social disorganization • Control and planning poverty housing illiteracy, food supplies prostitution rights of women and children ,venerable groups Elderly, handicapped, minority group , child labor, substance abuse, HIV/AIDS • Social welfare programme in India <p>Role of Nurse</p>	15hrs

Pharmacology
Placement: Second Year

Theory – 45Hrs.

Course Description: This course is designed to enable students to acquire understanding of pharmaco-dynamics, pharmacokinetic, principles and therapeutic and nursing implication

UNIT	CONTENT	HOURS
UNIT 1	Introduction to pharmacology <ul style="list-style-type: none"> • Definition • Sources • Terminology used • Types, classification • Pharamacodynamics Action, therapeutic • Adverse toxic • Pharmacokinetics ablsorapti8on, interaction excretion • Review routes and principles of administration of drugs • Indian pharmacopoeia Legal issue • Rational use of drugs • Principles of therapeutics 	3 Hrs
UNIT-2	Chemotherapy <ul style="list-style-type: none"> • Pharmacology of commonly used <ul style="list-style-type: none"> - Penicillin - Sources - Cephalosporins - Aminnoglycosides - Macrolilde and Broad spectrum antibiotics - Sulfonamides - Quinolones - Ant amoebic - Antimalaria - Anthelminities - Antiscabies agents - Antiviral and anti fungal agents - Ant tubercular drugs - Anti leprosy - Anticancer drugs - Immunosuppressant Composition, action, dosage, route, indications contraindication, drugs Interaction, side effects, adverse effects, toxicity and role of nurse	6 Hrs

UNIT- 3	<p>Pharmacology of commonly used antiseptics, disinfectants and insecticides</p> <p>Antiseptics: Composition, action dosage route, indications, contraindication, drug Interaction, side effects, adverse effects, toxicity and role of nurse</p> <ul style="list-style-type: none"> • Disinfectants • Insecticides 	2 hrs.
UNIT- 4	<p>Drug action on GI system</p> <ul style="list-style-type: none"> • pharmacology of commonly used <ul style="list-style-type: none"> - Antiemetics - Emetics - Purgatives - Antacids - Cholinergic - Fluid and electrolyte therapy - Anti diarrhoeals - Histamines <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p>	2 hrs.
UNIT-5	<p>Drugs used on respiratory system</p> <ul style="list-style-type: none"> * Pharmacology of commonly used <ul style="list-style-type: none"> - Antiasthematics - Mucolyties - Decongestants - Expectorants - antitussives - Bronchodilators - Antihistamins <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p>	2 hrs.
UNIT- 6	<p>Drugs used in Urinary system</p> <ul style="list-style-type: none"> • Pharmacology of commonly used <ul style="list-style-type: none"> - Diuretics and ant diuretics - Urinary antiseptics - Cholinergic and anticholinergic - Acidifiers and alkalanizers <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p>	2 hrs.

UNIT-7	<p>Miscellaneous</p> <ul style="list-style-type: none"> • Drugs used in deaddiction • Drug used in CPR and emergency • Vitamins and minerals • Immunosuppressant • Antidotes • Antivenom • Vaccines and sera 	4 hrs.
UNIT- 8	<p>Drugs used on skin and mucus membranes</p> <ul style="list-style-type: none"> • Topical application for skin, eye, ear, nose, and buccal cavity Antipruritics <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effect, toxicity and role of nurse</p>	1 hrs.
UNIT- 9	<p>Drugs acting on nervous system</p> <ul style="list-style-type: none"> • Basic and applied pharmacology of commonly used • Analgesics <ul style="list-style-type: none"> # Non steroidal anti inflammatory drug (NSAID) • Antipyretics • Hypnotics and sedatives <ul style="list-style-type: none"> # Opioids # Non opioids # Tranquilizers # General and local anesthetics # Gases: oxygen, nitrous oxide, carbon dioxide • Cholinergic and anticholinergic <ul style="list-style-type: none"> - Muscle relaxants - Major Tranquilizers - Anti psychotics - Anticonvulsants - Adrenergics - Nonadnergics - Mood stablizers Acetylcholine - Stimulants <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effect, adverse effect, toxicity and role of nurse</p>	8 hrs.

UNIT- 10	<p>Cardiovascular drugs</p> <ul style="list-style-type: none"> • Haematinics • Cardio tonics • Anti anginals • Anti hypertensive and vasodilators • Anti-arrhythmic • Plasma expanders • Coagulants and anticoagulants • Antiplatelets and thrombolytics • Hyplipidemics <p>Composition, action, dosage, route, indications, contraindication, drug interaction, side effects, adverse effects, toxicity and role of nurse</p>	5 hrs.
UNIT-11	<p>Drug use for hormonal disorders and supplementation, contraception and medical termination of pregnancy</p> <ul style="list-style-type: none"> • Insulin and oral hypoglycemic • Thyroid supplement and suppressants • Steroids, antibotics • Uterine stimulants and relaxants • Oral contraceptives • Other estrogen- progesterone preparation • Corticotrophine & gonadotropines • Adrenaline • Prostaglandins • Calcitonins • Calcium salts • Calcium regulators <p>Composition, action, dosage, route, indications, contraindication, drug Interaction, side effects, adverse effects, toxicity and role of nurse</p>	4 hrs.
UNIT- 12	<p>Introduction to drug used in alternative systems of medicine</p> <p>* Ayurveda, Homeopathy, Unani & Siddha etc.</p>	6hrs.

PATHOLOGY AND GENETICS

SECTION A – PATHOLOGY

Placement; Second year
hours

Time Theory – 30

Course Description; this course is designed to enable students to acquire knowledge of pathology of various disease conditions and apply this knowledge in practice of nursing

UNIT	CONTENT	TIME (HRS)	
UNIT - 1	<p>INTRODUCTION</p> <ul style="list-style-type: none"> • Importance of study of pathology • Definition of terms • Methods of technique • Cellular and tissue changes • Infiltration and regeneration • Inflammation and infection • Wound healing • Vascular changes <p>Cellular growth , Neoplasms</p> <ul style="list-style-type: none"> • Normal and cancer cell • Benign and Malignant growth • In situ carcinoma <p>Disturbances in fluid and electrolyte imbalance</p>	Thr. 3	Pr
UNIT -2	<p>Special pathology</p> <ul style="list-style-type: none"> • Pathological changes in disease conditions of various systems : • Respiratory tract Tuberculosis , Bronchitis, pleural effusion and pneumonia , Lung abscess Emphysema, Bronchiectasis. Bronchial asthma , Chronic obstructive pulmonary disease & tumors Cardio – vascular System <ul style="list-style-type: none"> • Pericardial effusion • Rheumatic heart disease • Infective endocarditis, atherosclerosis • Ischemia, infarction & aneurysm Gastro Intestinal Tract <ul style="list-style-type: none"> • Peptic ulcer, typhoid • Carcinoma of GI tract-buccal, esophageal • Gastric and intestinal 	10	5

	<p>Liver Gall bladder & pancreas</p> <ul style="list-style-type: none"> • Hepatitis, Chronic, liver abscess, cirrhosis • Tumors of liver gall bladder and pancreas • Cholecystitis <p>Kidneys and Urinary Tract:</p> <ul style="list-style-type: none"> • Glumerulonephritis, Pyelonephritis • Calculi, renal failure, renal carcinoma & cystitis <p>Male genital systems</p> <ul style="list-style-type: none"> • Cryptorchidism, testicular atrophy • Prostatic hyperplasia carcinoma penis,& prostrate <p>Female genital system</p> <ul style="list-style-type: none"> • Fibroids • Carcinoma cervix and endometrium • Vesicular mole, Choriocarcinoma • Ectopic gestation • Ovarian cyst & tumors <p>Cancer Breast</p> <p>Central Nervous System</p> <ul style="list-style-type: none"> • Hydrocephalus, Meningitis, Encephalitis • Vascular disorders- thrombosis, embolism • Stroke, paraplegia, Quadraplegia • Tumors, meningiomas- gliomas <p>Metastatic tumors</p> <p>Skeletal system</p> <ul style="list-style-type: none"> • Bone haling, osteoporosis, osteomyelitis <p>Arthritis & tumors</p>		
UNIT-3	<p>Clinical pathology</p> <ul style="list-style-type: none"> • Various blood and bone marrow test in assessment and monitoring of disease conditions • Hemoglobin • RBC, White cell & platelet counts • Bleeding time, clotting time and prothrombin time • Blood grouping and cross matching • Blood Chemistry • Blood culture • Serological and immunological test • Other blood test • Examination of bone marrow • Methods of collection of blood specimen for various clinical pathology, biochemistry, microbiology tests, <p>Inference and normal values</p>	4	3

UNIT 4	Examination of body cavity fluids, transudates and exudates <ul style="list-style-type: none"> • The laboratory tests used in CSF analysis • Examination of other body cavity fluids transudates and exudates sputum, wound discharge etc • Analysis of gastric and duodenal contents • Analysis of semen sperm count, motility and morphology and their importance in infertility 	2	1
UNIT- 5	Urine and Faeces <ul style="list-style-type: none"> # Urine <ul style="list-style-type: none"> • Physical characteristics • Analysis • Culture and sensitivity # Faeces <ul style="list-style-type: none"> • characteristics • Stool examination: occult blood, Ova, parasite and cyst, reducing substances etc. Methods of collection for various tests, inference and normal values	1	1

SECTION –B GENETICS

Placement: Second Year

Theory-15 hours

Course: Description: This course is designed to enable students to acquire understanding of Genetics, its role in causation and management of defects and diseases

UNIT	CONTENT	TIME (HRS)
UNIT -I	Introduction <ul style="list-style-type: none">• Practical application of genetics in Nursing• Impact of genetic condition on Families• Review of cellular division mitosis and meiosis• Characteristics and structure of genes• Chromosomes and sex determination• Chromosomal aberration patterns of inheritance<ul style="list-style-type: none"># Medallion theory of inheritance# multiple allots and blood groups# Sex linked inheritance# Errors in transmission (Mutation)	3
UNIT– II	Maternal, prenatal and genetic influence on development of defects and disease <ul style="list-style-type: none">• Condition affecting the mother genetic and infections• Consanguinity atopy• Prenatal nutrition and food allergies• Maternal age• Maternal drugs therapy• Prenatal testing and diagnoses• Effect of radiation, drugs and chemicals• Infertility• Spontaneous abortion• Neural tube defects and the role of folic acid in lowering the risk• Downs syndrome(Trisomy 21)	3
UNIT- III	Genetic testing in neonates and children <ul style="list-style-type: none">• Screening for<ul style="list-style-type: none"># Congenital abnormalities# Development delay# Dysmorphism	2
UNIT- IV	Genetic conditions of adolescents and adults <ul style="list-style-type: none">• Cancer genetics Familial Cancer• Inborn errors of metabolism• Blood group alleles and hematological disorder• Genetic haemochromatosis• Huntington’s disease• Mental illness	2

UNIT V	Services related to Genetics <ul style="list-style-type: none">• Genetic testing• Human genome project• Gene therapy• The Eugenics movement• Genetic Counseling• Legal and Ethical issues• Role of nurse	5
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Medical and Surgical
(Adult including Geriatrics)

Placement: Second Year

Time: theory – 210 hours
Practical -720hours

Course Description: - The purpose of this course is to acquire knowledge and develop proficiency in caring for patients with medical and surgical disorders in verities of health care settings and at home

UNIT	CONTENT	TIME(HRS)
UNIT – 1	<p>INTRODUCTION</p> <ul style="list-style-type: none"> • Introduction to medical surgical nursing – evolution and trends of medical and surgical nursing • Review of concepts of health and illness Disease – concepts. Diseases (ICD -10 or later version) Acute illness Chronic illness. Stages of illness. • Review of Concepts of comprehensive nursing care in medical surgical conditions based on nursing process. • Role of nurse patient and family in care of adult patient • Role and responsibilities of a nurse in of medical and surgical settings. Settings • Outpatient department • In - patient unit • Intensive care unit • Home and Community • Introduction to of Medical and surgical asepsis <ul style="list-style-type: none"> ▪ Inflammation and infection ▪ Wound healing ▪ Care of Surgical patient ▪ Pre-operative ▪ Intra-operative ▪ Post-operative 	15
UNIT- II	<p>Common signs and symptoms and management</p> <ul style="list-style-type: none"> • Fluid and electrolyte imbalance • Vomiting • Dyspnea and cough, respiratory obstruction • Fever • Shock • Unconsciousness, Syncope • Pain • Incontinence • Edema • Age related problem- Geriatric 	15

UNIT- III	<p>Nursing management of Patients (adults including elderly) with respiratory problems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of respiratory systems • Nursing Assessment – History and physical assessment • Etiology, Pathphysiology, Clinical manifestations diagnosis, treatment modalities and medical - surgical, dietetics & nursing management of adults including elderly with. • Upper Respiratory tract infections • Bronchitis • Asthma • Emphysema • Empyema • Atelectasis • Chronic Obstructive Pulmonary Diseases(COPD) • Broncheectasis • Pneumonia • Pulmonary tuberculosis • Lung abscess • Pleural effusion • Cysts and tumors • Chest injuries • Respiratory arrest and insufficiency • Pulmonary embolism <p>Special therapies, alternative therapies Nursing procedures Drugs used in treatment of respiratory disorders</p>	20
Unit- IV	<p>Nursing management of Patients (adults including elderly) with disorders of digestive systems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of digestive systems • Nursing Assessment – History and physical assessment • Etiology, Pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management ❑ Disorders of- oral cavity- lips, gums, tongue, salivary glands and teeth ❑ Oesohagus - inflammation, structure obstruction, bleeding and tumors. ❑ Stomach and Duodenum- hiatus hernia, gastritis, peptic ulcer, duodenum ulcer, bleeding, tumours, pyloric stenosis ❑ Small intestinal disorders-Colitis inflammation and infection, enteritis, obstruction, bleeding and tumour and perforation ❑ Large intestinal disorders- Colitis inflammation and infection, enteritis, obstruction, tumour and lump 	30

	<ul style="list-style-type: none"> <input type="checkbox"/> Hernias <input type="checkbox"/> Appendix- inflammation, mass, abscess, rupture <input type="checkbox"/> Anal & Rectum, hemorrhoids, fissures and fistulas <input type="checkbox"/> Peritonitis/acute abdomen <input type="checkbox"/> Pancreas: inflammation, cyst, abscess and tumour. <input type="checkbox"/> Liver: inflammation, cyst, abscess, cirrhosis, portal hypertension, hepatic failure and tumour <input type="checkbox"/> Gall Bladder: inflammation, obstruction, stones and tumour. <p>Special therapies, alternative therapies Nursing procedures Drug used in treatment of disorders of digestive systems.</p>	
Unit V	<p>Nursing management of patients (adults including elderly) with blood and cardio vascular problems.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of blood and cardio vascular system. • Nursing Assessment- History and physical assessment • Etiology pathphysiology Clinical manifestations diagnosis treatment modalities and medical surgical dietetics & nursing management of , • Vascular system • Hypertension hypotension • Artherosclerosis • Raynaud’s disease • Aneurysm and peripheral vascular disorder <p>Heart</p> <ul style="list-style-type: none"> • Coronary artery disease • Ischemic Heart Disease • Coronary arteriosclerosis • Angina pectoris • Myocardial infraction • Muscular disorders of the heart • Congenital and acquired • Rheumatic Heart diseases <p>Endocarditis, pericarditis/myocarditis</p> <ul style="list-style-type: none"> • Cardio Myopathies • Cardiac dysrhythmias, Heart Block • Congestive cardiac failure <ul style="list-style-type: none"> <input type="checkbox"/> Cor-pulmonale, pulmonary edema, cardiogenic shock cardiac tamponade • Cardiac emergencies and arrest • Cardio pulmonary Resuscitation (CPR) • Blood <ul style="list-style-type: none"> <input type="checkbox"/> Anemia’s <input type="checkbox"/> Polycythemia <input type="checkbox"/> Bleeding disorders, clotting factors defects and 	30

	<p>platelets defects</p> <ul style="list-style-type: none"> <input type="checkbox"/> Thalassemia <input type="checkbox"/> Leukaemias <input type="checkbox"/> Leukopenias and agranulocytosis <input type="checkbox"/> Lymphomas <input type="checkbox"/> Myelomas <p>• Special therapies</p> <ul style="list-style-type: none"> <input type="checkbox"/> Blood transfusion, safety checks, procedure and requirements, management of adverse transfusion, reaction, records for blood transfusion <input type="checkbox"/> Management and counseling of blood donors phlebotomy procedure, and post donation management Blood bank functioning and hospital transfusion committee Bio safety and waste management in relation to Blood transfusion <input type="checkbox"/> Role of a nurse in organ donation, retrieval and banking Alternative therapies <p>Nursing procedures Drug used in treatment of blood and cardio vascular disorders.</p>	
Unit-VI	<p>Nursing management of patients (adults including elderly) with Gento-Urinary problems.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of Gento-Urinary systems. • Nursing assessment-History and physical assessment • Etiology, pathophysiology clinical manifestations diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- • Nephritis • Nephrotic syndrome • Nephrosis • Renal calculus • Tumours • Acute renal failure • Chronic renal failure • End stage renal disease • Dialysis, renal transplant • Congenital disorders, urinary infections • Benign prostate hypertrophy • Disorders of ureter, urinary bladder and urethra-inflammation, infection, structure, obstruction, tumour, prostrate <p>Special therapies, alternative therapies Nursing procedures Drug used in treatment of disorders of Gento-Urinary systems</p>	10

UNIT-VII	<p>Nursing management of disorders of male (adults including elderly) Reproductive system</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of male reproductive system • Nursing Assessment – History and physical assessment • Etiology, pathophysiology clinical manifestations diagnosis treatment modalities and medical, surgical dietetics & nursing management of male reproductive system • Congenital malformations , cryptorchidism • Hypospadiasiis Epispadiasis • Infection • Testis and adjacent structures • Penis • Prostate inflammation, infection hypertrophy tumour • Sexual dysfunction • Infertility • Contraception • Brast gynccomastia tumour • Climacteric Changes. Special theories alternative therapies • Nursing producers • Drugs used in treatment of disorders of male reproductive system 	5
UNIT-VIII	<p>Nursing management of patients (adults including elderly) with disorders of endocrine systems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of endocrine system • Nursing Assessment -History and physical assessment Etiology, pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- <ul style="list-style-type: none"> <input type="checkbox"/> Disorders of Thyroid and parathyroid <input type="checkbox"/> Diabetes mellitus <input type="checkbox"/> Adrenal tumour <input type="checkbox"/> Pituitary disorders <p>Special therapies, alternative therapies Nursing procedures. Drugs used in treatment of disorders of endocrine systems</p>	10
UNIT-IX	<p>Nursing management of patients (adults including elderly) with disorders of integumentary system</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of integumentary system • Nursing Assessment History and physical assessment • Etiology, pathophysiology clinical manifestations, diagnosis treatment modalities and medical, surgical, dietetics & nursing management of skin and its 	10

	<p>appendages</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lesions and abrasions <input type="checkbox"/> Infection and infestations, Dermatitis <input type="checkbox"/> Dermatoses: Infectious and infectious “ Inflammatory Dermatoses” <input type="checkbox"/> Acne Vulgaris <input type="checkbox"/> Allergies and Eczema <input type="checkbox"/> Psoriasis <input type="checkbox"/> Malignant melanoma <input type="checkbox"/> Alopecia <p>Special therapies, alternative therapies Nursing procedures Drug used in treatment of disorders of integumentary system.</p>	
UNIT-X	<p>Nursing management of patients (adults including elderly) with disorders of musculoskeletal problems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of musculoskeletal system • Nursing Assessment- History and physical assessment. • Etiology, pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical dietetics & nursing management of <ul style="list-style-type: none"> <input type="checkbox"/> Muscles, Ligaments and joints- inflammation, infection, trauma <input type="checkbox"/> Bones- inflammation, infection, dislocation, fracture, tumour and trauma <input type="checkbox"/> Osteomalacia and osteoporosis <input type="checkbox"/> Arthritis <input type="checkbox"/> Congenital deformities <input type="checkbox"/> Spinal column- defects and deformities, tumour, prolapsed inter vertebral disc, Pott’s spine <input type="checkbox"/> Paget’s disease <ul style="list-style-type: none"> • Amputation • Prosthesis • Transplant & replacement surgeries • Rehabilitation <p>Special therapies, alternative therapies Nursing procedures Drugs used in treatment of disorders of musculoskeletal system.</p>	15
UNIT-XI	<p>Nursing management of patients (adults including elderly) with immunological problems.</p>	10

	<ul style="list-style-type: none"> • Review of immune system • Nursing Assessment- History and physical assessment • Etiology pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- <ul style="list-style-type: none"> <input type="checkbox"/> Immunodeficiency disorder <input type="checkbox"/> Primary immuno deficiency <input type="checkbox"/> Phagocytic dysfunction <input type="checkbox"/> B-cell and T- cell deficiency <input type="checkbox"/> Secondary immuno deficiency <input type="checkbox"/> Acquired immuno deficiency syndrome (AIDS) <input type="checkbox"/> Incidence of HIV & AIDS <input type="checkbox"/> Epidemiology <input type="checkbox"/> Transmission- Prevention of Transmission <input type="checkbox"/> Standard Safety Precautions <input type="checkbox"/> Role of nurse Counseling <input type="checkbox"/> Health education and home care consideration <input type="checkbox"/> National AIDS control programme – NACO various national and international agencies <input type="checkbox"/> Infection control program <input type="checkbox"/> Rehabilitation <p>Special therapies alternative therapies Nursing procedures Drugs used in treatment of disorders of Immunological system</p>	
UNIT XII	<p>Nursing management of patients (adults including elderly) with communicable Disease</p> <ul style="list-style-type: none"> • Overview of infectious disease the infectious process • Nursing Assessment History and physical assessment • Epidemiology, infectious process clinical manifestations diagnosis treatment prevention and dietetics Control and eradication of common Communicable diseases <ul style="list-style-type: none"> <input type="checkbox"/> Tuberculosis <input type="checkbox"/> Diarrhoeal disease <input type="checkbox"/> Hepatitis A- E <input type="checkbox"/> Herpes <input type="checkbox"/> Chickenpox <input type="checkbox"/> Small pox <input type="checkbox"/> Typhoid 	20

	<input type="checkbox"/> Meningitis <input type="checkbox"/> Gas gangrene <input type="checkbox"/> Leprosy <input type="checkbox"/> Dengue <input type="checkbox"/> Plague <input type="checkbox"/> Malaria <input type="checkbox"/> Diphtheria <input type="checkbox"/> Pentusis <input type="checkbox"/> Poliomyelitis <input type="checkbox"/> Measles <input type="checkbox"/> Filariasis <input type="checkbox"/> HIV AIDS <ul style="list-style-type: none"> • reproductive tract infection • Special infection control measures notification, isolation Quarantine, immunization, infection disease hospitals Special therapies, alternative therapies Nursing procedures Drugs used in treatment of communicable diseases 	
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<p>UNIT XIII</p>	<p>Preoperative nursing care</p> <ul style="list-style-type: none"> • Organization and physical set- up of the operation theatre (OT) <ul style="list-style-type: none"> <input type="checkbox"/> Classification <input type="checkbox"/> O.T. DESIGN <input type="checkbox"/> Staffing <input type="checkbox"/> members of OT team <input type="checkbox"/> Duties and responsibilities of nurse in OT <input type="checkbox"/> Principles of health and operating room attire <input type="checkbox"/> Instrument <input type="checkbox"/> Suture and sutures material <input type="checkbox"/> equipments <input type="checkbox"/> O. T. tables and set for common surgical procedures <input type="checkbox"/> Position and draping for common surgical procedures <input type="checkbox"/> Scrubbing procedures <input type="checkbox"/> Gowning and gloving <input type="checkbox"/> Preparation of OT sets Monitoring the patient during surgical procedures • Maintenance of therapeutic environment in O T • Standard safety Measures <ul style="list-style-type: none"> <input type="checkbox"/> Infection control fumigation disinfections and sterilization <input type="checkbox"/> Biomedical waste management <input type="checkbox"/> Prevention of accidents and hazards in O T • Anesthesia <ul style="list-style-type: none"> <input type="checkbox"/> Types <input type="checkbox"/> Methods of administration <input type="checkbox"/> Effects and stages <input type="checkbox"/> Equipments <input type="checkbox"/> Drugs 	<p>25</p>
	<ul style="list-style-type: none"> • Cardiopulmonary resuscitation (CPR) • Pain management techniques <ul style="list-style-type: none"> <input type="checkbox"/> Legal aspects 	

MEDICAL SURGICAL NURSING

(Adult including geriatrics)- I

Practical

Placement : Second Year

Time: 720 hours

AREA	SKILLS	DURATON (in Weeks)
General Medical Ward (Respiratory, Endocrine, Renal, Hematology)	<ul style="list-style-type: none">• Assessment of the patient<ul style="list-style-type: none">- Taking history- Perform general and specific Examination- Identify alteration and deviations• Practice Medical Surgical asepsis Standard safety Measures• Administer medications<ul style="list-style-type: none">- Oral, IV M Subcutaneous• IV Therapy<ul style="list-style-type: none">- IV Canulation- Maintenance and Monitoring• Oxygen therapy by different Methods• Mobilization• Chest Physiotherapy• Naso gastric Feeding• Assist in common diagnostic• Perform/Assist in therapeutic procedures• Blood and c component therapy• Throat suctioning• Collect specimen for common investigations• Maintain elimination<ul style="list-style-type: none">- Catheterization- Bowel wash- Enema- Urinary drainage• Maintain intake output and documentation• Counsel land teach related to specific disease conditions	6

<p>General Surgical Ward (GI Urinary, CTVS)</p>	<ul style="list-style-type: none"> • practice medical surgical asepsis • Standard safety Measures • Pre- operative preparation of the patients • Post operative care <ul style="list-style-type: none"> - Receiving patient , assessment - Monitoring care • Care of wounds and drainage • Sutures removal • Ambulating and exerciser • Naso gastric aspiration • Care of chest drainage • Ostomy care <ul style="list-style-type: none"> - Gastrostomy - Colostomy - Entrostomy • Blood component and therapy • Practice Universal precaution 	<p>6</p>
<p>Cardiology Ward</p>	<ul style="list-style-type: none"> • Physical examination of the cardio vascular system recoding and interpreting ECG • Monitoring of patient • Preparation and assisting in non- invasive and invasive diagnostic procedures • Administer cardiac drugs • Cardio pulmonary resuscitation • Teach patient and families • Practice medical and surgical asepsis standard safety measures 	<p>2</p>
<p>Skin and Communicable disease ward</p>	<ul style="list-style-type: none"> • Assessment of patient with skin disorders • Assist in diagnostic and therapeutic procedures • Administer topical medication • Practice medical and surgical asepsis standard safety measures • Use of personal protective equipment (PPE) • Give medicated baths • Counseling HIV positive patient • Teach prevention of infection disease 	<p>1</p>
<p>Orthopedic Ward</p>	<ul style="list-style-type: none"> • Assessment of orthopedic patient • Assist in application of plaster cast and removal of cast • Apply skin traction, buck's traction • Assist in application and removal of prosthesis • Physiotherapy and range of motion exercises (ROM) muscle strengthening exercises • Crutch maneuvering technique • Activities of daily living • Ambulance • Teach and counsel patients and families 	<p>2</p>

Operation theatre	<ul style="list-style-type: none"> • Scrubbing, gowning, gloving • Identify instruments • Suturing • Material for common operations • Disinfection, carbolization, Fumigation • Preparation of instrument sets for common operations • Sterilization of sharp and other instruments • Prepare OT table depending upon the operation • Positioning and monitoring of the patient • Endotracheal intubation • Assisting in minor and major operations • Handling specimens • Disposal of waste as per guidelines. 	6
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INTRENSHIP**TIME: 260 hrs. (9WEEKS)**

ICU, CCU, CARDIAC. O T	<ul style="list-style-type: none">• Assist in arterial Puncture for blood gas analysis• Perform ECG and interpret accordingly• Conduct and analysis Pulse toletry• care with artificial airway• Assist in en tracheal incubation• Setting up ventilators• Drugs Sheet• Observation of special procedure in OT	2
Neuro, ICU,ITU,OT	<ul style="list-style-type: none">• Assess neurological status• Implement care to head injury spinal injury• Drug sheet• Pre and post operative care with neureo surgery patients	2
Burns and plastic reconstructive surgery	<ul style="list-style-type: none">• Nursing care	2
OT, Laparoscopic Orthopedic, Eye, ENT		3

COMMUNITY HEALTH NURSING –I

Placement: Second Year

Theory- 90hrs

Practical – 135 hours

Course: description: This course is designed for students to appreciate principles of promotion and maintenance of health

UNIT	CONTENT	HOURS
UNIT- 1	Introduction <ul style="list-style-type: none"> • Community health nursing • Definition, concept and dimensions of health • Promotion of health • Maintenance of health 	2hrs
UNIT -2	Determinations of health <ul style="list-style-type: none"> • Eugenic • Environment <ul style="list-style-type: none"> - physical air, light ventilation, water, housing sanitation, disposal of waste, disposal of dead bodies forestation noise climate , communication infrastructure facilities and linkage - Acts regulating the environment: National pollution control board - Bacterial and viral agents, host carriers and immunity arthropods and rodents • food hygiene : Production, preservation, purchase, preparation, consumption • act Regulation food hygiene- prevention and food adulteration act, drug and cosmetic act • Socio-cultural <ul style="list-style-type: none"> - customs - Marriage system - Family structure - Status of special group females,. children elderly, challenged groups and sick persons • Life style • Hygiene • Physical activity <ul style="list-style-type: none"> - Recreation and sleep - Sexual life - Spiritual life philosophy - Self reliance - Dietary pattern 	20hrs

	<ul style="list-style-type: none"> - Education - Occupation • Financial management <ul style="list-style-type: none"> - Income - Budget - Purchasing power - Security 	
UNIT-3	<p>Epidemiology</p> <ul style="list-style-type: none"> • Definition: concept, aims, scope, uses and terminology used in epidemiology • Dynamics of disease transmission: epidemiological triad • Morbidity and mortality: measurements • Level of prevention • Methods of epidemiology <ul style="list-style-type: none"> - Descriptive - Analytical: Epidemic investigation - Experimental 	10 hrs.
UNIT-4	<p>Epidemiology and nursing management of common communicable disease</p> <ul style="list-style-type: none"> • Respiratory infection <ul style="list-style-type: none"> - Small pox - Chicken pox - Measles - Influenza - Rubella - ARI's and pneumonia - Mumps - Diphtheria - Mumps - Diphtheria - Whooping cough - Meningococcal meningitis - Tuberculosis - SARS • Intestinal infection <ul style="list-style-type: none"> - Poliomyelitis - Viral Hepatitis - Cholera - Diarrhoeal disease - Typhoid fever - Food poisoning 	25 hrs.

	<ul style="list-style-type: none"> - Amoebiasis - Hook worm infection - Ascariasis - Dracunculiasis • Arthropods infection <ul style="list-style-type: none"> - Dengue - Malaria - Filariasis • Zoonoses <p>Viral</p> <ul style="list-style-type: none"> - Rabies - Yellow fever - Japanese encephalitis - Kyasnur forest disease <p>• Bacterial</p> <ul style="list-style-type: none"> - Brucellosis - Plague - Human relationship - Anthrax - Leptospirosis <p>• Rickettsial disease</p> <ul style="list-style-type: none"> - Rickettsial zoo noses - Scrub typhus - Tick typhus - Q fever <p>• Parastic Zoonoses</p> <ul style="list-style-type: none"> - Taeniasis - Hydatid disease - Lsieshmaniasis <p>• Surface infection</p> <ul style="list-style-type: none"> - Trachoma - Tetanus - Leprosy - STD & RTI - Yaws - HIV/AIDS <p>Any other</p>	
UNIT-5	<p>Epidemiology and nursing management of non communicable disease</p> <ul style="list-style-type: none"> • Malnutrition: under nutrition, over nutrition, nutritional deficiencies • Anemia 	10 hrs.

	<ul style="list-style-type: none"> • Hypertension • Stroke • Rheumatic: heart disease • Coronary heart disease • Cancer • Diabetes mellitus • Blindness • Accidents • Mental illness • Obesity • Iodine deficiency • Fluorosis • Epilepsy 	
UNIT-6	<p>Demography</p> <ul style="list-style-type: none"> • Definition concept and scope • Method of collection analysis and interpretation of demographic data • Demographic rates and ratio 	6hrs
Unit -7	<p>Population and its control</p> <ul style="list-style-type: none"> • Population explosion and its impact on social, economic development of individual society and country • Population control: <ul style="list-style-type: none"> - Overall development : Women empowerment, social economic and educational devolvement - Limiting family size - Promotion of small family norm - Methods spacing (natural, biological chemical mechanical methods etc) - Terminal surgical methods - Emergency contraception 	17hrs

COMMUNITY HEALTH NURSING –I PRACTICAL

Placement: second Year

Practical 135 hours

AREAS	SKILLS	DURATION (in weeks)
Community Health nursing	<ul style="list-style-type: none">• Use techniques of interpersonal relation• Identification of health determinants of community• History taking• Physical examination• Collect specimens- sputum, malaria smear• Perform simple lab test at center blood for hemoglobin and sugar Urine for albumin and sugar• Administer vaccines and medications to adults• Counsel and teach individual family land community<ul style="list-style-type: none">- Nutrition- Hygiene- Self- health monitoring- Seeking health services- Healthy life style- Family welfare methods- Health promotion	2 weeks urban and 2 weeks rural

MICROBIOLOGY

Placement:

theory: 60 hrs (Theory 45+15 lab)

Course:- Description: This course is designed to enable students to acquire understanding of fundamentals for microbiology and identification of various microorganism . It also provides opportunities for practicing infection Control measures in Hospital and Community settings

UNIT	CONTENT	HOURS	
		Th.	Pr.
UNIT-1	Introduction <ul style="list-style-type: none"> • Importance and relevance to nursing • Historical prospective • Concepts and terminology • Principles of microbiology 	5hrs	----
UNIT 2	General Characteristics of microbes <ul style="list-style-type: none"> • Structure and classification of microbes • Morphological types • Size and form of bacteria • Motility • Colonization • Growth and nutrition of Microbes <ul style="list-style-type: none"> - Temperature Moisture - Blood and body fluids • Laboratory methods for identification fo micro organisms • Staining techniques, gram staining acid fast staining hanging drop0 preparation • Culture various medias - 	10hrs	5 hrs
UNIT -3	Infection control <ul style="list-style-type: none"> • Infection Sources portals of entry and exist, transmission • Asepsis • Disinfection: Types and methods • Sterilization : Types and methods • Chemotherapy and antibiotics • Standard safety measures • Biomedical waste management • Role of nurse • Hospital acquired infection • Hospital infection control programme <ul style="list-style-type: none"> - Protocols collection of samples preparation of report and status for rate of infection in the unit / hospital nurse accountability continuing education etc. 	10 hrs	2hrs

UNIT -4	Pathogenic organisms	12hrs	4 hrs
	<ul style="list-style-type: none"> • Micro organisms <ul style="list-style-type: none"> - Cocci - Gram positive and gram negative - Bacilli- Gram positive and gram negative - Spirochete - Mycoplasma - Rickettsiae - Chlamyidae • viruses • Fungi- Superficial and deep mycosis • Parasites • Rodents and vectors <ul style="list-style-type: none"> Characteristics sources portal of entry, transmission of Infection identification of disease production organisms Collection handling and transportation of various specimens 	8 hrs	4 hrs
Unit -5	Immunity <ul style="list-style-type: none"> • Immunity- types, classification • Antigen and antibody reaction • Hypersensitivity- skin test • Serological test • Immunoprophylaxis <ul style="list-style-type: none"> - vaccines & sera- types and classification, storage and handling, cold chain - Immunization for various disease - Immunization schedule 	8 hrs.	4 hrs.

**B.SC.
NURSING
THIRD YEAR**

MEDICAL SURGICAL NURSING
(ADULT INCLUDING GERIATICS)- II

Placement: third Year

Theory – 120 hrs

Practical – 270 hours

Course description: the purpose of this course is to acquire knowledge and develop proficiency in caring for patient with medical surgical disorders in various health care settings and at home

UNIT	CONTENT	HOURS
UNIT-1	<p>Nursing management of patient with disorders of Ear, Nose and throat</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of the ear, nose and throat • Nursing assessment History and physical assessment • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of ear, nose and throat disorders <p style="padding-left: 40px;"># External ear deformities otalgia, foreign bodies and tumors</p> <p style="padding-left: 40px;"># Middle ear impacted wax, tympanic membrane perforation, otitis media, tumors</p> <p style="padding-left: 40px;"># Inner ear Meniere's disease, labyrinthitis, ototoxicity, tumors</p> <p style="padding-left: 40px;"># Upper airway infections: Common cold sinusitis, ethmoiditis, and adenoiditis, peritonsillar abscess, laryngitis</p> <ul style="list-style-type: none"> • Upper respiratory airway • Nasal obstruction, laryngeal obstruction, cancer of the larynx • Cancer of the oral cavity • Speech defects and speech therapy • Deafness • Prevention, control and rehabilitation • Hearing aids, implanted hearing devices <p>Special therapies Nursing procedures Drug used in treatment of disorders of ear, nose and throat. Role of nurse communication with hearing impaired and deafness</p>	15 hrs.
UNIT- 2	<p>Nursing management of patient with disorders of Eye</p> <ul style="list-style-type: none"> • Review of anatomy, physiology of the eye • Nursing management-history and physical assessment • Etiology, pathophysiology, clinical, diagnosis, treatment modalities and medical and surgical nursing management of the eye disorders 	15 hrs.

	<ul style="list-style-type: none"> # Refractive errors # Eyelids- infection, tumors and deformities # Conjunctiva- inflammation and infection, bleeding # Cornea- inflammation and infection # Lens- cataract # Glaucoma # Disorders of posterior chamber and retina: retinal and vitreous problems # Retinal detachment # Ocular emergency and their prevention • Blindness • National blindness control program <ul style="list-style-type: none"> # Eye banking # Eye prostheses and rehabilitation <p>Role of a nurse- Communication with visually impaired patient, eye camps</p> <p>Special therapies</p> <p>Nursing procedures</p> <p>Drugs used in treatment of disorder of eye</p>	
UNIT-3	<p>Nursing management of patient with neurological disorders</p> <ul style="list-style-type: none"> # Review of anatomy and physiology of the neurological system • Nursing assessment- history and physical and neurological assessment and Glasgow coma scale • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of neurological disorders • Congenital malformation • Headache • Head injuries • Spinal injuries <ul style="list-style-type: none"> # Paraplegia # Hemiplegia # Quadraplegia • Spinal cord compression- herniation of in vertebral disc • Tumors of the brain and spinal cord • Intra cranial and cerebral aneurysms • Infection: <ul style="list-style-type: none"> # Meningitis, encephalitis, brain, abscess, neurocysticerosis • Movement disorders <ul style="list-style-type: none"> # Chorea # Seizures # Epilepsies • Cerebro vascular accidents (CVA) • Cranial, spinal neuropathies- Bells palsy trigeminal neuralgia • Peripheral Neuropathies Guillainbarr'e syndrome • Myasthenia gravis • Multiple sclerosis 	16 hrs.

	<ul style="list-style-type: none"> • Degenerative diseases <ul style="list-style-type: none"> #Delirium # Dementia # Alzheimer's disease # Parkinson's disease • Management of unconscious patient and a patient with stroke • Role of nurse in communicating with patient having neurological deficit • Rehabilitation of patient with neurological deficit Role of nurse in long stay facility (institution) and at home special therapies Nursing procedures Drug used in treatment of neurological disorders. 	
UNIT-4	<p>Nursing management of patients with disorder of female reproductive system.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of female reproductive system. • Nursing assessment- History and physical assessment • Breast self examination • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of disorder of female reproductive system • Sexuality and reproductive health • Menstrual disorders: Dysmenorrhea, amenorrhea, premenstrual syndrome • Abnormal uterine bleeding: menorrhagia, metrorrhagia • Pelvic Inflammatory disease • Ovarian and fallopian tube disorders: infection, cysts, tumors • Uterine and cervical and disorders: endometriosis, polyps, fibroids, cervical and uterine tumors uterine displacement, cystocele/ urethrocele/ rectocele • Vaginal disorders: infection and discharges fistulas • Vulvular disorders: infection, cysts and tumors • Diseases of breasts: deformities, infection cysts and tumors • Menopause and hormonal replacement therapy • Infertility • Contraception: types, methods, risk and effectiveness <ul style="list-style-type: none"> # Barrier methods, intra uterine device, hormonal, post conceptional methods etc. # Terminal methods Sterilization • Emergency contraception methods 	16 hrs.

	<ul style="list-style-type: none"> • Abortion- natural, medical and surgical abortion-MTP Act • Toxic shock syndrome • Injuries and trauma: Sexual Violence <p>Special therapies Nursing procedures Drug used in treatment of gynecological disorders National family welfare programme</p>	
UNIT-5	<p>Nursing management of patient with burns, reconstructive and cosmetic surgery</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of the skin and connective tissues and various deformities • Nursing assessment- History and physical assessment and assessment of burns and fluid and electrolyte loss • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of burns and reconstructive and cosmetic surgery • Types of re-constructive and cosmetic surgery: for burns, congenital deformities, injuries and cosmetic purposes • Role of nurse • Legal aspects • Rehabilitation • Special therapies <ul style="list-style-type: none"> □ Psychosocial aspects <p>Nursing procedures Drug used in treatment of burns, constructive and cosmetic surgery</p>	10 hrs.
UNIT-6	<p>Nursing management of patient with Oncological conditions</p> <ul style="list-style-type: none"> • Structure and characteristics of normal and cancer cells • Nursing assessment – history and physically assessment • Prevention, screening, early detections, warning sign of cancer • Epidemiology, etiology, classification, pathophysiology, staging, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of oncological condition • Common malignancies of various body system: oral, larynx, lung stomach, and colon, liver, leukemias, and lymphomas, breast, cervix, ovary, uterus, sarcoma, brain, renal, bladder, prostate etc. • Oncological emergencies • Modalities of treatment <ul style="list-style-type: none"> □ Immunotherapy □ Chemotherapy □ Radiotherapy □ Surgical intervention □ Stem cell and bone marrow transplants □ Gene therapy □ Other forms of treatment 	10 hrs.

	<ul style="list-style-type: none"> • Psychological aspects of cancer • Rehabilitation • Palliative care: Symptoms and pain management, nutritional support • Home care • Hospice care • Stomal therapy • Special therapies <ul style="list-style-type: none"> □ Psychosocial therapies <p>* Nursing procedures</p>	
UNIT-7	<p>Nursing management of patient in EMERGENCY AND DISASTER Situations</p> <p>Disaster Nursing:</p> <ul style="list-style-type: none"> • Concepts and principals of disaster nursing • Causes and types of disaster: Natural and manmade <ul style="list-style-type: none"> □ Earthquakes, floods, epidemics, cyclones □ Fire, explosion, accidents □ Violence, terrorism: biochemical, war • Policies related to emergency/ disaster management: Institutional, national state, institutional • Disaster preparedness: • Team, guidelines, protocols, equipments, resources • Co-ordination and involvement of : community, various Govt departments, non govt. organizations and international agencies • Role of nurse; working • Legal aspects of disaster nursing • Impact on health after effects: Post traumatic stress disorders • Rehabilitation: physical, psychosocial, financial relocation, Emergency nursing • Concept, priorities, principles and scope and scope and emergency nursing • Organization of emergency services: physical set-up, staffing, equipment and supplies, protocols, concepts of triage and role of triage nurse • Co-ordination and involvement of different departments and facilities • Nursing assessment-history and physical assessment • Etiology, classification, pathophysiology, staging, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of patient with medical and surgical emergency • Principles of emergency management • Common emergencies • Respiratory emergencies • Cardiac emergencies • Shock and hemorrhage 	10 hrs.

	<ul style="list-style-type: none"> • Pain • Poly-trauma, road accidents, crouch, injuries, wound • Bites • Poisoning; food, gas drug and chemical poisoning • Seizures • Thermal emergencies; heat stroke, and cold injuries • Pediatric emergencies • Obstetrical emergencies • Violence, abuse, sexual assault • Cardio pulmonary resuscitation • Crisis intervention • Role of nurse: communication and interpersonal relations • Medico legal aspects 	
UNIT-8	<p>Nursing care of the elderly</p> <ul style="list-style-type: none"> • Nursing assessment- history and physical assessment • Ageing • Demography: Myths and realities • Concepts and theories of ageing • Normal biological ageing • Age related body related changes • Psychosocial aspects of ageing • Medication and elderly • Stress and coping in elder patient • Common health problems and nursing management • Cardiovascular, respiratory, musculoskeletal • Endocrine, genitor-urinary, gastrointestinal • Neurological, skin and sensory organs <ul style="list-style-type: none"> <input type="checkbox"/> Psychosocial and sexual <input type="checkbox"/> Abuse of elderly • Role of nurse for care of elderly: ambulation, nutritional, communicational, psychosocial and spiritual • Role of family and formal and non formal caregivers • Use of aids and prosthesis (hearing aids, dentures) • Legal and ethical issues • Provision and programme for elderly, privileges, community Programs and health services * Home and institutional care 	10 hrs.
UNIT-9	<p>Nursing management of patients in critical care units</p> <ul style="list-style-type: none"> • Nursing assessment-history and physical assessment • Classification • Principles of critical care nursing 	10 hrs.

	<ul style="list-style-type: none"> • Organization: physical set-up, policies, staffing norms • Protocols, equipment, ventilators, cardiac monitors, defibrillators • Resuscitation equipments • Infection control and protocols 	
UNIT-10	<p>Nursing management of patients adults including elderly with Occupayional and Industrial disorders</p> <ul style="list-style-type: none"> • Nursing Assessment – History and Physical assessment • Etiology, Pathophysiology, clinical manifestations, diagnosis, diagnosis, treatment modalities and medical & surgical nursing management of occupational and industrial health disorders • Role of nurse • Special therapies, alternative therapies Nursing procedures • Drugs used in treatment of occupational and Industrial disorders. 	10 hrs.

MEDICAL SURGICAL NURSING
(Adult and geriatrics)-II Practical

Placement: Third year

Time: Theory-120 hrs
Practical – 270 hrs.
Internship - 430 hrs.

Areas	Skills to be developed	Duration (In weeks)
ENT	<ul style="list-style-type: none"> • Perform examination of ear, nose and throat • Assist with diagnostic procedures • Assist with therapeutic procedures • Instillation of drops • Perform/assist with irrigations • Apply ear bandage • Performs tracheotomy care • Teach patient and families 	1
Ophthalmology	<ul style="list-style-type: none"> • Perform examination of eye • Assist with diagnostic procedures • Assist with therapeutic procedures • Performs /assist with irrigations • Apply eye bandage • Apply eye drops/ointment • Assist with foreign body removal • Teach patient and families 	1
Neurology	<ul style="list-style-type: none"> • Perform neurological examination • Use Glasgow coma scale • Assist with diagnostic procedure • Assist with therapeutic procedures • Teach patient and families • Participate in rehabilitation program 	2
Gynecology ward	<ul style="list-style-type: none"> • Assist with gynecological examination • Assist with diagnostic procedure • Assist with therapeutic procedures • Teach patient and families • Teach self Breast examination • Assist with PAP smear collection 	1
Burns Unit	<ul style="list-style-type: none"> • Assessment of burns patient <ul style="list-style-type: none"> - Percentage of burns - Degree of burns • Fluid and electrolyte replacement therapy <ul style="list-style-type: none"> - Assess - Calculate - Replace - Record intake/output • Care of Burns wound <ul style="list-style-type: none"> - Bathing 	1

	<ul style="list-style-type: none"> - Dressing • Perform active and passive exercises • Practice medical and surgical asepsis • Counsel and teach patient and families • Participate rehabilitation program 	
Oncology	<ul style="list-style-type: none"> • Screen for common cancer-TNM classification • Assist with diagnostic procedures <ul style="list-style-type: none"> - Biopsies - Pap Smear - Bone- Marrow aspiration • Breast examination • Assist with therapeutic Procedures • Participates in various modalities of treatment <ul style="list-style-type: none"> - chemotherapy - radiotherapy - Pain management - Stomal therapy - Immuno therapy - Gene therapy - Alternative therapy • Participate in palliative care • Counsel and teach patient families • Self Breast examination • Warning signs • Participate in rehabilitation program - 	2
Critical care unit	<ul style="list-style-type: none"> • monitoring of patients in ICU • Maintain flow sheets • Care of patient on ventilators • Perform end tracheal suction • Demonstration use of ventilators, Carries monitors etc. • Collect specimen and interprets ABG analysis • Assist in arterial puncture • Maintain CVP line • Pulse oxymetry • CRP - ALS 	
	<ul style="list-style-type: none"> • Defibrillators • Pace makers • Bag-mask ventilation • Emergency tray trolley- Crash Cart • Administration of drugs <ul style="list-style-type: none"> - Infusion pump - Epidural - Intrathecal Intracardiac • Total parenteral therapy 	1

	<ul style="list-style-type: none"> • Chest physiotherapy • Perform active and passive exercises • Counsel the patient and family in dealing with grieving and bereavement 	
Casualty Emergency	<ul style="list-style-type: none"> • Practice triage • Assist with assessment examination investigations and their interpretation in emergency and disaster situations • Assist in legal procedures • In emergency unit • Participate in managing crowd • Counsel the patient and family in dealing with grieving and bereavement 	1

Placement: Internship

Time: 9 Weeks

Area	Skills	Duration
Medical Ward	Integrated Practice	2
Surgical ward		2
Critical care Unit /CCU		1
Casualty/Emergency		2
Operation theatre (Eye, ENT, Neuro)		2

Child Health Nursing**Placement: - Third Year****Time: Theory- 90hrs****Practical – 270 hrs****Internship**

Course Description: This course is designed for developing an understanding of the modern approach to childcare identification prevention and nursing management of common health problems of neonates and children

Unit	Content	TIME (HRS)
1	<p>Introduction</p> <p>Modern concepts of child care</p> <ul style="list-style-type: none"> • Internationally accepted rights of the child • National policy and legislations in relation to child health and Welfare • Agencies related to welfare services to the children • Changing trends in hospital care preventive promotive and curative aspects of child health • Child morbidity and mortality rates • Difference between an adult and child • Hospital environment for sick child • Impact of hospitalization on the child and family • Grief and bereavement • The role of a child health nurse in caring of a hospitalized child • Principles of pre and post operative care of infants and children • Child health nursing procedure 	15
II	<p>The Healthy Child</p> <ul style="list-style-type: none"> • Principles of growth and development • Factors effecting growth and development • Growth and development from birth to adolescence • The needs of normal ender through the stages of developmental and parental guidance • Nutritional needs of children and infants: exclusive breast-feeding supplementary/ artificial feeding and Weaning • Baby friendly Hospital concept • Accidents causes and prevention • Value of play and selection of play material • Prevention immunization, immunization Program and cold chain • Preventive pediatrics • Care of under five and under five clinics/well baby clinics <p>Nursing care of neonates</p>	20

III	<ul style="list-style-type: none"> • Nursing care of a normal newborn/essential newborn care • Neonatal resuscitation • Nursing management of a low birth weight baby • Kangaroo mother care • Nursing management of common neonatal disorder • Organization of neonatal unit • Identification and nursing management of common congenital malformations 	15
IV	Integrated management of neonatal and childhood illness (IMNCI)	10
V	<p>Nursing management in common childhood disease</p> <ul style="list-style-type: none"> • Nutritional deficiency disorders • Respiratory disorders and infections • Gastro intestinal infections infestations and congenital disorders • Cardiovascular problem congenital defects and rheumatic fever rheumatic heart disease • Genito-urinary disorder acute glomerular nephritis, Nephrotic syndrome, Wilm’s tumor, infection & congenital disorder • Neurological infections and disorder convulsions epilepsy meningitis hydrocephalus spina bifida • Hematological disorders: Anemia’s thalassemia, ITP, Leukemia hemophilia • Endocrine disorders Juvenile diabetes Mellitus • Orthopedic disorders club feet, hip dislocation and fracture • Disorder of skin eye and ears • Common communicable diseases in children, their identification, nursing management in hospital and home and prevention • Child health emergencies. Poisoning foreign bodies, hemorrhage, burns and drowning • Nursing care of infant and children with HIV/AIDS 	20
VI	<p>Management of behavioral and social problems in children</p> <ul style="list-style-type: none"> • Management of common behavioral disorders • management of common psychiatric problems • Management of challenged children Mentally, Physically, & Socially Challenged • Welfare services for challenged children in India • Child guidance clinics 	10

CHILD HEALTH NURSING PRACTICAL

**Placement : Third Year
hours Fourth Year
hours(3weeks)**

**Time – 27
Internship -145**

Areas	Skills	Duration (Weeks)
Pediatric Medicine Ward	<ul style="list-style-type: none"> • Taking pediatric history • Physical examination and assessment of children • Administer of oral I/M and I/V medicine/fluids • Calculation of fluid replacement • Prepare different strength not I/V Fluids • Apply restraints • Administer oxygen inhalation by different methods • Give baby bath • Feed children by katori spoon etc • Collect specimen for common investigation • Assist with common diagnostic procedure • Teaching mothers/parents <ul style="list-style-type: none"> <input type="checkbox"/> Malnutrition <input type="checkbox"/> Oral dehydration therapy <input type="checkbox"/> Feeding and Weaning <input type="checkbox"/> Immunization schedule <input type="checkbox"/> Play therapy <input type="checkbox"/> Enterostomy • Urinary catheterization and drainage • Feeding <ul style="list-style-type: none"> <input type="checkbox"/> Naso-gastric <input type="checkbox"/> Gastrostomy <input type="checkbox"/> Jejunostomy • Care of surgical wounds <ul style="list-style-type: none"> <input type="checkbox"/> Dressing <input type="checkbox"/> Suture removal 	3 wks
Pediatric surgery ward	<ul style="list-style-type: none"> • Calculate, prepare and administer I/V fluids • Do bowel wash • Care of ostomies <ul style="list-style-type: none"> <input type="checkbox"/> Colostomy irrigation <input type="checkbox"/> Ureterostomy <input type="checkbox"/> Gastrostomy <input type="checkbox"/> Enterostomy • Urinary catheterization and drainage • Feeding <ul style="list-style-type: none"> <input type="checkbox"/> Naso-gastric 	3 wks

	<input type="checkbox"/> Gastrostomy <input type="checkbox"/> Jejunostomy <ul style="list-style-type: none"> • Care of surgical wounds <input type="checkbox"/> Dressing <input type="checkbox"/> Suture removal 	
Pediatric OPD/Immunization	Assessment of children <input type="checkbox"/> Health assessment <input type="checkbox"/> Developmental assessment <input type="checkbox"/> Anthropometrics assessment <ul style="list-style-type: none"> • Immunization • Health/Nutrition education 	1 wks
Pediatric Medicine And surgical ICU	<ul style="list-style-type: none"> • Care of baby in incubator/ warmer • Care of child on ventilator • Endotracheal suction • Chest physiotherapy • Administer fluids with infusion pump • Total Parenteral nutrition • Phototherapy • Monitoring of babies • Cardio pulmonary resuscitation 	1+1 wks
	INTERNSHIP	
Pediatric Medicine WARD/ICU	Integrated practice	1 wks
Pediatric surgery ward/ICU	Integrated practice	1 wks
NICU	Integrated practice	1 wks

MENTAL HEALTH NURSING**Placement: Third Year****Theory-90 hrs****Practical-270 Hours****Internship-95 Hours (2 Weeks)**

Course Description: This course is designed for developing an understanding of the modern approach to mental health, identification, prevention and nursing management of common mental problem with special emphasis on therapeutic intervention for individuals' family and community

UNIT	CONTENT	HOURS
UNIT-I	Introduction <ul style="list-style-type: none"> • Perspectives of mental health and mental health nursing: evaluation of mental health services, treatments and nursing practices • Prevalence and incidence of mental health problems and disorders • Mental health act. • National mental health policy • National mental health programme • Mental health team • Nature and scope of mental health nursing • Role and functions of mental health nurse in various settings and factor affecting the level of nursing practice • Concepts of normal and abnormal behavior 	5 hrs.
UNIT -2	Principles and concepts of mental health nursing <ul style="list-style-type: none"> • definition Mental health nursing and terminology used • classification of mental disorders CID • Review of personality development, defence mechanism • Maladaptive behavior of individuals and group stress crisis and disaster(s) • Etiology bio-psycho- social factors • Psychopathology of mental disorders review of structure and function of brain, limbic system and abnormal neuro transmission • Principles of mental health nursing • Standards of mental health nursing practices • Conceptual model and role of nurse <ul style="list-style-type: none"> <input type="checkbox"/> Existential model <input type="checkbox"/> Psycho-analytical model <input type="checkbox"/> Behavior model <input type="checkbox"/> Interpersonal model 	5 hrs

UNIT – 3	<p>Assessment of mental health status</p> <ul style="list-style-type: none"> • History taking • Mental health examination • Mini mental health examination • Neurological examination review • Investigations related blood ESEG,ECT,MRI • Psychological tests <p>Role and responsibilities of nurse</p>	8 hrs
Unit -4	<p>Therapeutic communication and the nurse- patient relationship</p> <ul style="list-style-type: none"> • Therapeutic communication types techniques, characteristics • Types of relationship • Ethics and responsibilities • Element of nurse patient contract • Review of technique of IPR- Johari windows • Goals, phases, tasks therapeutic techniques • Therapeutic impasse and its intervention 	6hrs
Unit -5	<p>Treatment modalities and therapies used in mental disorders</p> <ul style="list-style-type: none"> • Psycho pharmacology • Psychological therapies Therapeutic community, Psycho therapy, Psychoanalytical cognitive and supportive, Family group, behavioral, play psycho drama, Music, dance recreational and light therapy, relaxation therapies Yoga mediation bio feedback • Alternative system of medicine • Occupational therapy • Physical therapy. Electro convulsive therapy • Geriatric considerations <p>Role of nurse in above therapies</p>	14hrs
Unit -6	<p>Nursing management of patient with Schizophrenia and other psychotic disorders</p> <ul style="list-style-type: none"> • Classification: ICD • Etiology, psycho-pathology, types, clinical manifestations, diagnosis • Nursing assessment- history and physical assessment and mental assessment • Treatment modalities and nursing management of patient with schizophrenia and other psychotic disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.
Unit-7	<p>Nursing management of patient with mood disorders</p> <ul style="list-style-type: none"> • Mood disorders: Bipolar affective disorder, Mania depression and dysthymia etc. • Etiology, psycho-pathology, types, clinical manifestations, diagnosis • Nursing assessment- history and physical assessment • Treatment modalities and nursing management of patient 	5 hrs.

	<p>with mood disorders</p> <ul style="list-style-type: none"> • Geriatric considerations • Follow-up and home care and rehabilitation 	
Unit-8	<p>Nursing management of patient with neurotic, stress related and somatization disorders.</p> <ul style="list-style-type: none"> • Anxiety disorders, phobias, dissociation and conversion disorders, post traumatic disorders • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment- History, physical and mental assessment • Treatment modalities and nursing management of patients with neurotic, stress related and somatization disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	8 hrs.
Unit-9	<p>Nursing management of patient with substance use and disorders</p> <ul style="list-style-type: none"> • Community used psychotropic substance: classification, forms, routes, action, intoxication and withdrawal • Etiology of dependence: tolerance, psychological and physical dependence, withdrawal syndrome, diagnosis • Nursing assessment- history, physical, mental assessment and drug assay • Treatment (detoxification, antagonist therapy and harm reduction) and nursing management of patient with substance abuse. • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.
Unit-10	<p>Nursing management of patient with personality, sexual and eating disorders</p> <ul style="list-style-type: none"> • Classification of disorders • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment –history, physical, mental assessment • Treatment modalities and nursing management of patients with personality, sexual and eating disorders • Treatment modalities and nursing management 	4 hrs.
Unit-11	<p>Nursing management of childhood and adolescent disorders including mental deficiency</p> <ul style="list-style-type: none"> • Classification • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment – history, physical, mental assessment and IQ assessment • Treatment modalities and nursing management of childhood and adolescent disorders including mental 	6 hrs.

	deficiency <ul style="list-style-type: none"> • Follow-up and home care and rehabilitation 	
Unit-12	Nursing management of organic brain disorders <ul style="list-style-type: none"> • Classification ICD • Etiology, psycho-pathology, clinical manifestations, diagnosis and differential diagnosis(Parkinson's and Alzheimer's) • Nursing assessment-history, physical, mental assessment and neurological assessment • Treatment modalities and nursing management of organic brain disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.
Unit-13	Psychiatric emergencies and crisis intervention <ul style="list-style-type: none"> • Types of psychiatric emergencies and their management • Stress adaptation mode: stress and stressors, coping, resources and mechanism • Grief: Theories of grieving, process, principles, technique of counseling • Crisis intervention; principles, techniques and process • Geriatric considerations and responsibilities of nurse 	6 hrs.
Unit-14	Legal issues in mental health nursing <ul style="list-style-type: none"> • The mental health Act 1987: Act, section, articles and their implications etc. • Indian lunacy act • Rights of mentally ill clients • Forensic psychiatry • Acts related to narcotic and psychotropic substance and illegal drug trafficking • Admission and discharge procedures Role and responsibilities of nurse	4 hrs.
Unit-15	Community mental health nursing <ul style="list-style-type: none"> • Development of community mental health services: • National mental health programme • Institutionalization versus deinstitutionalization • Model of preventive psychiatry: levels of prevention • Mental health services available at the primary, secondary, tertiary levels including rehabilitation and role of nurse • Mental health agencies: government and voluntary national and international • Mental health nursing issues for special population: children, adolescence, women, elderly, victims of violence and abuse, handicapped, HIV/AIDS etc 	

Mental Health Nursing

Practical

Placement: Third year

Fourth year

Time practical-270 hrs (9 weeks)

Internship- 95 hrs (2 weeks)

Areas	Skills	Duration (in weeks)
Psychiatric OPD	<ul style="list-style-type: none">• History taking• Perform mental status examination (MSE)• Assist in psychometric assessment• Perform neurological examination• Observe and assist in therapies• Teach patient and family members	1
Child Guidance Clinic	<ul style="list-style-type: none">• History taking• Assist in psychometric assessment• Observe and assist in various therapies• Teach family and significant others.	1
Inpatient ward	<ul style="list-style-type: none">• History taking• Perform mental status examination (MSE)• Perform neurological examination• Assist in psychometric assessment• Record therapeutic communication• Assist in Electro Convulsive therapy (ECT)• Participate in all therapies• Prepare patients for Activities of Daily Living (ADL)• Conduct admission and discharge counseling• Counsel and teach patient and families	6
Community psychiatry	<ul style="list-style-type: none">• Conduct case work• Identify individuals with mental health problems• Assist in mental health camps and clinics• Counsel and teach family members, patient and community	1
Internship		
Area	Skills	Duration
Psychiatry ward	Integrated practice	2 weeks

COMMUNICATION & EDUCATIONAL TECHNOLOGY

Placement: Third year

Time: Theory-90 hours

Course Description: This course is designed to help the students acquire an understanding of the principles and methods of communication and teaching it helps to develop skills in communicating effectively, maintaining effective interpersonal relations. Teaching individual and groups in clinical, community health and educational setting

UNIT	CONTENT	Time(Hrs)	Pr.(Hrs)
UNIT-1	Review of Communication process <ul style="list-style-type: none">• Process; elements and channel• Facilitators• Barriers and methods of overcoming• Techniques	5	
UNIT -II	Interpersonal relations <ul style="list-style-type: none">• Purposes & types• phases• Barriers an methods of overcoming• Johari Window	5	
UNIT- III	Human relations <ul style="list-style-type: none">• Understanding self• Social behaviour, motivation social attitudes• Individual and groups• Groups and individual• Human relation in context of nursing• Group dynamics• Team work	5	
UNIT- IV	Guidance and counseling <ul style="list-style-type: none">• Definition• Purposes, scope and need• Basic principles• Organization of counseling services• Types of counseling approaches• Role and preparation of counselor• Issues for counseling in nursing Students and parishioners• Counseling process-steps & techniques tools of counselor• Managing disciplinary problems• Management of crisis and referral	10	5
UNIT - V	Principles of education and teaching learning process	5	

	<ul style="list-style-type: none"> • Education meaning philosophy aims functions and principles • Nature and characteristics of learning • Principles and maxims of teaching • Formulating objectives general and specific • Lesson planning • Classroom management 		
UNIT- VI	<p>Methods of teaching</p> <ul style="list-style-type: none"> • Lectures Demonstration, seminar, symposium, panel discussion, role play, project, field trip, workshop, exhibition programmed instructions computer assisted learning micro teaching problems based learning self instructional Module and simulation etc • Clinical teaching methods - case method nursing round and report bedside clinic conference (individual and group) Process recording 	10	10
UNIT – VII	<p>Educational Media</p> <ul style="list-style-type: none"> • Purposes and types of AV Aids Principles and sources and etc • Graphic aids chalk board chart graph poster flash cards flannel graph bulletin board cartoon • Three dimensional aids, objects, specimens model puppets • Printed aids Pamphlet & leaflets • Projected aids slider overhead projector, Films TV. VCR, VCD, camera microscope, LCD • Audio aids : Tape recorder public address system, • Computer 	10	8
UNIT- VIII	<p>Assessment</p> <ul style="list-style-type: none"> • Purpose and scope of evaluation and assessment • Criteria for selection of assessments techniques and methods • Assessment of knowledge : Easy type question, short answer type question (SAQ), Multiple choice questions (MCQ) • Assessment of skills : observation Check list, Practical exam, Viva, objective structured clinical examination (OSCE) 	5	7

	<ul style="list-style-type: none"> • Assessment of attitudes , attitudes scale 		
UNIT - IX	Information, education and communication for health (IEC) <ul style="list-style-type: none"> • Health behavior and health education • Planning for health education • Health education with individual, group and communities • Communicating health messages • Methods and media for communicating health messages • Using mass media 	5	

1

Nursing Research and Statistics

Placement: Third Year

Time: Theory- 45 hrs

Practical -45 hrs

Course description: The course is designed to enable students to develop an understanding of basic concept of research process and statistics. It is further structured to conduct participate in needs based research studies in various setting and utilize the research findings to provide quality nursing care The burs foe practical will be utilized for conducting individual/ group research project

Unit	Content	Time (hrs)
	Research and research Process	
I	Research and research Process <ul style="list-style-type: none">• Introduction and need for nursing research• Definition of Research and nursing research• Steps of scientific method• Characteristics of good research• Steps of Research process- overview	4
II	Research Problem/Question <ul style="list-style-type: none">• Identification of problem area• Problem statement• Criteria of a good research Problem• Writing objectives	3
III	Review of literature <ul style="list-style-type: none">• Location• Sources• On line search: CINHALL, COCHRANE etc.• Purposes• Methods of review	3
IV	Research approaches and designs <ul style="list-style-type: none">• Historical, survey and experimental• Qualitative and quantitative designs•	4
V	Sampling and data collection <ul style="list-style-type: none">• Definition of populating sample• Sampling criteria, factors influencing sampling technique• Data why what from whom when and where to collect• Data collection methods and instruments<ul style="list-style-type: none">□ Methods of collection□ Questioning interviewing□ Observation record and analysis and measurements□ Types of instruments□ Validates and reliability of the instruments□ Pilot study□ Data collection procedureAnalysis of data <p>* Compilation, tabulation, Classification, Summarization,</p>	8

VI	Presentation, interpretation of data	4
VII	Introduction to statistics <ul style="list-style-type: none"> • Definition, use of statistics, scales of measurement • Frequency distribution and graphical presentation of data • Mean, Median, Mode, Standard Deviation • Normal probability and tests of significance • Co-efficient of correlation • Statistical packages and its application 	15
VIII	Communication and utilization of Research <ul style="list-style-type: none"> • Communication of research finding <ul style="list-style-type: none"> <input type="checkbox"/> Verbal report <input type="checkbox"/> Writing research report <input type="checkbox"/> Writing scientific article/paper <ul style="list-style-type: none"> - Critical review of published research - Utilization of research finding 	4

B.Sc. Nursing Fourth Year

MIDWIFERY AND OBSTETRICAL NURSING

Placement: Fourth Year

**Theory- 90 hrs.
Practical- 360 hrs.**

Course Description: This course is designed for students to the concepts and principles of midwifery and obstetrical nursing. It helps them to acquire knowledge and skills in rendering nursing care to normal and high risk pregnant woman during antenatal, natal and postnatal periods in hospital and community setting it also helps to develop skills in managing normal and high risk neonates and participate in family welfare programme

UNIT	CONTENT	HOURS
UNIT-1	Introduction to midwifery and obstetrical nursing <ul style="list-style-type: none">• Introduction to concept of midwifery and obstetrical nursing• Trends in midwifery and obstetrical nursing<ul style="list-style-type: none"><input type="checkbox"/> Historical perspective and current trends<input type="checkbox"/> Legal and ethical aspects<input type="checkbox"/> Pre-conception care and preparing for parenthood<input type="checkbox"/> Role of nurse in midwifery and obstetrical care<input type="checkbox"/> National policy and legislation in relation to material health and welfare<input type="checkbox"/> Maternal morbidity, mortality and fertility rates<input type="checkbox"/> Prenatal morbidity, mortality rates	3 hrs.
UNIT-2	Review of anatomy and physiology of female reproductive system and fetal development <ul style="list-style-type: none">• Female pelvis- general description of the bones joints, ligaments, planes of the pelvis diameters of the true pelvis important landmarks, variations in pelvic shapes• Female organs of reproduction – external genetlia, internal genital organs and their anatomical relation, musculature blood supply, nerves, lymphatic, pelvic cellular tissue, pelvic peritoneum• Physiology of menstrual cycle• Human sexuality• Fetal development<ul style="list-style-type: none"><input type="checkbox"/> Conception<input type="checkbox"/> Review of fertilization, implantation, development of the embryo and placement at term- functions, abnormalities, the fetal sac, amniotic fluid the umbilical chord<input type="checkbox"/> Fetal circulation, fetal skull, bones, sutures and measurements * Review of genetics	8 hrs.

<p>UNIT-3</p>	<p>Assessment and management of pregnancy (ante-natal)</p> <ul style="list-style-type: none"> • Normal pregnancy • Physiological changes during pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Reproductive system <input type="checkbox"/> Cardiovascular system <input type="checkbox"/> Respiratory system <input type="checkbox"/> Urinary system <input type="checkbox"/> Gastro intestinal system <input type="checkbox"/> Metabolic change <input type="checkbox"/> Skeletal change <input type="checkbox"/> Skin changes <input type="checkbox"/> Endocrine system <input type="checkbox"/> Psychological changes <input type="checkbox"/> Discomfort of pregnancy • Diagnosis of pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Signs <input type="checkbox"/> Differential diagnosis <input type="checkbox"/> Confirmatory tests • Ante natal care <ul style="list-style-type: none"> <input type="checkbox"/> Objectives <input type="checkbox"/> Assessment <ul style="list-style-type: none"> - History and physical examination - Antenatal examination - Signs of previous child birth <ul style="list-style-type: none"> <input type="checkbox"/> Relationship of fetus to uterus and pelvis lie attitude presentation. Position <input type="checkbox"/> per vaginal examination • Screening and assessment for high risk • Risk approach • History and physical examination • Modalities of diagnosis Invasive and non invasive ultrasonic cardio tomography, NST, CST • Antenatal preparation <ul style="list-style-type: none"> <input type="checkbox"/> Antenatal counseling <input type="checkbox"/> Antenatal exercises <input type="checkbox"/> Diet <input type="checkbox"/> Substance use <input type="checkbox"/> Education for childbirth <input type="checkbox"/> Husband and Families <input type="checkbox"/> Preparation for self confinement <input type="checkbox"/> Prevention from radiation • Psycho-social and cultural aspects <ul style="list-style-type: none"> <input type="checkbox"/> Adjustment to pregnancy <input type="checkbox"/> Unwed mother <input type="checkbox"/> Single parent 	<p>8 hrs.</p>
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	<ul style="list-style-type: none"> <input type="checkbox"/> Teenage pregnancy <input type="checkbox"/> Sexual violence • Adoption 	
UNIT-4	<p>Assessment and management of intranatal period</p> <ul style="list-style-type: none"> • Physiology of labour • Management of labour • First stage <ul style="list-style-type: none"> <input type="checkbox"/> Signs and symptoms of onset of labour normal and abnormal <input type="checkbox"/> Duration <input type="checkbox"/> Preparation of <ul style="list-style-type: none"> # Labour room # Woman <input type="checkbox"/> Assessment and observation of woman in labour: Partogram- maternal and fetal monitoring <input type="checkbox"/> Active management of labour, induction of labour <input type="checkbox"/> Pain relief and comfort in labour • Second stage <ul style="list-style-type: none"> <input type="checkbox"/> Sign and symptoms: normal and abnormal <input type="checkbox"/> Duration <input type="checkbox"/> Conduct of delivery: principles and technique <input type="checkbox"/> Episiotomies (Only if required) <input type="checkbox"/> Receiving the new born <ul style="list-style-type: none"> - Neonatal resuscitation; initial steps and subsequent resuscitation - Care of umbilical cord - Immediate assessment including screening for congenital anomalies <ul style="list-style-type: none"> - Identification - Bonding - Initiate feeding - Screening and transportation of the neonate * Third stage <ul style="list-style-type: none"> <input type="checkbox"/> Sign and symptoms: normal and abnormal <input type="checkbox"/> Duration <input type="checkbox"/> Method of placenta expulsion <input type="checkbox"/> Management : principles and technique <input type="checkbox"/> Examination of the placenta <input type="checkbox"/> Examination of perineum • Maintaining records and reports • Fourth stage 	12 hrs

UNIT-5	Assessment and management of women during post natal period <ul style="list-style-type: none"> • Normal puerperium: physiology duration • Postnatal assessment and management <ul style="list-style-type: none"> <input type="checkbox"/> Promoting physical and emotional well being <input type="checkbox"/> Lactation management <input type="checkbox"/> Immunization • Family dynamics after child • Family welfare services, methods, counseling • Follow-up • Records and reports 	5 hrs.
UNIT-6	Assessment and management of normal neonates <ul style="list-style-type: none"> • Normal neonate: <ul style="list-style-type: none"> <input type="checkbox"/> Physiological adaptation <input type="checkbox"/> Initial and daily assessment <input type="checkbox"/> Essential newborn care, thermal control <input type="checkbox"/> Breast feeding prevention of infections • Immunization • Minor disorders of newborn and its management • Levels of neonatal care (level II, &III) • At primary, secondary and tertiary levels • Maintenance of reports and records 	6 hrs.
UNIT-7	High risk pregnancy – assessment and management <ul style="list-style-type: none"> • Screening and assessment <ul style="list-style-type: none"> <input type="checkbox"/> Ultrasonic cardio tomography , NST CST, non invasive and invasive <input type="checkbox"/> Newer modalities of diagnosis • High risk approach • Levels of care primary secondary and tertiary levels • Disorders of pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Hyper-emesis, gravidarum bleeding in early pregnancy, abortion , ectopic <input type="checkbox"/> Pregnancy vesicular mole <input type="checkbox"/> Ante-partum hemorrhage • Uterine abnormality and displacement • Disease complicating pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Medical and surgical conditions <input type="checkbox"/> Infection, RTI(STD) UTI, HIV, TORCH <input type="checkbox"/> Gynecological diseases complicating pregnancy <input type="checkbox"/> Pregnancy induced hypertension and diabetes , toxemia of pregnancy hydramnios <input type="checkbox"/> Rh incompatibility <input type="checkbox"/> Mental pregnancy <input type="checkbox"/> Abnormalities of placenta and cord <input type="checkbox"/> Intra-uterine growth – retardation <input type="checkbox"/> Nursing management of mothers with high risk pregnancy <input type="checkbox"/> Maintenance of records and reports 	10hrs

UNIT-8	<p>Abnormal labour- assessment and management</p> <ul style="list-style-type: none"> • Disorders in labour <ul style="list-style-type: none"> <input type="checkbox"/> CPD and contracted pelvis <input type="checkbox"/> Malposition and Malpresentations <input type="checkbox"/> Premature labour, disorders of uterine action, precipitate labour, prolonged labor <input type="checkbox"/> complication of third stage Injuries to birth canal • Obstetrical emergencies and their management <ul style="list-style-type: none"> <input type="checkbox"/> Presentation and prolapse of cord, vasa praveia amniotic fluid emblems rupture of uterus shoulder dystocia obstetrical shock • Obstetrical procedures and operation <ul style="list-style-type: none"> <input type="checkbox"/> Introduction of labour, forceps vacuum version manual removal of placenta. Caesar ear. Section. destructive operation <p>* Nursing management of women undergoing obstetrical operation and procedures</p>	10 hrs.
UNIT- 9	<p>Abnormalities during postnatal period</p> <ul style="list-style-type: none"> • Assessment and management of woman with postnatal complications <ul style="list-style-type: none"> <input type="checkbox"/> Puerperal infection breast engorgement and infections and infection, UTI, thrombo-embolic disorders, post partum hamburger, eclampsia and subinvolution <input type="checkbox"/> Psychological complications : <ul style="list-style-type: none"> - Post partum blues - Post partum depression - Post partum psychosis 	4hrs
UNIT- 10	<p>Assissetment and management of High risk newborn</p> <ul style="list-style-type: none"> • Admission of neonates in the neonatal intensive care units protocols • Nursing management of : <ul style="list-style-type: none"> <input type="checkbox"/> Low birth weight babies <input type="checkbox"/> Infection <input type="checkbox"/> Respiratory problems <input type="checkbox"/> Hemolytic disorders <input type="checkbox"/> Birth injuries <input type="checkbox"/> Malformation • Monitoring of high risk neonates • Feeding of high risk neonates • Organization and management of neonatal intensive care units • Infection control in neonatal intensive care units • Maintenance of reports and records 	10hrs
UNIT – 11	<p>Pharamaco- therapeutics in obstetrics</p> <ul style="list-style-type: none"> • Indication, dosage, action contraindication and side effects of drugs 	4 hrs

	<ul style="list-style-type: none"> • effect of drugs on pregnancy labour and puerperium • Nursing responsibilities in the admission of drugs in obstetric-oxytocin, anti-hypertensives, diuretics, laccolitic agents, anticonvulsants: • Analgesics and anesthesia in obstetrics • Effect of maternal medication on fetus on fetus and neonate 	
UNIT-12	<p>Family welfare programme</p> <ul style="list-style-type: none"> • Population trends and problems in India • Concept, aims importance and history of family welfare programme • National population dynamics policy and education • National family welfare programme RCH. ICDS. MCH. Safe motherhood • Organization and administration national state district block and village levels • A method of contrception's spacing. temporay and permanent, emergency contraception • Infertility and its management • Counseling for family welfare • Latest research in contraception • Maintenance of vital statistics • Role of nurse in Family welfare programme • Train supervision collaboration with other functionaries in community like ANMs, LHVs, Anganwadi workers TBA (Traditional birth Attendant Dai) 	10hrs

**Midwifery and obstetrical
Nursing- Practical**

**Placement: Fourth year
(Third year)**

Time Practical-180 hrs

Internship-240

Area	Skills	Duration (in weeks)
Antenatal clinical/OPD	<ul style="list-style-type: none">* Antenatal history taking* Physical examination* Recording of weight and BP* Hb and urine testing for sugar and albumin* Antenatal examination-abdomen and breast* Immunization* Assessment of risk status* Teaching antenatal mother.* Maintenance of Antenatal records	2
Labour room OT	<ul style="list-style-type: none">* Assessment of woman in labour* Per vaginal examination and interpretation* Monitoring and caring of woman in labour* Maintenance of partograph* Conduct normal delivery* Newborn assessment and immediate care* Resuscitation of newborns* Assessment of risk status of newborn* Episiotomy and suturing* Maintenance of labour and birth record* arrange for and assist with Caesarean section and care for women and baby during caesarean* Arrange for and assist with MTP and other surgical procedures	4

Postnatal ward	<ul style="list-style-type: none"> * Examination and assessment of mother and baby * Identification of deviations * Care of postnatal mother and baby * Perineal care * Lactation management * Breast feeding * Baby bath * Immunization * Teaching postnatal mother <ul style="list-style-type: none"> # Mother craft # Post natal care # Exercise # Immunization 	4
Newborn nursery	<ul style="list-style-type: none"> * Newborn assessment * Admission of neonates * Feeding of at risk neonates * Katori spoon * Paladi, tube feeding * Total parental nutrition * Thermal management of neonates- kangaroo mother care * Care of baby in incubator * Monitoring and care of neonates * Administering medications * Intravenous therapy * Assisting with exchange transfusion * Care of baby on ventilator * Photo therapy * Infection control, protocols in the nursery 	2
Family planning clinic	<ul style="list-style-type: none"> * Teaching and counseling of parents * Maintenance of neonatal records * counseling technique * Insertion of IUD * Teaching on use of family planning methods * Arrange for and assist with family planning operations * maintenance of record and reports 	1
	<ul style="list-style-type: none"> * Essential Requirements for registration as midwife - antenatal examination 30 - conducting normal deliveries in hospital/ home health center 20 - vaginal examination 5 - Episiotomy suturing 5 - Neonatal resuscitation 5 - Assist with caesarean Section 2 - witness Assist abnormal deliveries 5 - Postnatal cases nursed in hospital /home/health center 20 - Insertion of IUD 5 	

NOTE:

All casebooks must be certified by teacher on completion if essential requirements.

Internship Obstetrical Nursing
Internship Duration 5 Weeks

Area	Skills	Duration (in weeks)
Labour Ward	* Integrated Practice	2
Neonatal intensive care unit/NICU		1
Antenatal		2

COMMUNITY HEALTH NURSING

Placement: Fourth year

Theory-90 hrs.

Practical-135 hrs.

Course Description: This course is designed for students to practice community health nursing for the individual, family and group at both urban and rural setting by using concept and principles of health and community health nursing

UNIT	CONTENT	HOURS
UNIT 1	Introduction <ul style="list-style-type: none">• Definition concept and scope of community health and community health nursing• Historical development of<ul style="list-style-type: none"><input type="checkbox"/> Community health<input type="checkbox"/> community health nursing<ul style="list-style-type: none">- Pre-independence- Post independence	4 hrs
UNIT-2	Health planning and policies and problems <ul style="list-style-type: none">• National health planning in India Five year plans• Various committees and commission on health and family welfare<ul style="list-style-type: none">• <input type="checkbox"/> central council of health and family welfare(CCH & FW)<ul style="list-style-type: none"><input type="checkbox"/> National health policies (1983,2002)<input type="checkbox"/> National health policy<input type="checkbox"/> Health problems in India	6hrs
UNIT-3	Delivery of community health services <ul style="list-style-type: none">• Planning budgeting and material management of SCS, PHC& CHC• Rural : organization staffing and functions of rural health services provided by government at:<ul style="list-style-type: none"><input type="checkbox"/> Village<input type="checkbox"/> Sub centre<input type="checkbox"/> Primary health center<input type="checkbox"/> Community Health Center/Subdivision<input type="checkbox"/> Hospitals<input type="checkbox"/> District<input type="checkbox"/> State<input type="checkbox"/> Centre <p>* Urban Organization staffing and function of urban health services</p> <ul style="list-style-type: none"><input type="checkbox"/> Slums<input type="checkbox"/> Dispensaries	15 hrs

	<ul style="list-style-type: none"> <input type="checkbox"/> Maternal and child health centers <input type="checkbox"/> Special clinics <input type="checkbox"/> Hospitals <input type="checkbox"/> Corporation Municipality board * Component's of health services <ul style="list-style-type: none"> <input type="checkbox"/> environmental sanitation <input type="checkbox"/> Health education <input type="checkbox"/> Vital statistics <input type="checkbox"/> MHC antenatal natal postnatal MTP act Female foeticide act, child adoption act <input type="checkbox"/> Family welfare <input type="checkbox"/> National health programme <input type="checkbox"/> School health services <input type="checkbox"/> Occupational health <input type="checkbox"/> Defense services <input type="checkbox"/> Institutional services • System of medicine and health care <ul style="list-style-type: none"> <input type="checkbox"/> Indian system medicine and homeopathy <input type="checkbox"/> Alternative health care system like yoga meditation social and spiritual healing etc Referral system 	
UNIT-4	<p>Community health nursing approaches concepts and roles and responsibilities of nursing personnel</p> <ul style="list-style-type: none"> • Approaches <ul style="list-style-type: none"> <input type="checkbox"/> Nursing theories and nursing process <input type="checkbox"/> Epidemiological approach <input type="checkbox"/> Problem solving approach <input type="checkbox"/> Evidenced based approach <input type="checkbox"/> Empowering people to care for themselves • Concept of primary health care <ul style="list-style-type: none"> <input type="checkbox"/> Equitable distribution <input type="checkbox"/> Community participation <input type="checkbox"/> Focus on prevention <input type="checkbox"/> Use of appropriate technology <input type="checkbox"/> multi- sector • Roles and responsibilities of community health nursing personnel in <ul style="list-style-type: none"> <input type="checkbox"/> Family health services <input type="checkbox"/> Information education communication (INC) <input type="checkbox"/> Management information system (MIS) maintenance of records and reports. <input type="checkbox"/> Training and supervision of various categories of health workers <input type="checkbox"/> National health programmes <input type="checkbox"/> Environmental sanitation <input type="checkbox"/> Maternal and child health and family welfare 	25 hrs.

	<input type="checkbox"/> Treatment of minor ailments <input type="checkbox"/> School health services <input type="checkbox"/> Occupational health <input type="checkbox"/> Organization of clinics camps types preparation planning <input type="checkbox"/> Waste management in the centers clinics etc. <ul style="list-style-type: none"> • Home visit concept Principles. Process techniques bag technique and home visit 	
Unit - 5	<p>Assisting individuals and group to promote and maintain their health</p> <ul style="list-style-type: none"> • Empowerment for self care of individual families and group in <p>A Assessment of self and family</p> <input type="checkbox"/> Monitoring growth and development <ul style="list-style-type: none"> - Mile stones - Weight measurement - Social development <input type="checkbox"/> Temperature and blood pressure monitoring <input type="checkbox"/> Menstrual cycle <input type="checkbox"/> Breast self examination and testicles <input type="checkbox"/> Warning signs of various diseases <input type="checkbox"/> Teats: Urine sugar and albumin, blood sugar <p>B Seek health service for</p> <input type="checkbox"/> Routine check – up <input type="checkbox"/> Immunization <input type="checkbox"/> Counseling <input type="checkbox"/> Diagnosis <input type="checkbox"/> Treatment <input type="checkbox"/> Follow – up <p>C Maintenance of health records for self and family D Continue medical care and follow – up in community for various disease and disabilities E Carryout therapeutic procedures as prescribed / required for self and the family F Waste management G Sensitize and handle social issues affecting health and development for self and family</p> <ul style="list-style-type: none"> • Women empowerment • Women and child abuse • Abuse of elders • Female foeticide • Commercial sex worker • Food adulteration • Substance abuse <p>H Utilize community resources for self and family</p>	15 hrs.

	<input type="checkbox"/> Trauma services <input type="checkbox"/> Old age homes <input type="checkbox"/> Orphanage <input type="checkbox"/> Home of physically and mentally challenged individuals <input type="checkbox"/> Homes for destitute	
Unit - 6	National health and family welfare programmers and the role of a nurse <ul style="list-style-type: none"> • National ARI programmer • Revised national tuberculosis programmer (RNTCP) • National anti-malaria programme • National filarial control programme • National guinea worm eradication programme • National leprosy eradication programme • National AIDS control programme • National STD control programme • Iodine deficiency disorder programme • Expanded programme of immunization • National family welfare programme • National water supply and sanitation programme • Minimum need programme • National diabetes control programme • Polio eradication programme • National cancer control programme • Yaws eradication programme • 20 pints programme • ICDS programme • Mid day meal applied nutritional programme • Health schemes <input type="checkbox"/> ESI <input type="checkbox"/> CGHS <input type="checkbox"/> Health insurance 	20 hrs.
Unit - 7	<ul style="list-style-type: none"> • Health agencies <ul style="list-style-type: none"> - International – WHO, UNFPA, UNDP, World bank, FAO, UNICEF, DANDIA, European commission (EC) Red cross, USAID, UNESCO, Colombo plan, ILO, CARE etc. - National – Indian red cross society, Indian council for child welfare, Family planning association of India (FPAI), Tuberculosis association of India, Hindu Kushwant Singh, Central social welfare board, All India women’s conference, Blind association of India etc. 	5 hrs.

Community Health
Nursing – II – Practical

Placement : Fourth Year

Time : Practical – 135 hrs
Internship – 195 hrs

Areas	Skills	Duration (In weeks)
Community Health Nursing	<ul style="list-style-type: none"> • Community health survey • Community diagnosis • Family care Home adaptation of common procedures • Home visit Bag technique • Organize and conduct clinics – antenatal Postnatal well baby clinic camps etc • Screen manage and referrals for <ul style="list-style-type: none"> <input type="checkbox"/> High risk mothers and neonates <input type="checkbox"/> Accidents and emergencies <input type="checkbox"/> Illness Physical and mental <input type="checkbox"/> Disabilities • Conduct delivery at home / center: episiotomy and suturing • Resuscitate newborn • School health programme <ul style="list-style-type: none"> <input type="checkbox"/> Screen manage, refer children • Collaborate with health and allied agencies • Train and supervise health workers • Provide family welfare services: insertion of IUD • Counsel and teach individual, family and community about: HIV, TB, Diabetes, Hypertension, Mantel health, adolescents, elderly health physically and mentally challenged individuals. • Collect and calculate Vital health statistics • Document and maintain <ul style="list-style-type: none"> <input type="checkbox"/> Individual family and administrative records <input type="checkbox"/> Write reports – center, disease, and national health programme/projects 	1 week for urban & 4 weeks for rural
Placement : Internship		Time :4 weeks
Areas	Skills	Duration
Urban	Provide comprehensive care to individual family and community	4 weeks

NOTE: During the rural posting they should stay in health centers under the supervision of teachers

Management of Nursing Services and Education

Placement: fourth

Time: Theory 90mhrs

Course description: This course is designed to enable students to acquire understanding of management of clinical and community health nursing services nursing educational programmes this is also designed to enable students to acquire understanding of the professional responsibilities prospects and contribution to the growth of the profession

UNIT	CONTENT	TIME (HRS)	
		Th	Pr
I	Introduction to management in nursing <ul style="list-style-type: none"> • definition concepts and theories • functions of management • Principles of management • Role of nurse as a manager 	4	
II	Management process <ul style="list-style-type: none"> • Planning mission. Philosophy. objectives operation plan • Staffing philosophy, staffing study, norm activities patient classification system scheduling • Human resources management recruiting selecting deployment retaining promoting super annuation etc • Budgeting concept, principles, types, costs, benefit analysis, audit • Material management equipment supplies • Directing process (Leading) • Controlling Quality management • Program Evaluation Review Technique (PERT) • Bench marking Activity plan (Gantt chart) 	5	
III	Management of nursing services in hospital and community <p>Planning</p> <ul style="list-style-type: none"> • Hospital and patient care units including ward management • Emergency and disaster management • Human resources management :- <ul style="list-style-type: none"> ☐ Recruiting selecting deployment retaining promoting super annuation etc ☐ categories of nursing personnel including job description of all levels <ul style="list-style-type: none"> ☐ Patient/ population classification system ☐ Care responsibilities • Staffing development and welfare • Patient/ population Assisting and care 	8	20
	Budgeting proposal projecting requirements for staff equipments and supplies for <ul style="list-style-type: none"> ☐ Hospital and patient care units ☐ Emergency and disaster management 		

	<ul style="list-style-type: none"> • Directing and leading delegations participatory management <input type="checkbox"/> Assignment rotation. Delegations <input type="checkbox"/> Supervision and guidance <input type="checkbox"/> Implement standards. Policies, procedures and practices <input type="checkbox"/> Staff development and welfare <input type="checkbox"/> Maintenance of discipline • controlling evaluation <input type="checkbox"/> Nursing <ul style="list-style-type: none"> - Rounds/Visits - Nursing protocols - Manuals <input type="checkbox"/> Quality assurance Model, documentation <input type="checkbox"/> Records and reports performance appraisal 		
IV	<p>Organizational behavior and human relations</p> <ul style="list-style-type: none"> • Concepts and theories of organizational behaviors • Review of channels of communication • Leadership styles • Review of motivation • Concept and theories • Group dynamics • Techniques of <ul style="list-style-type: none"> <input type="checkbox"/> Communication and <input type="checkbox"/> Interpersonal relationship <input type="checkbox"/> Human relation • Public relation in context of nursing • Relations with professional associations and employee union and collective bargaining 	5	
V	<p>In service education</p> <ul style="list-style-type: none"> • Nature and scope of in service education program • Organization of in service education • Principles of adult learning • Planning for in service education programme, technique, methods and evaluation of staff education program • Preparation of report 	5	5
VI	<p>Management of nursing educational institutions</p> <ul style="list-style-type: none"> • Establishment of nursing educational institutions INC norms and guidance's • Co-ordination with- <ul style="list-style-type: none"> <input type="checkbox"/> Regulatory bodies <input type="checkbox"/> Accreditation <input type="checkbox"/> Affiliation <ul style="list-style-type: none"> - Philosophy/objectives - Organization <input type="checkbox"/> Structure <input type="checkbox"/> Committees 	10	

	<ul style="list-style-type: none"> - Physical facilities <ul style="list-style-type: none"> <input type="checkbox"/> College/School <input type="checkbox"/> Hostel - Students <ul style="list-style-type: none"> # Selection # Admission # Guidance and counseling # Maintaining discipline - Faculty and staff <ul style="list-style-type: none"> <input type="checkbox"/> Selection <input type="checkbox"/> Recruitment <input type="checkbox"/> Job description <input type="checkbox"/> Placement <input type="checkbox"/> Performance appraisal <input type="checkbox"/> Development and welfare • Budgeting • Equipments and supplies audio visual equipment, laboratory equipment books journals etc. • Curriculum planning, implementation and evaluation • Clinical facilities • Transport facilities • Institutional records and reports- administrative faculty staff and students 		
VII	<p>Nursing as a profession</p> <p>Nursing as a profession</p> <ul style="list-style-type: none"> <input type="checkbox"/> Philosophy, nursing practice <input type="checkbox"/> aims and objectives <input type="checkbox"/> characteristics of a professional nurse <input type="checkbox"/> Regulatory bodies INC SNC Acts: constitution functions <input type="checkbox"/> current trends and issues in nursing <input type="checkbox"/> Professional ethics <input type="checkbox"/> code of ethics; INC, ICN <input type="checkbox"/> code of professional conduct; INC ICN • Practice standards for Nursing , INC • Consumer protection act <input type="checkbox"/> Legal aspects in nursing <input type="checkbox"/> Legal terms related to practice : registration and licensing <input type="checkbox"/> Laws related to nursing practice Breach and penalties <input type="checkbox"/> Malpractice and negligence 	10	
VIII	<p>Professional Advancement</p> <ul style="list-style-type: none"> • Continuing education • Career Opportunities • Collective bargaining • Membership with professional organization, National and International • Participate in research activities • Publication, Journals, newspapers etc. 	3	

First Year B.Sc. NURSING

NURSING FOUNDATION

Placement: First Year

**Theory-265hrs
Practical- 650hrs
(200lab and 450 clinical)**

Course Description: This course is designed to help the students to develop an understanding of the philosophy, objectives, theories and process of nursing in various supervised clinical setting. It is aimed at helping the students to acquire knowledge understanding and skill in techniques of nursing and practice them in supervised clinical setting

UNIT	CONTENT	HOURS
UNIT-1	Introduction <ul style="list-style-type: none"> * Concept of health: Health – Illness continuum * Factors influencing health * Causes and risk factors for developing illness * Body defenses : Immunity and immunization * Illness & illness behavior * Impact of illness on patient and family * Health care services: health promotion and prevention primary care, diagnosis, treatment, rehabilitation and continuing care. * Health care team * Types of health care agencies * Hospitals; Types, organization and functions * Health promotion and level of disease prevention * Primary health care and its delivery: Role of nurse. 	10 hrs.
UNIT-2	Nursing as a profession <ul style="list-style-type: none"> * Definition and characteristics of a profession * Nursing <ul style="list-style-type: none"> - Definition, concepts, philosophy, objectives. - Characteristics, nature and scope of nursing practice - Function of nurse - Qualities of nurse - Categories of nursing personnel - Nursing as a profession - History of nursing in India * Values : Definition, types, values clarification and values professional nursing: caring and advocacy * Ethics : <ul style="list-style-type: none"> - Definition and ethical principles - Code of ethics and professional conduct for nurse. 	16 hrs.
Unit -3	Hospital admission and discharge	4 hrs.

	<ul style="list-style-type: none"> * Admission to the hospital <ul style="list-style-type: none"> - Unit and its preparation admission bed - Admission procedure - Special considerations - Medico-legal issues - Roles and responsibilities of the nurse * Discharge from the hospital <ul style="list-style-type: none"> - Types: Planned discharge, LAMMA and abscond, referral And transfers - Discharge planning - Discharge procedure - Special consideration - Medico- legal issues - Roles and responsibilities of the nurse - Care of the unit after discharge 	
Unit -4	<p>Communication and the nurse patient relationship</p> <ul style="list-style-type: none"> * Communication: Levels, elements, types, modes, process, factors influencing communication. <ul style="list-style-type: none"> - Methods of effective communication <ul style="list-style-type: none"> # Attending skills # Rapport building skills # Empathy skill - Barriers to effective communication * Helping relationship (NPR): dimensions of helping relationships, phases of a helping relationship * Communicating effectively with patient, families and team members and maintain effective human relation with special reference to communicating with vulnerable group (children, woman, physically and mentally challenged and elderly) * Patient teaching: Importance purpose, process, role of nurse and integrating teaching in nursing process. 	10 hrs
Unit -5	<p>The Nursing process</p> <ul style="list-style-type: none"> * Critical thinking and nursing judgment <ul style="list-style-type: none"> - Critical thinking: Thinking and learning - Competencies, attitude for critical thinking, levels critical thinking in nursing * Nursing process overview: <ul style="list-style-type: none"> Application in practice <ul style="list-style-type: none"> - Nursing process format: INC, current format - Assessment <ul style="list-style-type: none"> # Collection of data: types, sources, methods - Nursing Diagnosis <ul style="list-style-type: none"> # Identification of client problems # Nursing diagnosis statement # Difference between medical and nursing diagnosis - Planning - Establishing goals and expected outcomes - Selection of intervention: Protocols and standing orders - Writing the nursing care plan 	15 hrs

	<ul style="list-style-type: none"> * Implementation <ul style="list-style-type: none"> - Implementing the plan of care * Evaluation <ul style="list-style-type: none"> - Outcome of care - Review and modify * Documentation and reporting 	
Unit -6	<p>Documentation and reporting</p> <ul style="list-style-type: none"> * Documentation: purpose of recording and reporting * Communication within the health care team * Types of record: ward records, medical/nursing records * Common record-keeping forms, computerized documentation * Guidelines for reporting :Factual basis, accuracy , completeness, current ness, organization, confidentiality * Methods of recording. * Reporting change –of shift reports: transfer reports, incident reports * Minimizing legal liability through effective record keeping 	4hrs
Unit -7	<p>Vital sign</p> <ul style="list-style-type: none"> * Guidelines for taking signs: * Body temperature <ul style="list-style-type: none"> - Physiology, regulation .Factor affecting body Temperature. - Assessment of body temperature: sites, equipments and technique special considerations - Temperature alterations: Hyperthermia, heat stroke, hypothermia - Hot and cold applications * Pulse <ul style="list-style-type: none"> - Physiology and regulation, characteristics of the pulse, factors affecting pulse - Assessment of pulse: sites, location, equipment and technique, Special consideration - Alteration in pulse * Respiration <ul style="list-style-type: none"> - Physiology and regulation, mechanics of breathing Characteristics of the respiration, factors affecting respiration - Assessment of pulse: site, location, equipments and technique, special consideration - Alteration in pulse. * Respiration: <ul style="list-style-type: none"> - Physiology and regulation, mechanics of breathing, characteristics, Factors affecting respiration - Assessment of respiration: technique, special consideration - Alteration in respiration * Blood pressure <ul style="list-style-type: none"> - Physiology and regulation, characteristics of blood pressure, Factors affecting blood pressure. 	15hrs

	<ul style="list-style-type: none"> - Assessment of blood pressure: equipments, technique, special consideration. - Alteration in blood pressure <p>* Reading of vital signs</p>	
UNIT 8	<p>Health assessment</p> <ul style="list-style-type: none"> # Purpose # Process of health assessment <ul style="list-style-type: none"> - Health history - Physical examination # Methods- inspection., palpation, percussion, auscultation olfaction # Preparation of examination; patient and unit # General assessment # Assessment of each body system # Recording of health assessment 	30 hrs
UNIT 9	<p>Machinery equipment and Linen</p> <ul style="list-style-type: none"> - Type Disposable and reusable – linen, rubber gods, glass ware, mental, plastics, furniture machinery <p>Introduction</p> <ul style="list-style-type: none"> - Indent - Maintenance - Inventory 	5hrs

UNIT 10	<p>Meeting needs of patient</p> <p>* Basic needs (Activity of daily living)</p> <ul style="list-style-type: none"> - Providing safe and clean environment - Physical- environment, temperature humidity, noise, ventilation, light, odors, pests control, reduction of physical hazards: Fire accidents - Safety devices restraints, side rails, airways, trapeze etc. - Role of nurse in providing safe and clean environment <p>* Hygiene - Factors influencing hygiene practices</p> <ul style="list-style-type: none"> - Hygienic care: care of the skin – bath and pressure points, feet and nail, oral cavity, hair care, eyes, ear and nose - Assessment, principles, types, equipments procedure, special considerations - Patient environment : Room equipment and linen, making patient beds - Types of beds and bed making - Comport:- - Factors influencing comport - Comport devices <p>* Physiological needs;</p> <p># Sleep & rest</p> <ul style="list-style-type: none"> - Physiology of sleep - Factors affecting Sleep - Promoting rest & sleep - Sleep disorders <p># Nutrition</p> <ul style="list-style-type: none"> - Importance - Factors affecting nutritional needs - Assessments of nutritional needs variables - meeting nutritional needs principles, equipments, procedure and special considerations <p>* Oral</p> <p>* Central : Naso/ orgastric, gastrostomy</p> <p>* Parental</p> <p>* Urinary elimination</p> <ul style="list-style-type: none"> - Review of physiology of urine elimination, composition and characteristics of urine - Factor influencing urination - Alteration in urinary elimination - Types & collection of urine specimen: observation, urine testing - Facilitating urine elimination : assessment, types, 	60hrs
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equipments, procedure and special considerations

- # Providing urinal & bed pan
- # Condom drainage
- # Perineal care
- # Catheterization
- # Care of urinary drainage
- # Care of urinary diversion
- # Bladder irrigation

*** Bowel elimination**

- Review of physiology of bowel elimination.

Composition and characteristics of faeces.

- Factor influencing bowel elimination
Alteration in bowel elimination

- Types & collection of faeces specimen: observation
- Facilitating bowel elimination: assessment,

equipment, procedures and special considerations

- # Passing of flatus tube
- # Enemas
- # Suppositories
- # Sitz bath
- # Bowel wash
- # Care of ostomies

*** Mobility and immobility**

- Principles of body mechanics
- Maintenance of normal body alignment and

mobility

- Factors affecting body alignment and mobility
- Hazards associated with immobility
- Alteration in body alignment and mobility
- Nursing intervention for impaired body alignment

and mobility: assessment, types, devices used, method and special consideration, rehabilitation aspects

- # Range of motion exercises
- # Maintaining body alignment: positions
- # Moving
- # Lifting
- # Transferring
- # Walking
- # Restraints

*** Oxygenation**

- Review of cardiovascular and respiratory physiology
- Factors affecting oxygenation
- Alteration in oxygenation
- Nursing intervention in oxygenation: assessment,

types, equipments used, procedure and special consideration

- # Maintenance of patient airway
- # Oxygen administration
- # Suction
- # Inhalation: dry & moist
- # Chest physiotherapy and postural drainage
- # Pulse oxymetry
- # CPR- Basic life support

* Fluid, electrolyte and acid-base balance

UNIT-11	<p>Infection control and clinical settings</p> <ul style="list-style-type: none"> * Infection control <ul style="list-style-type: none"> - Nature of infection - Chain of infection transmission - Defenses against infection: natural and acquired - Hospital acquired infection - Concept of asepsis: medical asepsis and surgical asepsis - Isolation precaution (barrier nursing) <ul style="list-style-type: none"> # Hand washing: simple, hand antisepsis and surgical antisepsis (scrub) # Isolation: source and protective # Personal protective equipments: types, uses and technique of wearing and removing # Decontamination of equipments and unit # Transportation of infected patients # Transmission based precautions * Biomedical waste management <ul style="list-style-type: none"> - Importance - Types of hospital waste - Hazards associated with hospital waste - Decontamination of hospital waste - Segregation and transportation and disposal 	20 hrs
UNIT-12	<p>Administration of Medication</p> <ul style="list-style-type: none"> * General principles/ considerations <ul style="list-style-type: none"> - Purpose of medications - Principles : 5 rights, special considerations, prescriptions, safety in administering medication and medication errors - Drug forms - Route of administration - Storage & maintenance of drug and nurses responsibility - Broad classification of drugs - Therapeutic effect, side effects, toxic effects, idiosyncratic reaction, allergic reaction, drug tolerance, drug interaction - Factors influencing drug action - Systems of drug measurements: metric system, apothecary system, households measurement, solution <ul style="list-style-type: none"> - Converting measurements units: Conversion within one system, conversion between system, dosage calculation - Terminologies and abbreviation used in prescription and medications. * Parenteral <ul style="list-style-type: none"> - General principles: decontamination of disposable syringes and needles - Types of parenteral therapies - Types of syringes, needles, canula and infusion sets - Protection from needles stick injuries: giving medication with the safety syringes 	40 hrs.

	<ul style="list-style-type: none"> - Routes of parenteral therapies # Intradermal: purpose, site, equipments, procedures, special consideration # Subcutaneous: purpose, site, equipments, procedure, special consideration # Intramuscular: purpose, site, equipments, procedure, special consideration # Intravenous: purpose, site, equipments, procedure, special consideration # Advanced techniques: epidural, intrathecal, intraosseous, intraperitoneal, intrapleural, intra arterial- role of nurse * Topical administration: purpose, site, equipments, procedure, special consideration <ul style="list-style-type: none"> - Application to skin - Application to mucus membrane # Direct application of liquids-Gargle and swabbing the throat # Insertion of drug into body cavity: Suppository/ medicated packing in rectum/ vagina # Instillation: Ear, eye, nasal, bladder and rectal # Irrigation : Ear, eye, bladder, vaginal and rectal # Spraying: Nose and throat * Inhalation: Nasal, oral, end tracheal / tracheal (steam, oxygen and medication) Purposes, types, equipments, procedure, special considerations <ul style="list-style-type: none"> - Recording and reporting of medication administered. 	
UNIT-13	<p>Meeting needs of pre-operative patients</p> <ul style="list-style-type: none"> * Definition and concept of pre operative nursing * Pre-operative phase <ul style="list-style-type: none"> - Preparation of patient for surgery * Intra operative <ul style="list-style-type: none"> - Operative theatre set up and environment - Role of nurse * Post operative phase <ul style="list-style-type: none"> - Recovery unit - Post operative room - Post operative care * Wounds: types, classification, wound healing process, factors affecting wound, complication of wound healing * Surgical asepsis * Care of wound ; types, equipments, procedure and special considerations <ul style="list-style-type: none"> - Dressing, suture care - Care of drainage - Application of bandages, binders, splints and slings - Heat and cold therapy 	10 hrs.
UNIT-14	<p>Meeting special needs of the patient</p> <ul style="list-style-type: none"> * Care of patient having alteration in <ul style="list-style-type: none"> - Temperature (hyper & hypothermia): Types, assessment, management 	15 hrs.

	<ul style="list-style-type: none"> - Sensorium (Unconsciousness); Assessment and management - Urinary elimination (retention & incontinence); Assessment and management - Functioning of sensory organs(visual & hearing impairment); Assessment and management - Communication method and special considerations - Mobility (physically challenged, cast); Assessment and management - Mental state (mentally challenged); Assessment and management - Communication methods and special considerations - Respiration (distress); Types, assessment, management - Comfort-(pain) nature, types, Factors influencing pain, coping , assessment& management * Treatment related to gastrointestinal system; naso-gastric suction, gastric irrigation, gastric analysis. 	
UNIT- 15	<p>Care of terminally ill patient</p> <ul style="list-style-type: none"> • Concepts of loss, grief, grieving process • Signs of clinical death • Care of dying patient, special considerations Advanced directives; euthanasia, will, dying declaration, organ donation etc. • Medic-legal issue • care of dead body • Equipment., procedure and care of unit • Autopsy • Embalming 	5hrs
UNIT- 16	<p>Professional nursing concepts and practices</p> <ul style="list-style-type: none"> • Conceptual and theoretical models of nursing practice introduction to models – holistic model, health belief Model, health promotion model etc. • Introduction to theories in nursing: peplum’s Henderson’s Orem. S Newman’s Roger’s and Roy’s • Linking theories with nursing process 	6hrs

Nursing Foundation practical

Placement: - First Year

Practical- 650hrs

(200 and 450 Clinical):

Course Description: This course is designed to help the students to develop an understanding of the philosophy, objectives, theories and process of nursing in various supervised clinical setting. It is aimed at helping the students to acquire knowledge, understanding and skills in techniques of nursing and practice them in supervised clinical settings

UNIT	CONTENT	HOURS
UNIT -1	<p>Hospital admission and discharge (III)</p> <ul style="list-style-type: none"> • Admission • Prepare unit for new patient • Prepare admission procedure <ul style="list-style-type: none"> New patient Transfer in • Prepare patient record <p>Discharge/Transfer out</p> <ul style="list-style-type: none"> • Gives discharge counseling • Perform discharge procedure (planned discharge, LAMMA and abscond, referrals and transfers) • Prepare records of discharge/transfer • Dismantle, and disinfect unit and equipment after discharge/transfer <p>Perform assessment</p> <ul style="list-style-type: none"> • History taking, nursing diagnosis, problem list, Prioritization goals & outcomes, selection of interventions • Write nursing care plan • Gives care as per the plan <p>Communication</p> <ul style="list-style-type: none"> • Use verbal and nonverbal communication techniques Prepare a plan for patient teaching session <p>Write patient report</p> <ul style="list-style-type: none"> • change of shift reports, transfer reports , incident report etc • Presents patient report <p>Vital sign</p> <ul style="list-style-type: none"> • Measure, record and interpret alteration in body temperature pulse respiration and blood pressure <p>Health assessment</p> <ul style="list-style-type: none"> • Health history taking 	<p>200 450 Minimum practice time clinical area</p>

	<ul style="list-style-type: none"> • Perform assessment <ul style="list-style-type: none"> -General - Body systems • Use various methods of physical examination • Inspection palpation, Percussion Auscultation, Olfaction • Identification of system wise deviations <p>Prepare patient's Unit</p> <ul style="list-style-type: none"> • Prepare beds <ul style="list-style-type: none"> - Open closed, occupied operation amputation - Cardiac, Fracture, burn and Fowler's bed - Pain assessment and provision for comfort 	
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	<p>Use comfort devices</p> <p>Hygienic care</p> <ul style="list-style-type: none"> • Oral hygiene • Bath and care of pressure points • Hair wash pediculosis Treatment <p>Feeding</p> <ul style="list-style-type: none"> • Oral, Eteral, Naso/orogastric gastrostomy and parenteral feeding • Naso- gastric insertion suction and irrigation <p>Assisting patient in urinary elimination</p> <ul style="list-style-type: none"> • Provides urinal/bed pan • Condom drainage • Catheterization • Care of urinary drainage <p>Bladder irrigation</p> <p>Assisting bowel elimination</p> <ul style="list-style-type: none"> • Insertion of Flatus tube • Enemas • Insertion of suppository <p>Bowel wash</p> <p>Body alignment and mobility:-</p> <ul style="list-style-type: none"> - Range of motion exercises - Positioning Recumbent lateral fowlers, Sims, lithotomic, prone, trend burg position - Assist patient in moving lifting transferring, Walking - Rest rants <p>Oxygen administration</p> <p>Suctioning: Or pharyngeal, nasopharyngeal</p> <p>Chest physiotherapy and postural drainage</p> <p>Care of chest drainage</p> <p>CPR- Basic life support</p> <p>Intravenous therapy</p> <p>Blood and blood component therapy</p> <p>Collect/ assist for collection of specimen for investigation urine, sputum, faces, vomit us, blood and other body fluid</p> <p>Perform lab tests:</p> <ul style="list-style-type: none"> • Urine: sugar, albumin and acetone • Blood: sugar (with stripe/ glucometer) <p>Hot and cold application: Local and general sitz bath.</p> <p>Communicating and assisting self care of visually and hearing impaired patients</p> <p>Communicating and assisting self care of mentally challenged/ disturbed patients</p> <p>Recreational and divers ional therapies</p> <p>Caring of patient with alteration in sensation</p> <p>Infection control</p>	
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	<p>* perform following procedures</p> <ul style="list-style-type: none"> - Hand washing techniques - (Simple, hand antisepsis and surgical antisepsis) - Prepare isolation unit in lab/ward - Practice technique of wearing and removing personal protective equipments - Practice standard safety precaution (universal precautions) <p>* Documentation of equipments and unit:-</p> <ul style="list-style-type: none"> - Surgical asepsis # Sterilization # Handling sterilization equipment # Calculate strengths of lotions # Prepare lotion <p>* Care of articles</p> <p>Pre and post operative care</p> <ul style="list-style-type: none"> • Skin preparation for surgery: Local • Preparation of post operative unit • Pre & Post operative teaching and counseling • Pre and post operative monitoring • Care of the wound • Dressing, suture care, care of drainage, application of bandage, binders, splint and sling • Bandaging of various body parts. <p>Administration of medications</p> <ul style="list-style-type: none"> • Administer medication in different forms and routes • Oral, sublingual and buccal • Parenteral: intradermal, subcutaneous, intramuscular etc. • Assist with the intravenous medication • Drug measurement and dose calculation • Preparation of lotion and solution • Administer topical applications • Insertion of drug into the body cavity: suppository & medicated packing etc. • Instillation of medicine and spray into Ear, eye, nose and throat • Irrigation: eye, ear, bladder, vagina and rectum • Inhalation: dry and moist <p>Care of dying patient</p> <ul style="list-style-type: none"> • Caring and packing of dead body • Counseling and supporting grieving relatives • Terminal care of the unit 	
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B.Sc. Nursing
Second Year

**Medical and Surgical
(Adult including Geriatrics)**

Placement: Second Year

**Time: theory – 210 hours
Practical -720hours**

Course Description: - The purpose of this course is to acquire knowledge and develop proficiency in caring for patients with medical and surgical disorders in verities of health care settings and at home

UNIT	CONTENT	TIME(HRS)
UNIT – 1	<p>INTRODUCTION</p> <ul style="list-style-type: none"> <li>• Introduction to medical surgical nursing – evolution and trends of medical and surgical nursing <li>• Review of concepts of health and illness Disease – concepts. Diseases (ICD -10 or later version) Acute illness Chronic illness. Stages of illness. <li>• Review of Concepts of comprehensive nursing care in medical surgical conditions based on nursing process. <li>• Role of nurse patient and family in care of adult patient <li>• Role and responsibilities of a nurse in of medical and surgical settings. Settings <li>• Outpatient department <li>• In - patient unit <li>• Intensive care unit <li>• Home and Community <li>• Introduction to of Medical and surgical asepsis <ul style="list-style-type: none"> <li>▪ Inflammation and infection <li>▪ Wound healing <li>▪ Care of Surgical patient <li>▪ Pre-operative 	15

	<ul style="list-style-type: none"> ▪ Intra-operative ▪ Post-operative 	
UNIT- II	<p>Common signs and symptoms and management</p> <ul style="list-style-type: none"> • Fluid and electrolyte imbalance • Vomiting • Dyspnea and cough, respiratory obstruction • Fever • Shock • Unconsciousness, Syncope • Pain • Incontinence • Edema • Age related problem- Geriatric 	15
UNIT- III	<p>Nursing management of Patients (adults including elderly) with respiratory problems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of respiratory systems • Nursing Assessment – History and physical assessment • Etiology, Pathphysiology, Clinical manifestations diagnosis, treatment modalities and medical - surgical, dietetics & nursing management of adults including elderly with. • Upper Respiratory tract infections • Bronchitis • Asthma • Emphysema • Empyema • Atelectasis • Chronic Obstructive Pulmonary Diseases(COPD) • Broncheectasis • Pneumonia • Pulmonary tuberculosis • Lung abscess • Pleural effusion • Cysts and tumors • Chest injuries • Respiratory arrest and insufficiency • Pulmonary embolism <p>Special therapies, alternative therapies Nursing procedures Drugs used in treatment of respiratory disorders</p>	20
Unit- IV	<p>Nursing management of Patients (adults including elderly) with disorders of digestive systems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of digestive systems • Nursing Assessment – History and physical assessment 	

	<ul style="list-style-type: none"> • Etiology, Pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management ❑ Disorders of- oral cavity- lips, gums, tongue, salivary glands and teeth ❑ Oesophagus - inflammation, structure obstruction, bleeding and tumors. ❑ Stomach and Duodenum- hiatus hernia, gastritis, peptic ulcer, duodenum ulcer, bleeding, tumours, pyloric stenosis ❑ Small intestinal disorders-Colitis inflammation and infection, enteritis, obstruction, bleeding and tumour and perforation ❑ Large intestinal disorders- Colitis inflammation and infection, enteritis, obstruction, tumour and lump ❑ Hernias ❑ Appendix- inflammation, mass, abscess, rupture ❑ Anal & Rectum, hemorrhoids, fissures and fistulas ❑ Peritonitis/acute abdomen ❑ Pancreas: inflammation, cyst, abscess and tumour. ❑ Liver: inflammation, cyst, abscess, cirrhosis, portal hypertension, hepatic failure and tumour ❑ Gall Bladder: inflammation, obstruction, stones and tumour. <p>Special therapies, alternative therapies Nursing procedures Drug used in treatment of disorders of digestive systems.</p>	
Unit V	<p>Nursing management of patients (adults including elderly) with blood and cardio vascular problems.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of blood and cardio vascular system. • Nursing Assessment- History and physical assessment • Etiology pathophysiology Clinical manifestations diagnosis treatment modalities and medical surgical dietetics & nursing management of , • Vascular system • Hypertension hypotension • Artherosclerosis • Raynaud's disease • Aneurysm and peripheral vascular disorder <p>Heart</p> <ul style="list-style-type: none"> • Coronary artery disease • Ischemic Heart Disease • Coronary arteriosclerosis • Angina pectoris • Myocardial infraction • Muscular disorders of the heart • Congenital and acquired 	30

	<ul style="list-style-type: none"> • Rheumatic Heart diseases <p>Endocarditis, pericarditis/myocarditis</p> <ul style="list-style-type: none"> • Cardio Myopathies • Cardiac dysrhythmias, Heart Block • Congestive cardiac failure <ul style="list-style-type: none"> □ Cor-pulmonale, pulmonary edema, cardiogenic shock cardiac tamponade • Cardiac emergencies and arrest • Cardio pulmonary Resuscitation (CPR) • Blood <ul style="list-style-type: none"> □ Anemia's □ Polycythemia □ Bleeding disorders, clotting factors defects and platelets defects □ Thalassemia □ Leukaemias □ Leukopenias and agranulocytosis □ Lymphomas □ Myelomas • Special therapies <ul style="list-style-type: none"> □ Blood transfusion, safety checks, procedure and requirements, management of adverse transfusion, reaction, records for blood transfusion □ Management and counseling of blood donors phlebotomy procedure, and post donation management Blood bank functioning and hospital transfusion committee Bio safety and waste management in relation to Blood transfusion □ Role of a nurse in organ donation, retrieval and banking Alternative therapies <p>Nursing procedures Drug used in treatment of blood and cardio vascular disorders.</p>	
Unit-VI	<p>Nursing management of patients (adults including elderly) with Gento-Urinary problems.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of Gento-Urinary systems. • Nursing assessment-History and physical assessment • Etiology, pathophysiology clinical manifestations diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- • Nephritis • Nephrotic syndrome • Nephrosis • Renal calculus • Tumours • Acute renal failure • Chronic renal failure • End stage renal disease • Dialysis, renal transplant 	10

	<ul style="list-style-type: none"> • Congenital disorders, urinary infections • Benign prostatic hypertrophy • Disorders of ureter, urinary bladder and urethra-inflammation, infection, structure, obstruction, tumour, prostrate <p>Special therapies, alternative therapies Nursing procedures Drug used in treatment of disorders of Genito-Urinary systems</p>	
UNIT-VII	<p>Nursing management of disorders of male (adults including elderly) Reproductive system</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of male reproductive system • Nursing Assessment – History and physical assessment • Etiology, pathophysiology clinical manifestations diagnosis treatment modalities and medical, surgical dietetics & nursing management of male reproductive system • Congenital malformations , cryptorchidism • Hypospadiasis Epispadiasis • Infection • Testis and adjacent structures • Penis • Prostate inflammation, infection hypertrophy tumour • Sexual dysfunction • Infertility • Contraception • Breast gynaecomastia tumour • Climacteric Changes. Special theories alternative therapies • Nursing procedures • Drugs used in treatment of disorders of male reproductive system 	5
UNIT-VIII	<p>Nursing management of patients (adults including elderly) with disorders of endocrine systems</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of endocrine system • Nursing Assessment -History and physical assessment Etiology, pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- <ul style="list-style-type: none"> <input type="checkbox"/> Disorders of Thyroid and parathyroid <input type="checkbox"/> Diabetes mellitus <input type="checkbox"/> Adrenal tumour <input type="checkbox"/> Pituitary disorders <p>Special therapies, alternative therapies Nursing procedures.</p>	15

UNIT-IX	<p>Drugs used in treatment of disorders of endocrine systems</p> <p>Nursing management of patients (adults including elderly) with disorders of integumentary system</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of integumentary system • Nursing Assessment History and physical assessment • Etiology, pathophysiology clinical manifestations, diagnosis treatment modalities and medical, surgical, dietetics & nursing management of skin and its appendages <p><input type="checkbox"/> Lesions and abrasions</p> <p><input type="checkbox"/> Infection and infestations, Dermatitis</p> <p><input type="checkbox"/> Dermatoses: Infectious and infectious “ Inflammatory Dermatoses”</p> <p><input type="checkbox"/> Acne Vulgaris</p> <p><input type="checkbox"/> Allergies and Eczema</p> <p><input type="checkbox"/> Psoriasis</p> <p><input type="checkbox"/> Malignant melanoma</p> <p><input type="checkbox"/> Alopecia</p> <p>Special therapies, alternative therapies</p> <p>Nursing procedures</p> <p>Drug used in treatment of disorders of integumentary system.</p>	10
UNIT-X	<p>Nursing management of patients (adults including elderly) with disorders of musculoskeletal system</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of musculoskeletal system • Nursing Assessment- History and physical assessment. • Etiology, pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical dietetics & nursing management of <p><input type="checkbox"/> Muscles, Ligaments and joints- inflammation, infection, trauma</p> <p><input type="checkbox"/> Bones- inflammation, infection, dislocation, fracture, tumour and trauma</p> <p><input type="checkbox"/> Osteomalacia and osteoporosis</p> <p><input type="checkbox"/> Arthritis</p> <p><input type="checkbox"/> Congenital deformities</p> <p><input type="checkbox"/> Spinal column- defects and deformities, tumour, prolapsed inter vertebral disc, pott’s spine</p> <p><input type="checkbox"/> Paget’s disease</p> <ul style="list-style-type: none"> • Amputation • Prosthesis • Transplant & replacement surgeries • Rehabilitation <p>Special therapies, alternative therapies</p> <p>Nursing procedures</p> <p>Drugs used in treatment of disorders of musculoskeletal system.</p>	15
UNIT-XI	Nursing management of patients (adults including elderly)	10

	<p>with immunological system</p> <ul style="list-style-type: none"> • Review of immune system • Nursing Assessment- History and physical assessment • Etiology pathophysiology clinical manifestations, diagnosis, treatment modalities and medical, surgical, dietetics & nursing management of- <ul style="list-style-type: none"> <input type="checkbox"/> Immunodeficiency disorder <input type="checkbox"/> Primary immuno deficiency <input type="checkbox"/> Phagocytic dysfunction <input type="checkbox"/> B-cell and T- cell deficiency <input type="checkbox"/> Secondary immuno deficiency <input type="checkbox"/> Acquired immuno deficiency syndrome (AIDS) <input type="checkbox"/> Incidence of HIV & AIDS <input type="checkbox"/> Epidemiology <input type="checkbox"/> Transmission- Prevention of Transmission <input type="checkbox"/> Standard Safety Precautions <input type="checkbox"/> Role of nurse Counseling <input type="checkbox"/> Health education and home care consideration <input type="checkbox"/> National AIDS control proqramme – NACO various national and international agencies <input type="checkbox"/> Infection control program <input type="checkbox"/> Rehabilitation <p>Special therapies alternative therapies Nursing procedures Drugs used in treatment of disorders of Immunological system</p>	
UNIT XII	Nursing management of patients (adults including elderly)	20

	<p>with communicable Disease</p> <ul style="list-style-type: none"> • Overview of infectious disease the infectious process • Nursing Assessment History and physical assessment • Epidemiology, infectious process clinical manifestations diagnosis treatment prevention and control eradication of common Communicable diseases <ul style="list-style-type: none"> <input type="checkbox"/> Tuberculosis <input type="checkbox"/> Diarrhoeal disease <input type="checkbox"/> Hepatitis A- E <input type="checkbox"/> Herpes <input type="checkbox"/> Chickenpox <input type="checkbox"/> Small pox <input type="checkbox"/> Typhoid <input type="checkbox"/> Meningitis <input type="checkbox"/> Gas gangrene <input type="checkbox"/> Leprosy <input type="checkbox"/> Dengue <input type="checkbox"/> Plague <input type="checkbox"/> Malaria <input type="checkbox"/> Diphtheria <input type="checkbox"/> Pertussis <input type="checkbox"/> Poliomyelitis <input type="checkbox"/> Measles <input type="checkbox"/> Filariasis <ul style="list-style-type: none"> <input type="checkbox"/> HIV AIDS <ul style="list-style-type: none"> • reproductive tract infection • Special infection control measures notification, isolation Quarantine, immunization, infection disease hospitals Special therapies, alternative therapies Nursing procedures Drugs used in treatment of communicable diseases 	
UNIT XIII	Preoperative nursing care	25

	<ul style="list-style-type: none"> • Organization and physical set- up of the operation theatre (OT) <ul style="list-style-type: none"> <input type="checkbox"/> Classification <input type="checkbox"/> O.T. DESIGN <input type="checkbox"/> Staffing <input type="checkbox"/> members of OT team <input type="checkbox"/> Duties and responsibilities of nurse in OT <input type="checkbox"/> Principles of health and operating room attire <input type="checkbox"/> Instrument <input type="checkbox"/> Suture and sutures material <input type="checkbox"/> equipments <input type="checkbox"/> O. T. tables and set for common surgical procedures <input type="checkbox"/> Position and draping for common surgical procedures <input type="checkbox"/> Scrubbing procedures <input type="checkbox"/> Gowning and gloving <input type="checkbox"/> Preparation of OT sets Monitoring the patient during surgical procedures • Maintenance of therapeutic environment in O T • Standard safety Measures <ul style="list-style-type: none"> <input type="checkbox"/> Infection control fumigation disinfections and sterilization <input type="checkbox"/> Biomedical waste management <input type="checkbox"/> Prevention of accidents and hazards in O T • Anesthesia <ul style="list-style-type: none"> <input type="checkbox"/> Types <input type="checkbox"/> Methods of administration <input type="checkbox"/> Effects and stages <input type="checkbox"/> Equipments <input type="checkbox"/> Drugs • Cardiopulmonary resuscitation (CPR) • Pain management techniques <ul style="list-style-type: none"> <input type="checkbox"/> Legal aspects 	
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MEDICAL SURGICAL NURSING

(Adult including geriatrics)- I

Practical

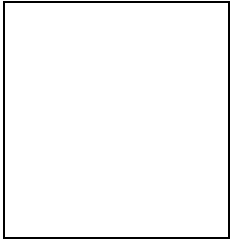
Placement: Second Year

times: 720 hours

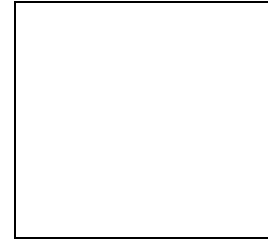
AREA	SKILLS	DURATON (in Weeks)
General Medical Ward (Respiratory, Endocrine, Renal, Hematology)	<ul style="list-style-type: none"> • Assessment of the patient <ul style="list-style-type: none"> - Taking history - Perform general and specific Examination - Identify alteration and deviations • Practice Medical Surgical asepsis Standard safety Measures • Administer medications <ul style="list-style-type: none"> - Oral, IV M Subcutaneous • IV Therapy <ul style="list-style-type: none"> - IV Canulation - Maintenance and Monitoring • Oxygen therapy by different Methods • Mobilization • Chest Physiotherapy • Naso gastric Feeding • Assist in common diagnostic • Perform/Assist in therapeutic procedures • Blood and c component therapy • Throat suctioning • Collect specimen for common investigations • Maintain elimination <ul style="list-style-type: none"> - Catheterization - Bowel wash - Enema - Urinary drainage • Maintain intake output and documentation • Counsel land teach related to specific disease conditions 	6

General Surgical Ward (GI Urinary, CTVS)	<ul style="list-style-type: none"> • practice medical surgical asepsis • Standard safety Measures • Pre- operative preparation of the patients • Post operative care <ul style="list-style-type: none"> - Receiving patient , assessment - Monitoring care 	6
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	<ul style="list-style-type: none"> • Care of wounds and drainage • Sutures removal • Ambulating and exerciser • Naso gastric aspiration • Care of chest drainage • Ostomy care <ul style="list-style-type: none"> - Gastrostomy - Colostomy - Entrostomy • Blood component and therapy • Practice Universal precaution 	
Cardiology Ward	<ul style="list-style-type: none"> • Physical examination of the cardio vascular system recoding and interpreting ECG • Monitoring of patient • Preparation and assisting in non- invasive and invasive diagnostic procedures • Administer cardiac drugs • Cardio pulmonary resuscitation • Teach patient and families • Practice medical and surgical asepsis standard safety measures 	2
Skin and Communicable disease ward	<ul style="list-style-type: none"> • Assessment of patient with skin disorders • Assist in diagnostic and therapeutic procedures • Administer topical medication • Practice medical and surgical asepsis standard safety measures • Use of personal protective equipment (PPE) • Give medicated baths • Counseling HIV positive patient • Teach prevention of infection disease 	1
Orthopedic Ward	<ul style="list-style-type: none"> • Assessment of orthopedic patient • Assist in application of plaster cast and removal of cast • Apply skin traction, buck's traction • Assist in application and removal of prosthesis • Physiotherapy and range of motion exercises (ROM) muscle strengthening exercises • Crutch maneuvering technique • Activities of daily living • Ambulance • Teach and counsel patients and families 	2
Operation theatre	<ul style="list-style-type: none"> • Scrubbing, gowing, gloving • Identify instruments • Suturing • Material for common operations • Disinfection, carbolization, Fumigation • Preparation of instrument sets for common operations • Sterilization of sharp and other instruments 	6



- Prepare OT table depending upon the operation
- Positioning and monitoring of the patient
- Endotracheal intubation
- Assisting in minor and major operations
- Handling specimens
- Disposal of waste as per guidelines.



INTRENSHIP

TIME: 260 hrs. (9WEEKS)

ICU, CCU, CARDIAC. O T	<ul style="list-style-type: none"> • Assist in arterial Puncture for blood gas analysis • Perform ECG and interpret accordingly • Conduct and analysis Pulse toiletry • care with artificial airway • Assist in en tracheal incubation • Setting up ventilators • Drugs Sheet • Observation of special procedure in OT 	2
Neuro, ICU,ITU,OT	<ul style="list-style-type: none"> • Assess neurological status • Implement care to head injury spinal injury • Drug sheet • Pre and post operative care with neureo surgery patients 	2
Burns and plastic reconstructive surgery	<ul style="list-style-type: none"> • Nursing care 	2
OT, Laparoscopic Orthopedic, Eye, ENT		3

COMMUNITY HEALTH NUSING –I

Placement: Second Year

Theory- 90hrs

Practical – 135 hours

Course: description: This course is designed for students to appreciate principles of promotion and maintenance of health

UNIT	CONTENT	HOURS
UNIT- 1	Introduction <ul style="list-style-type: none">• Community health nursing• Definition, concept and dimensions of health• Promotion of health• Maintenance of health	2hrs
UNIT -2	Determinations of health <ul style="list-style-type: none">• Eugenic• Environment<ul style="list-style-type: none">- physical air, light ventilation, water, housing sanitation, disposal of waste, disposal of dead bodies forestation noise climate , communication infrastructure facilities and linkage- Acts regulating the environment: National pollution control board- Bacterial and viral agents, host carriers and	20hrs

	<p>immunity arthropods and rodents</p> <ul style="list-style-type: none"> • food hygiene : Production, preservation, purchase, preparation, consumption • act Regulation food hygiene- prevention and food adulteration act, drug and cosmetic act • Socio-cultural <ul style="list-style-type: none"> - customs - Marriage system - Family structure - Status of special group females,. children elderly, challenged groups and sick persons • Life style • Hygiene • Physical activity <ul style="list-style-type: none"> - Recreation and sleep - Sexual life - Spiritual life philosophy - Self reliance - Dietary pattern - Education - Occupation • Financial management <ul style="list-style-type: none"> - Income - Budget - Purchasing power - Security 	
UNIT-3	<p>Epidemiology</p> <ul style="list-style-type: none"> • Definition: concept, aims, scope, uses and terminology used in epidemiology • Dynamics of disease transmission: epidemiological triad • Morbidity and mortality: measurements • Level of prevention • Methods of epidemiology <ul style="list-style-type: none"> - Descriptive - Analytical: Epidemic investigation - Experimental 	10 hrs.
UNIT-4	<p>Epidemiology and nursing management of common communicable disease</p> <ul style="list-style-type: none"> • Respiratory infection <ul style="list-style-type: none"> - Small pox - Chicken pox - Measles - Influenza - Rubella - ARI's and pneumonia - Mumps - Diphtheria - Mumps 	25 hrs.

- Diphtheria
- Whooping cough
- Meningococcal meningitis
- Tuberculosis
- SARS
- Intestinal infection
 - Poliomyelitis
 - Viral Hepatitis
 - Cholera
 - Diarrhoeal disease
 - Typhoid fever
 - Food poisoning
 - Amoebiasis
 - Hook worm infection
 - Ascariasis
 - Dracunculiasis
- Arthropods infection
 - Dengue
 - Malaria
 - Filariasis
- Zoonoses
- Viral
 - Rabies
 - Yellow fever
 - Japanese encephalitis
 - Kyasnur forest disease
- Bacterial
 - Brucellosis
 - Plague
 - Human relationship
 - Anthrax
 - Leptospirosis
- Rickettsial disease
 - Rickettsial zoo noses
 - Scrub typhus
 - Tick typhus
 - Q fever
- Parastic Zoonoses
 - Taeniasis
 - Hydatid disease
 - Lsieshmaniasis
- Surface infection
 - Trachoma
 - Tetanus
 - Leprosy
 - STD & RTI
 - Yaws
 - HIV/AIDS
- Any other

UNIT-5	<p>Epidemiology and nursing management of non communicable disease</p> <ul style="list-style-type: none"> • Malnutrition: under nutrition, over nutrition, nutritional deficiencies • Anemia • Hypertension • Stroke • Rheumatic: heart disease • Coronary heart disease • Cancer • Diabetes mellitus • Blindness • Accidents • Mental illness • Obesity • Iodine deficiency • Fluorosis • Epilepsy 	10 hrs.
UNIT-6	<p>Demography</p> <ul style="list-style-type: none"> • Definition concept and scope • Method of collection analysis and interpretation of demographic data • Demographic rates and ratio 	6hrs
Unit -7	<p>Population and its control</p> <ul style="list-style-type: none"> • Population explosion and its impact on social, economic development of individual society and country • Population control: <ul style="list-style-type: none"> - Overall development : Women empowerment, social economic and educational devolvement - Limiting family size - Promotion of small family norm - Methods spacing (natural, biological chemical mechanical methods etc) - Terminal surgical methods - Emergency contraception 	17hrs

COMMUNITY HEALTH NURSING –I PRACTICAL

Placement: second Year

Practical 135 hours

AREAS	SKILLS	DURATION (in weeks)
Community Health nursing	<ul style="list-style-type: none">• Use techniques of interpersonal relation• Identification of health determinants of community• History taking• Physical examination• Collect specimens- sputum, malaria smear• Perform simple lab test at center blood for hemoglobin and sugar Urine for albumin and sugar• Administer vaccines and medications to adults• Counsel and teach individual family land community<ul style="list-style-type: none">- Nutrition- Hygiene- Self- health monitoring- Seeking health services- Healthy life style- Family welfare methods- Health promotion	2 weeks urban and 2 weeks rural

B.SC.
NURSING
THIRD YEAR

Placement: third Year

**Theory – 12 hrs
Practical – 270 hours**

Course description: the purpose of this course is to acquire knowledge and develop proficiency in caring for patient with medical surgical disorders in various health care settings and at home

UNIT	CONTENT	HOURS
UNIT-1	<p>Nursing management of patient with disorders of Ear, Nose and throat</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of the ear, nose and throat • Nursing assessment History and physical assessment • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of ear, nose and throat disorders <p style="padding-left: 40px;"># External ear deformities otalgia, foreign bodies and tumors</p> <p style="padding-left: 40px;"># Middle ear impacted wax, tympanic membrane perforation, otitis media, tumors</p> <p style="padding-left: 40px;"># Inner ear Meniere's disease, labyrinthitis, ototoxicity, tumors</p> <p style="padding-left: 40px;"># Upper airway infections: Common cold sinusitis, ethmoiditis, and adenoiditis, peritonsillar abscess, laryngitis</p> <ul style="list-style-type: none"> • Upper respiratory airway • Nasal obstruction, laryngeal obstruction, cancer of the larynx • Cancer of the oral cavity • Speech defects and speech therapy • Deafness • Prevention, control and rehabilitation • Hearing aids, implanted hearing devices <p>Special therapies Nursing procedures Drug used in treatment of disorders of ear, nose and throat. Role of nurse communication with hearing impaired and muteness</p>	15 hrs.
UNIT- 2	<p>Nursing management of patient with disorders of Eye</p> <ul style="list-style-type: none"> • Review of anatomy, physiology of the eye • Nursing management-history and physical assessment • Etiology, pathophysiology, clinical, diagnosis, treatment modalities and medical and surgical nursing management of the eye disorders <p style="padding-left: 40px;"># Refractive errors</p> <p style="padding-left: 40px;"># Eyelids- infection, tumors and deformities</p> <p style="padding-left: 40px;"># Conjunctiva- inflammation and infection, bleeding</p> <p style="padding-left: 40px;"># Cornea- inflammation and infection</p> <p style="padding-left: 40px;"># Lens- cataract</p> <p style="padding-left: 40px;"># Glaucoma</p> <p style="padding-left: 40px;"># Disorders of posterior chamber and retina: retinal and vitreous problems</p>	15 hrs.

	<ul style="list-style-type: none"> # Retinal detachment # Ocular emergency and their prevention • Blindness • National blindness control program <ul style="list-style-type: none"> # Eye banking # Eye prostheses and rehabilitation <p>Role of a nurse- Communication with visually impaired patient, eye camps</p> <p>Special therapies</p> <p>Nursing procedures</p> <p>Drugs used in treatment of disorder of eye</p>	
UNIT-3	<p>Nursing management of patient with neurological disorders</p> <ul style="list-style-type: none"> # Review of anatomy and physiology of the neurological system • Nursing assessment- history and physical and neurological assessment and Glasgow coma scale • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of neurological disorders • Congenital malformation • Headache • Head injuries • Spinal injuries <ul style="list-style-type: none"> # Paraplegia # Hemiplegia # Quadraplegia • Spinal cord compression- herniation of in vertebral disc • Tumors of the brain and spinal cord • Intra cranial and cerebral aneurysms • Infection: <ul style="list-style-type: none"> # Meningitis, encephalitis, brain, abscess, neurocysticerosis • Movement disorders <ul style="list-style-type: none"> # Chorea # Seizures # Epilepsies • Cerebro vascular accidents (CVA) • Cranial, spinal neuropathies- Bells palsy trigeminal neuralgia • Peripheral Neuropathies Guillainbarr'e syndrome • Myasthenia gravis • Multiple sclerosis • Degenerative diseases <ul style="list-style-type: none"> #Delirium # Dementia # Alzheimer's disease # Parkinson's disease • Management of unconscious patient and a patient with stroke • Role of nurse in communicating with patient having neurological deficit • Rehabilitation of patient with neurological deficit 	16 hrs.

	<p>Role of nurse in long stay facility (institution) and at home special therapies Nursing procedures Drug used in treatment of neurological disorders.</p>	
UNIT-4	<p>Nursing management of patients with disorder of female reproductive system.</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of female reproductive system. • Nursing assessment- History and physical assessment • Breast self examination • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of disorder of female reproductive system • Sexuality and reproductive health • Menstrual disorders: Dysmenorrhea, amenorrhea, premenstrual syndrome • Abnormal uterine bleeding: menorrhagia, metrorrhagia • Pelvic Inflammatory disease • Ovarian and fallopian tube disorders: infection, cysts, tumors • Uterine and cervical and disorders: endometriosis, polyps, fibroids, cervical and uterine tumors uterine displacement, cystocele/ urethrocele/ rectocele • Vaginal disorders: infection and discharges fistulas • Vulvular disorders: infection, cysts and tumors • Diseases of breasts: deformities, infection cysts and tumors • Menopause and hormonal replacement therapy • Infertility • Contraception: types, methods, risk and effectiveness <ul style="list-style-type: none"> # Barrier methods, intra uterine device, hormonal, post conceptional methods etc. # Terminal methods • Sterilization • Emergency contraception methods • Abortion- natural, medical and surgical abortion-MTP Act • Toxic shock syndrome • Injuries and trauma: Sexual Violence <p>Special therapies Nursing procedures Drug used in treatment of gynecological disorders National family welfare programme</p>	16 hrs.
UNIT-5	<p>Nursing management of patient with burns, reconstructive and cosmetic surgery</p> <ul style="list-style-type: none"> • Review of anatomy and physiology of the skin and connective tissues and various deformities • Nursing assessment- History and physical assessment and assessment of burns and fluid and electrolyte loss • Etiology, pathophysiology, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing 	10 hrs.

	<p>management of burns and reconstructive and cosmetic surgery</p> <ul style="list-style-type: none"> • Types of re-constructive and cosmetic surgery: for burns, congenital deformities, injuries and cosmetic purposes • Role of nurse • Legal aspects • Rehabilitation • Special therapies <ul style="list-style-type: none"> □ Psychosocial aspects <p>Nursing procedures Drug used in treatment of burns, constructive and cosmetic surgery</p>	
UNIT-6	<p>Nursing management of patient with Oncological conditions</p> <ul style="list-style-type: none"> • Structure and characteristics of normal and cancer cells • Nursing assessment – history and physically assessment • Prevention, screening, early detections, warning sign of cancer • Epidemiology, etiology, classification, pathophysiology, staging, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of oncological condition • Common malignancies of various body system: oral, larynx, lung stomach, and colon, liver, leukemias, and lymphomas, breast, cervix, ovary, uterus, sarcoma, brain, renal, bladder, prostate etc. • Oncological emergencies • Modalities of treatment <ul style="list-style-type: none"> □ Immunotherapy □ Chemotherapy □ Radiotherapy □ Surgical intervention □ Stem cell and bone marrow transplants □ Gene therapy □ Other forms of treatment • Psychological aspects of cancer • Rehabilitation • Palliative care: Symptoms and pain management, nutritional support • Home care • Hospice care • Stomal therapy • Special therapies <ul style="list-style-type: none"> □ Psychosocial therapies <p>* Nursing procedures</p>	10 hrs.
UNIT-7	<p>Nursing management of patient in EMERGENCY AND DISASTER Situations Disaster Nursing:</p> <ul style="list-style-type: none"> • Concepts and principals of disaster nursing • Causes and types of disaster: Natural and manmade <ul style="list-style-type: none"> □ Earthquakes, floods, epidemics, cyclones 	10 hrs.

	<ul style="list-style-type: none"> ❑ Fire, explosion, accidents ❑ Violence, terrorism: biochemical, war • Policies related to emergency/ disaster management: Institutional, national state, institutional • Disaster preparedness: • Team, guidelines, protocols, equipments, resources • Co-ordination and involvement of : community, various Govt departments, non govt. organizations and international agencies • Role of nurse; working • Legal aspects of disaster nursing • Impact on health after effects: Post traumatic stress disorders • Rehabilitation: physical, psychosocial, financial relocation, Emergency nursing • Concept, priorities, principles and scope and scope and emergency nursing • Organization of emergency services: physical set-up, staffing, equipment and supplies, protocols, concepts of triage and role of triage nurse • Co-ordination and involvement of different departments and facilities • Nursing assessment-history and physical assessment • Etiology, classification, pathophysiology, staging, clinical manifestations, diagnosis, treatment modalities and medical and surgical nursing management of patient with medical and surgical emergency • Principles of emergency management • Common emergencies • Respiratory emergencies • Cardiac emergencies • Shock and hemorrhage • Pain • Poly-trauma, road accidents, crouch, injuries, wound • Bites • Poisoning; food, gas drug and chemical poisoning • Seizures • Thermal emergencies; heat stroke, and cold injuries • Pediatric emergencies • Obstetrical emergencies • Violence, abuse, sexual assault • Cardio pulmonary resuscitation • Crisis intervention • Role of nurse: communication and interpersonal relations • Medico legal aspects 	
UNIT-8	<p>Nursing care of the elderly</p> <ul style="list-style-type: none"> • Nursing assessment- history and physical assessment • Ageing • Demography: Myths and realities • Concepts and theories of ageing • Normal biological ageing 	10 hrs.

	<ul style="list-style-type: none"> • Age related body related changes • Psychosocial aspects of ageing • Medication and elderly • Stress and coping in elder patient • Common health problems and nursing management • Cardiovascular, respiratory, musculoskeletal • Endocrine, genitor-urinary, gastrointestinal • Neurological, skin and sensory organs <ul style="list-style-type: none"> □ Psychosocial and sexual □ Abuse of elderly • Role of nurse for care of elderly: ambulation, nutritional, communicational, psychosocial and spiritual • Role of family and formal and non formal caregivers • Use of aids and prosthesis (hearing aids, dentures) • Legal and ethical issues • Provision and programme for elderly, privileges, community Programs and health services * Home and institutional care 	
UNIT-9	<p>Nursing management of patients in critical care units</p> <ul style="list-style-type: none"> • Nursing assessment-history and physical assessment • Classification • Principles of critical care nursing • Organization: physical set-up, policies, staffing norms • Protocols, equipment, ventilators, cardiac monitors, defibrillators • Resuscitation equipments • Infection control and protocols 	10 hrs.

MEDICAL SURGICAL NURSING (Adult and geriatrics)-II Practical

Placement: Third year

**Time: Theory-120 hrs
Practical – 270 hrs.
Internship - 430 hrs.**

Areas	Skills to be developed	Duration (In weeks)
ENT	<ul style="list-style-type: none"> • Perform examination of ear, nose and throat • Assist with diagnostic procedures • Assist with therapeutic procedures • Instillation of drops • Perform/assist with irrigations • Apply ear bandage • Performs tracheotomy care 	1

	<ul style="list-style-type: none"> • Teach patient and families 	
Ophthalmology	<ul style="list-style-type: none"> • Perform examination of eye • Assist with diagnostic procedures • Assist with therapeutic procedures • Performs /assist with irrigations • Apply eye bandage • Apply eye drops/ointment • Assist with foreign body removal • Teach patient and families 	1
Neurology	<ul style="list-style-type: none"> • Perform neurological examination • Use Glasgow coma scale • Assist with diagnostic procedure • Assist with therapeutic procedures • Teach patient and families • Participate in rehabilitation program 	2
Gynecology ward	<ul style="list-style-type: none"> • Assist with gynecological examination • Assist with diagnostic procedure • Assist with therapeutic procedures • Teach patient and families • Teach self Breast examination • Assist with PAP smear collection 	1
Burns Unit	<ul style="list-style-type: none"> • Assessment of burns patient <ul style="list-style-type: none"> - Percentage of burns - Degree of burns • Fluid and electrolyte replacement therapy <ul style="list-style-type: none"> - Assess - Calculate - Replace - Record intake/output • Care of Burns wound <ul style="list-style-type: none"> - Bathing - Dressing • Perform active and passive exercises • Practice medical and surgical asepsis • Counsel and teach patient and families • Participate rehabilitation program 	1
Oncology	<ul style="list-style-type: none"> • Screen for common cancer-TNM classification • Assist with diagnostic procedures <ul style="list-style-type: none"> - Biopsies - Pap Smear - Bone- Marrow aspiration • Breast examination • Assist with therapeutic Procedures • Participates in various modalities of treatment <ul style="list-style-type: none"> - chemotherapy - radiotherapy - Pain management 	2

	<ul style="list-style-type: none"> - Stomal therapy - Immuno therapy - Gene therapy - Alternative therapy <ul style="list-style-type: none"> • Participate in palliative care • Counsel and teach patient families • Self Breast examination • Warning signs • Participate in rehabilitation program 	
Critical care unit	<ul style="list-style-type: none"> - • monitoring of patients in ICU • Maintain flow sheets • Care of patient on ventilators • Perform end tracheal suction • Demonstration use of ventilators, Carries monitors etc. • Collect specimen and interprets ABG analysis • Assist in arterial puncture • Maintain CVP line • Pulse oximetry • CRP – ALS 	
	<ul style="list-style-type: none"> • Defibrillators • Pace makers • Bag-mask ventilation • Emergency tray trolley- Crash Cart • Administration of drugs <ul style="list-style-type: none"> - Infusion pump - Epidural - Intrathecal Intracardiac • Total parenteral therapy • Chest physiotherapy • Perform active and passive exercises • Counsel the patient and family in dealing with grieving and bereavement 	1
Casualty Emergency	<ul style="list-style-type: none"> • Practice triage • Assist with assessment examination investigations and their interpretation in emergency and disaster situations • Assist in legal procedures • In emergency unit • Participate in managing crowd • Counsel the patient and family in dealing with grieving and bereavement 	1

Placement: Internship

Time: 9 Weeks

Area	Skills	Duration
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Medical Ward	Integrated Practice	2
Surgical ward		2
Critical care Unit /CCU		1
Casualty/Emergency		2
Operation theatre (ESye, ENT, Neuro)		2

**Child Health Nursing
Placement: - Third Year**

**Time: Theory- 90hrs
Practical – 270 hrs
Internship**

Course Description: This course is designed for developing an understanding of the modern approach to childcare identification prevention and nursing management of common health problems of neonates and children

Unit	Content	TIME (HRS)
1	Introduction Modern concepts of child care <ul style="list-style-type: none"> • Internationally accepted rights of the child • National policy and legislations in relation to child health and Welfare • Agencies related to welfare services to the children • Changing trends in hospital care preventive promotive and curative aspects of child health • Child morbidity and mortality rates • Difference between an adult and child • Hospital environment for sick child • Impact of hospitalization on the child and family • Grief and bereavement • The role of a child health nurse in caring of a hospitalized child • Principles of pre and post operative care of infants and children • Child health nursing procedure 	15
II	The Healthy Child <ul style="list-style-type: none"> • Principles of growth and development • Factors effecting growth and development • Growth and development from birth to adolescence • The needs of normal ender through the stages of developmental and parental guidance • Nutritional needs of children and infants: exclusive breast-feeding supplementary/ artificial feeding and Weaning • Baby friendly Hospital concept • Accidents causes and prevention • Value of play and selection of play material • Prevention immunization, immunization Program and cold chain • Preventive pediatrics • Care of under five and under five clinics/well baby clinics 	20
III	Nursing care of neonates <ul style="list-style-type: none"> • Nursing care of a normal newborn/essential newborn care • Neonatal resuscitation • Nursing management of a low birth weight 	15

	baby <ul style="list-style-type: none"> • Kangaroo mother care • Nursing management of common neonatal disorder • Organization of neonatal unit • Identification and nursing management of common congenital malformations 	
IV	Integrated management of neonatal and childhood illness (IMNCI)	10
V	Nursing management in common childhood disease <ul style="list-style-type: none"> • Nutritional deficiency disorders • Respiratory disorders and infections • Gastro intestinal infections infestations and congenital disorders • Cardiovascular problem congenital defects and rheumatic fever rheumatic heart disease • Genito-urinary disorder acute glomerular nephritis, Nephrotic syndrome, Wilm’s tumor, infection & congenital disorder • Neurological infections and disorder convulsions epilepsy meningitis hydrocephalus spina bifida • Hematological disorders: Anemia’s thalassemia, ITP, Leukemia hemophilia • Endocrine disorders Juvenile diabetes Mellitus • Orthopedic disorders club feet, hip dislocation and fracture • Disorder of skin eye and ears • Common communicable diseases in children, their identification, nursing management in hospital and home and prevention • Child health emergencies. Poisoning foreign bodies, hemorrhage, burns and drowning • Nursing care of infant and children with HIV/AIDS 	20
VI	Management of behavioral and social problems in children <ul style="list-style-type: none"> • Management of common behavioral disorders • management of common psychiatric problems • Management of challenged children Mentally, Physically, & Socially Challenged • Welfare services for challenged children in India • Child guidance clinics 	10

CHILD HEALTH NURSING PRACTICAL
Placement : Third Year
Internship -145 hours(3weeks)

Time – 27 hours Fourth Year

Areas	Skills	Duration (Weeks)
Pediatric Medicin Ward	<ul style="list-style-type: none"> • Taking pediatric history • Physical examination and assessment of children • Administer of oral I/M and I/V medicine/fluids • Calculation of fluid replacement • Prepare different strength oral I/V Fluids • Apply restraints • Administer oxygen inhalation by different methods 	3 wks

	<ul style="list-style-type: none"> • Give baby bath • Feed children by katori spoon etc • Collect specimen for common investigation • Assist with common diagnostic procedure • Teaching mothers/parents <ul style="list-style-type: none"> <input type="checkbox"/> Malnutrition <input type="checkbox"/> Oral dehydration therapy <input type="checkbox"/> Feeding and Weaning <input type="checkbox"/> Immunization schedule <input type="checkbox"/> Play therapy <input type="checkbox"/> Enterostomy • Urinary catheterization and drainage • Feeding <ul style="list-style-type: none"> <input type="checkbox"/> Naso-gastric <input type="checkbox"/> Gastrostomy <input type="checkbox"/> Jejunostomy • Care of surgical wounds <ul style="list-style-type: none"> <input type="checkbox"/> Dressing <input type="checkbox"/> Suture removal 	
Pediatric surgery ward	<ul style="list-style-type: none"> • Calculate, prepare and administer I/V fluids • Do bowel wash • Care of ostomies <ul style="list-style-type: none"> <input type="checkbox"/> Colostomy irrigation <input type="checkbox"/> Ureterostomy <input type="checkbox"/> Gastrostomy <input type="checkbox"/> Enterostomy • Urinary catheterization and drainage • Feeding <ul style="list-style-type: none"> <input type="checkbox"/> Naso-gastric <input type="checkbox"/> Gastrostomy <input type="checkbox"/> Jejunostomy • Care of surgical wounds <ul style="list-style-type: none"> <input type="checkbox"/> Dressing <input type="checkbox"/> Suture removal 	3 wks
Pediatric OPD/Immunization	<p>Assessment of children</p> <ul style="list-style-type: none"> <input type="checkbox"/> Health assessment <input type="checkbox"/> Developmental assessment <input type="checkbox"/> Anthropometrics assessment • Immunization • Health/Nutrition education 	1 wks
Pediatric Medicine And surgical ICU	<ul style="list-style-type: none"> • Care of baby in incubator/ warmer • Care of child on ventilator • Endotracheal suction 	1+1 wks

	<ul style="list-style-type: none"> • Chest physiotherapy • Administer fluids with infusion pump • Total Parenteral nutrition • Phototherapy • Monitoring of babies • Cardio pulmonary resuscitation 	
	INTERNSHIP	
Pediatric Medicine WARD/ICU	Integrated practice	1 wks
Pediatric surgery ward/ICU	Integrated practice	1 wks
NICU	Integrated practice	1 wks

MENTAL HEALTH NURSING

Placement: Third Year

Theory-90 hrs

Practical-270 Hours

Internship-95 Hours (2 Weeks)

Course Description: This course is designed for developing an understanding of the modern approach to mental health, identification, prevention and nursing management of common mental problem with special emphasis on therapeutic intervention for individuals' family and community

UNIT	CONTENT	HOURS
UNIT-I	Introduction <ul style="list-style-type: none"> • Perspectives of mental health and mental health nursing: evaluation of mental health services, treatments and nursing practices • Prevalence and incidence of mental health problems and disorders • Mental health act. • National mental health policy • National mental health programme • Mental health team • Nature and scope of mental health nursing • Role and functions of mental health nurse in various settings and factor affecting the level of nursing practice 	5 hrs.

	<ul style="list-style-type: none"> • Concepts of normal and abnormal behavior 	
UNIT -2	<p>Principles and concepts of mental health nursing</p> <ul style="list-style-type: none"> • definition Mental health nursing and terminology used • classification of mental disorders CID • Review of personality development, defence mechanism • Maladaptive behavior of individuals and group stress crisis and disaster(s) • Etiology bio-psycho- social factors • Psychopathology of mental disorders review of structure and function of brain, limbic system and abnormal neuro transmission • Principles of mental health nursing • Standards of mental health nursing practices • Conceptual model and role of nurse <ul style="list-style-type: none"> <input type="checkbox"/> Existential model <input type="checkbox"/> Psycho-analytical model <input type="checkbox"/> Behavior model <input type="checkbox"/> Interpersonal model 	5 hrs
UNIT – 3	<p>Assessment of mental health status</p> <ul style="list-style-type: none"> • History taking • Mental health examination • Mini mental health examination • Neurological examination review • Investigations related blood ESEG,ECT,MRI • Psychological tests <p>Role and responsibilities of nurse</p>	8 hrs
Unit -4	<p>Therapeutic communication and the nurse- patient relationship</p> <ul style="list-style-type: none"> • Therapeutic communication types techniques, characteristics • Types of relationship • Ethics and responsibilities • Element of nurse patient contract • Review of technique of IPR- Johari windows • Goals, phases, tasks therapeutic techniques • Therapeutic impasse and its intervention 	6hrs
Unit -5	<p>Treatment modalities and therapies used in mental disorders</p> <ul style="list-style-type: none"> • Psycho pharmacology • Psychological therapies Therapeutic community, Psycho 	14hrs

	<p>therapy, Psychoanalytical cognitive and supportive, Family group, behavioral, play psycho drama, Music, dance recreational and light therapy, relaxation therapies Yoga mediation bio feedback</p> <ul style="list-style-type: none"> • Alternative system of medicine • Occupational therapy • Physical therapy. Electro convulsive therapy • Geriatric considerations <p>Role of nurse in above therapies</p>	
Unit -6	<p>Nursing management of patient with Schizophrenia and other psychotic disorders</p> <ul style="list-style-type: none"> • Classification: ICD • Etiology, psycho-pathology, types, clinical manifestations, diagnosis • Nursing assessment- history and physical assessment and mental assessment • Treatment modalities and nursing management of patient with schizophrenia and other psychotic disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.
Unit-7	<p>Nursing management of patient with mood disorders</p> <ul style="list-style-type: none"> • Mood disorders: Bipolar affective disorder, Mania depression and dysthymia etc. • Etiology, psycho-pathology, types, clinical manifestations, diagnosis • Nursing assessment- history and physical assessment • Treatment modalities and nursing management of patient with mood disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.
Unit-8	<p>Nursing management of patient with neurotic, stress related and somatization disorders.</p> <ul style="list-style-type: none"> • Anxiety disorders, phobias, dissociation and conversion disorders, post traumatic disorders • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment- History, physical and mental assessment • Treatment modalities and nursing management of patients with neurotic, stress related and somatization disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	8 hrs.
Unit-9	<p>Nursing management of patient with substance use and disorders</p>	5 hrs.

	<ul style="list-style-type: none"> • Community used psychotropic substance: classification, forms, routes, action, intoxication and withdrawal • Etiology of dependence: tolerance, psychological and physical dependence, withdrawal syndrome, diagnosis • Nursing assessment- history, physical, mental assessment and drug assay • Treatment (detoxification, antagonist therapy and harm reduction) and nursing management of patient with substance abuse. • Geriatric considerations • Follow-up and home care and rehabilitation 	
Unit-10	<p>Nursing management of patient with personality, sexual and eating disorders</p> <ul style="list-style-type: none"> • Classification of disorders • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment –history, physical, mental assessment • Treatment modalities and nursing management of patients with personality, sexual and eating disorders • Treatment modalities and nursing management 	4 hrs.
Unit-11	<p>Nursing management of childhood and adolescent disorders including mental deficiency</p> <ul style="list-style-type: none"> • Classification • Etiology, psycho-pathology, clinical manifestations, diagnosis • Nursing assessment – history, physical, mental assessment and IQ assessment • Treatment modalities and nursing management of childhood and adolescent disorders including mental deficiency • Follow-up and home care and rehabilitation 	6 hrs.
Unit-12	<p>Nursing management of organic brain disorders</p> <ul style="list-style-type: none"> • Classification ICD • Etiology, psycho-pathology, clinical manifestations, diagnosis and differential diagnosis(Parkinson's and Alzheimer's) • Nursing assessment-history, physical, mental assessment and neurological assessment • Treatment modalities and nursing management of organic brain disorders • Geriatric considerations • Follow-up and home care and rehabilitation 	5 hrs.

Unit-13	Psychiatric emergencies and crisis intervention <ul style="list-style-type: none"> • Types of psychiatric emergencies and their management • Stress adaptation mode: stress and stressors, coping, resources and mechanism • Grief: Theories of grieving, process, principles, technique of counseling • Crisis intervention; principles, techniques and process • Geriatric considerations and responsibilities of nurse 	6 hrs.
Unit-14	Legal issues in mental health nursing <ul style="list-style-type: none"> • The mental health Act 1987: Act, section, articles and their implications etc. • Indian lunacy act • Rights of mentally ill clients • Forensic psychiatry • Acts related to narcotic and psychotropic substance and illegal drug trafficking • Admission and discharge procedures Role and responsibilities of nurse	4 hrs.
Unit-15	Community mental health nursing <ul style="list-style-type: none"> • Development of community mental health services: • National mental health programme • Institutionalization versus deinstitutionalization • Model of preventive psychiatry: levels of prevention • Mental health services available at the primary, secondary, tertiary levels including rehabilitation and role of nurse • Mental health agencies: government and voluntary national and international • Mental health nursing issues for special population: children, adolescence, women, elderly, victims of violence and abuse, handicapped, HIV/AIDS etc 	

Mental Health Nursing

Practical

Placement: Third year

Fourth year

Time practical-270 hrs (9 weeks)

Internship- 95 hrs (2 weeks)

Areas	Skills	Duration (in weeks)
Psychiatric OPD	<ul style="list-style-type: none"> • History taking • Perform mental status examination (MSE) • Assist in psychometric assessment • Perform neurological examination • Observe and assist in therapies • Teach patient and family members 	1
Child Guidance Clinic	<ul style="list-style-type: none"> • History taking • Assist in psychometric assessment • Observe and assist in various therapies • Teach family and significant others. 	1
Inpatient ward	<ul style="list-style-type: none"> • History taking • Perform mental status examination (MSE) • Perform neurological examination • Assist in psychometric assessment • Record therapeutic communication • Assist in Electro Convulsive therapy (ECT) • Participate in all therapies • Prepare patients for Activities of Daily Living (ADL) • Conduct admission and discharge counseling • Counsel and teach patient and families 	6
Community psychiatry	<ul style="list-style-type: none"> • Conduct case work • Identify individuals with mental health problems • Assist in mental health camps and clinics • Counsel and teach family members, patient and community 	
	Internship Skills	
Area		Duration
Psychiatry ward	Integrated practice	2 weeks

COMMUNICATION & EDUCATIONAL TECHNOLOGY

Placement: Third year

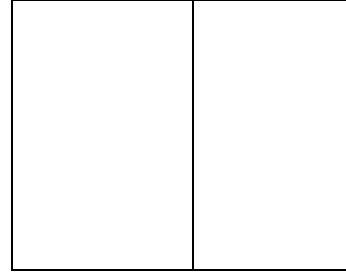
Time: Theory-90 hours

Course Description: This course is designed to help the students acquire an understanding of the principles and methods of communication and teaching it helps to develop skills in communicating effectively, maintaining effective interpersonal relations. Teaching individual and groups in clinical, community health and educational setting

UNIT	CONTENT	Time (Hrs)	Pr. (Hrs)
UNIT-1	Review of Communication process <ul style="list-style-type: none"> • Process; elements and channel • Facilitators • Barriers and methods of overcoming • Techniques 	5	
UNIT -II	Interpersonal relations <ul style="list-style-type: none"> • Purposes & types • Phases • Barriers an methods of overcoming • Johari Window 	5	
UNIT- III	Human relations <ul style="list-style-type: none"> • Understanding self • Social behavior, motivation social attitudes • Individual and groups • Groups and individual • Human relation in context of nursing • Group dynamics • Team work 	5	
UNIT- IV	Guidance and counseling <ul style="list-style-type: none"> • Definition • Purposes, scope and need • Basic principles • Organization of counseling services • Types of counseling approaches • Role and preparation of counselor • Issues for counseling in nursing Students and parishioners • Counseling process-steps & techniques tools of counselor • Managing disciplinary problems • Managing of crisis and referral 	10	5
UNIT - VI	Principles of education and teaching learning	10	

	<p>process</p> <ul style="list-style-type: none"> • Education meaning philosophy aims functions and principles • Nature and characteristics of learning • Principles and maxims of teaching • Formulating objectives general and specific • Lesson planning • Classroom management 		
UNIT- VI	<p>Methods of teaching</p> <ul style="list-style-type: none"> • Lectures Demonstration, seminar, symposium, panel discussion, role play, project, field trip, workshop, exhibition programmed instructions computer assisted learning micro teaching problems based learning self instructional Module and simulation etc • Clinical teaching methods - case method nursing round and report bedside clinic conference (individual and group) Process recording 	10	10
UNIT – VII	<p>Educational Media</p> <ul style="list-style-type: none"> • Purposes and types of AV Aids Principles and sources and etc • Graphic aids chalk board chart graph poster flash cards flannel graph bulletin board cartoon • Three dimensional aids, objects, specimens model puppets • Printed aids Pamphlet & leaflets • Projected aids slider overhead projector, Films TV. VCR, VCD, camera microscope, LCD • Audio aids: Tape recorder public address system, • Computer 	10	8
UNIT- VIII	<p>Assessment</p> <ul style="list-style-type: none"> • Purpose and scope of evaluation and assessment • Criteria for selection of assessments techniques an methods • Assessment of knowledge: Easy type question, short answer type question (SAQ), Multiple choice questions (MCQ) • Assessment of skills: observation Check list, Practical exam, Viva, objective structured clinical examination (OSCE) • Assessment of attitudes, attitudes scale 	5	7
UNIT - IX	<p>Information, education and communication for health (IEC)</p> <ul style="list-style-type: none"> • Health behavior and health education 	5	

- Planning for health education
- Health education with individual, group and communities
- Communicating health messages
- Methods and media for communicating health messages
- Using mass media



B.Sc. Nursing

Fourth Year

MIDWIFERY AND OBSTETRICAL NURSING

Placement: Fourth Year

Theory- 90 hrs.
Practical- 180 hrs.

Course Description: This course is designed for students to the concepts and principles of midwifery and obstetrical nursing. It helps them to acquire knowledge and skills in rendering nursing care to normal and high risk pregnant woman during antenatal, natal and postnatal periods in hospital and community setting it also helps to develop skills in managing normal and high risk neonates and participate in family welfare programme

UNIT	CONTENT	HOURS
UNIT-1	Introduction to midwifery and obstetrical nursing <ul style="list-style-type: none">• Introduction to concept of midwifery and obstetrical nursing• Trends in midwifery and obstetrical nursing<ul style="list-style-type: none">☐ Historical perspective and current trends	3 hrs.

	<ul style="list-style-type: none"> <input type="checkbox"/> Legal and ethical aspects <input type="checkbox"/> Pre-conception care and preparing for parenthood <input type="checkbox"/> Role of nurse in midwifery and obstetrical care <input type="checkbox"/> National policy and legislation in relation to material health and welfare <input type="checkbox"/> Maternal morbidity, mortality and fertility rates <input type="checkbox"/> Prenatal morbidity, mortality rates 	
<p>UNIT-2</p>	<p>Review of anatomy and physiology of female reproductive system and fetal development</p> <ul style="list-style-type: none"> • Female pelvis- general description of the bones joints, ligaments, planes of the pelvis diameters of the true pelvis important landmarks, variations in pelvic shapes • Female organs of reproduction – external genitalia, internal genital organs and their anatomical relation, musculature blood supply, nerves, lymphatic, pelvic cellular tissue, pelvic peritoneum • Physiology of menstrual cycle • Human sexuality • Fetal development <ul style="list-style-type: none"> <input type="checkbox"/> Conception <input type="checkbox"/> Review of fertilization, implantation, development of the embryo and placement at term- functions, abnormalities, the fetal sac, amniotic fluid the umbilical chord <input type="checkbox"/> Fetal circulation, fetal skull, bones, sutures and measurements * Review of genetics 	<p>8 hrs.</p>
<p>UNIT-3</p>	<p>Assessment and management of pregnancy (ante-natal)</p> <ul style="list-style-type: none"> • Normal pregnancy • Physiological changes during pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Reproductive system <input type="checkbox"/> Cardiovascular system <input type="checkbox"/> Respiratory system <input type="checkbox"/> Urinary system <input type="checkbox"/> Gastro intestinal system <input type="checkbox"/> Metabolic change <input type="checkbox"/> Skeletal change <input type="checkbox"/> Skin changes <input type="checkbox"/> Endocrine system <input type="checkbox"/> Psychological changes <input type="checkbox"/> Discomfort of pregnancy • Diagnosis of pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Signs <input type="checkbox"/> Differential diagnosis 	<p>8 hrs.</p>

<ul style="list-style-type: none"> <input type="checkbox"/> Confirmatory tests • Ante natal care <ul style="list-style-type: none"> <input type="checkbox"/> Objectives <input type="checkbox"/> Assessment <ul style="list-style-type: none"> - History and physical examination - Antenatal examination - Signs of previous child birth <ul style="list-style-type: none"> <input type="checkbox"/> Relationship of fetus to uterus and pelvis lie attitude presentation. Position <input type="checkbox"/> per vaginal examination • Screening and assessment for high risk • Risk approach • History and physical examination • Modalities of diagnosis Invasive and non invasive ultrasonic cardio tomography, NST, CST • Antenatal preparation <ul style="list-style-type: none"> <input type="checkbox"/> Antenatal counseling <input type="checkbox"/> Antenatal exercises <input type="checkbox"/> Diet <input type="checkbox"/> Substance use <input type="checkbox"/> Education for childbirth <input type="checkbox"/> Husband and Families <input type="checkbox"/> Preparation for self confinement <input type="checkbox"/> Prevention from radiation • Psycho-social and cultural aspects <ul style="list-style-type: none"> <input type="checkbox"/> Adjustment to pregnancy <input type="checkbox"/> Unwed mother <input type="checkbox"/> Single parent <input type="checkbox"/> Teenage pregnancy <input type="checkbox"/> Sexual violence • Adoption 	
<p>UNIT-4 Assessment and management of intranatal period</p> <ul style="list-style-type: none"> • Physiology of labour • Management of labour • First stage <ul style="list-style-type: none"> <input type="checkbox"/> Signs and symptoms of onset of labour normal and abnormal <ul style="list-style-type: none"> <input type="checkbox"/> Duration <input type="checkbox"/> Preparation of <ul style="list-style-type: none"> # Labour room # Woman <input type="checkbox"/> Assessment and observation of woman in labour: Partogram- maternal and fetal monitoring <ul style="list-style-type: none"> <input type="checkbox"/> Active management of labour, induction of labour <input type="checkbox"/> Pain relief and comfort in labours • Second stage <ul style="list-style-type: none"> <input type="checkbox"/> Sign and symptoms: normal and abnormal 	<p>12 hrs</p>

- Duration
- Conduct of delivery: principles and technique
- Episiotomies (Only if required)
- Receiving the new born
 - Neonatal resuscitation; initial steps and subsequent resuscitation
 - Care of umbilical cord
 - Immediate assessment including screening for congenital anomalies
 - Identification
 - Bonding
 - Initiate feeding
 - Screening and transportation of the neonate
- * Third stage
 - Sign and symptoms: normal and abnormal
 - Duration
 - Method of placenta expulsion
 - Management : principles and technique
 - Examination of the placenta
 - Examination of perineum
- Maintaining records and reports
- Fourth stage

UNIT-5

- Assessment and management of women during post natal period
- Normal puerperium: physiology duration
 - Postnatal assessment and management
 - Promoting physical and emotional well being
 - Lactation management
 - Immunization
 - Family dynamics after child
 - Family welfare services, methods, counseling
 - Follow-up
 - Records and reports

UNIT-6

- Assessment and management of normal neonates**
- **Normal neonate:**
 - Physiological adaptation
 - Initial and daily assessment
 - Essential newborn care, thermal control
 - Breast feeding prevention of infections
 - Immunization
 - Minor disorders of newborn and its management
 - Levels of neonatal care (level II, &III)
 - At primary, secondary and tertiary levels
 - Maintenance of reports and records

6 hrs.

UNIT-7	<p>High risk pregnancy – assessment and management</p> <ul style="list-style-type: none"> • Screening and assessment <ul style="list-style-type: none"> <input type="checkbox"/> Ultrasonic cardio tomography , NST CST, non invasive and invasive <input type="checkbox"/> Newer modalities of diagnosis • High risk approach • Levels of care primary secondary and tertiary levels • Disorders of pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Hyper-emesis, gravidarum bleeding in early pregnancy, abortion , ectopic <input type="checkbox"/> Pregnancy vesicular mole <input type="checkbox"/> Ante-partum hemorrhage • Uterine abnormality and displacement • Disease complicating pregnancy <ul style="list-style-type: none"> <input type="checkbox"/> Medical and surgical conditions <input type="checkbox"/> Infection, RTI(STD) UTI, HIV, TORCH <input type="checkbox"/> Gynecological diseases complicating pregnancy <input type="checkbox"/> Pregnancy induced hypertension and diabetes , toxemia of pregnancy hydramnios <input type="checkbox"/> Rh incompatibility <input type="checkbox"/> Mental pregnancy <input type="checkbox"/> Abnormalities of placenta and cord <input type="checkbox"/> Intra-uterine growth – retardation <input type="checkbox"/> Nursing management of mothers with high risk pregnancy <input type="checkbox"/> Maintenance of records and reports 	10hrs
UNIT-8	<p>Abnormal labour- assessment and management</p> <ul style="list-style-type: none"> • Disorders in labour <ul style="list-style-type: none"> <input type="checkbox"/> CPD and contracted pelvis <input type="checkbox"/> Malposition and Malpresentations <input type="checkbox"/> Premature labour, disorders of uterine action, precipitate labour, prolonged labor <input type="checkbox"/> complication of third stage Injuries to birth canal • Obstetrical emergencies and their management <ul style="list-style-type: none"> <input type="checkbox"/> Presentation and prolapse of cord, vasa praveia amniotic fluid emblems rupture of uterus shoulder dystocia obstetrical shock • Obstetrical procedures and operation <ul style="list-style-type: none"> <input type="checkbox"/> Introduction of labour, forceps vacuum version manual removal of placenta. Caesar ear. Section. destructive operation <p>* Nursing management of women undergoing obstetrical operation and procedures</p>	4hrs
UNIT- 9	<p>Abnormalities during postnatal period</p> <ul style="list-style-type: none"> • Assessment and management of woman with postnatal complications <ul style="list-style-type: none"> <input type="checkbox"/> Puerperal infection breast engorgement and infections and infection, UTI, thromboembolic disorders, post partum hamburger, eclampsia and subinvolution <input type="checkbox"/> Psychological complications : <ul style="list-style-type: none"> - Post partum blues - Post partum depression 	4hrs

	- Post partum psychosis	
UNIT- 10	Abnormalities during postnatal period <ul style="list-style-type: none"> • Admission of neonates in the neonatal intensive care units protocols • Nursing management of : <ul style="list-style-type: none"> <input type="checkbox"/> Low birth weight babies <input type="checkbox"/> Infection <input type="checkbox"/> Respiratory problems <input type="checkbox"/> Hemolytic disorders <input type="checkbox"/> Birth injuries <input type="checkbox"/> Malformation • Monitoring of high risk neonates • Feeding of high risk neonates • Organization and management of neonatal intensive care units • Infection control in neonatal intensive care units • Maintenance of reports and records 	10hrs
UNIT – 11	Pharamaco- therapeutics in obstetrics <ul style="list-style-type: none"> • Indication, dosage, action contraindication and side effects of drugs • effect of drugs on pregnancy labour and puerperium • Nursing responsibilities in the admission of drugs in obstetric- oxytocin, anti-hypertensives, diuretics, laccolic agents, anticonvulsants: • Analgesics and anesthesia in obstetrics • Effect of maternal medication on fetus on fetus and neonate 	4 hrs
UNIT-12	Family welfare programme <ul style="list-style-type: none"> • Population trends and problems in India • Concept, aims importance and history of family welfare programme • National population dynamics policy and education • National family welfare programme RCH. ICDS. MCH. Safe motherhood • Organization and administration national state district block and village levels • A method of contrception's spacing. temporay and permanent, emergency contraception • Infertility and its management • Counseling for family welfare • Latest research in contraception • Maintenance of vital statistics • Role of nurse in Family welfare prgramme • Train supervision collaboration with other functionaries 	10hrs

**in community like ANMs, LHVs, Anganwadi workers
TBA (Traditional birth Attendant Dai)**

**Midwifery and obstetrical
Nursing- Practical**

Placement: Fourth year

**Time Practical-180 hrs (Third year)
Internship-240**

Area	Skills	Duration (in weeks)
Antenatal clinical/OPD	<ul style="list-style-type: none"> * Antenatal history taking * Physical examination * Recording of weight and BP * Hb and urine testing for sugar and albumin * Antenatal examination-abdomen and breast * Immunization * Assessment of risk status * Teaching antenatal mother. * Maintenance of Antenatal records 	2
Labour room OT	<ul style="list-style-type: none"> * Assessment of woman in labour * Per vaginal examination and interpretation * Monitoring and caring of woman in labour * Maintenance of partograph * Conduct normal delivery * Newborn assessment and immediate care * Resuscitation of newborns * Assessment of risk status of newborn *Episiotomy and suturing * Maintenance of labour and birth record * arrange for and assist with Caesarean section and care for women and baby during caesarean * Arrange for and assist with MTP and other surgical procedures 	4

Postnatal ward	<ul style="list-style-type: none"> * Examination and assessment of mother and baby * Identification of deviations * Care of postnatal mother and baby * Perineal care * Lactation management * Breast feeding * Baby bath * Immunization * Teaching postnatal mother <ul style="list-style-type: none"> # Mother craft # Post natal care # Exercise # Immunization 	4
Newborn nursery	<ul style="list-style-type: none"> * Newborn assessment * Admission of neonates * Feeding of at risk neonates * Katori spoon * Paladi, tube feeding * Total parental nutrition * Thermal management of neonates- kangaroo mother care * Care of baby in incubator * Monitoring and care of neonates * Administering medications * Intravenous therapy * Assisting with exchange transfusion * Care of baby on ventilator * Photo therapy * Infection control, protocols in the nursery 	2
Family planning clinic	<ul style="list-style-type: none"> * Teaching and counseling of parents * Maintenance of neonatal records * counseling technique * Insertion of IUD * Teaching on use of family planning methods * Arrange for and assist with family planning operations * maintenance * Of record and reports 	1

	<p>* Essential Requirements for registration as midwife</p> <ul style="list-style-type: none"> - antenatal examination 30 - conducting normal deliveries in hospital/ home health center 20 - vaginal examination 5 - Episiotomy suturing 5 - Neonatal resuscitation 5 - Assist with caesarean Section 2 - witness Assist abnormal deliveries 5 - Postnatal cases nursed in hospital /home/health center 20 - Insertion of IUD 5 <p>NOTE: All casebooks must be certified by teacher on completion if essential requirements</p>	
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Area	Skills	Duration (in weeks)
Labour Ward	* Integrated Practice	2
Neonatal intensive care unit/NICU		1
Antenatal		2

COMMUNITY HEALTH NURSING

Placement: Fourth year

**Theory-90 hrs.
Practical-135 hrs.**

Course Description: This course is designed for students to practice community health nursing for the individual, family and group at both urban and rural setting by using concept and principles of health and community health nursing

UNIT	CONTENT	HOURS
UNIT 1	<p>Introduction</p> <ul style="list-style-type: none"> • Definition concept and scope of community health and community health nursing • Historical development of <ul style="list-style-type: none"> <input type="checkbox"/> Community health <input type="checkbox"/> community health nursing <ul style="list-style-type: none"> - Pre-independence - Post independence 	4 hrs
UNIT-2	<p>Health planning and policies and problems</p> <ul style="list-style-type: none"> • National health planning in India Five year plans • Various committees and commission on health and family welfare • <input type="checkbox"/> central council of health and family welfare(CCH & FW) <ul style="list-style-type: none"> <input type="checkbox"/> National health policies (1983,2002) <input type="checkbox"/> National health policy <input type="checkbox"/> Health problems in India 	6hrs
UNIT-3	<p>Delivery of community health services</p> <ul style="list-style-type: none"> • Planning budgeting and material management of SCS, PHC& CHC • Rural : organization staffing and functions of rural health services provided by government at: <ul style="list-style-type: none"> <input type="checkbox"/> Village <input type="checkbox"/> Sub centre <input type="checkbox"/> Primary health center <input type="checkbox"/> Community Health Center/Subdivision <input type="checkbox"/> Hospitals <input type="checkbox"/> District <input type="checkbox"/> State <input type="checkbox"/> Centre * Urban Organization staffing and function of urban health services <ul style="list-style-type: none"> <input type="checkbox"/> Slums <input type="checkbox"/> Dispensaries <input type="checkbox"/> Maternal and child health centers <input type="checkbox"/> Special clinics <input type="checkbox"/> Hospitals <input type="checkbox"/> Corporation Municipality board * Component's of health services <ul style="list-style-type: none"> <input type="checkbox"/> environmental sanitation <input type="checkbox"/> Health education <input type="checkbox"/> Vital statistics <input type="checkbox"/> MHC antenatal natal postnatal MTP act Female 	15 hrs

	<p>foeticide act, child adoption act</p> <ul style="list-style-type: none"> <input type="checkbox"/> Family welfare <input type="checkbox"/> National health programme <input type="checkbox"/> School health services <input type="checkbox"/> Occupational health <input type="checkbox"/> Defence services <input type="checkbox"/> Institutional services <ul style="list-style-type: none"> • System of medicine and health care <ul style="list-style-type: none"> <input type="checkbox"/> Indian system medicine and homeopathy <input type="checkbox"/> Alternative health care system like yoga meditation social and spiritual healing etc <p>Referral system</p>	
UNIT-4	<p>Community health nursing approaches concepts and roles and responsibilities of nursing personnel</p> <ul style="list-style-type: none"> • Approaches <ul style="list-style-type: none"> <input type="checkbox"/> Nursing theories and nursing process <input type="checkbox"/> Epidemiological approach <input type="checkbox"/> Problem solving approach <input type="checkbox"/> Evidenced based approach <input type="checkbox"/> Empowering people to care for themselves • Concept of primary health care <ul style="list-style-type: none"> <input type="checkbox"/> Equitable distribution <input type="checkbox"/> Community participation <input type="checkbox"/> Focus on prevention <input type="checkbox"/> Use of appropriate technology <input type="checkbox"/> multi- sectorial • Roles and responsibilities of community health nursing personnel in <ul style="list-style-type: none"> <input type="checkbox"/> Family health services <input type="checkbox"/> Information education communication (INC) <input type="checkbox"/> Management information system (MIS) maintenance of records and reports. <input type="checkbox"/> Training and supervision of various categories of health workers <input type="checkbox"/> National health programmes <input type="checkbox"/> Environmental sanitation <input type="checkbox"/> Maternal and child health and family welfare <input type="checkbox"/> Treatment of minor ailments <input type="checkbox"/> School health services <input type="checkbox"/> Occupational health <input type="checkbox"/> Organization of clinics camps types preparation planning <input type="checkbox"/> Waste management in the centers clinics etc. • Home visit concept Principles. Process techniques bag technique and home visit 	25 hrs.
Unit - 5	<p>Assisting individuals and group to promote and maintain their health</p> <ul style="list-style-type: none"> • Empowerment for self care of individual families and group in 	15 hrs.

- A Assessment of self and family
- Monitoring growth and development
 - Mile stones
 - Weight measurement
 - Social development
 - Temperature and blood pressure monitoring
 - Menstrual cycle
 - Breast self examination and testicles
 - Warning signs of various diseases
 - Teats: Urine sugar and albumin, blood sugar

B Seek health service for

- Routine check – up
- Immunization
- Counseling
- Diagnosis
- Treatment
- Follow – up

C Maintenance of health records for self and family

D Continue medical care and follow – up in community for various disease and disabilities

E Carryout therapeutic procedures as prescribed / required for self and the family

F Waste management

G Sensitize and handle social issues affecting health and development for self and family

- Women empowerment
- Women and child abuse
- Abuse of elders
- Female foeticide
- Commercial sex worker
- Food adulteration
- Substance abuse

H Utilize community resources for self and family

- Trauma services
- Old age homes
- Orphanage
- Home of physically and mentally challenged individuals
- Homes for destitute

Unit - 6

National health and family welfare programmers and the role of a nurse

- National ARI programmer
- Revised national tuberculosis programmer (RNTCP)
- National anti-malaria programme
- National filarial control programme

20 hrs.

Unit - 7	<ul style="list-style-type: none"> • National guinea worm eradication programme • National leprosy eradication programme • National AIDS control programme • National STD control programme • Iodine deficiency disorder programme • Expanded programme of immunization • National family welfare programme • National water supply and sanitation programme • Minimum need programme • National diabetes control programme • Polio eradication programme • National cancer control programme • Yaws eradication programme • 20 pints programme • ICDS programme • Mid day meal applied nutritional programme • Health schemes <ul style="list-style-type: none"> <input type="checkbox"/> ESI <input type="checkbox"/> CGHS <input type="checkbox"/> Health insurance 	
	<ul style="list-style-type: none"> • Health agencies <ul style="list-style-type: none"> - International – WHO, UNFPA, UNDP, World bank, FAO, UNICEF, DANDIA, European commission (EC) Red cross, USAID, UNESCO, Colombo plan, ILO, CARE etc. - National – Indian red cross society, Indian council for child welfare, Family planning association of India (FPAI), Tuberculosis association of India, Hindu kushwant singh, Central social welfare board, All India women’s conference, Blind association of India etc. 	5 hrs.

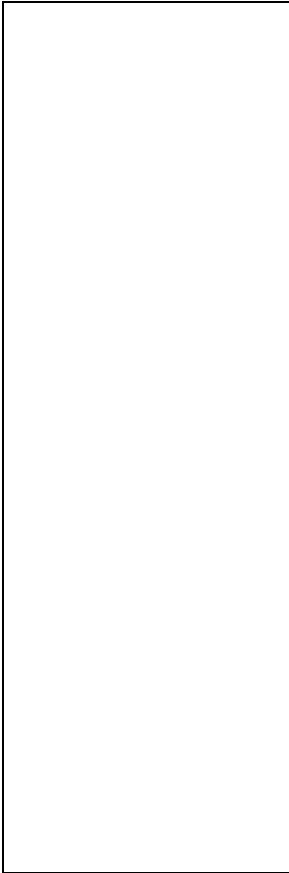
**Community Health
Nursing – II – Practical**

Placement : Fourth Year

**Time : Practical – 135 hrs
Internship – 195 hrs**

Areas	Skills	Duration (In weeks)
Community Health Nursing	<ul style="list-style-type: none"> • Community health survey • Community diagnosis • Family care Home adaptation of common procedures • Home visit Bag technique • Organize and conduct clinics – antenatal Postnatal well baby clinic camps etc 	1 week for urban & 4 weeks for rural

- Screen manage and referrals for
 - High risk mothers and neonates
 - Accidents and emergencies
 - Illness Physical and mental
 - Disabilities
- Conduct delivery at home / center: episiotomy and suturing
- Resuscitate newborn
- School health programme
 - Screen manage, refer children
- Collaborate with health and allied agencies
- Train and supervise health workers
- Provide family welfare services: insertion of IUD
- Counsel and teach individual, family and community about: HIV, TB, Diabetes, Hypertension, Mantel health, adolescents, elderly health physically and mentally challenged individuals.
- Collect and calculate Vital health statistics
- Document and maintain
 - Individual family and administrative records
 - Write reports – center, disease, and national health programme/projects



Placement : Internship

Time :4 weeks

Areas

Skills

Duration

Urban

Provide comprehensive care to individual family and community

4 weeks

P.B.BSC NURSING
MEDICAL –SURGICAL NURSING

Placement : Ist Year.

Allotted Theory: 90hrs.
Practical: 270hrs.

The purpose of this course is to widen the students' knowledge and develop proficiency in caring for patients with Medical Surgical problems. This course includes review of relevant anatomy & physiology, pathophysiology in Medical Surgical disorders & the nursing management of these conditions.

OBJECTIVES : At the end of the course, the F.Y.B.Sc. Nursing students will-

1. explain relevant Anatomy & Physiology of various systems of the body.
2. explain etiology, pathophysiology & manifestations of various disorders.
3. explain the actions, side-effects & nursing implications in administering drugs for various disorders.
4. discuss the recent advancement in the investigations, treatment & care of patients with Medical Surgical conditions.
5. develop skill in giving comprehensive nursing care to patients following the steps of nursing process.
6. assist the patients & their families in identifying & meeting their own health needs.
7. provide planned & incidental health education on various aspects related to disorder & relevant care.
8. appreciate the role of the nurse in the Medical Surgical health team.

COURSE CONTENTS :

UNIT I INTRODUCTION TO MEDICAL SURGICAL NURSING 4 hrs

- Introduction to medical surgical nursing.
- Review of concepts of comprehensive nursing care in medical surgical conditions.
- Nurse, patient & his/her family
- Functions of nurse in the outpatient department.
- Intensive care units. * Staff requirement. Client's needs & nsg. care.

UNIT II NURSING MANAGEMENT OF PATIENTS WITH SPECIFIC PROBLEMS 10 hrs

- Fluid & electrolyte imbalance.
- Dyspnoea, cough & respiratory obstruction.
- Fever & nursing care.
- Shock & nursing care.
- Unconsciousness & nursing care.
- Pain perception & nursing care.

- Acute & chronic illness & nursing care.
- Terminal illness & nursing care.
- Ageing & illness & nursing care.
- Pre & post-operative care.
- Nursing care of clients with incontinence.

UNIT III NURSING MANAGEMENT OF PATIENT WITH 08 hrs.
NEUROLOGICAL & NEURO-SURGICAL CONDITIONS.

- Review of anatomy & physiology of the nervous system & assessment of clients with CNS disorders.
- Pathophysiology, diagnostic procedures & management of :
 - cerebro-vascular accident & nursing care.
 - cranial, spinal & peripheral neuropathies & nursing care.
 - headache & intractable pain & nursing care.
 - epilepsy & nursing care.
 - nursing care of clients with infectious & inflammatory diseases & trauma of the nervous system.
 - nursing care of clients with common CNS disorders.
 - recent advances in diagnostic & treatment modalities & drugs used in CNS disorders.
 - brain, spinal tumours, congenital malformations, degenerative disorders.

UNIT IV NURSING MANAGEMENT OF PATIENTS WITH CARDIO- 08 hrs
VASCULAR PROBLEMS.

- Review of relevant anatomy & physiology of cardio-vascular system & assessment of clients with cardio-vascular disorders.
- Pathophysiology, diagnostic procedures & management of-
 - ischaemic heart disease.
 - cardiac arrhythmias.
 - congestive cardiac failure.
 - rheumatic & other valvular heart diseases.
 - endocarditis, cardiomyopathies, congenital heart diseases, hypertension, heart block.
 - cardiac emergencies: cardiac arrest, acute pulmonary oedema, cardiac tamponade, cardiogenic shock, aneurisms & periphero-vascular disorders, recent advancement in cardiology.

UNIT V NURSING MANAGEMENT OF PATIENT WITH 06 hrs
RESPIRATORY PROBLEMS.

- Review of anatomy & physiology of respiratory system & assessment of clients with respiratory disorders.
- Pathophysiology, diagnostic procedures and management of upper and lower respiratory track infection
 - Bronchitis, bronchiectasis & nursing care.
 - Asthama, emphysema, empyema, atelectasis, COPD and nursing care.

- Chest injuries, resp. arrest & insufficiency
- Special respiratory therapies & drugs used in the management.

UNIT VI NURSING MANAGEMENT OF CLIENTS WITH GENITO-URINARY PROBLEMS. 05 hrs.

- Review of anatomy & physiology of the genito-urinary system & assessment of clients with genito-urinary problems.
- Pathophysiology & management of-
 - congenital disorders, urinary infections.
 - nephritis, renal calculi.
 - acute renal failure, chronic renal failure, end stage renal disease.
 - special procedures : dialysis, renal transplant.
 - benign prostatic hypertrophy.
 - drugs used in the management of these patients.

UNIT VII NURSING MANAGEMENT OF CLIENTS WITH PROBLEMS OF THE DIGESTIVE SYSTEMS 10 hrs.

- Review of anatomy & physiology of gastro-intestinal system & accessory organs& assessment of clients with gastro-intestinal tract disorders.
- Pathophysiology, diagnostic procedures & management of -
 - gastro-intestinal bleeding.
 - peptic ulcer.
 - acute abdomen.
 - infections, colitis, diarrhoea, dysentery & mal-absorption syndrome.
 - cholecystitis.
 - hepatitis, hepatic coma & cirrhosis of liver, portal hypertension.
 - pancreatitis.
 - tumours, hernias, fistulas, fissures, haemorrhoids.
 - drugs used in the management of these patients.

UNIT VIII NURSING MANAGEMENT OF PATIENTS WITH ENDOCRINE PROBLEMS. 5 hrs

- Review of anatomy & physiology & assessment of clients with endocrine disorders.
- Pathophysiology, diagnostic procedures & management of -
 - thyroid disorders.
 - diabetes mellitus, diabetes insipidus.
 - adrenal tumours, pituitary disorders.
 - drugs used, diagnostic procedures & nursing management of patient with above problems.

UNIT IX NURSING MANAGEMENT OF PATIENTS WITH MUSCULO-

SKELETAL PROBLEMS.**5 hrs.**

- Review of anatomy, physiology & assessment of patients with musculo-skeletal disorders.
- Osteomalacia, osteoporosis, osteomyelitis, bursitis.
- Fractures, dislocation & trauma.
- Prolapsed disc.
- Prosthesis & rehabilitation.
- Transplant & replacement surgeries.

UNIT X NURSING MANAGEMENT OF PATIENTS WITH DISORDERS OF FEMALE REPRODUCTIVE TRACT. 3 hrs.

- Disorders of menstruation & inf. of genital tract. *Benign & malignant tumours of genital tract & RVF & VVF. * Climacteric changes & associated problems.

UNIT XI NURSING MANAGEMENT OF PATIENTS WITH ONCOLOGICAL DISORDERS. 5 hrs.

- Types of neoplasms & related pathophysiology, diagnostic procedures, modalities of treatment & nurses' role.
- Special therapies : chemotherapy & radiotherapy & nsg. care.
- Preventive measures, other therapies.

UNIT XII NURSING MANAGEMENT OF PATIENTS WITH BURNS & RECONSTRUCTIVE SURGERIES. 3 hrs.

- Pathophysiology, assessment & nursing management of patients with burns.
- Nursing management of patients with reconstructive surgeries.

UNIT XIII NURSING MANAGEMENT OF PATIENTS WITH COMMUNICABLE DISEASES, STDS & HIV/AIDS. 5 hrs.

- Nursing management of patients with common communicable diseases & STDs.
- Nursing management of patients with immunological disorders including HIV/AIDs.

UNIT XIV NURSING MANAGEMENT OF PATIENTS WITH DISEASES OF EYE,EAR,NOSE,THROAT & SKIN. 5 hrs.

- Assessment & nursing management of patients with eye disorders.
(eye injuries, cataract, inf., blindness)
- Assessment & nursing management of patients with ear disorders (deafness).
- Assessment & nursing management of patients with nose & throat disorders. (DNS, tonsillitis).

- Assessment & nursing management of patients with skin disorders.
(fungal inf., herpes, psoriasis etc)

UNIT XV NURSING MANAGEMENT OF PATIENTS WITH BLOOD DISORDERS. 5 hrs.

- Review of anatomy & physiology of blood & blood products.
- Pathophysiology, diagnostic procedures & management of blood disorders.
 - anaemia, leukaemia.
 - bleeding disorders, haemophilia, purpura etc.
 - blood transfusion, safety checks, procedure & requirements, management of adverse transfusion reaction, records for blood transfusion.
 - management & counseling of blood donors, phlebotomy procedure, & post-donation management.
 - blood bank functioning & hospital transfusion committee. Biosafety & waste management in relation to blood transfusion.

UNIT XVI NURSING IN EMERGENCIES. 3 hrs.

- Cardiac emergencies. (included in unit iv)
- Trauma.
- poisoning.
- crisis mgt :thyroid, hypertensive, & adrenal crisis included in unit viii & iv.

hrs.05.

MATERNAL NURSING

Placement: Ist Year

**Time Allotted Theory : 60 Hrs
Practical : 240**

COURSE DESCRIPTION :

The course is designed to widen the student's knowledge of obstetrics during pregnancy, labour and puerperium. It also helps to acquire knowledge and to develop skill in rendering optimum nursing care to a child bearing mother in a hospital or in community and help in the management of common gynaecological problems.

OBJECTIVES : At the end of the course, the student will be able to :

1. Describe the physiology of pregnancy, labour, and puerperium.
2. Manage normal pregnancy, labour and puerperium.
3. Explain the physiology of lactation, and advice on management of breast feeding.
4. Provide pre- and post operative nursing care in obstetric conditions.
5. Identify and manage high risk pregnancy including appropriate referrals.
6. Propagate the concept and motivate acceptance of family planning methods.
7. Teach , guide and supervise auxiliary midwifery personnel.

COURSE CONTENT

UNIT I INTRODUCTION AND HISTORICAL REVIEW 5 hrs.

- (a) Early history of midwifery and evolution of obstetrics
Maternity care and practices in various culture across the world.
Expanded role of the nurse in maternity and gynaecology.
- (b) Safe motherhood initiative
Maternal mortality, morbidity and perinatal mortality.
Legislation related to maternal benefits, MTP acts, incentives and Family planning. Family welfare programme.

UNIT II ANATOMY AND PHYSIOLOGY OF FEMALE REPRODUCTIVE SYSTEM 6 hrs.

- Review of anatomy and physiology of female reproductive system.
- Female pelvis and foetal skull.
- Menstrual cycle
- Human reproduction, gametogenesis, fertilization, embryo.
- Placenta, foetal membrane, liquor amnii, umbilical
- The foetus, foetal growth, foetal physiology, foetal circulation.

UNIT III	NORMAL PREGNANCY	8 hrs.
	<ul style="list-style-type: none"> - Physiological changes during pregnancy - Diagnosis of pregnancy and antenatal care - Antenatal assessment of foetal well being. - Physiology of normal labour - Mechanism of normal labour. - Management of I, II, and III stages of labour. - Physiology of puerperium. - Physiology of lactation and breast feeding - Management of normal puerperium 	
UNIT IV	NEW BORN BABY	6 hrs.
	<ul style="list-style-type: none"> - Resuscitation and immediate care of newborn.including SGA & LGA - Normal characteristics and essential care of newborn. - Asphyxia Neonatarum, respiratory distress - Jaundice in newborn - Birth injuries, congenital anomalies, infection in newborn, and vomiting in newborn. - Still birth – incidence, causes and prevention. - Care of low birth weight babies in labour room and nursery / NICU. 	
UNIT V	MEDICAL DISORDERS IN PREGNANCY	5 hrs.
	<ul style="list-style-type: none"> - Hypertensive disorders – Pregnancy induced hypertension, Eclampsia. - Anaemia in pregnancy - Diabetes mellitus in pregnancy - Heart diseases - Renal disorders in pregnancy - Jaundice in pregnancy - Pulmonary TB - Pregnancy with STD, HIV / AIDS. 	
UNIT VI	HIGH RISK PREGNANCY	10 hrs.
	<ul style="list-style-type: none"> - Abortion - Hydatiform mole - Ectopic pregnancy - Medical termination of pregnancy - Antepartum haemorrhage – Placenta previa, Abruption placenta - Vomiting in pregnancy - Pregnancy in Rh negative women - Multiple pregnancy, hydramnios - Preterm labour - Premature rupture of membrane 	

- IUGR, postdatism
- Pregnancy with previous caesarean section
- Fibroid with pregnancy
- Ovarian tumour with pregnancy

UNIT VII HIGH RISK LABOUR 3 hrs.

- Abnormal presentation – Unstable lie, Occipitoposterior, face and brow presentation
- Breech presentation, compound presentation
- Abnormal uterine action in labour and active management of labour
- Contracted pelvis and CPD
- Obstructed labour, rupture of uterus, injuries of maternal birth canal, cord prolapse.

UNIT VIII ABNORMALITIES OF PUERPERIUM 4 hrs.

- Puerperial pyrexia and sepsis
- Post partum haemorrhage
- Breast complications – Breast engorgement, breast abscess, acute mastitis
- Psychiatric disorders in puerperium

UNIT IX OBSTETRICAL EMERGENCIES & OPERATIVE OBSTETRICS 3 hrs.

- Uterine rupture, cervical tear
- D & E , S & E
- Use of instruments – Ephysiotomy Forcep, Vaccum
- Caesarean section

UNIT X PHARMACOTHERAPEUTICS 2 hrs.

- Oxytocics, Prostaglandins – use in obstetrics
- Anaesthesia and analgesics used in obstetrics

UNIT XI SPECIAL INVESTIGATIONS IN OBSTETRICS 2 hrs.

- USG, NST, CTG
- Radiography

UNIT XII CURRENT TRENDS IN REPRODUCTIVE HEALTH(RCH) 4 hrs.

- Infertility, genetic counseling
- Unwanted pregnancy
- Unwed mother
- Advances in obstetrics and maternity care.

UNIT XIII GYNAECOLOGICAL NURSING 4 hrs.

- Common Gynaecological Problems

- Cervical erosions, Carcinoma
- Fibroids, Uterine and Cervical Prolaps
- Uterine Inversion etc

PRACTICUM : Practice following Procedures

- Antenatal, Postnatal & per vaginal exam.
- Conduct normal delivery (For male candidates minimum conduct of 5 deliveries)
- Motivation of Planned Parenthood, advice on family planning methods.
- Assist in various diagnostic & therapeutic procedure including IUD insertion & removal.
- Follow Nursing process in providing care to 3-6 patients.

NURSING FOUNDATION

Placement: Ist Year

**Time Allotted: Theory : 45 Hrs
Practical : 30 Hrs**

COURSE DESCRIPTION :

This course will help students to develop an understanding of the philosophy, objectives and responsibilities of nursing as a profession. The purpose of the course is to orient to the current concepts involved in the practice of nursing and developments in the nursing profession.

OBJECTIVES : At the end of the course, the students will

1. Identify professional aspects of nursing
2. Explain theories of nursing
3. Identify ethical aspects of nursing profession
4. Utilise steps of nursing process
5. Identify the role of the nurse in various levels of health services
6. Appreciate the significance or quality assurance in nursing.
7. Explain current trends in health and nursing

COURSE CONTENTS :

UNIT I DEVELOPMENT OF NURSING AS A PROFESSION 6 hrs

- Philosophy
- Objectives and responsibilities of a graduate nurse
- Trends influencing nursing practice
- Expanded role of the nurse
- Development of nursing education in India and trends in nursing education
- Professional organizations, career planning
- Code of ethics & professional conduct for nurses.

UNIT II CONCEPTS OF HEALTH & ILLNESS 12 hrs

- Concepts of health and illness, effects on the person
- Stress and adaptation
- Health care concepts and nursing care concept
- Developmental concepts, needs, roles and problems of the developmental stages of individual – newborn, infant, toddler, pre-adolescent, adolescent, adulthood, middle-age, old age.

UNIT III	THEORY OF NURSING PRACTICE	5 hrs
	<ul style="list-style-type: none"> - Meta paradigm of nursing – characterized by four central concepts i.e. Nurse, Person (client/patient). Health and Environment. Nursing Theory; <ul style="list-style-type: none"> - Florence Nightingale - Virginia Henderson - Betty Neumen - Dorothea Orem - Martha Rogers etc. 	
UNIT IV	NURSING PROCESS	10 hrs
	<ul style="list-style-type: none"> - Nursing Process - Nursing diagnosis – Definitions, concepts, statements, types, interpretation - Planning: techniques for planning care, types of care plans. - Implementation: different approaches to care, organisations and implementation of care, recording. - Evaluation: tools for evaluation, process of evaluation. 	
UNIT V	QUALITY ASSURANCE	6 hrs
	<ul style="list-style-type: none"> - Quality assurance: nursing standards, nursing audit, total quality management - Role of council and professional bodies in maintenance of standards. 	
UNIT VI	APPROACHES TO HEALTH CARE	6 hrs
	<ul style="list-style-type: none"> - Primary health care concepts: <ul style="list-style-type: none"> - community oriented nursing - holistic nursing - primary nursing - family oriented nursing concepts: <ul style="list-style-type: none"> - Problem oriented nursing - Progressive patient care - Team nursing 	

CHILD HEALTH NURSING

Placement: Ist Year

Time Allotted Theory : 60hrs
Practical : 240hrs

COURSE DESCRIPTION :

This course is aimed at developing an understanding of the modern approach to child care, the principles of child health nursing and the common problems of neonates and children in health and sickness.

OBJECTIVES : At the end of the course, the students will be able to:-

1. Explain the modern concept of child care and the principles of child health nursing.
2. Describe the normal growth and development of children in various age groups.
3. Explain the physiological response of body to disease conditions in children.
4. Identify the health needs and problems of neonates and children, plan and implement appropriate nursing interventions.
5. Identify the various preventive, promotive and rehabilitative aspects of child care and apply them in providing nursing care to children in the hospital and in the community.

COURSE CONTENT

UNIT I INTRODUCTION TO CHILD HEALTH NURSING 8 hrs.

- Modern concept of child care
Internationally accepted rights of the child.
- Changing trends in hospital care, preventive, promotive and curative aspects of child health Child morbidity and mortality rates
- National policy and legislation"s in relation to child health and welfare.
- National programmes related to child health and welfare.
- Differences between adult and child
- Hospital environment for a sick child and role of a paediatric nurse in caring for the hospitalized child
- Principles of pre and post operative care of infants and children
- Paediatric nursing procedures Prepn of child for diagnostic tests, collection of specimens, calculation and administration of oral and parenteral medication, feeding, adm of oxygen, nebulisation ,collection of specimens ,exchange transfusion, restraints

UNIT II THE HEALTHY CHILD 12 hrs.

- Growth & development ---. Principles & factors affecting growth & development.
- Assessment of growth and development

- Growth & development from birth to adolescence, needs of normal children through stages of development and parental guidance.
- Nutritional needs of infants and children principles of paediatric nutrition
 - Breast feeding
 - Artificial feeding & Weaning
- Infancy ,toddler, pre schooler, school age child and adolescents.
- Role of play in children - Need, importance and value of play, selection of play material and nurse's role.
- Preventive immunization

UNIT III

CARE OF THE NEWBORN.

4 hrs.

- Characteristics and care of a newborn.
- Asphyxia neonatorum & neonatal resuscitation.
- Low birth weight infants
- Nursing management of common neonatal disorders.
 - Neonatal jaundice & photo therapy
 - Neonatal sepsis & hypoglycemia
 - Organization of Neonatal units, Prevention & Control of infection
 - Critical care concept in child health

UNIT IV

NURSING MANAGEMENT OF COMMON CHILDHOOD ILLNESS.

32 hrs.

- (a) **Nutritional deficiency disorders.**
 - Protein energy malnutrition
 - Vitamin deficiency disorders (Rickets, scurvy, Vit A deficiency disorders)
- (b) **Respiratory diseases & disorders .**
 - Acute bronchitis & Bronchiolitis
 - Pneumonia
 - Branchial Asthama
- (c) **Disorders of the gastro-intestinal system.**
 - Acute gastroenteritis
 - Tracheo esophageal fistula
 - Cleft lip and palate
 - Hypertrophic Pyloric Stenosis
 - Hirschsprung's disease & Intestinal Obstruction
 - Anorectal anomalies
- (d) **Cardiovascular system**
 - Rheumatic fever
 - Congenital heart diseases
 - Congestive cardiac failure
- (e) **Disorders of Genito urinary System**
 - Acute glomerulo nephritis
 - Nephrotic Syndrome
 - Wilm's tumour & Congenital disorders
- (f) **Neurological disorders**
 - Convulsions in children & Epilepsy

- Meningitis & Encephalitis
- Hydrocephalus, Meningocele and meningocele
- (g) **Haematological disorders**
 - Anaemia & Thalassemia
 - Idiopathic thrombocytic Purpura & Hemophilia
 - Leukaemia
- (h) **Endocrine Disorders**
 - Juvenile Diabetes Mellitus
- (i) **Orthopaedic Disorders**
 - CTEV (Club foot) , Congenital hip dislocation
 - Fractures
- (j) **Disorders of Skin, Eye & ENT**
 - Skin** : Eczema, urticaria, scabies, pediculosis, worm infestations
 - Eye & ENT** : Tonsillitis, Deafness, Otorrhoea, Otitis Media, Cong Cataract, hypertelorism
- (k) **Communicable Diseases in Children**
 - Measles/rubella, Chicken pox
 - Diphtheria, whooping cough
 - Tetanus, Poliomyelitis
 - AIDS
 - Tuberculosis
- (m) **Paediatric Emergencies**
 - Accidents, Poisoning ,Stings & Bites
 - Foreign bodies, Haemorrhage & Drowning Burns

UNIT V

MANAGEMENT OF BEHAVIOURAL PROBLEMS IN CHILDREN CHILDHOOD ILLNESS.

04 hrs.

- Enuresis, Encoprecis, temper tantrums somnambulism, juvenile delinquency, speech defects, tics, pica, antisocial behaviour
- **Management of challenged children**
Need for early diagnosis ,treatment and rehabilitation of Mentally challenged – Mental retardation
- Physically challenged – Cerebral palsy
Socially challenged – Child abuse & child labour

MENTAL HEALTH NURSING

Placement: IInd Year

Time Allotted Theory : 60 hrs.

Practical : 240 hrs.

COURSE DESCRIPTION

This course enables the students to recognize and appreciate the causes, symptoms and process of abnormal human behavior.

It also introduces the student to the present day treatment modalities in the light of psychological, social and cultural factors affecting human behavior.

This course helps the student to learn principles of mental health and psychiatric nursing and to develop skills in the management of the mentally ill in hospital and community.

OBJECTIVES : At the end of course, the student will

1. Identify and describe the philosophy and principles of mental health nursing.
2. Describe the historical development of mental health and psychiatric nursing.
3. Classify mental disorders.
4. Develop skills in history taking and performing mental status examination.
5. Describe etiological factors, psycho-pathology, clinical features, diagnostic criteria and treatment methods used for mental disorders.
6. Manage the patients with various mental disorders.
7. Communicate therapeutically with patients and their families.
8. Identify role of the nurse in preventive psychiatry.
9. Identify the legal aspects in practice of mental health and psychiatric nursing.

COURSE CONTENTS

UNIT-I	INTRODUCTION AND HISTORICAL DEVELOPMENT	5hrs.
-	Review of the concept of mental health and illness & mental mechanisms.	
-	History of psychiatry	
-	Historical development of mental health nursing.	
-	Philosophy, principles of mental health and psychiatric nursing.	
-	Theoretical approaches to Psychiatric Nursing.	
-	Concept of normal and abnormal behavior.	
-	Role and qualities of mental health and psychiatric nurse	
-	Mental health team and functions of team members.	
-	Legal aspects in psychiatry and mental health services.	
UNIT II	CLASSIFICATION AND ASSESSMENT OF MENTAL DISORDERS	5 hrs.
-	Terminologies used in Psychiatry	
-	Classification of mental disorders- ICD-10 classification	
-	Etiological factors and psychopathology of mental disorders	
-	History taking and mental status examination.	
UNIT III	THERAPEUTIC COMMUNICATION	4 hrs.
-	Communication process	
-	Interview skill	
-	Therapeutic communication techniques.	
-	Nurse patient Relationship.	
-	Therapeutic impasse and it's management	
-	process recording.	

UNIT IV	MANAGEMENT OF MENTAL DISORDERS	20 hrs.
-	Etiological factors, psychopathology, types, clinical features diagnostic criteria, treatment and nursing management of patient with following disorders.	
-	<u>Neurotic Disorders:</u>	
	- Anxiety disorders - General & Panic	
	- Depressive Neurosis	
	- Obsessive Compulsive Neurosis.	
	- Phobic Neurosis	
	- Hypochondriacal Neurosis.	
	- Stress related and Somatoform disorders	
	- Hysterical disorder.	
-	<u>Psychotic Disorders:</u>	
	- Schizophrenic disorders	
	- Affective disorders	
-	Organic Brain Syndromes – acute & chronic	
-	Epileptic disorders	
-	Sleep disorders	
-	Psychosomatic disorders	
-	Personality disorders	
-	Sexual Disorders	
-	Disorders of childhood:- Specific developmental disorders, Pervasive developmental disorders, Attention deficit disorders , Conduct disorders, Enuresis & Encopresis, Speech Disorders, Habit disorders, other disorders.	
-	Adolescent disorders –Attention deficit hyper activity disorder, conduct disorder, substance abuse, depression and suicide, eating disorders, running away.	
UNIT V	MANAGEMENT OF PATIENT WITH SUBSTANCE USE DISORDERS	3 hrs
-	Substance use and misuse	
-	Dependence, intoxication and withdrawal	
	- Classification of psychoactive substances	
	- Etiological & contributory factors	
	- Psychopathology	
	- Clinical features	
	- Diagnostic criteria	
-	Treatment and nursing management of patient with substance use disorders.	
-	Preventive and rehabilitative aspects in substance abuse.	
UNIT-VI	MANAGEMENT OF MENTAL SUB-NORMALITY / MENTALLY CHALLENGED-	2hrs
-	Classification of mental sub-normality	
-	Etiological factors	
-	Psychopathology	
-	Psychometric assessment	
-	Diagnostic criteria and management of sub-normality	
UNIT VII	PSYCHIATRIC EMERGENCIES	4 hrs.
-	Types of emergencies	
-	Psychopathology, Clinical feature, Assessment and diagnosis, Treatment and nursing management of patient with psychiatric emergencies such as-	
-	Suicide, Stupor & Catatonic syndrome, Aggression, other psychiatric emergencies	
-	Crisis Intervention therapy	
UNIT VIII	THERAPEUTIC MODALITIES-	12 hrs.
-	Principles, indication, contraindications and role of nurse in various treatment	

method:

- Pharmacotherapy
- Therapeutic community and Milieu therapy
- Psychotherapy- psychoanalysis, Behavior therapy, Cognitive Therapy, Supportive Therapy, Hypnosis, Abreaction, Relaxation Therapies, Biofeedback.
- Group therapy
- Family therapy
- Occupational Therapy
- Electro convulsive therapy
- Other miscellaneous therapies.

UNIT IX PREVENTIVE PSYCHIATRY- 5 hrs.

- Model of prevention
- Role of nurse in preventive psychiatry
- Psychiatric social worker
- Community mental health nursing
- Community mental health Services and agencies
- National mental health programme

COMMUNITY HEALTH NURSING

Placement : IInd year

Time Allotted Theory : 60 Hrs.

Practical : 240 Hrs.

COURSE DESCRIPTION:

The course enables the students to acquire knowledge and understanding of the changing concepts of comprehensive community health nursing practice, the national health care delivery system and to participate in the delivery of community health nursing practice.

This course also broadens the understanding in public health nursing administration, responsibility of nurse for early case finding, health assessment and health education based on principles of primary health care, Nursing process approach and comprehensive nursing care to the individual, family and community.

OBJECTIVES : At the end of the course the student will

- 1) Explain the concept of various factors contributing the health of individual family and community.
- 2) Explain and analyze health need of individual family and community based on factors contributing to health and illness
- 3) Describe national health care delivery system.

- 4) Describes epidemiological methods and principles of prevention and control of illness in the community.
- 5) Study implementation of national programmes and role of CHN in prevention and control of diseases.
- 6) Identify the role of personnel working in the community health setup and appreciate the integrated approach to community health.
- 7) Plan the work of community health nurse and supervise the health workers.
- 8) Study concept of public health administration and role of nurse as manager and supervisor.

COURSE CONTENT :

UNIT I	COMMUNITY HEALTH AND COMMUNITY HEALTH NURSING	8 hrs.
	<ul style="list-style-type: none"> - Changing concepts of health - Determinants of health - Introduction to community health & CH Nursing - Principles of working in a community. - Primary health care - concepts and principles. - Role of nurse in promoting primary health care. - Health for all - concepts strategy for HFA. - Community health assessment and diagnosis. 	
UNIT II	FAMILY HEALTH CARE & SERVICES	10 hrs.
	<ul style="list-style-type: none"> - Concepts, Objectives scope & Principles of family health services. - Family as a unit of community health service. - Factors influencing family health and high-risk families. - Family Health assessment, Health risk families. 	

- Principles and technique of home visits.
- Nursing process in family & community health care. Establishing working relationship with the family.
- Working with families in relation to prevention of disease and promotion of health.
- Care of Sick, & care of physically handicapped and mentally retarded at home
- Family health records.

UNIT III HEALTH ADMINISTRATION IN INDIA. 10 hrs.

- Health care delivery system in India.
- Health planning, National health policy and Five Years plan
- Organization and administration of health services at central, state, district level and Rural Health Services (Panchayati Raj).
- Monitoring and evaluation and health services
- System of medicines.
- Centrally sponsored health schemes.
- Role of voluntary health organization & International Health agencies.
- Health team concept, Public health legislation.
- Community Health Nursing Administration.
- Role of health personnel in community health Practice.
- Training Programmes for various health workers.
- Management and supervision in community health nursing practice.

UNIT IV HEALTH EDUCATION (IEC Information, Education, Communication) 5 hrs.

- Aims, concepts and scope of health education.
- Communication and health education.
- Methods and media for health education in community.
- Planning for health education and role of nurse in I.E.C.
- Central Health Education Bureau.

UNIT V ROLE OF NURSE IN NATIONAL HEALTH PROGRAMMES. 15 hrs.

- Development of community health services in India.
- Major health problem in India.
- National health programme for communicable and Non-communicable disease.
- Maternal and child health programme.
- Nutritional programme.
- Family welfare
- School health Programme.
- Occupational Health Programme.
- Disaster Management.
- As a health team members.
- Records and reports in Community health.

UNIT VI EPIDEMIOLOGY. 7 hrs.

- Epidemiology - Definition, Concepts, aims, objectives and methods and Principles.
- Epidemiology - Theories and Models.
- Application of Epidemiological Principles in community health.
- Monitoring and surveillance.
- Levels of prevention of disease

- Introduction, definition and scope, legislation.
- Report, recording and compiling of vital statistics at the local State, National and International level.
- Definitions and methods of computing vital statistics.
- Methods of presenting data.
- Management Information System.

**CLINICAL SPECIALITY – I MEDICAL
SURGICAL NURSING**

Hours of
instruction
Theory:

150 Hours
Practical: 650 Hours
Total : 800Hours

Course Description

This course is common for the students undergoing clinical speciality-II in neuro science nursing/cardiovascular & thoracic nursing/critical care nursing/oncology nursing/orthopaedic and rehabilitation nursing/nephro & urology nursing, gastroenterology nursing/ geriatric nursing.

It is designed to assist students in developing expertise and in depth knowledge in the field of medical Surgical Nursing. It will help students to appreciate the patient as a holistic individual and develop skill to function as a specialized Medical-Surgical Nurse. It will further enable the student to function as educator, manager and researcher in the field of Medical – Surgical Nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends & issues in the field of Medical –Surgical Nursing as a speciality.
2. Apply concepts & theories related to health promotion.
3. Appreciate the client as a holistic individual.
4. Perform physical, psychosocial assessment of Medical – Surgical patients.
5. Apply Nursing process in providing care to patients.
6. Integrate the concept of family centered nursing care with associated disorder such as genetic, congenital and long-term illness.
7. Recognize and manage emergencies with Medical- Surgical patients.
8. Describe various recent technologies & treatment modalities in the management of critically ill patients.
9. Appreciate the legal & ethical issues relevant to Medical – Surgical Nursing.
10. Prepare a design for layout and management of Medical – Surgical Units.

11. Appreciate the role of alternative systems of Medicine in care of patients.
12. Incorporate evidence based Nursing practice and identify the areas of research in the field of Medical – Surgical Nursing.
13. Recognize the role of Nurse practitioner as a member of the Medical – Surgical health team.
14. Teach Medical – Surgical Nursing to undergraduate nursing students & in-service nurses.

COURSE CONTENT:

Unit	Hours	Content
I	5	<p>Introduction:</p> <ul style="list-style-type: none"> □ Historical development of Medical- Surgical Nursing in India. □ Current status of health and disease burden in India. □ Current concept of health. □ Trends & issues in Medical – Surgical Nursing. □ Ethical & cultural issues in Medical – Surgical Nursing. □ Rights of patients. □ National health policy, special laws & ordinances relating to older people. □ National goals. □ Five year plans. □ National health programs related to adult health.
II	20	<p>Health Assessment of patients</p> <ul style="list-style-type: none"> □ History taking. □ Physical examination of various systems. □ Nutritional assessment. □ Related investigations and diagnostic assessment.
III	5	<p>Care in hospital settings:</p> <ul style="list-style-type: none"> □ Ambulatory care. □ Acute and Critical care. □ Long term care. □ Home Health Care. □ Characteristics, care models, practice settings, interdisciplinary team. □ Hospitalization- effects of hospitalization on the patient & family. □ Stressors & reactions related to disease process. □ Nursing care using Nursing process approach.
IV	10	<p>Management of patients with disorders of Gastro intestinal tract</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders-etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment- History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.

Unit	Hours	Content
V	10	<p>Management of patients with disorders of nervous system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
VI	10	<p>Management of patients with disorders of respiratory system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
VII	10	<p>Management of patients with disorders of cardio vascular system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
VIII	5	<p>Management of patients with disorders of blood</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies □ Evidence based nursing practice □ Rehabilitation and follow-up
IX	10	<p>Management of patients with disorders of genito urinary system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis.

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
X	10	<p>Management of patients with disorders of endocrine system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XI	10	<p>Management of patients with disorders of musculo-skeletal system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XII	8	<p>Management of patients with disorders of integumentary system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XIII	5	<p>Management of patients with disorders of Eye and ENT</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders-etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends.

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XIV	8	<p>Management of patients with disorders of reproductive system</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology. □ Common Disorders- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends. □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XV	8	<p>Geriatric nursing</p> <ul style="list-style-type: none"> □ Nursing Assessment-History and Physical assessment. □ Ageing; □ Demography; Myths and realities. □ Concepts and theories of ageing. □ Cognitive Aspects of Ageing. □ Normal biological ageing. □ Age related body systems changes. □ Psychosocial Aspects of Aging. □ Medications and elderly. □ Stress & coping in older adults. □ Common Health Problems & Nursing Management; □ Psychosocial and Sexual. □ Abuse of elderly. □ Role of nurse for care of elderly: ambulation, nutritional, communicational, psychosocial and spiritual. □ Role of nurse for caregivers of elderly. □ Role of family and formal and non formal caregivers. □ Use of aids and prosthesis (hearing aids, dentures, □ Legal & Ethical Issues. □ Provisions and Programmes for elderly; privileges, Community Programs and health services; □ Home and institutional care. □ Issues, problems and trends.
XVI	8	<p>Management of patients with communicable and sexually transmitted diseases:</p> <ul style="list-style-type: none"> □ Review of immune system. □ Common Disorders of immune system – HIV/AIDS. □ Review of infectious disease process. □ Communicable Diseases- etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. □ Treatment modalities and trends.

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Nursing management. □ Related research studies. □ Evidence based nursing practice. □ Rehabilitation and follow-up.
XVII	8	<p>Emergency, trauma and multi-system organ failure</p> <ul style="list-style-type: none"> □ DIC (disseminated intravascular coagulation) □ Trauma, burns, poisoning □ Etiology, Patho physiology, Clinical manifestations, complications, prognosis. □ Health assessment-History taking, physical examination, investigation and diagnostic assessment. <ul style="list-style-type: none"> ● Treatment modalities and trends. ● Nursing management. ● Related research studies. ● Evidence based nursing practice. ● Rehabilitation and follow-up.

CLINICAL SPECIALTY –I

CHILD HEALTH (PAEDIATRIC) NURSING

Placement : 1st Year

Hours of Instruction
Theory 150 Hours
Practical 650 Hours
Total : 800Hours

Course Description

This course is designed to assist students in developing expertise and in- depth understanding in the field of Pediatric Nursing. It will help students to appreciate the child as a holistic individual and develop skill to function as neonatal and pediatric nurse specialist. It will further enable the student to function as educator, manager, and researcher in the field of Paediatric nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the history and developments in the field of pediatrics and pediatric nursing as a specialty
2. Apply the concepts of growth and development in providing care to the pediatric clients and their families.
3. Appreciate the child as a holistic individual
4. Perform physical, developmental, and nutritional assessment of pediatric clients
5. Apply nursing process in providing nursing care to neonates & children
6. Integrate the concept of family centered pediatric nursing care with related areas such as genetic disorders, congenital malformations and long term illness.
7. Recognize and manage emergencies in neonates
8. Describe various recent technologies and treatment modalities in the management of high risk neonates
9. Appreciate the legal and ethical issues pertaining to pediatric and neonatal nursing
10. Prepare a design for layout and management of neonatal units
11. Incorporate evidence based nursing practice and identify the areas of research in the field of pediatric/neonatal nursing
12. Recognize the role of pediatric nurse practitioner and as a member of the pediatric and neonatal health team
13. Teach pediatric nursing to undergraduate students & in-service nurses

Course Content

Unit	Hours	Content
I	10	Introduction <ul style="list-style-type: none"> □ Historical development of Pediatrics and Pediatric Nursing in India; □ Current status of child health in India; □ Trends in Pediatrics and Pediatric Nursing, □ Ethical and cultural issues in pediatric care □ Rights of children □ National health policy for children, special laws and ordinances relating to children. □ National goals, □ Five yearplans, □ National health programs related to child health.
II	10 Hrs	Assessment of pediatric clients <ul style="list-style-type: none"> □ History taking □ Developmental assessment □ Physical assessment □ Nutritional assessment □ Family assessment
III	10	Hospitalized child <ul style="list-style-type: none"> □ Meaning of hospitalization of the child, preparation for hospitalization, effects of hospitalization on the child and family □ Stressors and reactions related to developmental stages, play activities for ill hospitalized child. □ Nursing care of hospitalized child and family -principles and practices
IV	15	Pre-natal Pediatrics <ul style="list-style-type: none"> □ Embryological and fetal development, Prenatal factors influencing growth and development of fetus, □ Genetic patterns of common pediatric disorders, chromosomal aberrations, genetic assessment and counseling legal and ethical aspects of genetic, screening and counseling role of nurse in genetic counseling, □ Importance of prenatal care and role of pediatric nurse.
V	15	Growth and Development of children <ul style="list-style-type: none"> □ Principles of growth and development, □ Concepts and theories of growth and development, □ Developmental tasks and special needs from infancy to adolescence, developmental milestones, □ Assessment of growth and development of pediatric clients, □ Factors affecting growth and development.
VI	15	Behavioral Pediatrics and Pediatric Nursing <ul style="list-style-type: none"> □ Parent child relationship, □ Basic behavioral pediatric principles and specific behavioral pediatric concepts/disorders- maternal deprivation, failure

Unit	Hours	Content
		<p>to thrive, child abuse, the battered child,</p> <ul style="list-style-type: none"> □ Common behavioral problems and their management, □ Child guidance clinic.
VII	15	<p>Preventive Pediatrics and Pediatric Nursing</p> <ul style="list-style-type: none"> □ Concept, aims and scope of preventive pediatrics, □ Maternal health and its influence on child health antenatal aspects of preventive pediatrics, □ Immunization, expanded program on immunization/ universal immunization program and cold chain, □ Nutrition and nutritional requirements of children, changing patterns of feeding, baby- friendly hospital initiative and exclusive breast feeding, □ Health education, nutritional education for children □ Nutritional programs □ National and international organizations related to child health, <p>Role of pediatric nurse in the hospital and community.</p>
VIII	30	<p>Neonatal Nursing</p> <ul style="list-style-type: none"> □ New born baby- profile and characteristics of the newborn, □ Assessment of the new born, □ Nursing care of the new born at birth, care of the new born and family, □ High risk newborn- pre term and term neonate and growth retarded babies, □ Identification and classification of neonates with infections, HIV & AIDS, Ophthalmia neonatorum, congenital syphilis. □ High risk new born- Identification, classification and nursing management □ Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU.
IX	30	<p>IMNCI (Integrated management of neonatal and childhood illnesses)</p>

CLINICAL SPECIALITY – I MENTAL

HEALTH (PSYCHIATRIC) NURSING

Placement : 1st Year

Course Description

Hours of
Instruction

Theory 150 hours
Practical 650 hours Total :
800hours

This course is designed to assist students in developing expertise and in- depth understanding in the field of Psychiatric Nursing. It will help students to appreciate the client as a holistic individual and develop skill to function psychiatric nurse specialist . It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends and issues in the field of psychiatry and psychiatric nursing.
2. Explain the dynamics of personality development and human behaviour.
3. Describe the concepts of psychobiology in mental disorders and its implications for psychiatric nursing
4. Demonstrate therapeutic communications skills in all interactions
5. Demonstrate the role of psychiatric nurse practitioner in various therapeutic modalities
6. Establish and maintain therapeutic relationship with individual and groups
7. Uses assertive techniques in personal and professional actions
8. Promotes self-esteem of clients, others and self
9. Apply the nursing process approach in caring for patients with mental disorders
10. Describe the psychopharmacological agents, their effects and nurses role
11. Recognize the role of psychiatric nurse practitioner and as a member of the psychiatric and mental health team
12. Describe various types of alternative system of medicines used in psychiatric settings
13. Incorporate evidence based nursing practice and identify the areas of research in the field of psychiatric nursing

Course Content

Units	Hours	Content
I	15	<p>Introduction</p> <ul style="list-style-type: none"> □ Mental Health and Mental Illness □ Historical perspectives □ Trends, issues and magnitude □ Contemporary practices □ Mental health laws/Acts □ National mental health program -National mental health authority, state mental health authority □ Human rights of mentally ill □ Mental Health/ Mental Illness Continuum □ Classification of mental illnesses-ICD, DSM □ Standards of Psychiatric nursing □ Challenges and Scope of psychiatric nursing □ Multi-disciplinary team and role of nurse <p>Role of psychiatric nurse- extended and expanded</p>
II	10	<p>Concepts of Psychobiology</p> <ul style="list-style-type: none"> □ The Nervous System: <ul style="list-style-type: none"> • An Anatomical Review • The Brain and limbic system • Nerve Tissue • Autonomic Nervous system • Neurotransmitters □ Neuroendocrinology <ul style="list-style-type: none"> • Pituitary, Thyroid Gland • Circadian Rhythms □ Genetics □ Neuro psychiatric disorders □ Psychoimmunology <ul style="list-style-type: none"> • Normal Immune response • Implications for psychiatric Illness □ Implications for Nursing
III	10	<p>Theories of Personality Development and relevance to nursing practice</p> <ul style="list-style-type: none"> □ Psychoanalytic Theory- Freud's □ Interpersonal Theory-Sullivan's □ Theory of Psychosocial Development-Erikson's □ Theory of object relations □ Cognitive Development Theory □ Theory of Moral Development □ A Nursing Model-Hildegard E. Peplau
IV	5	<p>Stress and its management</p> <ul style="list-style-type: none"> □ An introduction to the concepts of stress □ Psychological Adaptation to stress □ Stress as a Biological Response. □ Stress as an Environmental Event.

Units	Hours	Content
		<ul style="list-style-type: none"> □ Stress as Transaction between the Individual and the Environment. □ Stress management.
V	10	<p>Therapeutic communication and interpersonal relationship</p> <ul style="list-style-type: none"> □ Review communication process, factors affecting communication □ Communication with individuals and in groups □ Techniques of therapeutic communication-touch therapy □ Barrier of communication with specific reference to psychopathology □ Therapeutic attitudes □ Dynamics of a therapeutic Nurse-client relationship; Therapeutic use of self Gaining self-awareness □ Therapeutic nurse-patient relationship its phases ; Conditions essential to development of a therapeutic relationship □ Therapeutic impasse and its management
VI	10	<p>Assertive Training</p> <ul style="list-style-type: none"> □ Assertive Communication □ Basic Human Rights □ Response Patterns <ul style="list-style-type: none"> • (Nonassertive Behavior • Assertive Behavior • Aggressive Behavior • Passive-Aggressive Behavior) □ Behavioral Components of Assertive Behavior □ Techniques that Promote Assertive Behavior □ Thought-Stopping Techniques Method <p>Role of The Nurse</p>
VII	10	<p>Promoting Self-Esteem</p> <ul style="list-style-type: none"> □ Components of Self-Concept □ The Development of Self-Esteem □ The Manifestations of Low-Self-Esteem □ Boundaries <p>Role of The Nurse</p>
	5	<p>Women and Mental Health</p> <ul style="list-style-type: none"> <ul style="list-style-type: none"> } Normal reaction to conception, pregnancy and puerperium } Problems related to conception, pregnancy and puerperium and its management. • Counselling – Premarital, marital and genetic

Units	Hours	Content
VIII	10	<p>The nursing process in psychiatric/mental health nursing</p> <ul style="list-style-type: none"> □ Mental health assessment- History taking, mental status examination □ Physical and neurological examination □ Psychometric assessment □ Investigations, Diagnosis and Differential diagnosis □ Interpretation of investigations □ Nurse's role □ Nursing case management <ul style="list-style-type: none"> □ Critical pathways of care □ Documentation <ul style="list-style-type: none"> □ Problem-oriented recording □ Focus charting □ The PIE method
IX	35	<p>Psycho social and physical therapies</p> <ul style="list-style-type: none"> □ Individual therapy □ Behavioural Therapy- Relaxation therapy, cognitive therapy, positive-negative reinforcement, bio-feedback, guided imagery, ab-reactive therapy □ Group Therapy □ Family Therapy □ Milieu Therapy □ The Therapeutic Community □ Occupational therapy □ Recreational therapy □ Play therapy □ Music therapy □ Light therapy □ Color therapy □ Aroma therapy
XI	5	<p>Electroconvulsive Therapy</p> <ul style="list-style-type: none"> □ Historical Perspectives □ Indications □ Contraindications □ Mechanisms of Action □ Side Effects □ Risks Associated with Electroconvulsive Therapy □ The Role of The Nurse in Electroconvulsive Therapy
X	10	<p>Psychopharmacology</p> <ul style="list-style-type: none"> □ Historical Perspectives □ Role of a Nurse in Psychopharmacological Therapy <ul style="list-style-type: none"> ● Antianxiety Agents ● Antidepressants Agents ● Mood stabilizers ● Antipsychotics ● Sedative-Hypnotics ● Central Nervous System Stimulants □ Future developments

Units	Hours	Content
XII	15	Alternative systems of medicine in mental health <ul style="list-style-type: none"> □ Types of Therapies <ul style="list-style-type: none"> • Herbal Medicine • Unani • Siddha • Homeopathic • Acupressure and Acupuncture • Diet and Nutrition • Chiropractic Medicine • Therapeutic Touch and Massage • Yoga • Pet Therapy

**CLINICAL SPECIALITY-I OBSTETRIC AND
GYNAECOLOGICALNURSING**

Placement : 1st year

Hours of Instruction

Theory :
150 Hours.

Practical : 650 Hours.
Total : 800 Hours.

Course Description

This course is designed to assist students in developing expertise and in- depth understanding in the field of Obstetric and Gynaecological Nursing. It will help students to appreciate the client as a holistic individual and develop skill to function as an independent midwifery practitioner. It will further enable the student to function as educator, manager, and researcher in the field of Obstetric and Gynaecological nursing

Objectives

At the end of the course the students will be able to:

1. Appreciate the trends in the field of midwifery, obstetrics and gynaecology as a speciality.
2. Describe the population dynamics and indicators of maternal and child health
3. Describe the concepts of biophysical, psychological and spiritual aspects of normal pregnancy, labor and puerperium.
4. Provide comprehensive nursing care to women during reproductive period and newborns.
5. Integrate the concepts of family centered nursing care and nursing process approach in obstetric and gynaecological nursing.
6. Identify and analyze the deviations from normal birth process and refer appropriately.
7. Describe the pharmacological agents, their effects during pregnancy, child birth, puerperium, lactation and the role of nurse
8. Counsel adolescents, women and families on issues pertaining to pregnancy, child birth and lactation
9. Describe the role of various types of complementary and alternative therapies in obstetric and gynaecological nursing.
10. Incorporate evidence based nursing practice and identify the areas of research in the field of obstetric and gynaecological nursing.
11. Describe the recent advancement in contraceptive technology and birth control measures
12. Appreciate the legal and ethical issues pertaining to obstetric and gynaecological nursing

Course Content

Units	Hours	Content
I	10	<p>Introduction</p> <ul style="list-style-type: none"> □ Historical and contemporary perspectives □ Epidemiological aspects of maternal and child health □ Magnitude of maternal and child health problems □ Issues of maternal and child health : Age, Gender, Sexuality, psycho Socio cultural factors □ Preventive obstetrics □ National health and family welfare programmes related to maternal and child health: health care delivery system- National Rural health mission, Role of NGO's □ Theories, models and approaches applied to midwifery practice □ Role and scope of midwifery practice: Independent Nurse midwifery practitioner □ Legal and Ethical issues: Code of ethics and standards of midwifery practice, standing orders □ Evidence based midwifery practice □ Research priorities in obstetric and gynaecological nursing.
II	15	<p>Human reproduction</p> <ul style="list-style-type: none"> □ Review of anatomy and physiology of human reproductive system: male and female □ Hormonal cycles □ Embryology □ Genetics, teratology and counseling □ Clinical implications
III	25	<p>Pregnancy</p> <ul style="list-style-type: none"> □ Maternal adaptation : Physiological, psychosocial <ul style="list-style-type: none"> • Assessment – Maternal and foetal measures Maternal measures: History taking , examination-General, physical and obstetrical measure, identification of high risk, • Foetal measure- clinical parameters, biochemical- human estriol, Maternal Serum Alfa Feto Protein, Acetyl Choline esterase (AchE), Triple Test Aminocentesis, Cordocentesis, chorionic villus sampling (CVS)), • Biophysical- (US IMAGING, Foetal movement count, Ultra Sonography, Cardiotocography, cardiotomography, Non Stress Test(NST), Contraction stress test(CST), amnioscopy, foetoscopy, • Radiological examination, □ Interpretation of diagnostic tests and nursing implications □ Nursing management of the pregnant women, minor disorders of pregnancy and management, preparation for child birth and parenthood, importance of institutional delivery , choice of birth setting, importance and mobilizing of transportation, prenatal counseling, role of nurse and crisis intervention, identification of high risk pregnancy and refer □ Alternative/complementary therapies

Units	Hours	Content
IV	25	<p>Normal Labour and nursing management:</p> <ul style="list-style-type: none"> □ Essential factors of labour □ Stages and onset <p>First stage: Physiology of normal labour</p> <ul style="list-style-type: none"> • Use of partograph: Principles, use and critical analysis, evidence based studies • Analgesia and anaesthesia in labour • Nursing management <p>Second stage</p> <ul style="list-style-type: none"> • Physiology, intrapartum monitoring • Nursing management. • Resuscitation, immediate newborn care and initiate breast feeding (Guidelines of National neonatology forum of India) <p>Third stage</p> <ul style="list-style-type: none"> • Physiology and nursing management <p>Fourth stage – Observation, critical analysis and Nursing management.</p> <ul style="list-style-type: none"> • Various child birth practice: water birth, position change etc • Evidence based practice in relation to labour intervention <p>Role of nurse midwifery practitioner</p> <ul style="list-style-type: none"> • Alternative/complementary therapies
V	20	<p>Normal puerperium and nursing management</p> <ul style="list-style-type: none"> □ Physiology of puerperium □ Physiology of lactation, lactation management, exclusive breast feeding, Baby friendly hospital initiative (BFHI) □ Assessment of postnatal women. □ Minor discomforts and complications of puerperium □ Management of mothers during puerperium: Postnatal exercises, Rooming in, bonding, warm chain □ Evidence based studies <p>Role of nurse midwifery practitioner</p> <ul style="list-style-type: none"> • Alternative/complementary therapies
VI	20	<p>Normal Newborn</p> <ul style="list-style-type: none"> □ Physiology and characteristics of normal newborn □ Physical and Behavioural assessment of newborn □ Needs of newborn □ Essential newborn care: Exclusive breast feeding, Immunization, Hygiene measures, Newborn nutrition □ Organization of neonatal care, services (Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU □ Observation and care of newborn □ Parenting process

Units	Hours	Content
VII	10	<p>Pharmacodynamics in obstetrics</p> <ul style="list-style-type: none"> □ Drugs used in pregnancy, labour, post partum and newborn □ Calculation of drug dose and administration □ Effects of drugs used □ Anaesthesia and analgesia in obstetrics □ Roles and responsibilities of midwifery nurse practitioner □ Standing orders and protocols and use of selected life saving drugs and interventions of obstetric emergencies approved by the MOHFW
VIII	10	<p>Family welfare services</p> <ul style="list-style-type: none"> □ Population dynamics □ Demography trends: vital statistics, calculation of indicators especially maternal and neonatal mortality rates and problems and other health problems □ Recent advancement in contraceptive technology □ Role of nurses in family welfare programmes in all settings □ Role of independent nurse midwifery practitioner □ Family life education □ Evidence based studies □ Information, Education and Communication (IEC) □ Management information and evaluation system (MIES) □ Teaching and supervision of health team members
IX	5	<p>Infertility</p> <ul style="list-style-type: none"> □ Primary and secondary causes □ Diagnostic procedures □ Counseling: ethical and legal aspects of assisted reproductive technology (ART) □ Recent advancement in infertility management. □ Adoption procedures <p>Role of nurses in infertility management.</p>
X	5	<p>Menopause</p> <ul style="list-style-type: none"> □ Physiological, psychological and social aspects □ Hormone Replacement Therapy □ Surgical menopause □ Counseling and guidance <p>Role of midwifery nurse practitioner</p>
XI	5	<p>Abortion</p> <ul style="list-style-type: none"> □ Types, causes □ Legislations, Clinical rights and professional responsibility □ Abortion procedures □ Complications □ Nursing management <p>Role of midwifery nurse practitioner</p>

**CLINICAL SPECIALITY- I COMMUNITY
HEALTH NURSING**

Placement : 1st Year

Hours of Instructions
Theory 150 hours
Practical 650hours
Total 800hours

Course Description

The course is designed to assist students in developing expertise and in- depth understanding in the field of Community Health Nursing. It would help students to appreciate holistic life style of individuals, families & groups and develop skills to function as Community Health Nurse specialist/practitioner. It would further enable student to function as an educator, manager and researcher in the field of Community Health nursing.

Objectives

At the end of the course, the student will be able to:

1. Appreciate the history and development in the field of Community Health and Community Health Nursing.
2. Appreciate role of individuals and families in promoting health of the Community.
3. Perform physical, developmental and nutritional assessment of individuals, families and groups.
4. Apply the concepts of promotive, preventive, curative and rehabilitative aspects of health while providing care to the people.
5. Apply nursing process approach while providing care to individuals, families, groups and community.
6. Integrate the concepts of family centered nursing approach while providing care to the community.
7. Recognize and participate in the management of emergencies, epidemics and disasters.
8. Apply recent technologies and care modalities while delivering community health nursing care.
9. Appreciate legal and ethical issues pertaining to community health nursing care.
10. Conduct community health nursing care projects.
11. Participate in planning, implementation and evaluation of various national health and family welfare programmes at local, state and the national level.
12. Incorporate evidence based nursing practice and identify the areas of research in the community settings.

13. Participate effectively as a member of Community Health team.
14. Coordinate and collaborate with various agencies operating in the community by using inter-sectoral approach.
15. Teach community health nursing to undergraduates, in-service nurses and the community health workers.
16. Demonstrate leadership and managerial abilities in community health nursing practice

Course Content

Unit	Hours	Content
I	10	Introduction <ul style="list-style-type: none"> □ Historical development of Community Health and Community health Nursing- World and India, various health and family welfare committees □ Current status, trends and challenges of Community Health Nursing □ Health status of the Community-community diagnosis □ Scope of Community health Nursing practice □ Ethical and legal issues □ Socio-cultural issues in Community health Nursing □ National Policies, plans and programmes <ul style="list-style-type: none"> • National health policy • National Population policy • National Health and welfare Programmes • National Health goals/ indicators/ Millennium developmental goals(MDG)/ Strategies • Planning process: Five year plans • National Rural Health Mission • Panchayat raj institutions
II	10	Health <ul style="list-style-type: none"> □ Concepts, issues □ Determinants □ Measurements □ Alternate systems for health promotion and management of health problems □ Health economics □ Health technology □ Genetics and health □ Waste disposal □ Eco system
III	15	Population dynamics and control <ul style="list-style-type: none"> □ Demography □ Transition and theories of population □ National population policy □ National population programmes □ Population control and related programmes □ Methods of family limiting and spacing □ Research, Census, National Family Health Survey

Unit	Hours	Content
IV	30	<p>Community health Nursing</p> <ul style="list-style-type: none"> □ Philosophy, Aims, Objectives, Concepts, Scope, Principles, Functions □ Community health Nursing theories and models □ Quality assurance: Community health Nursing standards, competencies, Monitoring community health nursing, nursing audits □ Family nursing and Family centered nursing approach □ Family health nursing process <ul style="list-style-type: none"> ○ Family health assessment ○ Diagnosis ○ Planning ○ Intervention ○ Evaluation □ Nursing care for special groups: children, adolescents, adults, women, elderly, physically and mentally challenged- Urban and rural population at large □ Community nutrition □ Concept, role and responsibilities of community health Nurse practitioners/nurse midwifery practitioners-decision making skills, professionalism, legal issues <p style="text-align: right;">Hours of Instruction Theory 150 Hours Practical 150 Hours Total : 300Hours</p>
V	45	<p>Maternal and neonatal care</p> <ul style="list-style-type: none"> □ IMNCI(Integrated Management of Neonatal And Childhood Illnesses) module □ Skilled Birth Attendant (SBA)module
VI	15	<ul style="list-style-type: none"> □ Disaster nursing (INC module on Reaching out: Nursing Care in emergencies)
VII	10	<p>Information, education and communication</p> <ul style="list-style-type: none"> □ IEC/BCC: Principles and strategies □ Communication Skills □ Management information and evaluation system: Records and reports <p style="text-align: center;">CURRICULUM</p> <ul style="list-style-type: none"> □ Information technology □ Tele-medicine and teleNURSING EDUCATION □ Journalism □ Mass media □ Folk media
VIII	15	<p>Health care delivery system: Urban, rural, tribal and difficult areas</p> <ul style="list-style-type: none"> □ Health organization: National, State, District, CHC, PHC, Sub Centre, Village - Functions, Staffing, pattern of assistance, layout, drugs, equipments and supplies, Roles and Responsibilities of DPHNO □ Critical review of functioning of various levels, evaluation studies, recommendations and nursing perspectives □ Alternative systems of medicine □ Training and supervision of health workers

This course is designed to assist students to develop a broad understanding of Fundamental Principles, concepts, trends and issues related to education and nursing education. Further, it would provide opportunity to students to understand, appreciate and acquire skills in teaching and evaluation, curriculum development, implementation, maintenance of standards and accreditation of various nursing educational programs.

Objectives

At the end of the course, students will be able to:

1. Explain the aims of education, philosophies, trends in education and health: its impact on nursing education.
2. Describe the teaching learning process.
3. Prepare and utilize various instructional media and methods in teaching learning process.
4. Demonstrate competency in teaching, using various instructional strategies.
5. Critically analyze the existing nursing educational programs, their problems, issues and future trends.
6. Describe the process of curriculum development, and the need and methodology of curriculum change, innovation and integration.
7. Plan and conduct continuing nursing education programs.
8. Critically analyze the existing teacher preparation programs in nursing.
9. Demonstrate skill in guidance and counseling.
10. Describe the problems and issues related to administration of nursing curriculum including selection and organization of clinical experience.
11. Explain the development of standards and accreditation process in nursing education programs.
12. Identify research priorities in nursing education.
13. Discuss various models of collaboration in nursing education and services.

14. Explain the concept, principles, steps, tools and techniques of evaluation
15. Construct, administer and evaluate various tools for assessment of knowledge, skill, and attitude.

Course Content

Units	Hours		Course Content
	Theory	Practical	
I	10		<p>Introduction :</p> <ul style="list-style-type: none"> □ Education :Definition, aims, concepts, philosophies & their education implications, □ Impact of Social, economical, political & technological changes on education: <ul style="list-style-type: none"> • Professional education • Current trends and issues in education • Educational reforms and National Educational policy, various educational commissions-reports • Trends in development of nursing education in India
II	20	30	<p>Teaching – Learning Process</p> <ul style="list-style-type: none"> □ Concepts of teaching and learning: Definition, theories of teaching and learning, relationship between teaching and learning. □ Educational aims and objectives; types, domains, levels, elements and writing of educational objectives □ Competency based education(CBE) and outcome based education(OBE) □ Instructional design: Planning and designing the lesson, writing lesson plan : meaning, its need and importance, formats. □ Instruction strategies – Lecture, discussion, demonstration, simulation, laboratory, seminar, panel, symposium, problem solving, problem based learning (PBL), workshop, project, role-play(socio- drama), clinical teaching methods, programmed instruction, self directed learning(SDL), micro teaching, computer assisted instruction(CAI), computer assisted learning (CAL)

Units	Hours		Course Content
	Theory	Practical	
III	10	10	Instructional media and methods <ul style="list-style-type: none"> □ Key concepts in the selection and use of media in education □ Developing learning resource material using different media □ Instructional aids – types, uses, selection, preparation, utilization. □ Teacher's role in procuring and managing instructional Aids – Project and non-projected aids, multi media, video-tele conferencing etc
IV	10		Measurement and evaluation: <ul style="list-style-type: none"> □ Concept and nature of measurement and evaluation, meaning, process, purposes, problems in evaluation and measurement. □ Principles of assessment, formative and summative assessment-internal assessment external examination, advantages and disadvantages. □ Criterion and norm referenced evaluation,
V	12	10	Standardized and non-standardized tests : <ul style="list-style-type: none"> □ Meaning, characteristics, objectivity, validity, reliability, usability, norms, construction of tests- <ul style="list-style-type: none"> • Essay, short answer questions and multiple choice questions. • Rating scales, checklist, OSCE/OSPE(Objective structured clinical/practical examination) • Differential scales, and summated scales, sociometry, anecdotal record, attitude scale, critical incident technique □ Question bank-preparation, validation, moderation by panel, utilization □ Developing a system for maintaining confidentiality
VI	8	5	Administration, Scoring and Reporting <ul style="list-style-type: none"> □ Administering a test; scoring, grading versus marks □ Objective tests, scoring essay test, methods of scoring, Item analysis.
VII	12	6	Standardized Tools <p>ests of intelligence aptitude, interest, personality, achievement, socio-economic status scale, tests for special mental and physical abilities and disabilities.</p>

Units	Hours		Course Content
	Theory	Practical	
VIII	5	6	Nursing Educational programs <ul style="list-style-type: none"> □ Perspectives of nursing education: Global and national. □ Patterns of nursing education and training programmes in India. Non-university and University programs: ANM, GNM, Basic B.Sc. Nursing, Post Certificate B.Sc. Nursing, M.Sc(N) programs, M.Phil and Ph.D) in Nursing, post basic diploma programs, nurse practitioner programs.
IX	12	25	Continuing Education in Nursing <ul style="list-style-type: none"> □ Concepts – Definition, importance, need scope, principles of adult learning, assessments of learning needs, priorities, resources. □ Program planning, implementation and evaluation of continuing education programs. □ Research in continuing education. □ Distance education in nursing.
X	10	10	Curriculum Development <ul style="list-style-type: none"> □ Definition, curriculum determinants, process and steps of curriculum development, Curriculum models, Types and framework. □ Formulation of philosophy, objectives, selection and organization of learning experiences; master plan, course plan, unit plan. □ Evaluation strategies, process of curriculum change, role of students, faculty, administrators, statutory bodies and other stakeholders. □ Equivalency of courses: Transcripts, credit system.
XI	8	4	Teacher preparation <ul style="list-style-type: none"> □ Teacher – roles & responsibilities, functions, characteristics, competencies, qualities, □ Preparation of professional teacher □ Organizing professional aspects of teacher preparation programs □ Evaluation: self and peer □ Critical analysis of various programs of teacher education in India.

Units	Hours		Course Content
	Theory	Practical	
XII	10	5	Guidance and counseling <ul style="list-style-type: none"> □ Concept, principles, need, difference □ Guidance and counseling services : diagnostic and remedial. □ Coordination and organization of services. □ Techniques of counseling : Interview, case work, characteristics of counselor, problems in counseling. □ Professional preparation and training for counseling.
XIII	15	10	Administration of Nursing Curriculum <ul style="list-style-type: none"> □ Role of curriculum coordinator – planning, implementation and evaluation. □ Evaluation of educational programs in nursing-course and program. □ Factors influencing faculty staff relationship and techniques of working together. □ Concept of faculty supervisor (dual) position. □ Curriculum research in nursing. □ Different models of collaboration between education and service
XIV	10		Management of nursing educational institutions planning, organizing, staffing, budgeting, recruitment, discipline, public relation, performance appraisal, welfare services, library services, hostel,
XV	5	5	<ul style="list-style-type: none"> □ Development and maintenance of standards and accreditation in nursing education programs. □ Role of Indian Nursing Council, State Registration Nursing Councils, Boards and University. □ Role of Professional associations and unions.

CLINICAL SPECIALITY – II MEDICAL

SURGICAL NURSING

SUB SPECIALITY – CARDIO VASCULAR AND THORACIC NURSING

Placement : II year

Hours of Instruction

Theory : 150 hours.
Practical : 950 hours.
Total : 1100hours.

Course Description

This course is designed to assist students in developing expertise and in- depth understanding in the field of cardiovascular and thoracic nursing. It will help students to develop advanced skills for nursing intervention in various cardio medical and surgical conditions. It will enable the student to function as Cardio vascular and Thoracic Nurse practitioner/specialist. It will further enable the student to function as educator, manager and researcher in the field of cardio vascular and thoracic nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate trends and issues related to cardio vascular and thoracic Nursing.
2. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment of cardio vascular and thoracic conditions
3. Participate in national health programs for health promotion, prevention and rehabilitation of patients with cardio vascular and thoracic conditions
4. Perform physical, psychosocial & spiritual assessment
5. Assist in various diagnostic, therapeutic and surgical procedures
6. Apply nursing process in providing comprehensive care to patients with cardio vascular and thoracic conditions
7. Demonstrate advance skills/competence in managing patients with cardio vascular and thoracic conditions including Advance Cardiac Life Support.
8. Describe the various drugs used in cardio vascular and thoracic conditions and nurses responsibility
9. Demonstrate skill in handling various equipments/gadgets used for critical care of cardio vascular and thoracic patients
10. Appreciate team work & coordinate activities related to patient care.
11. Practice infection control measures.
12. Identify emergencies and complications & take appropriate measures

13. Discuss the legal and ethical issues in cardio vascular and thoracic nursing
14. Assist patients and their family to cope with emotional distress, grief, anxiety and spiritual needs.
15. Appreciate the role of alternative system of medicine in care of patient
16. Incorporate evidence based nursing practice and identify the areas of research in the field of cardio vascular and thoracic nursing
17. Identify the sources of stress and manage burnout syndrome among health care providers.
18. Teach and supervise nurses and allied health workers.
19. Design a layout of ICCU and ICTU and develop standards for cardio vascular and thoracic nursing practice.

Content Outline

Unit	Hours	Content
I	5	Introduction <ul style="list-style-type: none"> □ Historical development, trends and issues in the field of cardiology. □ Cardio vascular and thoracic conditions – major health problem. □ Concepts, principles and nursing perspectives □ Ethical and legal issues □ Evidence based nursing and its application in cardio vascular and thoracic nursing (to be incorporated in all the units)
II	5	Epidemiology <ul style="list-style-type: none"> □ Risk factors: hereditary, psycho social factors, hypertension, smoking, obesity, diabetes mellitus etc □ Health promotion, disease prevention, Life style modification □ National health programs related to cardio vascular and thoracic conditions □ Alternate system of medicine □ Complementary therapies
III	5	Review of anatomy and physiology of cardio vascular and respiratory system <ul style="list-style-type: none"> □ Review of anatomy and physiology of heart, lung, thoracic cavity and blood vessels. Embryology of heart and lung. □ Coronary circulation □ Hemodynamics and electro physiology of heart. □ Bio-chemistry of blood in relation to cardio pulmonary function.
IV	20	Assessment and Diagnostic Measures: <ul style="list-style-type: none"> □ History taking □ Physical assessment <ul style="list-style-type: none"> • Heart rate variability: Mechanisms , measurements, pattern, factors, impact of interventions on HRV □ Diagnostic tests <ul style="list-style-type: none"> • Hemodynamic monitoring: Technical aspects, monitoring, functional hemodynamic indices, ventricular function indices,

Unit	Hours	Content
		<p>output measurements (Arterial and swan Ganz monitoring). Blood gases and its significance, oxygen supply and demand</p> <ul style="list-style-type: none"> • Radiologic examination of the chest: interpretation, chest film findings • Electro cardiography(ECG) : electrical conduction through the heart, basic electrocardiography, 12 lead electrocardiogram, axis determination <ul style="list-style-type: none"> - ECG changes in: intraventricular conduction abnormalities- Arrhythmias, ischemia, injury and infarction, atrial and ventricular enlargement, electrolyte imbalance, • Echocardiography: technical aspects, special techniques, echocardiography of cardiac structures in health and disease, newer techniques • Nuclear and other imaging studies of the heart: Magnetic Resonance Imaging. • Cardio electrophysiology procedures: diagnostic studies, interventional and catheter ablation, nursing care • Exercise testing: indications and objectives, safety and personnel, pretest considerations, selection, interpretation, test termination, recovery period • Cardiac catheterization: indications, contraindications, patient preparation, procedure, interpretation of data • Pulmonary function test: Bronchoscopy and graphies • Interpretation of diagnostic measures • Nurse’s role in diagnostic tests <p>□ Laboratory tests using blood: Blood specimen collection, Cardiac markers, Blood lipids, Hematologic studies, Blood cultures, Coagulation studies, Arterial blood gases, Blood Chemistries, cardiac enzyme studies, Serum Concentration of Selected drugs.</p> <p>□ Interpretation and role of nurse</p>
V	25	<p>Cardiac disorders and nursing management:</p> <p>□ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of:</p> <ul style="list-style-type: none"> • Hypertension • Coronary Artery Disease. • Angina of various types. • Cardiomegaly • Myocardial Infarction, Congestive cardiac failure • Heart Failure, Pulmonary Edema, Shock. • Rheumatic heart disease and other Valvular Diseases • Inflammatory Heart Diseases, Infective Endocarditis, Myocarditis, Pericarditis. • Cardiomyopathy, dilated, restrictive, hypertrophic. • Arrhythmias, heart block <p>Associated illnesses</p>

Unit	Hours	Content
VI	10	<p>Altered pulmonary conditions</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of: <ul style="list-style-type: none"> • Bronchitis • Bronchial asthma • Bronchiectasis • Pneumonias • Lung abscess, lung tumour • Pulmonary tuberculosis, fibrosis, pneumoconiosis etc • Pleuritis, effusion • Pneumo, haemo and pyothorax • Interstitial Lung Disease • Cystic fibrosis • Acute and Chronic obstructive pulmonary disease (conditions leading to) • Cor pulmonale • Acute respiratory failure • Adult respiratory distress syndrome • Pulmonary embolism • Pulmonary Hypertension
VII	10	<p>Vascular disorders and nursing management</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of: <ul style="list-style-type: none"> • Disorders of arteries • Disorders of the aorta • Aortic Aneurysms, • Aortic dissection • Raynaud’s phenomenon • Peripheral arterial disease of the lower extremities • Venous thrombosis • Varicose veins • Chronic venous insufficiency and venous leg ulcers • Pulmonary embolism
VIII	10	<p>Cardio thoracic emergency interventions</p> <ul style="list-style-type: none"> □ CPR- BLS and ALS □ Use of ventilator, defibrillator , pacemaker □ Post resuscitation care. □ Care of the critically ill patients □ Psychosocial and spiritual aspects of care □ Stress management; ICU psychosis □ Role of nurse
IX	10	<p>Nursing care of a patient with obstructive airway</p> <ul style="list-style-type: none"> □ Assessment □ Use of artificial airway □ Endotracheal intubation, tracheostomy and its care □ Complication, minimum cuff leak, securing tubes <p>Oxygen delivery systems.</p> <ul style="list-style-type: none"> □ Nasal Cannula

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Oxygen mask, Venturi mask □ Partial rebreathing bag □ Bi-PAP and C-PAP masks □ Uses, advantages, disadvantages, nursing implications of each. <p>Mechanical Ventilation</p> <ul style="list-style-type: none"> □ Principles of mechanical ventilation □ Types of mechanical ventilation and ventilators. □ Modes of ventilation, advantage, disadvantage, complications. □ PEEP therapy, indications, physiology, and complications. Weaning off the ventilator. □ Nursing assessment and interventions of ventilated patient.
X	10	<p>Congenital Heart Diseases,</p> <ul style="list-style-type: none"> □ Etiology, clinical manifestations, diagnosis, prognosis, related pathophysiology, treatment modalities and nursing management of: <ul style="list-style-type: none"> • Embryological development of heart. • Classification – cyanotic and acyanotic heart disease. • Tetralogy of Fallots. • Atrial Septal Defect, Ventricular Septal Defect., Eisenmenger’s complex. • Patent ductus arteriosus, AP window • Truncus Arteriosus. • Transposition of great arteries. • Total Anomaly of Pulmonary Venous Connection. • Pulmonary stenosis, atresia. • Coarctation of aorta. • Ebstein’s anomaly • Double outlet right ventricle, Single ventricle, Hypoplastic left heart syndrome.
XI	10	<p>Pharmacology</p> <ul style="list-style-type: none"> □ Review □ Pharmacokinetics □ Analgesics/Anti inflammatory agents □ Antibiotics, antiseptics □ Drug reaction & toxicity □ Drugs used in cardiac emergencies □ Blood and blood components <ul style="list-style-type: none"> • Antithrombolytic agents • Inotropic agents • Beta-blocking agents • Calcium channel blockers. • Vaso constrictors • Vaso dilators • ACE inhibitors. • Anticoagulents • Antiarrhythmic drugs. • Anti hypertensives • Diuretics • Sedatives and tranquilizers. • Digitalis.

Unit	Hours	Content
		<ul style="list-style-type: none"> • Antilipemics <ul style="list-style-type: none"> □ Principles of drug administration, role and responsibilities of nurses and care of drugs
II	20	<p>Nursing Care of patient undergoing cardio thoracic surgery</p> <ul style="list-style-type: none"> □ Indications, selection of patient □ Preoperative assessment and preparation; counselling. □ Intraoperative care: Principles of open heart surgery, equipment, anaesthesia, cardiopulmonary by pass. □ Surgical procedures for Coronary Artery Bypass Grafting, recent advances and types of grafts, Valve replacement or reconstruction, cardiac transplant, Palliative surgery and different Stents, vascular surgery, other recent advances. □ Thoracic surgery: lobectomy, pneumonectomy, tumour excision etc □ Immediate postoperative care : assessment, post operative problems and interventions : Bleeding, Cardiac tamponade, Low cardiac output, Infarction, Pericardial effusion, Pleural effusion, Pneumothorax, Haemothorax, Coagulopathy, Thermal imbalance, Inadequate., ventilation/perfusion, Neurological problems, renal problems, Psychological problems. □ Chest physiotherapy □ Nursing interventions- life style modification, complementary therapy/alternative systems of medicine. □ Intermediate and late post operative care after CABG, valve surgery, others. <p>Follow up care</p>
III	5	<p>Cardiac rehabilitation</p> <ul style="list-style-type: none"> □ Process □ Physical evaluation □ Life style modification □ Physical conditioning for cardiovascular efficiency through exercise □ Counseling □ Follow up care
IV	5	<p>Intensive Coronary Care Unit/intensive cardio thoracic unit:</p> <ul style="list-style-type: none"> □ Quality assurance <ul style="list-style-type: none"> • Standards, Protocols, Policies, Procedures • Infection control; Standard safety measures • Nursing audit • Design of ICCU/ICTU • Staffing; cardiac team • Burn out syndrome □ Nurse's role in the management of I.C.C.U and ICTU. □ Mobile coronary care unit. □ Planning inservice educational programme and teaching

CLINICAL SPECIALITY – II OBSTETRIC AND GYNAECOLOGICALNURSING

Placement - II Year

Hours of Instruction	
Theory:	150 hrs
Practical	950 hrs
Total	1100 hrs

Course Description

This course is designed to assist the student in developing expertise and in- depth understanding in the field of Obstetric and gynecological Nursing .It will help the student to develop advanced nursing skills for nursing interventions in various obstetrical and gynecological conditions. It will further enable the students to function as midwifery nurse practitioner/ specialist, educator, manager and researcher in the field of obstetric and gynecological nursing.

Objectives

At the end of the course, the student will be able to:

1. Describe the epidemiology, etiology, pathophysiology and diagnostic assessment

- of women with obstetric and gynaecological conditions
2. Perform physical, psychosocial, cultural & spiritual assessment
 3. Demonstrate competence in caring for women with obstetrical and gynaecological conditions
 4. Demonstrate competence in caring for high risk newborn.
 5. Identify and Manage obstetrical and neonatal emergencies as per protocol.
 6. Practice infection control measures
 7. Utilize recent technology and various diagnostic, therapeutic modalities in the management of obstetrical , gynecological and neonatal care.
 8. Demonstrate skill in handling various equipments/gadgets used for obstetrical, gynaecological and neonatal care
 9. Teach and supervise nurses and allied health workers.
 10. Design a layout of speciality units of obstetrics and gynecology
 11. Develop standards for obstetrical and gynaecological nursing practice.
 12. Counsel women and families
 13. Incorporate evidence based nursing practice and identify the areas of research in the field of obstetrical and gynaecological nursing
 14. Function as independent midwifery nurse practitioner

Contents Outline

Unit	Hours	Content
I	25	<p>Management of problems of women during pregnancy</p> <ul style="list-style-type: none"> □ Risk approach of obstetrical nursing care , concept &goals. □ Screening of high-risk pregnancy, newer modalities of diagnosis. □ Nursing Management of Pregnancies at risk-due to obstetrical complication <ul style="list-style-type: none"> • Pernicious Vomiting. • Bleeding in early pregnancy, abortion, ectopic pregnancy, and gestational trophoblastic diseases. • Hemorrhage during late pregnancy, ante partum hemorrhage, Placenta praevia, abruptio placenta. • Hypertensive disorders in pregnancy, pre-eclampsia, eclampsia, Hemolysis Elevated liver enzyme Low Platelet count (HELLP) • Iso-immune diseases. Rh and ABO incompatibility • Hematological problems in pregnancy. • Hydramnios-oligohydramnios • Prolonged pregnancy- post term, post maturity. • Multiple pregnancies. • Intra uterine infection & pain during pregnancy. • Intra Uterine Growth Retardation(IUGR), Premature Rupture of Membrane(PROM), intra uterine death
II	15	<p>Pregnancies at risk-due to pre-existing health problems</p> <ul style="list-style-type: none"> □ Metabolic conditions. □ Anemia and nutritional deficiencies □ Hepatitis □ Cardio-vascular disease. □ Thyroid diseases. □ Epilepsy. □ Essential hypertension □ Chronic renal failure. □ Tropical diseases. □ Psychiatric disorders □ Infections Toxoplasmosis Rubella Cytomegalo virus Herpes (TORCH); Reproductive Tract Infection(RTI);STD; HIV/AIDS, Vaginal infections; Leprosy, Tuberculosis □ Other risk factors: Age- Adolescents, elderly; unwed mothers, sexual abuse, substance use □ Pregnancies complicating with tumors, uterine anomalies, prolapse, ovarian cyst
III	15	<p>Abnormal labour, pre-term labour & obstetrical emergencies</p> <ul style="list-style-type: none"> □ Etiology, pathophysiology and nursing management of <ul style="list-style-type: none"> • Uncoordinated uterine actions, Atony of uterus, precipitate labour, prolonged labour. • Abnormal lie, presentation, position compound presentation.

		<ul style="list-style-type: none"> • Contracted pelvis-CPD; dystocia. • Obstetrical emergencies Obstetrical shock, vasa praevia, inversion of uterus, amniotic fluid embolism, rupture uterus, presentation and prolapse cord. • Augmentation of labour. Medical and surgical induction. • Version • Manual removal of placenta. • Obstetrical operation: Forceps delivery, Ventouse, Caesarian section, Destructive operations • Genital tract injuries-Third degree perineal tear, VVF,RVF <p>□ Complications of third stage of labour:</p> <ul style="list-style-type: none"> • Post partum Hemorrhage. • Retained placenta.
IV	10	<p>post partum complications</p> <p>□ Nursing management of</p> <ul style="list-style-type: none"> • Puerperal infections, puerperal sepsis, urinary complications, puerperal venous thrombosis and pulmonary embolism • Sub involution of uterus, Breast conditions, Thrombophlebitis • Psychological complications, post partum blues, depression, psychosis
V	25	<p>High Risk Newborn</p> <p>□ Concept, goals, assessment, principles.</p> <p>□ Nursing management of</p> <ul style="list-style-type: none"> • Pre-term, small for gestational age, post-mature infant, and baby of diabetic and substance use mothers. • Respiratory conditions, Asphyxia neonatorum, neonatal apnoea meconium aspiration syndrome, pneumo thorax, pneumo mediastinum • Icterus neonatorum. • Birth injuries. • Hypoxic ischaemic encephelopathy • Congenital anomalies. • Neonatal seizures. • Neonatal hypocalcaemia, hypoglycemia, hypomagnesaemia. • Neonatal heart diseases. • Neonatal hemolytic diseases • Neonatal infections, neonatal sepsis, ophthalmia neonatorum, congenital syphilis, HIV/AIDS • Advanced neonatal procedures. • Calculation of fluid requirements. • Hematological conditions – erythroblastosis fetalis, hemorrhagic disorder in the newborn • Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU

VI	15	<p>HIV/AIDS</p> <ul style="list-style-type: none"> □ HIV positive mother and her baby □ Epidemiology □ Screening □ Parent to child transmission(PTCT) □ Prophylaxis for mother and baby □ Standard safety measures □ Counseling □ Breast feeding issues □ National policies and guidelines □ Issues: Legal,ethical, Psychosocial and rehabilitation <p>Role of nurse</p>
VII	25	<p>Gynecological problems and nursing management</p> <ul style="list-style-type: none"> □ Gynecological assessment □ Gynecological procedures □ Etiology, pathophysiology, diagnosis and nursing management of <ul style="list-style-type: none"> • Menstrual irregularities • Diseases of genital tract • Genital tract infections • Uterine displacement • Genital prolapse • Genital injuries • Uterine malformation • Uterine fibroid, ovarian tumors, Breast carcinoma, Pelvic inflammatory diseases, reproductive tract malignancies, hysterectomy – vaginal and abdominal. • Sexual abuse, rape, trauma , assault
VIII	5	<p>Administration and management of obstetrical and gynaecological unit</p> <ul style="list-style-type: none"> □ Design & layout □ Staffing, □ Equipment, supplies, □ Infection control; Standard safety measures □ Quality Assurance:-Obstetric auditing –records/reports, Norms, policies and protocols □ Practice standards for obstetrical and gynaecological unit
IX	5	<p>Education and training in obstetrical and gynaecological care</p> <ul style="list-style-type: none"> □ Staff orientation, training and development, □ In-service education program, □ Clinical teaching programs.

**CLINICAL SPECIALITY - II PSYCHIATRIC
(MENTAL HEALTH) NURSING**

Placement: II Year

Hours of Instruction
Theory 150 hrs
Practical 950 hrs
Total : 1100Hours

Course Description

This course is designed to assist students in developing expertise and in- depth understanding in the field of Psychiatric Nursing. It will help students to develop advanced skills for nursing intervention in various psychiatric conditions. It will enable the student to function as psychiatric nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Psychiatric nursing

Objectives

At the end of the course the students will be able to:

1. Apply the nursing process in the care of patients with mental disorders in hospital and community
2. Demonstrate advanced skills/competence in nursing management of patients with mental disorders
3. Identify and care for special groups like children, adolescents, women, elderly, abused and neglected, people living with HIV/AIDS.
4. Identify and manage psychiatric emergencies.
5. Provide nursing care to critically ill patients with mental disorders
6. Utilize the recent technology and various treatment modalities in the management of patients with mental disorders
7. Demonstrate skills in carrying out crisis intervention.
8. Appreciate the legal and ethical issues pertaining to psychiatric nursing.
9. Identify areas of research in the field of psychiatric nursing.
10. Prepare a design for layout and describe standards for management of Psychiatric units/emergency units/hospitals
11. Teach psychiatric nursing to undergraduate students & in-service nurses.

Course Content

Unit	Hours	Content
I	2	Principles and practice of Psychiatric nursing <input type="checkbox"/> Review
II	10	Crisis Intervention <input type="checkbox"/> Crisis, Definition <input type="checkbox"/> Phases In The Development of A Crisis <input type="checkbox"/> Types of Crisis; Dispositional , Anticipated Life Transitions Traumatic Stress, Maturation/ Development , Reflecting Psychopathology <input type="checkbox"/> Psychiatric Emergencies and their management <input type="checkbox"/> Grief and grief reaction <input type="checkbox"/> Crisis Intervention; Phases <input type="checkbox"/> Post traumatic stress disorder (PTSD) <input type="checkbox"/> Role of the Nurse
III	4	Anger/ Aggression Management <input type="checkbox"/> Anger and Aggression, Types, Predisposing Factors <input type="checkbox"/> Management <input type="checkbox"/> Role of The Nurse
IV	5	The Suicidal Client <input type="checkbox"/> Epidemiological Factors <input type="checkbox"/> Risk Factors <ul style="list-style-type: none"> • Predisposing Factors: Theories of Suicide-Psychological, Sociological ,Biological <input type="checkbox"/> Nursing Management
V	5	Disorders of Infancy, Childhood, and Adolescence <input type="checkbox"/> Mentally Challenged <input type="checkbox"/> Autistic Disorders <input type="checkbox"/> Attention-Deficit/Hyperactivity Disorder <input type="checkbox"/> Conduct Disorders, behavioural disorders <input type="checkbox"/> Oppositional Defiant Disorder <input type="checkbox"/> Tourette's Disorders <input type="checkbox"/> Separation Anxiety Disorder <input type="checkbox"/> Psychopharmacological Intervention and Nursing Management
VI	5	Delirium, Dementia, and Amnestic Disorders <input type="checkbox"/> Delirium <input type="checkbox"/> Dementia <input type="checkbox"/> Amnesia <input type="checkbox"/> Psychopharmacological Intervention and Nursing Management
VII	10	Substance-Related Disorders <input type="checkbox"/> Substance-Use Disorders <input type="checkbox"/> Substance-Induced Disorders <input type="checkbox"/> Classes Of Psychoactive Substances <input type="checkbox"/> Predisposing Factors

Unit	Hours	Content
		<ul style="list-style-type: none"> □ The Dynamics Of Substance-Related Disorders □ The Impaired Nurse □ Codependency □ Treatment Modalities For Substance-Related Disorders and Nursing Management
VIII	10	<p>Schizophrenia and Other Psychotic Disorders (CheckICD10)</p> <ul style="list-style-type: none"> □ Nature of the Disorder □ Predisposing Factors □ Schizophrenia -Types <ul style="list-style-type: none"> ● Disorganized Schizophrenia ● Catatonic Schizophrenia ● Paranoid Schizophrenia ● Undifferentiated Schizophrenia ● Residual Schizophrenia □ Other Psychotic disorders <ul style="list-style-type: none"> ● Schizoaffective Disorder ● Brief Psychotic Disorder ● Schizophreniform Disorder ● Psychotic Disorder Due to a General Medical Condition ● Substance-Induced Psychotic Disorder □ Treatment and Nursing Management
IX	8	<p>Mood Disorders</p> <ul style="list-style-type: none"> □ Historical Perspective □ Epidemiology □ The Grief Response □ Maladaptive Responses To Loss □ Types Of Mood Disorders □ Depressive disorders □ Bipolar disorders □ Treatment and Nursing Management
X	8	<p>Anxiety Disorders</p> <ul style="list-style-type: none"> □ Historical Aspects □ Epidemiological Statistics □ How Much is too Much? □ Types <ul style="list-style-type: none"> ● Panic Disorder ● Generalized Anxiety Disorder ● Phobias ● Obsessive-Compulsive Disorder ● Posttraumatic Stress Disorder ● Anxiety Disorder Due to a General Medical Condition ● Substance-Induced Anxiety Disorder □ Treatment Modalities □ Psychopharmacology & Nursing Management
XI	5	<p>Somatoform And Sleep Disorders</p> <ul style="list-style-type: none"> □ Somatoform Disorders □ Historical Aspects

Unit	Hours	Content
		<ul style="list-style-type: none"> • Epidemiological Statistics • Pain Disorder • Hypochondriasis • Conversion Disorder • Body Dysmorphic Disorder □ Sleep Disorder □ Treatment Modalities and Nursing Management
XII	4	Dissociative Disorders and Management <ul style="list-style-type: none"> □ Historical Aspects □ Epidemiological Statistics □ Application of the Nursing Management □ Treatment Modalities and Nursing Management
XIII	4	Sexual And Gender Identity Disorders <ul style="list-style-type: none"> □ Development Of Human Sexuality □ Sexual Disorders □ Variation In Sexual Orientation □ Nursing Management
XIV	4	Eating Disorders <ul style="list-style-type: none"> □ Epidemiological Factors □ Predisposing Factors : Anorexia Nervosa And Bulimia Nervosa obesity □ Psychopharmacology □ Treatment & Nursing Management
XV	4	Adjustment and Impulse Control Disorders <ul style="list-style-type: none"> □ Historical and Epidemiological Factors <ul style="list-style-type: none"> • Adjustment Disorders • Impulse Control Disorders □ Treatment & Nursing Management
XVI	4	Medical Conditions due to Psychological Factors <ul style="list-style-type: none"> □ Asthma □ Cancer □ Coronary Heart Disease □ Peptic Ulcer □ Essential Hypertension □ Migraine Headache □ Rheumatoid Arthritis □ Ulcerative Colitis □ Treatment & Nursing Management
XVII	8	Personality Disorders <ul style="list-style-type: none"> □ Historical perspectives □ Types Of Personality Disorders <ul style="list-style-type: none"> • Paranoid Personality Disorder • Schizoid Personality Disorder • Antisocial Personality Disorder • Borderline Personality Disorder

Unit	Hours	Content
		<ul style="list-style-type: none"> • Histrionic Personality Disorder • Narcissitic Personality Disorder • Avoidance Personality Disorder • Dependent Personality Disorder • Obsessive-Compulsive Personality Disorder • Passive-Aggressive Personality Disorders □ Identification, diagnostic, symptoms □ Psychopharmacology □ Treatment & Nursing Management
XVIII	8	<p>The Aging Individual</p> <ul style="list-style-type: none"> □ Epidemiological Statistics □ Biological Theories □ Biological Aspects of Aging □ Psychological Aspects of Aging □ Memory Functioning □ Socio-cultural aspects of aging □ Sexual aspects of aging □ Special Concerns of the Elderly Population □ Psychiatric problems among elderly population □ Treatment & Nursing Management
XIX	5	<p>The person living with HIV Disease</p> <ul style="list-style-type: none"> □ Psychological problems of individual HIV/AIDS □ Counseling □ Treatment & Nursing Management
XX	5	<p>Problems Related to Abuse or Neglect</p> <ul style="list-style-type: none"> □ Vulnerable groups, Women, Children, elderly, psychiatric patients, under privileged, challenged □ Predisposing Factors □ Treatment & Nursing management- Counseling
XXI	7	<p>Community Mental Health Nursing</p> <ul style="list-style-type: none"> □ National Mental Health Program- Community mental health program □ The Changing Focus of care □ The Public Health Model □ The Role of the Nurse □ Case Management □ The community as Client <ul style="list-style-type: none"> • Primary Prevention • Populations at Risk • Secondary prevention • Tertiary Prevention □ Community based rehabilitation
XXII	5	<p>Ethical and Legal Issues in Psychiatric/Mental Health Nursing</p> <ul style="list-style-type: none"> □ Ethical Considerations □ Legal Consideration

Unit	Hours	Content
		<ul style="list-style-type: none"> • Nurse Practice Acts • Types of Law • Classification within Statutory and Common Law • Legal Issues in Psychiatric/Mental Health Nursing • Nursing Liability
XXIII	5	Psychosocial rehabilitation <ul style="list-style-type: none"> □ Principles of rehabilitation □ Disability assessment □ Day care centers □ Half way homes □ Reintegration into the community □ Training and support to care givers □ Sheltered workshops □ Correctional homes
XXIV	5	Counseling <ul style="list-style-type: none"> □ Liaison psychiatric nursing □ Terminal illnesses-Counseling □ Post partum psychosis-treatment, care and counseling □ Death dying- Counseling □ Treatment, care and counseling – <ul style="list-style-type: none"> • Unwed mothers • HIV and AIDS
XXV	5	Administration and management of psychiatric units including emergency units <ul style="list-style-type: none"> □ Design & layout □ Staffing, □ Equipment, supplies, □ Norms, policies and protocols □ Quality assurance □ Practice standards for psychiatric nursing □ Documentation
XXVI	5	Education and training in psychiatric care <ul style="list-style-type: none"> □ Staff orientation, training and development, □ In-service education program, □ Clinical teaching programs.

**CLINICAL SPECIALTY –II PEDIATRIC
(CHILD HEALTH) NURSING**

Placement : II Year

Course Description

Hours of Instruction
Theory 150 hours
Practical 950 hours Total :
1100hours

This course is designed to assist students in developing expertise and in- depth understanding in the field of Pediatric Nursing. It will help students to develop advanced skills for nursing intervention in various pediatric medical and surgical conditions. It will enable the student to function as pediatric nurse practitioner/specialist. It will further enable the student to function as educator, manager, and researcher in the field of Paediatric nursing

Objectives

At the end of the course the students will be able to:

1. Apply the nursing process in the care of ill infants to pre adolescents in hospital and community
2. Demonstrate advanced skills/competence in nursing management of children with medical and surgical problems
3. Recognize and manage emergencies in children
4. Provide nursing care to critically ill children
5. Utilize the recent technology and various treatment modalities in the management of high riskchildren
6. Prepare a design for layout and describe standards for management of pediatric units/hospitals
7. Identify areas of research in the field of pediatricnursing

Course Content

Unit	Hours	Content
I	5	<p>Introduction</p> <ul style="list-style-type: none"> □ Current principles, practices and trends in Pediatric Nursing □ Role of pediatric nurse in various settings -Expanded and extended
II	35	<ul style="list-style-type: none"> □ Pathophysiology,assessment(including interpretation of various invasive and non-invasive diagnostic procedures), treatment modalities and nursing intervention in selected pediatric medical disorders <ul style="list-style-type: none"> • Child with respiratory disorders: <ul style="list-style-type: none"> - Upper respiratory tract: choanal atresia, tonsillitis, epistaxis, aspiration. - Lower respiratory tract: Broncheolitis, Bronchopneumonia, Asthma, cystic fibrosis • Child with gastro-intestinal disorders: <ul style="list-style-type: none"> - Diarrheal diseases, gastro-esophageal reflux. - Hepatic disorders: Hepatitis, Indian childhood cirrhosis, liver transplantation. - Malabsorption syndrome, Malnutrition • Child with renal/ urinary tract disorders: Nephrotic syndrome, Nephritis, Hydronephrosis, hemolytic-uremic syndrome, kidney transplantation • Child with cardio-vascular disorders: <ul style="list-style-type: none"> - Acquired: Rheumatic fever, Rheumatic heart disease, - Congenital: Cynotic and acynotic • Child with endocrine/metabolic disorders: Diabetes insipidus, Diabetes Mellitus– IDDM, NIDDM, hyper and hypo thyroidism, phenylketonuria, galactosemia • Child with Neurological disorders: Convulsions, Meningitis, encephalitis, guillian- Barre syndrome • Child with oncological disorders: Leukemias, Lymphomas, Wilms’ tumor, nephroblastomas, neuroblastomas, Rhabdomyosarcoma, retinoblastoma, hepatoblastoma, bone tumors • Child with blood disorders: Anemias, thalassemias, hemophilia, polycythemia, thrombocytopenia, and disseminated intravascular coagulation • Child with skin disorders • Common Eye and ENT disorders • Common Communicable diseases
III	35	<ul style="list-style-type: none"> □ Assessment(including interpretation of various invasive and non-invasive diagnostic procedures), treatment modalities including cosmetic surgery and nursing interventions in selected pediatric surgical problems/ Disorders <ul style="list-style-type: none"> • Gastrointestinal system: Cleft lip, cleft palate and conditions requiring plastic surgery, Tracheo esophageal fistula/atresia, Hirschsprungs’ disease/megacolon, malrotation, intestinal obstruction, duodenal atresia,

		<p>gastrochisis, exomphalus, anorectal malformation, omphalocele, diaphragmatic hernia</p> <ul style="list-style-type: none"> • Anomalies of the nervous system: Spina bifida, Meningocele, Myelomeningocele, hydrocephalus • Anomalies of the genito-urinary system: Hypospadias, Epispadias, Undescended testes, Exstrophy bladder • Anomalies of the skeletal system • Eye and ENT disorders • Nursing management of the child with traumatic injuries: General principles of managing Pediatric trauma <ul style="list-style-type: none"> - Head injury, abdominal injury, poisoning, foreign body obstruction, burns - & Bites • Child with oncological disorders: Solid tumors of childhood, Nephroblastoma, Neuroblastoma, Hodgkin's/Non Hodgkin's Lymphoma, Hepatoblastoma, Rhabdomyosarcoma • Management of stomas, catheters and tubes • Management of wounds and drainages
IV	10	<p>Intensive care for pediatric clients</p> <ul style="list-style-type: none"> □ Resuscitation, stabilization & monitoring of pediatric patients □ Anatomical & physiological basis of critical illness in infancy and childhood □ Care of child requiring long-term ventilation □ Nutritional needs of critically ill child □ Legal and ethical issues in pediatric intensive care □ Intensive care procedures, equipment and techniques □ Documentation
V	20	<p>High Risk Newborn</p> <ul style="list-style-type: none"> □ Concept, goals, assessment, principles. □ Nursing management of <ul style="list-style-type: none"> • Post-mature infant, and baby of diabetic and substance use mothers. • Respiratory conditions, Asphyxia neonatorum, neonatal apnoea meconium aspiration syndrome, pneumothorax, pneumomediastinum • Icterus neonatorum. • Birth injuries. • Hypoxic ischaemic encephelopathy • Congenital anomalies. • Neonatal seizures. • Neonatal hypocalcaemia, hypoglycemia, hypomagnesaemia. • Neonatal heart diseases. • Neonatal hemolytic diseases • Neonatal infections, neonatal sepsis, ophthalmia neonatorum, congenital syphilis, HIV/AIDS • Advanced neonatal procedures. • Calculation of fluid requirements.

		<ul style="list-style-type: none"> • Hematological conditions – erythroblastosis fetalis, hemorrhagic disorder in the newborn • Organization of neonatal care, services(Levels), transport, neonatal intensive care unit, organization and management of nursing services in NICU
VI	10	Developmental disturbances and implications for nursing <ul style="list-style-type: none"> □ Adjustment reaction to school, □ Learning disabilities □ Habit disorders, speech disorders, □ Conduct disorders, □ Early infantile autism, Attention deficit hyperactive disorders (ADHD), depression and childhood schizophrenia.
VII	10	Challenged child and implications for nursing <ul style="list-style-type: none"> □ Physically challenged, causes, features, early detection & management □ Cerebral palsied child, □ Mentally challenged child. □ Training & rehabilitation of challenged children
VIII	5	Crisis and nursing intervention <ul style="list-style-type: none"> □ The hospitalized child, □ Terminal illness & death during childhood □ Nursing intervention-counseling
IX	5	Drugs used in Pediatrics <ul style="list-style-type: none"> □ Criteria for dose calculation □ Administration of drugs, oxygen and blood □ Drug interactions □ Adverse effects and their management
X	10	Administration and management of pediatric care unit <ul style="list-style-type: none"> □ Design & layout □ Staffing, □ Equipment, supplies, □ Norms, policies and protocols □ Practice standards for pediatric care unit □ Documentation
XI	5	Education and training in Pediatric care <ul style="list-style-type: none"> □ Staff orientation, training and development, □ In-service education program, □ Clinical teaching programs.

CLINICAL SPECIALITY – II COMMUNITY

HEALTH NURSING

Placement : II Year

Hours of Instruction
Theory- 150 hours
Practicals- 950 hours
Total- 1100 hrs

Course Description

This course is designed to assist students in developing expertise and in- depth understanding in the field of community health nursing. It will help students to develop advanced skills for nursing intervention in various aspects of community health care settings. It will enable the student to function as community health Nurse practitioner/specialist. It will further enable the student to function as educator, manager and researcher in the field of community health nursing.

Objectives

At the end of the course the students will be able to:

1. Appreciate trends and issues related to community health Nursing- reproductive and child health, school health, Occupational health, international health, rehabilitation, geriatric and mental health.
2. Apply epidemiological concepts and principles in community health nursing practice
3. Perform community health assessment and plan health programmes
4. Describe the various components of Reproductive and child health programme.
5. Demonstrate leadership abilities in organizing community health nursing services by using inter-sectoral approach.
6. Describe the role and responsibilities of community health nurse in various national health and family welfare programmes
7. Participate in the implementation of various national health and family welfare programme
8. Demonstrate competencies in providing family centered nursing care independently
9. Participate/Conduct research for new insights and innovative solutions to health problems
10. Teach and supervise nurses and allied health workers.
11. Design a layout of sub center/Primary health center/Community health centre and develop standards for community health nursing practice.

Content Outlines

Unit	Hours	Content
I	20	<p>Epidemiology</p> <ul style="list-style-type: none"> □ Introduction <ul style="list-style-type: none"> • Concept, scope, definition, trends, History and development of modern Epidemiology • Contribution of epidemiology • Implications □ Epidemiological methods □ Measurement of health and disease: □ Health policies □ Epidemiological approaches <ul style="list-style-type: none"> • Study of disease causatives • Health promotion • Levels of prevention □ Epidemiology of <ul style="list-style-type: none"> • Communicable diseases • Non-communicable diseases □ Emerging and re-emerging diseases Epidemics □ National Integrated disease Surveillance Programme □ Health information system □ Epidemiology study and reports □ Role of Community health nurse
Unit II	40	<p>National Health and Family Welfare Programmes</p> <ul style="list-style-type: none"> □ Objectives, Organisation/manpower/resources, Activities, Goals, inter-sectoral approach, implementation, item/purpose, role and responsibilities of community health nurse: <ul style="list-style-type: none"> • National Vector Borne Disease Control Programm (NVBDCP) • National Filaria Control Programme • National Leprosy Eradication Programme • Revised national TB Control Programme • National Programme for Control of Blindness • National Iodine Deficiency disorders Control Programme • National Mental Health Programme • National AIDS Control Programme • National Cancer Control Programme • RCH I and II • Non- communicable disease programmes • NRHM <ul style="list-style-type: none"> - Health Schemes: <ul style="list-style-type: none"> * ESI * CGHS * Health Insurance

Unit	Hours	Content
III	15	<p>School Health</p> <ul style="list-style-type: none"> □ Introduction: definition, concepts, objectives,. □ Health assessment, Screening, identification, referral and follow up, □ Safe environment □ Services, programmes and plans- first aid, treatment of minor ailments □ Inter-sectoral coordination □ Adolescent health □ Disaster, disaster preparedness, and management □ Guidance and counseling □ School health records - maintenance and its importance □ Roles and responsibilities of community health nurse
IV	15	<p>International health</p> <ul style="list-style-type: none"> □ Global burden of disease □ Global health rules to halt disease spread □ Global health priorities and programmes □ International quarantine □ Health tourism □ International cooperation and assistance □ International travel and trade □ Health and food legislation, laws, adulteration of food □ Disaster management □ Migration □ International health agencies –World Health organizations, World health assembly, UNICEF, UNFPA, SIDA, US AID, DANIDA, DFID. AusAID etc □ International health issues and problems □ International nursing practice standards □ International health vis-a vis national health □ International health days and their significance
V	15	<p>Education and administration</p> <ul style="list-style-type: none"> □ Quality assurance □ Standards, Protocols, Policies, Procedures □ Infection control; Standard safety measures □ Nursing audit □ Design of Sub-Centre/Primary Health Centre/Community health center □ Staffing; Supervision and monitoring-Performance appraisal □ Budgeting □ Material management □ Role and responsibilities of different categories of personnel in community health □ Referral chain- community outreach services □ Transportation □ Public relations □ Planning in-service educational programme and teaching

Unit	Hours	Content
		<ul style="list-style-type: none"> □ Training of various categories of health workers- preparation of manuals
VI	10	<p>Geriatric</p> <ul style="list-style-type: none"> □ Concept, trends, problems and issues □ Aging process, and changes □ Theories of ageing □ Health problems and needs □ Psycho-physiological stressors and disorders □ Myths and facts of aging □ Health assessment □ Home for aged-various agencies □ Rehabilitation of elderly □ Care of elderly □ Elderly abuse □ Training and supervision of care givers □ Government welfare measures Programmes for elderly- Role of NGOs □ Roles and responsibilities of Geriatric nurse in the community
VII	10	<p>Rehabilitation</p> <ul style="list-style-type: none"> □ Introduction: Concepts, principles, trends, issues, □ Rehabilitation team □ Models, Methods □ Community based rehabilitation □ Ethical issues □ Rehabilitation Council of India □ Disability and rehabilitation- Use of various prosthetic devices □ Psychosocial rehabilitation □ Rehabilitation of chronic diseases □ Restorative rehabilitation □ Vocational rehabilitation □ Role of voluntary organizations □ Guidance and counseling □ Welfare measures □ Role and responsibilities of community health nurse
Unit VIII	10	<p>Community mental health</p> <ul style="list-style-type: none"> □ Magnitude, trends and issues □ National Mental Health Program- Community mental health program □ The Changing Focus of care □ The Public Health Model □ Case Management- Collaborative care □ Crisis intervention □ Welfare agencies □ Population at Risk □ The community as Client <ul style="list-style-type: none"> ● Primary Prevention

Unit	Hours	Content
		<ul style="list-style-type: none"> • Secondary prevention • Tertiary Prevention □ Community based rehabilitation □ Human rights of mentally ill □ Substance use □ Mentally challenged groups □ Role of community health nurse
IX	15	<p>Occupational health</p> <ul style="list-style-type: none"> □ Introduction: Trends, issues, Definition, Aims, Objectives, Workplace safety □ Ergonomics and Ergonomic solutions □ Occupational environment- Physical, social, Decision making, Critical thinking □ Occupational hazards for different categories of people- physical, chemical, biological, mechanical, , Accidents, □ Occupational diseases and disorders □ Measures for Health promotion of workers; Prevention and control of occupational diseases, disability limitations and rehabilitation □ Women and occupational health □ Occupational education and counseling □ Violence at workplace □ Child labour □ Disaster preparedness and management □ Legal issues: Legislation, Labour unions, ILO and WHO recommendations, Factories act, ESI act □ Role of Community health nurse, Occupational health team



**Revised Rules
Structure and contents of
Detailed Syllabus**

For

**Bachelor of Architecture (B. Arch) 2015 CBCS COURSE
(Amended in 2018)**

To be implemented from 2018-19

Bharati Vidyapeeth (Deemed to be University)
College of Architecture, Pune



Bharati Vidyapeeth
(Deemed to be University)
Pune, India.

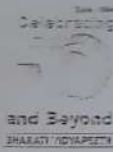
Founder Chancellor: Dr. Patangrao Kadam

Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Chancellor

Prof. Dr. M. M. Salunkhe
M.Sc., Ph.D., F.R.S.C.
Vice Chancellor

★ Accredited with 'A' Grade (2017) by NAAC ★
★ Category-I University Status by UGC ★
★ NIRF Ranking - 56 ★

"Social Transformation Through Dynamic Education"



Dr. Vishwajeet Kadam
B.Tech., M.B.A., Ph.D.
Pro Vice Chancellor

G. Jayakumar
M.Com., Dip. Pub. Adm.
Registrar

NOTIFICATION NO. 925

It is hereby notified for the information of all concerned that the University authorities have decided to approve the revised syllabus of M.Arch. programme and B.Arch. programme by adopting the Council of Architecture's amendments in the existing B.Arch. 2015 CBCS syllabus (Sem VII-X) to be implemented from the academic year 2018-19.

All the concerned are requested to make a note of this.

Ref. No. BVDU/2018-19/ 906
Date : July 20, 2018

G. Jayakumar
Registrar

To,

1. The Dean, Faculty of Engineering & Technology, College of Engineering, Pune 43.
2. The Principal, College of Architecture, Pune 43.
3. The Controller of Examinations, BVDU.

Notification 2018-19

- Exam-Section cot
- Lib-note
- Academic-coor
- PG-VG
- office file

[Signature]

Bharati Vidyapeeth (Deemed to be University) College of Architecture, Pune-43.	
Inward No.:	153
Date:	21/7/18
Sign:	


Changes in the contents of syllabus as per MOM of BOS meeting conducted on 24/12/2018

A meeting of Board of Studies in architecture was conducted on 24th December 2018 to discuss the feed by faculty members for implemented course of B.Arch CBCS 2015 and M.Arch CBCS 2018. Both the courses are approved through university notification 925 and in academic council meeting conducted on 4th December 2018. It is decided by the BOS in the meeting that the feedback should be carefully considered for next revision of syllabus in the syllabus formation meetings after detailed discussion. The specific suggestions for immediate action are follows for **B.Arch (CBCS 2015 course).**

1. **Working Drawing I (B.Arch CBCS 2015 amended in 2018)**- 'Municipal Drawing' needs to be included over and above the contents of the syllabus .
2. **Elective V-Sustainable architecture (B.Arch CBCS 2015 amended in 2018)**, the contents are revised as follows:

Aim: To understand the principles and practices of sustainable architecture.

- Concept of sustainable development and its relation to built environment
- Understanding relationship between climate and human comfort
- Understanding sustainable building design principles and practices

 11/11/2019

Prof. Archana Gaikwad

Chairperson BOS in Architecture

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Rules of Structure for First To Fifth Year B. Arch

Rule No.1: Eligibility for Admission

Eligibility Criteria: Students seeking admission to First year of Bachelors Degree Course in Architecture must fulfill the eligibility criteria laid down by Council of Architecture and the University as applicable from time to time.

Rule No.2: Duration and stages of the course (as per Council of Architecture)

- The architecture course shall be of minimum duration of 5 academic years/ 10 semesters of approximately 18 working weeks each inclusive of 90 days of practical training in IX semester in a professional's office.
- The 5 years Bachelors Degree Course in Architecture shall be conducted in two stages.
- The First stage of the course shall be the first 3 academic years or 6 semesters of institutional academic studies. The First stage shall be completed within the stipulated time as prescribed by the Council of Architecture.
- The Second stage of the course shall be of 2 academic years/ 4 semesters including 90 days (15-18 weeks) of practical training.
- A candidate will be eligible to register as an architect under the Architects Act, 1972 only after successful completion of both the stages.

Rule No.3: Scheme of Assessment

A candidate to be eligible for the degree of Bachelor of Architecture will be required to appear for and pass all examinations as under:

Stage I

- Semester I Examination in Architecture (First Year Sem I)
- Semester II Examination in Architecture (First Year Sem II)
- Semester III Examination in Architecture (Second Year Sem III)
- Semester IV Examination in Architecture (Second Year Sem IV)
- Semester V Examination in Architecture (Third Year Sem V)
- Semester VI Examination in Architecture (Third Year Sem VI)

Stage II

- Semester VII Examination in Architecture (Fourth Year Sem VII)
- Semester VIII Examination in Architecture (Fourth Year Sem VIII)
- Semester IX Examination in Architecture (Final Year Sem IX)
- Semester X Examination in Architecture (Final Year Sem X)

-

Rule No. 4: Granting of Academic Term

Each semester shall comprise of Eighteen weeks (Minimum 90 working days).

The candidate will be permitted to appear for semester examination only if he/she has,

- 75% attendance in each course that constitute a head of passing, prescribed by the university.
- Satisfactory completion of the 100% term work prescribed for each course.
- Satisfactory conduct as a bonafide student

The Principal/ Director of the institution shall have the right to withhold the student from appearing for examination of a specific course if the above requirements are not fulfilled.

Rule No. 5: Progression Requisite

As general rule a student shall be allowed to keep the next year of study of the course if he/she has a backlog of not more than “**Six heads of passing**” in the preceding year.

Furthermore,

- A student shall be allowed to get admitted to Second Year B. Arch. course if he/she has a backlog of not more than **six heads** of passing at First year B. Arch (semester I and II considered together).
- A student shall be allowed to get admitted to Third Year B. Arch course, if he/she has cleared all the subjects of passing at First year B.Arch and if he/she has a backlog of not more than **six heads** of passing at Second Year B.Arch (semester III and IV considered together).
- A student shall be allowed to get admitted to Fourth Year B.Arch course if he/she has cleared all the subjects of passing at Second Year B.Arch (Semester III and IV considered together.) and if he/she has a backlog of not more than **six heads** of passing at Third Year B.Arch (semester V and VI considered together)
- A student shall be allowed to get admitted to Final Year B.Arch course if he/she has cleared all the subjects of passing at Third Year B. Arch (Semester V and VI considered together), and if he/she has a backlog of not more than **six heads** of passing at fourth Year B.Arch (semester VII and VIII considered together)

Rule No 6: Examinations

6.1. Conduct of Examinations

The university examinations for all the 10 semesters shall be conducted at the end of each semester by the University.

6.2. Pattern of Examination: The evaluation scheme for B.Arch comprises of;

University Examination (UE)

Internal Assessment (IA)

6.2.1: *University Examination*

UE will be conducted by the University and will be based on the entire syllabus. Assessment would be undertaken by internal examiner and external examiner jointly in equal weightage. Oral will be based on sessional work produced by the student covering entire syllabus.

The nature of assessment will vary depending upon the subject and its delivery and whether it is studio-based or theory based. Refer to detailed syllabus on the format of UE for individual subjects.

6.2.2: *Internal Assessment*

IA will be conducted by the Institution imparting B.Arch course. IA will be done by the teacher teaching the course through a continuous assessment system that is spread through the duration of course. The attendance will have weightage of 10 marks and 25 marks for IA of 40 marks and 100 marks respectively. For remaining at least **two** and a maximum **four** of the below components can be used for continuous assessment.

Individual faculty member shall have the flexibility to design the continuous assessment in a manner so as to evaluate students' capabilities across knowledge, skills and attitudes. IA may be undertaken through any or combination of the methods stated below:

- Seminar presentation
- Written Test /Open Book
- Reviews
- Essays
- Short answer questions
- Study of best practices /precedent study/field study
- Multiple choice questions/Quiz
- Projects/group projects/Dissertation
- Reflective Practical assignments
- Drawing Portfolios
- Report writings
- Learning logs/diaries

The faculty shall announce in advance the units based on which continuous assessment shall be conducted. This progressive assessment for the IA must be communicated by the Institute to the university as per the schedule declared by the university. Detailed records of continuous

assessment shall be maintained by the Institute. The student does not have facility of grade improvement, if he/she passes at IA in a course.

6.3: Assessment of Term work

- In respect of term work “due date” shall be fixed for the completion of each assignment and the same shall be collected on the due date.
- At the end of the semester term work shall be assessed jointly by the internal and external examiners from amongst the panel approved by the University.
- Performance of a candidate in viva-voce shall be assessed on basis of the depth of understanding of the principles involved.
- Students may use computers for preparing term work where nature of work is unique to an individual and stress is on content rather than skill. For common form of work, drawing and reports/notes shall be manually prepared.
- An examiner for any of the subjects of examinations shall have a minimum of 3 years teaching/ professional experience in his/her field of study.

Rule No. 7: Credits

- The credits are defined in terms of the student-time spent in hours which are divided into two parts such as face to face instruction and Notional (lectures and studio).
- The total credits to be earned by the student to achieve B.Arch degree will be 300credits.

Semester	I	II	III	IV	V	VI	VII	VIII	IX	X
Credits	30	30	30	30	30	30	30	30	30	30

- Where, one credit is equal to 1hour of Lectures and 1 hour of Studio.
- Note: If a student secure D grade in either or both IA and UE for a particular course credits earned by the student for that courses shall be zero

Rule No.8: Criteria for Passing

To pass in every semester examination and earn the assigned credits, a candidate must obtain minimum 40% marks in each head of passing.

- a) For all courses, Both UE and IA constitute separate heads of passing. In order to pass in such courses and earn the assigned credits

The student must obtain minimum grade point of 5.0(40% marks) at UE and also minimum grade point of 5.0 (40%) marks at IA.

Or

If he/she fails in IA, the student passes in the course provided he/she obtains a minimum of 25% in IA and grade point average(GPA) for course is at least 6.0(50%in aggregate).the GPA for a course will be calculated only if student passes at UE.

- b) A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog and clear heads of passing.
- c) Students with backlog in IA will have to present themselves and their work for progressive marking throughout the semester for which they intend to appear.

Rule No.9: Grading system

9.1: Conversion of Marks to Grade points and Grades.

The marks shall be converted to grade points and grades as given in table below.

Range of marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} < 80$	9	A+
$60 \leq \text{Marks} < 70$	8	A
$55 \leq \text{Marks} < 60$	7	B+
$50 \leq \text{Marks} < 55$	6	B
$40 \leq \text{Marks} < 50$	5	C
Marks < 40	0	D

9.2: Performance

The performance of a student will be evaluated in terms of two indices, viz

- a) Semester Grade Point average (SGPA) which is grade point average for all the semester
- b) Cumulative Grade point average (CGPA) which is the grade point average for all the completed semesters at any point.

9.3: Semester Grade point average (SGPA)

SGPA measures the cumulative performance of a learner in all courses in a particular semester. SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$$

Where C_k is the credit-value assigned to a course and GP_k is a GPA obtained by the learner in the course.

The SGPA shall be calculated up to two decimal place accuracy.

9.4: Cumulative Grade point average (CGPA)

CGPA measures the cumulative performance of a learner in all courses since his/her enrolment. CGPA is calculated by the formula

$$CGPA = \frac{\sum C_k \times GP_K}{\sum C_k}$$

Where C_k is the credit-value assigned to a course and GP_K is a GPA obtained by the learner in the course.

The CGPA shall be calculated up to two decimal place accuracy.

The CGPA calculated after the minimum credits specified for the programme are earned will be the final result.

9.5: Award of Honours

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are as given in table below

Range of CGPA	Final Grade	Letter Grade
$9.50 \leq CGPA \leq 10.00$	O	Outstanding
$9.00 \leq CGPA \leq 9.49$	A+	Excellent
$8.00 \leq CGPA \leq 8.99$	A	Very Good
$7.00 \leq CGPA \leq 7.99$	B+	Good
$6.00 \leq CGPA \leq 6.99$	B	Average
$5.00 \leq CGPA \leq 5.99$	C	Satisfactory
CGPA Below 5.00	F	Fail

Rule No.10: Introduction of this Curriculum

The new curriculum for the degree course in architecture B.Arch will be introduced from Academic Session 2015 -2016

- First year B.Arch Course from June 2015
- Second year B.Arch Course from June 2016
- Third year B.Arch Course from June 2017
- Fourth year B.Arch Course from June 2018
- Final year B.Arch Course From June 2019

Rule No 11: Completion

Completion of only Stage-I, shall not qualify the candidates for registration as an architect. Degree of Bachelors in architecture shall be awarded only after successful completion of stage II.

Registration as an architect by council of architecture will only be given as per the prevailing rule of Council of Architecture, India.

Degree Requirements

Earned credits: A candidate who has successfully completed all the Core courses and elective courses, not less than minimum number of credits prescribed shall be eligible to receive the degree.

Rule No.12: Subject Code

Code used for serial numbers of the subjects in the structure for B.Arch course shall be as follows (from left, five digit/alphabet code)

- First alphabet for faculty of engineering-K
- Second digit for Board of Studies of architecture
- Third digit representing the year of the course in architecture
- Fourth and Fifth digits representing number of that subject in the course structure of that particular year

Structure and Contents
For
B.Arch 2015 CBCS course (Amended in 2018)

Bharati Vidyapeeth (Deemed to be University)
College of Architecture, Pune

Structure & Examination Pattern of First Year B.Arch

Semester-I								Total Duration-30hrs /week Total Credits-30			
Subject code	Subject	Teaching Scheme (in hours/week)			Examination Scheme (marks)			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
						Paper	Oral				
K8101	Architectural Design-I	2	4	6	40	-	60	100	2	4	6
K8102	Building construction and Material-I	2	4	6	40	-	60	100	2	4	6
K8103	Theory of structures-I	3	-	3	40		60	100	3	-	3
K8104	Creativity and Communication-I	2	2	4	40	-	60	100	2	2	4
K8104	Architecture drawings and graphics-I	2	4	6	40	60	-	100	2	4	6
K8106	Workshop - Model making	1	4	5	100	-	-	100	1	4	5
	Total	12	18	30	300	60	240	600	12	18	30

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Semester-II								Total Duration-30hrs/week Total Credits-30			
Subject code	Subject	Teaching Scheme (in hours/week)			Examination Scheme (marks)			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
						Paper	Oral				
K8107	Architectural Design-II	2	4	6	40	-	60	100	2	4	6
K8108	Building construction and Material-II	2	3	5	40	-	60	100	2	3	5
K8109	Theory of structures-II	2	-	2	40	-	60	100	2	-	2
K8110	Creativity and Communication-II	1	3	4	40	-	60	100	1	3	4
K8111	Architecture drawings and graphics-II	1	4	5	40	60	-	100	1	4	5
K8112	History of Architecture -I	3	-	3	40	60	-	100	3	-	3
K8113	Climatology and Climate Responsive Architecture	1	2	3	40	-	60	100	1	2	3
K8114	Workshop - Model making and Building Appraisal	-	2	2	100	-	-	100	-	2	2
	Total	12	18	30	380	120	300	800	12	18	30

Structure & Examination Pattern of Second Year B.Arch

Semester-III								Total Duration-30hrs/week Total Credits-30			
Subject code	Subject	Teaching Scheme No.of hours			Examination Scheme No. of Marks				Credits		
		L	S	Total	I.A	U.E		Total	L	S	Total
Paper	Oral										
K8201	Architectural Design -III	1	5	6	40	-	60	100	1	5	6
K8202	Building construction and Material-III	1	5	6	40	-	60	100	1	5	6
K8203	Theory of structures-III	2	-	2	40	-	60	100	2	-	2
K8204	Creativity and Communication-III	1	2	3	40	-	60	100	1	2	3
K8205	Architecture drawings and graphics-III	1	4	5	40	-	60	100	1	4	5
K8206	History of Architecture-II	3	-	3	40	60	-	100	3	-	3
K8207	Building Services -I	2	1	3	40	60	-	100	2	1	3
K8208	Elective-I	1	1	2	100	-	-	100	1	1	2
	Total	14	16	30	380	120	300	800	14	16	30

Elective I :Traditional Building Science/Vernacular architecture and Settlements/Environmental studies/Photography, etc.

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Semester-IV								Total Duration-30 hrs/week Total Credits-30			
Subject code	Subject	Teaching Scheme			Examination Scheme				Credits		
		L	S	Total	I.A	U.E		Total	L	S	Total
Paper	Oral										
K8209	Architectural Design-IV	1	5	6	40	-	60	100	1	5	6
K8210	Building construction and Material-IV	1	5	6	40	-	60	100	1	5	6
K8211	Theory of structures-IV	2	-	2	40	-	60	100	2	-	2
K8212	Computer aided Design and Drawings	1	3	4	40	-	60	100	1	3	4
K8213	History of Architecture-III	3	-	3	40	60	-	100	3	-	3
K8214	Surveying and leveling	1	3	4	40	-	60	100	1	3	4
K8215	Building services-II	2	1	3	40	60	-	100	2	1	3
K8216	Elective-II	1	1	2	100	-	-	100	1	1	2
	Total	14	16	30	380	120	300	800	14	16	30

Elective II:Seminar –I/Passive Design Principles/Animations/Communication Skills; etc.

Structure & Examination Pattern of Third Year B.Arch

Semester-V					Total Duration-30hrs/week Total Credits-30						
Subject code	Subject	Teaching Scheme			Examination Scheme				Credits		
		L	S	Total	I.A	U.E		Total	L	S	Total
		Paper	Oral								
K8301	Architectural Design-V	1	7	8	40	-	60	100	1	7	8
K8302	Building construction and Material-V	1	5	6	40	-	60	100	1	5	6
K8303	Theory of structures-V	2	-	2	40	-	60	100	2	-	2
K8304	Working drawing-I	1	4	5	40	-	60	100	1	4	5
K8305	History of Architecture-IV	3	-	3	40	-	60	100	3	-	3
K8306	Specification writing	2	-	2	40	60	-	100	2	-	2
K8307	Building services-III	2	-	2	40	60	-	100	2	-	2
K8308	Elective-III	1	1	2	100	-	-	100	1	1	2
Total		13	17	30	380	120	300	800	13	17	30

Elective III: Architecture Journalism/Appropriate Technology/Barrier-free Architecture/Seminar-II, etc.

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Semester-VI					Total Duration-30hrs/week Total Credits-30						
Subject code	Subject	Teaching Scheme			Examination Scheme				Credits		
		L	S	Total	I.A	U.E		Total	L	S	Total
		Paper	Oral								
K8309	Architectural Design-VI	1	7	8	40	-	60	100	1	7	8
K8310	Building construction and Material-VI	1	5	6	40	-	60	100	1	5	6
K8311	Theory of structures-VI	2	-	2	40	-	60	100	2	-	2
K8312	Working drawing-II	1	3	4	40	-	60	100	1	3	4
K8313	Landscape Architecture	1	2	3	40	-	60	100	1	2	3
K8314	Estimation and Costing	2	1	3	40	60	-	100	2	1	3
K8315	Building services-IV	2	-	2	40	60	-	100	2	-	2
K8316	Elective-IV	1	1	2	100	-	-	100	1	1	2
Total		13	17	30	380	120	300	800	13	17	30

Elective IV: Green Materials/Theatre and set design/Visual Communication/Advanced Building Material, etc

Structure & Examination Pattern of Fourth Year B.Arch

Semester-VII								Total Duration- 30hrs/week Total Credits-30			
Subject code	Subject	Teaching Scheme			Examination Scheme			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
						Pap er	Oral				
K8401	Architectural Design-VII	1	9	10	40	-	60	100	1	9	10
K8402	Building construction and Material-VII	1	3	4	40	60	-	100	1	3	4
K8403	Theory of structures-VII	2	-	2	40	-	60	100	2	-	2
K8404	Interior Design I	1	3	4	40	-	60	100	1	3	4
K8405	Advance Landscape Architecture	1	2	3	40	-	60	100	1	2	3
K8406	Urban planning I	1	2	3	40	60	-	100	1	2	3
K8407	Building services-V	2	-	2	40	-	60	100	2	-	2
K8408	Elective-V	1	1	2	100	-	-	100	1	1	2
	Total	10	20	30	380	-	420	800	10	20	30

Elective V :Sustainable Architecture/Industrial architecture/Disaster management/Housings, etc

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Semester-VIII								Total Duration- 30hrs/week Total Credits-30			
Subject code	Subject	Teaching Scheme			Examination Scheme			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
						Pap er	Oral				
K8409	Architectural Design-VIII	1	9	10	40	-	60	100	1	9	10
K8410	Building construction and Material-VIII	1	3	4	40	60	-	100	1	3	4
K8411	Vocabulary and Repertoire	1	2	3	40	-	60	100	1	2	3
K8412	Interior Design -II	1	3	4	40	-	60	100	1	3	4
K8413	Urban planning- II	1	2	3	40	60	-	100	1	2	3
K8414	Research Skills	1	3	4	40	-	60	100	1	3	4
K8415	Elective-VI	1	1	2	100	-	-	100	1	1	2
	Total	10	20	30	340	-	360	700	07	23	30

Elective VI : Conservation /Digital Architecture /Architectural software/ Real Estate Management , etc

Structure & Examination Pattern of Fifth Year B.Arch

Semester-IX: Practical Training								Total Credits-30				
Subject code	Subject	Teaching Scheme			Examination Scheme **			Credits				
		L	S	Total	I.A	U.E		Total	L	S	Total	
K8501	Practical Training				40		Paper		Oral	100		
								60				
		-	-	-					-	-	30	

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Note 1: For practical training, a student is expected to work for standard office timings i.e. @ 8 hours a day and minimum five days per week. Student has to undergo minimum 15 -18 weeks (90 work days) of training per semester. The credit requirement for practical training as per circular No.265, pt.II.8 is 24. Since a student will spend the entire semester learning at an office as an intern he/she will be given the 30 credits which are consistent with the 30 credits that are allotted to all other semesters.

Note 2: The work from practical training will be assessed after the student completes the internship in this semester.

Note 3: Validity of training shall be only for a year after completion of training.

Semester-X								Total Duration-30hrs/week				Total Credits-30			
Subject code	Subject	Teaching Scheme			Examination Scheme				Credits						
		L	S	Total	I.A	U.E		Total	L	S	Total				
K8502	Architecture Design Project	2	14	16	40		Paper		Oral	100	2	14	16		
								60							
K8503	Capstone project	1	5	6	40	-	60		100	1	5	6			
K8504	Professional Practice	2	2	4	40	60	-		100	2	2	4			
K8505	Self Study	1	3	4	100	-	-		100	1	3	4			
	Total	06	24	30	220	60	120	400	06	24	30				

Semester – I

Architectural Design -I

Subject Code	K8101	Semester -I
Credits	6	Subject type-Core

Learning Objectives	
1	To acquire knowledge about elements of design and principles of design.
2	To explore and understand fundamentals of design central to architecture and space design.
3	To understand design as a composite process of elements, principles and fundamentals of design.

A. Learning Outcomes: Student will be able to	
1	explore elements of design, principles of design and fundamentals of design
2	assimilate the above three to understand comprehensive design process
3	learn and analyze built and/or non-built spaces with respect to above elements

Units	Contents
Unit I	Elements, Principles and Fundamentals of Design Introduction to <ul style="list-style-type: none"> - different Elements of design, - Principles of design and - Fundamentals of Design
Unit II	Design Process: Function <ul style="list-style-type: none"> - Introduction to ‘human dimensions’ (anthropometry, modes of measurement) - Introduction to function and circulation of various building types - Demonstration the relationship of the above two with elements and principals of design (form, organization, movement, openings, linkages, etc)
Unit III	Design Process: Structure <ul style="list-style-type: none"> - Introduction to different structural systems - Introduction to components of structure - Introduction to structural behavior of different materials
Unit IV	Design Process : Context <ul style="list-style-type: none"> - Introduction to buildings and climate - Introduction to building and site - Introduction to building and orientation - Analyze and demonstrate relationship of context with elements and principles of design

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. ChingF. D. K. (2007), <i>Architecture: form, space, and order</i>, New Jersey, Canada, John Wiley and sons. 2. Pramara V. S.(1997),<i>Design Fundamentals in Architecture</i>,New York, U.S.A., Somaiya Publications
Reference Books:	<ol style="list-style-type: none"> 1. Editors of Phaidon Press (2004), <i>ThePhaidon Atlas of Contemporary World Architecture</i>, Phaidon Press; Comprehensive Edition. 2. Pandya Y., VastuShilpa Foundation, (2013),<i>Elements of space making</i>, India, New Jersey, Mapin Publishing. 3. Salvadori M., & Robert H., (1975),<i>Structure in architecture: the building of</i>

	<i>buildings</i> , Cornell University, Prentice-Hall. 4. Gropius W., (1962), <i>Scope of Total Architecture</i> , New York, Collier book
Websites:	Drawing Guidelines – Shaping Space http://www.riai.ie/downloads/education/pdf/ss_guidelines/drawing_guidelines.pdf
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignment (Any 3)	
1	Analysis and study of design principles and elements using different kinds of examples of built and/or non-built spaces with help of sketches, photographs, drawings etc.
2	Study of structural systems, components of structures in built spaces.
3	Analysis of relationship between building and climate, building and site and orientation with the help of built and/or non-built environment with the help of sketches, photographs, drawings, etc.
4	Photo documentation and study of use of materials for various design components and design considerations.

Building Construction and Materials-I

Subject Code	K8102	Semester-I
Credits	6	Subject type-Core

Learning Objectives	
1	To understand the properties, characteristics, strength, processing and application of materials
2	To understand the different components of masonry construction

Learning outcomes: Student will be able to	
1	Explore materials, properties characteristics, methods of preservation, treatment and methods of construction and uses of different materials
2	Describe in detail the method of construction of superstructure with various masonry
3	Discuss different material used for fencing as well as for gates.
Units	Contents
Unit I	Introduction <ul style="list-style-type: none"> - Building construction as subject and its relevance to architectural design. - Introduction to various components of building from foundation to roof. - Basic structural systems load bearing and framed structure
Unit II	Study of Materials Properties, various types, market form available, standard sizes, cost, application in buildings resource use, defects and strengths of each material <ul style="list-style-type: none"> - Bricks and stones - Cement, Sand , aggregates - Mortar, Plaster, Pointing - Lime
Unit III	Superstructure Masonry <ul style="list-style-type: none"> - Fundamentals, principal of load bearing construction for medium rise structures using Brick, stone, Concrete Blocks, solid Blocks, Hollow Blocks, Cavity Block etc. - Introduction to various types and junctions of brick bond and types of stone masonry
Unit IV	Fencing And Entrance Gate <ul style="list-style-type: none"> - Fencing and compound wall construction in different materials like Barbed wire, Chain link, Wire mesh, R.C.C. Grills, M.S. Grills etc. - Constructional details of an entrance gate in a compound wall of following types: Sliding Gate, Entrance gate side hung with floor channel, Entrance gate side hung with wicket gate

Learning Resources	
Text Books:	1. Rangwala S. C.(2007) <i>Engineering Materials</i> . Gujarat, Charotar, Publishing House. 2. Duggal S.K.(2009) <i>Building materials</i> . New Delhi, New Age International.
Reference Books:	1. Varghese P.C.(2005) <i>Building Materials</i> . New Delhi, Prentice Hall of India put Ltd. 2. Duggal S.K.(1997) <i>Building materials</i> . New Delhi, Oxford and IBH

	publishing Co, put, Ltd 3. Spencke R. F.and Cook D.J.(1983) <i>Building Materials in Developing Countries</i> . New York,John Wiley and sons
Websites:	www.shannonmasonryconstruction.com
Journals:	Construction and building materials -journal- else vier (www.journals.elsevier.com/construction-and-building-materials/) Journal of building construction and planning research (www.scirp.org/journal/jbcpr/)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation.(Min.4drgs.)
2	Field reports and Market survey of building technology topics.
3	Proposals of different designs in masonry construction and fencing designs for prescribed projects.(Under discretion of the subject faculty)

Theory of Structure -I

Subject Code	K8103	Semester-I
Credits	3	Subject type-Core

Learning Objectives	
1	To understand basic structural concepts
2	To understand behavior of different materials
3	To understand fundamentals of structure

Learning Outcomes: student will be able to	
1	Develop understanding of basic requirements of stability, strength of materials
2	Develop understanding of behaviour of basic structural elements
3	Understand importance of basic structural elements in structural systems.

Units	Contents
Unit I	Introduction Introduction to basic structural elements like column/post, beam, slab, load bearing walls. The load transfer mechanism. Introduction to dead load and live load. Simple calculation of dead load of one way slab and beam if their dimensions are known, in order to know how much load is transferred from each element
Unit II	Supports <ul style="list-style-type: none"> - Types Of Supports And Load Transfer To The Supporting Element : Explain beams as a system in equilibrium and explain conditions of equilibrium (Σf_x, Σf_y and $\Sigma m = 0$) - Types of supports: roller hinged and fixed supports. Explain in which practical connection we idealize it as hinge/ roller/ fixed. (theory only) - Type of beams: simply supported, cantilever and overhanged beam. Calculating the reaction they transfer to the support. (calculation should include udl and point load standard cases - UDL over entire span - Point load at centre and eccentric - UDL near one support - Shear force and Bending Moment and its importance
Unit III	Properties Of Section <ul style="list-style-type: none"> - Centre of gravity – its importance - How to find CG of standard T, Channel, I, angle section and combination of such sections
Unit IV	Moment of Inertia <ul style="list-style-type: none"> - Moment of inertia – its importance - MI formulae of standard sections. Calculations for rectangle and circle, T, Channel, angle and I section using parallel axis theorem. - Section modulus and radius of gyration – definition.

Learning Resources	
Text Books:	1. Mario Salvadori.(1980). <i>Why buildings stand up:The strength of architecture</i> .McGraw-Hill 2. Dongre A.P.(2011). <i>Strength of</i>

	<i>Materials</i> .Pune/Hyderabad,ScitechPublications
	3. Deo S.S.(2013). <i>Engineering Mechanics</i> .Pune,NiraliPrakashan 4. Deo S.S.(2013). <i>Strength of Materials</i> .Pune,NiraliPrakashan 5. S B Junnarkar& Dr. H J Shah,(2012). <i>Mechanics of Structures Vol. I & II</i> .Anand,CharotarPublishing
Reference Books:	1. Beer and Johnston,(2008). <i>Mechanics of Materials</i> .New Delhi,Tata McGraw-Hill 2. Khurmi R.S.(2014). <i>Strength of Materials</i> .New Delhi,S.Chand& Company Ltd 3. Nash W.A.(1994)International edition <i>Strength of materials - III rd edition, (theory and problems)</i> .Singapore,McGraw-Hill book co. 4. Timoshenko Stephen.(2002). <i>Strength of materials part I &II(elementary theory and problems) IIIrd ed</i> .New Delhi,CBS Publishers
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Calculate the load transferred on the supporting beam/ column for simply supported cantilever and overhang beam. (find reactions)
2	Study of various cross sections such T, C,L, I and O as various structural elements. Calculations of T,C, L ,I and o sections
3	Photo Documentation : various type of beams, various type of supports, various types of loads, various types of cross sections
4	Making models : various type of beams, various type of supports, various types of loads, various types of cross sections

Creativity & Communication -I

Subject Code	K8104	Semester -I
Credits	4	Subject type-Core

Learning Objectives	
1	To understand elements of design and principles of design as a basic creative activity.
2	To study/analyze principles of organizations.
3	To develop artistic and architectural vocabulary for effective verbal and written communication.
4	To appreciate visual art forms like sculpture, paintings, calligraphy, caricatures etc.

Learning Outcomes: Student will be able to	
1	Explore basic elements of design and their expressions artistically
2	Explore principles of design and their expressions artistically
3	Understand and explore principles of organizations
4	Understand and develop artistic and architectural vocabulary

Units	Contents
Unit I	Elements of Design <ul style="list-style-type: none"> - Introduction to Elements of design - Interpretation of points, lines and planes - Expressions through colors, textures and light
Unit II	Principles of Design <ul style="list-style-type: none"> - Introduction to Principles of Design - Theory on Lateral Thinking and exercise on generation of alternatives - Explorations of Principles of Design through 2D compositions
Unit III	Organization <ul style="list-style-type: none"> - Introduction to Organization - Explorations of Organization through 3D compositions
Unit IV	<ul style="list-style-type: none"> - Introduction to Visual arts (painting, sculpture, calligraphy etc.) - Understanding attributes of elements of visual and architectural aesthetics - Visual Arts appraisal
Unit V	Verbal and Written Communication <ul style="list-style-type: none"> - Exploration of different ways of verbal and written communication

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. Ching Francis, D. K. (2007) <i>Architecture: Form Space & Order</i>, New Jersey, John Willy and Sons 2. Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i>, New Jersey, John Willy and Sons
Reference Books:	<ol style="list-style-type: none"> 1. Yatin Pandya (2014) <i>Elements of Space Making</i>, Ahmedabad, Mapin Publishing 2. Shirish Vasant Bapat (1993) <i>Basic Design and Anthropometry</i>, Pune, Bela Books 3. Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i>, Australia, Watson-Guptill Publications 4. Bacon E.N. (1974) <i>Design of Cities</i>, England, Penguin Books

	<p>5. Akiko Busch (1991) <i>The Art of Architectural Models</i>, Hong Kong, Design Press</p> <p>6. Nick Bunn (2010) <i>Architectural Model Making</i>, London, Laurence King Publishing</p> <p>7. Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i>, United Kingdom, Acropolis Books</p> <p>8. Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i>, London, Grange Book Plc</p> <p>9. Edward De Bono (1990) <i>Lateral Thinking</i>, London, Penguin Books</p>
Websites:	<p>www.artinarch.org</p> <p>www.edwdebono.com</p>
Journals	

Assessment		Marks
IA	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
UE	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
Drawing portfolio consisting of relevant exercises including	
1	Self Portrait
2	Exercise on inter-relation of emotions and their expressions though lines and colors – in the form on thumb sketches or series of expressions explaining a story line OR creating a graphic strip explain a story OR creating a graphical story board for a concept
3	Exploration of textures in form of 3D models
4	Analysis of effects of different lighting conditions in architecture
5	Exploration of different generations of alternatives through modules
6	Exploration of Principles of Design based on 2D compositions of modules
7	Exploration of Vertical and Horizontal Planes based on modules to understand anthropometry
8	Exploration of Organization through 3D composition with solids like cubes, cuboids, pyramids, cones, cylinders, spheres etc.
9	Group work on Appreciation of Visual Arts
10	Exercise on verbal and written communication in the form of compilation of an architect's works and seminar presentation of the same or newspaper article etc.

Architectural Drawings and Graphics-I

Subject Code	K8105	Semester -I
Credits	6	Subject type-Core

Learning Objectives	
1	To understand visualization principles of various objects related to architecture.
2	To enable students to present in graphical form all building elements and free hand sketching.

Learning Outcomes: student will be able to	
1	Develop skills in free hand sketching
2	Represent different forms, building elements and materials
3	Visualize and represent in Two-Dimension And Three-Dimension Graphic communication

Units	Contents
Unit I	Basic skills of drafting <ul style="list-style-type: none"> - Lettering: Freehand architectural lettering. - Lines: Concept and types of lines, Dimension lines. - Drafting convention. - Study of Scales.
Unit II	Geometry <ul style="list-style-type: none"> - Geometrical constructions
Unit III	Represent 3D objects in 2 D <ul style="list-style-type: none"> - Definition, Meaning & concept. - Projection of points, lines, planes and solids through orthographic projections to understand 2D building representation. Sections <ul style="list-style-type: none"> - To represent the building through sections
Unit IV	Three dimensional representation <ul style="list-style-type: none"> - Existing building views through sketching

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. F. D K. Ching (2009) <i>Architectural Graphics</i>, New Jersey, John and Wiley and Sons 2. Hugh C. Browing (1996) <i>The Principles of Architectural Drafting</i>, New York, Watson-Guptill Publications 3. N.D.Bhatt (2012) <i>Engineering Drawing</i>, Gujrat, Charator Publishing House. 4. Rangwala(1991)<i>Civil Engineering Drawing</i>, Gujarat, Charator Publishing House
Reference Books:	<ol style="list-style-type: none"> 1. Calvin F. Schmid, Stanton E. Schmid, (1954) <i>Handbook on Graphic Presentation</i>, New York, The Ronald Press Company 2. David Littlefield (2012) <i>Matric Handbook</i>, London and New York, Routledge Taylor and Francis Group. 3. Sleeper R.(2000)<i>Architectural Graphic Standards</i>, New York, John Wiely and Sons.
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
UE	University Examination	60
	Theory paper of 03 hours	

Workshop –Model Making

Subject Code	K8106	Semester -I
Credits	5	Subject type-Core

Learning Objectives	
1	To equip students with the basic skills necessary to represent their ideas in a model format using simple materials like paper, thermocol, hardwood, Metals, glass fiber etc.
2	To familiarize students with cutting, drilling, grinding, slotting, shaping, bending and measuring instruments, filing, scraping and fitting etc.; processes used in making models.

Learning Outcomes: student will be able to	
1	Develop skills in making 2D and 3Dmodels.
2	Apply carpentry instruments and their uses.
3	Understand the importance of model making as a tool to represent ideas and visualize objects/ elements/structures in architecture.

Units	Contents
Unit I	Introduction to types of model - Block models, detailed model, Construction Model and interior, Models etc.
Unit II	Introduction to various materials - Experimentation with these materials for different geometries and scales of models
Unit III	Tools in model making - Development of the skill to use the tools with precision to obtain desired results in model making.
Unit IV	Exploration of Building materials - Hands on approach

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. Akiko Busch (1991) <i>The Art of Architectural Models</i>, Hong Kong, Design Press 2. Nick Bunn (2010) <i>Architectural Model Making</i>, London, Laurence KingPublishing. 3. Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i>, United Kingdom, Acropolis Books 4. Alexander Schilling, (2008)<i>Basics Model Building</i>, BostenBerlin,Birkhauser publishers for Architecture
Reference Books:	<ol style="list-style-type: none"> 1. ShirishVasantBapat (1993) <i>Basic Design and Anthropometry</i>, Pune, Bela Books. 2. Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i>, New Jersey, John Willy and Sons. 3. Ching Francis, D. K. (2007) <i>Architecture: Form Space & Order</i>, New Jersey, John Willy and Son
Websites:	www.artinarch.org
Journals:	

Assessment		Marks
I.A.	Internal Assessment	100
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	There is no 'University Examination' for this subjects	

Assignments	
1	Model making-design projects.
2	Model-Construction details.
3	Model -Creative Arts and crafts

Semester – II

Architectural Design -II

Subject Code	K8107	Semester -II
Credits	6	Subject type-Core

Learning Objectives	
1	To develop communication and representation skills
2	To document spaces in graphic form
3	To explore concepts of space design with a focus on function and anthropometry

Learning Outcomes: Student will be able to	
1	Develop skills to understand and represent design ideas through graphic communication.
2	Learn to measure, document and represent spaces.
3	Understand and demonstrate a simple design responding to functional requirements and appropriate scale.

Units	Contents
Unit I	Measured Drawing - Introduction and demonstration of modes of measurements and methods of documentation of built and/or non built spaces - Introduction and demonstration of different methods of representation
Unit II	Analysis - Study of function, circulation, scale and modes of measurement with respect to a specific activity.
Unit III	Design Demonstration - Design of single activity spaces reflecting understanding of the above.

Learning Resources	
Text Books:	
Reference Books:	1. Batley C., (1948), <i>The design development of Indian architecture</i> , J. Tiranti, ltd. 2. Ching F. D. K. (2007), <i>Architecture: form, space, and order</i> , New Jersey, Canada, John Wiley and sons. 3. Editors of Phaidon Press (2004), <i>The Phaidon Atlas of Contemporary World Architecture</i> , Phaidon Press; Comprehensive Edition. 4. Pandya Y., VastuShilpa Foundation, (2013), <i>Elements of space making</i> , India, New Jersey, Mapin Publishing. 5. Thakkar J., & Morrison S., (2008) <i>Matra, Ways of Measuring Vernacular Built Forms of Himachal Pradesh</i> , Ahmedabad, India, SID Research Cell 6. Radford W. A., (1921), <i>Architectural Details and Measured Drawings of Houses of the Twenties</i> , Courier Corporation. 7. Chitham R, (1980), <i>Measured Drawing for Architects</i> , originally from the University of Michigan, Architectural Press.
Websites:	Drawing Guidelines – Shaping Space http://www.riai.ie/downloads/education/pdf/ss_guidelines/drawing_guidelines.pdf Pandya Y. & Tiwari. S., (nd), <i>An Ethnographic and Collaborative Model of Inquiry: Activity Centre Project in India</i> , Chapter 2, from http://www.springer.com/978-981-4585-10-1
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Measured drawing of any structure relevant to the topic - Drawing Portfolio
2	Design of single activity unit with a demand of knowledge of function, circulation and anthropometry (e.g. Canteen, bus-stop, play school, library, clinic, boutique, etc.) – Drawing portfolio. Models to understand and explain the Designed Spaces.
3	Photo documentation and analysis of related / similar designed spaces.

Building Construction and Materials-II

Subject Code	K8108	Semester -I
Credits	5	Subject type-Core

Learning Objectives	
1	To involve students in a number of drawing exercises that will analyze the various building components in a simple load bearing structure.
2	To inform properties and characteristics of timber, its conversion, preservation and uses
3	To make students aware of various market forms of timber, their production, properties and application in the building industry

Learning Outcomes: Student will be able to	
1	Understand the different construction practices adapted for the various components of doors and windows to specific material in which it's made.
2	Understand the concept of opening and its construction techniques

Units	Contents
Unit I	Door, Windows and Openings <ul style="list-style-type: none"> - Introduction to various hardware used for doors, window - Terminology and construction aspects of door ,windowand opening
Unit II	Spanning Of Opening <ul style="list-style-type: none"> - lintel and arch construction - Terminology of arch construction and load transfer - Construction and formwork for lintel and arch - Spanning of opening using brick and stone for various types of arches like flat, segmental, semi circular etc. - Spanning of opening using brick, stone, timber, built-up sections for lintel construction
Unit III	Doors <ul style="list-style-type: none"> - Design considerations, single and double shutters, party glazed and partly paneled shutters - Glazed, Paneled and Flush doors in wood. Types of Flush doors. - Ledged, braced and battened and framed door. (Introduction) - Sliding and sliding- folding door in T.W. and Aluminum. - Steel Door Construction - Pressed sheet shutter - Box section frame and paneled shutter - Rolling shutter - Collapsible gates - Safety or Grilled doors
Unit IV	Windows <ul style="list-style-type: none"> - Underline principles for appropriate selection and application of different type of wooden windows & steel windows. - Paneled, fixed and partly and fully glazed and louvered, centrally pivoted, top hung windows, Side hung windows in wood. - Bay windows in wood - Steel window using 'Z' section - Steel window using Box section & of proprietary nature

Unit V	Study of Materials <ul style="list-style-type: none"> - Timber and Bamboo - Various timber joints - Hollow concrete block - Reinforced Brick work
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Learning Resources	
Text Books:	1. Rangwala S. C.(2007) <i>Engineering Materials</i> . Gujarat,Charotar, Publishing House. 2. Duggal S.K.(2009) <i>Building materials</i> . New Delhi, New Age International.
Reference Books:	1. Don A. Watson, (1972) <i>Construction Materials and Processes</i> , New York, McGraw Hill. 2. WB Mackey, (1981) <i>Building construction, Vol 1,2</i> .UK, Longman UK. 3. Francisa D.K. Ching(2000) <i>Building Construction Illustrated</i> .NewYork,John Wiley & Sons.
Websites:	http://www.slideshare.net/parteeeks9/doors-windows-12082151 (doors n windows)
Journals:	The open construction and Building Technology journal (benthamopen.com/tobctj/home)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination Assignments or portfolios based on entire syllabus as mentioned below.	60

Assignments	
1	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation.(min.4 drawings.)
2	Field reports and Market survey of building technology topics.
3	Proposals of different designs in door and window construction and opening designs for prescribed projects (Under discretion of the subject faculty).

Theory of Structures-II

Subject Code	K8109	Semester -II
Credits	2	Subject type-Core

Learning Objectives	
1	To understand forces acting on members
2	To understand properties and behaviour of different materials
3	To understand shear and bending stresses

B. Learning Outcomes: Student will be able to	
1	Develop understanding of stresses and strains on members.
2	Develop understanding of properties of basic structural materials.
3	Understand importance of consideration of shear forces.

Units	Contents
Unit I	Stress and Strain - What is stress (axial, bending and shear), strain. - Calculation of axial stress, strain for composite material like RCC.
Unit II	Bending Stress - Calculation of bending stress using formulae for standard sections. T,C, L and I - What is combination of axial and bending stress,for a masonry column and base of retaining wall for stability.
Unit III	Shear Stress Calculation - Calculation of shear stress using formulae for standard sections. T, C, L and I.
Unit IV	Elastic constants and stresses - Structural properties: Elasticity, maximum Permissible Tensile/compressive stress, bending stress and shear stress for various materials like timber, masonry, concrete and steel. Explain the difference between behaviour of a ductile material like steel and brittle material like concrete subjected to tensile force. (stress-strain curve and Hooke's law).

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Khurmi R.S.(2014)<i>Strength of Materials</i>. New Delhi, S.Chand& Company Ltd. 2. Nash W.A.(1994)International edition <i>Strength of materials - III rd edition, (theory and problems)</i>.Singapore, McGraw-Hill book company. 3. Timoshenko Stephen.(2002)<i>Strength of materials part I. (elementary theory and problems) IIIrd ed</i>. New Delhi, CBS Publishers..Timoshenko Stephen.(2002)<i>Strength of materials part II (elementary theory and problems) IIIrded</i>.NewDelhi,CBS Publishers. 4. Bansal R. K.(2014) <i>A text book of strength of materials</i>. 5. Singhal S.B.&Narayan.R. <i>Materials and structures (vol-I) Strength of materials</i>. New Delhi, R.Chand& Company Ltd. 6. Warnock F.V. <i>Strength of Materials with ED</i>. London, Sir Isaac Pitman & Sons.Ltd.

	7. RamamruthamS.Narayan.R. (2009) <i>Theory of Structures</i> . New Delhi, Dhanpatrai Publications P.Ltd. 8. RamamruthamS.Narayan.R.(2014) <i>Theory of Structures (for Engineering Degree ,Diploma)</i> .New Delhi, Dhanpatrai Publications P.Ltd.
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Numerical problems on calculation of axial stress and strain in composite elements.
2	Numerical problems on calculation of bending stress in beams and columns.
3	Numerical problems on calculation of combined stresses
	Photo Documentation: structural damages due to excessive stresses, identifying the reasons of damages.

Creativity & Communication-II

Subject Code	K8110	Semester -II
Credits	4	Subject type-Core

Learning Objectives	
1	To understand volume and form.
2	To study/analyze scale and proportions
3	To appreciate performing art forms like films, theatre, dance etc

Learning Outcomes: student will be able to	
1	Explore volume and form as basic elements of design
2	Understand scale and proportion and their impact on spaces
3	Appreciate performing arts

Units	Contents
Unit I	Volume and Form - Introduction to Attributes of Form and Space - Understanding derivatives of form - Volumetric Study of Spaces – positive and negative spaces
Unit II	Scale and Proportion - Theory on Scale and Proportion - Exploration of Scale and Proportion through 2D and 3D mediums
Unit III	Performing Arts Appraisal - Introduction to Performing arts (films, theatre, dance etc.) - Understanding attribute of elements of performing arts
Unit IV	Communication through performing art Exploration of different ways of communication through performing art

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Ching Francis, D. K. (2007) <i>Architecture: Form Space & Order</i>, New Jersey, John Willy and Sons 2. Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i>, New Jersey, John Willy and Sons 3. Yatin Pandya (2014) <i>Elements of Space Making</i>, Ahmedabad, Mapin Publishing 4. ShirishVasantBapat (1993) <i>Basic Design and Anthropometry</i>, Pune, Bela Books 5. Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i>, Australia, Watson-Guptill Publications 6. Bacon E.N. (1974) <i>Design of Cities</i>, England, Penguin Books 7. Akiko Busch (1991) <i>The Art of Architectural Models</i>, Hong Kong, Design Press 8. Nick Bunn (2010) <i>Architectural Model Making</i>, London, Laurence King Publishing 9. Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i>, United Kingdom, Acropolis Books 10. Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i>,

	London, Grange Book Plc 11. Edward De Bono (1990) <i>Lateral Thinking</i> , London, Penguin Books
Websites:	www.artinarch.org www.edwdebono.com
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
Drawing portfolio consisting of relevant exercises including	
1	Understanding Volume as an element of design and exploration of positive and negative spaces in a volume or 3D composition
2	Exercise on exploration of derivatives of form
3	Understanding theory of scale and proportions and representing the same through study of anthropometry of spaces
4	Group work on Documentary/ Film as Performing Arts appraisal

Architectural Drawings and Graphics-II

Subject Code	K8111	Semester -II
Credits	5	Subject type-Core

Learning Objectives	
1	To develop perception and presentation of different forms and their spatial dimension.
2	To develop rendering techniques and presentation skill

Learning Outcomes: Student will be able to	
1	Visualize three Dimensional representations of complex objects and to relate the graphics content with Architectural Design.
2	Explore Rendering technique skills with various media, incorporating sciography and creating three-dimensional effects.

Units	Contents
Unit I	Three dimensional representation - Isometric, axonometric and oblique view of solid composition and building.
Unit II	Interpenetration of solids - Interpenetration of various solids and its relation in building design.
Unit III	Presentation of drawings - Rendering technique with various media.
Unit IV	Sciography - Introduction of sciography. - Representation of Shade and shadows in plans and elevations.

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. Calvin F. Schmid, Stanton E. Schmid, (1954) <i>Handbook on Graphic Presentation</i>, New York, The Ronald Press Company 2. F. D K. Ching (2009) <i>Architectural Graphics</i>, New Jersey, John and Wiley and Sons. 3. Francis DK Ching (1989) <i>Drawing A Creative Process</i>, Van Nostrad Reinhold 4. Hugh C. Browing (1996) <i>The Principles of Architectural Drafting</i>, New York, Watson-Guptill Publications. 5. .N.D.Bhatt(2012) <i>Engineering Drawing</i>, Gujarat, Charator Publishing House
Reference Books:	<ol style="list-style-type: none"> 1. Calvin F. Schmid, Stanton E. Schmid, (1954) <i>Handbook on Graphic Presentation</i>, New York, The Ronald Press Company 2. David littlefield (2012) <i>Matric Handbook</i>, London and New York, RoutledgeTaylor and Francis Group.
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper of 03 hours	60

History of Architecture-I

Subject Code	K8112	Semester -II
Credits	3	Subject type-Core

Learning Objectives	
1	To understand development of architecture as a process of contextual and cultural evolution rather than simply as a product.
2	To acknowledge and interpret from history, best design guidelines which respond aptly to the vernacular character of that place, the lifestyle of the users and building traditions of that time.
3	To gain knowledge of the development of architectural form with reference to Technology, style and character.

Learning Outcomes: Student will be able to	
1	Discuss Geography, Politics, Economy, Social Systems, Religion, Paintings and Sculptures and its influence on Architecture at different periods of time.
2	Explore cultures and civilizations and settlements across the world

Units	Contents
Unit I	Pre-historic <ul style="list-style-type: none"> - Housing forms in the initial phase: Cave shelters- at Lascaux, Terra Amata - Community structures: Menhir, dolmen, gallery and passage graves, Stonehenge, Ggantija Malta
Unit II	River Valley Civilizations <ul style="list-style-type: none"> - Yellow River - Indus River - Nile River - Tigris River
Unit III	Vedic Architecture <ul style="list-style-type: none"> - Vedic culture and town planning layouts, Vedic Village, City Planning in later Vedic period, Building materials and construction techniques. Buddhist Phase <ul style="list-style-type: none"> - Major typologies – Stambha, Stupa, Chaitya, Vihara. - Development of Chaitya arch - Lomas Rishi, AshokanStambhas, The Great Stupa at Sanchi, Chaitya Hall at Karli, Viharas at Ajanta
Unit IV	Greek Civilization <ul style="list-style-type: none"> - History, evolution and characteristics Elements of special attributes: Classical Orders, Optical corrections – Acropolis, City of Athens - Major typologies - Temples, Theatres, Agora, Stoa, Council Halls
Unit V	Roman Civilization <ul style="list-style-type: none"> - History, evolution and characteristics Elements of special attributes: - Arches, lintels, bridges, aqueducts, Roman engineering skills - Major typologies - Temples- Pantheon, Basilica at Trajan, Amphitheatre, Hippodrome, Circus, Palaces, Thermae at Carcalla

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Sir Banister Fletcher, (1999) <i>A History of Architecture, Indian Edition</i>. Delhi, CBS Publications. 2. Spiro Kostof, (1985) <i>A History of Architecture: Setting and Ritual</i>. London, Oxford University Press. 3. Leland M Roth, (1994) <i>Understanding Architecture: Its Elements, History and Meaning</i>. Craftsman House; 4. Pier Luigi Nervi, General Editor, (1972) <i>History of World Architecture – Series</i>. New York, Harry N. Abrams Inc. Pub. 5. Burns, Ralph, Lerner, Meacham, (1991) <i>World Civilizations</i>. First Indian Edition, Delhi, Goyal Saab Publishers and Distributors. 6. Roger Smith, (1987) <i>An Illustrated history of Architectural Styles</i>. 7. Omega Books Ltd. 8. Sebastiano Serlio, (1982) <i>The five books on architecture</i>. New York, Dover Publication Inc. 9. Percy Brown, (1983) <i>Indian Architecture (Hindu And Buddhist)</i>. Bombay, Taraporevala and Sons. 10. Denis Montagnon, (2001) <i>Rome</i>. ISBN 3-8228-5870-6. Germany, TashchenGmbH 11. Satish Grover, (2003) <i>The Architecture of India (Buddhist and Hindu Period)</i>. New Delhi, Vikas Publishing Housing Pvt. Ltd.
Websites:	<p>www.ancient.eu/Roman_Architecture/ www.slideshare.net/mfresnillo/roman-architecture-398210 www.slideshare.net/mfresnillo/greek-architecture architecture.pppst.com/greek.htm msroseclass.weebly.com/uploads/2/5/9/.../ms_rose_greek_architecture.pp. http://www.slideshare.net/kabithamadhu/vedic-age</p>
Journals:	<p>JSAH-Society of Architectural Historians (www.sah.org/publications-and-research/jsah) Architectural Heritage-Edinburgh University Press (www.euppublishing.com/journal/arch) Architectural History (journal.eahn.org/)</p>

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper	

Climatology and Climate Responsive Architecture

Subject Code	K8113	Semester -II
Credits	3	Subject type-Core

Learning Objectives	
1	To understand climate and its impact on architectural design.
2	To understand co-relation between climate and other environmental parameters and built form at individual and settlement level
3	To understand the use of surrounding environment as one of the strategic design parameters.

C. Learning Outcomes: Student will be able to-	
1	Familiarize with climatological influences on built environment and comfort conditions for inhabitants.
2	Explore design principles in different climatic zones

Units	Content
Unit I	Basic Climatology <ul style="list-style-type: none"> - Introduction: To climate, weather, earth, sun relationship. Global, Macro and Micro climate. Importance of climate in architecture. - Elements of climate: Temperature, rainfall, humidity, wind, solar radiation etc.
Unit II	Basic Climatology <ul style="list-style-type: none"> - Human Comfort: - Human heat balance and comfort, thermal comfort and means of thermal comfort, heat stress, effective temperature, bioclimatic chart, subjective variables - Thermal Comfort Indices - Active & Passive means of thermal control: Degree of control
Unit III	Basic Climatology <ul style="list-style-type: none"> - Structural control : Shadow formation, sun control and shading devices - Ventilation & Air movement: Study of ventilation & its functions in buildings, air flow through buildings, position & size of opening
Unit IV	Climate Responsive Architecture <ul style="list-style-type: none"> - Study of nature of climate, its physiological objectives and design criteria's and discomfort indices. Planning of internal and external spaces, surface treatments and openings etc. for various climatic zones - Case Study of a contemporary or traditional shelter in the given climate - Study of traditional /vernacular architecture from various climatic zones (Hot and Dry; Warm and Humid; Composite; Cold –Dry, Cold-wet) - Study of effect of orientation, topography, vegetation, form, building material and surfaces on building design in response to climate

Learning Resources	
Text Books:	1. Koenigsberger, Ingersoll, Mayhew, Szokolay, (1996) Manual of Tropical Housing and Building - Climatic Design, Orient Longman Limited
Reference Books:	2. G. Z. Brown and Mark Dekay, John Wiley and Sons, (2001) Sun, Wind and Light, 2nd Edition, New York

	<p>3. Baruch Givoni,(1976) Man, Climate and Architecture, U. K., Applied science Publishers, 2nd Edition</p> <p>4. T. N. Sheshadri,(2001) Climatological and Solar Data for India, Meerat, SaritaPrakashan</p> <p>A. Krishan,(2001), Climate Responsive Architecture, Tata Mcgraw Hill</p>
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignment	
1	Case study of a climate responsive building
2	Study of shading devices in a building.
3	Performance of openings for light and ventilation
4	Site-Analysis (Climatic context) considering various climatic elements.

Workshop-Model Making and Building Appraisal

Subject Code	K8114	Semester -II
Credits	2	Subject type-Core

Learning Objectives	
1	To understand appreciation in architecture.
2	To understand how to read a building.

Learning Outcomes: Student will be able to	
1	Explain building using architecture language.
2	Analyses components of the building.
3	Represent same building in model format.
4	Apply model making as a tool of expression.

Units	Contents
Unit I	Aspects of appraisal - Aesthetics, Technical, Financial, Economic, Environmental and anthropological appraisals.
Unit II	Art consciousness - Aesthetics, perception, symbolism, expression, style, fashion, appropriateness and values.
Unit III	Building Appraisal - Understanding the meaning of appreciation and its normative criteria such as Form, space, site, function, structure etc.
Unit IV	Analysing design - Identification of place, Basic and modifying elements of architecture, geometries, Themes in Spatial organization - Appreciation of designer skills, theories of perception and variability of perception.
Unit V	Model Making

Learning Resources	
Text Books:	1. Simon Unwin (2009). <i>Analysing Architecture</i> third edition, revised and enlarged. USA and Canada by Routledge
Reference Books:	1. Corol Davidson cragoe(2008). <i>How to read building: A crash course in architectural styles</i> .NewYork,Rizzoli. 2. John Mittendorf and Dave Dodson (2015). <i>The art of readingbuilding</i> .USA.Penwell Cooperation. 3. Corol Davidson cragoe(2008). <i>How to read building: A crash course in architecture</i> New York, Herbert press Ltd
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	100
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	There is no 'University Examination' for this subjects	

Assignment	
1	Building appraisal Essay/report with sketches /Photographs
2	Model of a structure

Semester – III

Architectural Design -III

Subject Code	K8201	Semester -III
Credits	6	Subject type-Core

Learning Objectives	
1	To study and explore properties and behavior of different structural materials
2	To introduce students to a design process with a focus on materials and structural systems
3	To develop capacity of third dimensional thinking in students
4	To understand the process of multi activity space designing

Learning Outcomes: students will be able to	
1	Make appropriate choice of material based on the requirements of the design project
2	Explore properties of a particular material to its fullest.
3	visualize and think in third dimension and translate it into two dimensional design
4	synthesize and reflect analytical understanding of multi activity spaces into Architectural Design

Units	Contents
Unit I	Exposure to Materials - Introduction and knowledge of different materials and innovative structural systems
Unit II	Exploration of Forms - Exploration of innovative forms of structures based on the behavior of materials
Unit III	Design Demonstration - Introduction to a complex multi activity space design - Demonstrating the best use of the studied material/s in this space

Learning Resources	
Text Books:	
Reference Books	<ol style="list-style-type: none"> 1. Ching F. D. K. (2007), <i>Architecture: form, space, and order</i>, New Jersey, Canada, John Wiley and sons. 2. Editors of Phaidon Press (2004), <i>The Phaidon Atlas of Contemporary World Architecture</i>, Phaidon Press; Comprehensive Edition. 3. Salvadori M., & Robert H., (1975), <i>Structure in architecture: the building of buildings</i>, Cornell University, Prentice-Hall 4. Shankar P., (2014) <i>Himalayan Cities: Settlement Patterns, Public Places and Architecture</i>, New Delhi, India, USA, Canada, Niyogi Books.
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60

	Assignments or portfolios based on entire syllabus as mentioned below.	
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Assignment	
1	Analysis of different materials and structural systems through research and market surveys
2	Experimentation with models to explore properties, strengths, weaknesses, possibilities of different configurations of chosen materials (application of lateral thinking process)
3	Drawing portfolio for design of a complex multi activity space design (e.g., bungalow of some celebrity or professional, a small neighborhood shopping, primary health clinic, departmental store, small scale community housing, etc.

Building Construction and Materials-III

Subject Code	K8202	Semester-III
Credits	6	Subject type-Core

Learning Objectives	
1	To involve students in a number of drawing exercises that will analyze the Various building components in a simple framed structure.
2	To inform the properties and characteristics of different roofing and flooring materials

Learning outcomes: Student will be able to	
1	Understand the construction techniques of different building components like staircase and roof.
2	Acquire the knowledge of different flooring materials and its construction techniques.

Units	Contents
Unit I	Staircase <ul style="list-style-type: none"> - Design Consideration - Principles and components of staircase - Types of staircases - Staircase in Timber, steel and stone
Unit II	Roof <ul style="list-style-type: none"> - Timber Roofs: General idea of various forms in timber for different spans. General information of timber trusses, fixing of Mangalore tiles. - Steel roofing: Simple ridge roof trusses for various spans, design consideration, advantages, Connections of various members supported on RCC column, Brick piers, fixing of G.I. and A.C. and Aluminum sheets, gutter types, wind bracing etc. - Steel North light Roofing system: Connections, Gutters, paneled glazing etc. - Steel Monitor roofs: on steel Stanchions, Connections, Gutters, paneled glazing etc. - R.C.C. roofing types: Flat slabs (one way and two ways), vaults, domes, Grid slabs. - Masonry vaults and domes
Unit III	Floors <ul style="list-style-type: none"> - Specialized timber flooring for: - Dance halls, Sports halls etc. - Parquet flooring details. - General idea of timber floors in relation to spans, load transmission, Jack arch and composite floors. - Flooring & paving materials such, IPS Finish, Mosaic Tiles, and Plain Cement Tiles. Natural stones like Shahabad, Tandoor, Kota, Kadappa, Marble, Granite, etc. - Glazed and Ceramic Tiles, PVC Rubber, Linolium, Carpet etc

Unit IV	Study of Materials <ul style="list-style-type: none"> - Roofing materials. - Different flooring materials. - Importance of water proofing, its need in building construction. - Traditional and modern systems of water proofing and various water proofing materials available in the market
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Text Books:	1. Rangwala S. C.(2007) <i>Engineering Materials</i> . Gujarat,Charotar, Publishing House. 2. Duggal S.K.(2009) <i>Building materials</i> . New Delhi, New Age International.
Reference Books:	1. Don A. Watson,(1972) <i>Construction Materials and Processes</i> , New York, McGraw Hill. 2. WB Mackey,(1981) <i>Building construction, Vol 3,4</i> .UK, Longman UK.
Websites:	www.slideshare.net/mohdasrimohdhasim/superstructure-construction
Journals:	Journal of construction engineering, technology stmjournals.com/index.php?journal=jocetm Master builder -construction magazine, construction news(www.masterbuilder.co.in)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
2	Field reports and Market survey of building technology topics.
3	Proposals of different design in staircase for prescribed projects. (Under discretion of the subject faculty)

Theory of Structure -III

Subject Code	K8203	Semester-I
Credits	2	Subject type-Core

Learning Objectives	
1	To understand types-indeterminate and analysis of structures
2	To understand behavior of different structural elements

Learning Outcomes: Student will be able to	
1	develop understanding of basic requirements of framed structure
2	develop understanding of behaviour of basic structural elements
3	understand importance of basic structural elements in structural systems

Units	Contents
Unit I	Shear force and bending moment diagram - Simply supported beams, cantilever beams and overhang beams for simple combinations of the cases mentioned in segment 1.
Unit II	Deflection in beams - Using formulae for standard cases simply supported and cantilevers reaction of propped cantilever. Maximum and zero deflection conditions for simply supported and cantilever beams. Factors affecting deflection. Importance of deflection in design of structural elements.(no complicated problems with double integration
Unit III	Introduction to arches - Two hinged and three hinged. Differentiate between beam and arch action. (no problems) - Suspension structures: their behaviour and sample analysis. (no problems)
Unit IV	Fixed beams - Concept of fixity and end moments using formulae.Deflected shape and placement of steel. (no analysis) - Continuous beams Concept of continuity and moments using co-efficients from IS 456, concept of distribution of moments based on stiffness only explanation (no analysis by moment distribution method)

Learning Resources	
Text Books:	1. Dongre A.P. (2011) <i>Strength of Materials</i> .Pune/Hyderabad,Scitech Publications. 2. Deo S.S.(2013) <i>Strength of Materials</i> .Pune,NiraliPrakashan. 3. S B Junnarkar and Dr. H J Shah.(2012) <i>Mechanics of Structures Vol. I & II</i> .Anand,Charotar Publishing house.
Reference Books:	1. Parikh Janak P. (2002) <i>Understanding the concept of structural design and analysis</i> .Anand,Charotar Publishing house. 2. PanditG.S.Gupta S.P.(2002) <i>Structural analysis a matrix approach</i> .New Delhi, 3. Tata McGraw-Hill Publishing company limited. 4. Varghese P.C.(2001) <i>Limit state design of reinforced concrete</i> .New Delhi,Prentice-Hall of India.
Websites:	

Journals:	
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Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignment	
1	Problems of SFD, BMD
2	Deflection (limited to the standard load cases mentioned in segment 1) deflection problems using formulae, study of behavior of Arches, suspension bridges
3	Behavior of fixed and continuous beams.
	Making models of fixed beam, continuous beams, arches, suspension bridges, tensile structures, deflection of long span structures.

Creativity & Communication -III

Subject Code	K8204	Semester -III
Credits	3	Subject type-Core

Learning Objectives	
1	To enhance creative skills with different techniques and sources of inspiration.
2	To enhance digital communication skills.

Learning Outcomes: Student will be able to	
1	Understand various methods of improving creative skills.
2	Use different sources of inspiration to improve creative skills.

Units	Contents
Unit I	Techniques for improving Creativity - Brainstorming, Lateral Thinking, Random Combinations, Use of Manipulative Verbs, Tree of Possibilities, Abstraction, Transformation, Use of the Ridiculous, Matrix of Ideas, Role of Memory and Experience
Unit II	Sources of inspiration for Creativity - Material, Geometry, History, Nature & Climate, Mimesis, Multicultural, Association with other arts, Biographies, Fantasy.
Unit III	Graphical Communication - Introduction and application of computer software for graphical communication

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Ching Francis, D. K. (2007) <i>Architecture: Form Space & Order</i>, New Jersey, John Willy and Sons 2. Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i>, New Jersey, John Willy and Sons 3. Yatin Pandya (2014) <i>Elements of Space Making</i>, Ahmedabad, Mapin Publishing 4. ShirishVasantBapat (1993) <i>Basic Design and Anthropometry</i>, Pune, Bela Books 5. Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i>, Australia, Watson-Guptill Publications 6. Bacon E.N. (1974) <i>Design of Cities</i>, England, Penguin Books 7. Akiko Busch (1991) <i>The Art of Architectural Models</i>, Hong Kong, Design Press 8. Nick Bunn (2010) <i>Architectural Model Making</i>, London, Laurence King Publishing 9. Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i>, United Kingdom, Acropolis Books 10. Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i>, London, Grange Book Plc 11. Edward De Bono (1990) <i>Lateral Thinking</i>, London, Penguin Books
Websites:	www.artinarch.org www.edwdebono.com
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination-	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
	Drawing portfolio consisting of relevant exercises including –
1	Any two exercises to demonstrate Techniques for improving Creativity (2D and 3D)
2	Any two exercises to explore Sources of inspiration for Creativity (2D and 3D)
3	One exercise to demonstrate Graphical Communication
	(The nature of exercises will depend on the focus of the studio)

Architectural Drawings and Graphics-III

Subject Code	K8205	Semester -III
Credits	5	Subject type-Core

Learning Objectives	
1	To understand the relation between depth of building elements and shades and shadows.
2	To understand three - dimensional view of architectural projects

Learning Outcomes: student will be able to	
1	Represent Sciography in Plan and Elevation of Architectural design project
2	Sketch perspective of Interior and Exterior.

Units	Contents
Unit I	Sciography - Sciography in buildings. - Projection of sciography in plan and elevation
Unit II	Perspective - Anatomy of perspective: Station point, Eye level, Cone of vision, Picture plane, Horizon line, Ground line, Vanishing points. - Types of perspectives: One point, Two point, Three point
Unit III	Perspective - Perspective drawing by, Measuring pt. method, directs projection method Grid method etc - Perspectives of simple and complex blocks - Perspectives of simple household furniture items. - Perspectives of interiors - Perspectives of Residences
Unit IV	Sciography in perspective

Learning Resources	
Text Books:	1. F. D K. Ching (2009) <i>Architectural Graphics</i> , New Jersey, John and Wiley and Sons. 2. Francis D K Ching (1989) <i>Drawing a creative process</i> , Van Nostrad Reinhold 3. Hugh C. Browing (1996) <i>The Principles of Architectural Drafting</i> , New York, Watson-Guptill Publications. 4. Rangwala(1991) <i>Civil Engineering Drawing</i> , Gujarat, Charotor Publishing House.
Reference Books:	1. Gill R.W.(2011) <i>Rendering with Pen and Ink</i> , London, Thames &Hudson ltd. 2. Sleeper R. (2000) <i>Architectural Graphic Standards</i> , New York, John Wiely and Sons.
Websites:	http://www.assignmenthelp.net/sciography-of-geometrical
Journals:	

Assessment	Marks
I.A.	40
	20
	Refer To 'Rule number 6, sub point 6.2.2.'

U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments		
I.A. Assignments		
1	Sem II AD Project to be presented with 2 point Perspective using any method.	
2	Sciography of overhangs, stairs porticos pergolas to be enhanced on vertical, horizontal and curved surfaces.	
U.E. Assignments		
3	Drawing portfolio - Adequate number of drawings covering all the units.	

History of Architecture-II

Subject Code	K8206	Semester -III
Credits	3	Subject type-Core

Learning Objectives	
1	To understand development of architecture as a process of contextual and cultural evolution rather than simply as a product.
2	To acknowledge and interpret from history, best design guidelines which respond aptly to the vernacular character of that place, the lifestyle of the users and building traditions of that time.
3	To gain knowledge of the development of architectural form with reference to technology, style and character

Learning Outcomes: Student will be able to	
1	Explore Geography, Politics, Economy, Social Systems, Religion, Paintings and Sculptures and its influence on Architecture at different periods of time.
2	Acquire knowledge of the development of architectural form with reference to technology, style and character in the Indian context through the evolution of the temples, mosques and tombs in the various phases of Hindu and Islamic rule in India.
3	Acquire knowledge of the development of architectural form with reference to technology, style and character in the Western World through the evolution of the church from early Christian phase up to the Renaissance period

Units	Contents
Unit I	<p>Architecture in Indian sub-continent-Hindu Temple Architecture</p> <ul style="list-style-type: none"> - Evolution of architectural style, major influences on development of form and other architectural elements. - Gupta and early Chalukyan style - Gupta temple, Tigawa, Dasavatara Temple, Deogarh, Ladkhan and Durga temples, AiholeVirupaksha temple, Pattadakkal, Papanath temple, Pattadakkal, Cave temple, Badami, Kailash Temple, Ellora <p>Dravidian style</p> <ul style="list-style-type: none"> - Pallava - Rathas, Mamallapuram, Shore temple, Mamallapuram - Chola - Brihadeswara temple, Thanjavur - Hoysala - Keshava temple, Somnathpur - Vijayanagara - Vitthalaswami temple, Hampi, column orders - Madura - Meenakshi temple, Madurai, Sriranganathaswami temple, Srirangam <p>Indo Aryan Style</p> <ul style="list-style-type: none"> - Orissa - Parasurameswara, Mukteswara, Lingaraja temples, Bhubaneswar, Sun temple, Konark - Khajuraho - KandariyaMahadeo temple, Khajuraho - Gujarat - Sun temple, Modhera <p>Jain School</p> <ul style="list-style-type: none"> - Vimal Shah at Mount Abu, Chaumukh at Ranakpur
Unit II	<p>Architecture in Indian sub-continent -Islamic Architecture in India</p> <ul style="list-style-type: none"> - A brief introduction to origin and characteristics of Islamic architecture: building types, elements, structural systems, construction techniques

	<p>Imperial style of Delhi</p> <ul style="list-style-type: none"> - Slave dynasty - Quwat-ul-Islam Mosque, QutbMinar, Khirki Masjid, Sultan Ghari, Tomb of Iltumish, Tomb of Balban - Khilji Dynasty - Alai Darwaza., JamatKhana masjid <p>Provincial styles: (any two provinces)</p> <ul style="list-style-type: none"> - Punjab,Sind,Bengal,Gujrat,Kashmir,Jaunpur,Malwa,Deccan - Mosque: Jami – Ahmedabad, Champaner and Gulbarga - Tomb: GolGumbaj, Ibrahim Rauza, Bijapur - Civic work: Dada Hari stepped well, Adalaj <p>The Mughal phase</p> <ul style="list-style-type: none"> - Evolution of Mughal style and the different eras of rule: - Mosque: Jami – FatehpurSikri , Delhi - Tomb: Humayun, Akbar, Itmadud-daulla, TajMahal - Fort: FatehpurSikri, Red Fort, Delhi, - Regal Buildings: Birbal’s house, Jodhabai’s palace at FatehpurSikri
Unit III	<p>Architecture in Europe</p> <p>Early Christian and Byzantine Architecture</p> <ul style="list-style-type: none"> - Evolution of Church form, technique adopted to construct domes, surface treatment and material of construction - Elements of Special Attributes: - Domes, timber trusses, clear storey, pendentives - Major typologies - St. Peters, Rome (earlier one) Hagia Sophia, Constantinople <p>Romanesque</p> <ul style="list-style-type: none"> - Design evolution, planning principles and structural details - Elements of Special Attribute: Wall passages, raking arcades, triforium gallery, vaulting systems - Major typologies - Churches – St. Michelle Pavia, Campus at Pisa
Unit IV	<p>Architecture in Europe</p> <p>Gothic Phase</p> <ul style="list-style-type: none"> - Elements of Special Attribute: Structural innovations with buttresses, pointed arches, vaulting systems, window traceries, flying buttresses etc. - Major typologies - Churches- Amines Cathedral, Notre dame cathedral, Salisbury cathedral, West Ministers Abbey, castles <p>Renaissance Phase</p> <ul style="list-style-type: none"> - Elements of Special Attribute: Revived column orders, rusticated masonry, grand cornices, public architecture – piazzas- St Mark, Del Signoria - Major typologies - Churches – St. Peters Rome, St Paul’s, Palladian villas, buildings with respect to architects

Learning Resources	
Text Books:	
Reference Books:	1. Percy Brown, (1983) <i>Indian Architecture (Hindu And Buddhist)</i> . Bombay, Taraporevala and Sons.

	<p>2. Henri Stierlin, (2002) <i>Hindu India</i>. ISBN 3-8228-1767-8. Taschen GmbH.</p> <p>3. George Michell, (1995) <i>Architecture of the Islamic World</i>. London, Thames and Hudson Ltd.</p> <p>4. Sandra Forty, (2004) <i>Architecture..</i> Rochester, Grange books</p> <p>5. Sir Banister Fletcher, (1996) <i>A History of Architecture</i>. Delhi, CBS Publishers.</p> <p>6. Hiraskar, (2009) <i>The Great Ages of World Architecture</i>. New Delhi, DhanpatRai Publications (P) Ltd, 16th Reprint.</p>
Websites:	<p>http://www.twcenter.net/forums/showthread</p> <p>http://www.mughalhistory.com/humayun.htm</p> <p>www.indhistory.com</p> <p>http://www.indianetzone.com</p>
Journals:	<p>JSAH-Society of Architectural Historians (www.sah.org/publications-and-research/jsah)ArchitecturalHeritage-EdinburghUniversity Press(www.euppublishing.com/journal/arch)</p> <p>Architectural History (journal.eahn.org/)</p>

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper	

Building Services-I

Subject Code	K8207	Semester -III
Credits	3	Subject type-Core

Learning Objectives	
1	To Study Water supply, treatments, distribution and plumbing system for various type of buildings.
2	To Study Waste water treatments, Sewer lines for various types of buildings
3	To Study Drainage system for a low and medium level building

Learning Outcomes : Students will be able to	
1	Understand how water supply and sanitation services are managed, in small and medium buildings.
2	Acquire knowledge about the principles of water supply and sanitation

Units	Contents
Unit I	Water supply - Sources of water supply. - Treatment plants and Pipe Appurtenances
Unit II	Distribution Patterns - Service Connection (Ferrule, water meter etc.) - Water storage tanks (Ground and overhead), their capacity and location. Calculation of water consumption. - Water Distribution pipes, their sizes, materials, jointing, fixing and laying
Unit III	Sanitation - Principles of sanitation. Introduction of various terminologies used in sanitation. Collection of waste matter in buildings. Various sanitary fittings and fixtures like washbasins, WC's, bathtubs, sink urinals, bidets, flushing cistern traps etc. Various traps and their functions. - Sewerage Systems: Dry conservancy method Water carriage systems. - Sewage collection and disposal system for individual house of urban areas. - Locations and use of appurtenances i.e. I.C, manholes, disconnecting chambers. - Various types of sanitary pipes, their joining, fixing and laying. Pipes and piping network. Anti- Siphonage Pipes.
Unit IV	Testing of house drains. - Sewage disposal system for individual house of rural areas or un-sewered localities (Septic tank, soak pit, cesspools, aqua privy, leeching pits. - Self-cleaning and non-scouring velocities for drain pipes. Invert levels and drains on sloping site

Learning Resources	
Text Books:	1. S.C.Rangwala,(1989) <i>Water supply and sanitary engineerin.</i> ,Gujarat, Charotar publishing house.
Reference Books:	1. AFE Wise, JA Swaffied Water,(2002) <i>Sanitary & Waste Services in buildings</i> . V Edition, Los Angeles, Mitchell Publishing, Co. Ltd. 2. C. shah,(1999) <i>Water supply and sanitary engineering</i> , Delhi,Galgotia publishers.

Websites:	http://www.slideshare.net/prinskhaleel/sanitary-and-water-supply http://www.slideshare.net/Liquidliquid/presentation-plumbing
Journals:	Building Services Engineering Research and Technology (bse.sagepub.com) Energy and buildings-Journal-Elsevier (www.journals.elsevier.com/energy-and-buildings/) Technical journals- CIBSE-(www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper	

Elective-I

Subject Code	K8208	Semester- III
Credits	2	Subject type-Elective

Learning Objectives	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

Learning Outcomes: student will be able to	
1	Engage in systematic self study of topic they feel interested in.

Students can select one elective from the following list	
1	Traditional Building science
	<ul style="list-style-type: none"> - Introduction, Meaning, Elements etc. - Vastusastra Principles - Climatological, sustainable aspects of VastuSastra. - Relevance of vastushastra in Todays Built Environment
2	Vernacular architecture and settlements (Regionalism)
	<ul style="list-style-type: none"> - Defining Vernacular - Culture ,Tradition, Society, Climate and Shelter - Vernacular architecture in India - Study of traditional Building materials and Techniques - Study of Vernacular Settlements pattern - Style of the Maratha region
3	Environmental Studies
	<ul style="list-style-type: none"> - Environmental Factors effecting human habit such as climate,environmental pollution, environmental degradation, Green cover etc.at micro and macro scales. - Fundamentals of eco system - Environmental legislation
4	Photography
	<ul style="list-style-type: none"> - Introduction to Architectural Photography. - Techniques of Recording Building and surrounding on a film with respect to position of viewer and angle, light and shades, foreground and background, scale, colour, texture, mood, time etc. - Techniques of Photography for documentation - Photographs of drawings, models, feature of buildings and surroundings to be elaborated. - Close up Photographs - Photography practicals on: simple objects, still life composition with the play of light and shadow, Historical and modern Buildings with surroundings landscape ,Architectural details such as brackets, staircase etc.

Assessment		Marks
IA	Internal Assessment	100
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	There is no 'University Examination' for this subjects	

Semester – IV

Architectural Design -IV

Subject Code	K8209	Semester -IV
Credits	6	Subject type-Core

Learning Objectives	
1	To understand the contextual relationship of buildings with climate and landform
2	To document rural/traditional settlement to understand the context, people, function
3	To understand the process of complex multi-activity space design

Learning Outcomes: student will be able to	
1	understand relationship of building and site, climate and landform
2	document rural/traditional settlement
3	design multi-activity spaces responding to climate and landform

Units	Contents
Unit I	Documentation and analysis of Settlement <ul style="list-style-type: none"> - Document rural settlement in terms of settlement patterns, cluster configurations and building typology. - Document and analyze influence of climate and landform and all three levels - Document and analyze any traditional knowledge systems, structural system and architectural vocabulary of that place. - Documentation of social structure, religious and cultural practices that guide the built form
Unit II	Application of Context <ul style="list-style-type: none"> - Proposal of small design insert responding to existing context of the settlement based on the analysis
Unit III	Design Demonstration <ul style="list-style-type: none"> - Climate responsive design demonstrating passive design principles

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Baruch G., (1976), <i>Man, Climate and Architecture</i>, 2nd Edition, U. K., Applied Science Publishers. 2. Ching F. D. K. (2007), <i>Architecture: form, space, and order</i>, New Jersey, Canada, John Wiley and sons. 3. Dingle N., (2013), <i>Zarokha</i>, Brain Tonic Publishing. 4. Dingle N., (1998), <i>The Introvert and Extrovert Aspects of the Marathi House'</i>, House and Home in Maharashtra, USA, Oxford University Press. 5. Editors of Phaidon Press (2004), <i>The Phaidon Atlas of Contemporary World Architecture</i>, Phaidon Press; Comprehensive Edition. 6. Shankar P., (2014) <i>Himalayan Cities: Settlement Patterns, Public Places and Architecture</i>, New Delhi, India, USA, Canada, Niyogi Books. 7. Jain K. B. & Jain M., (2001), <i>Architecture of the Indian Desert</i> 8. Koenigsberger O.H.; Ingersoll, T.G.; Mayhew, Alan; Szokolay, S.V., (1980), <i>Manual of Tropical Housing and Building. Part one: Climatic design</i>, Longman Used.

	9. Steele J., Doshi B.V., (1998) <i>The complete architecture of Balkrishna Doshi: rethinking modernism for the developing world</i> , India, Super Book House
Websites:	
Journals:	Ahmed Muhaisen, S. "Shading simulation of the courtyard form indifferent climatic regions", <i>Building and Environment</i> Vol. 41, pp. 1731-1741, 2005.

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Rural/traditional settlement studio - Drawing portfolio, Models
2	Drawing portfolio or a detailed model for short design-insert related to settlement study shall be carried out as a time bound exercise
3	Drawing portfolio for design of a small campus involving complex issues of site, topography, integration, environment (primary school, sports club, small resort / institute, primary health care, nursing home, etc.)

Building Construction and Materials-IV

Subject Code	K8210	Semester -IV
Credits	6	Subject type-Core

Learning Objectives	
1	To involve students in construction process of special construction of cavity walls and retaining walls.
2	To aware student for natural disasters and techniques of protection
3	To inform the students about materials like steel and aluminum its properties

Learning Outcomes: student will be able to	
1	Understand special construction of masonry walls.
2	Understand site development with retaining walls with respect to different materials.
3	Be aware about earthquake resisting structures and its protections.

Units	Contents
Unit I	Retaining Wall - Retaining walls and its terminology, mass retaining wall in bricks, Stones etc. and cantilever retaining wall in R.C.C.
Unit II	Cavity Walls: - Principles of Cavity wall construction & advantages of Cavity wall - Cavity wall in Brick, Stone and Concrete blocks - Precautions in Hollow Concrete wall construction - Reinforced and Decorative Brick masonry, Jali construction
Unit III	Aluminum Doors & Windows - Aluminum and P.V.C. Windows - Aluminum and P.V.C. Doors
Unit IV	Earthquake Resistant Structures - For engineered and non-engineered construction.
Unit V	Study of Materials - Steel and Aluminum. - Water concrete admixtures. - Paints and varnishes

Learning Resources	
Text Books:	1. Rangwala S. C.(2007) <i>Engineering Materials</i> . Gujarat,Charotar, Publishing House. 2. Duggal S.K.(2009) <i>Building materials</i> . New Delhi, New Age International.
Reference Books:	1. J. S. Foster, Roger Greeno (2007) <i>Mitchell's Structure & Fabric: Part 2</i> .New York,Taylor and Francis group
Websites:	www.slideshare.net/vikskyn/earthquake-resistant-structure
Journals:	Journal of construction engineering, technology stmjournals.com/index.php?journal=jocetm) Master builder -construction magazine, construction news(www.masterbuilder.co.in)

Assessment	Marks
I.A.	Internal Assessment 40

	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
2	Field reports and Market survey of building technology topics.
3	Proposals of different design in aluminum door and window for prescribed projects. (Under discretion of the subject faculty).

Theory of Structures-IV

Subject Code	K8211	Semester -IV
Credits	2	Subject type-Core

Learning Objectives	
1	To understand basic structural concepts
2	To understand behavior of RCC as a material for framed structure
3	To understand fundamental beam column slab construction and loading

Learning Outcomes: student will be able to	
1	develop understanding of basic requirements of framed structure
2	develop understanding of strength of RCC structure
3	Understand different loads affecting strength and stability of structure.

Units	Contents
Unit I	<p>Design of RCC structures using limit state method (IS456)</p> <ul style="list-style-type: none"> - Different type of loads: dead load, live load, wind load, earthquake load. - Calculation of dead load (self weight) if dimensions of a beam, column, wall or slab and unit weight of material are given. - Principles and applications of live load and wind load in different types of structures such as residential, commercial, institutional etc. - Introduction to related IS specifications.
Unit II	<ul style="list-style-type: none"> - RCC framed structures flat roof i.e. beam slab column system - IS 456 provisions for removal of formwork, nominal cover. - Design of one way and two way slab, cantilever slab, load transfer from one way and two way slabs to beams and cantilever slab. - Beam design 1) simply supported 2) cantilever and 3) continuous. Continuous beam moments to be found using co-efficient. Explain similar details for continuous slab - Design of columns. Explain the structural actions on columns, explain slenderness ratio and its effect on load carrying capacity of columns, design of only short axially loaded columns. Explain uni-axial and biaxial bending cases. - Introduction to doubly reinforced beams and T or L beams. (no design problems)

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. Dr.Shah V.L. & Dr. Karve S.R.(2014)<i>RCC Theory and Design</i>.Pune,Structures Publishers. 2. Shah H.J. (2013)<i>Design of Reinforced Concrete Structures</i>.Anand,Charotar Publishing house. 3. Sinha S.N. (2014) <i>Reinforced Concrete Design</i>.New Delhi,Tata McGraw-Hill Publishing Company limited.
Reference Books:	<ol style="list-style-type: none"> 1. Dr.Shah V.L. & Dr. Karve S.R.2014) <i>Illustrated design of reinforced concrete buildings(design of G+3 storied office/residential building)</i>.Pune, Structures Publishers. 2. Negi L.S.&Jangid R.S.(2000)<i>Structural analysis</i>. New Delhi,Tata McGraw-Hill Publishing company limited
Websites:	Bureau of Indian standards

Journals:	IS: 456 - 2000
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Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	calculation of dead load, live load, G+1 building slab design, one beam, one column design, make drawings and schedule for the same

Computer Aided Design and Drawings

Subject Code	K8212	Semester -IV
Credits	4	Subject type-Core

Learning Objectives	
1	To develop computer aided drafting skill in 2D and 3D.
2	To familiarize with various software available for documentation, presentation and drawing purpose.
3	To understand the use of computer for graphical applications.
4	To introduce and use of various software's available for computer application in Architecture.

Learning Outcomes: Student will be able to	
1	Understand the use of computer as a tool for imagination and design.
2	Apply architectural presentation techniques using different software's.
3	Know how to use commands rather than what commands are.
4	Create 3D compositions and drafting plans.

Units	Contents
Unit I	Computer Aided Drawing (2D Composition) <ul style="list-style-type: none"> - Introduction of Auto CAD as drafting tool. - Basics of 2D drafting, Drawing simple objects, projections and plans etc. - Preparation of 2 dimensional drawing with dimensioning. - Creating layers, styles, Blocks, line types etc
Unit II	Computer Aided Architectural Modeling <ul style="list-style-type: none"> - Introduction to Auto cad 3D/Sketch up /3Dmax. - Drawing 3D standard solid models. - Drawing 3D planes and surfaces. - Complex 3D commands such as extrude/revolve, meshes and solids - Solid editing in 3D such as subtract - General introduction to rendering and light effects
Unit III	Computer aided presentation skills <ul style="list-style-type: none"> - Introduction of various software available for Architectural presentation. - Introduction to power point, Microsoft excel, Microsoft word
Unit IV	Animation/Walkthroughs

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. George Omura(1998).<i>Mastering Autocad</i>,Singapore,Tech publications. 2. Ted Boardman and Jercy Hubbell (1998).<i>Inside 3D studio Max2</i>, volume II,Modeling and Materials,New Delhi,G.C.Jain for techmedia. 3. Stephen Paul Jacobs(1991)<i>The CAD Design studio,3DModeling as a Fundamental Design Skill</i>,New York,McGraw-Hill,Inc. 4. Durvid Frey (1998)<i>Autocad 14</i>,New Delhi,BPB publications.
Reference Books	As required by subjects /topics in a particular semester.

Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Rendering drafting for Sem.III design .
2	Prepare digital drawings for Sem.III design portfolio.
3	Create 3D model.

History of Architecture-III

Subject Code	K8213	Semester -IV
Credits	3	Subject type-Core

Learning Objectives	
1	To gain knowledge of the development of architectural form with reference to style and character in the Indian context through the evolution of colonial Architecture in the country
2	To understand the Industrial era as evolving within specific contexts including aspects of social and political factors.
3	To gain knowledge of the development of architectural form with reference to technology, style and character in the Western World through the Industrial revolution and in the phases covering the Art and Craft , Art Nouveau styles

Learning Outcomes: Students will be able to	
1	Explore spatial and stylistic qualities associated with Colonial architecture.
2	Explain architecture as an outcome of various social, political and economic upheavals
3	Comprehend the condition of Industrial Revolution and its impact on architecture
4	Understand Art and Craft, Art Nouveau styles with reference to Industrial Revolution.

Units	Contents
Unit I	<p>Colonial Architecture in India</p> <ul style="list-style-type: none"> - Colonial Architecture under British, Portuguese and French with reference to industrial revolution and emergence of new materials and construction techniques. - Indian Colonial architecture-British: The styles and trends of architecture brought by British to India and their evolution – The impact of Indo-Sarcenic style on the British Architecture in India – The characteristics of British Colonial Architecture with examples from work of Edwin Lutyens. - The Impact of Portuguese architecture in India – The characteristics of Portuguese Colonial Architecture with examples from Goa-Bom Jesus Cathedral Complex-Old Goa. - The Impact of French Architecture in India – The characteristics of French Colonial Architecture with examples from Puducherry, Maheetc - The Impact of French Architecture in India – The characteristics of French Colonial Architecture with examples from Puducherry, Maheetc
Unit II	<p>Baroque Art, Rococo Art</p> <ul style="list-style-type: none"> - Roman Baroque churches: The central plan modified – St. Peters, Rome; - French Baroque: Versailles - English baroque – Sir Christopher Wren; - St. Paul’s London – Domestic Architecture in England. - Rococo Architecture – Interiors – hotels
Unit III	<p>Neo classical Art and Architecture</p> <ul style="list-style-type: none"> - Beginnings of modernity –Origin and development of Neo Classicism Structural Neo classicists: Laugier, Soufflot, Schinkel, Labrouste - Romantic Neo classicists: Ledoux, Boullée, Durand, Jefferson

Unit IV	<p>Industrial Revolution</p> <ul style="list-style-type: none"> - Causes, consequence and impact in Architecture – Urbanization in Europe and America- split of design education into architecture and engineering streams- Emergent new building / space types. Growing need for mass housing .Its influences in building, technology and modern building materials Steel, glass, RCC etc. Industrial exhibitions- Chicago School and skyscraper development. - Arts and Crafts in Europe and America : Morris, Webb - Art Nouveau: Opposition to industrial arts and production Horta, Van De Velde, Gaudi, Guimard, Mackintosh Hoffman, Olbrich- Wright’s early works
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Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. Kenneth Frampton, (1994) <i>Modern Architecture: A Critical History</i>. London, Thames & Hudson. 2. James C. Harle, (1994) <i>The Art and Architecture of the Indian Subcontinent</i>. Second Edition. Yale, Yale University Press. 3. Banister Fletcher, (1996) <i>A History of Architecture</i>. New York, Architectural Press, 4. Raeburn Micheal, (1988) <i>Architecture of the Western World</i>. England, Popular Press.
Reference Books:	<ol style="list-style-type: none"> 1. Hiraskar, (2009) <i>The Great Ages of World Architecture</i>. New Delhi, Dhanpat Rai Publications (P) Ltd, 16th Reprint. 2. Christian Norburg-Schulz,(1993) <i>Meaning in Western Architecture</i>. Rizzoli, Revised edition, 3. Ed.HenriStierlin,(2002) <i>Architecture of the world- Baroque</i>. ISBN 3-8228-9300-5.Germany, BenediktTaschenVerlagGmbtt
Websites:	<p>www.culturalindia.net › Indian Architecture www.britannica.com/EBchecked/...architecture/.../Baroque-and-Rococo www.greatbuildings.com/types/styles/neo-classical.html https://thearchiblog.wordpress.com/.../impact-of-industrial-revolution http://www.quora.com/What-is-impact-of-the-Industrial-Revolution-on-nineteenth-century-architecture</p>
Journals:	<p>JSAH-Society of Architectural Historians (www.sah.org/publications-and-research/jsah) Architectural Heritage-Edinburgh University Press (www.euppublishing.com/journal/arch) Architectural History (journal.eahn.org/)</p>

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Theory paper	

Assignments	
1	Study of Colonial Architecture in India with literature survey
2	Analysis of various Architecture and Art styles studied and their development
3	Report based on field study.

Surveying & Leveling

Subject Code	K8214	Semester -IV
Credits	4	Subject type-Core

Learning Objectives	
1	To understand various land forms.
2	To introduce surveying as a method to explain land form and its utility in site planning.
3	To acquaint students with the physical surveying and levelling work in order to, Measure and document built and non-built spaces.
4	To prepare and interpret of Base Map for Architectural Design Projects.
5	To read and interpret various forms of cartographic presentation.

Learning Outcomes: Students will be able to	
1	Understand importance of land forms and topography and its significance in site planning /Design.
2	Calculate area of a site / plot.
3	Discuss slope of land for site planning.
4	Design services and buildings on sloping terrain

Units	Contents
Unit I	<ul style="list-style-type: none"> - Introduction to surveying and survey equipments, understanding land topography and its relevance in Architecture. - Methods of Surveying: Chain and Compass, Plane Table Survey, computation of areas
Unit II	<ul style="list-style-type: none"> - Methods of Levelling: Contour Survey, Use of Theodolite. - Use of electronic equipment like EDM, Total Station etc.
Unit III	<ul style="list-style-type: none"> - Introduction to remote sensing and aerial photographic surveying etc. - (Electronic Total Station) ETS Survey - Study and analysis of Topo-sheet

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. N.N. Basak ,(2004) <i>Surveying and Levelling</i> , New Delhi ,Tata Mcgraw Hill, 2. Kanetkar, T.P and Kulkarni, S.V (2013) <i>Surveying and Leveling</i>. Pune Vidyarthi Pune. 3. R.Subramanian (2012) <i>Surveying and Leveling</i>Roorkee,Cyber TechPublication.
Reference Books:	<ol style="list-style-type: none"> 1. David Clerk, Surveying Vol -I & II, 2. Dr. K.R. Arora, Surveying Vol -I & II, 3. S.K. Duggal, Fundamentals of Surveying Milton.O.Schimidit.
Websites:	<p>www.aboutcivil.org, www.cambridge.org, www.civilprojectsonline.com</p>
Journals:	<p>International Organization of Scientific Research (IOSR) IOP Science (Institute of Physics), American Journal of Engineering Research (AJER)</p>

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	To measure plot by linear method and determine the area.
2	To measure the contour plot and work out the site sections to understand levels and slopes.
3	To prepare small report with presentation of various equipments used in surveying and leveling
4	Measurement of plot by using different methods. (Equipments, plot selection can be done by the student and approved by instructor
5	To measure the live plot by using chain & compass, plane table survey, and prepare drawing for the area calculation
6	Survey of a given area of city road to understand slope, road details by using chain & compass, plane table survey .submission will in the form of drawings and digital presentation
7	Report on topics related to remote sensing and aerial photographic survey.

Building Services-II

Subject Code	K8215	Semester -IV
Credits	3	Subject type-Core

Learning Objectives	
1	To Study basics of electricity and wiring systems within domestic and commercial buildings.
2	To Study fundamentals of lighting and lighting design.
3	To familiarize the students with the fundamentals of acoustics and principles in designing various built environment

Learning Outcomes: Student will be able to	
1	Understand the basics of Electricity and wiring system
2	Understand various fundamentals of Lighting and Lighting design
3	Learn and evaluate fundamentals of acoustics and its applications in buildings.

Units	Contents
Unit I	Electrical Services. <ul style="list-style-type: none"> - Different wiring systems, fuses and MCBs, electrical fittings and appliances. Detailed layout of electrical services in residences
Unit II	Daylighting <ul style="list-style-type: none"> - Day lighting, sky condition, daylight availability graph, sky condition square. - Luminance levels for various sky conditions as a function of solar altitude, daylight factor, daylight factor standards, components of daylight factor, functional objectives of daylight, - Site criteria, building configuration, building orientation. - Day light apertures, glare control, shading devices- external and internal, measurement of day lighting
Unit III	Illumination (Artificial lighting) <ul style="list-style-type: none"> - Light radiation, its unit, laws of illumination, types of illumination schemes –direct, semi direct, diffused lighting and their design consideration - Light sources, various types of lamps and their characteristics - Types of luminaries for interior and exterior - Exterior lighting for monuments, gardens, fountains, sculptures etc
Unit IV	Acoustics <ul style="list-style-type: none"> - Frequency range of Audible sound. - Propagation of sound, sound reflection, diffusion, diffraction, sounds insulation. - Echo, Reverberation and Doppler effect. - Sound absorption, absorbing materials, their classification and application. Sound Reflection and reflecting materials, their classification and application. - Space layout consideration and Buffer zones - Noise and Noise control Noise criteria curves, noise from ventilation and AC systems. - Floor and ceiling construction for noise insulation. - Floating floors, outdoor barriers for noise Control. - At least one live case study in detail of acoustical treatment of

	<ul style="list-style-type: none"> - Auditorium, Lecture halls/Conference hall (any performing space) - Acoustical defects and remedies.
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Learning Resources	
Text Books:	
Reference Books:	1. E.P. Ambrose,(1968) <i>Electric Heating</i> . New York, John Wiley & Sons Inc. 2. Philips,(1964) <i>Lighting in Architectural Design</i> . New York, McGraw Hill. 3. R. G. Hopkenson& J. D. Kay, (1969) <i>The lighting of Buildings</i> , London, Faber& Faber. 4. National Building Code of India, 2005 (NBC 2005)
Websites:	www.slideshare.net/haroldtaylor1113/9-acoustics-sound-and-noise-control https://www.scribd.com/doc/59706240
Journals:	Building Services Engineering Research and Technology (bse.sagepub.com) Energy and buildings-Journal-Elsevier (www.journals.elsevier.com/energy-and-buildings/) Technical journals- CIBSE-(www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Theory paper	

Assignments(Any 2)	
1	Design electrical layout for a low or medium size building.(an individual /independent unit)
2	Layout of acoustical space with reverberation time calculations
3	Daylight Calculation in medium sized space.

Elective - II

Subject Code	K8216	Semester IV
Credits	2	Subject type-Elective

Learning Objectives	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

Learning Outcomes: student will be able to	
1	Engage in systematic self study of topic they feel interested in.

Students can select one elective from the following list	
1	Passive Design Principles (SBDP) <ul style="list-style-type: none"> - Meaning ,Need of Passive Cooling - Principles of Passive Cooling - Passive Cooling in Different Climatic zones - Case studies
2	Seminar –I (Design Philosophies of Master Architects) <ul style="list-style-type: none"> - Independent study and documentation of architectural and allied subjects by individual student along with oral and visual presentation. - The seminar shall be a research paper on a topic related to Architecture.
3	Human settlements <ul style="list-style-type: none"> - Origin and growth of human settlement. - Role of River Banks in growth of human settlement. - Study of ancient Indian settlements like Mohenjodaro, Taxila, Nalanda. - Study of ancient Indian cave settlements of Ajanta, Ellora, Elephanta. - Ancient texts and treatises on settlement and area planning in India. - Historical survey of the city as an expression of the vitality of a civilization. - Human settlements during ancient medieval and modern periods in and India, and other parts of the world. - Characteristics of human settlements built by Hindu and Islamic Rulers in India
4	Communication skill/public speaking <ul style="list-style-type: none"> - Basic principles and Benefits of Better Communication, Communication Theory, Organizing Thoughts, Valuing People, Choosing Appropriate Words, Using Non Verbal Behaviors (Body Language, Voice Inflection) - Conducting Meetings, Giving Presentations, Writing for Business, Writing Letters, Memos and minutes, Writing Reports and reviews, Using Visuals, Interviewing and facing interviews. - English usage, grammar and composition, learning to listen and speak correctly (One to one communication, on the telephone, Group discussions) - Basic knowledge of effective use of ms word and excel and power point. - Business Etiquettes: Professional Image, Introductions and Greetings, Networking Manners, General, Workplace Manners, Life on the Cube Farm, Interacting With Superiors, Manager's Manners, Business Meetings,

	Business Gifts, Business Cards, Telephone Manners, Cell Phone Etiquette, E-Mail Etiquette, Gender-Free Etiquette, Business Dining, Avoiding Social Blunders When Abroad, Dealing with Angry Customers
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Assessment		Marks
IA	Internal Assessment	100
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	There is no 'University Examination' for this subjects	

Semester – V

Architectural Design -V

Subject Code	K8301	Semester -V
Credits	8	Subject type-Core

Learning Objectives	
1	To understand and reflect 'culture as maker of space'

Learning Outcomes: Students will be able to	
1	Develop analytical skill set for spatial design of built spaces
2	Synthesize and translate analytical understanding into Architectural Design

Units	Contents
Unit I	Research and analysis of community living with examples.
Unit II	Study of theories on neighborhood planning concepts, community living, campus planning principles etc.
Unit III	It can be a small eskii project like a club house, small community hall, badminton court.

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Bhatt V. & Seniver P., (1990), <i>Contemporary Indian Architecture: After The Masters</i>, Ahmedabad, USA, Mapin Publishing Pvt. LTD. 2. Kanvinde A. P. & Miller J. H., (1969), <i>Campus Design in India: Experience of a Developing Nation</i>, Jostens/American Yearbook Company 3. Mehta J., (2011) <i>Rethinking Modernity</i>, New Delhi, India, Niyogi Books 4. Pressman A., <i>Design Architecture the elements of Process</i>, USA, Routledge 5. Pandya Y., (2005) <i>Concepts of Space in Traditional Indian Architecture</i>, India, New Jersey, Mapin Publishing. 6. Salvadori M., & Robert H., (1975), <i>Structure in architecture: the building of buildings</i>, Cornell University, Prentice-Hall 7. Steele J., Doshi B.V., (1998) <i>The complete architecture of Balkrishna Doshi: rethinking modernism for the developing world</i>, India, Super Book House 8. Unwin S. (4th Ed), <i>Analysing Architecture</i>, Canada, Routledge
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Design Project demonstrating principles of community living, neighborhood planning etc. on any one of the following - Group Housing, High-end residential building, housing for economically weaker sections, Community Housing etc. –

	Drawing portfolio and model.
2	Design Project on any one of the following – Club House, Community Hall, Sports Club etc. which can be an extension of the projects mentioned above - Drawing portfolio and model.

Building Construction and Materials-V

Subject Code	K8302	Semester-V
Credits	6	Subject type-Core

Learning Objectives	
1	To introduce construction of building components in Reinforced Cement Concrete.
2	To introduce water proofing, insulation & protection systems and their methods of construction
3	To explain the concept of curtain wall and its architectural relevance.

Learning outcomes: Student will be able to	
1	Understand different foundation systems with respect to site and building character
2	Explore special construction techniques of curtain wall and design integration.
3	Become knowledgeable of alternative building materials used in construction

Units	Contents
Unit I	Foundation : <ul style="list-style-type: none"> - Concept of bulb of pressure and its significance for site investigation. - Introduction to relevance of soil mechanics in foundation design - Soil types & its behavior under different loading conditions
Unit II	Types Of Foundation <ul style="list-style-type: none"> - Mass concrete strip foundation. - Foundation for brick piers, entrance steps, compound walls etc. - Foundation on sloping site. - Foundation for point load. - Isolated R.C.C. footing for columns - Combined R.C.C. footing - Cantilever R.C.C .footing & eccentric footing - Foundation on weak strata. - Raft Foundation. - Pile Foundation
Unit III	Foundation and D.P.C. <ul style="list-style-type: none"> - Damp proof course treatment using rigid & flexible treatment - Brick on edge - Rough Shahabad stone - Bitumen sheets
Unit IV	Misc. Constructions : <ul style="list-style-type: none"> - Construction Details of Curtain Walls and Structural Glazing Including External Fixing and Cladding Details. Special Construction: <ul style="list-style-type: none"> - Basement Construction, Water Proofing details, etc. (Sketches, notes etc.) - Shoring and Underpinning - Flying, raking & dead shoring - Wall, Jack and mega pile, needle & pile, column underpinning

Unit V	Study of Materials <ul style="list-style-type: none"> - R.C.C. end connection details.(beam and column. Slab and beam etc.) - Reinforcement. - Fly ash brick, Stabilized earth block, Rammed earth block, Ferrocete, Concrete debri block. - Timbering & shuttering for French excavation - Glass
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Learning Resources	
Text Books:	1. M.S.Shetty(1986) <i>Concrete Technology</i> New Delhi, S.Chand&Co.ltd.
Reference Books:	1. J. S. Foster, Roger Greeno(2007). <i>Mitchell's Structure & Fabric: Part 2</i> .New York,Taylor and Francis group. 2. Mörsch, Emil (1909). <i>Concrete-steel Construction(Der Eisenbetonbau)</i> .New York, The Engineering News Publishing Company.
Websites:	www.slideshare.net/mvm2594/concrete-technology-12587295
Journals:	Journal of construction engineering, technology stmjournals.com/index.php?journal=jocetm Master builder -construction magazine, construction news(www.masterbuilder.co.in)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
2	Field reports and Market survey of building technology topics.
3	Proposals of different design in aluminum door and window for prescribed projects. (Under discretion of the subject faculty).

Theory of Structure -V

Subject Code	K8303	Semester-V
Credits	2	Subject type-Core

Learning Objectives	
1	To understand basic structural concepts in steel design.
2	To understand behavior of steel as a structural materials.
3	To understand fundamentals of steel structure.

Learning Outcomes: Student will be able to	
1	Develop understanding of basic requirements of steel structure
2	Develop understanding of behavior of use of steel structures
3	Explain importance of types of steel connections and jointing

Units	Contents
	Steel design (working stress and limit state both are acceptable – IS: 800)
Unit I	Sloping roof system - truss, loads acting on truss, design of purlin (working stress or limit state both shall be acceptable), analysis of truss using method of joints, identifying ties and struts, design of tension and compression members.
Unit II	Connections - Riveted, welded bolted connections, their strength. Explain single and double shear (no calculations, no zigzag riveting). Finding length of weld and arranging it along member edges
Unit III	Design of steel beams
Unit IV	Design of steel columns - (Compression members) single and built in (Introducing lacing and battening. No calculations for lacing and battening design) - Introduction to masonry structures and timber structural members. (no numericals)

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. Negi L.S (2008)<i>Design of Steel Structures</i>.New Delhi,Tata McGraw-Hill Publishing company limited. 2. Bhavikatti S.S.(2009)<i>Design of Steel Structures</i>.I.K. International publishing house. 3. Vazirani V. N. &Ratwani M. M. &Mehra H.(2012)<i>Analysis and Design of Steel Structures</i>.New Delhi,Khanna Publishers.
Reference Books:	<ol style="list-style-type: none"> 1. Mckay J.K.<i>The construction of buildings, vol- IV, 4th ed. (metric), preparations steel RCC fire protection.</i> 2. Ed Ownens, G.W. Knowles,P.R. Dowling. <i>Steel designers manual Vththe steel construction institute.</i> 3. Iyengar K.T.S.&Viswanathan C.S.(2003)<i>Torsteel design handbook for reinforced concrete members with limit state design</i>.New Delhi,Tata McGraw-Hill Publishing company limited. 4. Negi L.S.(2002)<i>Design of steel structures 2nd ed</i>.NewDelhi,Tata McGraw-Hill Publishing company limited. 5. Karve S.R. & Shah V. L.(2014)<i>Structural design databook steel structures according to IS 800-1984</i>.Pune,Structures Publication.

	<p>6. Vazirani V. N. &Ratwani M. M. &Mehra H. (2012)<i>Steel structure design and analysis</i>.New Delhi,Khanna Publishers.</p> <p>7. Habermann S.S.<i>Steel construction manual</i>.International Certification.</p> <p>8. AISC<i>Seismic provisions for structural steel buildings april 15th 1997</i>.American society of plant physiologists.</p> <p>9. RamamruthamS.&Narayanan R.(1997)<i>Design of steel structure</i>.New Delhi,Dhanpat Rai Publishing.</p>
Websites:	www.bis.org.in
Journals:	IS 800-2007

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Design of an industrial building, show column locations for given plan area, determine type of truss, design of purlin, purlin-truss connection detail, analysis of any three joints of truss, design of tension member with rivet/weld/bolt, design of compression member, design of columns (built in) supporting the trusses. Drawings and schedule

Working Drawing-I

Subject Code	K8304	Semester -V
Credits	5	Subject type-Core

Learning Objectives	
1	To understand and prepare working drawings necessary for construction/execution of buildings on site.
2	To make student understand how to read “Working drawings” on site

Learning Outcomes: Students will be able to	
1	Prepare working drawings for load bearing structure.
2	Prepare Detailed drawings such as doors, windows, toilets, kitchen, flooring etc.
3	Prepare drawing which are readable for all agencies which are involved in execution of the project.

Units	Contents
Unit I	Introduction to WD, their significance, study of Example of Working Drawings, site visit
Unit II	Translating design into working drawing of entire project.
Unit III	Drawing showing construction details.
Unit IV	Details of toilets, doors, windows etc

Learning Resources	
Text Books:	
Reference Books:	1. Wakita, Osamu A., Richard M. Linde, and Nagy R. Bakhom (2011). "The Professional Practice Of Architectural Working Drawings" 2. Drawings from ISO certified architect office
Websites:	
Journals:	Gawne, Eleanor. "Cataloguing architectural drawings." Journal of the Society of Archivists 24.2 (2003): 175-187

Assessment	Marks
I.A.	40
Internal Assessment	
	Refer To ‘Rule number 6, sub point 6.2.2.’
U.E.	60
University Examination	
	Assignments or portfolios based on entire syllabus as mentioned below.

Assignments	
1	Site visit report, Common project assignment.
2	Assignment of Time bound working studio assignment.
3	A portfolio of working drawings where student selects their own design.

History of Architecture-IV

Subject Code	K8305	Semester -V
Credits	3	Subject type-Core

Learning Objectives	
1	To introduce the idea of modernity and demonstrate its impact in the realm of Architecture.
2	To study modern architecture as evolving from specific aspects of modernity industrialization, urbanization, material development, modern art.
3	To study in detail different post modern and contemporary directions in World Architecture
4	To study quest for Indianness in architecture of India from the end of colonial rule to contemporary period

Learning Outcomes: student will be able to	
1	Acquire knowledge of the development of architectural form with reference to technology, materials, style and character of the decades of modernism, post modernism and contemporary architecture and architects.
2	Obtain an overall understanding of the architectural developments of Architecture of post-colonial India

Units	Contents
Unit I	<p>Modernism</p> <ul style="list-style-type: none"> - Introduction to Modern Architecture. <p>Isms in Art and Architecture</p> <ul style="list-style-type: none"> - Adolf Loos and critique of ornamentation- Raumplan: Peter Behrens-Werkbund. Expressionism: Mendelsohn, Taut, Polzeig- Futurism-Constructivism, Cubism-Suprematism- De-Stijl. Bauhaus- Gropius, Meyer and Mies. Bauhaus School, Chicago School of Architecture and Taliesin School of Architecture – Great masters like Louis Sullivan, Frank Lloyd Wright <p>International Style</p> <ul style="list-style-type: none"> - Post WW II developments and spread of international style –works of Corbusier:- Brasilia, Unite - Works of later modernists: Louis Kahn, Paul Rudolph, Eero Saarinen, Philip Johnson
Unit II	<p>Post Modernism</p> <ul style="list-style-type: none"> - Critiquing Modernism - Brutalism- projects of Smithsons and Aldo Van Eyck – writing of Jane Jacobs, Robert Venturi, Aldo Rossi and Christopher Alexander - Deconstructivism –Critical regionalism - Innovation and ideas of Archigram – post modern architects like Peter Cook, Paolo Soleri, Robert Venturi - Contemporary architects: Norman Foster, Richard Rogers, James Sterling, Peter Eisenman, Renzo Piano, Daniel leibskind, Zahahadid, Frank O Gehry, Santiago Calatrava, , Rem koolhaas
Unit III	<p>Post Colonial Architecture in India and any two examples across the globe</p> <ul style="list-style-type: none"> - Architectural debates associated with nation formation– early modernist architecture-

	- Post-independence city planning: Chandigarh and Bhuvanesar- influences on post-independence architects- Architecture of Kanvinde, Raje, Doshi, Correa, Nari Gandhi, Raj Rewal.
Unit IV	Master Architects influenced by Vernacular/Regional Architecture of India

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Kenneth Frampton, (1994) <i>Modern Architecture: A Critical History</i>. London, Thames & Hudson. 2. Kenneth Frampton, Richard Ingersoll, (2000) <i>World Architecture-A Critical Mosaic 1900-2000 Vol 1</i>. New York, China Architecture and Building Press. 3. Manfredo Tafuri, (1980) <i>Modern Architecture</i>. New York, Harry N. Abrams Inc. 4. William Jr. Curtis, (1988) Balkrishna Doshi, <i>An Architecture for India</i>. New York, Rizzoli Publication. James Steele, (1985) <i>Hassan Fathy</i>. London, Academy Editions. 5. Sandra Forty, (2004) <i>Architecture</i>. Rochester, Grange books 6. Andreas C. Papadakis (1991) <i>A spirit in Architecture</i>, London
Websites:	www.historiasztuki.com.pl/ARCHWSP-POSTMODERNIZ www.modern-architect.com http://www.quora.com/What-are-the-main-differences-of-modern-and-post-modern-architecture http://www.arthistoryarchive.com/arthistory/architecture/Architecture-UrbanCactus.html
Journals:	JSAH-Society of Architectural Historians (www.sah.org/publications-and-research/jsah) Architectural Heritage-Edinburgh University Press(www.euppublishing.com/journal/arch)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
Note	Based on the Assignments listed below with continuous assessment and attendance scrutiny. The final presentation in standard specified Portfolio with all written reports and graphical representations (sketches, pictures)
1	Analytical study of Post-Colonial Architecture in India with literature survey
2	Power point Presentation and discussion of Modern, Post modern, Contemporary World Architects with references to their styles, designs, technologies, materials and directions
3	Critical Analysis through book /literature survey of various architects and their buildings with relevance to vernacular architecture of India
4	Report based on field study.
5	Model making.

Specification Writing

Subject Code	K8306	Semester -V
Credits	2	Subject type-Core

Learning Objectives	
1	To develop skill of writing specifications for materials and works.

Learning Outcomes: students will be able to	
1	Write specifications with reference to building trades, materials, workmanship and performance of different items of work
2	Discuss specifications as integral part of contract document for building projects

Units	Contents
Unit I	<ul style="list-style-type: none"> - Specifications as part of contract document, definition, need and importance, its relationship with working drawings, bill of quantities and Schedule of rates. - Types of specifications, open, closed, restricted, prescriptive, performance based, or combination of above types. Use of manufacturers guide etc. - Specification writing method to include master list, sectional formats, page formats, general material items, tests, performance, mode of measurements etc
Unit II	<ul style="list-style-type: none"> - Methodology of writing detailed specifications including methods and forms of writing descriptive notes on materials and workmanship based on working drawings. - Collection of catalogues and technical information on various materials, products and specialized items. - Preparation of checklist for writing detailed specifications
Unit III	<ul style="list-style-type: none"> - Study of different building trades, their scope and contents. - Introduction to writing specifications for building services and checklist for services such as Water Supply, Drainage, Electrical and HVAC installations. - Writing specifications of a previous design project in full or part as final assignment

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. S. Patil (2013) <i>Civil Engineering Contracts and Estimate</i>. Anand. Orient Blackswan, Bangalore 2. B.N.Datta (2011) <i>Estimation and Quantity Surveying</i>, UBS Publishers & Distributors Ltd. Mumbai.
Reference Books:	<ol style="list-style-type: none"> 1. SP 27 (1987) <i>Handbook of Method of Measurement of Buildings Works</i>, Bureau of Indian Standards (BIS) 2. [CED 44: <i>Methods of Measurement of Works of Civil Engineering</i>] (first revision-2003) Bureau of India Standards. 3. Willis, C. & A. Willis (1997) <i>Specification writing for architects and surveyors</i>, Blackwell Science, United Kingdom
Websites:	www.training@theNBS.com(National Building Specifications) www.ncarb.org
Journals:	National Council of Architectural Registration Boards(N.C.A.R.B) - See more at: http://www.ncarb.org/en/About-NCARB.aspx#sthash.bpyDoY2q.dpuf International Cost Estimating and Analysis Association (ICEAA)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper.	

Building Services-III

Subject Code	K8307	Semester -V
Credits	2	Subject type-Core

Learning Objectives	
1	To expose students to the science behind HVAC system.
2	To familiarize students with the various air- conditioning systems and their applications
3	To study various aspects of Natural Ventilation

Learning Outcomes: student will be able to	
1	Acquire knowledge of various air conditioning systems and their applications.
2	Address various issues in design of HVAC system
3	Understand various issues in natural ventilation systems in buildings

Units	Contents
Unit I	HVAC <ul style="list-style-type: none"> - Air distribution systems, ducts and ducting layout. - Costing data and space requirements. Integration of AC systems in Design. - Principles of Psychometrics and heat transfer
Unit II	Components of HVAC <ul style="list-style-type: none"> - Unit AC's, Central AC's split AC's. - Components of AC system such as chilling plant, cooling towers, air handling units, calculation of AC load. - Water consumption for AC
Unit III	Ventilation of buildings <ul style="list-style-type: none"> - Natural ventilation (passive.) - Ventilation functions and requirements. - Physical mechanism of ventilation. - Design factors affecting ventilation
Unit IV	Mechanical ventilation (active) <ul style="list-style-type: none"> - Need of mechanical ventilation a) Forced ventilation – Exhaust fans, Axial flow fans, Blowers for industrial ventilation. b) Introduction to Air conditioning, heating and cooling

Learning Resources	
Text Books:	1. Benjamin Stein and John Renolds.(2006) <i>Mechanical and Electrical Equipment for Building</i> , New York, John Wiley and Sons.
Reference Books:	1. Vasisth K.(2011) <i>Waste management</i> New Delhi, Essential books. 2. National Building Code of India, 2005 (NBC 2005)
Websites:	http://bst1.cityu.edu.hk/e-learning/
Journals:	Building Services Engineering Research and Technology (bse.sagepub.com) Energy and buildings-Journal-Elsevier (www.journals.elsevier.com/energy-and-buildings/) Technical journals- CIBSE-(www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper	

Elective- III

Subject Code	K8308	Semester IV
Credits	2	Subject type-Elective

Learning Objectives	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

Learning Outcomes: Student will be able to	
1	Engage in systematic self study of topic they feel interested in.

Students can select one elective from the following list	
1	<p>Barrier Free Architecture</p> <ul style="list-style-type: none"> - Types of disabilities and its implications in Architecture, barrier free environment, access- provisions to facilities and amenities. - Typical barrier problems of the physically challenged people-parking, approaches to buildings travel within buildings etc. - Special design considerations in residential buildings, congregational buildings like auditoriums, theatres, studios, transport terminals etc, Institutional buildings, outdoor appurtenances, garden – parks etc. - Study of norms set by Central Government
2	<p>Appropriate technology</p> <ul style="list-style-type: none"> - Introduction to the concept of Appropriate technology and services suitable in Indian context for both rural and urban application - Study of theoretical and practical aspects of innovative /alternative materials and construction techniques developed in recent past. - Mud wall, suitability of soil for mud walls - Waffle and daub walls, Rammed earth walls, adobe walls - Walls, vaults using soil cement, compressed mud blocks, Nubian arch roof - Use of Bamboo as material its properties ,available in country - Burnt clay tile roofing, ferro cement roofing units, doubly curved tile roofing
3	<p>Contemporary Design Theory(History and Design)</p> <ul style="list-style-type: none"> - Detail study and analysis of styles of contemporary Indian and foreign Architects - Study of spatial order, structural, constructional and material order, manner of articulation, symbols, and meanings as these evolved in time and space. - Comparative study of building typologies in vernacular and architecture in modern period
4	<p>Seminar II</p> <ul style="list-style-type: none"> - Independent study and documentation of architectural and allied subjects by individual student alongwith oral and visual presentation. - The seminar shall be a research paper on a topic related to Architecture

Assessment		Marks
I.A.	Internal Assessment	100
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	There is no 'University Examination' for this subjects	

Semester – VI

Architectural Design -VI

Subject Code	K8309	Semester -VI
Credits	8	Subject type-Core

Learning Objectives	
1	To explore and demonstrate ‘technology and services as major determinants of Architectural form’ and understand co-relation between function, structure, services and form.

Learning Outcomes: Student will be able to	
1	Develop analytical skill set for understanding built and non-built spaces
2	Synthesize and translate the analytical understanding into Architectural Design

Units	Contents
Unit I	Research and Analysis of innovative technologies and materials prevailing in market, state of the art services and systems.
Unit II	Multi-functional public buildings like IT Complex, Hospitals, Commercial Centers, High Rise Structures
Unit III	Extension of the large project mentioned above e.g. Design of gymnasium, bank, departmental store, operation theatre, auditorium, etc.

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Bhatt V. & Seniver P., (1990), <i>Contemporary Indian Architecture: After The Masters</i>, Ahmedabad, USA, Mapin Publishing Pvt. LTD. 2. Kanvinde A. P. & Miller J. H., (1969), <i>Campus Design in India: Experience of a Developing Nation</i>, Jostens/American Yearbook Company 3. Mehta J., (2011) <i>Rethinking Modernity</i>, New Delhi, India, Niyogi Books 4. Pressman A., <i>Design Architecture the elements of Process</i>, USA, Routledge 5. Pandya Y., (2005) <i>Concepts of Space in Traditional Indian Architecture</i>, India, New Jersey, Mapin Publishing. 6. Salvadori M., & Robert H., (1975), <i>Structure in architecture: the building of buildings</i>, Cornell University, Prentice-Hall 7. Steele J., Doshi B.V., (1998) <i>The complete architecture of Balkrishna Doshi: rethinking modernism for the developing world</i>, India, Super Book House 8. Unwin S. (4th Ed), <i>Analysing Architecture</i>, Canada, Routledge
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Design project demonstrating integration of the building components and

	technology, services, vertical circulation, byelaws etc. on any one of the following – 3-star hotel, commercial complex, hospital, civic center, convention centre etc – Drawing portfolio and models
2	Design Project on any one of the following – gymnasium, bank, departmental store, operation theatre, auditorium, etc. - Drawing portfolio and models

Building Construction and Materials-VI

Subject Code	K8310	Semester -VI
Credits	6	Subject type-Core

Learning Objectives	
1	To introduce construction of building components in Reinforced Cement Concrete.
2	To introduce construction of building components in steel and its use in industrial construction
3	To introduce methods of the pre-engineered structures

Learning Outcomes: student will be able to	
1	Explore different R.C.C components of framed construction as well as special component construction.
2	Discuss different steel components and its construction
3	Understand concept of pre-engineered construction with respect to industrial construction

Units	Contents
Unit I	R.C.C. Framed Construction Element study <ul style="list-style-type: none"> - Principles and practices of R. C. Framed construction and its components - R. C. C. Footing for column, Isolated footing - R. C. C. Plinth beams and Plinth formation - R. C. C. Lintels and Chajja projections - R. C. C. Slab – one way, two way, single span and continuous spans - R. C. C. Beams – singly and doubly reinforced, single and continuous spans, cantilever beams - R. C. C. Columns
Unit II	R.C.C. Framed Construction Special Component study <ul style="list-style-type: none"> - R.C.C., Balconies, Canopies, fins, parapets - R.C.C. its potential and application - Details of junctions of slab and beam, slab-beam- column, primary, secondary beams - Study of form work construction - R.C.C. Staircase
Unit III	Steel Structures <ul style="list-style-type: none"> - Study of portal frames, its various types & connection details. - Study of Castellated Beam, Veradale girder, Portal Frames & Lattice Construction with - Connection details. - Medium span Roof Trusses with Sheet Cladding details & Rain Water Disposal details. - Introduction to framed steel structures using steel sections & steel decking
Unit IV	Industrial Building: <ul style="list-style-type: none"> - Study of constructional details for industrial buildings. - Details for lighting, Ventilation & Rain water disposal for industrial buildings. - Study of Machine foundation, gantry & high Strength flooring etc
Unit V	Study of Materials

	<ul style="list-style-type: none"> - Different cladding materials with fixing details. - Pre engineered structures. - Pre-stressed and post-tensioning methods pros and cons.
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Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. M.S.Shetty(1986)<i>Concrete Technology</i> New Delhi, S.Chand&Co.ltd. 2. J. S. Foster, Roger Greeno(2007)<i>Mitchell's Structure & Fabric: Part 2</i>.New York,Taylor and Francis group.
Reference Books:	<ol style="list-style-type: none"> 1. Gorenc, Tinyou, Syam(2005)<i>Steel Desinger's Handbook</i>. New Delhi,CBS Publishers and Distributors. 2. Ralph Monletta(1989)<i>Plastics in Architecture" – A guide to acrylic and Polycarbonate</i>.New York, Marcel Dekker Inc. 3. Jack M Landers(1983)<i>Construction Materials, Methods, Careers</i> USA,Good Heart - WilCox Company,Inc Publishers, Homewood, IL.
Websites:	www.slideshare.net/mvm2594/concrete-technology-12587295
Journals:	Journal of Construction Engineering, Technology stmjournals.com/index.php?journal=jocetm) Master Builder -Construction Magazine, construction News(www.masterbuilder.co.in)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
2	Field reports and Market survey of building technology topics.
3	Proposals of different design in industrial building for prescribed projects. (Under discretion of the subject faculty).

Theory of Structures-VI

Subject Code	K8311	Semester -IV
Credits	2	Subject type-Core

Learning Objectives	
1	To understand basic concepts for RCC foundations
2	To understand behavior of different soils and foundation choice
3	To understand different types of RCC footings

Learning Outcomes: student will be able to	
1	develop understanding of basic staircase design.
2	develop understanding of behaviour of footings
3	understand importance of prestressing structural elements

Units	Contents
Unit I	Staircases - Types based on supports, loads, design of simply supported doglegged staircase
Unit II	Soil types and foundations - Soil types and determining suitable foundation (only theory) : safe bearing capacity, shear failure, excessive settlement, differential settlement, trial pits, need of pile foundation, need of raft foundation. - Design of rcc isolated pad footing. Explain (not design)rcc details of isolated circular and sloped footing, eccentric footing. - Necessity of combined footing, behaviour of combined footing, rcc details. (no design problem)
Unit III	Foundation for steel columns - Theory.(no numerical)
Unit IV	Prestressing - Introduction to prestressed structural elements, procedures, advantages, disadvantages, simple numerical beam problem to explain the concept of prestressing

Learning Resources	
Text Books:	1. Shah H.J. (2014) <i>Design of RCC structures part II</i> . Anand, Charotar publishing house.
Reference Books:	1. Dr.Shah V.L.& Dr. Karve S.R.(2014) <i>RCC Theory and Design</i> .Pune,Structures Publishers. 2. Shah H.J.(2013) <i>Design of Reinforced Concrete Structures</i> .Anand,Charotar Publishing house. 3. Sinha S.N.(2014) <i>Reinforced Concrete Design</i> .New Delhi,Tata McGraw-Hill Publishing company limited.
Websites:	www.bis.org.in www.nptel.ac.in
Journals:	IS: 456-2000 code of practice for plain and reinforced concrete SP:16-Design aids for reinforced concrete

Assessment	Marks
I.A.	Internal Assessment
	40

	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Design of simply supported doglegged stair case, drawing and schedule
2	Design of isolated pad footing, drawing and schedule
3	Making a typical RCC structural drawing with column location, numbering, beams (identifying beams to be designed as simple/cantilever/continuous...slabs to be identified as one way/two way/cantilever/continuous...typical detail of each element and schedule – no design)
4	Photo documentation of various foundation problems and their solutions

Working Drawings -II

Subject Code	K8312	Semester -VI
Credits	4	Subject type-Core

Learning Objectives	
1	To understand and prepare advanced drawings necessary for construction/ execution of the buildings on site

Learning Outcomes: Student will be able to	
1	Prepare working drawings for RCC Framed structure
2	Prepare Detailed drawings such as OHWT, staircase, electrical layout, toilet details
3	Ability to coordinate with other consulting agencies involved in the project.

Units	Contents
Unit I	Preparation of working drawing for RCC structure
Unit II	Details
Unit III	Fieldwork: Setting of structure on Site

Learning Resources	
Text Books:	
Reference Books:	1.Wakita, Osamu A., Richard M. Linde, and Nagy R. Bakhoum (2011). "The Professional Practice Of Architectural Working Drawings
Websites:	
Journals:	Gawne, Eleanor. "Cataloguing architectural drawings." Journal of the Society of Archivists 24.2 (2003): 175-187

Assessment	Marks
I.A.	Internal Assessment
	Refer To 'Rule number 6, sub point 6.2.2.'
U.E.	University Examination
	Assignments or portfolios based on entire syllabus as mentioned below.

Assignment	
1	Common project
2	Field assignments
3	Individual design translated to working drawing portfolio with all details necessary for construction.

Landscape Architecture

Subject Code	K8313	Semester -VI
Credits	3	Subject type-Core

Learning Objectives	
1	To emphasis learning of architecture beyond building, in the outdoor environment and spaces
2	To introduce the role and importance of landscaping and site planning in enhancing and improving the quality of building environs, functionally and aesthetically.
3	To explain site and its context while designing of buildings
4	To use landscape elements to create and enhance exterior spaces and to achieve climatic control at the buildings and site level.

Learning Outcomes: Students will be able to	
1	Explore various aspects of site planning and relationship between built and openspaces
2	Understand role of landscape in architecture.
3	Design small scale landscape project using landscape elements.

Units	
Unit I	<p>Introduction to landscape architecture – Importance, need and scope</p> <p>Landscape Elements</p> <ul style="list-style-type: none"> - Plant element: Different aspects of - trees, shrubs, lawns, climbers, hedges, Indoor plants as elements. Basic idea about plants, plant selection, planting design and care of plants. Importance and use of NATIVE vegetation - Land element: Different aspects –soils, topography, levels, grading, earth forms, and foundations. - Water elements: Fountains, waterfalls, pools, cascades, channels, irrigation etc. - Architectural elements: sculptures, curbs, walls, steps, fence, etc
Unit II	<p>Historical and contemporary landscape practices and case studies</p> <p>Integration of indoor and outdoor spaces</p>
Unit III	<p>Climate</p> <ul style="list-style-type: none"> - Macro and microclimatic consideration in landscaping; effect on landscape and microclimate <p>Site analysis and planning</p> <ul style="list-style-type: none"> - Methodology and process of site study. Landform analysis, site analysis techniques. Importance of site planning for landscape design and architecture. <p>Principles of landscape design</p> <ul style="list-style-type: none"> - Aesthetical consideration
Unit IV	<p>Relation between built and open spaces</p> <p>Pedestrian and vehicular circulation</p> <p>Landscape construction details</p> <p>Services related to landscape</p> <ul style="list-style-type: none"> - Plumbing, water supply, electrical, sewage management

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Jellicoe, G. A., & Jellicoe, S. (1982). <i>The Landscape of Man: Shaping the Environment from Prehistory to the Present Day</i>: Van Nostrand Reinhold. 2. Simonds, J. O. (1998). <i>Landscape Architecture: A Manual of Site Planning and Design</i>: McGraw-Hill. 3. Booth, N. K., & Hiss, J. E. (2012). <i>Residential Landscape Architecture: Design Process for the Private Residence</i>: Prentice Hall. 4. Reid, G. W. (2007). <i>From Concept to Form in Landscape Design</i>: Wiley. 5. Robinette, G. O. (Ed.). (1983). <i>Landscape Planning for Energy Conservation</i>. NewYork: Van Nostrand Reinhold Company. 6. White, S., & Stein, J. A. (1993). <i>Building in the garden: the architecture of Joseph Allen Stein in India and California</i>: Oxford University Press. 7. Kanvinde, A., & Miller, H. J. (1969). <i>Campus Design in India: Experience of a Developing Nation</i>: Jostens/American Yearbook Company. 8. Lynch, K. (1984). <i>Site Planning</i> (Third ed.): M.I.T. Press
Websites:	
Journals:	Journal of landscape Architecture (LA)

Assessment	Marks
I.A.	Internal Assessment
	Refer To 'Rule number 6, sub point 6.2.2.'
U.E.	University Examination
	Assignments or portfolios based on entire syllabus as mentioned below.

Assignments	
1	Comprehensive landscape proposal(Drawing portfolio) <ol style="list-style-type: none"> a) One project for Functional and Aesthetic considerations, at residence level. (Especially landscape places like interiors, courtyards, terrace gardens, window landscaping etc.) b) One project for campus planning including vegetation, parking, road sections, footpaths, lighting etc.
2	Case studies of landscape project under consideration in the form of report

Estimation and Costing

Subject Code	K8314	Semester -VI
Credits	3	Subject type-Core

Learning Objectives	
1	To equip students with necessary technical knowledge for calculating estimates and detailed costing for small to medium projects with developing the skill of writing specifications for materials and item works.

Learning Outcomes: Students will be able to	
1	Compute quantities of various building items for simple load bearing structures and be acquainted with various types of Estimates including mode of measurements as adopted by I.S.1200.
2	Compute quantities and rate analysis of various building items of R.C.C. framed structure along with building services such as water supply, sanitation and drainage, electrical installations etc

Units	Contents
Unit I	Introduction, purpose of “Quantity Computation” i.e. estimating, types of estimates (preliminary, Detailed) - Study of I.S.-1200. - A small project in load bearing and R.C.C. frame construction or their part to work out quantities and to understand market rate of materials and labours.
Unit II	- Bill of quantities for single story structures - Load bearing construction system. - R.C.C. Frame construction system.
Unit III	- Methods of calculating quantities for building works - Preparation of Bill of Quantities (B.O.Q.) Mode of measurements of quantities. Market rates of labour and building materials. Labour requirement and norms for consumption of basic materials. - Schedule of rates
Unit IV	- Study of different agencies involved in construction e.g. CPWD, PWD, etc. - Rate analysis and cost index. - Study of rate of innovative building materials in the market. - General factors affecting the rate of an item .rate analysis for different components of construction. - Software for calculation of quantities of various building items

Learning Resources	
Text Books:	1. B. S. Patil(2006). Civil Engineering Contracts and Estimates (Third Edition), Orient Blackswan. 2. B.N.Datta, (2011) Estimation and quantity surveying
Reference Books:	1. SP 27 (1987): Handbook of Method of Measurement of 2. Buildings Works [CED 44: Methods of Measurement of Works of 3. Civil Engineering] (first revision-2003) Bureau of India Standards 4. Arthur J.Willls (1979). Specification writings for Architects and surveyor by. Published by Crosby Lockwood 5. National Building Code(N.B.C.)2005,Bureau of India Standards
Websites:	www.bdg.org. WDBG- National Institute of Sciences.(Cost Estimating)

	<i>www.cost -estimating.com</i>
Journals:	Specifications Consultants in Independent Practice (SCIP) International Cost Estimating and Analysis Association (ICEAA)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper	

Assignments	
	Exercises for IA
1	To work out the quantities of a small load bearing structure having area not more than 40 sqm.
2	To work out the quantities of items of construction work of load bearing and R.C.C. framed structure along with presentation
3	To prepare the list of items in construction and work out the quantities of items as directed by instructor

Building Services-IV

Subject Code	K8315	Semester -VI
Credits	2	Subject type-Core

Learning Objectives	
1	To study different high rise systems with respect to service core designs and building automation systems.
2	To familiarize the students with firefighting equipment and their installation
3	To familiarize students with water supply and sanitation systems in high rise
4	To study various aspects of vertical communication systems.

Learning Outcomes: Student will be able to	
1	Explore various services including core and building automation systems.
2	Understand fire safety, fire fighting, fire prevention and installations in buildings including codal requirements
3	Address various design issues of water supply and sanitation systems in high rise buildings.
4	Understand various systems of vertical communication

Units	Contents
Unit I	Advanced Building Services - Types of High Rise Buildings - Building Core Arrangements
Unit II	- Water distribution systems in High rise buildings- downfeed water distribution, pumped upfeed distribution, constant pressure upfeed, gravity downfeed system - Sanitation systems in High rise buildings- two pipe system, solvent system.
Unit III	- Vertical communication systems for high rise buildings-Types of Elevators, Sky lobby Elevator system, double- deck elevator system, Hydraulic Elevators
Unit IV	- Fire fighting in high rise buildings- Water fire suppression systems and other fire suppression systems, Fire detection systems - Codal provision and standards for Fire fighting
Unit V	- Building automation system

Learning Resources	
Text Books:	1. Benjamin Stein and John Renolds.(2006) <i>Mechanical and Electrical Equipment for Building</i> , New York, John Wiley and Sons.
Reference Books:	1. "Fire Safety: National Building Code of India 1983" published by Bureau of Indian Standards. 2. Andrew H Buchanan, (2001) <i>Design for fire safety</i> .New York,John Wiley & Sons Ltd 3. Yeang K.(2002) <i>Service cores details in building</i> . New York, John Wiley and sons. 4. National Building Code of India, 2005 (NBC 2005)
Websites:	http://www.slideshare.net/rdpatil65/fire-fighting-presentation http://www.powershow.com

Journals:	Building Services Engineering Research and Technology (bse.sagepub.com) Energy and buildings-Journal-Elsevier (www.journals.elsevier.com/energy-and-buildings/) Technical journals- CIBSE-(www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t)
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Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper	

Elective-IV

Subject Code	K8316	Semester IV
Credits	2	Subject type-Elective

Learning Objectives	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

Learning Outcomes; student will be able to	
1	Engage in systematic self study of topics they feel interested in.

Students can select one elective from the following list	
1	Architectural Journalism <ul style="list-style-type: none"> - Structure of architecture Journals - Writing Descriptive and analytical reports - Editing write ups, Photo Journalism. - Book reviews - Page compositions - The public process - Electronic media
2	Theatre /Film set Design <ul style="list-style-type: none"> - History of set and backdrop design for performance - Theme based design strategies - Period and modern sets, Technology applications
3	Green material/advanced material <ul style="list-style-type: none"> - Green material Selection, factors in selection, Resources to assist in determining materials appropriateness. - Material consideration when using the LEED rating program - Finishing materials for interior and exterior - Insulating materials :organic binders and bitumen and tar based materials like Bitumen, tar, emulsions, mastics, waterproofing items - Polymer sand polymer –based materials and components, polymer based building material for walls, pipes, sanitary-ware, glues and mastics - Metals in advanced building systems, steel cables, structural glazing and curtain walling - Light weight roofing materials :asbestos, galvanized iron, acrylic, polycarbonate
4	Visual Communication <ul style="list-style-type: none"> - Visual communication in architecture - Non verbal communication –signs, symbols, metaphor. - General concepts of image and schema - Concept sketches, bubble Diagrams, Area Diagram - Exploring methods of presentation for design through photographs, ppt, sketching, rendering etc. - Built forms and environment, Way finding in architecture and space between environment

Assessment		Marks
I.A.	Internal Assessment	100
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	There is no 'University Examination' for this subjects	

Semester – VII

Architectural Design -VII

Subject Code	K8401	Semester -VII
Credits	10	Subject type-Core

Learning Objectives	
1	To learn different visual mapping methods in architecture
2	To understand and analyze the urban context and respond through design of a public space /public building

Learning Outcomes: Student will be able to	
1	Learn methods of mapping data
2	Develop analytical skills responsive to the broader socio-economic & physical context of the study area
3	Synthesize and translate analytical understanding into Architectural Design

Units	Contents
Unit I	Data Collection, Representation <ul style="list-style-type: none"> - Learning different methods of data collection, documentation and representation through mapping - Documenting the socio-economic & physical context of the study area, understanding character and distinctive features of the same. - Understanding of the legislative provisions including land-use, zoning, DCR& relevant acts as applicable to the study area.
Unit II	Data Analysis <ul style="list-style-type: none"> - Analyzing the available data to arrive at issues, concerns and design decisions based on methods like SWOT analysis. - Arriving at a design proposal and developing design brief based on the analysis
Unit III	Design Proposal <ul style="list-style-type: none"> - Design of a public space/building responsive to the context - site and people

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Alexander C., Ishikaw S., Silverstein M. & Jacobson, <i>A Pattern Language, Town, Buildings, Construction</i>, Oxford University Press 2. Alexander C., Ishikaw S., Silverstein M. & Jacobson, <i>A Timeless way of Buildings</i>, Oxford University Press 3. Bacon E. N., (1976), <i>Design of Cities</i> Revised Edition, USA, Penguin Books 4. Jain K. B., (2011), <i>Architecture Conceptual to the Manifest</i> 5. Lang J., (1994) <i>Urban Design: The American experience</i>, John Wiley & Sons, 6. Cullen G., (1971), <i>The Concise Townscape</i>, New York, USA, Architectural Press, Routledge. 7. Lang J. T. , Desai M. & Desai Madhavi, (1997) <i>Architecture and independence: the search for identity--India 1880 to 1980</i>, USA, Oxford University Press 8. Lynch K., (1960, 1990), <i>The Image of the City</i>,Massachusetts Institute of Technology Cambridge, Massachusetts, and London, England, The M.I.T. Press (20th Printime)

Websites:	Atre S., <i>Comprehensive Architecture + Urban Design Studio, Architecture And Context</i> California Polytechnic State University, San Luis Obispo College of Architecture & Environmental Design, From http://www.calpoly.edu/~arch/program/fifthyr/atre.pdf
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignment	
1	Data collection and analysis of urban fabric of selected site
2	Site responsive design demonstration of the following building typologies may be encouraged — residential, industrial, museums, libraries, transportation, institutional, hospitality buildings, recreational, any public activity spaces, etc. - Drawing portfolio and 3 - d model

Building Construction and Materials-VII

Subject Code	K8402	Semester-VII
Credits	4	Subject type-Core

Learning Objectives	
1	To introduce students to the advanced construction systems.
2	To introduce large scale roof constructions like stadiums, industrial buildings etc, and related materials.
3	To introduce types of swimming pool design and construction.
4	To introduce student to concepts of modular design and construction.

Learning outcomes: Student will be able to	
1	Understand various typologies and technologies of long span structures.
2	Understand various design and construction parameters of swimming pools.
3	Analyze modular concept of design and construction in large scale projects.
4	Explore sport stadiums, their field area and support space as well as building envelopes.

Units	Contents
Unit I	Long Span Structures <ul style="list-style-type: none"> • Shell structure like single curvature and double curvature etc. • Folded slab structure • Tension Structures like membrane, cable net and air supported etc. • Grid structure and skeletal like Space frames etc.
Unit II	Multi-basement <ul style="list-style-type: none"> - Soil bearing capacity and excavation techniques for basement. - Different uses of basement, it's planning criteria, Techniques of construction techniques like retaining wall, diaphragm wall, caissons, cofferdam etc. - Various services related to Basement like waterproofing, drainage, Ventilation, Ramps, elevators etc.
Unit III	Auditorium <ul style="list-style-type: none"> - Auditorium shape and size, seating arrangements. - Cone of vision, sightlines, stage and back stage design. - Acoustical design consideration, Noise and its criteria, sound defects etc. - Ancillary spaces like projection room, balcony, green rooms, orchestra pit etc. required for Auditorium. - Services related to Auditorium like fire protection and ventilation etc.
Unit IV	Modular coordination. <ul style="list-style-type: none"> • Precast and prefabricated building components used for roof, wall, interior and floor construction etc.
Unit V	Study of Materials <ul style="list-style-type: none"> - Study of modern building materials with respect to long span roof, modular system ,Acoustics ,basement etc.

Learning Resources	
Text Books:	1. T.D Ahuja and G.S. Birdie (1996) <i>Fundamentals of Building Construction</i> New Delhi, Dhanpat Rai Publishing Company Pvt. Ltd
Reference Books:	2. J. S. Foster, Roger Greeno(2007) <i>Mitchell's Structure & Fabric: Part 2.</i> New York,Taylor and Francis group. 3. Gorenc, Tinyou, Syam(2005) <i>Steel Designer's Handbook</i> New Delhi,CBS

	Publishers and Distributor. 4. Ralph Monletta (1989) <i>Plastics in Architecture</i> ” – A guide to acrylic and Polycarbonate. New York, Marcel Dekker Inc.
Websites:	http://roofhugger.com/ConstructionDetails.htm?utm_source=Come+See+Us+in+New+Orleans&utm_campaign=Hugger+News-January+2018&utm_medium=email`
Journals:	Journal of Construction Engineering, Technology stmjournals.com/index.php?journal=jocetm) Master Builder -Construction Magazine, Construction News(www.masterbuilder.co.in)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2’	
U.E.	University Examination	60
	Theory paper	

Theory of Structures -VII

Subject Code	K8403	Semester-VII
Credits	2	Subject type-Core

Learning Objectives	
1	To understand trends and challenges in contemporary building structural systems.
2	To understand complex building structures and large spans
3	To understand importance and need for structural modeling

Learning Outcomes :Student will be able to	
1	Develop connections between Design, Construction and Material.
2	Design Ground and First floor structures with R.C.C. and steel building with simple configuration
3	Apply software as tool for modeling structures

Units	Contents
Unit I	<ul style="list-style-type: none"> - Earthquake zoning, base shear, lateral forces. Introduction to IS: 1893 - Introduction to shear wall, structural behaviour, typical details. - Ductile detailing: introduction to IS: 13920, typical details of beams, columns, junctions
Unit II	<ul style="list-style-type: none"> - Introduction to flat slab (beamless). Major structural actions, behaviour and RCC details. - Introduction to plate girders, gantry girders, castellated girders. - Introduction to flitched beams.
Unit III	<ul style="list-style-type: none"> - Introduction to shell roofs. Behaviour, structural actions and rcc details of spherical dome. - Understanding space frame and space truss (3D elements, equilibrium conditions and concepts only) - Introduction to long span structures: arches, open web sections, bow string girders, typical details. - Modelling and analysis of structure on STAAD-Pro software.

Learning Resources	
Text Books:	<ol style="list-style-type: none"> 1. Sarma T.S. (2014) <i>STAAD Pro V8i for Beginners with Indian Examples</i>. Chennai, Notion Press. 2. Shah H.J.(2014)<i>Design of RCC Structures part II</i>.Anand,Charotar Publishing house.
Reference Books:	<ol style="list-style-type: none"> 1. Dr.Shah V.L.& Dr. Karve S.R.(2014)<i>Illustrated design of reinforced concrete buildings(design of G+3 storeyed office/residential building)</i>.Pune,Structures Publishers. 2. Negi L.S.&Jangid R.S.(2000)<i>Structural analysis</i>.New Delhi,Tata McGraw-Hill Publishing company limited.
Websites:	<p>www.nicee.org www.bis.org www.nptel.ac.in INSDAG website</p>
Journals:	IS :1893 and IS: 13920

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignment	
1	Sketching and explaining structural behaviour of above topics.
2	Case study of structural systems implemented by imminent architects in their projects
3	Modelling and analysis of simple structure on STAAD-Pro

Interior Design I

Subject Code	K8404	Semester -VII
Credits	4	Subject type-Core

Learning Objectives	
1	To make students understand various aspects of interior spaces
2	To make students understand qualities of interior spaces to develop skills in designing for functional and aesthetical meaningful interior spaces.

Learning Outcomes: Student will be able to	
1	Design interior spaces of buildings.
2	Design furniture with all necessary details.
3	Develop competence for working with various materials & construction techniques used in interior design

Units	Contents
Unit I	- Introduction to the field of interior design and various parameters. market survey of various interior materials
Unit II	- Market survey of various interior materials.
Unit III	- Case study of a small interior project. (100sq.m to 150 sq,m) Carpet area.
Unit IV	- A detailed design of the interior projects. (50sq.m to 100 sq,m) Carpet area.

Learning Resources	
Text Books:	1. John Coles & Naomi, (2007) The fundamentals of interior architecture/AVA Publishing SA.
Reference Books:	1. Mitcheil Beazley (2004), The new colour book/octopus publishing group ltd. 2. Julie Savill (2001), Good homes magazine(101 colour schemes that really works)/BBC World wide. 3. Elizabeth wilhide. (2007), Surface & Finish(Directory of materials for interiors) /Quadrille publishing Ltd. UK
Websites:	www.quadrille.co.in. www.theaid.in.
Journals:	Magazine published by IIID “Insite” International journal of interior architecture & spatial design.

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Study Example report with drawings & Studio based time bound Interior design project.
2	Report on survey of materials in market (This will be referred for UE examination)
3	Drawing portfolio comprising of Individual interior design layout, elevations,

	sections and views
4	Constructional drawing of various interior components and specification of the above interior finalized project.

Advance Landscape Architecture

Subject Code	K8405	Semester -VII
Credits	3	Subject type-Core

Learning Objectives	
1	To understand the complex issues related to landscape architecture and respond comprehending natural, man-made and social environment.
2	To understand various factors affecting landscape design at urban scale

Learning Outcomes: student will be able to	
1	Respond to complex issues related to landscape architecture at macro level
2	Understand influences of various factors on design of landscape at urban scale

Units	Contents
Unit I	Understanding advancements in Landscape Architecture -Terrace Gardens, Roof Gardens, Vertical Landscapes, etc. -Landscape for atriums -Innovative Landscape construction techniques.
Unit II	Understanding the process of site analysis and planning at macro level (involving complex issues such as physical, functional, environmental and socio-cultural) - Physical factors such as topography, geology, site features, hydrology, surrounding land-use, buildings and soil conditions - Environmental factors such as climate, existing flora and fauna - Socio-cultural such as existing use, structures of historic or religious importance if any , - Aesthetics such as views from and within site - Storm water management
Unit III	Understanding role of landscape for energy conservation -Role of vegetation -Role of water bodies -Role of land form -Effect on temperature, air movement, noise and pollution
Unit IV	Understanding the various factors affecting design and planning of urban open spaces and provide landscape solution for the same. - Physical Factor - Social Factors - Environmental Factors - Functional Aspects

Learning Resources	
Text Books:	-----
Reference Books:	<ol style="list-style-type: none"> 1. Jellicoe .G and Jellicoe. S (1987).The Landscape of Man, Thames and Hudson, London 2. Simonds. J. O. (1961). Landscape Architecture, The Shaping of Man's Natural Environment. F.W. Dodge Cooperation, London 3. Harris.C.W and Dine.N.T ; Time Saver Standards For Landscape Architecture, McGraw – Hill International Edition, Arch. Series

	<p>4. Starke .B and Simonds. J. O. (2013) Landscape Architecture: A Manual of Site Planning and Design. McGraw-Hill Professional</p> <p>5. Reid G. W: (1987) Landscape Graphics.</p> <p>6. Reid G. W: (1993) From Concept to Form: In Landscape Design. John Wiley & Sons .</p> <p>7. 7.Robinette, G.O (1977) Landscape planning for energy conservation. Environmental Design Press,Reston, VA</p>
Websites:	-----
Journals:	Journal of Landscape Architecture

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Case studies based on unit I
2	Assignment based on unit III
3	Case studies or readings based on unit IV
4	One large scale studio project based on unit II or IV

Urban Planning I

Subject Code	K8406	Semester -VII
Credits	3	Subject type-Core

Learning Objectives	
1	To introduce students to the basic concepts of Town and Urban Planning.
2	To understand the hierarchy of planning.
3	To understand the importance of Town Planning with respect to legislative guidelines, through Acts and Byelaws
4	To introduce the subject of Urban Design in order to enable students to establish a larger context for Architectural Design

Learning Outcomes: Student will be able to	
1	Understand the basic concepts of Town and Urban Planning
2	Legislation and rules of Town Planning
3	Do the Subdivision of Layout, and Municipal Drawings.
4	Understand the evolution of urban form of cities

Units	Contents
Unit I	Introduction to the subject of Urban Planning. Introduction to the Basic concepts in planning like landuse, zoning, byelaws etc Need and importance of study of Rural/ Town /Urban Planning for an architect.
Unit II	Evolution of planning in settlements from ancient to contemporary times. Principles, influences on Indus cities, Egyptian cities, Greek cities, Roman cities, Industrial cities etc.
Unit III	Planning Theories By Patrick Geddes; Kevin Lynch; Clarence Perry; Frank Lloyd Wright; Ebenezer Howard; Le Corbusier, C.A. Doxiadis, Lewis Mumford. Conceptual study of Garden city, Satellite towns, Industrial Towns, New Towns, Planned Cities, Twin Cities, Neighbourhood Etc. City plan patterns -Linear, Radial, Grid Iron layout and Ribbon development
Unit IV	Introduction to Housing and Housing Typologies Characteristics of Urban housing. Study of Housing typologies based on Topographical and Social, Economics aspects. Housing scenario and its impact. Study of Housing Neighbourhoods with reference to planning concepts and principles by planners.
Unit V	Introduction to Planning Legislation Introduction to various planning related laws, their contents and provisions, viz: M.R.T.P. Act of 1966, Land Acquisition Act of 1894, Maharashtra Slum Redevelopment Act, Urban Arts Commission Act, Municipal Act etc
Unit VI	Introduction to urban form and space Urban Form and space in historical and theoretical terms.

Learning Resources	
Text Books:	1. Kevin Lynch (1960) <i>The Image of the City</i> USA, MIT press. 2. Lewis Mumford (1972) <i>The City in History: Its Origins, Its Transformations, and Its Prospects</i> .USA, Harcourt, Inc.

	<p>3. Peter Geoffrey Hall (1996 Updated Edition) <i>Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century</i> USA, Blackwell publishing.</p> <p>4. Anthony J. Catanese, James C. Snyder (2014) <i>Urban Planning</i>. New Delhi, McGrawHill Education Private Limited.</p> <p>5. AbirBandyopadhyay, (2010) <i>Town Planning</i>, Kolkata, ArunabhaSen</p>
Reference Books:	<p>1. Brown A.J.(1969) <i>Introduction to town and country planning</i> Australia, Angus and Robertson publisher.</p> <p>2. P.Healey,(1981) <i>Planning Theory</i>.UK, Pergamon Press</p> <p>3. Arthur Gallion(1993)<i>The Urban Pattern</i>. New York, John Wiley and Sons</p>
Websites:	<p>www.planetizen.com/websites/2014 http://www.unhabitat.org/@UNHABITAT http://sustainablecitiescollective.com/@sustainablecities</p>
Journals:	<p>Cities: The International Journal of Urban Policy and Planning Urban Policy and Research Urban Studies</p>

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper	

Building Services-V

Subject Code	K8407	Semester -VII
Credits	2	Subject type-Core

Learning Objectives	
1	To expose students to the various integrated services of water supply And drainage at campus level.
2	To familiarize students with solid waste management.
3	To study various Building Management Systems.

Learning Outcomes: student will be able to	
1	Acquire knowledge of various integrated building services.
2	Address various issues of solid waste management.
3	Understand various Building management systems

Units	Contents
Unit I	Water Distribution systems <ul style="list-style-type: none"> - For housing schemes and high rise buildings. Schematic water distribution from treatment plant to town, group housing etc. - Hot water supply in high rise buildings. - Water heaters, boilers - Solar water heating
Unit II	Sewage collection and disposal <ul style="list-style-type: none"> - For large campuses, complexes, High rise Buildings etc. Mechanical methods of removal of sewage from basements (Shone's ejector). - Sewage treatment, Waste water conservation, recycling, biogas etc
Unit III	Urban Drainage Systems <ul style="list-style-type: none"> - For private and public places. - Drainage ,sub drains, culverts, ditches, gutters, drop inlets and catch basins - Rain water Harvesting.
Unit IV	Solid waste or refuse Disposal <ul style="list-style-type: none"> - Refuse chutes. - Waste /kitchen - waste Managements
Unit V	Integration of Services <ul style="list-style-type: none"> - ETP, STP and other building management services like CCTV, PG & UPS

Learning Resources	
Text Books:	1. Benjamin Stein and John Renolds.(2006) <i>Mechanical and Electrical Equipment for Building</i> , New York, John Wiley and Sons.
Reference Books:	1. Vasisth K.(2011) <i>Waste management</i> New Delhi, Essential books. 2. National Building Code of India, 2005 (NBC 2005)
Websites:	http://bst1.cityu.edu.hk/e-learning
Journals:	CIBSE journal http://www.cibsejournal.com/ Building Services Engineering Research and Technology (bse.sagepub.com) Energy and buildings-Journal-Elsevier (www.journals.elsevier.com/energy-and-buildings/) Technical journals- CIBSE-(www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t)
Assessment	Marks

I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Detail services layout which includes water supply and sanitation requirements for a campus project. (Project is preferably the architectural design project which the students have already worked on)

Elective- V

Subject Code	K8408	Semester IV
Credits	2	Subject type-Elective

Learning Objectives	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

Learning Outcomes: Student will be able to	
1	Engage in systematic self study of topics they feel interested in.

Students can select one elective from the following list	
1	<p>Housing</p> <ul style="list-style-type: none"> - Housing survey and methodologies - Factors effecting housings - Housing demand, slums, Typologies, finance, etc. - Comparative study of various housing policies and programmes. - Housing case studies - Post Occupancy evaluation. - Importance of housing in urban and regional development - Structural concepts, use of traditional and new building materials ,self help and low cost housing - Role of co-operative and public and private agencies
2	<p>Disaster Management</p> <ul style="list-style-type: none"> - Study of building designs to resist following types of disasters: Earthquake; Fire; Flood; Cyclone; Tsunami; Other natural disasters - Post-disaster problems - Study of geological structure and its deformation - Study of behaviour of the structure in such disasters - design aspects and considerations for various types of buildings especially the residential, congregational and institutional buildings
3	<p>Sustainable architecture</p> <ul style="list-style-type: none"> - Study of effects of Luminous Environment on comfort condition in built space, including Analysis Techniques, Design Strategies and Evaluation Procedures - Introduction and Analysis of the Precedent - Analysis of the site and climate - Analysis of the building programme and use. - Schematic design. - Design development. - System integration - Various rating systems like LEED, GRIHA.
4	<p>Industrial Architecture</p> <ul style="list-style-type: none"> - Location and planning aspects of Industrial areas - Indoor and Outdoor working environment in Industries - Services essential for Industries, considerations f industrial safety (Fire) - Various acts applicable to construction of industries such as Factory act,

	Pollution control Act etc. - Review of structural systems used for Industries with materials. - Environmental pollution as resultant of industrial activity.
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Assessment		Marks
I.A.	Internal Assessment	100
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	There is no 'University Examination' for this subjects	

Semester – VIII

Architectural Design VIII

Subject Code	K8409	Semester -VIII
Credits	10	Subject type-Core

Learning Objectives	
1	To develop understanding of present day urban/socio-economic/technological/infrastructural issues and identify redevelopment triggers.
2	To evaluate performance of a built space with respect to present day urban parameters.
3	To develop skill of feasibility analysis and design capacity in given urban context.

Learning Outcomes: Student will be able to	
1	Learn building Design issues such as parking, additional FSI with design and work out feasibility due to change in life style.
2	Redevelop a precinct to meet the present day needs like innovative technology
3	Study of relevant bylaws applicable for the above mentioned project.

Units	Contents
Unit I	Identify, Research and analyze urban issues such as parking/changed life style/changed urban fabric/infrastructure of a given plot of land and feasibility study.
Unit II	Case study of redevelopment projects
Unit III	Design of given plot (Redevelopment)

Learning Resources	
Text Books:	
Reference Books:	1. Shah Jagan, 2008, Contemporary Indian Architecture, Lustre Press 2008 8 ISBN 174364463, 9788174364463 2. National Building Code of India, 2016
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment Refer To 'Rule number 6, sub point 6.2.2.'	40
U.E.	University Examination Assignments or portfolios based on entire syllabus as mentioned below.	60

Assignment	
1	Collecting data about a project/site to be developed.
2	Feasibility study and formulation of design brief
3	Design: The project that can be taken up can be redevelopment of a plot, addition and alterations to existing structures/change of use.

Building Construction and Material VIII

Subject Code	K8410	Semester -VIII
Credits	04	Subject type-Core

Learning Objectives	
1	To introduce the concept of multi-basement and its construction systems.
2	To introduce the Acoustical design considerations for Auditorium and its construction systems.
3	To introduce various considerations in Design and Construction of high rise structures.

Learning Outcomes: Student will be able to	
1	Understand different systems of basement constructions and its services.
2	Understand different systems of Semi- permanent structures and its installation techniques.
3	Understand different design consideration for Auditorium and its systems of construction.

Units	Contents
Unit I	Swimming Pool <ul style="list-style-type: none"> • Components of Swimming pool like basin, drain, filter, deck, ladder, diving board, lane and lane marking etc. • Types like private, public, recreational, theme based, sports etc. • Materials used for swimming pool like brick, concrete, fiber reinforced etc. • Techniques used for constructions of swimming pool like underground, above ground, elevated etc. - Services related to swimming pool like filtration, electrical, drainage , maintenance etc.
Unit II	Stadium: <ul style="list-style-type: none"> • Introduction to Components of Stadiums like stadium field area, Seating area, envelope and roof. • Field area and their shapes, orientation, field drainage, field protection etc. • Stadium Bowl design parameters like viewing distances and sightlines, gangways, vomitories, media boxes, VIP areas, player areas, facility areas like food and services. • Building Envelope and roof materials and their technologies. • Roof design considerations like wind and sun. • Services related to Stadium like lighting, access control, signage, toilet, maintenance etc. -
Unit III	Semi-permanent Structures <ul style="list-style-type: none"> - Need, Planning and Layout, Installation techniques used worldwide. - Various Semi-permanent Structural systems for floor, wall, roof etc. - Services related to water and sanitation layout, natural and mechanical ventilation, lighting, insulation etc.
Unit IV	High Rise Structures <ul style="list-style-type: none"> - Design consideration like wind and seismic, foundation, form work systems,

	Construction Techniques and Building Envelope, mechanical floors. - Systems in steel and Concrete. - Structural glazing, elevators,
Unit V	Study of Materials - Study of different modern building materials with respect to Swimming Pool, Stadium, installable structures and high rise.

Learning Resources	
Text Books:	1. T.D Ahuja and G.S. Birdie (1996) <i>Fundamentals of Building Construction</i> New Delhi, Dhanpat Rai Publishing Company Pvt. Ltd
Reference Books:	2. J. S. Foster, Roger Greeno(2007) <i>Mitchell's Structure & Fabric: Part 2</i> .New York,Taylor and Francis group. 3. Gorenc, Tinyou, Syam(2005) <i>Steel Designer's Handbook</i> New Delhi,CBS Publishers and Distributor. 4. Ralph Monletta (1989) <i>Plastics in Architecture” – A guide to acrylic and Polycarbonate</i> .New York, Marcel Dekker Inc.
Websites:	https://www.som.com/ideas/research/design_of_high-rise_buildings www.losberger.com/us/en_us/applications/semi-permanent-structu... www.theatresolutions.net > Layouts & Design
Journals:	Journal of Construction Engineering, Technology stmjournals.com/index.php?journal=jocetm) Master Builder -Construction Magazine, Construction News(www.masterbuilder.co.in)

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Theory paper	

Assignments	
1	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
2	Field reports and Market survey of building Material topics.
3	Proposals of different designs of swimming pool and sitting area for small scale stadia. (as per discretion of the subject faculty)

Vocabulary and Repertoire

Subject Code	K8411	Semester -VII
Credits	3	Subject type-Core

Learning Objectives	
1	To express understanding of architecture writings.
2	To learn vocabulary to be used for analyzing Architecture.

Learning Outcomes: student will be able to	
1	Acquire effective verbal communication in architecture
2	Write essays, research papers, book reviews etc.

Units	Contents
Unit I	Architectural expression <ul style="list-style-type: none"> - Form and expression - structural expression - society - culture and expression - spatial expression Vocabulary and grammar of form Glossary of technical words
Unit II	Architectural Journalism <ul style="list-style-type: none"> - Writing Descriptive and analytical reports - Book reviews - Page compositions
Unit III	Elements of Architecture <ul style="list-style-type: none"> - Basic elements of architecture - Modifying elements of architecture
Unit IV	Seminar on Architects Biography and Concepts in contemporary architecture

Learning Resources	
Text Books:	Simon Unwin (2009). <i>Analysing Architecture</i> third edition, revised and enlarged. USA and Canada by Routledge.
Reference Books:	John Ruskin (1989). <i>The seven lamps of Architecture</i> . London, Dover Publications Neelkanth Chhaya (2014). <i>Harnessing the intangible, collected essays on the work of Balkrishna Doshi</i> , New Delhi, NIASA Council of Architecture.

Assessment	Marks
I.A.	40
Internal Assessment Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	60
University Examination Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Writing Journals on Theory of design
2	Any one Book review and Any one Architects Biography

Interior Design II

Subject Code	K8412	Semester -VIII
Credits	04	Subject type-Core

Learning Objectives	
1	In this subject students will apply their skills, knowledge gained in the previous interior design studio for more complex interior design projects with all details of services.
2	The students will also understand the complex interior designing process, specification, various detailing and tentative estimate of to fulfill the needs of client.

Learning Outcomes: Student will be able to	
1	Acquire knowledge of various high end interior building materials their specification its cost and its application in interior design project.
2	Design complex Interior spaces with services, construction details with cost consideration to suit its function and aesthetics in a Systematic cad presentation with all detail drawings.

Units	Contents
Unit I	Introduction to the field of interior design with respect to services.
Unit II	Market survey of application of various finishing interior materials and techniques.
Unit III	Detailed Case study of a medium scale interior project. (150 sq.m to 250 sq.m.)
Unit IV	A detailed design of the medium scale interior projects showing all necessary services, specifications and costing. Carpet Area (150 sq.m to 250 sq.m.)

Learning Resources	
Text Books:	Office Spaces – Crane Dixon, Architectural Data Sheets
Reference Books:	Corporate Interiors – Kogek Yee, Office Interiors – Alan Phillips
Websites:	www.quadrille.co.in. www.theaid.in.
Journals:	Architectural Digest, Elle Décor, Home and Design, Interior Design etc.

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignment	
1	Report based on Market survey of interior Materials
2	Live Case Study of a completed Interior Project
3	Detailed drawings of the Interior Design project of the following – residential, public, commercial etc with thrust on services, specification and tentative

	estimate etc.
4	Design of the decorative ceiling, paneling, lightings, floor details, toilet details etc for the above projects.
5	Detailed design of two furniture units with specification and construction/ joinery details.

Urban Planning II

Subject Code	K8413	Semester -VIII
Credits	03	Subject type-Core

Learning Objectives	
1	To introduce students to the advanced concepts of Town and Urban Planning.
2	To understand the planning procedures at various levels of planning.
3	To understand the holistic relationship of planning with various other aspects of physical developments.
4	To develop an urban vocabulary required to understand urban form and public spaces

Learning Outcomes: Student will be able to	
1	Understand the interrelated concepts of Town and Urban Planning
2	Exposure to the various laws and rules for planning and balanced development.
3	Understand the effects of various policies on physical development.
4	Understand urban form and space

Units	Contents
Unit I	Introduction to the process of formulation and implementation of : Regional Plan, Development Plan and Town Planning Schemes. Study of various Planning agencies and their role in planning like HUDCO, CIDCO, HDFC, MHADA etc.
Unit II	Role and relevance of Transport Planning, Landscape and Environmental issues, Heritage etc in Urban Planning.
Unit III	Introduction to various planning tools. Methodology of conducting town planning surveys, types of surveys (physical, social, and economical, Aesthetic Surveys etc) and analysis of data collected.
Unit IV	Urbanization and Its Impacts. Introduction to Study of Contemporary Issues of Urban Development and concerns in the City.
Unit V	Policies and legal framework for contemporary planning development: National Missions, Schemes for funding various planning activities, infrastructure development schemes like JNNURM, HRIDAY, SMART CITY etc.
Unit VI	Introduction to urban design terminologies and definitions To understand the urban form derived from theories as well as empirical evidence.

Learning Resources	
Text Books:	6. Kevin Lynch (1960) <i>The Image of the City</i> USA, MIT press. 7. Lewis Mumford (1972) <i>The City in History: Its Origins, Its Transformations, and Its Prospects</i> .USA, Harcourt, Inc. 8. Peter Geoffrey Hall (1996 Updated Edition) <i>Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century</i> USA, Blackwell publishing. 9. Anthony J. Catanese, James C. Snyder (2014) <i>Urban Planning</i> . New Delhi, McGrawHill Education Private Limited.

	10. AbirBandyopadhyay, (2010) <i>Town Planning</i> , Kolkata, ArunabhaSen
Reference Books:	4. Brown A.J.(1969) <i>Introduction to town and country planning</i> Australia, Angus and Robertson publisher. 5. P.Healey,(1981) <i>Planning Theory</i> .UK, Pergamon Press 6. Arthur Gallion(1993) <i>The Urban Pattern</i> . New York, John Wiley and Sons
Websites:	www.planetizen.com/websites/2014 http://www.unhabitat.org/ / @UNHABITAT http://sustainablecitiescollective.com/ / @sustaincities
Journals:	Cities: The International Journal of Urban Policy and Planning Urban Policy and Research Urban Studies
Assessment	
I.A.	Internal Assessment
	Refer To 'Rule number 6, sub point 6.2.2.'
U.E.	University Examination
	Theory paper
	Marks
	40
	60

Research Skills

Subject Code	K8414	Semester -VIII
Credits	04	Subject type-Core

Learning Objectives	
1	To inculcate in students methodical process to approach an architectural design project holistically.
2	To develop research skills necessary to provide approach and directions in design of architectural project.
3	To develop a systematic approach of research for application in Architectural Design Project.
4	To develop skill sets of writing research paper

Learning Outcomes: student will be able to	
1	Develop primary skills to conduct research in Architecture
2	Demonstrate Visual Research Methods.
3	Demonstrate acquired research skills through the topic selected for Architectural Design Project.

Units	Contents
Unit I	Introduction to Research Skills , Types of research , Methods of data collection , Ethics ,and Referencing
Unit II	Visual Research Methods in Design Imageability Environmental mapping – Direct observation and direct communication Visual representation Environmental behaviour
Unit III	Selection of topic for Architectural Design project giving overview of introduction, background, context, relevance, scope and limitation, methodology and identification of case studies.
Unit IV	Demonstration of Case study and its analysis (Minimum two Book /live case studies) to understand the Project. Literature review minimum three research papers relevant to the research project
Unit V	Research Paper Writing

Learning Resources	
Text Books:	
Reference Books:	1. Robert Bechtel et al (eds). Methods in Environmental and Behavioral Research, NY:VanNostrand Reinhold, 1987. 2. Gary T Moore et al. Environmental Design Research Directions: Process and Prospect. New York: Preager Publishers, 1985. 3. Henry Sanoff. Visual Research Methods in Design. New York: Van Nostrand Reinhold, 1991
Websites:	
Journals:	

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Synopsis of Architectural design project.
2	Literature review.
3	Case studies and its analysis (minimum two).
4	Research Paper Writing.
5	Seminar presentation of components level research areas based on selected Architectural Design Project .

Elective- VI

Subject Code	K8415	Semester IV
Credits	2	Subject type-Elective

Learning Objectives	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

Learning Outcomes: Student will be able to	
1	Engage in systematic self study of topics they feel interested in.

Students can select one elective from the following list	
1	<p>Real Estate Management</p> <ul style="list-style-type: none"> - Real estate development: Fundamental concepts and techniques, recognizing institutional and entrepreneurial elements, issues encountered in various phases of development like site evaluation and land procurement, development team assembly, -market study and development scheme, construction & project management, project marketing and hand-over of completed projects. -Development & project financing: Project Feasibility, Development Financing, Asset Disposal and Redevelopment Options, -Analyses of Development Sites and Case Studies, integrated case study on a specific development project, which requires reviewing, analyzing and resolving the problems or strategic issues. - Urban policy & real estate markets : Impact of Government Regulations and Public Policies on Real Estate Markets, include urban land rent and location theories, land use structures, community and neighbourhood dynamics, degeneration and renewal in urban dynamics, private-public participation, government policies on 95 public and private housing, and urban fiscal policy including property taxation, local government finance. - Corporate real estate asset management: Strategic plans to align real estate needs with corporate business plans; -Performance measurement techniques to identify asset acquisition or disposal; methods for enhancing value through alternative uses, efficient space utilization or improving user satisfaction. - Commercial real estate appraisals: Determination of the capitalization rates across different types of properties;-Appraisal of freehold and leasehold interests; -Critical analysis of the valuation approaches adopted for securitized real estate; Asset pricing models; investment flexibility and future redevelopment opportunities.
2	<p>Architectural Conservation</p> <ul style="list-style-type: none"> - History and theory of conservation - Philosophy of conservation

	<ul style="list-style-type: none"> - Pioneers of conservation - Definition of conservation, preservation, restoration, reconstruction ,Adoption - Broad concepts of terms such as Reuse, Rehabilitation, Revitalization, Regeneration, Up gradation etc. - Value and ethics - Traditional building materials and their decaying characteristics. Environmental influences: thermal effect, corrosion and oxidation. - Preparation of Inspection reports. - Cultural Heritage - Conservation methods - Classifications - Management of historic sites - Studies of various charters. <p>Role of INTACH,UNESCO, ECOMOS and other organizations</p>
3	<p>Digital architecture (can be a combination of seminar and workshop - project and practice based course)</p> <ul style="list-style-type: none"> -Compare approaches of design processes - conventional process focused on architects' style and contemporary process influences by digital tools -Introduce the new tools of design, production and fabrication in architecture that affect various stages of architectural production, from conception and visualization to development and manufacturing -Provide opportunities to integrate the use of the computer for design, production, and presentation with the help of individual projects -Provide understanding of software packages, and modeling techniques
4	<p>Architectural Software</p> <ul style="list-style-type: none"> -Provide hands-on exposure to various software packages to work on design, modelling, and simulations used in architectural design -Use of various (relevant at the time) 2D drafting and 3D modeling tools for rendering and architectural presentation -Use of various software packages for analysing building systems and services performance (this can be for passive and/or active measures relevant to the semester focus) -Options <p>Advanced AutoCAD Advanced SketchUp with various plugins Revit</p>

Assessment		Marks
I.A.	Internal Assessment	100
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	There is no 'University Examination' for this subjects	

Semester – IX

Practical Training

Subject Code	K8501	Semester -IX
Credits	30	Subject type-Core

Learning Objectives	
1	To acquaint students with prevalent purview and procedure of architectural and allied practice
2	To invite practitioners participation in the education of the 'would-be entrants' to the profession for up datedness of information and orientation
3	To boost the dialogue between 'practice' and 'academics' of architecture for progressive learning of a student

Learning Outcomes: student will be able to	
1	Develop skills in professional behavior
2	Explore different facets of office management including preparation of working drawings, detailed drawings, perspectives, study of filing systems of documentation, preparation of tender documents etc.
3	Gain site experience in respect of supervision of construction activity, observation, layout on site, taking the measurements and recordings.

Units	Contents
Unit I	Indoor activities, office administration <ul style="list-style-type: none"> - Routine correspondence with client's local authorities, contractors and other agencies dealing in building industries - Systematic filing and registering office correspondence for easy re-reference. - Regular maintenance of work-diaries with notes on principal's instructions, interviews with various agencies, indoor and/or outdoor work and time-spent - Systematic filing and indexing of technical catalogues and price lists for handy reference. - Systematic ordering and use of office library
UnitII	Indoor activities, drawing and designing <ul style="list-style-type: none"> - Making of preliminary designs and drawings accountably by requisite prior study, research, and case studies. - Preparing 'Presentation' 'statutory ', 'working' and 'detailed' drawings of customary contents and format by understanding their propriety and logic - Reading and making use of 'Contour Plans' while at VI & VII above - Dependably efficient handling of auxiliary routine operations like taking off and codified rendering of prints and electronic and/or computerized communication, drafting, copying etc - Briefing with various technical consultants and co-coordinating their drawings. - Preparation of 'study' and 'Presentation' models of buildings and/or development lay-outs in different levels and chromatic material-textures
Unit III	Outdoor activities: <ul style="list-style-type: none"> - Attending routine meetings with clients, local authorities, contractors and other trade representatives - Checking of lining-out of buildings on site - Systematic surveying of sites and/or existing buildings of moderate size and complexity in conventionally comprehensive format - Architecturally monitoring the work-progress on site/s through periodic

	supervisions, instructions and reports thereon
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Learning Resources	
Reference	Architects Drawings

Assessment		Marks
I.A.	Internal Assessment- Refer To ‘Rule number 6, sub point 6.2.2.’	40
1	The Log-Book duly filled in and authenticated by the said responsible registered architect- member of the employer-organization. (one member-signatory throughout Log-Book)	15
	Diary- The day to day hand-written preformed Work-Diary maintained by the student during the period of ‘training’ (as stipulated hereinabove) and certified by the said responsible registered architect-member of the employer-organization- one and the same members signatory who authenticates the Log-Book. (preferably initialed per day)	15
	Work report- The manually laboured ‘Work-Report’ structured as herein after prescribed under ‘Term work’ and authenticated too only by the said responsible registered architect-member of the employer organization. (One member-signatory who certifies Log-Book and Work-Diary).	10
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
	Portfolios consisting of drawings prepared by the student as intern in the office

Details of training	<p>-The practical training of minimum duration of 15 to 18 working weeks (90 work days) shall be carried out in the office of an architect or an organization Operating in an allied field of practice or research, duly approved by the institution, under mentorship of an architect having experience of at least 5 years.</p> <p>-Training in Foreign Country shall be done under the Registered Architect of that Country and to be approved and monitored by the Head of the Institution.</p>
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Semester – X

Architectural Design Project

Subject Code	K8502	Semester-X
Credits	16	Subject type-Core

Learning Objectives	
1	To inculcate in the students methodological process to approach an architectural project holistically.
2	To prepare students to handle large scale complex architectural projects individually.

Learning Outcomes: student will be able to	
1	Include intensive study of relevant literature, case studies, climatology and analysis of problems concerned with development of functional organisation of space form and structure.
2	Study based on correlation and interpretation of the social, economic and physical data.

Units	Contents
Unit I	The architectural project should consist of 2 parts: A. Technical Report: well documented report consisting of hypothesis formulation, data acquisition, verification, and analysis by following qualitative and quantitative research methods. B. Design Solution: Self explanatory drawings, covering various aspects of construction, function, technology, services, and site planning etc. few suggested buildings types are institutional projects, civic amenities, commercial, industrial, sports and recreation, administrative, transportation facilities, housing, specialized building, etc.
Unit II	Technical report: - A hard bound copy of original report shall be submitted, which will be certified and signed by the college authorities as authentication of the work and by the guide who has guided the work - Size: Project Report size A4 Sized '120 Mm x 297 mm portrait with embossed title necessarily on the spine and front page. - Total Pages: There Shall Be Maximum 50 Pages with double side printing excluding drawings. - Printing: Font type like Arial/ Times New Roman With 12-point size shall be used for regular typing with 15- point size shall be used for captions. The typing shall be done with 1.5 lines spacing throughout. - The presentation copy shall be necessarily a hard bound copy. Number of copies shall be as prescribed by the college. (1 copy for the student, 1 original copy for the college library and 1 soft copy on a CD.)
Unit III	Design solution: Graphically presented design solution with minimum 5000 Sq.M Built up area shall be in form of a drawing portfolio. It shall consist sufficient number of architectural drawings (manually drawn / computerized) with models, etc. Since the architectural project is the culmination of five years of learning in various aspects of architecture, it is expected that student demonstrates an ability of holistic and comprehensive thinking in the areas of, - Site Planning - Structural considerations

	<ul style="list-style-type: none"> - Space Designing - Landscape Design - Building Services - Climate Responsive, Energy Efficient and Exhibiting Qualities of sustainable architecture. - Architectural Detailing. <p>The portfolio will consist of drawings (minimum of 10 and maximum of 15) sufficiently in detail to demonstrate consideration given to above mentioned attributes. The emphasis shall be given to prepare self-explanatory drawings.</p>
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Learning Resources: As required by individual project.

Assessment		Marks
I.A.	Internal Assessment	40
	The Internal Assessment of “Architectural Project shall be carried out stage wise as decided by the subject Coordinator for the year which shall be announced to the students at the beginning of the semester.	
U.E.	University Examination	60
	The final assessment in the examination shall be done by both internal and external examiners in which the student will display his/her work and answer all the queries raised by the examiner.	

Capstone Project

Subject Code	K8503	Semester -X
Credits	06	Subject type-Core

Learning Objectives	
1	To study interrelationship of all subjects that a student has learned in the curriculum of architectural studies.
2	To understand the architecture as a “craft”.

Learning Outcomes; Student will be able to	
1	Develop competence in transforming architectural drawing to professional working document
2	Prepare documents of building design project minimum 500 Sq.M. such as Presentation drawings, Working drawings, Specifications, Quantities, Estimates, and Tender document.

Units	Contents
Unit I	Preparation of working drawing, municipal drawing of the above
Unit II	Preparation of Specifications and Bill of Quantities (BOQ)
Unit III	Preparation of Contract Document

Learning Resources	
Text Books:	
Reference Books:	<ol style="list-style-type: none"> 1. Wakita, Osamu A., Richard M. Linde, and Nagy R. Bakhom (2011) "The Professional Practice of Architectural Working Drawings. 2. Reference drawings from an ISO certified architect’s office 3. Handbook of Professional Documents: 2011, Council of Architecture, New Delhi, India 4. Indian Institute of Architects, Handbook
Websites:	
Journals:	Gawne, Eleanor. "Cataloguing Architectural Drawings." Journal of the Society of Archivists 24.2 (2003): 175-187.

Assessment		Marks
I.A.	Internal Assessment	40
	Refer To ‘Rule number 6, sub point 6.2.2.’	
U.E.	University Examination	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
1	Assignment I: Preparation of Presentation Drawings with rough estimates
2	Assignment II: Preparation of Set of Working Drawings, Specifications, BOQ, and Contract Document

Professional Practice

Subject Code	K8504	Semester -X
Credits	4	Subject type-Core

Learning Objectives	
1	To introduce aspects of professional conduct, duties and responsibilities, legal rights and procedures of architectural profession.
2	To enable student to acquaint with various responsibilities of professional architect.
3	To acquaint students with documentation and procedures for execution of building work/projects as well as with management aspects

Learning Outcomes	
1	Visualise various working situations that may arise in practice as an architect
2	Manage his/her professional environment towards fair practice
3	Understand ethics of architectural profession
4	Learn to work with various agencies in practice

Units	Contents
Unit I	Laws, Rules and Guidelines related to Architectural Practice <ul style="list-style-type: none"> - Architects Act 1972 - brief overview, introduction to nature, scope and functions of Council of Architecture - Detailed study of professional conduct regulation - Comprehensive architectural services, scale of professional fees as framed by Council of Architecture - Architectural competitions guidelines by Council of Architecture - Architects Liability
Unit II	Setting up architectural practice as profession, tax liabilities <ul style="list-style-type: none"> - Nature of profession, difference between trade, business and profession - Emerging Role of architectural profession - Accounting and taxation - Organization of architects office and different models of business
Unit III	Land tenures and contracts <ul style="list-style-type: none"> - Introduction to valuation, land tenures and easements and dilapidations - Architects role in construction contracts

Learning Resources	
Text Books:	RoshanNamavati (1968). Professional Practice: Estimating and Valuation, , Universal Book Corporation
Reference Books:	MadhavDeobhakta, MeeraDeobhakta (2007) Architectural Practice in India, , Council of Architecture, New Delhi Handbook of Professional Documents: 2011, Council of Architecture, New Delhi, India Indian Institute of Architects, Handbook Standard Contracts, International Federation of Consulting Engineers (FIDIC) The Architect's Handbook of Professional Practice- 2013, American Institute of Architects, John Wiley & Sons.
Websites:	

Journals:	
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Assessment		Marks
I.A.	Internal Assessment	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
U.E.	University Examination	60
	Theory paper	

Self Study

Subject Code	K8505	Semester -X
Credits	4	Subject type-Core

Learning Objectives	
1	To facilitate the students to learn out of a pool of specialized subjects, which provides extended scope or which enables exposure to cross-disciplinary subjects
2	To facilitate the students to learn cross-disciplinary subjects.

Learning Outcomes	
1	Engage in systematic self study.

Units	Contents
	Under this, the student can select any one subject related the parent course or other than the parent course. The choice of the subject is not restricted. If a student is interested in a subject of a particular discipline he/she has to inform accordingly to the Principal and academic Co-ordinator of that department.

Learning Resources: As required by subject.

Assessment		Marks
U.E.	University Examination	100
	Based on Reports and evidences of the course	




**Proposed Draft Structure for CBCS-2020
For
Bachelor of Architecture (B. Arch) Programme**

(Structure Semester I & X and Contents Semester I & II)

To be implemented from Academic Year 2020-21

Bharati Vidyapeeth (Deemed to be University)
College of Architecture, Pune



Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Chancellor

Prof. Dr. M. M. Salunkhe
M.Sc., Ph.D., F.R.S.C.
Vice Chancellor


Bharati Vidyapeeth

(Deemed to be University)
Pune, India.

Founder Chancellor : Dr. Patangrao Kadam

★ Accredited with 'A' Grade (2017) by NAAC ★
★ Category-I University Status by UGC ★
★ NIRF Ranking - 66 ★

"Social Transformation Through Dynamic Education"



Dr. Vishwajeet Kadam
B.Tech., M.B.A., Ph.D.
Pro Vice Chancellor

G. Jayakumar
M.Com., D.P.A., Dip.
Registrar

NOTIFICATION NO. 1055

It is hereby notified for the information of all concerned that the proposal to revise the course structure, syllabus and rules of examinations of B.Arch. programme proposed by the concerned Board of Studies and recommended by the Faculty of Engineering and Technology is considered by the authorities of the University.

The authorities of the University have approved the course structure, rules of examinations and 1st year syllabus of B.Arch. programme offered under the Faculty of Engineering and Technology to be implemented from the academic year 2020-21 :

Ref. No. BVDU/ 2020-21/1786
Date : November 5, 2020

G. Jayakumar
Registrar

- ✓ 1. The Principal, College of Architecture, Pune 43
2. The Dean, Faculty of Engineering and Technology, Pune 43
3. The Controller of Examinations, BVDU
4. The IT Cell for uploading in the Website.

Adm/Syllabus/Exam/COA File

Bharati Vidyapeeth (Deemed to be University) College of Architecture, Pune-43.	
Inward No.:	151
Date:	21/11/2020
Sign:	

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VISION OF BV (DU) UNIVERSITY

“To be a world class University for Social Transformation through Dynamic Education”

MISSION OF BV (DU) UNIVERSITY

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency, and accountability for social community, economic and environmental conditions.

VISION OF BV (DU) COLLEGE OF ARCHITECTURE PUNE

“Inculcate Sensitivity towards Sustainable Built Environment through Architectural Education”

MISSION OF BV (DU) COLLEGE OF ARCHITECTURE PUNE

The institution shall strive

- To inculcate knowledge, skills, values and ethics to create ‘**socially responsible**’, ‘**environmentally sensitive**’, ‘**economically conscious**’, architectural professionals.
- To promote innovations and research for sustainable built environment.

PROGRAMME: BACHELOR OF ARCHITECTURE (B.ARCH)

Programme Objectives:

- To develop creative, capable, future ready architectural professionals.
- To create responsible and dedicated individuals who are intellectually mature, emotionally sensitive and self-motivated towards sustainable built environment.
- To orient courses and course content in order to develop holistic learners, for taking up challenging responsibilities in the respective field.
- To offer courses which help the graduates to emerge as competent professionals fully aware of their commitment to the society and nation.

Programme Outcomes:

The graduates will be able to:

- Imbibe the fundamental knowledge of built environment.
- Identify and analyze current architectural issues.
- Create and envision built environment responding to physical, social, cultural, economical and environmental context.
- Communicate effectively in verbal, written and graphical form.
- Use modern architectural tools, technology and software for analysis, design and construction.
- Imbibe ethics and values as learners and professionals.
- Develop research ability and promote experiential learning.
- Function effectively as individual; work cooperatively and responsibly as team.
- Encourage interdisciplinary learning.
- Prepare for professional, societal and environmental challenges.
- Promote managerial, entrepreneur and leadership qualities in profession.

SALIENT FEATURES OF SYLLABUS

- Imparting '**Outcome Based Education**'.
- Included programme outcome, programme specific outcome, course outcome and intended learning outcome.
- Categorisation of courses focusing on development of 'Cognitive', 'Affective' and 'Psychomotor' domains of learning and learners.
- Offered wide range of electives in every semester, which facilitates choice to learners in selecting courses of their own interests. Introduced open electives at First year B.Arch
- Skill enhancement facilitated through professional skill courses as well as open electives.
- Practical training incorporated in VIII semester which helps for students in achieving research ability by providing consecutive courses such as Research projects and Architectural design Project in IX and X semesters respectively.
- Social and environmental awareness through 'Audit Courses'.
- Vertical progression and horizontal integration of courses considering the stage of development of learning.

RULES FOR FIRST TO FIFTH YEAR B. ARCH

❖ Rule No.1: Eligibility for Admission

Eligibility Criteria: Students seeking admission to First year of Bachelors Degree Course in Architecture must fulfil the eligibility criteria laid down by Council of Architecture, New Delhi, India and the University as applicable from time to time.

❖ Rule No.2: Duration of the course (as per Council of Architecture)

The Architecture course shall be of minimum duration of 5 academic years/ 10 semesters of approximately 15 to 18 working weeks (90 work days)each, inclusive of one semester of approximately 16 working weeks of Practical Training during Semester-VIII in a Professional's office.

❖ Rule No.3: Scheme of Assessment

A candidate to be eligible for the degree of Bachelor of Architecture will be required to appear for and pass all examinations as under:

- Semester I Examination in Architecture (First Year Semester-I)
- Semester II Examination in Architecture (First Year Semester-II)
- Semester III Examination in Architecture (Second Year Semester-III)
- Semester IV Examination in Architecture (Second Year Semester-IV)
- Semester V Examination in Architecture (Third Year Semester-V)
- Semester VI Examination in Architecture (Third Year Semester-VI)
- Semester VII Examination in Architecture (Fourth Year Semester-VII)
- Semester VIII Examination in Architecture (Fourth Year Semester-VIII)
- Semester IX Examination in Architecture (Final Year Semester-IX)
- Semester X Examination in Architecture (Final Year Semester-X)

❖ Rule No. 4: Granting of Academic Term

Each semester shall comprise of Eighteen weeks (Minimum 90 working days).

The candidate will be permitted to appear for semester examination only if he/she has,

-75 % attendance in each course that constitute a head of passing as prescribed by the university.

- **Satisfactory completion of the sessional work as prescribed in the syllabus.**
-

Good conduct: The Principal/ Director of the institution shall have the right to withhold the student from appearing for examination of a specific course if the above requirements are not fulfilled.

❖ Rule No. 5: Progression Requisite

As general rule, a student shall be allowed to keep the next year of study of the course, if he/she has a backlog of not more than “**Six heads of passing**” in the preceding year.

Furthermore,

- A student shall be allowed to get admitted to Second Year B. Arch. course, if he/she has a backlog of not more than “**Six heads of passing**” at First year B. Arch (semester I and II considered together).
- A student shall be allowed to get admitted to Third Year B. Arch course, if he/she has cleared all the heads of passing at First year B.Arch and if he/she has a backlog of not more than “**Six heads of passing**” at Second Year B.Arch (semester III and IV considered together).
- A student shall be allowed to get admitted to Fourth Year B.Arch course, if he/she has cleared all the heads of passing at Second Year B.Arch (Semester III and IV considered together) and if he/she has a backlog of not more than “**Six heads of passing**” at Third Year B.Arch (semester V and VI considered together).
- A student shall be allowed to get admitted to Final Year B.Arch course, if he/she has cleared all the heads of passing at Third Year B. Arch (Semester V and VI considered together), and if he/she has a backlog of not more than “**Six heads of passing**” at fourth Year B.Arch (semester VII and VIII considered together).

❖ Rule No 6: Examinations

6.1. Conduct of Examinations

The university examinations for all the 10 semesters shall be conducted at the end of each semester by the University.

6.2. Pattern of Examination: The evaluation scheme for B.Arch comprises of --

University Examination (UE) -60 marks (for courses having IA and UE both)

Internal Assessment (IA)- 40 marks (for courses having IA and UE both)

Internal Assessment (IA) - 100 marks (for courses having only IA)

UE and IA will constitute two separate heads of passing.

6.2.1 University Examination (UE)

- UE will be conducted by the University and will be based on the entire syllabus.
- UE shall be assessed jointly by the internal and external examiners from amongst the panel approved by the University in equal weight-age. An examiner for any of the courses of examinations shall have a minimum of 5 years teaching or 5 years of professional experience in his/her field of study. However, an external examiner for Semester-X Architectural Design Project shall have minimum of 10 years teaching/ professional experience after Council of Architecture registration.

- The nature of assessment will vary depending upon the course and its delivery and whether it is studio-based or theory based. **Refer to detailed syllabus for individual courses.**
- Work done by the student which is assessed for UE i.e Sessional (SS) or Sessional + Oral (SO) will be based on entire syllabus.
- Number of assignments for UE will be minimum **three** and a maximum **five** .
- UE may be undertaken through following suggestive form of assignments (but not restricted to):
 - Portfolio
 - Models
 - Reports

University Examination (UE) head will constitute ANY ONE of the following:

a. Sessional(SS) : Assessment by internal & external examiner in equal weight-age of the sessional , that is ,work done by the student during the semester and certified by the course teacher.

b. Sessional + Oral(SO): Assessment by internal & external examiner in equal weight-age of the sessional ,that is, work done by the student during the semester and certified by the course teacher along with oral of the student is to be conducted (i.e provided that the student appears for UE).

c. Terminal paper(TP): Assessment by internal & external examiner in equal weight-age of total maximum marks.(Duration of paper: 2-1/2 hrs for theory paper & 3 hrs. for drawing paper.)

6.2.2: Internal Assessment (IA)

IA will be conducted by the Institution imparting B.Arch course. IA will be done by the teacher teaching the course through a continuous assessment system that is spread through the duration of course and weight-age will be for the sessional , that is, work done by the student during the semester & assessed by the course teacher covering the entire syllabus. The marks assigned for attendance in IA weight-age will be 5(five) only. Number of assignments for IA will be minimum **three** and a maximum **five** .

There will be 15(fifteen) teaching and 3(three) assessment weeks in a semester.

Individual faculty member shall have the flexibility to design the continuous assessment assignments in a manner so as to evaluate student's capabilities across knowledge, skills and attitudes. IA may be undertaken through any or combination of the methods stated below:

The following components can be used-

- Seminar presentation
- Written Test /Open Book
- Reviews
- Essays

Final Draft B.Arch CBCS 2020 Course

- Short answer questions
- Study of best practices /precedent study/field study
- Multiple choice questions/Quiz
- Projects/group projects/Dissertation
- Reflective Practical assignments
- Drawing Portfolios
- Report writings
- Learning logs/diaries
- Hands on workshops and participation

For IA, in case of courses having Terminal paper (TP), it is mandatory to conduct minimum one class- test as a form of assignment.

The faculty shall announce in advance the units based on which continuous assessment shall be conducted. Detailed records of continuous assessment shall be maintained by the teaching faculty and these will be submitted to the institute at the end of the semester.

❖ Rule No. 7: Credits

The total credits for B.Arch degree programme are 296 credits.

Semester-wise distribution of credits is as follows:

Semester	I	II	III	IV	V	VI	VII	VIII	IX	X
Credits	30	30	30	30	30	30	30	30	28	28

7.1. Evaluation criteria for additional credits:

Credit may also be given for participation in extra-curricular/co-curricular activities. There will be maximum of **10 credits at UG level. 25-30 hours** of extra-curricular/ co-curricular work may be considered as one credit.

Participation in these activities at national/ international/state level can be claimed to earn maximum 10 extra credits which are over and above the minimum number of credits the student has to complete for award of the degree. These credits would be awarded for type of activity undertaken from the joining of course till end of course. Students have to submit the necessary documents at the end of Semester-X.

7.2. Award of extra credits per participation

Sr.No	Type of Activity	Credits Awarded
1	Publication in International/ National Journal(for 1st or 2nd author only)	01
	Publication in Scopus/ Referred Journal	02
2	Participation with presentation in seminar, workshop, conference, etc (national/ international/state/	01

3	Participation in seminar, workshop, conference, etc (national/ international /state/ local)	0.5
4	Sending entry to design competition held at state / national / international level	01
5	Winning award at the contest mentioned above	02
6	Publication of Final year Architectural Design Project in International/ National Journal under guidance & co-	1
7	MOOC Courses with certificate:	
	1. 4 hr/week course	1
	2. 12 hr/week course	3

The student has to accumulate and submit the respective documents to the Principal, to become eligible for getting the credits as mentioned above.

7.3. *Non-credit courses -Audit Courses:*

Audit Courses will be conducted in Semester-IV and Semester-VI as per the syllabus. University will conduct examination and it is mandatory for students to pass in these courses. Passing in these courses is by clearance. **Audit courses are Non-credit courses**

7.4. *Credit Transfer:*

Credit transfer option may be made available to students on exchange with other universities under MoUs if any after verifying the equivalency for particular courses on case to case basis.

❖ **Rule No.8: Criteria for Passing**

To pass in every semester examination and earn minimum grade point , a candidate must obtain minimum 50% marks in each head of passing and 50% marks in aggregate.

8.1. For all courses, both UE and IA constitute separate heads of passing.

- In order to pass in such courses and earn minimum grade point.
- The student must obtain minimum grade point of 6.0(50% marks) at UE and also minimum grade point of 6.0 (50%) marks at IA.
- A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

8.2. Students with backlog in IA will have to present themselves and their work for continuous assessment throughout the semester for which they intend to appear.

8.3. In case of backlog courses, a student can work on same topic of assignment for two more chances. Even after two chances in case he/she fails, the course teacher may change or modify the topic of assignment.

❖ Rule No.9: Grading system

The grading system will be 10-point absolute grading system.

9.1 Award of Grades (Ten point Grading systems):

The assignment of score obtained by the candidate (out of maximum 100) to a grade may be done as follows:

Range of % of marks	Grade Point	Grade Letter
80<= Marks <100	10	O
70<= Marks <80	9	A+
60<= Marks <70	8	A
55<= Marks <60	7	B+
50<= Marks <55	6	B
Marks <50	0	D

9.2 Performance

The performance of a student will be evaluated in terms of two indices, viz

- Semester Grade Point average (SGPA) is calculated separately after every end-semester examination.
- Cumulative Grade point average (CGPA) is calculated across all the semesters at the end of the programme.

9.3 Semester Grade point average (SGPA)

SGPA measures the cumulative performance of a learner in all courses in a particular semester. SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k \times GP_K}{\sum C_k}$$

Where C_k the credit-value is assigned to a course and GP_K is a GPA obtained by the learner in the course.

The SGPA shall be calculated up to two decimal place accuracy.

9.4 Cumulative Grade point average (CGPA)

CGPA measures the cumulative performance of a learner in all courses since his/her enrolment. CGPA is calculated by the formula

$$CGPA = \frac{\sum C_k \times GP_K}{\sum C_k}$$

Where C_k is the credit-value assigned to a course and GP_K is a GPA obtained by the learner in the course.

The CGPA shall be calculated up to two decimal place accuracy.

❖ Rule No.10: Award of Degree (B.Arch)

A student who has completed the minimum grade point specified for the programme and obtains required CGPA as prescribed (in the table below) shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed within the time permissible by the University & as per COA Rules prescribed.

The criteria for the award of **Degree (B.Arch)** are as given in table below:

Range of CGPA	Final Grade	Letter Grade
$9.50 \leq CGPA \leq 10.00$	O	Outstanding
$9.00 \leq CGPA \leq 9.49$	A+	Excellent
$8.00 \leq CGPA \leq 8.99$	A	Very Good
$7.00 \leq CGPA \leq 7.99$	B+	Good
$6.00 \leq CGPA \leq 6.99$	B	Satisfactory
CGPA Below 6.00	F	Fail

Degree Requirements:

A candidate who has successfully completed all the Core and Elective courses and obtains required CGPA as prescribed (in the table above), shall be eligible to receive the Degree.

Registration (as an Architect) will only be given by Council of Architecture, New Delhi, India as per the prevailing rules .

University & Council of Architecture, New Delhi may frame additional rules and regulations or modify these rules if needed and once approved they would be binding on the students.

❖ Rule No.11: Introduction of this Curriculum

The new curriculum for the degree course in architecture B.Arch will be introduced from Academic Session 2020 -2021

- First year B.Arch Course from June 2020

Final Draft B.Arch CBCS 2020 Course

- Second year B.Arch Course from June 2021
- Third year B.Arch Course from June 2022
- Fourth year B.Arch Course from June 2023
- Final year B.Arch Course From June 2024

❖ Rule No.12: Course Code

Code used for serial numbers of the courses in the structure for B.Arch course shall be as follows :

12.1. First Character: will be Faculty and for Engineering Faculty BVDU has assigned K character.

12.2. Second Character: will be for BoS to which that course belongs (H for Architecture)

12.3. Third character: relates to Department for which course is to be conducted (M for Architecture)

12.4. Fourth character: will be for UG or PG course (U for UG in Architecture)

12.5. Fifth Character: will stand for Semester No.

Semester Code :

1. First Semester
2. Second Semester
3. Third Semester
4. Fourth Semester
5. Fifth Semester
6. Sixth Semester
7. Seventh Semester
8. Eighth Semester
9. Ninth Semester
10. Tenth semester

12.6. Sixth character: will be serial no. of course in that semester structure from 1 to 9.

❖ Rule No.13: Maximum period for duration of course

Students have to qualify for a degree within the period prescribed by the University Grants Commission. If the student could not, he/she will be allowed two more years beyond prescribed period. In exceptional cases, further extension of one more year, may be considered by the University. University & Council of Architecture, New Delhi may frame additional rules and regulations or modify these rules if needed and once approved they would be binding on the students.

In case a candidate is not able to complete the course in the prescribed duration, the university or institution may provide an exit option for the candidate if has completed and earned all credits for the first three years of study.

STRUCTURE OF B.ARCH DEGREE PROGRAMME

Structure of B.Arch degree programme is proposed to be implemented from academic year 2020-21, to provide students centric educational philosophy.

A. Course Categories:

Under CBCS, the degree programme will consist of the following categories of courses, in the framework of council of Architecture:

1. Professional Core Courses (PC)
2. Building Science and Applied Engineering (BS& AE)
3. Enhancement Course
4. Skill Enhancement Courses (SEC)
5. Professional Ability Enhancement Courses (PAEC)
6. Elective Courses
 - a. Open Electives (OE)
 - b. Professional elective (PE)

In addition, a student should satisfactorily complete Audit courses (AC) minimum 2 Nos prescribed in the curriculum. Audit courses are non credit courses.

A.1. Compulsory courses consisting of

- a. **Professional Core (PC)**) courses introducing the students the foundation of architectural topics
- b. **Building Science and Applied Engineering (BS& AE)** courses informs the Professional Core courses
- c. **Skill Enhancement (SEC)** Courses nurtures skill of the
- d. **Professional Ability Enhancement (PAEC)** Courses

A.2. Elective Course enables students to take up a course of their own interest and facilitates students a freedom in selecting courses.

- a. **Open Elective Courses** enables an exposure to some other discipline
- b. **Professional Elective Courses** supportive to the core discipline of the study or provides an extended scope; may be very specific; specialized; advanced.

A.3. Audit Course courses consisting of

- a. Disaster Management
- b. Environmental Studies

B. Credits:

Credits are the weightages are assigned to the courses based on the following general pattern:

- | | |
|---|----------|
| 1. lecture period | 1 credit |
| 2. Periods Lab/Workshop/ Tutorial | 1 credit |
| 3. Period of Design/ Construction/ Practical Training/ Thesis | 1 credit |

B.1.The curriculum for B. Arch. Programme is designed to have a minimum of 296 credits + 2Non CGPA credits distributed across ten semesters of study for the award of degree.

B.2.A student must earn a minimum number of credits under each category as shown in Table 1 and also a minimum total of credits (296 credits + 2 Non CGPA courses) for the award of B. Arch degree.

Table1: Distribution of credits

No.	Category	Code	Credits	Percentage
1	Professional Core	PC	149	50.34%
2	Building Science and Applied Engineering	BSAE	60	20.27%
3	Skill Enhancement Course	SEC	17	05.74%
4	Professional Ability Enhancement Courses	PAEC	34	11.49%
5	Open Elective	OE	10	03.38%
6	Professional Electives	PE	26	8.78%
	Total Credits		296	100.00%
		NON CGPA		
	Audit courses		----	---

Structure & Examination Pattern of First Year B.Arch

Semester I							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Course	Teaching Scheme				Examination Scheme (Marks)				Credits	
			(in hours/week)				IA	UE				Total
			L	SP	W	Total			TP	SO	SS	
KHMU11	PC	Architectural Design-I	2	2	2	6	40	-	60	-	100	6
KHMU12	BSAE	Building Construction and Material-I	2	-	4	6	40	-	60	-	100	6
KHMU13	BSAE	Theory of Structures-I	1	-	1	2	40	-		60	100	2
KHMU14	PC	History of Architecture –I	2	-	1	3	40	60	-	-	100	3
KHMU15	PC	Architecture Drawings and Graphics-I	1	-	4	5	40	60	-	-	100	5
KHMU16	PC	Workshop	1	-	2	3	40	-	-	60	100	3
KHMU17	PC	Basic Design-I	1	-	2	3	40	-	60	-	100	3
KHMU18	OE	Elective I	1	-	1	2	100	-	-	-	100	2
		Total				30	380	120	180	120	800	30
Notations: L-Lectures, SP-Studio project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination TP- Terminal Paper ,SS-Sessional ,SO -Sessional Oral												
PC: Professional Core Course; BSAE: Building Science and Applied Engineering Course ,OE: Open Elective												

Structure & Examination Pattern of First Year B. Arch

Semester-II							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
							TP	SO	SS			
KHMU21	PC	Architectural Design-II	2	2	2	6	40	-	60	-	100	6
KHMU22	BSAE	Building Construction and Material-II	2	-	4	6	40	-	60	-	100	6
KHMU23	BSAE	Theory of Structures-II	1	-	1	2	40	-	-	60	100	2
KHMU24	PC	History of Architecture –II	2	-	1	3	40	60	-	-	100	3
KHMU25	PC	Architecture Drawings and Graphics-II	1	-	4	5	40	60	-	-	100	5
KHMU26	PC	Climatology	2	-	1	3	40	-	-	60	100	3
KHMU27	PC	Basic Design -II	1	-	2	3	40	-	60	-	100	3
KHMU28	OE	Elective II	1	-	1	2	100	-	-	-	100	2
		Total				30	380	120	180	120	800	30
Notations: L-Lectures, SP-Studio project, W-Workshop/Studio Exercises												
IA: Internal Assessment, UE: University Examination, TP- Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, BSAE: Building Science and Applied Engineering Course, OE: Open Elective												

Structure & Examination Pattern of Second Year B.Arch

Semester-III							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU31	PC	Architectural Design -III	1	4	1	6	40	-	60	-	100	6
KHMU32	BSAE	Building Construction and Material-III	2	-	4	6	40	-	60	-	100	6
KHMU33	BSAE	Theory of structures-III	2	-	-	2	40	60	-	-	100	2
KHMU34	PC	History of Architecture-III	2	-	1	3	40	-	60	-	100	3
KHMU35	PC	Architecture Drawings and Graphics-III	1	-	4	5	40	-	-	60	100	5
KHMU36	PC	Building services-I	2	-	1	3	40	60	-	-	100	3
KHMU37	SEC	Computer Applications in Architecture-I	1	-	2	3	100	-	-	-	100	3
KHMU38	PE	Elective-III	1	-	1	2	100	-	-	-	100	2
		Total				30	440	120	180	60	800	30
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment, UE: University Examination, TP- Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, BSAE: Building Science and Applied Engineering Course, SEC: Skill Enhancement Course, PE: Professional elective												

Structure & Examination Pattern of Second Year B.Arch

Semester-IV							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits Total	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU41	PC	Architectural Design-IV	1	4	1	6	40	-	60	-	100	6
KHMU42	BSAE	Building Construction and Material-IV	2	-	4	6	40	-	60	-	100	6
KHMU43	BSAE	Theory of Structures-IV	2	-	-	2	40	60	-	-	100	2
KHMU44	PC	History of Architecture-IV	2	-	1	3	40	-	60		100	3
KHMU45	BSAE	Surveying and Levelling	1	-	4	5	40	-	-	60	100	5
KHMU46	BSAE	Building Services-II	2	-	1	3	40	60	-	-	100	3
KHMU47	SEC	Computer Applications in Architecture-II	1	-	2	3	100	-	-	-	100	3
KHMU48	PE	Elective-IV	1	-	1	2	100	-	-	-	100	2
	AC	Environmental Studies	-	-	-	-	-	-	-	-	-	-
		Total				30	440	120	180	60	800	30
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment, UE: University Examination, TP- Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, BSAE: Building Science and Applied Engineering Course, SEC: Skill Enhancement Course, PE: Professional Elective, AC: Audit Course												

Structure & Examination Pattern of Third Year B. Arch

Semester-V							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU51	PC	Architectural Design-V	1	6	1	8	40	-	60	-	100	8
KHMU5	BSAE	Building Construction and Material-V	2	-	3	5	40	60	-	-	100	5
KHMU53	BSAE	Theory of Structures-V	1	-	1	2	40	-	-	60	100	2
KHMU54	PC	Specification Writing	2	-	1	3	40	60	-	-	100	3
KHMU55	PC	Landscape Architecture -I	1	1	1	3	40	-	60	-	100	3
KHMU56	BSAE	Building Services-III	2	-	1	3	40	-	-	60	100	3
KHMU57	SEC	Working Drawing -I	1	-	3	4	40	-	60	-	100	4
KHMU58	PE	Elective-V	1	-	1	2	100	-	-	-	100	2
		Total				30	380	120	180	120	800	30
Notations: L-Lectures, SP-Studio project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course; BSAE: Building Science and Applied Engineering Course, SEC: Skill Enhancement Course, PE: Professional Elective												

Structure & Examination Pattern of Third Year B. Arch

Semester-VI							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU61	PC	Architectural Design-VI	1	6	1	8	40	-	60	-	100	8
KHMU62	BSAE	Building Construction and Material-VI	2	-	3	5	40	60	-	-	100	5
KHMU63	BSAE	Theory of Structures-VI	1	-	1	2	40	-	-	60	100	2
KHMU64	PC	Estimation and Costing	2	-	1	3	40	60	-	-	100	3
KHMU65	PC	Landscape Architecture -II	1	1	1	3	40	-	60	-	100	3
KHMU66	BSAE	Building Services-IV	2	-	1	3	40	-	-	60	100	3
KHMU67	SEC	Working Drawing- II	1	2	1	4	40	-	60	-	100	4
KHMU68	PE	Elective-VI	1	-	1	2	100	-	-	-	100	2
	AC	Disaster Management	-	-	-	-	-	-	-	-	-	-
		Total				30	380	120	180	120	800	30
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, BSAE: Building Science and Applied Engineering Course, SEC: Skill Enhancement Course, PE: Professional Elective, AC: Audit Course												

Structure & Examination Pattern of Fourth Year B. Arch

Semester-VII							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU71	PC	Architectural Design-VII	1	8	1	10	40	-	60	-	100	10
KHMU72	PC	Interior Design	1	2	1	4	40	-	60	-	100	4
KHMU73	PC	Urban Planning	1	-	2	3	40	-	60	-	100	3
KHMU74	PAEC	Research in Architecture	2	-	2	4	40	-	-	60	100	4
KHMU75	SEC	Advance Computer Applications in Architecture	1	-	2	3	40	-	60	-	100	3
KHMU76	PE	Elective-VII	1	-	2	3	40	-	-	60	100	3
KHMU77	PE	Elective-VIII	1	-	2	3	40	-	-	60	100	3
		Total				30	280	Nil	240	180	700	30
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, TP: Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course; PAEC: Professional Ability Enhancement Course, SEC: Skill Enhancement Course, PE: Professional Elective												

Structure & Examination Pattern of Fourth Year B. Arch

Semester-VIII							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits Total	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU81	PAEC	Practical Training	-	-	-	-	-	-	100		100	24
KHMU82	OE	Self-Study	-	-	-	-	-	-		100	100	6
							Nil	Nil	100	100	200	30
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, TP: Terminal Paper, SS-Sessional, SO -Sessional Oral												
PAEC: Professional Ability Enhancement Course, OE: Open Elective												
Note 1: For practical training, a student has to undergo 16 weeks of training per semester.												
Note 2: The work from practical training will be assessed after the student completes the internship in this semester.												
Note 3: Validity of training shall be only for a year after completion of training.												

Structure & Examination Pattern of Fifth Year B. Arch

Semester-IX							Total Duration-28 hrs/Week					
							Total Credits -28					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)					Credits
			L	SP	W	Total	IA	UE			Total	
								TP	SO	SS		
KHMU91	PC	Advanced Architectural Design	2	6	4	12	40	-	60	-	100	12
KHMU92	PC	Capstone Project	1	2	1	4	40	-	60	-	100	4
KHMU93	PAEC	Research Project	1	-	3	4	40	-	-	60	100	4
KHMU94	PAEC	Professional Practice	1	-	1	2	40	-		60	100	2
KHMU95	PE	Elective-IX	1	-	2	3	40	-	60	-	100	3
KHMU96	PE	Elective-X	1	-	2	3	40	-	60	-	100	3
		Total				28	240	Nil	240	120	600	28
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, TP: Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, PAEC: Professional Ability Enhancement Course, PE: Professional Elective												

Structure & Examination Pattern of Fifth Year B. Arch

Semester-X							Total Duration-28 hrs/Week					
							Total Credits -28					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU101	PC	Architectural Design Project	1	12	5	18	40		60		100	18
KHMU102	PC	Seminar in Architecture	1	-	3	4	100				100	4
KHMU103	PE	Elective-XI	1	-	2	3	40		60		100	3
KHMU104	PE	Elective-XII	1	-	2	3	40		60		100	3
		Total				28	220	Nil	180	Nil	400	28
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, TP: Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, PE: Professional Elective												

LIST OF ELECTIVES

Following is the list of electives under various streams for each semester to facilitate choice to learners in selecting courses of their own interest. However, the list given is only suggestive and can expand or modify it for enrichment of the course. The college will offer electives based upon the availability of resources in the college, provided minimum 20 students choose the particular elective. However colleges have to ensure that the student does not repeat a particular elective. Wide range of 'Open Electives are offered for Sem I , II & VIII as below. Students have to choose any one from the list.

Semesters	Open Electives
Sem-I	Physical Education and Yoga
	Performing Arts
	Culinary Art
	Stress Management
	Community Engagement
	Pottery
Sem-II	Architectural Photography
	Personality development and Communication Skills
	Foreign Languages
	Calligraphy Techniques
	Ayurveda as a lifestyle
	Cyber Security
Sem.VIII	Certificate Course
	Study in their interest area

For Sem. VIII students can take up certificate course such as MOOC, SWAYAM etc. It could be online course, or conduct study in their interest area.

From Sem-III to Sem X, students can choose electives as per structure of the syllabus from any of the three streams (Professional Electives) mentioned in the table below. A student may adhere to a particular stream of elective of his/her choice and nurture his/her area of interest and develop his/her expertise across semesters. In the semesters where two electives are offered per semester, students have to choose them from two different streams.

Semesters	Design	Technology and Management	Allied (Art, legalities, culture, environment, etc)
Sem-III	Vernacular Architecture	Alternative Building Materials and	Sketching
	Theory of Design	Presentation Techniques in Architecture	Horticulture
Sem-IV	Climate Responsive Building Design	Modular Co-ordination	Visual Communication
	Vastu Shastra	Glass in Architecture	Study of Iconography in Temples
	Graphic Design	Sustainable Water Management	Introduction to Indology
Sem-V	Universal Design	Building Automation	Rural development
	Light in Architecture	Sustainable Waste Management	Architectural Journalism
	Water in Architecture	Cost Effective Construction	Ekistics
Sem-VI	Furniture Design	Auditorium Acoustics and Services	Affordable Housing
	Gendered Spaces	Fenestrations in Buildings	Building Economics
	Architects and Their Philosophies	Facility Management	Introduction to Archaeology
Sem-VII	Product Design	Long Span Structures	Gender in Architecture
	Architectural Conservation	Disaster Resistance Structures	Behaviour Psychology
	Healthcare Design	Pre-Fabricated and Pre-Stressed Structures	Ergonomics
	Critical Thinking of Modern Architecture	Steel Structures	Housing Laws and Policies
Sem-IX	Set Design	Office Management	Study of Cities
	Hospitality Design	Real Estate Management	Intellectual Property Rights
	Urban Design	Fire Fighting Systems in Buildings	Art in Architecture
	Landscape Urbanism	Pneumatic Structures	Urban Infrastructure Planning
Sem-X	Digital Architecture	Construction Management	Cultural Landscapes
	Industrial Design	Intelligent Building Systems	Geographic Information System
	Modular Furniture Design	Valuation	Legalities in Architectural Profession
	Specialized Architecture(Defence/	Specialized Services in Buildings	Green Building Rating Systems

GUIDELINES FOR PAPER-SETTING SYLLABUS CBCS-2020

1. Question paper to cover questions from entire syllabus.
2. All UE theory papers are for maximum 60 marks.
3. Duration:
 - a. 2&1/2 hrs. for writing papers
 - b. 3hrs. for drawing papers.
4. There will be Two sections of max. marks 30 each.
 - a. Section-I from Units-I,II& III of syllabus
 - b. Section-II from Units-IV,V& VI of syllabus
5. There will be Four questions in each section of 10 marks each.
6. Maximum marks for each question will be in whole numbers & not in fractions.
7. In each Section following pattern will be followed:

Section –I

 - a. Question no. 1 is compulsory
 - b. Attempt any Two questions out of Question no. 2,3,4.

Section –II

 - a. Question no. 5 is compulsory
 - b. Attempt any Two questions out of Question no. 6,7,8.
8. In each section 20% marks will be assigned for Analytical questions i.e in each section out of 30 marks 6 marks are assigned for Analytical component. This component will be in compulsory question i.e Question no.1 and Question no.5.

SEMESTER I

First Year B Arch.

Architectural Design-I

Course Code:KHMU11	Course Category: Professional Core		Semester: I
Credits :	6	Internal Assessment	40 Marks
Lectures per week	2	Terminal Paper	-
Studio Projects per week	2	Sessional Oral (SO	60marks
Workshops or studio exercises / week	2	Sessionals (SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	108Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	90 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	18 Hours

Course Objectives:

1. To apply knowledge gained in other subjects and present them in graphic form using manual medium.
2. To imbibe the importance of pre-study in design process
3. To provide knowledge and understanding of design with special attention to design fundamentals and orientation

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Define anthropometry and recognize the importance of cardinal directions in design.
2.	Understanding	Comprehend design fundamentals in relation to space design.
3.	Applying	Develop visualization of liveable spaces by understanding relationship between the activities and spaces through case studies and site visits.
4.	Analyzing	Analyze the aspects related to function, space, structure, and aesthetics
5.	Evaluating	Relate knowledge in the domain of fundamentals of design
6.	Creating	Design a single activity space and create final project and model

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Study of Design Fundamentals <ul style="list-style-type: none"> - Study of anthropometry, (study of basic human activities in Indian and Global context) - Study of function and circulation (Relationship between function and space) 	12
Unit -II	Study of orientation of buildings <ul style="list-style-type: none"> - Study of cardinal and ordinal directions - Study of building orientation with respect to basics of sun and wind - Understanding the preferred/ non preferred, favorable/ non favorable orientation with respect to cardinal directions and climate 	12
Unit -III	Pre-study: Learning from primary and secondary resources <ul style="list-style-type: none"> - Case-studies and site visits - Books, reports, articles - Films and documentaries 	24
Unit-IV	Architectural Design <ul style="list-style-type: none"> - Single activity architectural design project (approximately 50 sqm.), with application of the learning's from study of design fundamentals, study of cardinal directions, climate, and the pre-study. 	30
Unit-V	3-D models <ul style="list-style-type: none"> - Study models - Physical model of the final design proposal with site development 	12
Total Contact Hours		90

Learning Resources:

1.	Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press
2.	Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and Sons
3.	Ching Francis, D. K. (2007) <i>Architecture: Form Space & Order</i> , New Jersey, John Willy and
4.	Krishnan Arvind (2017), <i>Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings</i> , McGraw Hill Education

5.	Neufert Ernst (1970) <i>Neufert Architects data</i> , Bauwelt-Verlag (German 1 st Ed.), Lockwood (English 1 st Ed.)
6.	Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing
7.	Pandya Yatin (2014) <i>Elements of Space Making</i> , Ahmedabad, Mapin Publishing
8.	Pramar V. S. (1973) <i>Design Fundamentals in Architecture</i> , Somaiya Publication
9.	Rapoport Amos (1969), <i>House, form and culture</i> , Pearson
10.	Thakkar Jay, Morrison Skye, (2008) <i>Matra: Ways of Measuring Vernacular Built Forms of Himachal Pradesh</i> , SID research Cell, CEPT University

First Year B Arch.

Building Construction and Material-I

CourseCode:KHMU13	Course Category: BSAE		Semester: I
Credits :	6	Internal Assessment	40 Marks
Lectures per week	2	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	60marks
Workshops or studio exercises / week	4	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	108Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	90 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	18 Hours

Course Objectives:

1. To enable students to understand materials, principles and methods of construction
2. To cover the breadth of students including components and systems of buildings

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Define various components of building and know technical terms, different materials available for masonry work
2.	Understanding	Understand the concept of load transmission and distinguish load bearing and framed structure
3.	Understanding	Describe purpose ,methods and types of finishes
4.	Applying	Apply knowledge gained in Theory of Structure and develop understanding about basic principles of construction method
5.	Analyzing	Analyze different materials in terms of properties, types, application in design ,market forms available ,advantages and disadvantages etc
6.	Evaluating	Compare different types of materials in masonry work
7.	Creating	Design masonry element and entrance gate applying alternative materials and methods of construction
8.	Creating	Create drawings, models and relate structural behaviourism and construction techniques

Course Contents:

Units	Contents of The Course	Hours
Unit -I	<p>Introduction Introduction to building construction as course and its relevance to Architectural design.</p> <ul style="list-style-type: none"> - Introduction to various components of building from foundation to roof. - Structural elements of load bearing and framed structure and its differences 	7
Unit -II	<p>Materials</p> <ul style="list-style-type: none"> - Properties, sustainability aspects, various types, cost, application in buildings, defects and strengths, market survey of bricks , stones ,cement, sand, aggregates, mortar and lime. 	7
Unit -III	<p>Finishes</p> <ul style="list-style-type: none"> - Pointing: Purpose and types - Plastering: Method and types i.e. neeru faced, sand faced, rough cast, pebble finish and all proprietary types. <p>Innovative materials used for pointing and plastering</p>	7
Unit-IV	<p>Foundation</p> <ul style="list-style-type: none"> - Excavation: purpose and types, plinth formation - Introduction to shallow foundation - Strip foundation for a load bearing structure in stone and brick upto plinth level including plinth formation - Foundation for brick piers, entrance steps, compound walls. 	21
Unit-V	<p>Masonry</p> <ul style="list-style-type: none"> - Fundamentals, principles of load bearing construction for medium rise structures using brick, stone, concrete blocks, solid blocks, hollow blocks, cavity blocks etc. - Introduction to various types of brick masonry. - Bonds: English, Flemish, header, stretcher, garden wall, rat trap and other types. - Junctions: Tee, crossed and right angled - Introduction to stone masonry and its types : dry rubble, uncoursed rubble, random rubble, squared, polygonal, etc. - Composite masonry 	31
Unit-VI	<p>Entrance gate and Fencing</p> <ul style="list-style-type: none"> - Entrance gate - Constructional details of entrance gate in a compound wall of following types: Sliding Gate with floor channel, Sidehung , side hung with wicket gate. - Fencing - Construction in different materials like Barbed wire, Chain link, Wire mesh, R.C.C. Grills, M.S. Grills etc. 	17
Total Contact Hours		90

Learning Resources:

1.	Rangwala S.C.(2007) Engineering Materials, Gujarat, Charator Publication House
2.	Duggal S.K.(2009) Building materials, New Delhi, New Age International
3.	Varghese P.C. (2005) Building Materials, New Delhi, Prentice Hall of India Pvt. Ltd.
4.	Duggal S.K. (1997) Building Materials, New Delhi, Oxford and IBH publishing Co.Pvt. Ltd.
5.	Spence R.F. and Cook D.J.(1983) Building Materials in Developing Countries, New York, John Wiley and Sons.
6.	W.B. McKay(1981)Building construction Vol. II, UK,Longmans Green and Co.
7.	Barry(1958)The construction of buildings, Vol.I , Blackwell science
8.	Roy Chudley, GogerGreeno (1988), Buildings Construction handbook, Routledge

First Year B Arch

Theory of Structures-I

CourseCode:KHMU13	Course Category: BSAE		Semester: I
Credits :	2	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises/ week	1	Sessionals(SS)	60marks
No.s of Weeks in Semester	18	No.s of hours in Semester	36 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	30 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	6 Hours

Course Objectives:

1. To understand the structural concepts and behaviour of structural element

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Recognize the significance of the main structural elements in structural analysis
2.	Understanding	Explain structural concepts, fundamentals of structure and describe of the various loading conditions acting on the structure
3.	Understanding	Illustrate the concept of free body diagram of structures and structural elements
4.	Applying	Calculate self weight, resolution of forces, centre of gravity, moment of inertia, material constants for all types of structures, and stress calculations of structural members having different material properties
5.	Applying	Develop an ability to analyse internal response of structure
6.	Analyzing	Compare response of structural system for various materials
7.	Evaluating	Evaluate the behaviour of structural elements of ancient and modern structures
8.	Creating	Design stepped foundation, wall of uniform thickness and variable thickness and relate principals of this subject to the other subjects such as Building Construction, Architectural design, Architectural drawing and graphics, History of Architecture

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Introduction to fundamental concepts of structure:- Introduction to fundamental concepts of Applied Mechanics relevant to structures and characteristics of material like unit weight, elasticity, plasticity, ductility, hardness. Understanding of rigid body, deformable body, force systems, characteristics of forces, transmissibility, types of structures. Concept of tension, compression in structures	04
Unit -II	Resolution of forces :- Types of loads and moment a) calculation of self weight based on density for load bearing elements. b) Resultant of concurrent force system with simple practical examples. c) Concept of moment and resultant of non concurrent force system with simple practical examples	06
Unit -III	Equilibrium of forces acting on beam:- Introduction to i) Equilibrium conditions of force systems. ii) Types of loads - point loads, uniformly distributed load(udl), uniformly varying load(uvl), types of supports (hinge, simple, roller, fixed) , types of beams (simply supported, cantilever, overhanging, fixed, continuous) iii) Support reactions in beams.	06
Unit-IV	Centroid & Centre of Gravity: Importance and application of centroid and centre of gravity for plane sections like Rectangle, circle, semicircle, triangle.iii) Calculation of centroid for shapes-- C,T,L,I	04
Unit-V	Moment of Inertia: Moment of Inertia For standard sections, Parallel axis theorem, Perpendicular axis theorem, Radius of gyration. Moment of Inertia of sections considered for center of gravity (Unit IV).Importance and Application	04
Unit-VI	Simple stress & Strain:- Concept of Simple stress and strain. Calculation of self weight for load bearing elements and downward soil pressure due to the same. Simple numerical based composite (modular ratio) and compound elements. Behaviour of ductile and brittle material in terms of stress and strain curve. Introduction to elastic constants and its significance. Definition of fatigue, creep. Introduction to flinched beams	06
Total Contact Hours		30

Learning Resources:

1.	Beer and Johnston,(2008).Mechanics of Materials.NewDelhi,Tata McGraw-Hill
2.	Mario Salvadori.(1980).Why buildings stand up:The strength of architecture. McGraw-Hill
3.	S.B.Junnarkar&Dr.HJ Shah,(2012).Mechanics of Structures Vol. I &II.Anand,CharotarPublishing
4.	KhurmiR.S.(2014).Strength of Materials.NewDelhi,S.Chand& Company Ltd
5.	DongreA.P.(2011).Strength of Materials.Pune/Hyderabad,Scitech Publications

First Year B Arch.

History of Architecture-I

CourseCode:KHMU14	Course Category: Professional Core		Semester: I
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	60marks
Studio Projects per week	-	Sessional Oral (SO)	-
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	9 Hours

Course Objectives:

1. To learn from the wisdom of traditional knowledge systems.
2. To imbibe the fundamental knowledge of the built environment
3. To study history of architecture as a response to climate, culture and socio political conditions.

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Identify issues with reference to cultures, civilizations and settlements across the world at different periods of time
2.	Remembering	Know technology and its impact on built environment and building for
3.	Understanding	Understand the development of architecture as a process through a holistic approach of contextual and cultural evolution
4.	Understanding	Differentiate between various styles and elements of development and describe prominent historic buildings
5.	Applying and Analyzing	Develop ability to analyze the evolutionary aspects of stage of progress
6.	Evaluating	Compare architectural style across culture of that time with reference to location -geography , Social Systems, Religion ,climate, art etc.
7.	Creating	Derive materials ,construction techniques in design from historic civilization

Course Contents:

Units	Contents of The Course	Hours
Unit -I	<p>Prehistoric Housing forms in the initial phase: Cave shelters- (suggestive examples at Lascaux, Terra Amata etc) Community structures: (suggestive examples Menhir , dolmen, gallery and passage graves, Stonehenge, Ggantija Malta etc)</p>	6
Unit -II	<p>River Valley Civilizations –Asia Introduction to development of the settlements - location, social and cultural aspects, climate, construction techniques, building materials, building typologies and architectural characteristics, settlement principles etc - Yellow River, Indus River</p>	9
Unit-III	<p>Vedic Architecture Vedic culture and settlement planning layouts, City Planning in later Vedic period and Buildings and construction techniques. Buddhist Architecture Introduction to the Evolution and development of Major typologies like Stambha, Chaitya, Vihara ,Stupa. Development of Chaitya arch(suggestive examples Ashokan Stambhas, Lomas Rishi Cave,The Great Stupa at Sanchi, Chaitya Hall at Karli, Chaitya and Viharas at Verul and Ajanta etc)</p>	7
Unit-IV	<p>River Valley Civilizations -Western Introduction to development of the settlements - location, social and cultural aspects, climate, construction techniques, building materials, building typologies and architectural characteristics, settlement principles etc - Nile River ,Tigris River</p>	7
Unit-V	<p>Greek Civilization Introduction to the, Social and cultural Systems, political scenario, History and evolution of Architectural typologies, Characteristics of Buildings, construction technology and elements evolved like Classical Orders, Optical corrections etc. (suggestive examples Acropolis, City of Athens Temples, Theatres, Agora, Stoa, Council Halls etc)</p>	8
Unit-VI	<p>Roman Civilization Introduction of the History, evolution and characteristics Elements of special attributes. Introduction to the, Social and cultural Systems, political scenario, History and evolution of Architectural typologies, Characteristics of Buildings, construction technology and elements evolved like Arches, arcuated construction, bridges, aqueducts, etc(suggestive examples</p>	8

	City of Rome ,Temples- Pantheon, Basillica at Trajan, Amphitheatre, Hippodrome, Circus, Palaces-hydrian's villa , Thermae at Carcalla etc	
Total Contact Hours		45

Learning Resources:

1.	Sir Banister Fletcher, (1999) A History of Architecture, Indian Edition. Delhi, CBS Publications.
2.	Percy Brown,(1983) Indian Architecture (Hindu And Buddhist). Bombay, Taraporevala and Sons
3.	Denis Montagnon, (2001) Rome . ISBN 3-8228-5870-6. Germany, TashchenGmnH Satish Grover, (2003) The Architecture of India (Buddhist and Hindu Period). New Delhi, Vikas Publishing Housing Pvt. Ltd.
4.	Leland M Roth ,(1994) Understanding Architecture: Its Elements, History and Meaning. Craftsman House;
5.	Pier Luigi Nervi, General Editor, (1972) History of World Architecture – Series. New York, Harry N. Abrams Inc. Pub
6.	Burns, Ralph, Lerner, Meacham, (1991) World Civilizations. First Indian Edition, Delhi, Goyl Saab Publishers and Distributors.
7.	Roger Smith, (1987) An Illustrated history of Architectural Styles. Omega Books Ltd. Sebastiano Serlio,(1982) The five books on architecture. New York, Dover Publication Inc.
8	Sebastiano Serlio,(1982) The five books on architecture. New York, Dover Publication Inc
9	Satish Grover, (2003) The Architecture of India (Buddhist and Hindu Period). New Delhi, Vikas Publishing Housing Pvt. Ltd.

First Year B Arch.

Architectural Drawing and Graphics-I

CourseCode:KHMU15	Course Category: Professional Core		Semester: I
Credits :	5	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	60marks
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	4	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	90 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	75Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	15 Hours

Course Objectives:

1. To develop visualization and presentation skills as tools for creative thinking and representation of ideas and concepts
2. To acquire effective communication in graphical form in Architecture
3. To impart basic knowledge and skill to draft a drawing manually.

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Know architectural drawing techniques using drafting tools.
2.	Remembering	Acquire vocabulary and grammar such as scale, annotations, labelling ,dimensioning etc.
3.	Understanding	Understand the concept of orthographic projection, surface development.
4.	Applying	Use freehand techniques for preparing drawings and develop perception and presentation of different forms
5.	Analyzing and Evaluating	Analyze and relate Architectural Drawing Graphics with Architectural Design, Building Construction, Working Drawing etc
6.	Creating	Create conceptual and presentation drawings for various purposes

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Introduction to graphic language and its components <ul style="list-style-type: none"> - Introduction to instruments - Line types: meaning and application - Architectural lettering and dimensioning techniques and their role and application in composition of drawings with various examples - Architectural annotations and conventions 	12
Unit -II	Orthographic Projections <ul style="list-style-type: none"> - Geometrical construction, planar geometry - Method of Orthographic projections - Drawing 2-dimensional drawings from 3-dimensional objects 	18
Unit -III	Surface Development <ul style="list-style-type: none"> - Surface Development of various three-dimensional objects 	13
Unit-IV	Study of Graphical Scales <ul style="list-style-type: none"> - Introduction to graphic scale and their applications - Scaled enlargement and reduction of simple objects and site plans of complex shapes - Scaled drawings (plan/s section/s and elevation/s) of complex objects/ simple building of sufficient size to demonstrate use of various scales, conventions and standard annotations 	9
Unit-V	Sketching <ul style="list-style-type: none"> - Introduction to architectural sketching and principles of free hand sketching such as proportions, light and shade: with primary thrust on sketching of building elements and built/un-built environment. 	8
Unit-VI	Sections: from simple geometrical elements to complex architectural elements <ul style="list-style-type: none"> - Graphical and visual communication through sections of geometrical forms along with the understanding of the line weights, material indications, etc. - Graphical and visual communication through sections of architectural elements / building along with the understanding of the line weights, material, indications, etc 	15
Total Contact Hours		75

Learning Resources:

1.	F. D K. Ching (2009) Architectural Graphics, New Jersey, John and Wiley and Sons.
2.	Manual of Section, David J. Lewis, Marc Tsurumaki, and Paul Lewis.
3.	Architectural Drawing Course: Tools and Techniques for 2D and 3D Representation, by Mo
4.	N.D.Bhatt (2012) Engineering Drawing, Gujrat, Charotar Publishing House.
5.	Hugh C. Browning (1996) The Principles of Architectural Drafting, New York, Watson-
6.	Calvin F. Schmid, Stanton E. Schmid, (1954) Handbook on Graphic Presentation, New York,
7.	David Littlefield (2012) Matric Handbook, London and New York, Routledge Taylor and
8.	Sleeper R.(2000)Architectural Graphic Standards, New York, John Wiely and Sons.

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Workshop

CourseCode:KHMU16	Course Category: Professional Core		Semester: I
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	2	Sessionals(SS)	60
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

Course Objectives:

1. To introduce various types of models at appropriate scales such as site model, study model, block model, finished presentation models
2. To introduce students to various materials, tools and techniques used in making architectural models.
3. To introduce students to various skills such as joinery, cutting, finishing in carpentry, smithy.

Course Outcomes:

CO No.	Psychomotor levels	On successful completion of course the learner will be able to:
1.	Imitation	Observe the nature and texture of different materials
2.	Manipulation	Replicate forms in drawing by making models
3.	Precision	Choose tools and joinery techniques required for model making
4.	Precision	Integrate two dimensional drawing and three dimensional form
5.	Articulation	Construct or Compose three dimensional forms using different model making materials and equipment in different scale
6.	Naturalisation	Make everyday objects, some building elements ,building forms with a wide variety of available materials and handle simple tools in carpentry

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Materials for model making: Introduction to various materials like various types of papers, mount boards, softwood (balsa), cork, clay etc for architectural model making.	6
Unit -II	Tools and techniques in model making Introduction to various tools and techniques cutting, scoring, folding and gluing techniques, using templates, measuring aids, to build surfaces and simple/ solids such as cubes, prism, cylinders, pyramids, cones, spheres etc or interpenetrated forms.	9
Unit-III	Adv. Materials, methods and tools: Using materials such as plastics, films, plaster of paris, clay, acrylic, wax, metals, glass, fabric etc and their moulding, scooping, cutting, joining methods etc	6
Unit -IV	Wood and metal work: Exercises in cutting and joinery with planers, saw, lathe, and jigs; Joinery details in wood, metal, blocks, pipes, plates, etc, composition of basic and complex geometrical forms.	9
Unit-V	Finishing: Exercises in finishing with planers, sander; Finishing surfaces with various protective coats, paints, varnishes, oils etc	9
Unit-VI	Prototyping and advanced modelling: Introduction to model making using machines - explore laser cutting, acid etching, stereo lithography, 3D printing, etc. Introduction to various types of model making for Architectural studies like block model, working models, contour models, site models ,openable models, service models etc.	6
Total Contact Hours		45

Learning Resources:

1.	Engel, P. (1989). Folding the Universe: Origami from Angelfish to Zen. Vintage.
2.	Janke, R. (1978). Architectural models/Architekture modelle (No. 72.027). Academy Editions,.
3.	Mills, C. B. (2011). Designing with models: a studio guide to architectural process models. John Wiley & Sons.
4.	Taylor, J. R., & Taylor, J. R. (1971). Model building for architects and engineers. McGraw-Hill Companies.

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Basic Design -I

CourseCode:KHMU17	Course Category: Professional Core		Semester: I
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO)	60marks
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

Course Objectives:

1. To develop the basic understanding of the fundamentals of design
2. To provide knowledge and understanding of elements and principals of design; its importance

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Know elements of Design
2.	Understanding	Understand effects of scale, the concept of form, space and structure through creative thinking
3.	Applying	Develop lateral thinking and apply the principles of design
4.	Analyzing	Analyse aspects of form, space and aesthetics
5.	Evaluating	Appraise design forms in terms of visual character and critique basic design composition
6.	Creating	Create two dimensional and three dimensional composition with various media

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Elements of Design: Introduction to: - Different Elements of design - Fundamentals of Design	08

Unit -II	Scale, Proportion: <ul style="list-style-type: none"> - Proportion & scale: Material proportions, structural proportions - Golden Section - Anthropometry Visual Scale and Human Scale	08
Unit -III	Principles of Design <ul style="list-style-type: none"> - Introduction to Principles of Design - Theory on Lateral Thinking and exercise on generation of alternatives - Explorations of Principles of Design through 2D and 3D compositions 	09
Unit-IV	Volume , Form & Space <ul style="list-style-type: none"> - Properties of Form - Subtractive & additive forms - Degree of enclosure – Planes - Volumetric Study of Spaces – positive and negative spaces 	08
Unit-V	Organization: <ul style="list-style-type: none"> - Organization of Form & Space - Spatial Relationships - Spatial Organizations - Explorations of Organization through 3D compositions 	08
Unit-VI	Indian Aesthetics: Introduction to all art forms including architecture as a holistic sacred domain with reference from Vishudharmottar purana. ·Introduction to Art in India as a way of life, as a ritual, as a socio-cultural expression, and more, e.g. Rangoli, Mehendi, Serving of food, ornamentation, arrangement of puja, and so on.	04
Total Contact Hours		45

Learning Resources:

1.	Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press
2.	Bacon E.N. (1974) <i>Design of Cities</i> , England, Penguin Books
3.	Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i> , Australia, Watson-Guptill
4.	Ching Francis, D. K. (2007) <i>Architecture: Form Space & Order</i> , New Jersey, John Willy and
5.	Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and Sons
6.	Edward De Bono (1990) <i>Lateral Thinking</i> , London, Penguin Books

7.	Gupta Neerja (2017), <i>A Student's Handbook of Indian Aesthetics</i> , Cambridge Scholars
8.	Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing
9.	Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i> ,
10	ShirishVasantBapat (1993) <i>Basic Design and Anthropometry</i> , Pune, Bela Books
11	Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i> , London, Grange Book Plc
12	Yatin Pandya (2014) <i>Elements of Space Making</i> , Ahmedabad, Mapin Publishing

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Elective -I

CourseCode:KHMU18	Course Category: Open elective		Semester: I
Credits :	2	Internal Assessment	100 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	1	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	36 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	30 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	06 Hours

Course Objectives:

1. To facilitate the students to learn out of a pool of specialized courses, which provides extended scope or which enables exposure to discipline-centric courses as well as cross-disciplinary courses.
2. To encourage interdisciplinary learning and imbibe values as learners
3. To give students an opportunity to develop their attitudes and skills in a subject they may opt for making carrier

Course Outcomes:

CO No.	Affective levels	On successful completion of course the learner will be able to:
1.	Receiving	Identify and describe the aspects or issues of offered contents
2.	Responding	Report case study
3.	Valuing	Justify their ideas /opinions in relation to contents of elective
4.	Organization	Document and present the data collected in systematic way.
5.	Internalizing	Display a technical base through in depth study

Course Contents:

Units	Contents of The Course	Hours
	The detail course contents will vary as per options selected for elective and expert teaching the course will frame the contents at the beginning of semester along with objectives, outcomes, references and details for assignments.	
Total Contact Hours		

Learning Resources:

1.	As per topic chosen
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SEMESTER-II

First Year B Arch.

Architectural Design -II

CourseCode:KHMU21	Course Category: Professional Core		Semester: II
Credits :	6	Internal Assessment	40 Marks
Lectures per week	2	Terminal Paper	-
Studio Projects per week	2	Sessional Oral (SO	60 Marks
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	108 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	90 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	18 Hours

Course Objectives:

1. To make the students familiar with design and the architectural design process as a synthesis of factors such as climate, comfort, land, technology
2. To equip the students with communication and presentation skills
3. To inculcate sensitivity towards environment through climate responsive design

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Represent built/un-built spaces in graphic form
2.	Understanding	Understand the concept of form, space and structure through documentation
3.	Applying	Use isometric, axonometric, and rendering techniques and demonstrate their ideas and observations graphically as well as verbally
4.	Applying	Develop understanding to respond to the climate in order to achieve human comfort
5.	Analyzing	Analyze measured drawing with respect to structure ,form ,material, climate etc.
6.	Creating	Design multi activity space
7.	Creating	Make 3D views of design proposal

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Documentation Measured drawing of a well-articulated structure with its surrounding context	18
Unit -II	Pre-study: place, climate, scale, people and their activities - Study of place and climate - Site analysis, activity and/or function analysis (Learning from primary and secondary resources such as case-studies and site visits, books, reports, articles, films and documentaries, etc.)	12
Unit -III	Analysis Analysis and presentation of measured drawing with respect to structure, material, planning, context, climate, geography, resources, form, function, elements of design, aesthetics, etc.	18
Unit-IV	Architectural Design - Context based multi-activity architectural design project (approximately 300 sq. m.)	30
Unit-V	Time bound project - Single-activity architectural design project: this project shall be based on values in architecture (e.g. universal design, etc.)	12
Total Contact Hours		90

Learning Resources:

1.	Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press
2.	Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and Sons
3.	Ching Francis, D. K. (2007) <i>Architecture: Form Space & Order</i> , New Jersey, John Willy and Sons
4.	Krishnan Arvind (2017), <i>Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings</i> , McGraw Hill Education
5.	Neufert Ernst (1970) <i>Neufert Architects data</i> , Bauwelt-Verlag (German 1 st Ed.), Lockwood (English 1 st Ed.)
6.	Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing
7.	Pandya Yatin (2014) <i>Elements of Space Making</i> , Ahmedabad, Mapin Publishing
8.	Pramar V. S. (1973) <i>Design Fundamentals in Architecture</i> , Somaiya Publication
9.	Rapoport Amos (1969), <i>House, form and culture</i> , Pearson
10	Thakkar Jay, Morrison Skye, (2008) <i>Matra: Ways of Measuring Vernacular Built Forms of Himachal Pradesh</i> , SID research Cell, CEPT University

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Building Construction and Materials -II

CourseCode:KHMU22	Course Category: BSAE		Semester: II
Credits :	6	Internal Assessment	40 Marks
Lectures per week	2	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	60 Marks
Workshops or studio exercises / week	4	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	108 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	90 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	18 Hours

Course Objectives:

1. To enable students to understand materials, principles and methods of construction
2. To introduce timber construction and its elements in detail.

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Know timber as materials in depth and its elements in building construction.
2.	Remembering	Define terms of different timber elements
3.	Understanding	Describe different flooring and roofing materials and understand the concept of spanning for roof element
4.	Applying	Apply appropriate type of timber elements such as door windows, staircase, floor and roof in design considering form..
5.	Analyzing	Classify different timber elements used in construction and compare different types of materials for roofing ,flooring etc
6.	Evaluating	Evaluate suitable joinery for openings
7.	Creating	Summarise knowledge gained in this subject to the architecture design and create drawings and models

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Introduction <ul style="list-style-type: none"> · Introduction to timber construction · Properties, strength, defects and preservation of timber. · Various timber joints : widening joints, halved joints, cogged joints, bearing joints, oblique joints, etc. 	7
Unit -II	Materials <ul style="list-style-type: none"> · Mud blocks ,rammed earth blocks · Roofing materials - types, purpose, characteristics, advantages and disadvantages · Flooring and paving - different flooring and paving materials 	7
Unit -III	Timber doors and windows <ul style="list-style-type: none"> · Terminology and construction aspects of doors and windows · Timber doors & Partitions - Design consideration and construction for single and double shutters, partly glazed and partly panelled, fully glazed, fully panelled, flush doors, ledged, braced and battened doors. · Timber windows -Design considerations, principles and construction for sash types-panelled, fixed, partly glazed, fully glazed and louvered. · Timber windows -Types of opening- centrally pivoted, top hung, side hung, casement, bay window and sliding. · Hardwares used for doors and windows 	28
Unit-IV	Timber roofs and trusses <ul style="list-style-type: none"> · Timber roofs - Types of roof construction with respect to slope, span and spanning members · Terminology of sloping roof and members · Need and types of sloping roofs : lean to roof, couple roof, close couple roof and collar roof. · Timber trusses – Principles and considerations of trusses. Forces in truss members. Construction of trusses such as king post, queen post truss, ,mansard roof and trusses for various spans 	28
Unit-V	Timber floors <ul style="list-style-type: none"> · Timber flooring - General idea of timber floors in relation to spans, load transmission · Types :Single joist, double joist, triple joist 	15
Unit-VI	Staircase <ul style="list-style-type: none"> · Design Consideration and components · Types of staircase · Timber staircase 	5
Total Contact Hours		90

Learning Resources:

1.	Rangwala S.C.(2007) Engineering Materials, Gujarat, Charator Publication House
2.	Duggal S.K.(2009) Building materials, New Delhi, New Age International
3.	Don A. Watson,(1972) Construction Materials and Processes, New York, McGraw Hill
4.	W.B. Mckay(1981)Building Construction Vol. I,II, UK,Longmans Green and Co.
5.	Barry(1958)The construction of buildings, Vol.I,II, Blackwell science
6.	Roy Chudley, Goger Greeno (1988), Buildings Construction handbook, Routledge

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Theory of Structures -II

CourseCode:KHMU23	Course Category: BSAE		Semester: II
Credits :	2	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	1	Sessionals(SS)	60 Marks
No.s of Weeks in Semester	18	No.s of hours in Semester	36 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	30 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	6 Hours

Course Objectives:

1. To understand the structural concepts and behaviour of structural element
2. To introduces forces acting on members in structures

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Recognize the significance of shear force and Bending moment diagram in structural analysis
2.	Understanding	Categorize the forces acting on members in structural analysis
3.	Applying	Develop an understanding of stresses and strain on members
4.	Analyzing	Analyze the behaviour and response of structural system to various load consideration
5.	Evaluating	Justify the dimensions assigned to structural elements of structure for serviceability and safety criteria
6.	Creating	Calculate the load for various load combinations and nature of load (Dead load, Live load)

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Introduction to Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) for Simply supported, cantilever, and overhang. Definition of Shear Force (SF),Bending Moment (BM), Sign convention, sagging ,hogging, Point of contra flexure, contra shear, effect of couple on beams	04

Unit -II	Details of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD). Details for simply supported, cantilever, overhang beam for a combination of uniformly distributed load(UDL) and point load.	06
Unit -III	Theory of Simple Bending:- Theory of simple bending and bending stress. Details based on standard section with bending stress distribution diagrams.	06
Unit-IV	Shear Stress of Beam:- Shear stress. Details based on standard section with shear stress distribution diagram. Introduction to shear centre.	06
Unit-V	Slope And Deflection:- slope and deflection in beams based on standard cases (no derivations).	04
Unit-VI	Arches:- Introduction to arches as structural element, two hinged, three hinged and fixed.	04
Total Contact Hours		30

Learning Resources:

1.	S B Junnarkar&Dr. H J Shah,(2012).Mechanics of Structures Vol. I &II.Anand,Charotar Publishing
2.	Deo S.S.(2013).Engineering Mechanics.Pune, NiraliPrakashan
3.	Deo S.S.(2013).Strength of Materials.Pune,NiraliPrakashan
4.	Ramamrutham S. Narayan.R.(2014) <i>Theory of Structures (for Engineering Degree ,Diploma)</i> .New Delhi, Dhanpatrai Publications P.Ltd
5.	Timoshenko Stephen.(2002) <i>Strength of materials part I. (elementary theory and problems) IIIrd ed.</i> New Delhi, CBS Publishers..Timoshenko Stephen.(2002) <i>Strength of materials part II (elementary theory and problems) IIIrded.</i> NewDelhi,CBS Publishers.

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History of Architecture -II

CourseCode:KHMU24	Course Category: Professional Core		Semester: II
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	60 Marks
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

Course Objectives:

1. To learn from the wisdom of traditional knowledge systems.
2. To imbibe the fundamental knowledge of the built environment
3. To study history of architecture as a response to climate, culture and socio political conditions.

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Identify issues with reference to cultures, civilizations and settlements across the world at different periods of time
2.	Remembering	Know technology and its impact on built environment and building fo
3.	Understanding	Understand evolution of various styles of art and architecture
4.	Understanding	Differentiate between various styles and elements of development and describe prominent historic buildings
5.	Applying and Analyzing	Develop ability to analyze the evolutionary aspects of stage of progress
6.	Evaluating	Compare architectural style across culture of that time with reference to location -geography , Social Systems, Religion ,climate, art etc.
7.	Evaluating	Appraise structures as a developmental process rather than simply as a product and critique building forms, structure
8.	Creating	Design buildings in historic architectural styles

Course Contents:

Units	Contents of The Course	Hours
Unit -I	<p>Evolution of -Hindu Temple Architecture</p> <p>Evolution of architectural style, principles and major influences on development of form, Spatial organisation, structural development and ornamentation style and other architectural elements during.</p> <ul style="list-style-type: none"> - Gupta period (suggestive examples Temple no 17 , Sanchi, Dasavatara Temple Deogarhetc) - Early and later Chalukyan Temple Development at Aihole , Badami Pattadakal. (suggestive examplesLadkhan and Durga temples-Aihole , Cave temple-Badami, Virupaksha and Papanath temple- Pattadakal, etc)3. - Temple Development by Rashakutas. (suggestive example Kailash Temple Ellora) - Temple Development by Pallava - Rock cut and Structural Temples (suggestive examples Rathas, Rock cut caves, Shore temple at Mamallapuram etc) 	9
Unit -II	<p>Introduction to Dravidian style (Development in South India)</p> <p>Evolution of architectural style, principles and major influences on development of form, Spatial organisation, structural development and ornamental style and other architectural elements during</p> <ul style="list-style-type: none"> - Hoysala Temple Development.(suggestive example Keshava temple at Somnathpur) - Temple development by Cholas. (suggestive example - Brihadeshwara temple, ThanjavoreEtc - Development of gopuram during Pandya Period. - Vijayanagara Period. (suggestive example -Vitthalaswami temple, Hampi, column orders etc) - Development of Temple cities during Madura period. (suggestive examples - Meenaksi temple atMadurai, Sriranganathaswami temple at srirangametc) 	9
Unit -III	<p>Introduction to Nagara style (Development in North India)</p> <p>Evolution of architectural style, principles and major influences on development of form, Spatial organisation, structural development and ornamental style and other architectural elements in</p> <ul style="list-style-type: none"> - Orissa -(suggestive examples Mukteshwar Temple, Lingaraja temples at Bhubaneswar, Sun temple at Konark) - Khajuraho- (suggestive examples –Kandariya Mahadeo temple, Khajuraho etc) - Western regions of Gujarat -(suggestive example Sun temple, Modheraetc) - Jain Temple Development in Western India. (suggestive 	9

	examples Vimal Shah at Mount Abu, Chaumukh Temple at Ranakpuretc)	
Unit-IV	<p>Early Christian and Byzantine Architecture</p> <p>Introduction to the social systems, aspects of Spatial organization, structural development, planning principles and ornamentation elements in the Evolution of Church form.</p> <p>Introduction to the special elements like timber trusses, clerestory, pendentives, dome construction, surface treatment, materials of construction etc. (suggestive examples -St. Peters at Rome (earlier one) Hagia Sophia at Constantinople etc)</p>	6
Unit-V	<p>Romanesque</p> <p>Introduction to the social systems, aspects of Spatial organization, structural development, planning principles and ornamentation elements in the Evolution of Church form.</p> <p>Introduction to the special elements like Wall passages, raking arcades, triforium gallery, vaulting systems etc(suggestive examples – St. Michelle Pavia, Campus at Pisa etc)</p>	6
Unit-VI	<p>Gothic Phase</p> <p>Introduction to the Spatial organization, planning principles and ornamentation elements in the Evolution of Church form.</p> <p>Introduction to the special elements like buttresses with Structural innovations, pointed arches, vaulting systems, window traceries, flying buttresses etc.(suggestive examples -Amines Cathedral, Notre dame cathedral, Salisbury cathedral, West Ministers Abbey, castles etc)</p>	6
Total Contact Hours		45

Learning Resources:

1.	Percy Brown, (1983) Indian Architecture (Hindu And Buddhist). Bombay, Taraporevala and Sons.
2.	Henri Stierlin, (2002) Hindu India. ISBN 3-8228-1767-8. Taschen GmbH.
3.	George Michell, (1995) Architecture of the Islamic World. London, Thames and Hudson Ltd.
4.	Sandra Forty, (2004) Architecture. Rochester, Grange books
5.	Sir Banister Fletcher, (1996) A History of Architecture. Delhi, CBS Publishers.
6.	DhanpatRai Publications (P) Ltd, 16th Reprint

First Year B Arch.

Architectural Drawing and Graphics -II

CourseCode:KHMU25	Course Category: Professional Core		Semester: II
Credits :	5	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	60 Marks
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	4	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	90Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	75 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	15 Hours

Course Objectives:

1. To introduce various techniques of three-dimensional presentation of simple , complex objects and building elements.
2. To enable the students to understand and express Composite three-dimensional built forms through additive and interpenetrated elements using various graphical projection systems through sections
3. To understand scale proportions in buildings and communication through architectural drawings

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Recognize , three dimensional drawing and its importance in architectural drawing
2.	Understanding	Understand interpenetration of solids and explain concept of isometric, axonometric projections
3.	Applying	Develop understanding of sciography and apply in plan and elevations of design
4.	Analyzing Evaluating	Analyze and relate the graphics content with Architectural Design
5.	Creating	Create 3D views using isometric and axonometric

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Advanced orthographic projections <ul style="list-style-type: none"> - To draw and compose composite solids and its orthographic projection - Drawing Plan/s, Section/s, Elevation/s of building elements by using methods of orthographic projection 	15
Unit -II	Three dimensional drawings-I <ul style="list-style-type: none"> - Drawing of isometric, axonometric and oblique views of solid objects and their compositions 	15
Unit-III	Three dimensional drawings - II <ul style="list-style-type: none"> - Drawing of isometric, axonometric and oblique views of building elements 	10
Unit -IV	Interpenetration of objects <ul style="list-style-type: none"> - Intersection and interpenetration of solid geometric objects and their compositions - Intersection and interpenetration of architectural elements and their compositions 	15
Unit-V	Introduction to Sciography <ul style="list-style-type: none"> - Introduction to sciography of simple objects - Representation of shade and shadows in plans and elevations 	8
Unit-VI	Architectural drawings. <ul style="list-style-type: none"> - Learning to make architectural drawings of Master Architect's building drawings (referred from books) in terms of plans, elevations and sections. - Architectural representation of trees, hedges, foliage, human figures, cars, etc., - Building Elements: Techniques of representing building elements such as doors, windows, steps, chajja, porch, canopy, etc. 	12
Total Contact Hours		75

Learning Resources:

1.	F. D K. Ching (2009) Architectural Graphics, New Jersey, John and Wiley and Sons.
2.	Manual of Section, David J. Lewis, Marc Tsurumaki, and Paul Lewis.
3.	Architectural Drawing Course: Tools and Techniques for 2D and 3D Representation, by Mo
4.	N.D.Bhatt (2012) Engineering Drawing, Gujrat, Charotar Publishing House.

5.	Hugh C. Browning (1996) The Principles of Architectural Drafting, New York, Watson-Guptill
6.	Calvin F. Schmid, Stanton E. Schmid, (1954) Handbook on Graphic Presentation, New York,
7.	David Littlefield (2012) Matric Handbook, London and New York, Routledge Taylor and
8.	Sleeper R.(2000)Architectural Graphic Standards, New York, John Wiely and Sons.
9.	Gill R.W.(2011) Rendering with Pen and Ink, London, Thames &Hudson ltd.

First Year B Arch.

Climatology

CourseCode:KHMU26	Course Category: Professional Core		Semester: II
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO)	-
Workshops or studio exercises / week	2	Sessionals(SS)	60 Marks
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching + Sessional Work	15	No.s of Hours for Teaching + Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

Course Objectives:

1. To understand climate and its impact on Architectural Design
2. To encourage sensitivity towards environments

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Outline elements of climate, nature of climate and its zone and recognize importance of climate in architecture
2.	Understanding	Understand the climatic influences on built environment and comfort conditions for inhabitants
3.	Applying	Use the surrounding environment as one of the strategic design parameters
4.	Applying	Employ solar charts and sun path and apply fundamentals of climatology in building design
5.	Analyzing	Analyse characteristic of climatic zone in India
6.	Evaluating	Justify opening position, its size in building design by considering air movement
7.	Creating	Relate climate, other environmental parameters and built form at individual and settlement level
8.	Creating	Design climate responsive building

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Introduction: <ul style="list-style-type: none"> - Climate, weather, earth- sun relationship - Elements of climate: Temperature, rainfall, humidity, wind, solar radiation etc. - Importance of climate in Architecture - Global, Macro and Micro climate 	6
Unit -II	Human Comfort: <ul style="list-style-type: none"> - Human heat balance and comfort - Thermal comfort and means of thermal comfort - Heat stress, Effective temperature 	6
Unit -III	Comfort conditions: <ul style="list-style-type: none"> - Bioclimatic chart - Subjective variables - Thermal Comfort Indices - Active & Passive means of thermal control - Degree of control. 	9
Unit-IV	Solar charts & Sun-path: <ul style="list-style-type: none"> - Study of Sun-path, Azimuth & Altitude Angle - Structural control : Sun control and shading devices 	9
Unit-V	Ventilation & Air movement: <ul style="list-style-type: none"> - Study of ventilation & its functions in buildings - Air flow through buildings - Position & size of opening 	6
Unit-VI	Study of Climatic zones & Built environment: <ul style="list-style-type: none"> - Study of nature of climate, its physiological objectives and design criteria - Planning Principles of internal and external spaces, surface treatments and openings etc. for various climatic zones 	9
Total Contact Hours		45

Learning Resources:

1.	Koenigsberger, Ingersoll, Mayhew, Szokolay, (1996) Manual of Tropical Housing and Building - Climatic Design, Orient Longman Limited
2.	G. Z. Brown and Mark Dekay, John Wiley and Sons, (2001) Sun, Wind and Light, 2nd Edition, New York
3.	Baruch Givoni, (1976) Man, Climate and Architecture, U.K., Applied science Publishers, 2nd Edition
4.	T. N. Sheshadri, (2001) Climatological and Solar Data for India, Meerat, Sarita Prakashan
5.	A. Krishan, (2001), Climate Responsive Architecture, Tata Mcgraw Hill

First Year B Arch.

Basic Design-II

CourseCode:KHMU27	Course Category: Professional Core		Semester: II
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO)	60 Marks
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

Course Objectives:

1. To introduce to the design process as a synthesis of a variety of factors, analysed and studied.
2. To enhance creative thinking skill

Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	Acquire ,creative thinking and theory of Rasa
2.	Understanding	Understand various techniques for improving creativity
3.	Applying	Use the sources of inspiration for creating concepts for design
4.	Analyzing	Select tools for concept Building
5.	Evaluating	Decide inspiration for concept Building
6.	Creating	Synthesis knowledge gained in this subject with Architectural Design

Course Contents:

Units	Contents of The Course	Hours
Unit -I	Techniques for improving Creativity I: <ul style="list-style-type: none"> - Theories by Edward De Bono: Six thinking hats, lateral thinking - Brainstorming, - Random Combinations - Tree of Possibilities 	08

Unit -II	Techniques for improving Creativity II - Abstraction - Transformation - Matrix of Ideas	08
Unit -III	Sources of inspiration for Creativity: - Role of experience - Mimesis - Literature	08
Unit-IV	Inspiration for concept building: - Material - Geometry - History	08
Unit-V	Tools for Concept building: - Nature and geometry - Visual Memory - Association with other arts	08
Unit-VI	Indian Aesthetics: Introduction to theories of Indian aesthetics specifically the ‘Rasa’ theory by Abhinavgupta, Bharatmuni, Abhinavbharati, etc., with examples from Natyashastra	05
Total Contact Hours		45

Learning Resources:

1.	Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press
2.	Bacon E.N. (1974) <i>Design of Cities</i> , England, Penguin Books
3.	Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i> , Australia, Watson-
4.	Ching Francis, D. K. (2007) <i>Architecture: Form Space & Order</i> , New Jersey, John Willy and
5.	Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and
6.	Edward De Bono (1990) <i>Lateral Thinking</i> , London, Penguin Books
7.	Gupta Neerja (2017), <i>A Student’s Handbook of Indian Aesthetics</i> , Cambridge Scholars
8.	Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing
9.	Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami</i>
10.	ShirishVasant Bapat (1993) <i>Basic Design and Anthropometry</i> , Pune, Bela Books
11.	Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i> , London, Grange Book Plc

First Year B Arch.

Elective-II

CourseCode:KHMU28	Course Category: Open Elective		Semester: II
Credits :	2	Internal Assessment	100 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	1	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	36 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	30 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	06 Hours

Course Objectives:

1. To facilitate the students to learn out of a pool of specialized courses, which provides extended scope or which enables exposure to discipline-centric courses as well as cross-disciplinary courses.
2. To encourage interdisciplinary learning and imbibe values as learners
3. To give students an opportunity to develop their attitudes and /or skills in a subject they may opt for making carrier

Course Outcomes:

CO No.	Affective levels	On successful completion of course the learner will be able to:
1.	Receiving	Identify and describe the aspects or issues of offered contents
2.	Responding	Report case study
3.	Valuing	Justify their ideas /opinions in relation to contents of elective
4.	Organization	Document and present the data collected in systematic way.
5.	Internalizing	Display a technical base through in depth study

Course Contents:

Units	Contents of The Course	Hours
	The detail course contents will vary as per options selected for elective and expert teaching the course will frame the contents at the beginning of semester along with objectives, outcomes, references and details for assignments.	
Total Contact Hours		

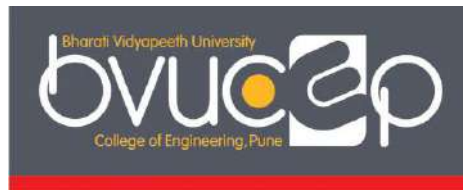
Learning Resources:

1.	As per topic chosen
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Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune



B.Tech. (Computer Science and Business Systems)
Program Curriculum
(2021 Course)

VISION OF UNIVERSITY:

Social Transformation Through Dynamic Education.

MISSION OF UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination.
- To offer education to the students in a conducive ambience created by enriched infrastructure and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities.
- To make available quality education to the students of rural, tribal, and other deprived sections of the population.

VISION OF THE INSTITUTE:

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE:

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research, and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

Vision of the Department

To syndicate industry and institute to impart high quality knowledge through scholarship, research and creative endeavour

Mission of the Department

- To impart contemporary technology conforming to a dynamic curriculum.
- To engage in professional development and scholarly endeavour through knowledge of common business principles.
- To promote the awareness of business discipline and ethical responsibility through industry alliance

Programme Educational Objectives (PEOs)

1. Prevail technical competency to concord the industry engrossment.
2. Assimilate business management skills.
3. Instigate business level innovation with societal consideration.

Program Specific Outcomes (PSOs)

Students of B. Tech (CSBS) will be

PSO1: Able to apply pragmatic, innovative and critical thinking approach for solving complex business problems.

PSO2: Able to choose effective business communication techniques in professional Institute/organization.

PSO3: Able to use financial domain understanding to formulate technological strategy.

PSO4: Skilled in contemporary courses from emerging domains such as artificial intelligence, Machine learning and data science.

Programme Outcomes (POs)

The students of B.Tech (Computer Science & Business Systems) will be able to

- a. Demonstrate logical and programming skills through comprehensive programming foundation.
- b. Apply knowledge of mathematics, computer engineering and basic science to comprehend and solve real world problems.
- c. Develop software applications and processes for complex problems to provide efficient solutions by assessing its environmental, social and ethical constraints.
- d. Investigate and solve complex computing problems with alternate solutions.
- e. Use functional skills of modern IT tools and techniques for engineering activities.
- f. Understand the social and cultural impact of computing on society.
- g. Provide optimized computational solutions that apprehend the societal and environmental aspects.
- h. Exhibit the professional, ethical and legal responsibilities related to industry.
- i. Perform as an individual and efficient team player to accomplish a goal.
- j. Present professional concepts through effective communication skills and documentation.
- k. Demonstrate management skills for developing time-bound projects within the available budget and resources.
- l. Develop the ability of lifelong learning for new IT practices.

CORELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Programme Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Knowledge	✓											
Problem Analysis		✓										
Design/Development of Solutions			✓									
Conduct Investigations of Complex Problems				✓								
Modern Tool Usage					✓							
The Engineer and Society						✓						
Environment and Sustainability							✓					
Ethics								✓				
Individual and Teamwork									✓			
Communication										✓		
Project Management and Finance											✓	
Life-Long Learning												✓

DEFINITION OF CREDITS:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
2 Hour Practical (P) per week	1 credit
4 Hours Practical (P) per week	2 credit

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Breakup of Credits
1	Basic Science Course (BSC)	61
2	Engineering Science Course (ESC)	08
3	Core Course (CC)	96
4	Elective Course (EC)	24
5	Project (PROJ)	18
6	Internship (INT)	03
7	Vocational Course (VC)	08
8	Massive Open Online Course (MOOC)	06
9	Research Paper Publication (Research)	02
10	Social Activities (SA)	04
11	Mandatory Courses (MC)	Non-Credit
TOTAL		230

DISTRIBUTION OF COURSE COMPONENTS

Sr. No.	Category	Number of Courses
1.	Basic Science Course (BSC)	18
2.	Engineering Science Course (ESC)	02
3.	Core Course (CC)	22
4.	Elective Course (EC)	06
5.	Project (PROJ)	04
6.	Internship (INT)	01
7.	Vocational Course (VC)	04
8.	Massive Open Online Course (MOOC)	03
9.	Research Paper Publication (Research)	01
10.	Social Activities	02
11.	Mandatory Courses	02
12.	Internal Assessment (IA)	--
13.	University Examination (UE)	--
TOTAL		65

Program: B.TECH. (Computer Science & Business Systems)**Semester – I****2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Discrete Mathematics	3	2	-	60	40	-	50	-	150	3	1	-	4
2		Statistics, Probability and Calculus	3	-	1	60	40	-	-	-	100	3	-	1	4
3		Principles of Electrical Engineering	3	2	-	60	40	25	-	-	125	3	1	-	4
4		Fundamentals of Computer Science	3	4	-	60	40	-	-	50	150	3	2	-	5
5		Physics for computing science	3	2	-	60	40	25	-	-	125	3	1	-	4
6		Business Communication & Value Science - I	3	2	-	50	-	-	50	-	100	3	1	-	4
		Total	18	12	1	350	200	50	100	50	750	18	06	01	25

Program:

B.TECH. (Computer Science & Business Systems)

Semester – II

2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Linear Algebra	3	0	1	60	40	-	-	-	100	3	0	1	4
2		Statistical Methods	3	2	-	60	40	25	-	-	125	3	1	-	4
3		Data Structures and Algorithms	3	4	-	60	40	-	-	100	200	3	2	-	5
4		Fundamentals of Economics	3	0	-	60	40	-	-	-	100	3	0	-	3
5		Principles of Electronics Engineering	3	2	-	60	40	25	-	-	125	3	1	-	4
6		Business Communication & Value Science - II	3	4	-	50	-		50	-	100	3	2	-	5
		Total	18	12	1	350	200	50	50	100	750	18	06	1	25

Program: **B.TECH. (Computer Science & Business Systems)**

Semester – III

2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	T W	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Formal Language and Automata Theory	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Computer Organization & Architecture	3	2	-	60	40	25	-	-	125	3	1	-	4
3		Object Oriented Programming	3	2	-	60	40	-	-	50	150	3	1	-	4
4		Computational Statistics	3	4	-	60	40	-	-	50	150	3	2	-	5
5		Software Engineering*	4	2	-	60	40	-	-	25	125	4	1	-	5
6		Business Communication & Value Science – III	2	4	-	50	-	-	50	-	100	2	2	-	4
7		Vocational Course- I	-	-	-	-	-	-	50	-	50	-	2	-	2
8		MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	2
9		Environmental Studies** (Mandatory Audit Course)	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			18	14	1	350	200	25	100	125	800	18	9	1	30

*Industry Taught Course-I

** 100 Marks Theory Examination

Vocational Course – I

S. No.	Course Name	Offered By	Offered By	Offered By
1.	Web Programming Fundamentals	HarvardX	IBM	Johns Hopkins University
2.	Excel Skills for Business	Macquarie University	IBM	PwC
3.	Software Design and Architecture	University of Alberta	University of Colorado System	IIT Madras
4.	Full Stack Development	IBM	IIT Madras	The Hong Kong University of Science and Technology
5.	Software Testing	Edureka	Udemy	ISTQB, LambdaTest

Program:

B.TECH. (Computer Science & Business Systems)

Semester – IV

2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Operating Systems	4	2	-	60	40	25	-	-	125	4	1		5
2		Database Management Systems	4	4	-	60	40	-	-	50	150	4	2		6
3		Software Design with UML*	3	2	-	60	40	-	-	50	150	3	1		4
4		Introduction to Innovation, IP Management & Entrepreneurship	3	-	1	60	40	-	-	-	100	3	-	1	4
5		Business Communication & Value Science – IV	2	4	-	50	-	-	50	-	100	2	2		4
6		Operations Research	2	2	-	60	40	25	-	-	125	2	1		3
7		Vocational Course-II	-	-	-	-	-	-	50	-	50	-	2		2
8		Social Activities - I	-	-	-	-	-	-	-	-	-	-	-		2
9		Disaster Management** (Mandatory Audit Course)	-	-	-	-	-	-	-	-	-	-	-		-
Total			18	14	1	350	200	50	100	100	800	18	9	1	30

* Industry Taught Course-II

** 100 Marks Theory Examination

Vocational Course – II

S. No.	Course Name	Offered By	Offered By	Offered By
1.	NoSQL	IBM	MongoDBInc	AWS
2.	Linux and Git	Google,	Linux Foundation	IIT, Bombay
3.	Programming for Problem Solving	MITx	IIT Kanpur	edX/ Coursera
4.	Game Development	Harvard	Google for games	Coursera Michigan State University
5.	Python Certification	Google	Coursera	edX

Program: **B.TECH. (Computer Science & Business Systems)**

Semester – V

2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Design and Analysis of Algorithms	3	4	-	60	40	-	-	50	150	3	2		5
2		Compiler Design	3	2	-	60	40	-	25	-	125	3	1		4
3		Fundamentals of Management	2	-	-	60	40	-	-	-	100	2	0		2
4		Business Strategy	2	-	-	60	40	-	-	-	100	2	0		2
5		Design Thinking*	3	4	-	60	40	-	-	50	150	3	2		5
6		Elective-I	3	2	-	60	40	-	25	-	125	3	1		4
7		Project-I Stage- I	-	2	-	-	-	-	100	-	100	-	4		4
8		Vocational Course-III	-	-	-	-	-	-	50	-	50	-	2		2
9		MOOC-II	-	-	-	-	-	-	-	-	-	-	-		2
Total			16	14	-	360	240	-	200	100	900	16	12		30

* Industry Taught Course-III

Elective - I	Machine Learning	Conversational Systems	Cloud, Microservices and Application
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Vocational Course – III

S. No.	Course Name	Offered By	Offered By	Offered By
1.	Data Science	Databricks	IBM	IIT Madras
2.	UI / UX Design	University of Michigan	California Institute of the Arts	Google
3.	Agile Development & Management	University of Virginia	University of Minnesota	IBM
4.	Django	IBM	University of Michigan	HarvardX
5.	Machine Learning & AI with Python	Indian Institute of Technology, Bombay	Google, IBM	Stanford University, Harvard University

Program:

B.TECH. (Computer Science & Business Systems)

Semester – VI

2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Computer Networks	3	2	-	60	40	-	-	25	125	3	1	-	4
2		Information Security	3	2	-	60	40	-	-	25	125	3	1	-	4
3		Artificial Intelligence*	3	2	-	60	40	-	25	-	125	3	1	-	4
4		Financial & Cost Accounting	2	-	-	60	40	-	-	-	100	2	-	-	2
5		Quantitative Techniques Communication and Values	2	2	-	60	40	-	-	-	100	3	-	-	3
6		Elective- II	3	2	-	60	40	-	25	-	125	3	1	-	4
7		Project-I Stage-II	-	2	-	-	-	-	100	-	100	-	4	-	4
8		Internship	-	-	-	-	-	-	50	-	50	-	3	-	3
9		Vocational Course-IV	-	-	-	-	-	-	50	-	50	-	2	-	2
Total			16	12	-	360	240	-	250	50	900	17	13		30

*** Industry Taught Course-IV**

Elective - II	Data Mining and Analytics	Robotics and Embedded Systems	Modern Web Applications
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Vocational Course – IV

S. No.	Course Name	Offered By	Offered By	Offered By
1.	Artificial Intelligence and Deep Learning	Harvard University	IIT Roorkee	IBM
2.	Cyber Security	IBM	New York University	Uttarakhand Open University, Haldwani
3.	Angular JS	Harvard University	IICT Chennai	Sun Certified Enterprise
4.	Certification in Big Data Analytics	University of California	Electronics and ICT Academy, IIT Guwahati	SAP
5.	AI Foundations for Everyone	HarvardX	IIT Guwahati	IBM

Program: **B.TECH. (Computer Science & Business Systems)**

Semester – VII

2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1.		Usability Design of Software Applications	3	2	-	60	40	-	25	-	125	3	1	-	4
2.		IT Workshop*	3	4	-	60	40	-	-	25	125	3	2	-	5
3.		Financial Management	2	-	1	60	40	-	-	-	100	2	-	1	3
4.		Human Resource Management	2	-	-	60	40	-	-	-	100	2	-	-	2
5.		Elective- III	3	2	-	60	40	-	25	-	125	3	1	-	4
6.		Elective- IV	3	2	-	60	40	-	25	-	125	3	1	-	4
7.		Project-II Stage- I	-	4	-	-	-	-	200	-	200	-	4	-	4
8.		MOOC-III	-	-	-	-	-	-	-	-	-	-	-	-	2
9.		Research Paper Publication	-	-	-	-	-	-	-	-	-	-	-	-	2
Total			16	14	1	360	240	-	275	25	900	16	9	1	30

* Industry Taught Course-V

Elective- III	DS	Cognitive Science & Analytics
	DTS	Introduction to IoT
	DS	Cryptology
Elective- IV	CS	Quantum Computation & Quantum Information
	DS	Advanced Social, Text and Media Analytics
	DTS	Mobile Computing

Program: **B.TECH. (Computer Science & Business Systems)**

Semester – VIII

2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1.		Services Science & Service Operational Management	4	2	-	60	40	-	50	-	150	4	1	-	5
2.		IT Project Management*	3	2	-	60	40	-	50	-	150	3	1		4
3.		Marketing Research & Marketing Management	3	0	1	60	40	-	-	-	100	3	0	1	4
4.		Elective-V	3	2	-	60	40	-	25	-	125	3	1	-	4
5.		Elective-VI	3	2	-	60	40	-	25	-	125	3	1	-	4
6.		Seminar	-	2	-	-	-	-	50	-	50	-	1	-	1
7.		Project-II Stage-II	-	4	-	-	-	-	200	-	200	-	6	-	6
8.		Social Activities - II	-	-	-	-	-	-	-	-	-	-	-	-	2
Total			16	14	1	300	200	-	400	-	900	16	11	1	30

* Industry Taught Course -VI

Elective-V	SH	Behavioral Economics
	MS	Computational Finance & Modeling
	SH	Psychology
Elective-VI	DTS	Enterprise Systems
	MS	Advance Finance
	DTS	Image Processing and Pattern Recognition

List of MOOCs

MOOC-I	MOOC-II	MOOC-III
Numerical Methods	Programming in Java	Data Analytics with Python
Probability and Statistics	Software Project Management	Big Data Computing
Communication Skills	Advanced Database Management System	Information security
Linear Algebra	Introduction to Artificial Intelligence	Introduction to Human Computer Interaction
Software Engineering	Machine Learning, ML	Data Mining
Data Structure and Algorithms Using Java	The Joy of Computing using Python	Management Information System
Introduction to Database Systems	Business and Sustainable Development	Decision Support System for Managers
Introduction to Automata, Languages and Computation	Applied Econometrics	Entrepreneurship
Software Engineering	Secure Computation: Part I	User-centric Computing for Human-Computer Interaction
An Introduction to Probability in Computing	Data Analytics with Python	Software Project Management

B.TECH (Computer Science & Business Systems)

SEMESTER – I

COURSE SYLLABUS

Discrete Mathematics

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03 Credits
Practical:	02 Hours/Week	Internal Assessment	40 Marks	Practical	01 Credit
		Term work & Oral	50 Marks	Total	04 Credits

Course Prerequisite:

Basic knowledge of Elementary Linear Algebra, Numerical Mathematical Computation, Programming basics.

Course Objective:

The objective is to provide a mathematical foundation and skills those are required in further study of Computer Science. The course Discrete Mathematics deals with discrete objects, countable sets. It helps to develop logical thinking and a wide variety of real-world applications to computer science. It is a very good tool for improving reasoning and problem-solving capabilities.

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the ability to write the sentences in the symbolic logic and evaluate a proof technique.
2. Apply the basic principles of set theory to analyse the data relationship and prove basic properties of set.
3. Analyse the properties of relations and functions to determine their properties.
4. Apply the knowledge of Boolean algebra for building basic electronic and digital circuits.
5. Solve problems of combinatorics and recurrence relations.
6. Model problems in Computer Science using graphs and trees.

Unit I

06 Hours

Logic: Propositional calculus - propositions and connectives, syntax; Semantics – truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness.

Unit II

06 Hours

Set Theory: Types of sets, Sets operations and laws, Algebra of Sets, Multisets, Application of the principle of inclusion and exclusion.
Boolean algebra: Introduction of Boolean algebra, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

Unit III

06 Hours

Relations: Basic definition, properties and types of relations, relations and digraphs, paths in relations and digraphs, equivalence and partially ordered relations.
Functions: Types of functions, Identity functions, Composition of functions, Mathematical functions, Pigeonhole principle.

Unit IV

06 Hours

Algebraic Structures: Isomorphism and Homomorphism. Algebraic Structures with Binary Operations, rings, Cyclic groups, codes.

Unit V

06 Hours

Combinatorics: Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle.

Unit VI

06 Hours

Graph Theory Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.

Textbooks:

1. Topics in Algebra, I. N. Herstein, John Wiley and Sons.
2. Digital Logic & Computer Design, M. Morris Mano, Pearson.
3. Elements of Discrete Mathematics, (Second Edition) C. L. LiuMcGraw Hill, New Delhi.
4. Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, Macmillan Press, London.
5. Mathematical Logic for Computer Science, L. Zhongwan, World Scientific, Singapore.

Reference Books:

1. Introduction to linear algebra. Gilbert Strang.
2. Introductory Combinatorics, R. A. Brualdi, North-Holland, New York.
3. Graph Theory with Applications to Engineering and Computer Science, N. Deo, Prentice Hall, Englewood Cliffs.
4. Introduction to Mathematical Logic(Second Edition), E. Mendelsohn, Van-Nostrand, London.

List of Assignments:

The sample class assignments are given below.

1. Given a fact or a statement prove or disprove using suitable technique.
2. Write the given English language sentences represent in the Symbolic logic.
3. Given the statement forms Infer the validity of the statement form.
4. Draw a Hasse diagram and find chains and antichains.
5. Find the number of ways for any event or given sample space.
6. Given a problem represent in a graph and compute the optimal solution.
7. Given a communication network find the path between the given nodes.

List of Laboratory Exercises:

1. Perform set Operations.
2. Compute a power set of a given set.
3. List various properties of Relation and construct a program to evaluate it with a program.
4. Apply Warshall's algorithm to compute a Transitive Closure of a given relation entered by the user(Use any suitable programming language).
5. Solve a programming problem based on application of Eulerian and Hamiltonian Graph.
6. Develop a program using RSA algorithm.
7. Develop a program to apply different algorithms on graph and solve areal tie problem.

List of Project Based Learning Topics:

1. Discrete Mathematics in Railway Planning using graph theory and linear algebra.
2. Object transformations using linear algebra.
3. Discrete mathematics in cryptography.
4. In Google maps to determine fastest driving routes and times.
5. In image processing
6. In relation database using sets.
7. In cyber security using graph theory.
8. Shortest path between two cities using a transportation system.
9. Data compression system with the help of Huffman coding.

10. Find the shortest tour that visits each of a group of cities only once and then ends in the starting city using graphs.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Statistics, Probability and Calculus

TEACHING SCHEME:

Lectures: 3 Hrs/Week
Tutorials: 1 Hr/Week
Practical: Nil

EXAMINATION SCHEME:

Semester Examination: 60 Marks
Internal Assessment: 40 Marks
Term Work: Nil

CREDITS ALLOTTED:

Theory: 3 Credits
Tutorial :1 Credit
Total : 4 Credit

Course Pre-Requisites:

The students should have basic knowledge of high school mathematics and calculus.

Course Objective:

The course introduces fundamental concepts of statistics and probability.

Course Outcomes:

1. Students will be able to use appropriate statistical terms to describe data.
2. Students will be able to use appropriate statistical methods to collect, organize, display and analyse relevant data.
3. Students will be able to apply concepts of various probability distributions to find probabilities and understand mathematical expectation and moments generating function.
4. Students will be able to apply concepts of Normal, Poisson, Binomial, uniform, exponential, t and F-distribution.
5. Students will be able to apply concepts of differentiation.
6. Students will be able to apply concepts of integration to find area and volume using double and triple integral.

UNIT – I

6 Hours

Introduction to Statistics: Definition of Statistics. Basic objectives. Applications in various branches of science with examples

Collection of Data: Internal and external data, Primary and secondary data. Population and sample, Representative sample.

UNIT – II

6 Hours

Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution. Linear regression and correlation. Rank correlation.

UNIT III

6 Hours

Probability Theory: concept of experiments, sample space, event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem

Mathematical expectation: Expected values & moments: mathematical expectation & its properties, Moments (including variance) & their properties, interpretation, Moment generating function

UNIT – IV

6 Hours

Probability distributions: Discrete & continuous distributions, Binomial, Poisson & Geometric distributions, Uniform, Exponential, Normal, Chi-square, t, F distributions

UNIT – V

6 Hours

Differential Calculus: Differential equation and its application

UNIT – VI

6 Hours

Integral Calculus: Multiple integral, application of double and triple integral.

List of Assignments:

Problem sets to be shared by faculty covering the following topics:

Graphical representation of data, Histograms, Descriptive measures - central tendency and dispersion
Estimating moments, Distribution parameters.

List of Project Based Learning Topics:

1. Prepare a questionnaire for survey
2. Do the population survey of a certain area
3. Prepare survey model of literate/illiterate
4. Prepare survey model of employed/ unemployed
5. Classify primary and secondary data
6. Collect the raw data, analyse it and plot it using graphs
7. Find the stability of the data using coefficient of variation
8. Use concept of correlation to find coefficient of correlation between different observations
9. Use Rank correlation to find correlation for qualitative data
10. Derive Spearman's Rank correlation
11. Data fitting using linear regression
12. Data fitting using nonlinear regression
13. Find the chance of happening particular event using Baye's theorem
14. Find the Moment generating function of given function.
15. Use probability theory to estimate the life of electric equipments
16. Find the height, weight of the population using the example of normal distribution
17. Evaluate the electric circuit problem using differential equations
18. Evaluate the heat conduction problem using differential equations
19. Find the area using double integrals
20. Find the volume using triple integrals

Textbooks:

1. Introduction of Probability Models, S.M. Ross, Academic Press, N.Y.
2. Fundamentals of Statistics, vol. I & II, A. Goon, M. Gupta and B. Dasgupta, World Press.
3. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, Delhi.

Reference Books:

1. A first course in Probability, S.M. Ross, Prentice Hall.
2. Probability and Statistics for Engineers (Fourth Edition), I.R. Miller, J.E. Freund and R. Johnson, PHI.
3. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybill and D.C. Boes, McGraw Hill Education.
4. Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Thomson Learning.
5. Advanced Engineering Mathematics, (Second Edition) M. D. Greenberg, Pearson Education.
6. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar, VidyarthiPrakashan.

Syllabus for Unit Test:

Unit Test -I

UNIT - I, II and III

Unit Test -II

UNIT - IV, V and VI

Principles of Electrical Engineering

TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term Work: 25Marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical: 1 Credit

Total : 4 Credits

Course Pre-requisites:

The Students should have knowledge of Mathematics, physics.

Course Objectives:

The course introduces fundamental concepts of DC and AC circuits, Electrostatics electromagnetism, transformer, electrical wiring and illumination.

Course Outcomes: After learning this course the students will be able to

1. Apply knowledge of basic concepts of work, power, energy for energy conversion and calculate current in electrical network using Kirchoff's laws.
2. Calculate response of electrical circuit using network theorems.
3. Define basic terms of single phase and three phase ac circuits and supply systems.
4. Describe construction, principle of operation, specifications and applications of capacitors and batteries
5. Describe and apply fundamental concepts of magnetic and electro-mechanics for operation of single phase transformer.
6. Describe illumination, types of wiring and earthing system.

UNIT – I

6 Hours

Introduction: Concept of EMF, Potential difference, voltage, current, resistance. Fundamental linear passive and active elements to their functional current-voltage relation, Terminology and symbols in order to describe electric networks, voltage source and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchoff-s laws and applications to network solutions using mesh and nodal analysis, Concept of work, power, energy, and conversion of energy.

UNIT – II

6 Hours

DC Circuits: Current-voltage relations of the electric network by mathematical equations to analyze the network (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem) Simplifications of networks using series-parallel, Star/Delta transformation. Superposition theorem.

UNIT III

6 Hours

AC Circuits: AC waveform definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3 phase Balanced AC Circuits (Y- Δ & Δ -Y).

UNIT – IV

6 Hours

Electrostatics: Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitor composite, dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors, Principle of batteries, types, construction and working, application.

UNIT – V

6 Hours

Electro-Mechanics: Electricity and Magnetism, magnetic field and Faraday's law, self and mutual inductance, Ampere's law, Magnetic circuit, Magnetic material and B-H Curve, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, KVA rating, losses in transformer, efficiency and regulation, Determination of Efficiency & Regulation by direct load test, Electromechanical energy conversion

UNIT – VI

6 Hours

Measurements and Sensors: Introduction to measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems(Current & Single-phase power), Basic concept of indicating and integrating instruments, Electrical Wiring and Illumination system: Basic layout of the distribution system, Types of Wiring System & Wiring Accessories, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED),Necessity of earthing, Types of earthing, Safety devices & system.

List of Assignments:

Respective subject teacher shall design minimum six assignments on above units.

List of Laboratory Exercises:

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits.
2. Determination of resistance temperature coefficient
3. Verification of Superposition Theorem
4. Verification of Thevenin's Theorem
5. Verification of Norton's Theorem
6. Verification of Kirchoff's Laws
7. Verification of Maximum power transfer Theorem
8. Simulation of Time response of RC circuit
9. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
10. Verification of relation in between voltage and current in three phase balanced star and delta connected loads.
11. Direct loading test on Single phase transformer
12. a) Voltage and current ratios.
b) Efficiency and regulations.
13. Demonstration of measurement of electrical quantities in DC and AC systems.

List of Project Based Learning Topics:

Student shall demonstrate minimum one concept based on syllabus topic.

1. Demonstration of conversion of energy.
2. Study and understand practical specifications of transformer.
3. Demonstration of electrostatics and understand practical specifications of batteries.
4. Demonstration of phenomenon of electromagnetic induction.
5. Demonstration of electromagnetism, electro mechanics and their applications by using professional software tool.
6. Development of practical kits for understanding different theorems related to electrical circuits. (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem, Superposition theorem etc.)
7. Demonstration of illumination system.
8. Demonstration of distribution system.
9. Study and understand safety practices in electrical system.
10. Study and understand electrical earthing system.

Textbooks:

1. Electric Machinery,(Sixth Edition) A.E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, Tata McGraw Hill.
2. A Textbook of Electrical Technology,(vol. I),B. L. Theraja, Chand and Company Ltd., New Delhi.
3. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4. Theory and problems of Basic Electrical Engineering, (SecondEdition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
3. Engineering Circuit Analysis, William H. Hayt & Jack E. Kemmerly, McGraw-Hill Book Company Inc.
4. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.
5. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication
6. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications
7. John Omalley Shawn – “Basic circuits analysis” McGraw Hill Publications
8. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications

Syllabus for Unit Test:

Unit Test -1
Unit Test -2

UNIT – I, UNIT – II, UNIT - III
UNIT – IV, UNIT – V, UNIT - VI

Fundamentals of Computer Science

TEACHING SCHEME:

Lectures: 3Hrs/Week

Tutorials: Nil

Lab: 4 Hrs/Week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

Term work & Practical: 50 Marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical: 2 Credits

Total : 5 Credits

Course Pre-Requisites:

Basic knowledge of computers.

Course Objective:

The course introduces fundamental concepts of computer science

Course Outcomes:

1. Understand the basics of computer science & the process of moving from a problem statement to a computational formulation of a method for solving the problem.
2. Apply the basic concepts of control structures.
3. Understand basic concepts of function.
4. Implement concept of arrays and pointers.
5. Develop an application using the concept of file handling.
6. Describe unix system interface and programming method.

UNIT – I

6 Hours

General problem-Solving concepts and Imperative languages: Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C). Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation

UNIT – II

6 Hours

Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming

UNIT – III

6 Hours

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Pre-processor, Standard Library Functions and return types

UNIT – IV

6 Hours

Pointers and Arrays: Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

UNIT – V

6 Hours

Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields

Input and Output: Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions

UNIT – VI

6 Hours

Unix system Interface: File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator
Programming Method: Debugging, Macro, User Defined Header, User Defined Library Function, make file utility.

List of Assignments:

1. Define Algorithm. Explain Characteristics of Algorithm.
2. Explain all types of Operators in detail with example.
3. Explain control structures in detail with example.
4. Define function. Explain types of Functions with example.
5. Write a short note on:
i) Pointers ii) Types of Array iii) Pointer Array
6. Define Structure. Explain concept of Array of Structure with suitable example.
7. Explain File Descriptor and Storage Allocator in detail.

List of Laboratory Exercises:

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
 - i. Small but tricky codes
 - ii. Proper parameter passing
 - iii. Command line Arguments
 - iv. Variable parameter
 - v. Pointer to functions
 - vi. User defined header
 - vii. Make file utility
 - viii. Multi file program and user defined libraries
 - ix. Interesting substring matching / searching programs
 - x. Parsing related assignments

List of Project Based Learning Topics:

1. Inventory Management System using File Handling
2. Online Jewellery Shopping System using File Handling
3. Library Management System using File Handling
4. Online Examination System using File Handling
5. Hospital Management System using File Handling
6. Railway Reservation System using File Handling
7. Payroll Management System using File Handling
8. Cooking Recipe Portal using File Handling
9. Art Gallery Management System using File Handling
10. Student Database Management System using File Handling
11. Restaurant Management Database System using File Handling
12. Electric Bill System using File Handling
13. Online Examination System using File Handling
14. Event Management System using File Handling
15. Attendance Management System using File Handling
16. Slam book using File Handling.

Textbooks:

1. B. W. Kernighan and D. M. Ritchi, “The C Programming Language”, Second Edition, PHI.
2. B. Gottfried, “Programming in C”, Second Edition, Schaum Outline Series.

Reference Books:

1. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill.
2. Yashavant Kanetkar, "Let Us C", BPB Publications.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Physics for Computing Science

TEACHING SCHEME:

Lectures: 3Hrs/Week

Tutorials: Nil

Lab: 2 Hrs/Week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

Term work :25 Marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical : 1 Credit

Total : 4 Credits

Course Prerequisites: -

Students are expected to have a basic understanding of physics and calculus.

Course Objectives:-

To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Computer Science and Business System.

Course Outcomes: -

1. Summarise the terms damping constant, characteristic frequency, kinetic and potential energy of a spring.
2. Appraise the wave nature of light and apply it to measure stress, pressure and dimension etc.
3. Solve quantum physics problems to micro level phenomena and solid-state physics.
4. Summarise the arrangement of atoms in solids and its influence the properties of matter.
5. Summarise the structure and properties of lasers to their performance and intended applications such as fibre optics.
6. Summarise the applications of thermodynamics.

Unit I. Oscillation

6 Hours

Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring-mass system. Resonance-definition damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.

Unit II. Wave Optics

6 Hours

Interference-Principle of superposition-Young's experiment: Theory of interference fringes-types of interference-Fresnel's prism-Newton's rings.

Diffraction-Two kinds of diffraction-Difference between interference and diffraction- Fraunhofer diffraction at single slit-plane diffraction grating, Temporal and Spatial Coherence.

Polarization of light- Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster's law, double refraction.

Unit III. Quantum Mechanics

6 Hours

Introduction- Planck's quantum theory- Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one-dimensional potential box.

Unit IV. Crystallography and Semiconductor Physics

6 Hours

Crystallography: Basic terms-types of crystal systems, Bravais lattices, miller indices, d spacing, Atomic packing factor for SC, BCC, FCC and HCP structures, X-ray diffraction.

Semiconductor Physics: Conductor, Semiconductor and Insulator; Origin of Band Theory, Basic concept of Band theory.

Unit V. Laser and Fiber optics

6 Hours

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO₂ and Neodymium YAG (Neodymium-doped Yttrium Aluminum Garnet); Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and Applications, Types of optical fibers.

Unit VI. Thermodynamics and Electromagnetism

6 Hours

Thermodynamics: Zero-th law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Engine, entropy, change in entropy in reversible and irreversible processes.

Basic Idea of Electromagnetisms: Continuity equation for current densities, Maxwell's equation in vacuum and non-conducting medium.

List of Assignments:

Six assignments to be given by the subject teacher (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

List of Laboratory Exercises:

1. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings
2. Determination of wavelength of light using diffraction grating
3. Determination of resolving power of telescope
4. Determination of thickness of a thin wire by air wedge
5. Determination of refractive index for O-ray and E-ray
6. Determination of divergence of a laser beam
7. Particle size by semiconductor laser
8. Determination of wavelength of laser by diffraction grating
9. To study Hall effect and determine the Hall voltage
10. Calculation of conductivity by four probe method
11. Study of solar cell characteristics and calculation of fill factor
12. Determination of band gap of semiconductor
13. Determination of Planck's Constant by photoelectric effect
14. Magnetic field along the axis of current carrying coil – Stewart and Gee
15. Determination of Stefan's Constant

List of Project Based Learning Topics:

1. Design and simulation of automatic solar powered time regulated water pumping
2. Solar technology: an alternative source of energy for national development
3. Double pendulum and its application
4. The study on the effect of length on the resistance of a copper wire (verification of ohms law r directly proportional to l)
5. Possible effects of electromagnetic fields (emf) on human health
6. Design and construction of digital distance measuring instrument
7. Design and construction of automatic bell ringer
8. Design and construction of remote control fan
9. Design and construction of sound or clap activated alarm
10. Electronic eye (Laser Security) as autoswitch/security system
11. Study of vibration of bars
12. Determination of absorption coefficient of sound absorbing materials
13. Determination of velocity of O-ray and E-ray in different double refracting materials
14. Need of medium for propagation of sound wave
15. Thin film interference in soap film-formation of colours

Textbooks

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)

4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Business Communication & Value Science-I

TEACHING SCHEME:

Lectures: 3 Hr./Week

Lab: 2 Hrs./Week

EXAMINATION SCHEME:

Semester Examination: 50 marks

Internal Assessment: Yes

Term work & Oral -50 Marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical: 1 Credit

Total : 4 Credits

Course Prerequisites: -

1. Students should have knowledge of Basic English grammar
2. Students should have basic information of sound system of English language
3. Basics of written communication

Course Objective:-

The course objective of Business Communication & Value Science-I aims to augment student's overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The English language topics for this semester focus on the development of basic fluency in English, usage of words and introduce them to the concept and importance of interpersonal skills so as to effectively present their personalities. Understand what life skills are and their importance in leading a happy and well-adjusted life. Motivate students to look within and create a better version of self.

Course Outcomes: -

Graduates will able to:

1. Recognize the need for life skills, values and own strengths and opportunities and apply the life skills to different situations
2. Understand and apply applications of sounds of English language for correct pronunciation
3. Construct the error free sentences of English language and do implementation of it in the spoken and written business communication
4. Understand communication process and principles to do applications in professional communication
5. Build up the ability to study employment professional communication skills and its proper implications
6. Recognize the core of professional skills and apply them for future venture through activities

Unit 1 Skills and Values and Basics of Grammar:

6 Hours

Recognize the need for life skills and values, **Overview of LOL** (include activity on introducing self), **Self-awareness** – identity, body awareness, forms of tense, articles, preposition, use of auxiliaries and modal auxiliaries, common errors.

Unit II Vocabulary/Phonetics/study of sounds in English:

6 Hours

Vocabulary development through GRAPS-PT, types of sentences voice, direct indirect speech, degree of comparison, Introduction to phonetics, study of speech organs, study of phonetic script, transcriptions of words, articulation of different sounds in English

Unit III Honing Spoken Communication:

6 Hours

Situational conversation, Law of nature- Importance of listening skills, Difference between listening and hearing, Types of listening, building team, team communication dynamics

Unit IV Communication Skills

6 Hours

Introduction, forms and function of communication process, non-verbal codes in communication, barriers to communication and overcoming them, digital communication

Unit V Mechanics of Written Communication**6 Hours**

Principles of effective writing, Email writing, technical report writing, format, structure and its types, real time report writing, create a podcast on an interested topic, create a musical using the learnings from unit

Unit VI Skill allied to professionalism:**6 Hours**

Introduction to professional skills, overview of leadership, dealing with ambiguity, Time management, Pareto Principle (80/20) Rule in time management, Time management matrix, creativity and result orientation, working under pressure, stress management.

List of Laboratory Exercises:

01. Presentation on favourite cricket captain in IPL and the skills and values they demonstrate
02. Learning Vocabulary through activity
03. Self-work with immersion – interviews a maid, watchman etc.
04. Write a newspaper report on an IPL match
05. Expressing self, connecting with emotions, visualizing and experiencing purpose
06. Evaluation on Listening skills – listen to recording and answer questions based on them
07. Written Communication: Summary writing, story writing
08. Understanding Life Skills: Movie based learning-**Pursuit of Happiness**.
09. Multiple Intelligences, Embracing diversity – Activity on appreciation of diversity
10. Life skill: Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity, result orientation etc.

Project:	01	Create a podcast on a topic that will interest college students
	02	Create a musical using the learnings from the whole course

List of Project Based Learning Topics:

01. Communication Origami
02. Preparing a model for the LOL activity
03. Investigating values around you and imbibing
04. Vocabulary: play-way method by using cards
05. Investigating into linguistic by creating models
06. Interviewing your role model for situational conversation
07. Honing LSRW: Preparing a model on each skill
08. Knowing body language: Making a video of professional presentation
09. Preparing a model of report writing (preferably real time report)
10. Analysis of Pareto Principle for Time Management
11. Creating a model of Leadership styles and their functions
12. Analysis of Time Management Matrix for effective time Management

Reference Books:

1. Business Communication by Meenakshi Raman, Prakash Singh published by Oxford University press, second edition,
2. Spoken English- A manual of Speech and Phonetics by R. K. Bansal, J. B. Harrison published by Orient Blackswan
3. Communication Skills by Sanjay Kumar, PushpLata, published by Oxford University press, second edition
4. Technical Communication by Meenakshi Raman, Sangeeta Sharma published by Oxford University press
5. Developing Communication Skills by Krishna Mohan, MeeraBanerji published by Macmillan India Pvt Ltd

Recommended web-links for enhancing English language and business communication

1. <http://www.bbc.co.uk/worldservice/learningenglish>
2. <http://www.englishlearner.com/tests/test.html>

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

B. TECH (Computer Science & Business Systems)

SEMESTER – II

COURSE SYLLABUS

Linear Algebra

TEACHING SCHEME:

Lectures: 3Hrs./Week

Tutorials: 1Hr./Week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

CREDITS ALLOTTED:

Theory: 3 Credits

Tutorial: 1 credit

Total : 4 Credits

Course Pre-Requisites:

The students should have basic Knowledge of high school math, Boolean algebra and calculus.

Course Objective:

To develop ability to use the mathematical techniques, skills, and tools necessary for computer science.

Course Outcomes:

At the end of the course, a student will be able to:

1. Apply knowledge of basics of Matrices, Determinants.
2. Solve the consistency of any type of systems.
3. Describe Vector space, Orthogonality and Projection.
4. Apply methods Gram-Schmidt orthogonalization and QR decomposition.
5. Calculate Eigenvalues and Eigenvectors.
6. Describe Singular value decomposition and Principal component analysis.

UNIT – I

6 Hours

Introduction to Matrices and Determinants, Solution of Linear Equations, Cramer's rule, Inverse of a Matrix.

UNIT – II

6 Hours

Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

UNIT – III

6 Hours

Vector space, Dimension, Basis, Orthogonality, Projection.

UNIT – IV

6 Hours

Gram-Schmidt orthogonalization and QR decomposition.

UNIT – V

6 Hours

Eigenvalues and Eigenvectors, Positive definite matrices, Linear transformations, Hermitian and Unitary matrices.

UNIT – VI

6 Hours

Singular value decomposition and Principal component analysis, Introduction to their applications in Image Processing and Machine Learning.

List of Assignments:

Assignments & tutorials covering the following: Vectors and linear combinations, Matrices, Determinants, Linear transformations, Complete solution to $AX=b$, Eigenvalues and Eigenvectors.

List of Project Based Learning Topics:

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Cramer's rule
2. System of linear equations solution
3. Rank of matrix
4. Gauss elimination

5. LU-decomposition method
6. Dimension and basis
7. Gram Schmidt Orthogonalization
8. QR decomposition
9. Single value ecomposition
10. Principal component analysis
11. Eigen values and eigen vectors
12. Hermitian and unitary matrices
13. Positive definite matrices
14. Image processing
15. Machine learning

Textbook:

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.

Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil.
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education.
3. Introduction to linear algebra, 5th Edition, Gilbert Strang.
4. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Digital Image Processing, R C Gonzalez and R E Woods.
6. <https://machinelearningmastery.com/introduction-matrices-machine-learning/>

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Statistical Methods

TEACHING SCHEME:

Lectures: 3 Hrs/Week

Tutorials: Nil

Laboratory: 02 Hrs/week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

Term Work: 25

CREDITS ALLOTTED:

Theory: 3 Credits

Practical: 1 Credit

Total : 4 Credits

Course Pre-requisites:

Basic of statistics and probability, Basic programming experience (in any language).

Course Objective:

The course introduces fundamental concepts of linear statistical models, estimation methods, hypothesis testing and fundamental concepts of programming in R.

Course Outcomes:

The students completing this course will be able to

1. Understand the basic concepts of Statistical Inference,
2. Understand the basic concepts of Estimation methods,
3. Understand the basic concepts of Hypothesis Testing
4. Understand the basic concepts of linear statistical models.
5. Understand Introductory R language fundamentals, basic syntax and how to use R; what R is and how it's used to perform data analysis.
6. Understand major R data structures and create visualizations using R.

UNIT – I

6 Hours

Sampling Techniques: Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling

UNIT – II

6 Hours

Linear Statistical Models: Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation. Standard multiple regression models with emphasis on detection of collinearity, outliers, non-normality and autocorrelation, Validation of model assumptions. Multiple correlation, Analysis of variance (one way, two way with as well as without interaction)

UNIT – III

6 Hours

Estimation: Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation.

UNIT – IV

6 Hours

Test of hypothesis: Concept & formulation, Type I and Type II errors, Neyman Pearson lemma, Procedures of testing

UNIT – V

6 Hours

Non-parametric Inference: Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test.

UNIT – VI

6 Hours

Basics of Time Series Analysis & Forecasting: Stationary, ARIMA Models: Identification, Estimation and Forecasting.

List of Assignments:

Problem sets to be shared by faculty covering the following topics: Estimation Methods: Parametric & Non – Parametric, Hypothesis Testing

List of Laboratory Exercises:

R statistical programming language: Introduction to R, Functions, Control flow and Loops, Working with Vectors and Matrices, Reading in Data, Writing Data, Working with Data, Manipulating Data, Simulation, Linear model, Data Frame, Graphics in R

List of Project Based Learning Topics:**Project Based learning topics:**

Students are expected prepare report on any one topic, write its definition, applications and analyze the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. Random Sampling
2. Stratified random sampling
3. Linear regression
4. Rank correlation
5. Method of least squares
6. Multiple correlation
7. One way analysis of variance
8. Two way analysis of variance
9. Estimation
10. Maximum likelihood estimation
11. Testing of hypothesis
12. Types of errors
13. Nonparametric tests
14. Time series
15. Forecasting

Textbooks:

1. Probability and Statistics for Engineers (4th Edition) - I.R. Miller, J.E. Freund and R. Johnson.
2. Fundamentals of Statistics (vol. I and vol. II) - A. Goon, M. Gupta and B. Dasgupta.
3. Hands-on Programming with R - Garrett Grolemond
4. R for Everyone: Advanced Analytics and Graphics - Jared P. Lander

Reference Books:

1. Statistical Theory with Engineering Application - A. Hald.
2. Statistical Methods - G.W. Snedecor and W.G. Cochran.
3. Statistical Concepts & Methods - G.K. Bhattacharyya and R.A. Johnson.
4. Introduction to Linear Regression Analysis - D.C. Montgomery & E. Peck
5. Introduction to the Theory of Statistics - A.M. Mood, F.A. Graybill & D.C. Boes.
6. Practical Non-Parametric Statistics - W.J. Conover
7. Applied Regression Analysis - N. Draper & H. Smith

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Data Structures and Algorithms

TEACHING SCHEME:

Lectures: 3 Hrs./ Week

Tutorials: Nil

Lab: 4 Hrs./ Week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

Term work & Practical: 100Marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical: 2 Credits

Total : 5 Credits

Course Pre-Requisites:

Students should have knowledge of Fundamentals of data types and programming concepts

Course Objective:

The course is aimed to provide an understanding of key concepts underlying the choice and implementation of data structures, algorithms and step by step approach in solving problems with the help of these fundamental data structures.

Course Outcomes:

Students will be able to:

1. Understand the fundamentals and analysis of algorithms
2. Implement Linear data structures
3. Implement Non-Linear data structure of Trees.
4. Implement Non-Linear data structure of Graphs.
5. Implement the sorting algorithms
6. Understand the concepts of different file system organisation.

UNIT – I

6 Hours

Basic Terminologies & Introduction to Algorithm and Data Organization: Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction

UNIT – II

6 Hours

Linear Data Structure: Array, Stack, Queue, Linked list and its types, Various Representations, Operations & Applications of Linear Data Structures

UNIT – III

6 Hours

Non-linear Data Structure Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree), Various Representations, Operations: search and traversal algorithms and complexity analysis Applications of Trees.

UNIT – IV

6 Hours

Non-linear Data Structure Graphs: Graphs: Directed and Undirected, Various Representations Operations: Search and traversal algorithms and complexity analysis Applications of Graphs.

UNIT – V

6 Hours

Searching and Sorting: Sequential Search, Binary Search, Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap Sort, Introduction to Hashing

UNIT – VI

6 Hours

File: Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes

List of Assignments:

Respective subject teacher shall design any six assignments on above units.

List of Laboratory Exercises:

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.
3. Trees with all operations.
4. All graph algorithms.
5. Saving / retrieving non-linear data structure in/from a file

List of Project Based Learning Topics:

1. Create an appropriate data structure for student data and result representation. Provide operations on these structures.
2. Develop a string reverser using stack. The stack operations called herein should be defined in file other than the reverser.
3. Develop a polynomial multiplier. The polynomials should be stored using linked lists.
4. Develop a phonebook using double linked list.
5. Demonstrate the bubble sort technique on doubly linked list.
6. Develop a two way threaded binary tree with its traversals.
7. Develop a customer database using direct access file which provides functions to read, write, modify, add and search records.
8. Write students information to a sequential file. Extract these records and construct a binary search tree out of these records. Use any parameter of the information for search/arranging criteria.
9. Develop a file merge application. It should have provision to create new files or add records to existing files. Any selected two or more files should be merged into a single new one.
10. Convert a graph representation using adjacency matrix to represent the same using adjacency list.

Textbooks:

1. Fundamentals of Data Structures, E. Horowitz and S. Sahni, 1977.
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman

Reference Books:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning)), 31st ed. Edition , Pat Morin

Syllabus for Unit Test:

Unit Test -1
Unit Test -2

UNIT – I, UNIT – II, UNIT - III
UNIT – IV, UNIT – V, UNIT - VI

Fundamentals of Economics

TEACHING SCHEME:

Lectures: 3 Hrs/Week

Tutorials: Nil

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

CREDITS ALLOTTED:

Theory: 3 Credits

Total : 3 Credits

Course Pre-Requisites:

Knowledge of Class XII level Mathematics

Course Objective:

1. To impart knowledge, with respect to concepts, principles of Economics, which govern the functioning of a firm/organization.
2. To explain the students about concept of production, cost, national income, an aggregate supply and aggregate demand consumption.

Course Outcomes:

After completing this course, students should be able to:

1. Demonstrate an understanding of the methods and principles of microeconomic and macroeconomic theory, including tradeoffs, opportunity costs, and marginal decision making.
2. Explain how markets work and how market prices are determined using principles of supply and demand.
3. Assess the impact of market failure such as externalities, and public goods and evaluate possible public policy remedies.
4. Analyze financial markets and investments, including the stock market, and their relation to the economy.
5. Evaluate key economic indicators (including GDP, unemployment, inflation) and their use in evaluating macroeconomic conditions.
6. Understand major macroeconomic tools, including fiscal and monetary policies, and their use in managing the economy. Also apply ethical principles in a variety of economic contexts.

UNIT – I

6 Hours

Microeconomics

Principles of Demand and Supply – Supply Curves of Firms – Elasticity of Supply Demand Curves of Households – Elasticity of Demand Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve) Welfare Analysis – Consumers' and Producers' Surplus – Price Ceilings and Price Floors

UNIT –II

6 Hours

Consumer Behaviour – Axioms of Choice – Budget Constraints and Indifference Curves

Consumer's Equilibrium – Effects of a Price Change, Income and Substitution Effects – Derivation of a Demand Curve ,Applications – Tax and Subsidies – Intertemporal Consumption – Suppliers' Income Effect

UNIT – III

6 Hours

Theory of Production – Production Function and Iso-quants – Cost Minimization Cost Curves – Total, Average and Marginal Costs – Long Run and Short Run Costs ,Equilibrium of a Firm Under Perfect Competition Monopoly and Monopolistic Competition

UNIT – IV

6 Hours

Macroeconomics

National Income and its Components – GNP, NNP, GDP, NDP Consumption Function Investment Simple Keynesian Model of Income Determination and the Keynesian Multiplier Government Sector – Taxes and Subsidies External Sector – Exports and Imports

UNIT – V**6 Hours**

Money – Definitions ,Demand for Money – Transitional and Speculative Demand
Supply of Money – Bank’s Credit Creation Multiplier ,Integrating Money and Commodity Markets – IS, LM Model ,Business Cycles and Stabilization – Monetary and Fiscal Policy – Central Bank and the Government .

UNIT – VI**6 Hours**

The Classical Paradigm – Price and Wage Rigidities – Voluntary and Involuntary Unemployment.

List of Assignments: -

In the discussion topics mentioned above, students should be asked to prepare in advance in groups and present in class .

List of Project Based Learning Topics:

1. Types of markets (Monopoly, Monopolistic, Perfect Competition) and their real time examples in the economy.
2. Fiscal and Monetary Policy of India.
3. Concept of Price Ceilings and Price Floors and it's practical working in the economy.
4. Elasticity of Demand and it's types.
5. Elasticity of Supply and it's types.
6. Types of Costs in a Firm.
7. Money and it's demand
8. Understanding Credit Creation by banks using real time data from various banks.
9. Studying Unemployment and its types and the type of unemployment prevailing in India.

Textbooks:

1. Microeconomics- Pindyck, Robert S., and Daniel L. Rubinfeld Microeconomics
2. Macroeconomics- Dornbusch, Fischer and Startz

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Principles of Electronics Engineering

TEACHING SCHEME:

Lectures: 3 Hrs/Week

Tutorials: Nil

Lab: 2 Hrs/ Week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

Term Work: 25 marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical :1 Credit

Total : 4 Credits

Course Pre-Requisites:

The students should have knowledge of Class XII level Electronics, Physics & Mathematics

Course Objective:

The course introduces fundamental concepts of electronics

Course Outcomes:

Students will be able to,

1. Identify semiconductor materials, draw band-diagrams and distinguish between intrinsic and extrinsic semiconductors.
2. Explain the phenomenon of rectification, draw the I-V characteristics and calculate ripple factor.
3. Explain the I-V characteristics of BJTs: Input and output, learn to bias transistors as an amplifier.
4. Describe FET and MOSFET and differentiate between BJT, FET and MOSFET.
5. Explain the fundamentals of feedback amplifiers, Oscillators and Operational Amplifier.
6. Demonstrate the knowledge of Boolean algebra including simplification techniques and operation of basic types of flip-flops.

UNIT – I

6 Hours

Semiconductors: Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers.

UNIT –II

6 Hours

Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

UNIT – III

6 Hours

Bipolar Junction Transistors: Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor.

UNIT – IV

6 Hours

Field Effect Transistors: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles

UNIT – V

6 Hours

Feed Back Amplifier, Oscillators and Operational Amplifiers: Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability;

effect of positive feedback: instability and oscillation, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

UNIT – VI

6 Hours

Digital Electronics Fundamentals: Difference between analog and digital signals, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters.

List of Assignments: -

1. Describe applications of diodes as Clippers and Clampers.
2. Describe application of Zener diode as Voltage regulator.
3. Study of characteristic curves for CB configuration of BJT using Virtual Lab.
4. Simulation of BJT amplifier using Virtual Lab.
5. Design and Implementation of Various Arithmetic Circuits using Virtual Lab.
6. To design, built and test any electronic circuit (Group activity)/ Presentation on any Electronic circuit application.

List of Laboratory Exercises:

1. To plot V-I characteristics of PN junction diode.
2. To plot regulation characteristics of half wave rectifier
3. To plot regulation characteristics of Full wave rectifier
4. To plot input-output characteristics of CE configuration of BJT.
5. To study Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias circuits.
6. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
7. To study Colpitts Oscillator.
8. Study of OP-AMP circuits: Inverting and Non-inverting Amplifier.
9. Implementation and verification of DeMorgan's theorem .
- 10 Implementation and verification of half adder and full adder.

List of Project Based Learning Topics:

1. Water Level Indicator.
2. LED Emergency Light.
3. Security control System
4. AC to DC converter.
5. Automatic Street Light controller
6. Rain Alarm system.
7. Flashing LED
8. Dancing Light
9. Voltage regulator using Zener diode.
10. Amplifier using Op-Amp.
11. JFET as an analog switch.
12. BJTs as a digital switch.
13. Sine wave generator
14. Adder/ Subtractor circuit

15. Up/Down counter

Textbooks:

1. Microelectronics Circuits, Adel S. Sedra and Kenneth Carless Smith, Oxford University Press.
2. Millman's Integrated Electronics, Jacob Millman, Christos Halkias, Chetan Parikh, McGraw Hill Education.
3. Digital Logic & Computer Design, M. Morris Mano, Pearson

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky.
2. Solid State Electronic Devices, 6th Edition, Ben Streetman, Sanjay Banerjee
3. Electronic Principle, Albert Paul Malvino.
4. Electronics Circuits: Discrete & Integrated, D Schilling C Belove T Apelewicz R Saccardi.
5. Microelectronics, Jacob Millman, Arvin Grabel.
6. Electronics Devices & Circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj
7. Electronic Devices & Circuit Theory, 11th Edition, Robert L. Boylestad, Louis Nashelsky

Business Communication & Value Science – II

TEACHING SCHEME:

Lectures: 03 Hrs/Week

Lab: 04 Hrs/ Week

EXAMINATION SCHEME:

Semester Examination: 50 marks

Internal Assessment: Yes

Term work & Oral:50 marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical:2 Credits

Total : 5 Credits

Course Prerequisites: -

Basic knowledge of the parts of speech in English.

Vocabulary covered in the previous semester along with basic knowledge of verbs & adverbs.

Basic awareness of the need of speaking skills within social circle.

The elements of team dynamics done during the previous semester with proper application and basic awareness of the concepts of feedback, criticism.

The various common conflicts that may arise at varied situations

Course Objective:-

The course objective of Business Communication & Value Science-I aims to augment student's overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The soft skills topics for this semester are intended to develop student's expertise on public speaking skills and to deal positively with criticism and to effectively present their personalities

Course Outcomes: -

Graduates will able to:

1. To understand the concept of soft skills, Business Values and its implication at workplace
2. To construct the error free sentences of English language and develop proper reading Skills for Oral and written business communication
3. To develop team building and leadership skills by applying motivational factors
4. To construct effective business presentation and do effective implementation of it through activities
5. To inculcate appropriate business ethics and etiquettes for effective professionalism
6. To understand the concept of Diversity and Inclusion and its application at workplace

Unit I Importance of Soft skills and Values Sciences:

6 Hours

Soft skills, meaning, need and importance, difference between soft skills and hard skills, life skills and personal skills, applying soft skills across culture values of a good manager, Respect for Individual and Integrity. Importance of Ethics and Values in Business World.

Unit II Enhancing Writing and Reading Skills:

6 Hours

Good and Bad Writing. Common errors, punctuation rules, use of words Formation of an E-magazine, Blog writing, writing notice, agenda and Minutes of meeting, Introduction to skimming and scanning Techniques of Good Reading, Bad reading Habits [

Unit III Developing interpersonal skills:

6 Hours

Team Building Skills, Team dynamics, Types of teams Classification of teams, Bruce Tuckman's Team Building Model, Challenges and Remedies of Team Development Belbin's 8 Team Roles and Lindgren's Big 5 personality traits. Belbin's 8 team player styles Leadership Skills: Good Leadership Skills, Difference between Leadership and Management Defining Qualities and Strengths of leadership

Unit IV Public Speaking and Presentation Skills:**6 Hours**

Public Speaking: fundamentals of effective public speaking, types- Extempore speech, manuscript speech, and ways to enhance public speaking skills, storytelling, oral review Power Point presentations, Effective ways to structure the presentation, importance of body language Group discussion, interview skills

Unit V Corporate / Business Etiquettes:**6 Hours**

Corporate grooming & dressing, etiquettes in social & office Setting-Understand the importance of professional behaviour at the workplace, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming

Unit VI Diversity and Inclusion:**6 Hours**

Concepts, Advantages and Disadvantages, Different forms of Diversity in our society. Socio-Cultural and Cross-Cultural Sensitivities at the Workplace: PWD and LGBT at the workplace, Learning disabilities at the workplace; Caste, class, regionalism, religion and poverty: the different identities of Indian employees and employers and how to include everyone; Global diversity identities of race, religion, nationhood; Appropriate Social Media Use

List of Laboratory Exercises:

- 1) Join Hands Movement'. Individual identification of social Issues
- 2) SATORI – Participants share the personal take away acquired from GD, writing and reading skills activities captured in their handbook
- 3) Form an NGO. Create Vision, Mission, Value statement, tagline and Design a logo.
- 4) Plan and design an E Magazine.
- 5) Lucid Writing, Catherine Morris and Joanie McMahon's writing techniques.
- 6) Speed Reading session: Introduction to skimming and scanning; practice the same.
- 7) Design a skit- a) write the script articulating the message of their respective NGOs. Read out the script. (Skit time-5 minutes).
- 8) Promote the play through a social media and gather your audience. Enact the play. Capture the numbers of likes and reviews
- 9) Team Falcon Practical to identify individual personality traits with Belbin's 8 team player styles
- 10) Ten minutes of your time – a short film on diversity. Play the video, Discuss the concept of empathy
- 11) Touch the target (Blind man) - Debriefing of the Practical. Film: "The fish and I" by Babak Habibifar"
- 12) To create a story – 10 minutes of a person's life affected by the social issue groups
- 13) Research on a book, incident or film based on the topic of your respective NGO and Discuss
- 14) Interviews of people from diverse groups (Ask 5 questions). Share the recordings in FB
- 15) Prepared speech- Every student will narrate the challenges faced by a member of a diverse group in 4 minutes (speech in first person)
- 16) Discussion on TCS values, Respect for Individual and Integrity.

Project:	01	Form an NGO with a social cause in a group and make an awareness among people by doing different activities
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List of Project Based Learning Topics:

1. Analysing difference between Soft Skills and Hard skills
2. Preparing a model for evaluating Values and Ethics of Good Managers
3. Developing Reading and writing Skills: Preparing a model on each skill
4. Form a model for communicative writing which avoid grammar mistakes and common errors
5. Develop Bruce Tuchman's Team Building Models with classmates/Teammates
6. Analysing difference between Leadership and Management skills
7. Watch and Listen the best videos of Good Public Speaker s and List out their Qualities and Attributes
8. Knowing body language and Paralinguistic Features for the Presentation: Making a video of professional presentation

9. Visit one nearest origination/Firm and find out what etiquettes and mannerism are being used there that enhance the capacity of their work place
10. Preparing a model of dress codes and attire for different professional situations
11. Analysing the majors aspects of diversity and inclusion in the workplace
12. Creating a good model for increasing diversity and enhancing the proper inclusion that will help in achieve the goal of the origination effectively
13. Analysing markers of global identities for inclusive work culture

Reference Books:

1. Business Communication Today by Bovee, Thill, Raina
2. Business Communication by Meenakshi Raman, Prakash Singh published by Oxford University press, second edition,
3. Spoken English- A manual of Speech and Phoonetics by R. K. Bansal, J. B. Harrison published by Orient Blackswan
4. Communication Skills by Sanjay Kumar, PushpLata, published by Oxford University press, second edition
5. Technical Communication by Meenakshi Raman, Sangeeta Sharma published by Oxford University press
6. Developing Communication Skills by Krishna Mohan, MeeraBanerji published by Macmillan India Pvt Ltd
7. Strategic Communication by Charles Marsh
8. English vocabulary in use – Alan Mc'Carthy and O'dell
9. Business Communication – Dr.SarojHiremath

Web References:

01. Ethics fundamentals and approaches to ethics
<https://www.eolss.net/Sample-Chapters/C14/E1-37-01-00.pdf>
02. A Framework for Making Ethical Decisions
<https://www.brown.edu/academics/science-and-technology-studies/framework-making-ethical-decisions>
03. Five Basic Approaches to Ethical Decision-
http://faculty.winthrop.edu/meelerd/docs/rolos/5_Ethical_Approaches.pdf

B. TECH (Computer Science & Business Systems)

SEMESTER – III

COURSE SYLLABUS

Formal Language & Automata Theory

TEACHING SCHEME:

Lectures: 3Hrs./Week

Tutorials: 1Hr./Week

Lab: Nil

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

Term Work: Nil

CREDITS ALLOTTED:

Theory: 3 Credits

Tutorial: 1 Credit

Total : 4 Credits

Course Pre-Requisites:

The students should have basic Knowledge Set algebra, elementary formal logic, constructing proofs, recurrence relations, Discrete Structures and Data structures and problem solving.

Course Objective:

1. To understand problem classification and problem solving by machines.
2. To understand the basics of automata theory and its operations.
3. To study computing machines by describing, classifying and comparing different types of computational models.
4. Encourage students to study theory of computability and complexity.
5. To understand the P and NP class problems and its classification.
6. To understand the fundamentals of problem decidability and reducibility.

Course Outcomes:

- 1) To construct finite state machines to solve problems in computing.
- 2) To write mathematical expressions for the formal languages.
- 3) To understand context free and context sensitive languages.
- 4) To construct Turing Machine for formal languages.
- 5) To express the understanding of the decidability and undecidability problems.
- 6) To identify NP Hard and complete problems.

UNIT – I

6 Hours

Introduction: Alphabet, Strings and languages, Graphs, Directed Graphs, Trees, FSM.

UNIT – II

6 Hours

Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, *Keene's theorem*, pumping lemma for regular languages, Myhill-Nerode theorem and its uses, minimization of finite automata.

UNIT – III

6 Hours

Context-free languages and pushdown automata: Productions and Derivation, Context-free grammars (CFG) and languages (CFL), Chomsky hierarchy of languages, Chomsky Normal Forms and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

UNIT – IV

6 Hours

Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

UNIT – V**6 Hours**

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages.

UNIT – VI**6 Hours**

Basic Introduction to Complexity: Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines, P and NP, NP-completeness, Cook's Theorem, other NP-Complete problems.

List of Assignments:

YACC, the parser-generating tool (Chapter 5 of Introduction to Automata Theory, Languages, and Computation (John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman.)

List of Project Based Learning Topics:

1. Design a FA for Vending Machine
2. Explain Pigeon hole Principle
3. Implement Push Down Automata
4. Implement Regular Expression
5. Implement lexical Analyzer
6. Implement Turing Machine for Mathematical Expression
7. Design an application to search a string from given text using FA
8. Implement a FSM for residing mod 3.
9. Provide solutions for Missionaries and Cannibals problems.

Textbooks:

1. Introduction to Automata Theory, Languages, and Computation John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman. Pearson Publication.

Reference Books:

1. Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou.
2. Automata and Computability, Dexter C. Kozen.
3. Introduction to the Theory of Computation, Michael Sipser.
4. Introduction to Languages and the Theory of Computation, John Martin.
5. Computers and Intractability: A Guide to the Theory of NP Completeness, M. R. Garey and D. S. Johnson.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Computer Organization & Architecture

TEACHING SCHEME:

Theory: 03 Hours / Week
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Internal Assessment: 40 Marks
Term Work: 25 Marks

CREDITS

ALLOTTED:

Theory: 3 Credits
Practical :1 Credit
Total : 4 Credits

Course Pre-Requisites:

The students should have basic Knowledge Digital electronics and computer system

Course Objective:

To understand the design of the various functional units of computer system.

Course Outcomes:

After completion of this course students will be able to

1. Explain the architecture and functions of Central Processing Unit.
2. Solve fixed point and floating-point arithmetic problems using algorithms
3. List the design approaches and functional requirements for implementing control unit.
4. Analyze the characteristics of memory system.
5. Describe the I/O organization and interconnections.
6. Infer parallel processing and multiprocessor configuration.

UNIT – I

6 Hours

Revision of basics in Boolean logic and Combinational/Sequential Circuits.

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.

Introduction to x86 architecture

Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

UNIT – II

6 Hours

Data representation: Signed number representation, fixed and floating-point representations, character representation.

Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

UNIT – III

6 Hours

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

UNIT – IV

6 Hours

Memory system design: Semiconductor memory technologies, memory organization.

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

UNIT – V

6 Hours

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCSI, USB

UNIT – VI

6 Hours

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

List of Assignments:

Assignments covering the following topics should be given

1. Booth's algorithm for multiplication
2. Restoring and non-restoring division
3. Fixed point and floating-point representation
4. Programmer's model of 80386
5. Hardwired and micro-programmed design approaches.
6. Characteristics of Memory system
7. Cache organization and address mapping
8. Virtual memory and replacement algorithms
9. Calculating throughput and speed in pipelining
10. Multiprocessor architecture

List of Laboratory Exercises:

1. Circuits on breadboard or simulators

(a) Implementation of Combinational Digital/Boolean Circuits: Adder, Subtractor, Multiplication Module, Division Module, Multiplexer, Demultiplexer, Encoder, Decoder.

(b) Implementation of Sequential Circuits: Counters, Linear Feedback Shift Registers (LFSR)

2. C/C++ programming to understand the formats of char, int, float, double, long etc.
3. Machine language programming on x86 or higher version kits or simulators

List of Project Based Learning Topics:

1. Automatic night lamp with morning alarm
2. Traffic light with sensor + 7segment
3. Multi pattern running lights.
4. .Washing machine
5. Simple Lock Using Keypad and 7 segment
6. Electronic quiz table
7. Electronic Digital Clock
8. .temperature controller
9. Plant Irrigation System
10. Car Parking Management
11. Customer counter for supermarket
12. Electronic queue management system in food stall
13. Safety box
14. Shop lot automatic door with 7segment display
15. Bank queue management system
16. Water level controller
17. Automatic home system
18. Commuter system
19. Automatic room light control
20. Elevator control system

Textbooks:

1. Computer System Architecture M. M. Mano: 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
3. Computer Organization and Embedded Systems, Carl Hamacher.

Reference Books:

1. Computer Architecture and Organization, John P. Hayes.
2. Computer Organization and Architecture: Designing for Performance, William Stallings

Syllabus for Unit Test:

Unit Test -1
Unit Test -2

UNIT – I, UNIT – II, UNIT - III
UNIT – IV, UNIT – V, UNIT - VI

Object Oriented Programming

TEACHING SCHEME:

Lectures: 3Hrs./Week

Practical: 2Hrs/Week

EXAMINATION SCHEME:

Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term work & Practical: 50 Marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical :1 Credit

Total : 4 Credits

Course Pre-Requisites:

The students should have basic Knowledge of “C” programming language.

Course Objective:

The course introduces fundamental concepts of Object-oriented programming.

Course Outcomes:

At the end of this course students will able to:

1. Understand basic concepts of Procedural programming and, the overview of C programming language
2. Understand some basic difference between C and C++.
3. Understand basic concepts of Object Oriented Programming, classes and objects in OOP.
4. Apply the concept of Access Specifier, friend function, constructor, destructor and Error Handling using C++ programs
5. Implement the concept of polymorphism, virtual functions and inheritance using C++
6. Develop OOP applications using Templates and file Handling.

UNIT – I

6 Hours

Procedural programming, An Overview of C: Types Operator and Expressions, Scope and Lifetime, Constants, Pointers, Arrays, and References, Control Flow, Functions and Program Structure, Namespaces, error handling, Input and Output (C-way), Library Functions (string, math, stdlib), Command line arguments, Pre-processor directive

UNIT – II

6 Hours

Some difference between C and C++: Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable, parameter passing – value vs reference, passing pointer by value or reference, #define constant vs const, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments

UNIT – III

6 Hours

The Fundamentals of Object Oriented Programming: Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object.

UNIT – IV

6 Hours

More extensions to C in C++ to provide OOP Facilities: Scope of Class and Scope Resolution Operator, Member Function of a Class, private, protected and public Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception)

UNIT – V

6 Hours

Essentials of Object Oriented Programming: overloading, Inheritance – Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling.

UNIT – VI

6 Hours

Generic Programming: Template concept, class template, function template, template specialization

Input and Output: Streams, Files, Library functions, formatted output

Object Oriented Design and Modelling: UML concept, Use case for requirement capturing, Class diagram, Activity diagram and Sequence Diagram for design, Corresponding C++ code from design

List of Assignments:

1. Define Procedural Oriented Programming. Explain basic concepts of procedural oriented programming.
2. Differentiate between C and C++ in detail with suitable example.
3. Explain basic concepts of Object-Oriented Programming in detail with suitable example.
4. Write short note on:
 - i) Scope Resolution Operator
 - ii) Access Specifiers
5. Explain Virtual Function and Function Overloading in detail with Example.
6. Explain Concepts of Object-Oriented Design and Modelling.

List of Laboratory Exercises:

1. Parameter passing: passing parameter by value vs by reference, passing array as constant pointer
2. Function overloading: writing string operations like strcat and strncat, strcpy and strncpy as overloaded functions.
3. Dynamically allocating space for a pointer depending on input and doing this repeatedly, depending on different inputs and finally de-allocating the pointer.
4. Define class complex with all possible operations: constructor, destructor, copy constructor, assignment operator with the data members stored as pointer to integers.
5. Define class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators
6. Define class matrix of integers with all possible operations like constructor, destructor, copy constructor and assignment operators
7. Define class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators
8. Define class stack, queue, linked-list, array, set using some data-type (int) with data members kept as private and functions kept in both protected and public sections.
9. Define class complex with all possible operators: constructor, destructor, copy constructor, assignment operator and operators >, <, >=, <=, ==, ++ (pre and post), +, +=, (), with the data members stored as pointer to integers.
10. Define class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators >, <, >=, <=, ==, ++ (pre and post), +, +=, ()
11. Define class matrix of integers with all possible operations like constructor, destructor, copy constructor and assignment operators >, <, >=, <=, ==, ++ (pre and post), +, +=, ()
12. Define class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators >, <, >=, <=, ==, ++ (pre and post), +, +=, ()
13. Define stack and queue inherited from array class, with standard functions and operators
14. Define a class called 'array' with data type passed as template type with constructor, destructor, copy constructor and assignment operators and index operator.
15. Define template functions for compare and use it in the algorithms like bubble sort, insertion sort, merge sort.
16. Formatted input-output examples
17. Input manipulators
18. Overriding operators <<, >>
19. Define class model for complex number, student class, book class and show it using UML diagram as well as concrete class.
20. Show behavioural modelling through sequence diagram and activity diagram for workflow in a typical log-in, log-out situation.

List of Project Based Learning Topics:

1. Employee Management System.
2. Trading Software.
3. Billing System.
4. Intuitive Gadgets.
5. Traffic Management System
6. Security Systems.
7. Car Rental System.
8. Login and Registration System.
9. Bookshop inventory system.
10. Student Report Management System.
11. Calendar application.

Text Books:

1. The C++ Programming Language, Bjarne Stroustrup.
2. C++ and Object-Oriented Programming Paradigm, Debasish Jana

Reference Books:

1. Programming – Principles and Practice Using C++, Bjarne Stroustrup.
2. The Design and Evolution of C++, Bjarne Stroustrup.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Computational Statistics

TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 04 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term work & Practical -50 Marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical :2 Credits

Total : 5 Credits

Course Pre-requisites: The Students should have knowledge of basics of statistics.

Course Objectives:

The aim of this course is to give graduate students knowledge of statistical concepts like factor analysis, regression analysis and Python programming. The course objective is to exercise students for data set handling, data wrangling, data visualization etc. using Python.

Course Outcomes:

1. Understand basics of normal distribution and linear regression model.
2. Apply knowledge of multivariate regression and discriminant analysis.
3. Outline component analysis and factor analysis.
4. Design various clusters.
5. Understand and demonstrate fundamentals of Python programming.
6. Demonstrate visualization in Python.

UNIT – I

6 Hours

Python Concepts, Data Structures, Classes: Interpreter, Program Execution, Statements, Expressions, Flow Controls, Functions, Numeric Types, Sequences and Class Definition, Constructors, Text & Binary Files - Reading and Writing.

Data Wrangling: Combining and Merging Datasets, Reshaping and Pivoting, Data Transformation, String Manipulation, Regular Expressions

UNIT – II 6 Hours

Data Aggregation, Group Operations, Time series: GroupBy Mechanics, Data Aggregation, Groupwise Operations and Transformations, Pivot Tables and Cross Tabulations, Time Series Basics, Data Ranges, Frequencies and Shifting.

UNIT – III

6 Hours

Multivariate Normal Distribution: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

Multiple Linear Regression Model: Standard multiple regression models with emphasis on detection of collinearity, outliers, non-normality and autocorrelation, Validation of model assumptions.

UNIT – IV

6 Hours

Multivariate Regression: Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance and covariance.

Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

UNIT - V

6 Hours

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

Factor Analysis: Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

UNIT – VI

6 Hours

Clustering and Segmentation Analysis: Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering- Profiling and Interpreting Clusters.

List of Assignments:

Respective subject teacher shall design any six assignments on above units.

List of Laboratory Exercises:

1. Introduction to python programming (String operation, Mathematical operation, loops, branching).
2. Implementation of classes and constructor in Python.
3. Implementation of basic data structures in Python.
4. File Handling in the Python.
5. Introduction to data set handling in Python.
6. Implement various pre-defined libraries in Python like Panda, NumPy, Cbor (Drawing of statistical graph).
7. Implementation of Multivariate Normal Distribution.
8. Implementation of Multiple Linear Regression Model
9. Implementation of Multivariate Regression
10. Implementation of Discriminant Analysis
11. Implementation of clustering and segmentation
12. Implementation of data wrangling, data aggregation, group operations and time series operations.
13. Data Visualization in Python.

Textbooks:

1. An Introduction to Multivariate Statistical Analysis, T.W. Anderson.
2. Applied Multivariate Data Analysis, Vol I & II, J.D. Jobson.
3. Statistical Tests for Multivariate Analysis, H. Kris.
4. Programming Python, Mark Lutz.
5. Python 3 for Absolute Beginners, Tim Hall and J-P Stacey.
6. Beginning Python: From Novice to Professional, Magnus Lie Hetland. Edition, 2005.

List of Project Based Learning Topics:

1. Design and development of Student management system using object oriented approach and file structure.
2. Development of student performance analysis system (Use of file, OO Python and regression model, Graphical dash board).
3. Development of multivariate predictive model for rain forecasting (use rainfall data for last 50 years).
4. Development of multivariate predictive model for gold rate. (Use daily gold rate data for last 10 years).
5. Development of multivariate predictive model for patrol rate. (Use daily patrol rate data for last 10 years).
6. Comparative analysis of predictions of single multivariate predictive model against multiple linear predictive models.
7. Comparative analysis of dimensionality reduction performance using principle component analysis (PCA) and linear discriminant analysis (LDA).
8. Comparative analysis of classification performance of principle component analysis (PCA) and linear discriminant analysis (LDA) techniques.
9. Study of effectiveness of analysis of variance (ANOVA) and analysis of covariance (ANCOVA) for predictive analysis.
10. Comparing operating differences of various clustering Techniques.
11. Comparative analysis of performance for parameter (variable/factors) selection using principle component analysis (PCA) and factor analysis (FA) for multivariate analysis.

Reference Books:

1. Regression Diagnostics , Identifying Influential Data and Sources of Collinearity, D.A. Belsey, E. Kuh and R.E. Welsh
2. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner.
3. The Foundations of Factor Analysis, A.S. Mulaik.
4. Introduction to Linear Regression Analysis, D.C. Montgomery and E.A. Peck.
5. Cluster Analysis for Applications, M.R. Anderberg.
6. Multivariate Statistical Analysis, D.F. Morrison.
7. Python for Data Analysis, Wes Mc Kinney.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Software Engineering

TEACHING SCHEME:

Lectures: 4Hrs./Week
Lab: 2Hrs./Week

EXAMINATION SCHEME:

Semester Examination: 60 Marks
Internal Assessment: 40 Marks
Term work & Practical: 25 Marks

CREDITS ALLOTTED:

Theory: 4 Credits
Practical: 1 Credit
Total : 5 Credits

Course Pre-Requisites:

The students should have sound knowledge of data structures, programming experience and an extensive hands-on experience of using software.

Course Objective:

The course introduces key aspects of software engineering processes for the development of a complex software system.

Course Outcomes:

1. Learn importance of software engineering process and its principles
2. Understand the software development life cycle with appropriate models
3. Understand software quality concepts
4. Document user requirements using suitable techniques
5. Analyze the software design from and Object-Oriented perspective.
6. Apply appropriate testing techniques on a software

UNIT – I

8 Hours

Introduction: Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; engineering approach to software development; role of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline.

UNIT – II

8 Hours

Software Project Management: Basic concepts of life cycle models – different models and milestones; software project planning – identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

UNIT – III

8 Hours

Software Quality and Reliability: Internal and external qualities; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126; introduction to Capability Maturity Models (CMM and CMMI); introduction to software reliability, reliability models and estimation.

UNIT – IV

8 Hours

Software Requirements Analysis, Design and Construction: Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics-based control methods; measures of code and design quality.

UNIT – V

8 Hours

Object Oriented Analysis, Design and Construction: Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object oriented construction principles; object oriented metrics.

UNIT – VI

8 Hours

Software Testing: Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction-based testing; testing for non-functional requirements – volume, performance and efficiency; concepts of inspection.

List of Assignments:

Teaching faculty will design home assignment on following topics

1. Software development Models
2. Software Requirement Specification
3. Data Flow Diagrams
4. Testing
5. Object Oriented Analysis, Design and Construction
6. Software project covering various software development methodology techniques will be implemented.

List of Laboratory Exercises:

1. Develop Flow-Charts for (any open-ended problem statement) to understand basic problem solving technique using suitable tool.
2. Perform domain analysis for given problem.
3. Develop requirements specification document as per IEEE format for a given problem
4. Develop DFD model (level-0, level-1 DFD and Data dictionary) of the project under consideration.
5. Perform Structured design for the developed DFD model.
6. Calculate Cyclomatic complexity for given code snippet.
7. Identify the usage of regression testing.
8. Identify the different types of performance testing

List of Project Based Learning Topics:

1. Fingerprint voting system
2. Weather forecasting system
3. Android local train ticketing system
4. Railway tracking and arrival time prediction system
5. Android Patient Tracker
6. Opinion mining for social networking platforms
7. Automated payroll system with GPS tracking and image capture
8. Data leakage detection system
9. Credit card fraud detection
10. AI shopping system
11. Camera motion sensor system
12. Bug tracker
13. e-Learning platform
14. Smart health prediction system
15. Software piracy protection system

Text Books:

1. Software Engineering, Ian Sommerville
2. Object Oriented Software Engineering: A Use Case Driven Approach --Ivar Jacobson

Reference Books:

1. Fundamentals of Software Engineering, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino

2. Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices, Michael Jackson
3. The Unified Development Process, Ivar Jacobson, Grady Booch, James Rumbaugh
4. Design Patterns: Elements of Object-Oriented Reusable Software, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides
5. Software Metrics: A Rigorous and Practical Approach, Norman E Fenton, Shari Lawrence Pfleeger
6. Software Engineering: Theory and Practice, Shari Lawrence Pfleeger and Joanne M. Atlee
7. Object-Oriented Software Construction, Bertrand Meyer
8. Object Oriented Software Engineering: A Use Case Driven Approach --Ivar Jacobson
9. Touch of Class: Learning to Program Well with Objects and Contracts --Bertrand Meyer
10. UML Distilled: A Brief Guide to the Standard Object Modeling Language --Martin Fowler

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Business Communication & Value Science-III

TEACHING SCHEME:

Lectures: 2 Hr./Week

Lab: 4 Hrs./Week

EXAMINATION SCHEME:

Semester Examination: 50 Marks

Internal Assessment: Yes

Term work & Oral: 50Marks

CREDITS ALLOTTED:

Theory: 2 Credits

Practical: 2 Credits

Total : 4 Credits

Course Prerequisites: -

Good knowledge of Business Communication and Value Science (Covered Semester I and II) Basic Knowledge of English (verbal and written) Completion of all units from Semesters I and II

Course Objective

The course objective of **Business Communication & Value Science-III** aims to develop technical writing skills; introduce students to Self-analysis techniques like SWOT & TOWS and develop the sense of Pluralism in cultural spaces, Cross-cultural communication, Science of Nation building

Course Outcomes: -

Graduates will able to:

1. Apply & analyze the basic principles of SWOT & life positions.
2. Understand, analyse & leverage the power of motivation in real life Identify & respect pluralism in cultural spaces.
3. Understand and apply the concepts of Global, glocal and trans-locational & analyse cross cultural communication
4. Apply the science of Nation building, the diverse culture of India
5. Identify & analyze the common mistakes made in cross-cultural communication, tools of technical writing,
6. Recognize the roles and relations of different genders. Understand Artificial intelligence & recognize its impact in daily life

Unit I SWOT and Life Positions:

4 Hours

Summarize the basic principles of SWOT and Life Positions; apply SWOT in real life scenarios. TOWS analysis, research on TOWS and find out how you can turn your threat into opportunity

Unit II VUCA World & Motivation:

4 Hours

Research through SWOT and TOWS on what are the strengths they have identified to survive in the VUCA World, Motivation: its role and application in real life.

Unit III Pluralism in cultural spaces:

4 Hours

Identify pluralism in cultural spaces, Respect pluralism in cultural spaces, Differentiate between the different cultures of India.

Unit IV Cross cultural communication

4 Hours

Define the terms global, glocal and translocational, differentiate between global, glocal and translocational culture, implications of cross-cultural communication, common mistakes made in cross-cultural communication, roles and relations of different genders.

Unit V Technical Communication

4 Hours

Role of science in nation building, tools and best practices of technical writing, technical writing in real-life scenarios.

Unit VI Role of technical writing in science and technology

4 Hours

AI (artificial intelligence), the importance of AI, Designing College in the year 2090 with help of technical writing and technology, role of technical writing in science and technology, IOT

List of Laboratory Exercises:

- 01 SWOT and Life Positions Meet Dananjaya Hettiarachchi:
<https://www.youtube.com/watch?v=bbz2boNSeL0&t=24s>
- 02 SWOT Vs. TOWS: The Balancing Act <https://www.youtube.com/watch?v=RHR04t86phA>
- 03 Presentation on what are the strengths they have identified to survive in the VUCA World.
- 04 Maslow's Theory: Present their findings and approaches as groups. They need to explain the idea of motivation with the help of examples
- 05 Cultural diversity: Awareness and respect for pluralism in cultural spaces
- 06 Pluralism through the representation of Indian rivers
- 07 Global, glocal, translocational
- 08 Group discussion on the implications of cross-cultural communication.
- 09 Gender awareness: An activity to sensitize gender awareness
- 10 Role of science in nation building
- 11 Role of science post- independence
- 12 Practice activity on technical writing.
- 13 How will a voice assistant evolve in 25 years from now?
- 14 Design your college in the year 2090
- 15 Applying technical writing in profession
- 16 Scenario-based Assessment on technical writing
- 17 Explain IOT to your helping hand at home
- 18 Will machines control us in future?
Debate in the presence of an external moderator.

Project:	01	Visit rural area/ underprivileged parts of city to address some of the local issues; if relevant suggest a practical technology solution to the issues.
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List of Project Based Learning Topics:

01. Preparing strategies by using SWOT and TWOS analysis
02. Analysis of SWOT and TWOS for VUCA world
03. Application of motivation for surviving in VUCA world
04. Identify pluralism in cultural spaces and presentation on its application for organization
05. Preparing a model of local, global and translocational
06. Preparing a model by using translocational strategies for marketing purpose
07. Preparing a model on benefits and limitation of cross-cultural communication
08. Real time application of Technical Writing for scientific topics
09. Investigation into contribution of science in nation building and preparing a model of technical writing
10. Identifying the role of technical writing in science and preparing five blogs on current scientific inventions
11. Using learning of earlier semester; prepare a technical document
12. Investigation into a research paper of your area of interest and preparing a review paper on them.

Reference Books:

- 01 Swot Analysis: A Guide to Swot for Business Studies Students by Alan Sarsby
- 02 The SWOT Analysis: Using Your Strength to Overcome Weaknesses, Using Opportunities to Overcome Threats by Lawrence G. Fine
- 03 Cross-Cultural and Intercultural Communication by William B. Gudykunst
- 04 Technical Communication by Meenakshi Raman, Sangeeta Sharma published by Oxford University press
- 05 Developing Communication Skills by Krishna Mohan, MeeraBanerji published by Macmillan India Pvt Ltd

Recommended web-links for enhancing English language and business communication

- 01 <https://youtube/CsaTshSDI>

- 02 https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
- 03 <https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y>
- 04 https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
- 05 <https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be>

B.TECH (Computer Science & Business Systems)

SEMESTER – IV

COURSE SYLLABUS

Operating System

TEACHING SCHEME:

Lectures: 4 Hrs./Week

Tutorials: nil

Lab: 2 Hrs./Week

EXAMINATION SCHEME:

Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term Work: 25 Marks

CREDITS ALLOTTED:

Theory: 4 Credits

Practical: 1 Credit

Total : 5 Credits

Course Pre Requisites:

Prerequisites for this course include thorough knowledge in some high-level programming language as C or C++ and UNIX / Linux operating system environment. As programs are to be implemented by writing C code during the course and will cover the details of C and its close relationship to UNIX and Linux in the case study in 6th unit.

Course Objectives:

1. To learn the basic concepts of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication.
3. To learn the methods of process scheduling.
4. To gain knowledge on Mutual exclusion, deadlock detection algorithms.
5. To know the concept of memory management and virtual memory.
6. To learn programmatically file management techniques.

Course Outcomes:

1. To learn and apply the basic concept of operating system.
2. To infer the concept of process and process state transition and concept of thread and multithreading.
3. Understand the importance of scheduling and types of scheduling algorithms.
4. To gain the knowledge of interprocess communication strategies, concept of deadlock along with its avoidance.
5. To analyse the memory management techniques, paging and segmentation.
6. To understand the file management and disk management techniques.

UNIT – I

8Hours

Introduction: Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.

UNIT – II

8 Hours

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT – III

8 Hours

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT – IV

8Hours

Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Barber's shop problem.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Concurrent Programming: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

UNIT – V**8 Hours**

Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT – VI**8Hours**

I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

Case study: UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

List of Assignments:

1. To learn evolution and structure of operating system.
2. To understand the concept of Real Time scheduling.
3. To analyse the problem of process synchronization.
4. To implement the shell programming in UNIX OS.

List of Laboratory Exercises:

1. Unix commands (files directory, data manipulation, network communication etc), shell programming and vi editor
2. C program implementation of the following:
 - a. Scheduling Algorithms
 - b. Shared memory
 - c. Thread and Multi Thread
 - d. Inter Process Communication
 - e. Deadlock Avoidance and Deadlock Detection
 - f. Semaphore
 - g. Memory Management
 - h. Indexing and Hashing

List of Project Based Learning Topics:

1. Virtual traffic management system using threads with semaphore to control traffic.
2. Virtual memory management system.
3. File system handling.
4. A Client -Server application, use of IPC.
5. A simple web browser.
6. Device driver for some device.
7. Design of mail system project.
8. Design of RTOS for embedded system.
9. Mini project on Linux Shell.
10. Railway reservation system using scheduling.

Textbooks:

3. Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne.

Reference Books:

1. Operating Systems: Internals and Design Principles. William Stallings.
2. Operating System: A Design-oriented Approach. Charles Patrick Crowley.
3. Operating Systems: A Modern Perspective. Gary J. Nutt.
4. Design of the Unix Operating Systems. Maurice J. Bach.

5. Understanding the Linux Kernel, Daniel Pierre Bovet, *Marco Cesati*

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Database Management Systems

TEACHING SCHEME:

Lectures: 4 Hrs./Week

Tutorials: NIL

Practical: 4 Hrs./Week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

Term work & Practical: 50 marks

CREDITS ALLOTTED:

Theory: 4 Credits

Practical: 2 credits

Total : 6 Credits

Course Prerequisites:

Students should have knowledge of

- 1) Basic understanding of data and data structure
- 2) Basic understanding of programming language

Course Objectives:

1. Identify various techniques to communicate with database.
2. Relate relevant data for effective processing of data.
3. Construct a database to maintain data adroitly.
4. Study various queries and tools to deal with the data.
5. Understand the relation between data set and respective means to access it.
6. Understand influence of data in the effective development of software.

Course Outcomes:

After successful completion of this course students will be able to:

1. Model an application's data requirements using conceptual modeling tools
2. Demonstrate concepts of relational algebra and queries
3. Demonstrate concepts of relational database design
4. Interpret the query processing and optimization activities in database
5. Interpret the transaction activities in database
6. Recognize the emerging database applications and security concerns

UNIT – I

8 Hours

Introduction: Introduction to Database. Hierarchical, Network and Relational Models. Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

UNIT – II

8 Hours

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

UNIT – III

8 Hours

Relational database design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design.

UNIT – IV

8 Hours

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Storage strategies: Indices, B-trees, Hashing.

UNIT – V

8 Hours

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

UNIT – VI

8 Hours

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

List of Assignments:

Respective subject teacher shall design any six assignments on above units.

List of Laboratory Exercises:

Assignments & tutorials covering the relational database design and operations in SQL and PL/SQL

List of Project Based Learning Topics:

1. Make a project to maintain employee data using files and dynamic object/structure. The project should be able to read, write, modify, add and search records. Also demonstrate the effect of performing change in employer data definition after few records have been added.
2. Make an extended ER diagram for insurance management system. Transform this into relation design and implement these relations with appropriate domain and integrity constraints.
3. Employ various data control restrictions on databases, relations and attributes of relations.
4. Create a phonebook which enables user to save contacts with additional information and provides various retrieval mechanisms. Provisions should be made to view data in multiple ways.
5. Design and develop a library management system. The relations in the system should be normalized upto BCNF
6. Design and develop a inventory management system and create multiple views on the relations so that users not authorised to edit the relations should be able to views the data.
7. Implement of audit trails and backup on relations.
8. Create a student result calculation system. However when updating final results after calculation should be only of students who paid complete fees, such that transaction of each row is executed separately. Hint- use explicit cursor
9. Develop a student data management system using hash files.
10. Installation of a NoSQL database and implementing a simple student database to compare with SQL database.

Textbooks:

1. Database System Concepts. Abraham Silberschatz, Henry F. Korth and S. Sudarshan.

Reference Books:

1. Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman.
2. Fundamentals of Database Systems. R. Elmasri and S. Navathe.
3. Foundations of Databases. Serge Abiteboul, Richard Hull, VictorVianu.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Software Design with UML

TEACHING SCHEME:

Lectures: 3Hrs./Week

Practical: 2Hrs./Week

EXAMINATION SCHEME:

Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term work & Practical: 50Marks

CREDITS ALLOTTED:

Theory: 3 Credits

Practical: 01 Credit

Total : 4 Credits

Course Pre Requisites:

The students should have sound knowledge software engineering and programming experience using data structures.

Course Objective:

To model software solutions, application structures, system behaviour and business processes using UML.

Course Outcomes:

1. Apply Unified Modeling Language (UML) for representation of an object-oriented system using different modeling views
2. Analyze requirements to represent logical design that is recognized by various object relationships.
3. Identify interaction among structural elements to translate analysis model into design model.
4. Model dependencies among packages and package able element ownership
5. Model dynamic behavior of the system and message flow from one object to other.
6. Envision the topology of the physical components of a system where the software components are utilized

UNIT – I

6 Hours

Introduction to on Object Oriented Technologies and the UML Method: Software development process: The Waterfall Model vs. The Spiral Model; The Software Crisis, description of the real world using the Objects Model; Classes, inheritance and multiple configurations; Quality software characteristics; Description of the Object Oriented Analysis process vs. the Structure Analysis Model. UML Language: Standards; Elements of the language; General description of various models; The process of Object Oriented software development; Description of Design Patterns; Technological Description of Distributed Systems.

UNIT – II

6 Hours

Requirements Analysis Using Case Modeling AND The Logical View Design: Analysis of system requirements; Actor definitions; Writing a case goal; Use Case Diagrams; Use Case Relationships. **The Static Structure Diagrams:**The Class Diagram Model; Attributes descriptions; Operations descriptions; Connections descriptions in the Static Model; Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.

UNIT – III

6 Hours

Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams: Description of goal; Defining UML Method, Operation, Object Interface, Class; Sequence Diagram; Finding objects from Flow of Events; Describing the process of finding objects using a Sequence Diagram; Describing the process of finding objects using a Collaboration Diagram.

UNIT – IV

6 Hours

Package Diagram Model: Description of the model; White box, black box; Connections between packagers; Interfaces. ; Create Package Diagram; Drill Down.

UNIT – V

6 Hours

Dynamic Model: State Diagram / Activity Diagram: Description of the State Diagram; Events Handling; Description of the Activity Diagram; Exercise in State Machines.

UNIT – VI

6 Hours

Component Diagram Model: Physical Aspect; Logical Aspect; Connections and Dependencies; User face; Initial DB design in a UML environment. **Deployment Model:** Processors; Connections; Components; Tasks; Threads; Signals and Events.

List of Assignments:

Teaching faculty will take assignment on following topic for internal assessment.

1. Study of UML notations
2. Class diagram
3. Interaction diagrams
4. Activity diagram
5. State diagram
6. Software project covering various software development methodology techniques will be implemented.

List of Laboratory Exercises:

1. For Object Oriented Modeling, choose a hypothetical system of significant complexity (on your project topic) and write an SRS.
2. Draw one or more Use Case diagrams for capturing and representing requirements of the system. Use case diagrams must include various scenarios as per template.
3. Draw basic class diagrams to identify and describe key concepts like classes, types in your system and their relationships.
4. Draw sequence diagrams with advanced notation for your system to show objects and their message exchanges.
5. Draw activity diagrams to display either business flows or activity flow.
6. Draw component diagrams assuming that you will build your system reusing existing components along with a few new ones.
7. Draw deployment diagrams to model the runtime architecture of your system.
8. Implement Singleton Pattern, Abstract Factory Pattern and Singleton Pattern using Java.

List of Project Based Learning Topics:

1. Implementation level UML class diagram to illustrate usage of Android Camera API
Deployment diagram for Android application deployment.
2. Online shopping UML diagrams
3. Ticket vending machine UML diagrams
4. Bank ATM UML diagrams
5. Hospital management UML diagrams
6. Airport check-in and security screening Use case modeling and Requirement analysis
7. e-Library online public access UML
8. Coffee vending machine UML diagrams.
9. Online order Processing UML diagrams.

Textbooks:

1. Object-Oriented Software Engineering: using UML, Patterns, and Java. Bernd Bruegge and Allen H. Dutoit.
2. The Unified Modelling Language User Guide. Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

Reference Books:

1. Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Introduction to Innovation, IP Management & Entrepreneurship

TEACHING SCHEME:

Lectures: 3 Hrs./Week

Tutorials: 1Hr./Week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

CREDITS ALLOTTED:

Theory: 3 Credits

Tutorial: 1 Credit

Total : 4 Credits

Course Pre-Requisites:

Good knowledge of Fundamentals of Management.

Course Objective:

The major emphasis of the course will be on creating a learning system through which management students can enhance their innovation and creative thinking skills, acquaint themselves with the special challenges of starting new ventures and use IPR as an effective tool to protect their innovations and intangible assets from exploitation.

Course Outcomes:

1. Learn to be familiar with creative and innovative thinking styles.
2. Learn opportunity reorganization and entrepreneurship skills.
3. Learn to investigate, understand and internalize the process of founding a startup.
4. Understand financial aspects of Entrepreneurship.
5. Learn to manage various types of IPR to protect competitive advantage.
6. Understand the types of IP.

UNIT – I

6 Hours

Innovation: What and Why?

Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations.
Class Discussion- Is innovation manageable or just a random gambling activity?

UNIT – II

6 Hours

Building an Innovative Organization

Creating new products and services, exploiting open innovation and collaboration, use of innovation for starting a new venture
Class Discussion- Innovation: Co-operating across networks vs. 'go-it-alone' approach

UNIT – III

6 Hours

Entrepreneurship:

Opportunity recognition and entry strategies, Entrepreneurship as a Style of Management, Maintaining Competitive Advantage- Use of IPR to protect Innovation

UNIT – IV

6 Hours

Entrepreneurship- Financial Planning: Financial Projections and Valuation. Stages of financing, Debt, Venture Capital and other forms of Financing

UNIT – V

6 Hours

Intellectual Property Rights (IPR): Introduction and the economics behind development of IPR: Business Perspective, IPR in India – Genesis and Development, International Context, Concept of IP Management, Use in marketing.

UNIT – VI

6 Hours

Types of Intellectual Property: Patent- Procedure, Licensing and Assignment, Infringement and Penalty, Trademark- Use in marketing, example of trademarks- Domain name, Geographical Indications- What is GI, Why protect them?, Copyright- What is copyright, Industrial Designs- What is design? How to protect?

Class Discussion- Major Court battles regarding violation of patents between corporate companies.

List of Assignments:

1. Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.
2. Further, the topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.
3. Topic 1- Is innovation manageable or just a random gambling activity?
4. Topic 2- Innovation: Co-operating across networks vs. 'go-it-alone' approach.
5. Topic 3- Major Court battles regarding violation of patents between corporate companies.

List of Project Based Learning Topics:

Design case studies for based on any of the following technologies

1. Artificial intelligence
2. Machine Learning
3. Cloud Computing
4. IOT
5. HCI
6. Brain Computer Interface
7. Web Designing
8. Blockchain

Textbooks:

1. Joe Tidd, John Bessant. Managing Innovation: Integrating Technological, Market and Organizational Change
2. Case Study Materials: To be distributed for class discussion

Syllabus for Unit Test:

Unit Test -1
Unit Test -2

Unit

UNIT – I, UNIT – II, UNIT - III
UNIT – IV, UNIT – V, UNIT - VI

Business Communication & Value Science – IV

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 02 Hr./Week	Semester Examination: 50 Marks	Theory: 02 Credits
Practical: 04 Hrs./Week	Internal Assessment: Yes	Practical: 02 Credit
	Term work & Oral: 50 Marks	Total : 4 Credits

Course Prerequisite: -

Basic Knowledge of English (verbal and written).

Course Objectives:

Recognize the importance of diversity in workplace, Recognize the best practices of communicative writing, Understand the importance of emotional intelligence in personal and professional lives, Apply emotional intelligence in real life scenarios, Use the best practices of public speaking in real life scenarios, Understand the importance of corporate social responsibility (CSR), Understand the importance of corporate etiquettes, Practice corporate etiquettes in real life scenarios

Course Outcomes: -

Upon completion of the course, students shall have ability to

1. Understand the importance of diversity in workplace
2. Recognize the best practices of communicative writing
3. Apply knowledge of multiple intelligences and learning styles in interpersonal interactions
4. Recognize the attributes needed to function and grow in a corporate environment
5. Identify the best practices to manage stress
6. Understand the importance of corporate social responsibility (CSR)

Unit I Diversity and Inclusion at workplace 4 Hours

Recapitulation activity of Satori. Introduce the concept of Diversity in corporate environments through an activity. Understand the importance of diversity and inclusion at workplace, Diversity and inclusion matter at workplace.

Unit II Communicative Writing: 4 Hours

Aspects of communicative writing, Application of communicative writing in real life scenarios, Use of charts and graphs in communicative writing, The best practices of communicative writing

Unit III Emotional Intelligence 4 Hours

what is emotional intelligence? Emotional intelligence in personal and professional lives its importance need and application, public speaking at workplace, Importance, need and ways, The best practices of public speaking, Apply public speaking in real life scenarios

Unit IV Corporate Social Responsibility (CSR) 4 Hours

Corporate social responsibility (CSR) its importance and need, Stalwarts in CSR, the attributes needed to function and grow in a corporate environment, the best practices to share and receive feedback for CSR

Unit V Intelligences and learning styles in interpersonal interactions: 4 Hours

Application of emotional intelligence in real life scenarios, intelligences and learning styles in interpersonal interactions, the impact of conflicts, Basic guidelines required to manage conflicts.

Unit VI Corporate etiquette, Stress & Time Management: 4 Hours

The key features of corporate etiquette, Application of the business idioms and corporate terms, the impact of stress in life and work, the best practices to manage stress, the importance of time management, the best time management practices

List of Laboratory Exercises:

- 1) Introduce the concept of Diversity in corporate environments through Role play activity
- 2) Students will be asked to create a business writing proposal to get funding to begin a start-up of their choice.
- 3) How to tell a story with charts and graphs: how to visually represent information to tell complete story. Students will be required to use the proposal for the start-up that they created in the previous class for this.
- 4) Introduce the concept of EI and give them the experience through a game/activity. Discuss the findings that students with higher EQ Ask students to note down the names of at least two movies in their Satori slam book, in which the characters display EI. Ref reading: 10 Ways to Build EI by Daniel Goleman
- 5) Public speaking – best practices Ask each group (formed earlier) to research and come up with a list of best practices along with examples (in the class)
- 6) Get, Set, Go – sell your start-up ideas
- 7) Tell a CSR story Activity - Groups will research in class, prepare and present CSR activity of Tata Steel, Microsoft, Google, TCS, Starbucks, Titan, Tata Chemicals and TOMS Shoes
- 8) Who am I? (Image Management. Building a perfect image) connect to importance of personal branding to stay relevant
- 9) Examination Result Activity - Locus of control
- 10) Applying emotional intelligence
- 11) Understanding conflicts
- 12) Corporate etiquette Mock interview rounds for each group with a prospective employer followed by discussions on corporate etiquette (leverage Interview Ready app)
- 13) Each group will present their posters and the class will come up with a list of stress management tips to be put up on the Fb/Insta page.
- 14) Managing your time better through activities
- 15) Business idioms and Corporate Terms Identify the business idioms and corporate terms from given excerpts Download the TCS BizVocab on their Smartphone
- 16) Create memories and Satori Discussion

Project: (Summative Assessment based on End Semester Project)	Each group to create a POC (Proof of Concept) for their start-up applying their learning's from the CSBS course (core subjects + BCVS). The evaluation for this POC will be done as part of the Sem end assessment by the TCS team. During the assessment, students need to share the journey of creating their start-up: from inception to POC.
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List of Project Based Learning Topics:

1. Diversity and inclusion at workplace.
2. Challenges in workplace due to diversity.
3. Importance and Benefits of Inclusion in Workplace.
4. Use of charts and graphs in communicative writing,
5. Best practices of communicative writing
6. Emotional intelligence in personal and professional lives
7. The best practices of public speaking.
8. Public speaking at workplace.
9. Importance and need of Corporate social responsibility (CSR)
10. Best CSR Practices in India.
11. Learning styles in interpersonal interactions.
12. Best Practices of Conflict Management.
13. Effective ways of Stress Management.
14. Time Management Practices

15. Corporate etiquettes and its implications

Reference Books:

1. Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman
2. Putting Emotional Intelligence to Work by Ryback David.
3. How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion by Dale Carnegie.
4. TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations
5. Diversity, Inclusion and Engagement 3rd Edition by Mervyn Hyde Lorelei Carpenter, Shelley Dole

Web References:

01. <https://www.tata.com/about-us/tata-group-our-heritage>
02. <https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity-philanthropy-and-ethics/articleshow/41766592.cms>
03. <https://youtu.be/reu8rzD6ZAE>
04. https://youtu.be/Wx9v_J34Fyo
05. <https://youtu.be/F2hc2FLOdhI>
06. <https://youtu.be/wHGqp8lz36c>
07. <https://youtu.be/hxS5He3KVEM>
08. <https://youtu.be/nMPqsjuXDmE>

Operations Research

TEACHING SCHEME:

Lectures: 2 Hrs./Week

Lab: 2 Hrs./Week

EXAMINATION SCHEME:

Semester Examination: 60 marks

Internal Assessment: 40 marks

Term Work :25 marks

CREDITS ALLOTTED:

Theory: 2 Credits

Practical: 1Credit

Total : 3 Credits

Course Pre-Requisites:

Good knowledge of mathematics.

Course Objective: The students will be able to understand various models in operations research used in industries to solve problems

Course Outcomes:

As a part of this course, students will:

1. Understand OR problem and associated models.
2. Understand Linear Algebra.
3. Use transportation and assignment problems.
4. Use PERT for modelling.
5. Use Inventory Control System.
6. Apply queuing theory and modulation techniques.

UNIT – I

4 Hours

Introduction to OR:

Origin of OR and its definition. Concept of optimizing performance measure, Types of OR problems, Deterministic vs. Stochastic optimization, Phases of OR problem approach – problem formulation, building mathematical model, deriving solutions, validating model, controlling and implementing solution.

UNIT – II

4 Hours

Linear Programming:

Linear programming – Examples from industrial cases, formulation & definitions, Matrix form. Implicit assumptions of LPP.

Some basic concepts and results of linear algebra – Vectors, Matrices, Linear Independence/Dependence of vectors, Rank, Basis, System of linear eqns., Hyperplane, Convex set, Convex polyhedron, Extreme points, Basic feasible solutions.

Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy & degeneracy, Sensitivity analysis.

Simplex Algorithm – slack, surplus & artificial variables, computational details, big-M method, identification and resolution of special cases through simplex iterations.

Duality – formulation, results, fundamental theorem of duality, dual-simplex and primal-dual algorithms.

UNIT – III

4 Hours

Transportation and Assignment problems:

TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations, Solution methods – NWCR, minimum cost and VAM, test for optimality (MODI method), degeneracy and its resolution.

AP - Examples, Definitions – decision variables, constraints, formulation, Balanced & unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

UNIT – IV

4 Hours

PERT – CPM:

Project definition, Project scheduling techniques – Gantt chart, PERT & CPM, Determination of critical paths, Estimation of Project time and its variance in PERT using statistical principles, Concept of project crashing/time-cost trade-off.

UNIT – V**4 Hours****Inventory Control:**

Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics of inventory policy (order, lead time, types), Fixed order-quantity models – EOQ, POQ & Quantity discount models. EOQ models for discrete units, sensitivity analysis and Robustness, Special cases of EOQ models for safety stock with known/unknown stock out situations, models under prescribed policy, Probabilistic situations.

UNIT – VI**4Hours****Queuing Theory:**

Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queuing system, queue types (channel vs. phase).

Kendall's notation, Little's law, steady state behavior, Poisson's Process & queue, Models with examples - M/M/1 and its performance measures; M/M/m and its performance measures; brief description about some special models.

Simulation Methodology:

Definition and steps of simulation, random number, random number generator, Discrete Event System Simulation – clock, event list, Application in Scheduling, Queuing systems and Inventory systems.

List of Assignments:

Respective subject teacher shall design any six assignments on above units.

List of Laboratory Exercises:

1. Formulation of linear programming problems.
2. Solution of linear programming problem using graphical method with:
 - i. Multiple constraints
 - ii. Unbounded solution
 - iii. Infeasible solution
 - iv. Alternative or multiple solution
3. Enumeration of all basic solutions for linear programming problem.
4. Solution of linear programming problem with simplex method.
5. Problem solving using Big M method.
6. Problem solving using two phase method.
7. Solution on primal problem as well as dual problem.
8. Solution based on dual simplex method.
9. Verification of weak duality, strong duality and complementary slackness property.
10. Solution of transportation problem.
11. Solution of assignment problem.
12. Solution of integer programming problem using Branch and Bound method.
13. Solution of integer programming problem using Gomory's cutting plane method.
14. Simulation: Random number generation.
15. Monte Carlo method.
16. Performance measures for M/M/1 queuing model.
17. ABC analysis.
18. Inventory model.

List of Project Based Learning Topics:

1. Students must work on one of the projects listed below (but not limited to) during the semester
2. Find the companies that used OR as a tool to sort a problem successfully and unsuccessfully. Compare them and analyze as to why certain strategies worked and others failed.
3. Visit any industry and choose one of their products. Develop a LPP for maximizing profits on the sale of that product considering the various constraints on it. Solve the LPP and make suggestions of the same for the company.
4. Develop a software that helps in making timetable for the department by making and solving an LPP.
5. Visit a small departmental store/hotel, collect data, and make an LPP for optimum use of space. Solve the LPP and make relevant suggestions

6. Write a research paper on how LPP helps companies to solve problems referencing latest papers.
7. Write a research paper on how assignment tools help companies to solve problems referencing latest papers.
8. Write a research paper on how transportation tools help companies to solve problems referencing latest papers.
9. Visit a small-scale industry. Collect data and make WBS and a network diagram. Solve it by CPS and PERT methods and make relevant suggestions
10. Write a research paper on how network analysis tools help companies to solve problems referencing latest papers.
11. Write a research paper on how queuing models help companies to solve problems referencing latest papers.
12. Go to a nearby petrol pump, bank, departmental store, hotel. Record the arrival and service rates for multiple days. Analyze the data and make relevant suggestions
13. Write a research paper on how inventory models help companies to solve problems referencing latest papers.
14. Go to a nearby petrol pump, departmental store, hotel. Record inventory levels and inventory practices for multiple days. Analyze the data and make relevant suggestions

Textbooks:

1. Operations Research: An Introduction. H.A. Taha.

Reference Books:

1. Linear Programming. K.G. Murthy.
2. Linear Programming. G. Hadley.
3. Principles of OR with Application to Managerial Decisions. H.M. Wagner.
4. Introduction to Operations Research. F.S. Hillier and G.J. Lieberman.
5. Elements of Queuing Theory. Thomas L. Saaty.
6. Operations Research and Management Science, Handbook: Edited By A. Ravi Ravindran.
7. Management Guide to PERT/CPM. Wiest & Levy.
8. Modern Inventory Management. J.W. Prichard and R.H. Eagle.

Syllabus for Unit Test:

Unit Test -1
Unit Test -2

Unit

UNIT – I, UNIT – II, UNIT - III
UNIT – IV, UNIT – V, UNIT - VI

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune
Department of Chemical Engineering
B. Tech. Chemical Curriculum- 2021

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Programme: B. Tech. (Chemical) (2021 Course)
Curriculum Structure (Semester I and II)

BharatiVidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology

Program: B.Tech. (Chemical)

Semester – I

CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hours/week)			Examination Scheme (Marks)						Credits				
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P		T	Total
													TW/OR/PR			
1		Algebra and Statistics	4	-	1	60	40	-	-		100	4	-		1	5
2		Organic Chemistry- I	4	2	-	60	40	25	-	25	150	4	1		-	5
3		Material and Wave Physics	4	2	-	60	40	25	-	25	150	4	1		-	5
4		Computer Aided Graphics	3	4	-	60	40	25	25	-	150	3	2		-	5
5		Chemical Engineering (Scope and Significance)	3	-	-	60	40	-	-	-	100	3	-		-	3
6		Data Structure (C Programming)	-	4	-	-	-	50	50	-	100	-	2		-	2
Total			18	12	1	300	200	125	75	50	750	18	6		1	25

Program: B.Tech. (Chemical)

Semester – II

CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hours/week)			Examination Scheme (Marks)						Credits				
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P		T	Total
													TW/OR/PR			
1		Differential and Integral Calculus	4	-	1	60	40	-	-		100	4	-		1	5
2		Organic Chemistry- II	4	2	-	60	40	25	-	25	150	4	1		-	5
3		Inorganic Chemistry	3	2	-	60	40	25	-	25	150	3	1		-	4
4		Biological Science	3	4	-	60	40	25	25	-	150	3	2		-	5
5		Material and Energy Balance Calculations	4	-	-	60	40	-	-	-	100	4	-		-	4
6		Java Programming	-	4	-	-	-	50	50	-	100	-	2		-	2
Total			18	12	1	300	200	125	75	50	750	18	6		1	25

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Programme: B. Tech. (Chemical) (2021 Course)
Syllabi of Semester I to Semester II Courses

Programme: B. Tech
Chemical (2021) Sem –I
(Chemical)

ALGEBRA AND STATISTICS		
Designation: Mathematics		
Pre-requisite Courses: Basic knowledge of mathematics		
Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 04 Hours/Week	End Semester Examination : 60 Marks	Theory : 04
Tutorial : 01 Hours/Week	Continuous Assessment : 40 Marks	Tutorial : 01
Total : 05 Hours/Week	Total : 100 Marks	Total Credits : 05
Topics Covered		
UNIT-I	Matrices Determinant, Adjoint, Rank, Inverse of matrix, Normal form, System of linear equations, Linear dependence and independence, Linear and Orthogonal transformations. Eigen Values, Eigen Vectors, Cayley – Hamilton Theorem, Application to problems in Engineering.	(08Hours)
UNIT-II	Complex Numbers and Applications Definition, Cartesian, Polar and Exponential forms, Geometrical representation of imaginary and complex numbers, De' Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic functions, Logarithm of complex numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.	(08Hours)
UNIT-III	Statistics Collection of data, Graphical representation of data, Measure of central tendency, Measures of dispersion, Coefficient of variation, Standard deviation, Correlation and coefficient of correlation, Standard error estimates, Rank correlation. Statistical test : t-test, F test, χ^2 test Data fitting: Linear, Multilinear and nonlinear regression	(08Hours)
UNIT-IV	Probability Laws of probability and notations, Random variable, Probability distribution-normal, Binomial, Poisson Weibull, Interpretation of failure data, Equal likely hood and Boolean algebra, Probability of union, Joint and marginal probability, Conditional probability, and Distribution function.	(08Hours)

UNIT-V	Vector Algebra and Calculus Vector, Space coordinates and mathematical operations, Physical applications, Differentiation of vectors, Identities involving gradient divergence curl and their physical meaning, Line and surface integrals, Green, Guass and Stoke's theorem.	(08Hours)
UNIT-VI	Solid Geometry Equation of line, Equation of plane, Conditions for line on plane, Coplanar lines, Intersection of three planes, Equation of sphere, Cone, Cylinder, Quadric surface, Surface of revolution, Combination of surfaces.	(08 Hours)

Project Based Learning

1. Find the Eigen values and Eigen vectors of any random matrix.
2. Check the consistency of algebraic equations.
3. Find roots of any algebraic equation.
4. Separate into Real and Imaginary parts of complex numbers
5. Collect the raw data, analyse it and plot it using graphs
6. Find the stability of the data using coefficient of variation
7. Use concept of correlation to find coefficient of correlation between different observation.
8. Use Rank correlation to find correlation for qualitative data.
9. Derive Spearman's Rank correlation.
10. Data fitting using linear regression.
11. Data fitting using nonlinear regression.
12. Find work done using vector integral.

Text Books/References

- 1 P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.
- 2 B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi, 2017.
- 3 B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
- 4 E. Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
- 5 P. V. O'Neil Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
- 6 M. Greenberg Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

Syllabus for Unit Tests

Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

ORGANIC CHEMISTRY - I

Designation: Basic Science

Pre-requisite Courses: Basic knowledge of Chemistry, Stereoisomerism, Reactive intermediates.

Teaching Scheme		Examination Scheme		Credits Allotted	
Lectures	: 04 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 04
Practical	: 02 Hours/Week	Continuous Assessment	: 40 Marks	Tutorial	: -
Total	: 06 Hours/Week	Term-work (TW)	: 25 Marks	Practical	: 01
		Practical/Oral	: 25 Marks	Total Credits	: 05
		Total	: 150 Marks		

Course Outcomes

1	Understand the concept of generation, stability of intermediates and mechanisms of various named reactions.
2	Illustrate the principles of stereochemistry and study the skills for stereochemical assignment related to cycloalkane
3	Explain and illustrate the knowledge about the synthesis of alkanes, alkenes and alkynes with its chemical reactions
4	Explain and illustrate the knowledge about the synthesis of Haloalkanes and alcohols with its chemical reactions.
5	Understand and apply the knowledge about preparation reactions of Aldehydes, ketones and Phenols and their chemical reactions.
6	Understand importance of synthesis reactions for Carboxylic acids and derivatives and their chemical reactions.

Topics Covered

UNIT-I	<p>Structural effects and Reactive intermediates Electron Displacement:- Effects-Inductive, Electromeric, Mesomeric and Hyperconjugative effects.</p> <p>Reactive intermediates – Carbocations and Carbanions Introduction, Classification of carbocations, Preparation of carbocations, Reactions of carbocations, Carbocations stabilisation, Introduction, Classification of carboanions, Preparation of carboanions, Reactions of carboanions, Carboanions stabilization, Kinetic and thermodynamic controls, Effect of solvent, temperature.</p>	(06 Hours)
UNIT-II	<p>Stereoisomerism Optical isomers with two chiral centres [A, A and A, B type], erythro, threo, meso, diastereomers, Stereo isomers in cycloalkanes – Baeyer's strain theory, heats of combustion and relative stability of cycloalkanes, Factors affecting the stability of conformation, Conformations of cyclohexane, equatorial and axial bonds in cyclohexane. Mono substituted cyclohexanes</p>	(06 Hours)
UNIT-III	<p>Chemistry of alkanes, alkenes and alkynes Introduction, Classification, Physical properties of alkanes, alkenes and alkynes, Preparation of alkanes from hydrogenation of alkenes and alkynes,</p>	(06 Hours)

	Wurtz Reaction, Reactions of alkanes - and Halogenation ,Preparation of alkenes from alkyl halides and alcohols, Reactions of alkenes - Electrophilic additions their mechanisms (Markownikoff/Anti-Markownikoff addition), oxymercuration-demercuration. Preparation of alkynes - calcium carbide, vicinal dihalides, Reactions of alkynes - Electrophilic and Nucleophilic additions	
UNIT-IV	Haloalkanes, alcohols Introduction, Classification, Nomenclature of alkyl halides ,Preparation of alkyl halides from alkanes and by addition of HX to alkenes, Reactions of alkyl halides- Substitution and Elimination reactions, Introduction, Classification, Nomenclature of alcohols, Preparation of alcohols- Hydrolysis of alkyl halides and Reduction of aldehydes and ketones, Reactions of alcohols- Hydrogen halides and Dehydration of Alcohols	(06 Hours)
UNIT-V	Aldehydes, ketones and Phenols Structure of carbonyl group, Nomenclature of aldehydes and ketones and physical properties, Preparation of aldehydes from primary alcohols and methyl benzenes ,Preparation of ketones from secondary alcohols and Friedel-Crafts acylation, Reactions of aldehydes and ketones – Aldol condensation, reduction- Clemmensen's, Cannizzaro's reaction, Preparation of phenols from laboratory method, Reactions of phenols – Nitration and Sulphonation	(06 Hours)
UNIT-VI	Carboxylic acids and derivatives Structure, classification, Nomenclature and physical properties, Preparation of carboxylic acids from primary alcohols and oxidation of alkyl benzene, Reactions of carboxylic acids – acidity, salt formation, Acid derivatives – Structure and Nomenclature, Preparations and properties of acid chlorides.	(06 Hours)
Project based learning		
<ul style="list-style-type: none"> • Prepare and give the composition and role of ingredients in dry hand sanitizer. • Prepare a safe way to make fruit vinegar at home. • Write a review paper based on the role of terpenes and derivatives in the cosmetic, food, and pharmaceutical industries and get it published in reputed journal (eg. Google Scholar). • With the help of extraction from cinnamon/discharge essential oil. How to present and introduce cinnamon/lemongrass essential oil products? • Prepare a hardware model based on a simple automatic handwashing device. • Write a review paper based on organic compounds are used as explosives in practice and get it published in reputed journal (eg. Google Scholar). 		
*Students in a group of 3 to 4 shall complete any one project from the above list.		
Term work		
Term work will consist of the experiments listed below, which are to be performed in laboratory by the students		
1	Purification of organic compounds by crystallization using the following solvents: <ol style="list-style-type: none"> 1. Water 2. Alcohol 3. Alcohol-Water 	
2	Effect of impurities on the melting point – mixed melting point of two unknown organic compounds.	
3	Determination of boiling point of liquid compounds. (boiling point lower than and more than	

	100 °C by distillation and capillary method)
Text Books/References:	
1	R. Macy, Organic Chemistry Simplified, 2 nd Ed., Chemical Publishing Company, New York 1995.
2	J. J. Li, C.Limberakis, D. A. Pflum, Modern Organic Synthesis, Oxford University Press, New York, 2007.
3	J. Clayden, Organic Chemistry, Oxford University Press, New York, 2000.
4	R. T. Morrison, R. N. Boyd, Organic Chemistry, 6 th Ed., Pearsons Publications, New York, 1992.
5	B. S. Furniss, A. J. Hannaford, P.W. G. Smith, A. R. Tatchell, Vogel's Textbook of Practical Organic Chemistry, 5 th Ed., Longman Scientific & Technical, Harlow 2001.
Syllabus for Unit Tests	
Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

MATERIAL AND WAVE PHYSICS

Designation: Basic Science

Pre-requisite Courses: Students are expected to have a basic understanding of physics and calculus.

Teaching Scheme		Examination Scheme		Credits Allotted
Lectures	: 04 Hours/Week	End Semester Examination	: 60 Marks	Theory : 04
Practical	: 02 Hours/Week	Internal Assessment	: 40 Marks	TW/OR/PR : 01
Total	: 06 Hours/Week	Term-work (TW)	: 25 Marks	Total Credits : 05
		Practical/Oral	: 25 Marks	
		Total	: 150 Marks	

Course Objective: To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Chemical Engineering.

Course Outcomes

1	Appraise the atomic spectra of one and two valance electron atoms and the change in behavior an external applied electric and magnetic field.
2	Solve quantum physics problems to micro level phenomena and solid state physics.
3	Summarise the arrangement of atoms in solids and its influence the properties of matter.
4	Use the knowledge of nanoscience to develop new materials with tunable properties.
5	Connect the problems associated with defects and use ultrasonic as a tool in industry form on destructive testing.
6	Infer the wave nature of light and apply it to measure stress, pressure and dimension etc.

Topics Covered

UNIT-I	Atomic and Molecular Physics Inroduction - JJ Thomson and Bohr, Sommerfeld and Vector Models, Origin of quantum numbers, Vector model for two valance electrons atom, LS and JJ coupling, origin of spectra (Electronic, atomic and molecular), Stark effect.	(08 Hours)
UNIT-II	Quantum Mechanics Dual nature of matter, concept of wave packet, group and phase velocity and relation between them, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, step potential and potential barrier (analytical discussion), tunnelling effect.	(08 Hours)
UNIT-III	Crystallography Introduction-Lattice, basis, Unit cell and Bravais lattice, cubic system, lattice planes and Miller indices, packing factor, inter planar distances, Bragg's law (Statement only), Origin of Line and Continuous Spectrum of X-ray, Mosley's law, Crystal defects (1.Point defects vacancies, interstitial defects, substitution defects, 2. Line defect-screw dislocation, edge dislocation, 3.surface defects-material surface, grain boundaries).	(08 Hours)
UNIT-IV	Nanoscience Introductions of nanoparticles, properties of nanoparticles (Optical, electrical,	(08 Hours)

	Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications, quantum dots – wide band semiconductors, direct/indirect band gap semiconductors	
UNIT-V	Ultrasonics Introduction to ultrasonics, Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating –Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C–scan displays, Medical applications – Sonogram, emulsification, cavitation, thickness measurement, flaw detection,	(08 Hours)
UNIT-VI	Wave Optics Interference Interference of waves, interference due to thin film (Uniform and non-uniform), Applications of interference (optical flatness, interference filter, non-reflecting coatings). Diffraction Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima Polarisation Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.	(08 Hours)

Term Work

Term work will consist of the experiments listed below, which are to be performed in laboratory by the students. (Any Eight of the Following)

1	Determination of Planck's Constant by photo electric effect
2	To study Hall effect and determine the Hall voltage
3	Calculation of conductivity by four probe method
4	Synthesis of metal oxide nanoparticles (ZnO/ZnS/Gold)
5	UV-VIS spectra of synthesised semiconductor nanoparticles
6	Determination of radius of plan convex lens/wavelength of light/Flatness testing by Newton's rings
7	Determination of wave length of light using diffraction grating
8	Determination of resolving power of telescope
9	Determination of thickness of a thin wire by air wedge
10	Determination of refractive index for O-ray and E-ray
11	Determination of velocity of sound in liquid by ultrasonic interferometer
12	Ultrasonic probe-a study

Project Based Learning

1	Design and simulation of automatic solar powered time regulated water pumping
2	Solar technology: an alternative source of energy for national development
3	The study on the effect of length on the resistance of a copper wire (verification of ohms law R directly proportional to l)
4	Possible effects of electromagnetic fields (emf) on human health
5	Design and construction of digital distance measuring instrument using ultrasonics
6	Measurement /simulation of reverberation time
7	Study of vibration of bars

8	Determination of absorption coefficient of sound absorbing materials
9	Determination of velocity of O-ray and E-ray in different double refracting materials
10	Quantum confinement effect in wide band semiconductors
11	Need of medium for propagation of sound wave
12	Small wind turbines as a source of electricity
13	Tesla Coil
14	Thin film interference in soap film-formation of colours
15	LiFi- wireless data transfer system using light

Text Books/References

1	A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and T V S Arun Murthy, S. Chand Publishing(2018)
2	Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3	Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S.Rai Choudhury, McGraw Hill Education (2017)
4	Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
5	Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
6	Principles of Physics, John W. Jewett, Cengage publishing (2013)
7	Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
8	Principles of Solid State Physics, H. V. Keer, New Age International (1993)
9	Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
10	Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
11	Science of Engineering Materials- C. M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
12	Introduction to Electrodynamics–David R. Griffiths, Pearson(2013)

Syllabus for Unit Tests

Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

Computer Aided Graphics		
Designation: Engineering Science		
Pre-requisite Courses: Fundamentals of Mathematics		
Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 4 Hours/ Week	Internal Assessment : 40 Marks	TW/OR/PR : 02
Total : 7 Hours / Week	Term-work (TW) : 25 Marks	Total Credits : 05
	Practical/Oral : 25 Marks	
	Total : 150Marks	
Course Objectives:		
To understand the basic principles of engineering drawing and highlight the importance of Computer Aided Drafting in engineering		
To develop the graphical skills for communication of concepts & idea through technical drawings		
Course Outcomes:		
After completion of the course students would be able to:		
1	Understand the fundamental concepts of CAD Drawing, its applications, different types of lines, curves and dimension technique with practical application.	
2	Understand the concept of Orthographic projections and apply it to draw detail views by using 1st angle projection method	
3	Understand the concept of isometric projection and apply it to construct 3D view of a component.	
4	Understand the concept of projections of Point, Line and plane; and apply to draw its projection by using 1st angle projection method and to locate its traces	
5	Understand the concept of projections of different types of solids and sectioned solids; and apply to draw its projection by using 1st angle projection method	
6	Understand the concept of Development of Lateral surfaces; and apply to development of simple and sectioned Solids.	
Topics covered		
UNIT-I	Fundamentals of CAD and Engineering Curves Introduction to Engineering Drawing, Types of lines and Dimensioning, Layout and size of drawing sheets, Scales. Engineering Curves -Ellipse drawing by Focus-Directrix Circle Method and Concentric Circle Method, Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone and Cylinder. Fundamentals of Computer Aided Drafting (CAD) and its applications, Various softwares for Computer Aided Drafting. AutoCAD initial setting and AutoCAD commands	(08 Hours)
UNIT-II	Orthographic Projection Basic principle planes of Projections, First and Third angle method of Projection, Orthographic Projections of given Pictorial view by first angle projection method only, Sectional orthographic Projection. Orthographic Drawing by using AutoCAD.	(08 Hours)
UNIT-III	Isometric Projections Principles of Isometric Projections-Isometric Scale, Isometric Axes, Isometric Projections and Isometric Drawing. Constructions of Isometric view from given Orthographic Views and given origin. Isometric Drawing by using AutoCAD.	(08 Hours)

UNIT-IV	Projection of Points, Lines and Plane Surfaces Projections of Points, Projections of Oblique lines in First Quadrant, Traces. Projections of Planes- Projection of perpendicular and oblique planes (polygonal and circular surfaces), Obtaining true shape of plane surface. Projection of Points, Lines and Plane Surfaces by using AutoCAD.	(08 Hours)
UNIT-V	Projection of Solids and Sectioned Solids Introduction of solids-Types of solids, Projection of solid inclined both references plane, Projection of common solids such as prism, pyramid, cylinder and cone. Projection of solids cut by AIP and AVP, obtaining true shape of a section. Projection of Solids and Sectioned Solids by using AutoCAD.	(08 Hours)
UNIT-VI	Development of Lateral Surfaces Development of the lateral surfaces of solids like Prisms, pyramids, cylinders and cones. Development of cut solids. Development of Lateral Surfaces by using AutoCAD.	(08 Hours)

Project Based Learning

Following is the list topic for project based learning (Not Limited to) based on the syllabus contents:

1	To obtain industrial drawings to identify the types of lines, dimensioning methods and method of projection.
2	To develop the model/charts based on engineering curves
3	To prepare model/chart for identification of engineering curves in nature for industrial, societal, etc application
4	To demonstrate different methods of orthographic projection.
5	To demonstrate projection of Points
6	To demonstrate projection of Lines
7	To demonstrate projection of Planes.
8	To demonstrate projection of Solids
9	To demonstrate developments of surfaces for solids
10	To demonstrate industrial application of development of surfaces such as steam carrying pipes, Ducts of air conditioning systems, etc.
11	To demonstrate Isometric projection method through model of a cube

*Students in a group of 3 to 4 shall complete any one project from the above list.

Term Work

Term work shall consist of **seven** A2 size (594 mm x 420 mm) sheets using **AutoCAD**.

1	Types of lines, Dimensioning practice, 1st and 3rd angle methods symbol
2	Engineering Curves
3	Orthographic Projections
4	Isometric views
5	Projections of Points and Lines and planes
6	Projection of Solids and Section of solids
7	Development of Lateral surfaces

Text Books:

1	“Elementary Engineering Drawing”, N.D. Bhatt, Charotar Publishing house, Anand India.
2	“Text Book on Engineering Drawing”, K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.

References:

1	“Fundamentals of Engineering Drawing”, Warren J. Luzzader, Prentice Hall of India, New Delhi.
2	“Engineering Drawing and Graphics”, Venugopal K., New Age International publishers.

3	M.B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
4	P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
5	P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988
Syllabus for Unit Test:	
Unit Test : I	Units : I, II, and III
Unit Test : II	UNIT : IV, V, and VI

CHEMICAL ENGINEERING: SCOPE AND SIGNIFICANCE

Designation: Basic Science

Course Pre-requisites: Basic Chemistry

Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 03 Hours/Week	End Semester Examination : 60Marks	Theory : 03
	Internal Assessment : 40Marks	Total credits : 03
	Total : 100Marks	

Course Outcomes

After completion of the course students will be able to

1. Appraise the importance of chemical engineering and related processes
2. Select unit operations and processes for desired application
3. Justify the importance of chemical engineering in Petroleum and Petrochemical industries
4. Justify the importance of chemical engineering in Food and Pharmaceutical industries
5. Justify the importance of chemical engineering in agricultural industries
6. Design a pathway to face today's and upcoming challenges using knowledge of chemical engineering

Topics Covered

UNIT - I	Introduction Chemical Engineering: Origin and development; Definition of Chemical Engineering; Major components and scope of Chemical Engineering; Role of Chemical Engineer in Chemical and allied industries; Chemical Engineering and national economy	(06 Hours)
UNIT - II	Unit operations and Unit processes Definition of unit operations and unit processes; Unit operations: fluid flow, heat and mass transfer, and mechanical operations; Unit processes: Addition, condensation, substitution; Application of unit operations and unit processes: industrial case studies.	(06 Hours)
UNIT - III	Petroleum and Petrochemical Industry Overview of petroleum and petrochemical industry; Major petroleum and petrochemical products; Unit operations and processes in petroleum and petrochemical industry; Economical impact.	(06 Hours)
UNIT - IV	Food and Pharmaceutical Industry Overview of food and pharmaceutical industries; Unit operations involved in food and pharmaceutical industries; Application of Chemical Engineering: industrial case studies; Role of Chemical Engineers; Economical impact.	(06 Hours)
UNIT - V	Agro-chemical Industry Significance of agro-chemicals; Role of chemical engineer in synthesis of agro-chemicals; Value added products: biofertilizers, biofuel, bioadsorbents, etc.; Fertilizers, pesticides, herbicides, crop growth enhancers, etc.; Social and economical importance of agricultural chemicals	(06 Hours)

UNIT - VI	Chemical Engineering and challenges (i) Energy: Sources of energy and constraints; Need for renewable energy (ii) Air: Sources of air pollution; Air quality parameters; Air pollution control (iii) Water: Water quality parameters; Water recycle and reuse; Water treatment methodologies Role of Chemical Engineer in Energy, Air and Water sectors; Economical impact.	(06 Hours)
Text Books/ References:		
1	Watcher: Kirk Othmer Encyclopaedia of Chemical Technology, 4 th Ed, Jonh Wiley and Sons, New York, 2000	
2	F.Ullmann: Ullmann's Encyclopaedia of Industrial Chemistry, 16 th Ed, Wiley VCH, Edinberg, 2016	
3	R. H. Perry, D. W. Green: Perry's Chemical Engineering's Handbook, 9 th Ed., McGraw Hill, New York, 2018	
4	I. D. Wilson: Encyclopaedia of Separation Science, 3 rd Ed., Wiley VCH Edinberg, 2007	
5	R. Trebal: Mass Transfer operations, McGraw Hill Publications 1997	
6	McCabe, Smith, Harriot: Unit Operations of Chemical Engineering, McGraw Hill Publications, 1997	
Project based learning: Below is the list of possible topics, which is for guidance faculty can design and provide relevant topics in addition to these		
1	Study and prepare a report on the activities and roles carried out by chemical engineers in different industries	
2	Study and prepare a report on the chemical and allied industries and their importance in national economy and social upliftment	
3	Study and prepare a report on the fluid flow operations used in any one chemical industry and their importance on overall processing	
4	Investigate and prepare a report on the heat transfer operations used in any one chemical industry and their importance on overall processing	
5	Investigate and prepare a report on the mass transfer operations used in any one chemical industry and their importance on overall processing	
6	Investigate and prepare a report on the mechanical operations used in any one chemical industry and their importance on overall processing	
7	Investigate and prepare a report on the unit processes used in any one chemical industry and their importance on overall operation	
8	Study the life and work of eminent chemical engineer from India and prepare a report on the economical and societal impact of their work	
9	Investigate and prepare a report on formation, processing, life cycle, application and role of chemical engineering in any one petroleum product and its societal and economical impact, along with the role of chemical engineer	
10	Investigate and prepare a report on formation, processing, life cycle, application and role of chemical engineering in any one petrochemical product and its societal and economical impact	
11	Investigate and prepare a report on formation, processing, life cycle, application and role of chemical engineering in any one processed food product and its societal and economical impact	
12	Investigate and prepare a report on formation, processing, life cycle, application and role of chemical	

	engineering in any one processed pharmaceutical product or drug and its societal and economical impact
13	Investigate and prepare a report on formation, processing, life cycle, application and role of chemical engineering in any agrochemical and its societal and economical impact
14	Investigate and prepare a report on the challenges of air and water pollution, its effects and role of chemical engineering in overcoming the same
15	Investigate and prepare a report on the challenges in energy sector, its effects and role of chemical engineering in overcoming the same
Syllabus for Unit Test:	
Unit Test : I	UNIT : I, II, and III
Unit Test : II	UNIT : IV, V, and VI

DATA STRUCTURE (C PROGRAMMING)

Designation: Computational

Pre-requisite Courses: Basic knowledge of computers

Teaching Scheme		Examination Scheme		Credits Allotted
Practical	: 04 Hours/Week	Term-work (TW)	: 50 Marks	TW/OR/PR : 02
Total	: 04 Hours/Week	Practical/Oral	: 50 Marks	Total Credits : 02
		Total	: 100 Marks	

Course Outcomes

1	Apply the knowledge of constant, variables, data types and various standard input output functions to write C-programs.
2	Design a flow chart and write C-programs using control constructs and looping statements and arrays.
3	Develop C-programs using string and pointers.
4	Elucidate the basic concepts of Data structure
5	Clarify dynamic store management.
6	Plot graphs using C- Programming

Topics Covered

UNIT-I	C-Programming Language Introduction; Character sets; Constant; Variables and Data Types: integer, float, double, char, string; Operators: arithmetic, relational, logical, increment and decrement, assignment, conditional; Standard input-output functions: printf (), scanf (), getch () or getchar (); Programs using if statement, if-else statement, goto statement, etc.; Programs based on standard input-output functions used in C-Programming. 1. Programs based on if-else statements. 2. Programs based on goto statements. 3. Programs based on switch-case statements
UNIT-II	Loops and Arrays Programs using while loop; do-while loop and for loop; Single dimensional and multi-dimensional arrays. 4. Programs based on while loop. 5. Programs based on do-while loop. 6. Programs based on for loop. 7. Write algorithm and flowchart for array. 8. Programs based on single dimensional arrays. 9. Programs based on multi-dimensional arrays.
UNIT-III	String and Pointers Programs using string; String functions: strlen()/ strcpy()/ strcmp()/ strcat ()/strlwr ()/strupr ()/ strcmp (); Programs using pointers; Use of * and & operators; Pointer arithmetic's; Use of pointers; Pointer and function: parameter passing to function by

	reference and by value; File handling; Linked list. 10. Programs based on strings and string functions. 11. Programs based on pointers and function.
UNIT-IV	Introduction to data structures Storage structure for arrays; Sparse matrices, Stacks and Queues: Representation and application; Linked lists: Single linked lists, linked list representation of stacks and Queues; Operations on polynomials; Double linked list; circular list. 12. Programs based on Array implementation of stack and queues. 13. Programs based on Linked list implementation of stack and queues
UNIT-VI	Dynamic storage management Garbage collection and compaction; Infix to post fix conversion; postfix expression evaluation; Trees: Tree terminology, Binary tree, Binary search tree. 14. Programs based on checking balanced parentheses in an expression. 15. Programs based on implementation of tree and tree traversal. 16. Programs based on implementation of binary search tree.
UNIT-VI	Graphs: Graph terminology; Representation of graphs; path matrix; BFS (breadth first search); DFS (depth first search); Topological sorting;Warshall's algorithm (shortest path algorithm.); Sorting and Searching techniques : Bubble sort, selection sort, Insertion sort, Quick sort, merge sort, Heap sort, Radix sort. Linear and binary search methods. 17. Programs based on bubble sort, insertion sort, quick sort, merge sort 18. Programs based on implementation of linear and binary search methods
In addition to these above stated programs / practical's concern faculty member may design his/her own programs / practical's.	
Term Work	
Term work will consist of the programs/practical's listed above, out of which any ten programs/practical's are to be performed in laboratory by the students.	
Text Books/References	
1	Y. C. Kanetkar, Let Us C, 15 th edition, BPB Publications, New Delhi, 2016.
2	M. Cooper, The Spirit of 'C': An Introduction to Modern Programming, First edition , Jaico Publishing House, 1998
3	Rajaraman V, Adabala N, Fundamentals of Computers, 6th edition, Prentice Hall India Learning Private Limited, 2014.
4	R. Thareja, Data Structures Using C, 2 nd edition, Oxford University Press India, 2014.
5	A. N. Kamthane, Introduction to Data Structures in C, Pearson India, 2010
6	A. K. Sharma, Data Structure Using C, Pearson India, 2010

Programme: B. Tech
Chemical (2021)Sem –
II(Chemical)

DIFFERENTIAL AND INTEGRAL CALCULUS		
Designation: Mathematics		
Pre-requisite Courses: Basic knowledge of mathematics		
Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 04 Hours/Week	End Semester Examination : 60 Marks	Theory : 04
Tutorial : 01 Hours/Week	Continuous Assessment : 40 Marks	Tutorial : 01
Total : 05 Hours/Week	Total : 100 Marks	Total Credits : 05
Topics Covered		
UNIT-I	Ordinary Differential Equations Formation of the ordinary differential equations(ODEs), Solution of an ordinary differential equation, Equations of the first order and first degree, Linear differential equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations, Ordinary differential equation of higher order with constant and variable coefficients.	(08 Hours)
UNIT-II	Partial Differential Equations Functions of two or more variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Change of variables, Jacobians - Geometrical interpretation: Tangent plane and normal to a surface.	(08 Hours)
UNIT-III	Applications of Ordinary and Partial Differential Equations Taylor's theorem for two variables, Errors and approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers, Differentiation under the integral Sign, Leibnitz's rules. Solution of Higher order ODE with constant and variable coefficients and its applications, Series solution of differential equations, Bessel functions, Legendre Polynomials, Error function. Applications of partial differential equations to chemical engineering problems.	(08 Hours)
UNIT-IV	Integral Calculus Beta and Gamma functions, Change of order of integration, Differentiation under the integral sign, Surface integrals, Volume integrals, Error functions, Double and Triple integrations.	(08 Hours)
UNIT-V	Applications of Integral Calculus Applications to Area, Volume, Mean and Root Mean Square Values.	(08 Hours)
UNIT-VI	Fourier and Laplace Transforms Fourier series: Trigonometric series, Even and odd functions, Half-range series, Parseval's identity, Complex form, Fourier integrals, Fourier sine and cosine integrals. Fourier transform: Fourier sine and cosine transforms and	(08 Hours)

	<p>their elementary properties. Convolution theorem, Application of Fourier transforms to boundary value problems.</p> <p>Laplace Transform</p> <p>Laplace and inverse Laplace transform of some standard functions, Shifting theorems, Laplace transform of derivatives and integrals. Convolution theorem, Initial and final value theorem. Laplace transform of periodic functions, Error functions, Heaviside unit step function and Dirac delta function. Applications of Laplace transform.</p>	
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Project Based Learning

Term work will consist of the experiments listed below, which are to be performed in laboratory by the students.

1.	Formation of differential equation
2.	Evaluate the electric circuit problem using differential equations.
3.	Evaluate the heat conduction in 1-D using differential equations.
4.	Find the error using the concept of total derivative.
5.	Solving the wave equation using partial differential equations.
6.	Solving the heat equation in 2-D using partial differential equations.
7.	Find Maxima and Minima of functions of two variables.
8.	Use differentiation under the integral Sign to solve integrals.
9.	Find root mean square values using integrals.
10.	Find the volume using triple integrals.
11.	Find work done using Green's theorem.
12.	Find scalar potential using vectors.
13.	Evaluating integrals using Green's theorem, Gauss's and stoke's theorem.
14.	Use Laplace transform to solve differential equations.
15.	Use Laplace transform to solve integrals equations.

Text Books/References

1	P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7 th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.
2	B. S. Grewal, Higher Engineering Mathematics, 42 th Ed., Khanna Publication, Delhi, 2017
3	B.V. Ramana, Higher Engineering Mathematics, 6 th Ed., Tata McGraw-Hill, New Delhi, 2008.
4	E. Kreyszig, Advanced Engineering Mathematics, 10 th Ed., John Wiley & Sons, Inc., 2015.
5	P. V. O'Neil Advanced Engineering Mathematics, 7 th Ed., Cengage Learning, 2012.
6	M. Greenberg Advanced Engineering Mathematics, 2 nd Ed., Pearson Education, 1998.

Syllabus for Unit Tests

Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

Organic Chemistry- II

Designation: Basic Science

Pre-requisite Courses: Basic knowledge of chemistry

Teaching Scheme		Examination Scheme		Credits Allotted
Lectures	: 4 Hours/Week	End Semester Examination	: 60 Marks	Theory : 04
Practical	: 2 Hours/ Week	Internal Assessment	: 40 Marks	TW/OR/PR : 01
Total	: 6 Hours / Week	Term-work (TW)	: 25 Marks	Total Credits : 05
		Practical/Oral	: 25 Marks	
		Total	:150Marks	

Course Objectives:

To develop the interest among the students regarding chemistry and their applications in engineering

To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.

The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the field such as Chemical Engineering.

Course Outcomes:

After completion of the course students would be able to:

1	Understand the fundamentals of reaction kinetics for nucleophilic substitution reactions and apply the knowledge to determine reaction mechanisms.
2	Understand and apply the concept of reaction kinetics for elimination reactions and determine reaction mechanisms.
3	Explain and illustrate the knowledge about the synthesis of haloalkanes and haloarenes with its chemical reactions.
4	Explain the importance of ionic liquids with synthesis and structural determination of natural products.
5	Apply the knowledge about the synthesis, properties and uses of such heterocyclic compounds like pyrrole, pyridine, thiophene and furan.
6	Illustrate the principles of organometallic chemistry and importance of synthesis reactions and their applications

Topics covered

UNIT-I	Nucleophilic Substitution at saturated carbon Introduction, Nucleophiles and leaving groups, Mechanism of nucleophilic substitution:-SN1 reaction: Kinetics and Mechanism. SN1 reaction: stereochemistry (Racemisation) The SN2 reaction: Kinetics and Mechanism. SN2 reaction: stereochemistry (Inversion) Comparison of SN1 and SN2 reaction.	(08 Hours)
UNIT-II	Elimination Reactions and Aromatic substitution reactions Introduction, Mechanism of 1, 2-elimination reactions, The E2 mechanism, Evidence for E2 mechanism, Orientation and reactivity in E2:- Saytzeff rule, Hoffmann elimination. E1 mechanism, Evidence for E1 mechanism, Orientation in E1 General mechanism of Electrophilic substitutions, Friedel-Crafts alkylation and acylation reactions, nitration, halogenations, sulphonation, chloro-sulphonation.	(08 Hours)
UNIT-III	Haloalkanes and haloarenes Alkyl halides: Methods of preparation, nucleophilic substitution reactions – SN1 and SN2 mechanisms and effect of solvent etc. Aryl halides: Methods of preparation-diazonium salts. nucleophilic aromatic substitution. Relative reactivity of alkyl,	(08 Hours)

	allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions. Nitro and amino arenes: General reactions, Basicity of aminoarenes	
UNIT-IV	Ionic Liquids and Natural products Ionic Liquids: Introduction to Ionic liquids, structure and formation of ionic liquids, Physical properties of ionic liquids. Natural Products: Terpenoids :- Introduction, Isolation and Purification Classification of Terpenoids, General methods for structure determination of Terpenoids, Isoprene rule. Alkaloids :- Introduction, Extraction and Purification General properties of Alkaloids, General methods for structure determination of Alkaloids.	(08 Hours)
UNIT-V	Heterocyclic Compounds Definition, classification and nomenclature of heterocyclic compounds. Five membered heterocyclic compounds - Furan, Thiophene and Pyrrole Structure and Method of synthesis, Properties and reactions, Electrophilic orientation. Six membered heterocyclic compounds – Pyridine, Structure and Method of synthesis, Properties and chemical reactions.	(08 Hours)
UNIT-VI	Metal Organics Introduction to Organometallic Chemistry: Metal- carbon bond formation, factors affecting M-C bond formation; Transition metal- π alkene complexes: synthesis, reactions, bonding and stability, Metal Organometallics: Organo-Lithium Compounds and Organo-Magnesium Compounds Applications of organometallic compounds: in catalytic processes such as hydroformylation and hydrogenation.	(08 Hours)

Assignments

Six assignments to be given by the subject teacher (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum.

Project Based Learning

Following is the list topic for project based learning (Not Limited to) based on the syllabus contents:

1	Prepare and give the composition and role of chelating compounds in engineering applications.
2	Prepare a safe way to make surface disinfectant at home.
3	Write a review paper based on the role of alkaloids and derivatives in the cosmetic, food, and pharmaceutical industries and get it published in reputed journal (eg. Google Scholar).
4	With the help of extraction from rose petals/discharge essential oil. How to present and introduce rose petals essential oil products?
5	Prepare a model based on structure and formation of ionic liquids.
6	Write a review paper based on diazonium salts with nucleophilic aromatic substitution
7	In practice and get it published in reputed journal (eg. Google Scholar).

*Students in a group of 3 to 4 shall complete any one project from the above list.

Term Work

1	Determination of R _f values and identification of organic compounds.
	1) To prepare tribromobenzene from aniline.
	2) To prepare p-nitro aniline from acetanilide.
	3) To separate green leaf pigments by thin layer chromatography and determine their R _f values
2	Determine the type and performs functional group test for the given organic compounds-
	1) Aldehydes
	2) Ketones
	3) Phenols
	4) Carboxylic acids

	5) Esters
	6) Ethers
Text Books/ References:	
1	R. T. Morrison, R. N. Boyd and S K Bhattacharjee , Organic Chemistry, 7th Ed., Pearson Prentice Hall, Chennai, 2011
2	J. J. Li, C. Limberakis, D. A. Pflum, Modern Organic Synthesis, Oxford University Press, New York, 2007.
3	J. Clayden, N. Greeves, S. Warren, and P. Wothers, Organic Chemistry, Oxford University Press, 2009
4	P. Wasserscheid, T. Welton, Ionic Liquids in Synthesis, 2nd edition , Wiley-VCH, 2007
5	McMurry, J.E. Fundamentals of Organic Chemistry, 7thEd. Cengage Learning India Edition, 2013.
Syllabus for Unit Test:	
Unit Test : I	Units : I, II, and III
Unit Test : II	UNIT : IV, V, and VI

INORGANIC CHEMISTRY

Designation: Basic Science

Pre-requisite Courses: Basic knowledge of Chemistry, Types of bonding, Periodic Table.

Teaching Scheme		Examination Scheme		Credits Allotted	
Lectures	: 03 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 04
Practical	: 02 Hours/Week	Continuous Assessment	: 40 Marks	Tutorial	: -
Total	: 05 Hours/Week	Term-work (TW)	: 25 Marks	Practical	: 01
		Practical/Oral	: 25 Marks	Total Credits	: 04
		Total	: 150 Marks		

Course Outcomes

1	Appraise the importance, formation and rearrangement of chemical bonding.
2	Infer the chemical bonding as per the molecular structure.
3	Justify the chemical bonding based on the properties of s, p, d, f elemental orbitals and chemistry of group IA, IIB, IIIB and VIIB.
4	Justify the importance of transition metal complexes and design their chemical interactions.
5	Appraise the importance, formation and rearrangement of chemical bonding based upon acid base chemistry.
6	Design a pathway for chemical transformation through chemical kinetics

Topics Covered

UNIT-I	Chemical Bonding Quantum mechanical methods in chemical bonding: molecular orbital theory, symmetry of molecular orbitals, MOs for homonuclear diatomic molecules, application of MO theory to heteronuclear diatomics, valence bond theory, hybridization, hybridization involving d orbitals, conjugated molecules, Huckel molecular orbital theory of conjugated systems, metallic bonding, band theory.	(06 Hours)
UNIT-II	Chemical Bonding and Molecular structure Orbital concept and its implications for periodicity and chemical reactivity, Lewis bonding and the derivation of Lewis structures, Octet rule and extensions to the octet rule, VSEPR theory, Valence Bond theory and hybrid orbitals, Molecular Orbital theory and delocalised orbitals.	(06 Hours)
UNIT-III	s, p, d, f elements and chemistry of group IA, IIB, IIIB and VIIB Periodic Table, s, p, d and f elements and their general properties, correlations among various properties. Main group Chemistry: Hydrogen, Chemistry of Group IA, II B and Group IIIB to VIIB elements and noble gases	(06 Hours)
UNIT-IV	Transition Metal Bonding in transition metal complexes: coordination compounds, crystal field theory, octahedral, tetrahedral and square planar complexes, crystal field stabilization energies, Jahn-Teller theorem, spectral and magnetic properties.	(06 Hours)

UNIT-V	Acid-base and solution Brønsted and Lewis acids, pH concept and pK values, Hydrolysis equilibria of weak acids and bases, Hydrolysis equilibria of polyprotic acids/bases, Speciation Diagrams, Hydrolysis equilibria in salt solutions, Buffers, Solubility and solubility product, Simple coordination (complex formation) equilibria, Simultaneous equilibria	(06 Hours)
UNIT-VI	Chemical kinetics Rate of reaction and rate laws, Elementary and non-elementary reactions, Empirical kinetics, First and second order reactions, Integral and differential evaluation, Isolation method, Initial rate method, Complex mechanisms, Parallel reactions, Reactions with equilibrium, Sequential reactions, Radical chain reactions, Derivation of a mechanistic rate law, Steady-state approximation, Quasi-equilibrium approximation, Reaction intermediates and transition states, Temperature dependence of rates (Arrhenius law).	(06 Hours)
Project based learning		
<ul style="list-style-type: none"> • Prepare a hardware model based on Huckel molecular orbital theory of conjugated systems. 		
<ul style="list-style-type: none"> • With the help of Hydrolysis equilibria, select for study various salt solutions. 		
<ul style="list-style-type: none"> • Write a review paper based on applications of Bonding in transition metal complexes and get it published in reputed journal (eg. Google Scholar). 		
<ul style="list-style-type: none"> • With the help of, d and f elements and their general properties, prepare a model based on correlations among various properties, 		
<ul style="list-style-type: none"> • Prepare a hardware model based on VSEPR theory. 		
<ul style="list-style-type: none"> • Write a review paper based on applications of MO theory to heteronuclear diatomics and get it published in reputed journal (eg. Google Scholar). 		
*Students in a group of 3 to 4 shall complete any one project from the above list.		
Term work		
Term work will consist of the experiments listed below, which are to be performed in laboratory by the students		
1	To determine the equivalent weight of the given metal (Zn or Mg) Eudiometrically.	
2	To determine distribution coefficient of iodine between water and CCl ₄ .	
3	To standardize Na ₂ SO ₄ solution by preparing K ₂ Cr ₂ O ₇ & to estimate % of copper from given solution.	
4	Heat of neutralization.	
5	Thermodynamic parameters.	
6	To determine loss in weight & percentage composition of NaHCO ₃ by gravimetric method.	
7	To determine water of crystallization of MgSO ₄ .xH ₂ O by gravimetric method.	
8	To determine water of crystallization of BaCl ₂ . xH ₂ O by gravimetric method.	
9	Determine λ-max for KMnO ₄ and find concentration of unknown solution by using colorimetric measurements.	
10	Determine surface tension of a given liquid by stalagmometer.	
11	Experiments based on chemical reaction equilibria	
12	Experiments based on chemical reaction kinetics	

13	Experiments based on electrolyte systems, acid- base and solution chemistry
14	Experiments based on surface and interfacial phenomena
Text Books/References:	
1	C.E. Housecroft ,E.C. Constable, Chemistry, 4 th Ed., Pearson - Prentice Hall, London, 2010.
2	J. D. Lee, Concise Inorganic Chemistry, Chapman & Hall, London, 1996.
3	J. A. C. Broekaert, Analytical Atomic Spectrometry with Flames and Plasmas, Wiley-VCH Verlag GmbH & Co. KGaA, New York, 2002
4	W. L. Jolly, Modern Inorganic Chemistry, McGraw-Hill International, 2 nd Ed., New York, 1991.
5	J. E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry, Principles of Structure and Reactivity, Harper Collins, New York 1997.
Syllabus for Unit Tests	
Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

BIOLOGICAL SCIENCES		
Designation: Professional Core		
Pre-requisite Courses: Biology, Chemistry		
Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 4 Hours/ Week	Internal Assessment : 40 Marks	TW/OR/PR : 02
Total : 7 Hours / Week	Term-work (TW) : 25 Marks	Total Credits : 05
	Practical/Oral : 25 Marks	
	Total : 150Marks	
Course Outcomes:		
After completion of the course students would be able to:		
1	Identify the microorganism and its structure.	
2	Learn the basics of biochemistry.	
3	Analyze the enzyme technology with different aspects.	
4	Identify the biomaterials and their applications.	
5	Learn the concept of Biodiversity and applications of biological science.	
6	Analyze the Bio safety framework in India.	
Topics covered		
UNIT-I	Molecular Cell Biology Introduction to cell; Eukaryotes and prokaryotes; Classification of microorganisms and important cell types; Structures of the bacterial cell; Classification and Identification of microorganisms; Cultivation of bacteria; Reproduction and growth.	(06 Hours)
UNIT-II	Biochemistry Biological oxidations; Photosynthesis; Carbohydrates, lipids and their metabolism; Structure of biomolecules; Intra and intermolecular forces; Introduction to kinetics of biological systems.	(06 Hours)
UNIT-III	Enzymes for Life Sciences Classification of enzymes; Specificity of enzyme action; Factors modifying enzyme activity; Biotechnological applications of enzymes in various industries; Enzyme Immobilization.	(06 Hours)
UNIT-IV	Bio-materials Classification of biomaterials; Comparison of properties of some common biomaterials; Effects of physiological fluid on the properties of biomaterials; Biodegradable materials; Introduction to bio-materials in medicine.	(06 Hours)
UNIT-V	Biodiversity and Applications of Biological science Components of Biodiversity; Biodiversity crisis and biodiversity loss, Importance of biodiversity in daily life; Biodiversity and climate change; Biofuel; Bio fertilizers; Biocides; Application in food industry.	(06 Hours)
UNIT-VI	Biosafety-regulatory Framework in India Food Adulteration Act (1955), Standard safety methods for handling microorganisms; National Environment Policy (2006); Storage of hazardous microorganisms/genetically engineered organisms or cells; Case studies for	(06 Hours)

	handling of various microorganisms.	
*Project Based Learning		
1	Identification of microorganisms according to structure of bacterial cell	
2	Learn to cultivate bacteria	
3	Analyze enzyme applications in medical field	
4	Analyze enzyme applications in chemical engineering	
5	Analyze enzyme applications in food industry	
6	Illustration of Biomaterial applications in medical field	
7	Learn the concept of Biodiversity and climate change	
8	Analyze application of biofuel	
9	Analyze application of biocides in agricultural industry	
10	Learn handling of microorganisms at various conditions	
*Students in a group of 3 to 4 shall complete any one project from the above list.		
Term Work		
Term work will consist of the experiments listed below, which are to be performed in laboratory by the students.		
1	Enzyme catalysis	
2	Enzyme activity assay	
3	Yeast fermentation	
4	Enzyme concentration	
5	Substrate concentration effect on enzyme activity	
6	Temperature effect on enzyme activity	
7	Effect of pH on enzyme activity	
8	Effect of inhibitors on the enzymatic activity	
9	Effect of inhibitors on the enzyme activity	
Text Books/References:		
1	Bruce A. Alexander J. Julian L., Martin R. Keith R. and Peter W.: "Molecular Biology of the Cell", 5th Edition, CRC Press, India.	
2	Paul D.: "Physics in Biology and Medicine", 3rd Edition, Academic Press, USA.	
3	Colin R. Bjorn K. : "Basic Biotechnology", 3rd Edition, Cambridge University Press, UK	
Syllabus for Unit Test:		
Unit Test	: I	Units : I, II, and III
Unit Test	: II	UNIT : IV, V, and VI

MATERIAL AND ENERGY BALANCE CALCULATIONS

Designation: Professional Core

Course Pre-requisites: Basic knowledge of chemistry

Teaching Scheme		Examination Scheme	Credits Allotted		
Lectures	: 04 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 04
Total	: 04 Hours/Week	Internal Assessment	: 40 Marks	Total Credits	: 04
		Total	: 100 Marks		

Course Outcomes:

1	Solve problems based on basic chemical calculations with considering the concepts of units and dimensions.
2	Estimate material balance calculations without chemical reaction for the systems involved in various unit operations.
3	Estimate material balance calculations involving chemical reaction for the unit processes carried out in chemical industry.
4	Elaborate the concept of recycle, bypass, purge operations and solve problems based on humidification, recycle, bypass and purge operations.
5	Interpret the concept of energy balance and solve the problems based on energy balance calculations.
6	Evaluate gross and net calorific values of fuel and solve the problems based on them.

Topics covered

UNIT-I	Basic Chemical Calculations Units and dimensions; Mole, atomic mass, and molar mass concept; Gas mixtures; Gas –liquid mixtures; Joule Thomson effect; Basic composition calculations for homogeneous two phase and three phase systems.	(08 Hours)
UNIT-II	Material Balances without Chemical Reactions Generalized law of conservation of mass; Mass conservation without chemical reaction; Mass balances for unit operations encountered in chemical process industry : Distillation, extraction, evaporation, crystallization, blending etc.	(08 Hours)
UNIT-III	Material Balances involving Chemical Reactions Generalization of law of conservation of mass involving chemical reaction and its simplification; Chemical equations and stoichiometry; Basic concepts: conversion, yield, selectivity; Material balance for unit processes encountered in chemical process industry: nitration, esterification, acylation, sulfonation etc.	(08 Hours)
UNIT-IV	Recycle, Bypass and Purge Operations Necessity of recycle, bypass and purge streams; Basic calculations of recycle, bypass and purge streams for unit operations and unit processes; Industrial examples of recycling, bypassing and purging with complete mass balance viz. biofuel synthesis, food processing etc.; Humidification operation.	(08 Hours)
UNIT-V	Energy Balance Basic concepts; Heat capacity; Sensible heat and latent heat: Clausius-Clapeyron equation; Standard heat of formation, combustion and reaction; Hess's law; General equation of energy balance; Energy balance approach and calculations for exothermic and endothermic reactions with industrial examples; Steam table and its utility; Utility energy balance calculations; Simultaneous heat and energy balance; Humidification operation.	(08 Hours)

UNIT-VI	Fuels and Combustion Types of fuels: solid, liquid and gas; Calculations of energy content of fuel; Analysis of fuel; Oxygen requirement and excessity; Adiabatic flame temperature calculations; Endothermic and exothermic reaction; Energy analysis and calculations.	(08 Hours)
Project Based Learning:		
1.	Investigate and prepare a report on mass and energy balance for any one of following unit operations for given system.	
	a) Distillation	
	b) Evaporation	
	c) Extraction	
	d) Crystallization	
	e) Drying. etc	
2.	Investigate and prepare a report on mass and energy balance for any one of following unit processes for given system. It may include overall energy and/or mass balance over a given chemical process equipment.	
	a) Nitration	
	b) Esterification	
	d) Fermentation	
	e) Sulfonation etc.	
3.	Visit chemical industry and prepare a detailed report on various unit operations and unit processes used in industry along with their mass and energy balance.	
4.	Measure the calorific values of any two types of fuel and prepare an assessment on the factors affecting calorific value.	
5.	Prepare an report and present the mass and energy balance for unit operations and unit processes with chemical reaction carried out in chemical industry.	
6.	Solve last five years GATE question papers with reference to material and energy balance calculations.	
7.	Students have to study any five NPTEL videos related to material and energy balance calculations and prepare/present power point presentation.	
8.	Technical interview based on knowledge of material and energy balance calculations.	
9.	Prepare models for recycle, bypass and purge operations carried out in chemical industry.	
10.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.	
11.	Prepare a report on unit operations which are newly introduced in the current year.	
12.	Write a report on your visit to research and development laboratory of national/international repute.	
Students in a group of 3 to 4 shall complete any one project from the above list. In addition to these above stated topics concern faculty member may design his/her won topics.		
Text Books/References:		
1.	B. I. Bhatt and S. M. Vora, Stoichiometry (SI Units), 5 th Ed., Tata McGraw Hill Publishers, New Delhi, 2010.	
2.	D. M. Himmelblau, Basic Principles and Calculations in Chemical Engineering, 8 th Ed. Prentice Hall Publications, 2015.	
3.	O. A. Hougen, K. M Watson and R. A. Ragatz, Chemical Processes Principles, Part-I, Material and Energy Balances, Asia Publishing House, Bombay, 2004.	

4.	R.M. Felder and R.W. Rousseau, Elementary Principles of Chemical Processes, 3 rd edition, John Wiley & Sons Publications, 2005.
5.	D. F. Rudd, G. J. Powers and J. F. Sirola, Process Synthesis, Prentice Hall Publications.
6.	S.D. Shukla and G. N. Pandey, Chemical Engineering Calculations, Lion Press, Kanpur.
7.	W.E. Ranz, Describing Chemical Engineering Systems, McGraw Hill Publications, 1970.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

JAVA PROGRAMMING

Designation: Computing

Pre-requisite Courses: Basic knowledge of computer fundamentals, C/C++ programming.

Teaching Scheme	Examination Scheme	Credits Allotted
Practical : 04 Hours/Week	TW : 50 Marks	TW/OR/PR : 02
	Practical/Oral : 50 Marks	Total Credits : 02
	Total : 100 Marks	

Course Outcomes

- | | |
|---|---|
| 1 | Elucidate basic OOPs concepts and requirement of Java |
| 2 | Clarify class fundamentals |
| 3 | Apply OOPs concept using inheritance |
| 4 | Elucidate runtime exceptions |
| 5 | Comprehend reading and writing files in java |
| 6 | Clarify collection of objects with searching and sorting. |

Topics Covered

UNIT-I	<p>Introduction to Java : OOPs concepts; Need of Java; Java Virtual Machine (JVM); Java Development Kit (JDK); byte code; variable; Data types, Handling strings, arrays, operators, and control flow statements: command line arguments, Automatic type promotion.</p> <ol style="list-style-type: none"> 1. Programs based on if-else, switch-case statements. 2. Programs based on loop statements. 3. Programs based on arrays.
UNIT-II	<p>Class Fundamentals: Java classes and objects; Methods and constructors; 'this' keyword; Method accepting and returning objects; Method overloading and constructor overloading; static and final keywords; Nested classes.</p> <ol style="list-style-type: none"> 4. Programs based on method accepting and returning objects. 5. Programs based on method overloading and constructor overloading. 6. Programs based on object arrays.
UNIT-III	<p>Inheritance: Simple inheritance; Member access in inheritance; super class variable can refer subclass object; super keyword; Multilevel hierarchy of inheritance; Method Overriding; Dynamic method dispatch (Run time polymorphism); Abstract classes; Interfaces; DMD using abstract classes and interfaces; Interfaces can be extended; final keyword to restrict inheritance; Creating packages.</p> <ol style="list-style-type: none"> 7. Programs based on multilevel hierarchy of inheritance. 8. Programs based on super keywords. 9. Programs based on dynamic method dispatch (DMD).
UNIT-IV	<p>Exception handling: Exception introduction; Uncaught exception; try-catch blocks; Describing an exception; 'throw' keyword; 'throws' keyword; finally keyword; Manual exception.</p> <ol style="list-style-type: none"> 10. Programs based on dynamic method dispatch using abstract classes and interfaces 11. Programs based on manual exception.

	12. Programs based on Buffered Reader class.
UNIT-V	IO Mechanism: Byte stream; Character stream; Reading data from console: BufferedReader, DataInputStream class; Reading and writing files: FileInputStream and FileOutputStream class. 13. Programs based on DataInputStream class. 14. Programs based on FileInputStream class. 15. Programs based on File Output Stream class.
UNIT-VI	Collection Framework: Equals () and hashCode () methods, instanceof operator; Lists; Sets; Maps; Sorting and searching. 16. Programs based on Sorting. 17. Programs based on searching.

In addition to these above stated programs / practicals concern faculty member may design his/her own programs / practicals.

Term Work

Term work will consist of the programs/practicals listed above, out of which any ten programs/practicals are to be performed in laboratory by the students.

Text Books/References

1	H. Schildt, Java 2 Complete Reference, 5 th Edition, Tata Mc-Gra Hill.
2	SCJP 1.6 – Khalid Mughal.
3	SCJP 1.6 – Kathy Sierra.
4	JAVA 7 Programming, Black Book ,Kogent Learning Solutions Inc.
5	K. Arnold, J. Gosling, D. Holmes, The Java Programming Language, 3 rd Edition, Sun Microsystems.
6	A Primer, E. Balaguruswamy, Programming with Java, Tata Mc-Graw Hill Companies.
7	P. Naughton, H. Schildt, The complete reference Java 2 Third Edition, TMH publication.

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune
Department of Chemical Engineering
B. Tech. Chemical Curriculum- 2021

Bharati Vidyapeeth

(Deemed to be University)

Faculty of Engineering and Technology

Programme: B. Tech. (Chemical) (2021 Course)

Curriculum Structure (Semester III and IV)

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology

Program: B. Tech. (Chemical) Semester – III CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hours/week)			Examination Scheme (Marks)						Credits				
			L	P/D	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P		T	Total
													TW/OR/PR			
1		Chemical Engineering Thermodynamics- I	4	-	1	60	40	-	-	-	100	4	-		1	5
2		Process Heat Transfer	3	4	-	60	40	25	-	25	150	3	2		-	5
3		Fluid Mechanics	3	4	-	60	40	25	-	25	150	3	2		-	5
4		Particulate Technology	4	2	-	60	40	25	-	25	150	4	1		-	5
5		Material Science and Engineering*	4	-	-	60	40	-	-	-	100	4	-		-	4
6		Python Programming	-	4	-	-	-	50	50	-	100	-	2		-	2
7		Vocational Course- I: Analytical Techniques	-	-	-	-	-	25	25	-	50	-	2		-	2
8		MOOC-I	-	-	-	-	-	-	-	-	-	-	-		-	2
9		Environmental Studies [#]	-	-	-	-	-	-	-	-	-	-	-		-	-
Total			18	14	1	300	200	150	75	75	800	18	9		1	30

* Industry Taught Course I; # Mandatory Audit Course with end semester examination of 100 marks

Program: B. Tech. (Chemical) Semester – IV CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hours/week)			Examination Scheme (Marks)						Credits				
			L	P/D	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P		T	Total
													TW/OR/PR			
1		Numerical Methods for Chemical Engineering	4	-	-	60	40	-	-	-	100	4	-		-	4
2		Chemical Engineering Thermodynamics- II	4	-	1	60	40	-	-	-	100	4	-		1	5
3		Design of Heat Transfer Equipment	3	4	-	60	40	25	-	25	150	3	2		-	5
4		Chemical Technology	3	4	-	60	40	25	-	25	150	3	2		-	5
5		Industrial Pollution and Abatement*	4	2	-	60	40	25	-	25	150	4	1		-	5
6		MATLAB programming	-	4	-	-	-	50	50	-	100	-	2		-	2
7		Vocational Course- II: Industrial Heating Systems	-	-	-	-	-	25	25	-	50	-	2		-	2
8		Social Activities- I	-	-	-	-	-	-	-	-	-	-	-		-	2
9		Disaster Management [#]	-	-	-	-	-	-	-	-	-	-	-		-	-
Total			18	14	1	300	200	150	75	75	800	18	9		1	30

* Industry Taught Course II; # Mandatory Audit Course with end semester examination of 100 marks

Bharati Vidyapeeth
(Deemed to be University)
Faculty of Engineering and Technology
Programme: B. Tech. (Chemical) (2021 Course)
Syllabi of Semester III and Semester IV Courses

Programme: B. Tech Chemical (2021)

Sem -III (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS- I		
Designation: Professional Core		
Pre-requisite Courses: Basic knowledge of chemistry, physics and mathematics, Material and energy balance calculations.		
Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 04 Hours/Week	End Semester Examination : 60 Marks	Theory : 04
Tutorial : 01Hours/Week	Internal Assessment : 40 Marks	Tutorial : 01
Total : 05 Hours/Week	Total : 100 Marks	Total Credits : 05
Course Outcomes		
1	Differentiate between energy, work and heat	
2	Estimate energy requirement for a system using first law of thermodynamics	
3	Estimate efficiency of heat engines and entropy of system using second law of thermodynamics	
4	Estimate pressure, volume and temperature of fluid.	
5	Estimate thermodynamic properties of pure fluids using pressure, volume and temperature conditions.	
6	Apply laws of thermodynamics to refrigeration and steam power plants	
Topics Covered		
UNIT-I	Basic concepts of Thermodynamics Scope of Thermodynamics; Macroscopic and microscopic Thermodynamics; Dimensions and units; Thermodynamic properties: pressure, temperature, volume; Work, energy and heat; Thermodynamic systems: Closed, open, and isolated systems; Concept of continuum; Intensive and extensive properties; State function and path function; Thermodynamic equilibrium: Mechanical, thermal and chemical; Phase rule; Reversible and irreversible processes.	(08 Hours)
UNIT-II	First Law of Thermodynamics and its applications Joule's experiment and internal energy; First law of Thermodynamics and its generalized mathematical form; Enthalpy; Heat Capacity; Constant volume and constant pressure processes; Applications of first law of Thermodynamics: Mass and energy balance equations for flow process; Limitations of first law of Thermodynamics.	(08 Hours)
UNIT-III	Second Law of Thermodynamics Necessity of second law of Thermodynamics; Kelvin-Plank and Clausius statements of second law of thermodynamics; Heat engine: Carnot cycle and efficiency; Entropy; Clausius entropy inequality; Entropy change of ideal gas; Mathematical statement of second law of thermodynamics; Third law of thermodynamics and its mathematical statement.	(08 Hours)

UNIT-IV	Volumetric Properties of Pure Fluids PVT behaviour of pure substance: PT and PV diagrams; Basic equation of state; Ideal gas and real gas; PVT behaviour of ideal gas; Thermodynamic relations for ideal gas for isochoric, isobaric, isothermal, adiabatic, and polytropic processes; PVT behaviour of real gas: (i) the Virial equations, (ii) two parameter equations such as van der Waal equation, Redlich-Kwong equation, etc. (iii) compressibility factor: two and three parameter theorems of corresponding state.	(08 Hours)
UNIT-V	Thermodynamic Properties of Fluids Fundamental property relations for homogeneous phases: (i) Internal energy, Enthalpy, Helmholtz energy, and Gibbs energy, (ii) Maxwell relationships; Two-phase systems: Clausius - Clapeyron equation and Antoine equation; Fugacity and fugacity coefficient: Estimation of fugacity of pure gas; Thermodynamic diagrams: (i) temperature-entropy, (ii) pressure-enthalpy, and (iii) enthalpy-entropy (the Mollier diagram).	(08 Hours)
UNIT-VI	Major Applications of Laws of Thermodynamics (i) Refrigeration Carnot theory and ideal efficiency for refrigeration; Industrial refrigeration cycles and efficiency calculations: Vapor compression cycle and gas absorption cycle. (ii) Steam power plant Carnot theory and ideal efficiency for steam power plant; Industrial steam power plants and efficiency calculations: Rankine cycle, reheat cycle, and regenerative cycle.	(08 Hours)

Project Based Learning

1.	Draw P-T and P-V diagrams for pure substances.
2.	Numerical involving Pure Fluid Properties Coupled to 1st and 2nd Laws.
3.	Solving numerical based on application of thermodynamics to transient open and closed systems
4.	Students have to study any five NPTEL videos related to Chemical Engineering Thermodynamics I and prepare/present power point presentation.
5.	Group discussions on any of the following topics: a) Importance of Chemical Engineering Thermodynamics in chemical industries. b) Practical applications involving various thermodynamic processes. c) Ideal Gas, Real Gas, Ideal gas mixture, Ideal solution.
6.	Questions involving first law applied to pure component systems.
7.	Solving numerical in connection with entropy changes of ideal gas for various thermodynamic processes.
8.	Solving numerical based on Refrigeration and Liquefaction.
9.	Enhancement in collaborative learning is done through, group assignments that will be given to

	encourage students to work with classmates to discuss and complete homework assignments.
10.	Solve question papers of CET I of previous THREE years.
11.	Unsolved numerical from the reference books on various topics studied.
12.	Preparation of a brief report on applicability of equations of states (EOS) in chemical engineering systems.
Text Books/References	
1	J. M. Smith and H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics", McGraw- Hill Publication
2	T. E. Daubert, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
3	K.V. Narayanan, "Chemical Engineering Thermodynamics", PHI Learning Pvt. Ltd.
4	B. F. Dodge, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
5	M. D. Koretsky, "Engineering and Chemical Thermodynamics", 2nd Edition, John Wiley & Sons
6	S. I. Sandler, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
7	S. Glasstone, "Thermodynamics for Chemists", Affiliated East West Press Pvt.Ltd.
Syllabus for Unit Tests	
Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

PROCESS HEAT TRANSFER

Designation: Professional Core

Pre-requisite Courses: Basic knowledge of physics and mathematics; Material and energy balance calculations

Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 03Hours/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 04 Hours/Week	Internal Assessment : 40 Marks	TW/OR/PR : 02
Total : 07 Hours/Week	Term-work (TW) : 25 Marks	Total Credits : 05
	Practical/Oral : 25 Marks	
	Total : 150 Marks	

Course Outcomes

1	Estimate rate of heat transfer by conduction mode.
2	Estimation of overall heat transfer coefficient.
3	Estimation of heat transfer coefficient for natural and forced convection using appropriate empirical correlation.
4	Estimate rate of heat transfer in boiling and condensation phenomena.
5	Estimation of radiative heat transfer rate.
6	Estimation of time required to raise/reduce the temperature of given process/operation by a desired degree.

Topics Covered

UNIT-I	Conduction Concept of heat conduction; Fourier's law of heat conduction; Thermal conductivity: solids, liquids and gases; Effect of temperature and pressure on thermal conductivity; Steady state heat conduction through composite wall; Steady state heat conduction through a variable area: Cylinder and sphere; Steady state heat conduction with heat sources: plane wall, cylinder and sphere; Average temperature calculations.	(06Hours)
UNIT-II	Heat Transfer Coefficient Concept of convective heat transfer and heat transfer coefficient; Newton's law of convective heat transfer; Overall heat transfer coefficient: Heat transfer between fluids separated by plane wall and cylindrical wall; Heat transfer from extended surfaces; Thermal contact resistance; Critical insulation thickness; Optimum insulation thickness.	(06 Hours)
UNIT-III	Natural and Forced Convection Concept of natural and forced convection; Estimation of heat transfer coefficients: Dimensional analysis and dimensionless groups; Factors affecting individual heat transfer coefficient; Empirical correlations for natural convection: flat plate, cylinder and sphere; Empirical correlations for forced convection: Internal flows (laminar and turbulent flow through circular	(06Hours)

	and non-circular pipes) and external flow (flat plate, cylinder and sphere); Heat transfer with variable driving force: Counter current and co-current operations; Momentum and heat transfer analogies.	
UNIT-IV	Boiling and Condensation Concept of boiling; Boiling regimes and heat transfer rate: Natural convection, nucleate boiling, transition boiling and film boiling; Concept of condensation; Film-wise and drop-wise condensation; Film condensation on vertical and horizontal surfaces; Estimation of condensation heat transfer coefficient: Nusselt's theory; Factors affecting the rate of condensation.	(06 Hours)
UNIT-V	Radiation Concept of radiation; Blackbody radiation; Radiative heat transfer laws: Planck's law, Wien's law, Stefan-Boltzmann law, Kirchhoff's law; Radiative heat exchange between surfaces: View factor; Rate of radiation exchange between black and grey bodies; Radiation intercepted by shield; Radiation combined with conduction and convection.	(06 Hours)
UNIT-VI	Unsteady State Heat Transfer Unsteady state heat conduction; Concept of thermal diffusivity; Unsteady state heat transfer in mechanically agitated contactors (MAC): MAC configurations, Overall heat transfer calculations, Estimation of time needed to attain desired temperature for a given operation/process using isothermal and non-isothermal heating medium; Unsteady state heat transfer in multiphase reactors: Estimation of overall heat transfer coefficient and time needed to calculate process temperature attainment.	(06 Hours)

Project Based Learning

1	By determining optimum thickness of insulation give solution to an industrial problem to minimize the heat loss.
2	Design laboratory manuals better than existing ones with clearly shown specimen calculations.
3	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in Industry.
4	Write a technical report on your visit to a process industry.
5	Solve old (last ten years) GATE question papers with reference to heat transfer subject.
6	Group discussion on the recent advances in heat transfer processes.
7	Write a report on your visit to research and development laboratory of national/international repute.
8	Technical interview based on the knowledge of heat transfer.
9	Write a report on the recent advances in heat transfer processes with reference to the current year.
10	Solve old (last five years) question papers with reference to particular topic.
11	Prepare a model for any of the heat transfer equipment.
12	Prepare a report on heat transfer equipments which are newly introduced in the current year.
13	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
14	Evaluate capacity and economy for any industrial evaporator.
15	Estimate how much heat transfer rate is decreased due to the scale formation on surface of industrial heat transfer equipment?

Term Work	
Term work will consist of the experiments listed below, which are to be performed in laboratory by the students	
1	To determine rate of heat flow and thermal conductivity of an insulating material.
2	To determine thermal conductivity of a metal bar.
3	To study Newton's law of cooling to find rate of heat flow.
4	To determine the local heat transfer coefficients using the various correlations in natural convection.
5	To determine heat transfer coefficient in forced convection.
6	To study film wise condensation.
7	To study drop wise condensation.
8	To determine the critical heat flux
9	To study Stefan-Boltzman law and find the value of its constant.
10	To study heat transfer through a composite wall.
11	To determine emissivity of an aluminum plate.
12	To study unsteady state processes.
Text Books/References	
1	Holman, J.P., "Heat Tansfer", 9th edn. The McGraw-Hill Companies, 2008
2	Dutta B. K., "Heat Transfer: Principles and Applications", PHI, 2001
3	Kern D. Q., "Process Heat Transfer", Tata McGraw-Hill Edition, 1997
4	McCabe, W. L., Smith, J. C., and Harriott, P., "Unit Operations of Chemical Engineering", McGraw-Hill, 6th. Ed., 2001
5	Chapman, A.J. "Heat Transfer", 4th edn. Maxwell Macmillan International Edition, 1984.
Syllabus for Unit Tests	
Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

FLUID MECHANICS

Designation: Professional Core

Course Pre-requisite: Material and Wave Physics.

Teaching Scheme		Examination Scheme		Credits Allotted
Lectures	: 03 Hours/Week	End Semester Examination	: 60 Marks	Theory : 03
Practical	: 04 Hours/Week	Internal Assessment	: 40 Marks	TW/OR/PR : 02
Total	: 07 Hours/Week	Term-work (TW)	: 25 Marks	Total Credits : 05
		Practical/Oral	: 25 Marks	
		Total	: 150 Marks	

Course Outcomes

- 1 Evaluate properties of fluids using basic concept of fluid flow.
- 2 Apply the basic equations of fluid flow to study various flow systems
- 3 Select an appropriate type of flow measuring device.
- 4 Determine the major and minor energy losses for fluid flowing through a pipe.
- 5 Identify and select various types of fluid moving equipments for fluid flow.
- 6 Determine the friction factors and pressure drop for flow through packed and fluidized bed.

Topics Covered

UNIT-I	<p>Basic Concepts of Fluid Flow Fluid statics and dynamics: Scope and applications; Rheological classification of fluids; Incompressible and compressible fluids; Types of flow: laminar, transition and turbulent flow and their characteristics, Reynolds experiment; Properties of fluids: concept of viscosity, Newton's law of viscosity, viscosity of gases and liquids, eddy viscosity; Concept of fluid pressure and hydrostatic equilibrium.</p>	(06Hours)
UNIT-II	<p>A. Equations of Fluid Flow Equation of continuity and motion: Cartesian coordinates, Navier Stokes equation; Bernoulli's equation: assumptions, equation with and without friction, limitations of Bernoulli's equation, correction factors; Applications of equations of fluid flow.</p> <p>B.Flow of Incompressible Fluids Characteristics of pipe flow: laminar flow in pipes, shear stress distribution and velocity profiles, relationship between skin friction and wall shear, Hagen Poiseuille equation, relation between average and maximum velocity.</p>	(06 Hours)
UNIT-III	<p>A. Turbulent flow Basics of turbulent flow, equations of continuity and motion for turbulent flow, Boussinesq hypothesis, Prandtl mixing length theory, turbulent pipe flow, basis of Universal velocity profile and its use.</p> <p>B. Flow metering devices Pitot tube, orifice meter, venturi meter, rotameter, notches and weirs.</p>	(06Hours)
UNIT-IV	<p>Major and Minor Losses in Pipe Flow Major losses: Head loss due to friction, Darcy-Weisbach equation; Friction</p>	(06 Hours)

	factor: concept, correlations of friction factor for laminar, transition and turbulent flow, friction factor chart (Moody's diagram), frictional loss in highly turbulent flow, effect of wall roughness; Minor losses: pipe entrance and exit, sudden expansion and contraction, fittings, valves, bends etc.	
UNIT-V	Flow Moving Machinery Pumps: types, selection and specifications, characteristic curves, cavitation phenomena, net positive suction head (NPSH) calculations, operating parameters affecting the performance of a pump, calculation of power requirement; Blowers and compressors: selection and specifications, factors affecting performance, power calculations for given duty.	(06 Hours)
UNIT-VI	Flow Past Immersed Bodies Hydrodynamic boundary layer: concept, boundary layer thickness, growth over a flat plate, boundary layer separation, drag on a flat plate for laminar and turbulent flow, drag on immersed bodies; Flow through packed and fluidized beds: flow through beds of solids, motion of particles through the fluid, particle settling, mechanism of fluidization, minimum fluidization velocity, friction factors for flow through beds of solids, pressure drop calculations, particulate and aggregative fluidization, applications of fluidization.	(06 Hours)

Term Work

Term work will consist of the experiments listed below, out of which at least eight experiments should be performed in laboratory by the students.

1	To determine kinematic viscosity and to study the effect of temperature on kinematic viscosity of given oil.
2	To study flow characteristics using Reynolds apparatus and determine Reynolds number.
3	To determine the coefficient of discharge for venturimeter.
4	To determine the coefficient of discharge for orificemeter.
5	To determine Darcy Weisbach coefficient of friction for laminar and turbulent flow.
6	To determine friction and pressure drop for flow through helical/spiral coils.
7	To find losses due to sudden expansion and contraction in pipe.
8	To calculate minimum fluidization velocity using fluidized bed reactor.
9	To verify Bernoulli's theorem.
10	To study characteristics of centrifugal pump.
11	To Study Darcy's law.
12	To study pressure drop in packed bed for different fluid velocities.
13	To determine the coefficient of discharge for different notches like rectangular notch, V notch, and trapezoidal notch.
14	To determine terminal velocity of particles in fluids of different viscosity and plot a graph of drag coefficient (C_D) as a function of NRe .

Project Based Learning:

1	Investigate and prepare a report on any one of the following topics.
	a) Importance of fluid flow operations in chemical industries.
	b) Pumps, blowers and compressors.
	c) Flow measuring devices.
2	Students have to study any five NPTEL videos related to fluid flow operations and prepare/present power point presentation.

3	Visit to suppliers and prepare a report on detailed specifications of following fluid moving equipments.
	a) Pumps.
	b) Blowers.
	c) Compressors.
4.	Visit to suppliers and prepare a report on detailed specifications of following flow measuring devices.
	a) Venturimeter.
	b) Orificemeter.
	c) Pitot tube.
	d) Roatameters.
5.	Students have to visit chemical industry and make a detailed report on overall fluid flow operations.
6.	Prepare models for various types of valves and write industrial applications.
7.	Prepare models for various types of bends and write industrial applications.
8.	Prepare models for various types of fittings and write industrial applications.
9.	Prepare a report on fluid flow operations which are newly introduced in the current year.
10	Write a report on your visit to research and development laboratory of national/international repute.
11	Technical interview based on knowledge of fluid flow operations.
12	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
Students in a group of 3 to 4 shall complete any one project from the above list. In addition to these above stated topics concern faculty member may design his/her won topics.	
Text Books/References	
1	W. L. McCabe, J. C. Smith, and P. Harriott, Unit Operations of Chemical Engineering, 5 th edition, McGraw Hill Publications, 2008.
2	J.M.Coulson, J. F.Richardson, J. R. Backhurst, J. H. Harker, Chemical Engineering Volume 1, 6 th edition, Pergamon Press, 2003.
3	S.K.Gupta, Momentum transfer operations, Tata McGraw Hill Publishers.
4	R. K. Bansal, A text book of fluid mechanics and hydraulic machines, 9 th Ed., Laxmi Publications (P) Ltd, New Delhi, 2010.
5	R.B. Bird, W.E. Stewart, E.N. Lightfoot, Transport Phenomena, John Wiley & Sons, New York, 2007.
6	M.M. Denn, Process fluid mechanics, Prentice Hall Publications, 1979.
Syllabus for Unit Tests	
Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

PARTICULATE TECHNOLOGY

Designation: Professional Core

Pre-requisite Courses: None.

Teaching Scheme		Examination Scheme		Credits Allotted
Lectures	: 04 Hours/Week	End Semester Examination	: 60 Marks	Theory : 04
Practical	: 02 Hours /Week	Internal Assessment	: 40 Marks	TW/OR/PR : 01
		Term-work (TW)	: 25 Marks	Total credits : 05
		Practical/Oral	: 25 Marks	
		Total	: 150 Marks	

Course Outcomes: After completion of the course students will be able to

1	To select suitable type of screening and size reduction equipment for different particle sizes
2	To select suitable type of thickeners and clarifiers for separation of suspended solid particles from liquid for example applications in Wastewater treatment plants.
3	To apply beneficiation techniques in Chemical Industries.
4	To select a suitable type of conveyor for transportation of different types of solids
5	To select a suitable type of agitator for mixing and agitation and to estimate power consumption in mixing and agitation.
6	To select a suitable type of filter for filtration of a slurry or a suspension.

Topics Covered

UNIT-I	Screening and Size Reduction of Solids Properties of solids; Performance of screening equipment; Testing sieves; Tyler standard sieve series; Sieve shaker; Types of screen analysis; Necessity of size reduction; Crushing efficiency; Energy requirement calculations by using crushing laws; Classification of size reduction equipment: Crushers, Grinders, Ultrafine grinders, Cutters, Dry versus wet grinding; Open and closed circuit grinding.	(08 Hours)
UNIT-II	Settling and Sedimentation Motion of particle in fluid; Drag force; Drag coefficient; Gravity settling methods; Terminal falling velocity; Stoke's law and Newton's law of settling; Gravity sedimentation operations; Sedimentation test; Kynch theory; Determination of thickener area and depth of thickener; Thickeners, Clarifiers, Sedimentation centrifuges.	(08 Hours)
UNIT-III	Beneficiation Equipment Froth flotation; Magnetic separator; Scrubbers; Electrostatic precipitators; Mineral jig; Cyclone separator; Hydro cyclone types and centrifuges.	(08 Hours)
UNIT-IV	Handling and Conveying of Solids Storage of solids; Characteristics of bulk solids; Conveyors: Principle, Construction and Working, Advantages, Disadvantages and Design calculations of Belt Conveyors, Screw conveyors, Chain & Flight conveyors, Bucket elevators and Pneumatic conveyors.	(08 Hours)
UNIT-V	Mixing and Agitation Types of Impellers; Flow patterns in un-baffled and baffled tanks; Draft tube; Mechanically agitated vessel; Power requirement in mixing;	(08 Hours)

	Performance of mixers; Paste and viscous material mixing; Solid-solid mixing; Batch and continuous mixers; Agitator selection.	
UNIT-VI	Filtration Classification of filtration and filters; Theory of filtration-equations; Filter media and filter aids; Batch and continuous filters; Plate and frame filter press; Filling and washing in a filter press; Horizontal pressure leaf filters; Rotary drum vacuum filters; Fabric filter: Centrifugal filters-basket type.	(08 Hours)
List of Experiments:		
Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.		
1	To determine effectiveness of given set of standard screen.	
2	To determine energy consumption and crushing law constants for jaw crusher.	
3	To determine Critical speed of Ball mill & Average particle size of the product obtained in ball mill.	
4	To determine mixing Index of a mixture in Ribbon Blender. OR To determine mixing Index of mixture in Sigma Mixer.	
5	To determine filter medium resistance and cake resistance by using Vacuum Leaf filter.	
6	To determine filter medium resistance and cake resistance by using Plate & frame Filter Press OR by using centrifuge machine.	
7	To determine area of batch thickener by conducting batch sedimentation test.	
8	To determine separation efficiency by using froth flotation cell.	
9	To determine separation efficiency by using magnetic separator.	
10	To determine efficiency of Cyclone separator.	
Project Base Learning :		
1	What is surface loading rate explain in brief. The flow into clarifier is 3.2 MGD in tank 80 feet long and 40 feet wide. What is surface loading rate?	
2	Research on Recent trends in particle size technology.	
3	Watch the NPTEL video on this subject of any TWO modules and summarize it	
4	Solve numerical problems asked in previous THREE year question papers.	
5	Solve questions asked on filtration in previous THREE year question papers.	
6	If your particles are not spherical which equivalent particle size would be suitable to calculate for the purpose of filtration	
7	What media are used in filters? What factors affect filter efficiency?	
8	How does sedimentation fit in to the waste water treatment process?	
9	What zones are present in sedimentation basin?	
10	How is sedimentation sludge disposed of?	
11	Pilot scale solid-liquid fluidization: Expansion characteristics of solids	
12	Estimate power consumption for homogeneous system	
13	Industry related unit operation (ANY ONE INDUSTRY) detailing of it.	
14	How does filtration fit into the water treatment process?	
15	How Does Filtration clean water?	
16	What types of filters are used for water treatment? Explain in brief	
Text Books/References		
1	McCabe, W. L.; Smith, J. C. and Harriott, P.; Unit Operations of Chemical Engineering, 6 th edition, McGraw Hill Publications.	
2	Coulson, J.M.; Richardson, J. F.; Backhurst, J. R.; Harker, J. H.; Chemical Engineering Volume 2,	

	6 th edition, Pergamon Press.
3	Badger W. L & Banchemo J.T. "Introduction to Chemical Engineering", McGraw Hill
4	Foust A. S "Principles of Unit Operation".
5	George G. Brown, "Unit operations", CBS publishers and distributors.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

MATERIAL SCIENCE AND ENGINEERING

Designation: Professional Core

Pre-requisite Courses: Chemistry, Physics and Biology

Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 4 Hours/Week	End Semester Examination : 60 Marks	Theory : 04
	Internal Assessment : 40 Marks	Total credits : 04
	Total : 100Marks	

Course Outcomes:

After completion of the course students would be able to:

- 1 Appraise material properties to choose appropriate material for desired application
- 2 Compare properties of metals and alloys to select appropriate metal for desired application
- 3 Analyze properties of hydrocarbon materials and recommend proper material for desired application
- 4 Define appropriate ceramic material for required applications
- 5 Assess possibility of material failure by mechanical and chemical failure based upon application and environmental conditions
- 6 Design appropriate preventive measure to avoid material failure

Topics covered

UNIT-I	Introduction Introduction to materials; Bonding between atoms: metallic, ionic, covalent; Van der Waals forces; Role of materials selection in design; Structure-property-processing-performance relationships; Materials and criteria for selection of material in process industries; Material properties: Mechanical, thermal, chemical, electrical, magnetic and technological properties; Modification and control of material properties.	(08 Hours)
UNIT-II	Metal and Their Alloys <i>Ferrous materials:</i> Pure iron, cast iron, mild steel, stainless steels, special alloy steels, iron and iron carbide; Phase diagram: Heat treatment of carbon steels. <i>Nonferrous materials:</i> Lead, tin, aluminium, zinc, nickel, copper, magnesium and their alloys; Properties and applications in process industries.	(08 Hours)
UNIT-III	Hydrocarbon Materials <i>Polymers:</i> Natural and synthetic polymeric materials; Polymer material structure and properties: Deformation, flow and melt characteristics, morphology and order in crystalline polymers, mechanical properties of polymers; Polymer structure and physical properties correlation; Selection of polymeric materials for equipment linings; Fibre reinforced plastic; Application of special polymers like Polyester, Teflon in engineering; Sustainable and biodegradable polymers; Depolymerization; Polymer composites and blends <i>Paints, Coatings and Adhesives:</i> Compositions, properties and applications	(08 Hours)
UNIT-IV	Ceramic, Glasses and Cement Definition of ceramics and glasses; Interaction between structure, processing, and properties; Applications of ceramic and glass materials; Crystalline and	(08 Hours)

	non-crystalline ceramics: Silicates, refractory, clays, glass, vitreous silica and borosilicate. Cement and its properties: Special cements, cement concrete, RCC- Pre stressed concrete.	
UNIT-V	Material Failure Analysis <i>Thermal and mechanical failures:</i> Creep; Stress; Crystal structure and defects: Vacancies, equilibrium concentration of vacancies, interstitial and substitution impurities in solids, dislocations, types and characteristics of dislocations, interfacial defects, stacking faults <i>Chemical failure:</i> Acid base environment, water; Corrosion: Theories of corrosion, corrosion attack methods; Types of corrosion: Chemical, biochemical, and electrochemical; Internal and external factors affecting corrosion of chemical equipments; Corrosion charts for process equipment.	(08 Hours)
UNIT-VI	Material failure prevention Property enhancement by electroplating; Glass and ceramic linings; Polymer lining; Paints; Coatings; Heat treatment techniques; Alloy preparation; Composite and blend formation; Control and prevention of corrosion.	(08 Hours)

Text Books/References:

1	Kodgire V. D.: Material Science and Metallurgy for Engineers, 44 th Ed. Everest publication India, 2018
2	Gowarikar V. R., Vishwanath N. V., Shreedhar J.: Polymer science, New age International publication, India, 1986
3	Budinsky K. G., Budinsky K. M.: Engineering materials- Properties and Selection, 9 th Ed. Prentice Hall of India, 2009.
4	Clauster H. R.: Industrial and Engineering materials, McGraw Hill Book Co. India, 1995
5	Lee J. L. and Evans: Selecting Engineering Materials for Chemical and Process Plants, Business Works, New York, 1974
6	Raghavan V.: Material Science and Engineering, 4 th Ed. PHI Learning Private Limited, India, 2015

Project based learning: Below is the list of possible topics, which is for guidance faculty can design and provide relevant topics in addition to these

1	Study and prepare a presentation of different materials, their bonds, bond energy and their effect on material properties
2	Study and prepare a presentation on factors affecting selection of material for any particular engineering application
3	Investigate and prepare the report on cast iron, composition of cast iron and variation in property and application of cast iron based on its composition
4	Investigate and prepare the report on stainless steel and its types, composition of stainless steel based upon its types and variation in property and application of stainless steel based on its composition
5	Investigate and prepare the report on lead and its alloys, composition of alloys and variation in property and application of alloys based on its composition
6	Investigate and prepare the report on Tin and its alloys, composition of alloys and variation in property and application of alloys based on its composition
7	Investigate and prepare the report on Aluminium and its alloys, composition of alloys and variation in property and application of alloys based on its composition

8	Investigate and prepare the report on Nickel and its alloys, composition of alloys and variation in property and application of alloys based on its composition
9	Investigate and prepare the report on Copper and its alloys, composition of alloys and variation in property and application of alloys based on its composition
10	Investigate and prepare the report on Magnesium and its alloys, composition of alloys and variation in property and application of alloys based on its composition
11	Investigate and prepare the report on properties and benefits of polymer, property tuning based upon monomer and composition variation
12	Investigate and prepare the report on properties and benefits of polymer, property tuning based upon monomer and composition variation
13	Investigate and prepare the report on biodegradable polymers and depolymerization, its importance and environmental impact
14	Investigate and prepare the report on surface coating, its importance, and preparation of surface for the same
15	Investigate and prepare the report on effect of composition variation and processing on the properties and applicability of ceramics
16	Investigate and prepare a report on the causes of material failure (chemical or mechanical) by taking a suitable industrial or real life example

Syllabus for Unit Test:

Unit Test : I	UNIT: I, II, and III
Unit Test : II	UNIT : IV, V, and VI

PYTHON PROGRAMMING

Designation: Computational

Course Pre-requisite: Basic knowledge of computer fundamentals.

Teaching Scheme	Examination Scheme	Credits Allotted
Practical : 04 Hours/Week	Term-work (TW) : 50 Marks	TW/OR/PR : 02
Total : 04 Hours/Week	Practical/Oral : 50 Marks	Total Credits : 02
	Total : 100 Marks	

Course Outcomes

1	Develop algorithm and explain building blocks of algorithms.
2	Elaborate data type and operators.
3	Elucidate concept of control flow statements and functions
4	Elaborate concept of advanced data types
5	Elucidate concept of data structure
6	Elucidate concept of files, modules, packages.

Topics Covered

UNIT-I	<p>ALGORITHMIC PROBLEM SOLVING Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). 1. Programs based on arithmetic operations. 2. Programs based on operators. 3. Programs based on areas of different geometrical figures.</p>
UNIT-II	<p>DATA, EXPRESSIONS, STATEMENTS Python interpreter and interactive mode; Values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments, modules and functions, function definition and use, flow of execution, parameters and arguments. 4. Write a program to exchange the values of two variables. 5. Programs based on data types.</p>
UNIT-III	<p>CONTROL FLOW, FUNCTIONS Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module. 6. Programs based on conditional statements. 7. Programs based on loop statements. 8. Programs based on functions. 9. Programs based on recursion. 10. Programs based on local and global scope.</p>
UNIT-IV	<p>LISTS, TUPLES, DICTIONARIES Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and</p>

	<p>methods; advanced list processing - list comprehension.</p> <p>11. Programs based on list.</p> <p>12. Programs based on tuple.</p> <p>13. Programs based on dictionaries.</p>
UNIT-V	<p>DATA STRUCTURE</p> <p>Lists as arrays. OOPs concepts; linear search, binary search, selection sort, insertion sort, mergesort, histogram.</p> <p>14. Programs based on searching.</p> <p>15. Programs based on sorting.</p> <p>16. Programs based on OOPs concept.</p>
UNIT-VI	<p>FILES, MODULES, PACKAGES</p> <p>Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages. Application to Data Science.</p> <p>17. Programs based on files.</p> <p>18. Programs based on modules.</p> <p>19. Programs based on exception handling.</p>
<p>In addition to these above stated programs/practical's concern faculty member may design his/her own programs / practical's.</p>	
Term Work	
<p>Term work will consist of the programs/practical listed above, out of which any eight programs/practical's are to be performed in laboratory by the students.</p>	
Text Books/References	
1	A. B. Downey, Think Python: How to Think Like a Computer Scientist, 2 nd edition, Updated for Python 3, Shroff/O' Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/).
2	G. Van Rossum, F. L. Drake, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3	C. Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
4	J. V Guttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press , 2013.
5	K. A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
6	P. Gries, J. Campbell, J. Montoyo, Practical Programming: An Introduction to Computer Science using Python 3, 2 nd edition, Pragmatic Programmers,LLC,2013.
7	R. Sedgewick, K. Wayne, R. Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

VOCATIONAL COURSE – I: ANALYTICAL TECHNIQUES

Designation: Basic Science

Course Pre-requisites: Basic Chemistry

Teaching Scheme	Examination Scheme	Credits Allotted
Practical : 04 Hours/Week	Term-work (TW) : 25 Marks	TW/OR/PR : 02
Total : 04 Hours/Week	Practical/Oral : 25 Marks	Total Credits : 02
	Total : 50 Marks	

Course Outcomes

After completion of the course students will be able to

1. Analyse the samples using HPLC and define its content and concentration
2. Analyse the samples using GC and define its content and concentration
3. Analyse the samples using UV and FTIR, and define its content and concentration
4. Analyse the samples for carbon, fluoride ion content and define its flow properties
5. Analyse water and fuel samples for properties and composition
6. Analyse the samples for surface properties and particle size

Topics Covered

Analytical Method - I	High Precision Liquid Chromatography Analysis principle; Criteria of selection; Preparation of samples; Selection of eluent and detector; Selection of elution conditions; Standardization and calibration; Sample analysis: Qualitative and quantitative results	(08 Hours)
Analytical Method - II	Gas Chromatography Analysis principle; Criteria of selection; Preparation of samples; Selection of eluent and detector; Temperature programming; Elution conditions; Standardization and calibration; Sample analysis: Qualitative and quantitative results	(08 Hours)
Analytical Method - III	Spectrographic analysis Analysis principle and limitations of spectroscopic analysis UV-vis spectrophotometry: Beer-Lambert's law; Preparation of samples; Dilutions; Standardization and calibration; Sample analysis: Qualitative and quantitative assessment Fourier Transfer Infrared Spectroscopy: Preparation of samples; KBr pellet formation; Film analysis; Powder analysis; Interpretation of data: Sample analysis	(08 Hours)
Analytical Method - IV	Carbon and Fluoride Ion analysis Selection of methods for analysis; Preparation of samples; Standardization; Analysis and interpretation Viscometry analysis Redwood and plate and cone type viscometers: Measurement principle; Sample Analysis;	(08 Hours)
Analytical Method-	Fuel Analysis: Bomb calorimetry; Flash point analysis; Fire point analysis; Coal analysis: Ultimate and proximate analysis; Moisture content measurement	(08 Hours)

V	by Karl Fisher titration: Standardization and data analysis. Water Analysis: Concept of Biological oxygen demand (BOD), Chemical oxygen demand (COD), Total Organic Carbon (TOC) and heavy metal content analysis; Sample analysis	
Analytical Method - VI	Surface and particle analysis: <i>Particle size analysis:</i> Principle; Preparation of solution or dispersion; Sample analysis <i>Atomic forced microscopic analysis:</i> Principle; AFM analysis.	(08 Hours)
The analytical methods and their applications would be defined along with background information, principal and application determination, limitation and applications		
Text Books/ References:		
1	I. M. Kolthoff, J. D. Winefordner, M. M. Bursey: Treatise on Analytical Chemistry, Part 1 Vol. 11: Theory and Practice, 2 nd Ed., Wiley and Sons, New York, 1989	
2	J. A. C. Broekaert: Analytical Atomic Spectrometry withFlames and Plasmas, Wiley-VCH Verlag GmbH & Co. KGaA, New York, 2002	
3	G. D. Christian, P. K. Dasgupta, K. A. Schug: Analytical Chemistry, John Wiley & Sons, Inc., Danvers, 2014	
4	D. Harvey: Modern Analytical Chemistry, McGraw-Hill Higher Education, Kingsport, 2000	
5	J. Mendham, A. Vogel: Vogel's Textbook of Quantitative Chemical Analysis, 6 th Ed., Addison Wesley Publishing Co., Boston, 2000	

Programme: B. Tech Chemical (2021)

Sem: IV (Chemical)

NUMERICAL METHODS FOR CHEMICAL ENGINEERING		
Designation: Professional Core		
Pre-requisites courses: Basic knowledge of mathematics including derivative, integration etc.		
Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 04 Hours/Week	End Semester Examination : 60 Marks	Theory : 04
Total : 04 Hours/Week	Internal Assessment : 40 Marks	Total Credits : 04
	Total : 100 Marks	
Course Outcomes		
After completion of the course students will be able to		
1	Estimate the true percent relative error for given problem	
2	Compute the roots of the equation using bracketing methods and open methods	
3	Solve Chemical Engineering problems using regression analysis	
4	Solve Chemical Engineering problems using numerical differentiation methods	
5	Evaluate the integral value using Trapezoidal rule, Simpson's 1/3 rd rule, Simpson's 3/8 th rule, and Romberg integration	
6	Apply finite difference methods to solve boundary value problems	
Topics covered		
UNIT-I	Approximations and Error Analysis Approximations; Significant figures; Accuracy and precision; Error definitions; Round off error; Truncation error; True percent relative error; Prespecified percent tolerance; Total numerical error; Error propagation; Error analysis of numerical differentiation; Root mean square error; Mean square error; Analysis of variance.	(08Hours)
UNIT-II	Engineering Applications: Roots of equations Bracketing methods: Bisection method, False position method; Open methods: Secant method, Newton-Rapson method, Modified Newton-Rapson method; Roots of Polynomials: Mueller's method, Bairstow's method, Picard's method; Solve Chemical Engineering problems using above methods.	(08 Hours)
UNIT-III	Regression analysis and Interpolation Regression analysis: Linear regression, Least square regression, Logistic regression, Polynomial regression, Nonlinear Regression, Curve fitting, Regression Vs Classification. Interpolation: Direct Method, Lagrange interpolating polynomials, Newton's Divided-Difference interpolating polynomials, Sterling's interpolation, Inverse	(08 Hours)

	interpolation, Approximation of functions. Solve Chemical Engineering problems using above methods.	
UNIT-IV	Engineering Applications: Differential Equations Problems based on Process Calculation, Fluid Flow operation and Heat Transfer to be solved using following methods: Euler's method, Modified Euler's method, 2 nd order Runge-Kutta Method, 4 th order Runge-Kutta method; Picard's method of successive approximations; Taylor series method; Milne's predictor-corrector method; Richardson Extrapolation; Ordinary Differential Equation: Boundary Value Problems.	(08 Hours)
UNIT-V	Numerical Integration Solve Chemical Engineering problems using Newton- Cotes integration, Trapezoidal rule, Simpson's 1/3 rd rule, Simpson's 3/8 th rule, Romberg integration; Cauchy integral formula; Multiple application of Simpson's 1/3 rd , 3/8 th rule, Trapezoidal rule.	(08 Hours)
UNIT-VI	Finite Difference Methods Introduction to finite difference method; Boundary value problems of exact differential equations up to second order; Hyperbolic equations; Finite difference approximations to derivatives; Elliptical Equation; Control Volume Approach; Heat Conduction Equation. Problems based on Process Calculation, Fluid Flow operation and Heat Transfer to be solved using these methods.	(08 Hours)
Assignments		
There will be six (6) assignments from various units mentioned in the syllabus. Each assignment will carry 10 marks.		
1.	Estimate the error and do the error analysis for any chemical Engineering based problem	
2.	Find the roots of equations for the problems based on Fluid Mechanics, Heat Transfer	
3.	Solve the equations from Heat Transfer, Fluid Mechanics, and Particulate Technology using numerical differentiation methods	
4.	Estimate the integral value for the problems based on Heat Transfer, Fluid Mechanics, Chemical Engineering Thermodynamics, and Particulate Technology etc.	
5.	Solve Chemical Engineering problems using regression analysis	
6.	Solve the boundary value problems using finite difference methods	
7.	Solve old (last five years) question papers with reference to particular topic	
8.	Solve old (last five years) GATE paper questions of Numerical Methods for Chemical Engineering subject	
9.	With suitable case study explain in detail how this subject is prerequisite for Process Modeling of chemical processes	
10.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts for industrial practice	

Project Based Learning	
Students in a group of 3 to 4 shall complete any one project from the below list	
1.	Estimate the roots of polymeric equations for fluid flow operations, equations such as buoyancy of any ball, liquid level in manometer etc.
2.	Apply numerical differentiation techniques to solve the case studies of process heat transfer.
3.	Evaluate the integral value/area under the curve for given equations related to any unit operation/process.
4.	Apply finite difference method for boundary value problems of exact differential equations up to second order for specific chemical engineering system.
5.	Collect experimental data from open source literature and do the regression analysis.
6.	Apply Sterling's interpolation formula for the given experimental data and calculate the desired results.
7.	Analyze the given experimental data and apply the curve fitting techniques.
8.	Collect experimental data from open source literature, apply regression analysis for prediction and calculate root mean square error (RMSE).
9.	Using Euler's method solve the case study related to transient heat conduction.
10.	Apply the bracketing methods to find the root of equations of fluid flow systems.
Text Books/References	
1	S. C. Chapra and R.P. Canale, Numerical Methods for Engineers, 6 th Ed., Tata-McGraw Hill Publications, 2015.
2	T. F. Edgar and D. M. Himmblblau, Optimization of Chemical Processes, 2 nd Ed., Tata-McGraw Hill Publications, 2001.
3	M. K. Jain, S. R .K. Iyengar and R. K. Jain, Numerical methods for Scientific and Engineering Computational, 5 th Ed., New Age International (P) Publishers, 2005.
4	S. S. Sastri , Introductory methods of Numerical analysis, 4 th Ed., Prentice-Hall India, 2009.
5	S. Pushpavanam, Mathematical Methods for Chemical Engineering, 1 st Ed., Prentice-Hall of India, 2012.
6	E. Balagurusamy, Numerical Methods, McGraw Hill Education (India) Private Limited, 2008.
Syllabus for Unit Tests	
Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

CHEMICAL ENGINEERING THERMODYNAMICS II

Designation: Professional Core

Pre-requisite Courses: Basic knowledge of chemistry, physics and mathematics, Chemical engineering thermodynamics, Material and energy balance calculations

Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 04Hours/Week	End Semester Examination : 60 Marks	Theory : 04
Tutorial : 01Hours/Week	Internal Assessment : 40 Marks	Tutorial : 01
Total : 05 Hours/Week	Total : 100 Marks	Total Credits : 05

Course Outcomes

1	Characterize ideality of gaseous mixtures and liquid solutions.
2	Estimate fugacity coefficient to measure the deviation from ideality.
3	Estimate activity coefficient to measure the deviation from ideality.
4	Analyze vapor liquid equilibrium using thermodynamic stability and consistency tests.
5	Estimate partition coefficient for liquid liquid equilibrium and solid liquid equilibrium.
6	Estimate chemical reaction constant and composition of system at thermodynamic equilibrium.

Topics Covered

UNIT-I	Thermodynamics of Ideal Solution Fundamental property relationships for solutions; Concept of chemical potential and partial molar properties; Estimation of partial molar properties; Gibbs-Duhem equation; Ideal gas mixtures: Gibbs theorem; Ideal solution: Characteristics of ideal solution, Lewis Randall law.	(08 Hours)
UNIT-II	Thermodynamics of Non-ideal Gas Mixtures Concept of non-ideality in gaseous mixtures; Fugacity and fugacity coefficient for non-ideal gas mixtures; Effect of temperature and pressure on fugacity coefficient; Estimation of fugacity coefficient; Concept of residual property; Relation between residual property and fugacity coefficient.	(08 Hours)
UNIT-III	Thermodynamics of Non-ideal Liquid Solution Concept of non-ideality in liquid solution; Activity and activity coefficient for non-ideal solution; Effect of temperature and pressure on activity coefficient; Estimation of activity coefficient; Excess properties: Gibbs excess energy; Relation between excess property and activity coefficient; Excess properties of mixing and heat effects.	(08 Hours)
UNIT-IV	Vapor-liquid equilibrium (VLE): Criteria of vapour liquid equilibria and stability; Basic equation for vapor-liquid equilibrium(Raoult'slaw); Qualitative behavior of VLE; Non-ideality in vapour and liquid phases (Modified Raoult's law); Estimation of liquid phase properties from VLE data; Excess Gibbs free energy models; Azeotropic data; Multicomponent VLE; Bubble point and dew point calculations;	(08 Hours)

	Thermodynamic consistency test for VLE data.	
UNIT-V	Liquid-liquid Equilibria (LLE) and Solid-liquid Equilibria (SLE): Equilibrium and stability; LLE: Basic equation governing LLE, Distribution coefficient (Partition Coefficient), solubility diagram, Intermolecular interactions; SLE: Basic equation governing SLE, Solid liquid equilibrium models and estimation of design parameters.	(08 Hours)
UNIT-VI	Chemical reaction equilibria The reaction coordinate; Application of equilibrium criteria to chemical reactions; The standard Gibbs energy change and the equilibrium constant; Effect of temperature on the equilibrium constant; Evaluation of equilibrium constant; Relation of equilibrium constants to composition; Phase rule for reacting systems; Multi-reaction equilibria.	(08 Hours)

Project Based Learning

1. Group discussions on any of the following topics:
2. Importance of Phase equilibria in chemical industries.
3. Solving numerical in connection with phase equilibria
4. Solving numerical based on application of Rault's law for the calculation of dew point and bubble point
5. Unsolved numerical from the reference books on various topics studied.
6. Draw P-xy and T-xy diagrams.
7. Solving numerical based on chemical reaction equilibrium.
8. Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments.
9. Students have to study any five NPTEL videos related to Chemical Engineering Thermodynamics I and prepare/present power point presentation.
10. Solving numerical in connection with the solution thermodynamics
 - a) Questions involving fugacity and activity for the species in solution.
 - b) Thermodynamic properties for pure species and species in solution
11. Preparation of a brief report on applicability of liquid-liquid equilibrium (LLE) in chemical engineering systems.
12. Solve question papers of CET II of previous THREE years.

Text Books/References

- 1 J. M. Smith and H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics", McGraw- Hill Publication
- 2 T. E. Daubert, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
- 3 K.V. Narayanan, "Chemical Engineering Thermodynamics", PHI Learning Pvt. Ltd.
- 4 B. F. Dodge, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
- 5 M. D. Koretsky, "Engineering and Chemical Thermodynamics", 2nd Edition, John Wiley & Sons
- 6 S. I. Sandler, "Chemical Engineering Thermodynamics", McGraw- Hill Publication

7	S. Glasstone, "Thermodynamics for Chemists", Affiliated East West Press Pvt.Ltd.	
Syllabus for Unit Tests		
Unit Test I	Units I, II, and III	
Unit Test II	Units IV, V, and VI	

DESIGN OF HEAT TRANSFER EQUIPMENT

Designation: Professional Core

Pre-requisite Courses: Basic knowledge of Heat transfer, Particulate technology, Chemical engineering thermodynamics, Material and energy balance calculations

Teaching Scheme	Examination Scheme	Credits Allotted
Lectures : 03 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 04 Hours/Week	Internal Assessment : 40 Marks	TW/OR/PR : 02
Total : 07 Hours/Week	Term-work (TW) : 25 Marks	Total Credits : 05
	Practical/Oral : 25 Marks	
	Total : 150 Marks	

Course Outcomes

1	Design of double pipe heat exchanger
2	Perform process design of shell and tube heat
3	Perform the evaporation calculations and estimate heat transfer area of evaporator.
4	Analyse heat transfer characteristics of mechanically agitated contactors
5	Analyse heat transfer characteristics of fluidised beds
6	Analyse the heat transfer characteristics of furnaces

Topics Covered

UNIT-I	Double pipe heat exchanger(DPHE) Selection criteria of DPHE, Heat load calculations; Estimation of physical properties of fluid if any; Material of construction (MOC); Selection of flow arrangements; LMTD calculations; Estimation of film heat transfer coefficient using appropriate empirical correlation; Estimation of overall heat transfer coefficient; Heat transfer area; Concept of hydraulic diameter; Pressure drop calculations: Design and working pressure.	(08Hours)
UNIT-II	Shell and tube heat exchangers Shell and tube configurations; Heat load calculations; Material of construction (MOC); Estimation of film heat transfer coefficient; Estimation of overall heat transfer coefficient; Heat transfer area and number of tubes; Sizing of shell and tube heat exchanger: Design of baffle, tie rods, tube sheet and nozzles; Pressure drop calculations: Design and working pressure; TEMA standards.	(08 Hours)
UNIT-III	Evaporators Concept of evaporation; Types of evaporators; Performance parameters of evaporators: capacity, economy and steam consumption; Methods of feeding for evaporators; Material and energy balances; Sizing of evaporators; Design	(08 Hours)

	of steam chest: Estimation of heat transfer coefficient and area, boiling point elevation; Factors affecting performance of evaporators; Pressure drop calculations: Design and working pressure.	
UNIT-IV	Mechanically agitated contactors (MAC) Heat transfer configurations of MAC; Heat load calculations; Heat transfer calculations for homogeneous and heterogeneous systems: Estimation of film heat transfer coefficient, overall heat transfer coefficient and heat transfer area; Sizing of MAC; Material of construction (MOC); Factors affecting heat transfer characteristics: system and operating parameters; Indian MAC standards.	(08 Hours)
UNIT-V	Fluidised beds Concept of fluidization; Fluidization regimes; Pressure drop calculations: Effect of superficial velocity and physical properties of solid and fluidising medium; Velocity voidage relationship; Determination of heat transfer rates: Overall heat transfer coefficient calculations; Sizing of fluidised beds based on heat transfer characteristics;	(08 Hours)
UNIT-VI	Furnaces Components of a furnace; Classification, Performance measures in furnaces: Excess air, heat distribution, temperature control, draft control, waste heat recovery; Heat transfer in furnace. Furnace efficiency calculations. Lobo and Evans method. Wohlenberg simplified method.	(08 Hours)

Project Based Learning:

1	Visit to any heat transfer equipment fabrication industry and prepare report on internals of heat exchanger.
2	Perform process design for heat exchanger for given application
3	Visit to sugar industry to observe operation of evaporators and prepare report.
4	Enlist TEMA Standards.
5	Make Power point presentation on recent advances in heat transfer characteristics of any one chemical process equipment
6	Write report on heat transfer aspect and any one multiphase reactor based on recent advances.
7	Design experimental methodology to estimate time needed to heat a given fluid to design temperature with a given heat resource.
8	Designed any one heat transfer equipment on laboratory scale and demonstrate its working.
9	Propose suitable heat exchanger for given operation/ process based rational reasoning.
10	Enlist empirical correlations to estimate HTC in heat exchanger and report applicability.
11	Enlist empirical correlations to estimate HTC in mechanically agitator vessel.
12	Demonstrate effect and specific heat of fluid time needed to raise desired temperature by experimental methodology
13	Enlist possible ways to enhance HTC in a given heat exchange system.

Term Work	
Term work will consist of the experiments listed below, which are to be performed in laboratory by the students	
1	To study temperature distribution and overall heat transfer coefficient, in parallel flow finned tube heat exchanger.
2	To study effectiveness and heat transfer rates in counter flow finned tube heat exchanger.
3	To study temperature distribution, effectiveness, overall heat transfer coefficient, heat transfer rates in double pipe heat exchanger.
4	To study Wilson plot in double pipe heat exchanger.
5	To determine overall heat transfer coefficient, effectiveness for shell and tube heat exchanger.
6	To determine number of tubes, pressure drop for shell and tube heat exchanger.
7	Calculation of heat transfer coefficient, rate of heat flow and effectiveness in Double pipe heat exchanger.
8	Detailed flow arrangements, design and drawing of double pipe heat exchanger
9	Detailed design and drawing of shell and tube heat exchanger
10	Detailed design and drawing of evaporator.
11	Calculation of heat transfer coefficient, No of tubes and rate of heat flow in shell and tube heat exchanger
12	Detailed design and drawing of agitated vessel.
Text Books/References	
1	Holman, J.P., "Heat Tansfer", 9th edn. The McGraw-Hill Companies, 2008
2	Dutta B. K., "Heat Transfer: Principles and Applications", PHI, 2001
3	Kern D. Q., "Process Heat Transfer", Tata McGraw-Hill Edition, 1997
4	McCabe, W. L., Smith, J. C., and Harriott, P., "Unit Operations of Chemical Engineering", McGraw-Hill, 6th. Ed., 2001
	Richardson, J. F., and J. M. Coulson: "Chemical Engineering," Butterworth Heinemann, Volume 6.
5	Chapman, A.J. "Heat Transfer", 4th edn. Maxwell Macmillan International Edition, 1984.
6	George E.Totten and M.A.H.Howes: Steel heat treatment handbook
7	P.Mullinger and B. Jenkins: Industrial and process furnaces
Syllabus for Unit Tests	
Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

CHEMICAL TECHNOLOGY

Designation: Professional Core

Pre-requisite Courses: Basic knowledge of chemistry

Teaching Scheme		Examination Scheme		Credits Allotted	
Lectures	: 03 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 03
Practical	: 04 Hours/Week	Internal Assessment	: 40 Marks	TW/OR/PR	: 02
Total	: 07 Hours/Week	Term-work (TW)	: 25 Marks	Total Credits	: 05
		Practical/Oral	: 25 Marks		
		Total	: 150 Marks		

Course Outcomes

- 1 | Learn the concept of unit operations and unit processes.
- 2 | Analyze recent methods used in chloro alkali and electrolytic industries.
- 3 | Learn the manufacturing processes used in sulfur and nitrogen industry
- 4 | Learn the recent techniques used in oil industry.
- 5 | Analyze the various processes used in Sugar-Starch industry and fermentation industry.
- 6 | Learn the production methods used in petrochemical industry .

Topics Covered

UNIT-I	<p>Unit operations and Unit processes Unit operations and unit processes; Concept of block diagram; Process flow diagram (ASME guidelines); Major engineering problems; Schematic representation and applications for unit operations and unit processes. Chlor-alkali industry, sea chemicals i) Chlor-alkali industry: Recent processes for the production of soda ash, NaOH and Chlorine ii) Sea chemicals: Sodium-Magnesium compounds, methods for salt recovery</p>	(06 Hours)
UNIT-II	<p>Nitro- Phosphorous Industry and Sulphur Industry i) Nitrogen Industry: Recent processes for the production of Ammonia, Nitric acid, Urea, Ammonium Nitrate ii) Phosphorous Industry: Production of Phosphoric acid, single and triple Super Phosphate, Ammonium Phosphate iii) Sulphur Industry: Production of Sulphur, Sulphuric acid, Ammonium sulphate.</p>	(06 Hours)
UNIT-III	<p>Oils, Fats, Soaps and Detergents Extraction of oil from seeds, Oil purification, Hydrogenation of oil. Solvent extraction process; Biodiesel production Production of soap, natural glycerine, production of detergents.</p>	(06 Hours)
UNIT-IV	<p>Sugar-Starch Industry and Fermentation industry i) Sugar-Starch Industry: Production of Sugar, Starch Derivatives ii) Fermentation Industry: production of ethyl alcohol, citric acid and antibiotics.</p>	(06 Hours)
UNIT-V	<p>Natural products Terpenes, alkaloids, plant pigments, their applications, Methods for extraction, isolation, molecular separation and purification of biomolecules from natural sources.</p>	(06 Hours)

UNIT- VI	Petrochemical Industry i) C1 Compounds: Production of methanol, formaldehyde, and halogenated hydrocarbons. ii) C2 Compounds: Production of ethylene and acetylene- steam cracking of hydrocarbons, ethylene dichloride, vinyl chloride. iii) C3 Compounds: Production of propylene by indirect hydration, acetone, cumene. iv) Aromatic Compounds: Production of phenol, phthalic anhydride, and styrene.	(06 Hours)
*Project Based Learning		
1	Development of working model of belt conveyor	
2	Development of working model of bucket elevator	
3	Prepare prototype of effluent treatment plant with different units like clarifier, bioreactor , pressure sand filter etc. (Activated sludge process: prototype working model)	
4	Prepare prototype of any chemical process industry representing the all the unit operations	
5	Prepare prototype of any chemical process industry representing the all the unit processes	
6	Analyze Safety aspects in Chemical Process industry	
7	Prepare working model of cooling tower	
8	Prepare prototype of distillation column using packed column/rasching rings	
9	Prepare prototype of dryer tray dryer or rotary dryer	
10	Analyze Personal protective equipment used in chemical industry	
*Students in a group of 3 to 4 shall complete any one project from the above list.		
Term Work		
Term work will consist of the experiments listed below, which are to be performed in laboratory by the students.		
1	Determination of saponification value of oil sample.	
2	Application of pH meter to find acidity and alkalinity of a solution.	
3	To study the hydrolysis of cane sugar solution in the presence of an acid by Fehling's solution method and find out the reaction constant.	
4	Determination of the strength of unknown hydrochloric acid by titrating it against caustic soda by conductometric method.	
5	Preparation of laundry soap and to determine its yield.	
6	Analysis of acid oils and soap stocks.	
7	Analysis of Glycerine (sweet water).	
8	Analysis of detergent powders.	
9	Preparation of report on industrial visit.	
Text Books/References		
1	C.E.Dryden, Outlines of Chemical Technology" (Edited and Revised by M.GopalRao and Sittig .M) 3 rd Ed., East West Press. , New Delhi, 1997.	
2	G.T.Austin, Shreve's Chemical Process Industries, 5 th Ed., McGraw Hill Education publisher, 2017	
3	P.H.Groggins, Unit process in organic synthesis, 5 th Ed.Tata McGraw-Hill Edition, 2004.	
4	W.L.Faith, D.B. Keyes, R.L. Clark, Industrial Chemicals, John Wiley, 1975.	
5	Kirk and Othmer, Encyclopaedia of Chemical Technology, Wiley, 2005	
6	G.N.Pandey and S.D.Shukla, Chemical Technology Vol – I,Vikas publication, 2004	
Syllabus for Unit Tests		
Unit Test I	Units I, II, and III	
Unit Test II	Units IV, V, and VI	

INDUSTRIAL POLLUTION AND ABATEMENT		
Designation: Professional Core		
Course Pre-requisites:		
Before studying this subject the student should have knowledge of		
1.	Basic fundamentals included in environmental sciences.	
2.	Fundamentals of unit operation.	
Teaching Scheme		
Examination Scheme		
Credits allotted		
Lectures: 04Hours/Week	End Semester Examination : 60 Marks	Theory: 04
Practical: 02Hours/Week	Internal Assessment : 40 Marks	TW/PR/OR: 01
Total : 06 Hours/Week	Term-work (TW) : 25 Marks	Total Credits 05
	Practical/Oral : 25 Marks	
	Total : 150 Marks	
Course Outcomes:		
1.	Identify and demonstrate the characterization of wastewater with statutory limits for disposal.	
2.	To analyze the important parameters of the wastewater such as BOD, COD, DO, etc.	
3.	Demonstrate the various physical unit operations used in the treatment.	
4.	Define the various treatment methods available for wastewater and solid waste.	
5.	Demonstrate the effect of various air pollutants on man and environment.	
6.	Demonstrate the operations of various air pollution control equipments.	
Topics covered		
UNIT - I	Introduction Overview of pollution aspects in Chemical Process Industries (CPI); Types of pollution; Introduction to all prevailing international standards of Health, Safety, and Environment; Environmental laws and regulations; ISO 14000+; Environmental legislation; Air pollution control act; Indian standards for disposal of industrial effluents; Environmental impact assessment; Life cycle assessment.	(08 Hours)
UNIT -II	Air pollution Air pollutants: sources, classification of air pollutants, air quality, air pollution minimisation and control, source and control of fugitive emissions, Effects of air pollutants, Measurement of air pollutants; Air pollution control: Particulate emission control by mechanical separation and electrostatic precipitation, wet gas scrubbing, gaseous emission control by absorption and adsorption, Design of cyclones, ESP, fabric filters and absorbers.	(08 Hours)
UNIT - III	Water pollution and its control Groundwater and surface water pollution: types, sources and effects of water pollutants; Physical treatment: solids removal by setting and sedimentation, filtration centrifugation, coagulation and flocculation; Biological Treatment: Anaerobic and aerobic treatment, biochemical kinetics, trickling filter, activated sludge and lagoons, aeration systems, sludge separation and drying; Assessment of water quality through the measurement of: Dissolved oxygen, biological oxygen demand and chemical oxygen demand.	(08 Hours)
UNIT IV	Advanced treatment methods Advanced oxidation processes viz. Ozonation, Fenton's and photo-Fenton process, electrochemical process, photocatalysis, ultrasound and hydrodynamic cavitation etc. for the treatment of recalcitrant organics and inorganics/metals;	(08 Hours)

	Hybrid treatment processes; recent advanced in treatment methods.	
UNIT- V	Solid waste management Analysis and quantification of hazardous and non-hazardous wastes; Treatment and disposal of solid wastes; Land filling; Leachate treatment; briquetting / gasification and Incineration.	(08 Hours)
UNIT - VI	Industrial case studies Concept of zero discharge system; Application of advanced treatment methods for water reclamation and reuse; Study of minimum two case studies for treatment of industrial waste: pesticide industry, textile industry, pharmaceutical industry etc.	(08 Hours)
Expert Interaction	Lecture(s) by eminent scholar(s) on the topic(s) mentioned in the syllabus.	(02 Hours)
Project based learning		
1	Visit to any waste water treatment plant and specify the advanced in the treatment methods	
2	Conduct the survey of air quality in Pune city	
3	Write a report on concept of zero discharge and its significance	
4	Enlist Indian standards for disposal of industrial effluents.	
5	Prepare power point presentation on recent advances in waste water treatment	
6	Group discussion on health hazards of air and water pollution.	
7	Design a novel method for effective solid waste management.	
8	Demonstrate the applications of biological processes in waste water treatment.	
9	Design the activated sludge process for any particular industrial effluent.	
10	Enlist the characteristics of industrial effluent.	
11	Prepare the report on primary, secondary and tertiary treatment methods used in industries	
12	Visit a pesticide manufacturing industry and prepare a case study for treatment of pesticide industry effluent	
13	Prepare a technical report on the effective treatment of pharmaceutical waste.	
14	Visit to nearby municipal water treatment plant.	
List of Practical:		
1.	Determination of pH, color, and turbidity of a given waste water sample.	
2.	Inorganic characterization of waste water sample.	
3.	Measurement of D. O. of waste water sample.	
4.	Measurement of C. O. D. of waste water sample.	
5.	Estimation of B. O. D. of waste water sample.	
6.	Study of flocculation technique for a given waste water sample.	
7.	Study of froth flotation technique for a given waste water sample.	
8.	Study of sedimentation method for the treatment of waste water.	
9.	Characterization of dairy waste- A report.	
10	Characterization of domestic sewage - A report.	
Text Books/References:		
1.	Theodore L &Bhomlore A.J. "Air Pollution Control Equipments."	
2.	Coulson J. M. Richerdson J.F. Vol.6.Tata McGraw-Hill.	

3.	Rao M.N. & H.V.N. Rao. "Air Pollution McGraw-Hill.
4.	S.P. Mahajan "Pollution Controls in process industries." Tata McGraw-Hill.
5.	C.S.Rao, "Environmental Pollution control Engg." Willey Estern Ltd.
6.	Noel de Nevers, "Air Pollution control Engg." McGraw-Hill, Inc, Publication.
Syllabus for Unit Test:	
Unit Test I	Units I, II, and III
Unit Test II	Units IV, V, and VI

MATLAB PROGRAMMING

Designation: Professional Core

Pre-requisite Courses: Computer fundamentals

Teaching Scheme	Examination Scheme	Credits Allotted
Practical : 04 Hours/Week	TW : 50 Marks	TW/OR/PR : 02
	Practical/Oral : 50 Marks	Total Credits : 02
	Total : 100 Marks	

Course Outcomes:

After completion of the course students would be able to:

- 1 | Develop a basic programme applying MATLAB syntax.
- 2 | Design programs involving matrix and publish report.
- 3 | Develop programs involving loops.
- 4 | Apply MATLAB to solve mathematical problems.
- 5 | Design a program to evaluate Thermodynamics, Process calculation problems.
- 6 | Design a program to evaluate Heat transfer and Fluid flow problems.

Topics Covered

UNIT-I	<p>Getting started with MATLAB Features of MATLAB window: Command window, current directory pane, workspace, command history window, figure window, editor window, data type, file type; Performing operations: Arithmetic operators, create arrays and vectors, working with arrays of number; File creation: creating, saving and executing a script file and function file. Creating and printing simple plots. 1. Programs based on Fundamentals in MATLAB Programming.</p>
UNIT-II	<p>Creating files Programs using Arrays and Matrices; working with anonymous function; symbolic computation; importing and exporting data; publishing reports. 2. Programs based on Matrix calculations. 3. Programs based on function creation and evaluation. 4. Programs based on publishing report.</p>
UNIT-III	<p>Programming Creating a script file; creating function file; programs using while, if and for loop. 5. Programs for script and function file. 6. Programs based on loops. 7. Combined program of script file with function and loops.</p>
UNIT-IV	<p>Applications to Numerical Methods Programs to solve linear and Nonlinear equations; Curve fitting and interpolation; Numerical Integration; Partial and Ordinary differential equation. 8. Program to solve set of linear equations. 9. Program to solve set of non- linear equations. 10. Program based on curve fitting and interpolation. 11. Program based on partial/ ordinary differential equations.</p>
UNIT-V	<p>Application to Chemical Engineering Applications of MATLAB to solve Thermodynamics, physical property estimation and process calculation problems. 12. Vapor pressure estimation of a given component. 13. Estimating bubble point/dew point for a given mixture.</p>

	14. Estimating physical properties of components like humidity, density, viscosity etc.
UNIT-VI	Application to Chemical Engineering Applications of MATLAB to solve Heat Transfer and Fluid Mechanics problems. 15. Program based on flow in horizontal pipe (average velocity calculation). 16. Program for estimating pipe diameter/ power requirement. 17. Program for estimating LMTD 18. Estimating heat transfer coefficient for shell and tube heat exchanger.
In addition to these above stated programs/practical's concern faculty member may design his/her own programs / practical's.	
Term Work	
Term work will consist of the programs/practical listed above, out of which any eight programs/practical's are to be performed in laboratory by the students.	
Text Books/References:	
1	Yeong K. Y. , Chemical Engineering Computation with MATLAB, Taylor and Francis Group, CRC Press, Newyork, 2017.
2	Rudra P., Getting Started with MATLAB: A quick introduction for scientist and engineers, Oxford University Press. Reprint India 2011.
3	Gilat A., MATLAB –An introduction with Application, Wiley, India 2012.
4	Jain S. and Kaphse S., Modeling and Simulation using MATLAB Wiley, India 2016.

VOCATIONAL COURSE II: INDUSTRIAL HEATING SYSTEMS

Designation: Skill Development

Pre-requisite Courses: Chemical Engineering Thermodynamics, Heat Transfer, Particulate technology

Teaching Scheme	Examination Scheme	Credits Allotted
Practical : 04 Hours/Week	Term-work (TW) : 25 Marks	TW/OR/PR : 02
Total : 04 Hours/Week	Practical/Oral : 25 Marks	Total Credits : 02
	Total : 50 Marks	

Term Work

Term work will consist of the practicals based on the following topics. Any ten practicals are to be performed in laboratory by the students.

Topics Covered

1	Liquid Fired Thermic Fluid Heaters Design principle, selection and characterization of liquid fuel and thermic fluid, Efficiency of system, Control system for thermic fluid heaters, Operation and maintenance of liquid fired thermic fluid heaters.
2	Solid Fired Thermic Fluid Heaters Design principle, selection and characterization of solid fuel and thermic fluid, Efficiency of system, Control system for solid thermic fluid heaters, Operation and maintenance of solid fired thermic fluid heaters.
3	Boiler (Fire-Tube Boiler) Design principle, Construction and working principle, Types of fire tube boilers, Selection criteria, Operation and maintenance of fire tube boilers,
4	Boiler (Water-Tube Boiler) Design principle, Construction and working principle, Types of water tube boilers, Selection criteria, Operation and maintenance of water tube boilers
5	Furnaces Design principle, Classification and types of furnaces, Construction and working principle, Heating distribution within furnace, selection criteria for furnace. Operation and troubleshooting of furnaces.
6	Selection of Heating System for Industrial Purpose Selection criteria and factors to be considered, Characteristics of a good heating system, Risk barriers and uncertainty, Case studies.

Text Books/References

1	Y. V. Deshmukh, "Industrial Heating, Principles, Techniques, Materials, Applications, and Design", 1st edition, CRC Press 2005
2	H. Pfeifer, "Handbook of Heat Processing: Fundamentals - Calculations – Processes" 2nd edition, Vulkan-Verlag(2016)
3	J. G. Wüning, A.Milani, "Handbook of Burner Technology for Industrial Furnaces: Fundamentals - Burner – Applications" 2nd Edition, Vulkan-Verlag(2015)

Bharati Vidyapeeth (Deemed To Be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Civil) –CBCS 2021 Course

Program: B. Tech. Civil

Sem: I

CBCS2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1.		Differential Calculus	4	-	1	60	40	-	-	-	100	4	-	1	5
2.		Acoustics and Modern Physics	3	2	-	60	40	25	-	-	125	3	1	-	4
3.		Construction and Materials	4	2	-	60	40	-	50	-	150	4	1	-	5
4.		Civil Engineering Structures and Geology	4	2	-	60	40	-	-	50	150	4	1	--	5
5.		Introduction and Opportunities in Civil Engineering	3	-	-	60	40	-	-	-	100	3	-	--	3
6.		Graphics for Civil Engineers	-	2	-	--	--	-	50	-	50	-	1	--	1
7.		Workshop Technology	-	2	-	--	--	50	-	-	50	-	1	--	1
8.		Fundamentals of Problem Solving Logic (Using C)	-	2	-	--	--	25	-	-	25	-	1	--	1
		Total	18	12	1	300	200	100	100	50	750	18	6	1	25

Bharati Vidyapeeth (Deemed To Be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Civil) –CBCS 2021 Course

Program: B. Tech. Civil

Sem: II

CBCS2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1.		Integral Calculus	4	-	1	60	40	-	-	-	100	4	-	1	5
2.		Applied Chemistry	3	2	-	60	40	25	-	-	125	3	1	-	4
3.		Statics and Dynamics	4	2	-	60	40	25	-	-	125	4	1	-	5
4.		Basic Land Surveying	4	2	-	60	40	-	-	75	175	4	1	-	5
5.		Construction Design & Drawing*	3	2	-	60	40	-	50	-	150	3	1	-	4
6.		Civil Engineering Software – I (AutoCAD)	-	2	-	-	-	-	-	50	50	-	1	-	1
7.		Object Oriented Programming (Using C++)	-	2	-	-	-	25	-	-	25	-	1	-	1
Total			18	12	1	300	200	75	50	125	750	18	6	1	25

*Theory paper of 4 hours duration

Programme: B. Tech. (Civil) Sem – I (2021)

Course: Differential Calculus		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: -04
Tutorial: 1 Hour / Week		Tutorial: - 01
Course Pre-requisites: The students should have knowledge of		
1	Algebra of matrices and its Determinants, Maxima and Minima of single variable functions.	
Course Objectives:		
To study	<ol style="list-style-type: none"> 1. Fundamental theorems, concepts in Matrices, Demoivr's theorem and its applications in engineering. 2. Various techniques in Calculus, Explanation of functions and Infinite series. 3. Partial differentiation, maxima, minima and its applications in engineering. 	
Course Outcomes: The student will be able to		
1	Understand rank of matrix and apply it to solve system of linear equations	
2	Understand the DeMoiver's theorem, hyperbolic functions and apply it in engineering problems.	
3	Understand the Leibnitz's rule and apply it to find nth derivative of a function.	
4	Understand fundamental concepts of convergence, divergence of infinite series and its tests.	
5	Understand the concept of partial differentiation and apply it to find total derivative.	
6	Evaluate the maxima and minima of any two variables functions.	
Course Content:		
UNIT - I	Matrices: Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors.	(08 Hrs)
UNIT - II	Complex Numbers and Applications: Definition, Cartesian, Polar and Exponential Forms, Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.	(08 Hrs)
UNIT - III	Differential Calculus: Differential Calculus: Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem. Expansion of Functions: Taylor's Series and Maclaurin's Series.	(08 Hrs)
UNIT - IV	Differential Calculus: Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits. Infinite Series: Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.	(08 Hrs)

UNIT - V	Partial Differentiation and Applications: Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables	(08 Hrs)
UNIT - VI	Jacobian: Jacobians and their applications, Chain Rule, Functional Dependence. Maxima and Minima: Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.	(08 Hrs)
Internal Assessment		
	Unit Test: I and II	
Textbooks:		
1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, (Pune Vidyarthi Griha Prakashan, Pune), 7 th Edition, 1988, Reprint 2010.		
2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi), 42 th Edition, 2012.		
Reference Books:		
1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill), Edition ,2008.		
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.), 8 th Edition, 1999, Reprint 2010.		
3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning), Edition 2007		
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education), 2 nd , Edition, 2002.		
Project Based learning topics for Differential Calculus:		
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable.		
1. Echelon form		
2. Normal form		
3. Linear and orthogonal transformation		
4. Eigen values and eigen vectors		
5. Argand diagram		
6. De Moivre's theorem		
7. Hyperbolic and logarithmic functions		
8. Leibnitz theorem		
9. Taylor's theorem		
10. L'Hospital rule		
11. Tests for convergence		
12. Euler theorem for homogeneous functions		
13. Total derivative		
14. Maxima and minima for two variable function		
15. Lagrange undetermined multipliers		

Programme: B. Tech. (Civil) Sem – I (2021)

Course: Acoustics and Modern Physics		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 3
Practical: 2 Hours / Week	Term Work: 25Marks	Term Work :1
		Total: 4
Course Pre-requisites: The students should have knowledge of		
1	Basic understanding of physics and calculus.	
Course Objectives:		
	To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Civil Engineering.	
Course Outcomes: The student will be able to		
1	Summarise the terms damping constant, characteristic frequency, kinetic and potential energy of a spring.	
2	Relate the problems associated with architectural acoustics and give their remedies.	
3	Connect the problems associated with defects and use ultrasonic as a tool in industry for non-destructive testing.	
4	Summarise and solve the engineering problems on Electromagnetism.	
5	Correlate the principles of different types of polarization and structural phase transitions phenomena in ferroelectric systems.	
6	Infer the wave nature of light and apply it to measure stress, pressure and dimension etc.	
Course Content:		
UNIT - I	Waves and oscillation Periodic motion, simple harmonic motion, characteristics of simple harmonic motion, vibration of simple springs mass system (Different combinations), Resonance - definition, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.	(06 Hours)
UNIT - II	Architectural Acoustics Elementary acoustics, Limits of audibility, Audibility curve, Noise and musical sound, timbre, Reverberation and reverberation time, Sabine’s formula (without Derivation), Intensity level, Sound intensity level, Loudness, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.	(06 Hours)
UNIT - III	Ultrasonic & NDT Introduction to ultrasonic, Production of ultrasonic by magnetostriction and	(06 Hours)

	piezoelectric methods Classification of Non-destructive testing methods, Principles of physics in Non-destructive Testing, Advantages of Non-destructive testing methods, Acoustic Emission Testing, Ultrasonic (thickness measurement, flaw detection), Radiography testing.	
UNIT - IV	Electromagnetic Wave Displacement current, Maxwell's equations (derivation), Wave equation for electromagnetic waves, Propagation in free space, Poynting theorem, Characteristic of Transverse electric and magnetic waves, Skin depth, Rectangular and circular waveguides.	(06 Hours)
UNIT - V	Engineering Materials and Applications Paramagnetic materials, diamagnetic materials, ferromagnetic materials, Dielectrics and electric polarisation. Liquid crystals: Noematic, Semitic and cholesteric phases, Liquid crystal display. Multiferroics: Type I & Type II multiferroics and applications, Magneto resistive Oxides: Magnetoresistance.	(06 Hours)
UNIT - VI	Wave optics Interference Interference of waves, interference due to thin film (Uniform and nonuniform), Applications of interference (optical flatness, interference filter, non-reflecting coatings). Diffraction Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima Polarisation Introduction, Double refraction and Huygens's theory, Positive and negative crystals, Nicol prism, Dichroism.	(06 Hours)
Internal Assessment:		
Part- A	UNIT TEST – I and II	
Part- B	Assignments: Six assignments to be given by the subject teacher (Theory)- one from each unit/one mini project with report-students can work in group of 4 Maximum	
Term Work:		
	The term-work shall consist of any eight of the following.	
	1. Oscillation of a Spring - Mass System and a Torsional Pendulum	
	2. To study normal modes of oscillation of two coupled pendulums and to measure the normal mode frequencies.	
	3. To study normal modes of transverse vibration of a stretched string	
	4. Study of resonance in LCR circuit	
	5. To determine the velocity of sound	
	6. Measurement of average SPL across spherical wave front and behavior with the distance	

	7. Expansion chamber muffler: investigation of muffler response as a filter in the low frequency approximation by determining insertion loss.	
	8. Interference of sound using PC speakers	
	9. Determination of velocity of sound in liquid by ultrasonic interferometer	
	10. Ultrasonic probe - a study	
	11. Plotting the hysteresis loop for given magnetic material	
	12. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings	
	13. Determination of wavelength of light using diffraction grating	
	14. Determination of resolving power of telescope	
	15. Determination of thickness of a thin wire by air wedge	
	16. Determination of refractive index for O-ray and E-ray	

Textbooks:

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books:

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid-State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)
11. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)

Topics for project-based Learning for Acoustics and Modern Physics

1. Measurement and effect of environmental noise in the college
2. Design and simulation of automatic solar powered time regulated water pumping
3. Solar technology: an alternative source of energy for national development

4. Double pendulum and its application
5. Comparison of various method used in measuring the gravitational constant g
6. The physics of stars and their astronomical identification
7. Design and construction of digital distance measuring instrument
8. Electronic eye (Laser Security) as autoswitch/security system
9. Electric power generation by road power
10. Measurement /simulation of reverberation time
11. Study of vibration of bars
12. Determination of absorption coefficient of sound absorbing materials
13. Determination of velocity of O-ray and E-ray in different double refracting materials
14. Need of medium for propagation of sound wave
15. Small wind turbines as a source of electricity

Programme: B. Tech. (Civil) Sem – I (2021)

Course: Construction and Materials		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 4
Practical: 2 Hours / Week	Term Work & OR: 50 Marks	Term Work & OR: 1
		Total:5
Course Pre-requisites: The students should have knowledge of		
1	Basic concepts of Engineering Drawing	
Course Objectives:		
	To develop the knowledge of building components, materials and construction practices	
Course Outcomes: The student will be able to		
1	Elaborate the types of structures and components of building	
2	Explain building foundation, types of masonry	
3	Identify the types of doors, windows and design various staircases	
4	Select and apply the proper type of floors and types of roofs	
5	Illustrate the types of plasters, pointing and paints	
6	Apply the proper formwork and scaffolding, use proper construction safety	
Course Content:		
UNIT - I	Civil Engineering materials and Building Components Civil Engineering scope, Types of Building as per National Building Code and role of Civil engineer; Types of structures based on loading, material and configuration (all types of construction materials); Building components and their functions	(08 Hours)
UNIT - II	Building Foundation, Masonry and Material Foundation: Types – Shallow foundation and Deep foundation, Suitability of foundations, failure of foundation and its causes. Stones and Stone Masonry: Requirement of good building stones, Stone masonry-principal terms, types (Random Rubble, Uncoursed Rubble, Coursed Rubble and Ashlar Masonry) Brickwork and Brick masonry: Characteristics of Bricks, IS Specification of Bricks, Classifications of bricks (Silica, refractory, fire and Fly ash bricks), Types of bonds: English, Flemish, Header, Stretcher.	(08 Hours)
UNIT - III	Doors, Windows and Staircase Doors: Definition and terminology, Installation of doors frames, Types of Doors: Glazed or sash door, flush door, louvered door, collapsible doors, revolving doors, sliding doors, swing doors. Windows: Definition and terminology, Types of window: Casement window, Sliding Window, Louvered or venetian window, gable window, skylight window, Ventilators. Stairs: Classification, Terminology used, Types: Straight staircase, Open well stair, quarter turn stairs, half turn stairs, turning staircase, dog legged	(08 Hours)

	staircase, circular stairs, Bifurcated stairs and spiral stairs, Details of Ramps, Lifts and Escalators. Lintels: Types, Details of R.C.C. lintels and chajja.	
UNIT - IV	Floors and Roofs Flooring: I.S. Specifications, Types of floor finishes and suitability, Construction details of (mud, concrete, brick and stone flooring), Factors for selection of flooring, types of flooring: Timber flooring, tiled flooring, ceramic flooring, mosaic flooring, Industrial flooring: tremix or Vacuum Dewatered Flooring (VDF) Roofs: Types, Suitability, Roof structures, Selection of roof covering material, Methods of water proofing of roofs, Types of trusses, Fixtures & fastenings.	(08 Hours)
UNIT - V	Building Finishes Plastering: Methods, tools used, Mortars, Defects, Plaster types: Lime plaster, cement plaster, gypsum plaster, Plaster of Paris and applications Pointing: Purpose and Types of pointing, Methods of pointing. Paints: Types and applications, Textures, Apex, Plastic emulsion Wall cladding: Materials, method of fixing, wall papering and glazing work.	(08 Hours)
UNIT - VI	Formwork, Scaffolding and Safety in construction Formwork: Necessity, Materials, Factors for selection, Types Scaffolding: Necessity, Materials, Factors for selection Safety in Construction: safety on site, storage of materials, construction safety, prevention of accidents, fire proof construction, repairs and maintenance.	(08 Hours)
Internal Assessment:		
Part- A	UNIT TEST- I :- UNIT – I, II, III	
	UNIT TEST II :- UNIT- IV,V,VI	
Part- B	Assignments: Students should perform theoretical / experimental assignment/s from the list below	
	1) Types of structures and building components	
	2) Building foundations, Stone and Brick Masonry	
	3) Design of staircase.	
	4) Floors and roofs	
	5) Building finishes	
	6) Formwork, scaffolding and Safety in construction	
Term Work:		
Part- A	The term-work shall consist of minimum Five drawing sheets from list below.	
	1) Lettering, Symbols, Types of line and dimensioning	
	2) Foundation: Isolated, Combined footings, Under Reamed Piles, Rafts	
	3) Type of stone masonry: Elevation and Sectional Drawing	
	4) Types of Brick Masonry:	
	5) Types of Doors and windows:	
	6) Types of stairs: plan and sectional drawing	
	7) Trusses: Various types of Trusses	

	8) Site Visit: To understand Various building Material and their use.	
Text Books:		
1.	“Building Construction”-Rangwala,Charotar Publication	
2.	“The Text Book of Building Construction”-S.P.Arora&S.P.Bindra-DhanpatRai Publication	
3.	“Building Technology and Valuation”- TTTI Madras, -- Tata McGraw Hill Publication	
4.	“Building Construction” by B.C.Punmia, Laxmi Publications.	
Reference Books:		
1.	“My Construction Practices” R.B.Chaphalkar	
2.	“A to Z” Building Construction” Mantri Publications	
3.	“Materials of Construction” – Ghose- Tata McGraw Hill Publications	
4.	“Civil engineering Material’- TTTI Chandigarh- Tata McGraw Hill Publications	
5.	‘Building Material Technology by Ruth T. Brantly& L Reed Brantley, Tata McGraw Hill	
6.	Building Materials by S.K.Duggal, New Age International Publishers.	
e-Resources		
1.	https://nptel.ac.in/course.html	
2.	https://theconstructor.org/write-for-us/	
3.	https://www.engineerwing.com/2012/10/tremix-flooring.html	
4.	http://home.iitk.ac.in/~mohite/composite_introduction.pdf	
Topics for Project based learning:		
1:	Model making on various components of buildings, report writing, cost analysis and site visit.	
2.	Market survey, sample collections and report writing on all types of construction materials.	
3.	Report on Scope of Civil Engineering in various fields.	
4.	Collecting various National Building codes and report writing.	
5.	Model making on Types of Shallow foundations report writing	
6.	Model making on Types of Deep foundations report writing	
7.	Sample collections of various types of stones used in stone masonry report writing	
8.	Model making on Different types of stone masonry (mentioned in syllabus) report writing	
9.	Model making on various types of Brick bond masonry. (Mentioned in syllabus) report writing	
10.	Model making on different types of Doors report writing	
11.	Model making on different types of windows reports writing	
12.	Model making on different types of staircase report writing	
13.	Market survey, sample collections and report writing on various roofing materials.	
14.	The rain roof water-harvesting systems.	
15.	Site visit, market survey, report writing and cost analysis of various plastering materials.	
16.	Site visit, market survey, report writing and cost analysis of various types of Paint.	
17.	Model making on Types of formwork and designs.	
18.	Model making on various types of Scaffolding and designs.	
19.	Corrosion mechanism, prevention, and repairs measures of RCC structure.	
20	Construction Project Management & Building Information Modelling	

Syllabus

Programme: B.Tech Civil Sem - I (2021)

Course: Civil Engineering Structures and Geology		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	TH:- 4
Practical: 2 Hours / Week	TW and PR :- 50 Marks	TW and PR: 1
		Total: 5
Course Pre-requisites: The students should have knowledge of		
1	Basic engineering sciences.	
Course Objectives:		
	To make the student know the variety of Civil Engineering Structures and the importance of Geology for Civil Engineers.	
Course Outcomes: The student will be able to		
1	Identify and know various civil engineering structures based on their function.	
2	Identify and know various civil engineering structures based on their behaviour.	
3	Identify and know various civil engineering structures based on their performance	
4	Students should be able to identify different rocks & minerals.	
5	Students should be able to identify different Geological structures to decide location and type of civil engineering structure.	
6	Students should be able to carry out preliminary geological investigation for Tunnel, Dam & Bridge.	
Course Content:		
UNIT - I	Structures Based on their Function: Types of structures, various functions served by Civil Engineering structures, Structures used for residential purpose, structures used for water storage and retaining, structures used for industries, structures used for transportation, structures used for treatment of water and wastewater, structures used for storage of liquids, special structures like nuclear reactors, towers, chimneys etc..	(08 Hours)
UNIT - II	Structures based on their behaviour: Various behaviours of a structure, Load bearing Structures, Framed Structures, light structures, medium structures, heavy structures, solid structures, tubular structures, cavity walls, shear walls, tall structures, flat slabs, precast and pre-stressed structures.	(08 Hours)
UNIT - III	Structures based on their performance: Various performances of a structure-strength, serviceability, Energy conservation, soil conservation from a structure, water conservation from a structure.	(08 Hours)

	Concept of ECO building, green buildings, Intelligent building, Low-Cost Housing, High rise buildings.	
UNIT - IV	Importance of Geology in Civil Engineering structures. Importance of Geology in Civil Engineering structures Mineralogy and Petrology: Mineralogy: Formation Process of Minerals, types of minerals, classification of minerals. Petrology: Igneous rocks-mineral composition, texture, classification of igneous rock. Secondary rocks- Weathering, texture & structure of sedimentary rocks & its classification. Metamorphic Rocks-Agents & types of metamorphism, building stones.	(08 Hours)
UNIT - V	Structural Geology & Indian Geology: Structural Geology- Outcrop, dip & strike, conformable series, unconformity & overlap, faults & folds in rocks, mode of occurrence of igneous rocks, joints & fractures. Indian Geology- General Principles of stratigraphy, age of the earth & divisions of geological time, physiographic divisions of India & their characteristics, geological history of peninsula, study of formations in peninsula.	(08 Hours)
UNIT - VI	Geological Investigations: Preliminary geological investigations surface survey, use of geological maps & sections, subsurface investigation. drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts etc. Limitation of drilling, engineering significance of geological structures.	(08 Hours)
Internal Assessment:		
Part- A	UNIT TEST – I and II	
Part- B	Assignments: Students should perform theoretical / experimental assignment/s from the list below	
	1) Types of structures and their functions.	
	2) Structures based on behavior	
	3) Structures based on performance	
	4) Types of minerals & Their physical properties	
	5) Types of different geological structures	
	6) Preliminary geological investigation.	
Term Work:		
	a) Review project on any one type of structures	
	b) Identification of the Minerals (2 Practical)	
	c) Identification of Igneous rocks (1 Practical)	
	d) Identification of Secondary rocks (1 Practical)	
	e) Identification of Metamorphic rocks (1 Practical)	
	f) Study of Contoured Geological Maps & drawing the sections (Six Practical)	
	g) Visit to site for understanding the geological features.	
Textbooks:		
	1. S.P. Bindra S.P. Arora, “Building Construction”, Laxmi Publication	

2. M. L. Shah, C. M. Kale, S. Y. Patki, "Building Drawing with integrated approach to Built Environment", Tata McGraw Hill Publishers
3. Gupte R.B, "A text book of engineering geology",P.V.G. Publications,Pune.
Reference Books:
1. IS provisions "National Building Code"
2. "Development Control Rules" of local plan sanctioning authority
3. Calendar, "Time Saver Standards for Architectural Design", Tata McGraw Hill Publishers
4. Merit, "Building Design and Construction", Tata McGraw Hill Publishers
5. Engineering Geology & General Geology By Parbin singh
6. General Geology & Engineering Geology by Dr.P.T.Sawant, New Delhi Publication.
Topics for project-based Learning for Civil Engineering Structures and Geology
1. Prepare a chart for structures used for Water treatment and sewage treatment plant.
2. Collect the information of various types of structures.
3. Prepare a model or chart for a retaining wall or any hydraulic structures.
4. Prepare a chart for comparison of load bearing and framed structure.
5. Prepare a prototype model for load bearing structure with showing all components.
6. Prepare a chart for various types of soil and water conservation structures.
7. Prepare a model of Bridge structure.
8. Collect the information of high rise building in India and prepare the report.
9. Prepare a chart or prototype model for Eco friendly and Intelligent building.
10. Effect of solid waste on quality of ground water.
11. Geophysical investigation using seismic refraction method to determine causes of real failure.
12. Resistivity methods used in horizontal and vertical discontinuities in the electrical properties of the Ground water.
13. Structural interpretation and mineral potential using remote sensing data and GIS tools.
14. Application of electrical resistivity method in ground water exploration.
15. Types of minerals.
16. Types of igneous rocks.
17. Types of metamorphic rocks.
18. Types of secondary rocks.
19. Texture of rocks.
20. Folds in rocks.
21. Failure in rocks.
22. Structures in rocks.
23. Determination of rock parameters, specific gravity, density and compressive strength of different types of rocks.

Syllabus
Programme: B. Tech. (Civil) – Sem – I CBCS 2021 Course

Course: Introduction and Opportunities in Civil Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED: 3</u>
Theory: 3Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory:3
Course Pre-requisites: The students should have knowledge of		
1	Basic Science	
Course Objectives:		
	To develop the knowledge of Basics of Civil Engineering and Building construction.	
Course Outcomes: The student will be able to		
1	Explain the introduction to civil engineering and various discipline.	
2	Elaborate Scope and role of civil engineering in all sectors.	
3	Identify the Civil Engineering project and process.	
4	Select the approvals required for Civil Engineering Construction Projects.	
5	Illustrate the Recent Developments in Civil Engineering	
6	Apply the Opportunities in Civil Engineering	
Course Content:		
UNIT - I	Introduction to Civil Engineering: Introduction to History of Civil Engineering, Definition of Civil Engineering, Various branches of civil Engineering and its application : Structural engineering , Construction engineering , Surveying and mapping engineering, Transportation engineering r, Environmental engineering, Hydraulic and irrigation engineering, Geotechnical engineering, Estimation and coasting ,Project management, Link of Civil Engineering with various discipline of Engineering : Mechanical Engineering, Electrical Engineering, Chemical Engineering, Electronic and Entc, Computer Engineering.	(06 Hours)
UNIT - II	Scope and role of Civil engineering: Impact of infrastructural development on the economy of a country, Role of civil engineers, Importance of planning, Scope of Civil engineering in government sector, Scope of civil engineering in private sector, Role of civil engineering in society	(06 Hours)
UNIT - III	Civil Engineering Project and Process: Need of project, Estimation cost and benefits of project, Cost-benefit ratio, Conceptual approval, technical planning and project proposal, Administrative approval, Detailed project report, Detailed Estimate of cost, Approvals and NOCs, Tendering and contracts, Terms and conditions, Work allotment, Inspection and quality control, Completion, maintenance, Peoples and organizations involved, Role and responsibility of them, (Owner, Engineers, Architects, Contractor, Consultant, Govt departments)	(06 Hours)
UNIT - IV	Approvals required for Civil Engineering Construction Projects: Introduction, Different approvals required for Civil Engineering construction projects, different stages of the projects and approval required at every stage, Authorities for giving approvals, Necessity & Importance of approval, the	(06 Hours)

	procedure for approvals	
UNIT - V	Recent Developments in Civil Engineering Introduction to Automation and mechanization in construction industry – Advantages and Disadvantages, Use of Precast and Pre-Fabrication in Civil Engineering Industry, Concept and Elements of SMART cities, Intelligent buildings, concept of low-cost housing, erection techniques of temporary structures.	(06 Hours)
UNIT - VI	Opportunities in Civil Engineering Introduction, Types of career roles for Civil Engineers, Certifications for Civil Engineering, Required Skill set for Civil Engineering, Employment Opportunities for Civil Engineers, Career path for Civil Engineers- Government sector, Public sector companies and Own start-ups.	(06 Hours)
Text Book:		
1	“Building Construction”-Rangwala,Charotar Publication	
2	“The Text Book of Building Construction”-S.P.Arora&S.P.Bindra-DhanpatRai Publication	
3	“Building Technology and Valuation”- TTTI Madras,Tata McGraw Hill Publication	
4	“Building Construction” by B.C.Punmia, Laxmi Publications.	
Reference Books:		
1	“My Construction Practices ”R.B.Chaphalkar	
2	“A to Z” Building Construction” Mantri Publications	
3	IS provisions “National Building Code”	
4	“Development Control Rules” of local plan sanctioning authority	
5	Calendar, “Time Saver Standards for Architectural Design”, Tata McGraw Hill Publishers	
6	Merit, “Building Design and Construction”, Tata McGraw Hill Publishers	
Syllabus For:		
Unit Test-I	UNIT – I, II, III	
Unit Test-II	UNIT- IV,V,VI	
List of Projects:		
Unit: I	Introduction to Civil Engineering	
1	1.Collection of Structural Information Historical structure of India: Visit, take photos, brows information and prepare report /chart	
2	Give day to day examples of Link of Civil Engineering with various discipline of Engineering: Photos in their day-to-day life they see about link of civil engineering with other discipline and write note in their own words on example they have seen (Minimum one example of link with each discipline)	
3	branches of Civil Engineer - Structural engineering, Construction engineering, Surveying and mapping engineering, Transportation engineering r, Environmental engineering, Hydraulic and irrigation engineering, Geotechnical engineering, Estimation and coasting, Project management: collect information on the branch of civil engineer of their choice and submit power point presentation	

Unit: II	Scope and role of Civil engineering	
4	Infrastructural development: Collect information on infrastructural development of country in last 6 years and prepare booklet on it	
5	Scope of Civil engineering in government sector: collect information on jobs in government sector, selection criteria process and exams for selection. Make a poster and display on notice board of department	
6	Scope of civil engineering in private sector and Role of civil engineering in society: collect information on jobs in private sector, make a poster and display on notice board of department	
Unit: III	Civil Engineering Project and Process	
7	Visit and take a interview of Civil Engineers, Architects, Contractor, Consultant, Govt departments and write your own observations of their work and share in for of class	
Unit: IV	Approvals required for Civil Engineering Construction Projects	
8	Different approvals required for Civil Engineering construction projects: make list of approvals requires brows the information about the process and prepare leaflet (Hard Copy)	
9	Authorities for giving approvals: visit any one approval authority of your place and prepare digital chart and mail to all staff and students of Department and take feed back	
10	Necessity & Importance of approval, the procedure for approvals: Prepare digital leaflet of necessity & importance of approval, the procedure for approvals and mail it to students and take feed back	
Unit: V	Recent Developments in Civil Engineering	
11	Present your ideas on low coast housing: Students have to build model of low coast house and need to explain its importance	
12	Present your ideas on Intelligent building: Students have to build model and explain concept.	
13	Present your ideas on Eco-Friendly building: Students have to build model and explain concept	
Unit: VI	Opportunities in Civil Engineering	
14	PPT on Required Skill set for Civil Engineering	
15	Own start-ups : Present idea of own start-up in front of class	
16	Software in civil engineering and its importance: collect information, download any one free software related to civil engineering and present its working in front of class	
17	Study the building structure where you live and write your observation along with photograph	
18	Study the traffic, traffic signals, parking on your way to college write your observation along with photograph	
19	Study Plumbing system of your house write your observation along with photograph	
20	Write a report on waste management in your house with photograph, discuss with your parents and improve waste management of your house.	

Syllabus

Programme: B.Tech Civil Sem - I (2021)

Course: GRAPHICS FOR CIVIL ENGINEERING

Course: GRAPHICS FOR CIVIL ENGINEERING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 2 Hours / Week	End Semester Examination: -- Internal Assessment: --	Credits: --
	Term Work & OR: 50 Marks	Term Work & OR:01
		Total: 1
Course Pre-requisites: The students should have knowledge of		
1	Basics of Mathematics at Secondary School Level.	
Course Objectives:		
	To provide knowledge about	
	<ul style="list-style-type: none"> • Fundamentals of engineering drawing and curves • Isometric views and projection • Projections of points, lines, planes & solids • Use of CAD tools. 	
Course Outcomes: The student will be able to		
1	Understand dimensioning methods and drawing of engineering curves.	
2	Draw orthographic projections using 1 st angle method of projection*.	
3	Draw Isometric views from given orthographic projections*.	
4	Draw projection of Lines, its traces and projections of planes*.	
5	Draw projection of different solids*.	
6	Draw development of lateral surfaces of solids*.	
	*Using CAD tools	
Course Content:		
UNIT - I	Lines and Dimensioning in Engineering Drawing and Engineering Curves Different types of lines used in drawing practice, Dimensioning–linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Ellipse by Arcs of Circles method, Concentric circles method. Involute of a circle, Cycloid. Introduction to Auto CAD commands.	(04 Hours)
UNIT - II	Orthographic Projections Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection	(04 Hours)

	method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections. (Using AutoCAD commands).	
UNIT - III	Isometric Projections Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view. (Using AutoCAD commands)	(04 Hours)
UNIT - IV	Projections of Points & Lines Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only). (Using AutoCAD commands)	(04 Hours)
UNIT - V	Projections of Planes Projections of Planes, Inclination of the plane with HP, VP. (Using AutoCAD commands)	(04 Hours)
UNIT - VI	Projections of Solids Projection of prism, pyramid, cone and cylinder by rotation method. (Using AutoCAD commands)	(04 Hours)
Term Work:		
	All sheets should complete using AutoCAD.	
	1. Types of Lines, Dimensioning practice, free hand lettering, 1 nd and 3 rd angle method symbol.	
	2. Engineering Curves	
	3. Orthographic Projections	
	4. Isometric Views	
	5. Projections of Points and Lines	
	6. Projections of Planes	
	7. Projections of Solids	
Text Books / Reference Books:		
1. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publishing house, Anand India,		
2. "AutoCAD 2020 Beginning and Intermediate", Munir Hamad, Mercury Learning & Information Publication, 2019.		
3. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.		
Reference Books		
1. "Text Book on Engineering Drawing", K. L. Narayana & P. Kannaiah, Scitech Publications, Chennai.		
2. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi,		
3. "Engineering Drawing", M. B. Shah and B.C. Rana, 1 st Ed, Pearson Education, 2005		
4. "Engineering Drawing", P. J. Shah, C. Jamnadas and Co., 1 st Edition, 1988		
5. "Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10 th Edition, S. K. Kataria and Sons, 2005		

Syllabus

Programme: B.Tech Civil Sem - I (2021)

WORKSHOP TECHNOLOGY			
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory: - 00 Hours/ Week	End Semester Examination	-----	Theory: 00
Practical: -02 Hours/ Week	IA	-----	
	Term Work	50 Marks	Term Work: 01
	Total	50 Marks	01
Course Pre-requisites: -	Students should have basic knowledge of hand tools used in day to day life.		

Course Objectives:	
The Student should	
1. To acquire the knowledge of basic manufacturing processes.	
2. To identify tools, work material and measuring instruments useful for sheet metal, welding, carpentry, plumbing and Piping practice.	
Course Outcomes:	
The students should be able to	
1.	Understand the basic Manufacturing Processes used in the industry.
2.	Understand various tools and apply suitable tools for suitable operations in civil work.
3.	Understand the importance of safety.

Term work shall consist of any three jobs and demonstrations on rest of the trades, journal consisting of five assignments one on each of the following topics.
Plumbing and Pipe fitting Shop: Study of Pipe joints, Pipe fitting, Cutting, Threading and Laying of pipes. Different tools and equipment like pipe vice, pipe bending machine, dies and die holder, plumbing vice, cutting dies, pipe wrench, ball peen hammer etc. are used for plumbing operations on G.I. pipe.
Welding Shop: Electric arc welding, Study of tools and Operations, Edge preparations, Types of welding joints, Exercises making of various joints. safety practices and general guidelines.
Joining methods: Study of tools and Operations of riveting , Fabrication of toolbox, tray, electrical panel box etc. and study of bolts. joints by bolting etc.
Carpentry Shop: Introduction to wood working, Study of tools and Operations and carpentry joints, Simple exercise using jack plain. To prepare half lap corner joint, mortise and Tennon joints, Simple exercise on woodworking lathe. Safety practices and general guidelines.

Plastic Molding shop: Introduction to plastic molding. types of plastics. types of plastic molding. Exercise on plastic molding machine.

Text Books/ Reference Books

- O.P.Khanna , A Text Book of Welding Technilogy, Dhanpat Rai and Sons
- P.N.Rao , Manufacturing Technology- Vol I, mCgRAW Hill Education 9 India Pvt.
- Chapman W.A.J “ Workshop Technology “ volume I,II.III, ELBS.
- Hajra Choudhary S.K. , Bose S.K. “Elements of Workshop Technology” Volume I,II
- Begman, Manufacturing Processes.

Syllabus

Programme: B.Tech (Civil) Sem – I(2021)

Course: Fundamentals of Problem Solving Logic(Using C)		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS:</u>
Theory: -- Tutorial: --	Semester End Examination: -- Internal Assessment: --	Credits: --
Practical: 2 Hours / Week	Term Work: 25 Marks Oral: --	Credits: 1
Course Pre-requisites: The students should have knowledge of		
1	Basic knowledge of Computer Handling	
Course Objective:		
1	To provide an overview of computers and problem-solving methods using 'C' Language	
2	To serve as a foundation for the study of programming languages.	
Course Outcomes: The student will be able to		
1	Know computer systems	
2	Understand concept and steps towards problem solving	
3	Understand fundamental concepts of C programming language	
4	Use decision control structures	
5	Use modular programming approach	
6	Use of arrays and structures	
Course Content:		
UNIT - I	Introduction to Computing: Components of Computer Systems, Concept of hardware and software, Types of software, Concept of computing, data and information, Introduction to computer programming, Types of programming languages, Software Development Life Cycle	
UNIT - II	Problem solving Techniques: Steps in problem solving techniques: Define the problem, Formulate the mathematical model, develop an algorithm, Write the code for the problem, Test the program. Introduction to program planning tools- algorithm, flowcharts, pseudo codes	
UNIT - III	Programming language 'C': Features of C, basic concepts- header files, compiling and executing a C program, variables, data types, Operators- assignment, arithmetic, relational, logical, increment and decrement, Input and Output functions- print f and scan f	
UNIT - IV	Decision Control Structures in 'C': if-else statement, nested if-else, use of logical operators, Loop control structure: for, while, do-while loops, use of break and continue, Case control structure: switch case	
UNIT - V	Function: Types of functions, Function definition and declaration, function prototype, calling and returning function, passing values between	

	functions, standard library functions and user defined functions, passing array as function parameter, Recursive function.	
UNIT - VI	Arrays and structures in 'C': Concept, declaration, initialization, processing with array, one and multidimensional array, Strings. Structures in 'C': Concept, declaration, accessing structure elements, Array of structures, Pointer to structures, Uses of structures.	
Internal Assessment:		
	NA	
Term Work: Term-work will consist of following assignments		
1	Write a C program to check prime number and even-odd numbers	
2	Write a C program to print sum of digits 1 to 10	
3	Write a C program to swap two numbers	
4	Write a C Program to check whether an alphabet is vowel or consonant	
5	Write a C Program to Find the Length of a String without using string functions	
6	Write a C program to find area and circumference of circle	
7	Write a C program to accept the length of three sides of a triangle and to check triangle as equilateral or not	
8	Write a C program to implement linear search technique	
Oral/Practical:		
	NA	
Reference Books:		
1) Kanetkar, Yashavant P. Let us C. BPB publications, 2004.		
2) Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall, ISBN 0131103628, Second Edition		
3) Donald E. Knuth, "The Art of Computer Programming", Vols. 1, Addison-Wesley, ISBN13: 978-0201485417, ISBN-10: 0201485419		
4) T. E. Bailey, "Program design with pseudo code", Brooks/Cole Publisher, ISBN-10: 0534055745, ISBN-13: 978-0534055745		
5) Subrata Saha and Subhodip M., "Basic Computation and Programming with C", Cambridge University of Press, India, ISBN:9781316601853		
6) Lamey Robert, "Logical problem solving", Prentice Hall, ISBN: 9780130618825		
7) Henry Mullish, Herbert L. Cooper, "The Spirit of C", Thomson Learning, ISBN 0314285008		

Syllabus
Programme: B.Tech Civil Sem - II Course (2021)

Course: Integral Calculus		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 4
Tutorial: 1 Hour / Week		Tutorial:-01
Course Pre-requisites: The students should have knowledge of		
1	Student should have Basic Knowledge of differential calculus	
Course Objectives:		
To study	1. Methods to evaluate first order, first degree differential equations and its applications in engineering problems. 2. Distinct co-ordinate systems, fourier series and curve tracing. 3. Various techniques for integral calculus and its applications in engineering problem.	
Course Outcomes: The student will be able to		
1	Understand and evaluate first order and first degree differential equations.	
2	Understand the formulation of physical systems as first order, first degree differential equation and evaluate particular solution of it	
3	Understand the Fourier series and apply it to represent periodic function	
4	Understand and evaluate methods of integral calculus and curve tracing.	
5	Understand co-ordinate system and apply it to solve locus problems.	
6	Understand concept of multiple integral and apply it to evaluate area, volume, centre of gravity and moment of inertia.	
Course Content:		
Unit - I	Differential Equations (DE): Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types	(08 Hrs)
Unit - II	Application of DE: Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, One-Dimensional Conduction of Heat.	(08 Hrs)
Unit - III	Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis. Integral Calculus: Differentiation Under the Integral Sign, Error functions.	(08 Hrs)
Unit - IV	Integral Calculus: Reduction formulae, Beta and Gamma functions Curve Tracing: Tracing of Curves, Cartesian, Polar. Rectification of Curves	(08 Hrs)
Unit - V	Solid Geometry: Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder	(08 Hrs)
Unit - VI	Multiple Integrals and their Applications: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square	(08 Hrs)

Syllabus
Programme: B.Tech Civil Sem - II Course (2021)

	Values.	
Text Books:		
1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill), Edition ,2008.		
2. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi GrihaPrakashan, Pune), 7 th Edition, 1988, Reprint 2010.		
Reference Books:		
1. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education), 2 nd ,Edition, 2002.		
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.), 8 th Edition, 1999, Reprint 2010.		
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.) , 6 th Edition, 1995		
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi), 42 th Edition ,2012.		
Syllabus for		
Unit Test-I - UNIT – I, II, III		
Unit Test-II - UNIT- IV, V, VI		
Project Based learning topics for Integral Calculus:		
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable.		
1. Formation of differential equation		
2. Exact differential Equation		
3. Linear differential equation		
4. Newton's law of cooling		
5. Newton's second law of motion		
6. Fourier's law		
7. Kirchhoff's voltage law		
8. Fourier series		
9. Harmonic analysis		
10. Gamma and beta function		
11. Curve tracing		
12. Locating position in three dimensional space		
13. Multiple integrals applications		
14. Error function		
15. Differentiation under integral sign		

Syllabus
Programme: B. Tech. Civil Sem - II Course (2021)

Course: Applied Chemistry		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 03 Hours/Week	Semester End Examination: 60Marks Internal Assessment: 40Marks	Theory :03
Practical: 02 Hours / Week	Term Work: 25 Marks	Term Work: 01
Course Pre-requisites: The students should have knowledge of		
1	Corrosion, water and wastewater	
2	air pollution and air polluting parameters	
3	properties of cement, fuel cell, solar cell and alloys	
Course Objective:		
	The student should be able to determine properties of water, cement and metal.	
Course Outcomes: The student will be able to		
1	Apply their knowledge for protection of different metals from corrosion.	
2	Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.	
3	Identify the sources of air pollution and its implications on the environment.	
4	To learn fundamentals of energy storage systems such as battery, solar cell	
5	Outline the importance of testing of cement and its properties and applications.	
6	To understand and analyze the necessity of making an alloy and its applications in various industries.	
Course Content:		
Unit - I	Corrosion And Corrosion Protective Treatments: Introduction, Definition, Types of corrosion, Mechanism of wet corrosion, Protection of Corrosion like, Metallic coatings, Electroplating, Methods of cleaning articles before electrode position, Electroplating methods, Electro less plating, Some electro less plating's, Some other metallic, coatings, Chemical conversion coatings, Organic Coatings, Paints, Varnishes, Enamels, Special paints.	(06-Hrs)
Unit - II	Water And Waste Water Chemistry Introduction, Hardness of water, characteristics imparted by impurities, Analysis of contaminants, Treatment of Water by Zeolite, L-S process, Boiler feed water, Wastewater treatment. Green Chemistry: Definition, Twelve principles of Green Chemistry.	(06-Hrs)
Unit - III	Air Pollution And its Analysis : Pollutants and their sources, pollution by SO ₂ , CO ₂ , CO, NO _x , H ₂ S and other foul-smelling gases. Methods of estimation of CO, NO _x , SO _x and control procedures. Green House effect and Global warming, Ozone	(06-Hrs)

Syllabus

Programme: B. Tech. Civil Sem - II Course (2021)

	depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates. Acid Rain, Green house effects, Depletion of Ozone	
Unit - IV	Industrial Practice: Energy Storage Device : Solar cell, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Ni-Mn Batteries, Li-Ion Batteries, Lead – Acid Batteries.	(06-Hrs)
Unit - V	Cement : Definition, Classification and properties - Natural, Pozzolana & Port land Chemical constituent of Portland cement. Manufacture of Portland cement by wet process. Manufacture of Portland cement by dry process (using flow sheet diagram)Setting& Hardening of Portland cement with chemical reaction. Heat of hydration of cement. Properties and applications of Portland cement, Nano cement Chemical Reactions of Portland Cement, Cement/Water Reaction, Carbonation Reactions, Hydration Reaction Mechanism, Hydration Reaction on Aluminates, Fly ash reaction.	(06-Hrs)
Unit - VI	Alloys : Introduction, Necessity (Purpose) of making alloys, Classification of alloys. Preparation of alloys – Fusion method, Electro deposition method, Composition, Properties & Application of following - (i) Brass (ii) Bronze (iii) Duralumin (iv) Nichrome (v) Steel – Mild, Medium & High.	(06-Hrs)
Term Work: (Experiments)		
1	Determination of dissolved oxygen in water.	
2	Determination of hardness of a given water sample by using EDTA	
3	Measurement of chloride, sulphate and salinity of water samples by Simple titration method. (AgNO ₃ and potassium chromate)	
4	Determination of Ca from cement	
5	To determine the strength of given acid using pH titrations.	
6	Determination of Biochemical Oxygen Demand (BOD)	
7	Study of corrosion of metals in medium of different pH.	
8	To learn the specific charge/discharge characteristics of a Lithium- ion (Li- ion) battery through experimental testing of a remote triggered Li- ion Battery.	
9	To Prepare Phenol formaldehyde/Urea formaldehyde resin.	
10	To study set up of Daniel Cell	
11	Determination of Biological Oxygen Demand (BOD)	
12	To determine pH of soil	
13	To determine Acidity of soil	
14	To Study Lead – Acid Battery	
15	Preparation of borax/ boric acid.	
Assignments:		
Six assignments to be given by the subject teacher (Theory)-one from each unit		

Syllabus
Programme: B. Tech. Civil Sem - II Course (2021)

Reference Books:
1.A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004
2.Engineering Chemistry (16th Edition) Jain& Jain, Dhanpat Rai Publishing Company, 2013.
3.Jain P.C & Jain Monica, Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 1992.
4.Bhal&Tuli, Text book of Physical Chemistry (1995), S. Chand & Company, New Delhi.
5.O. G. Palanna , Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi.
6.S. S. Dara, A textbook of Engineering Chemistry, McGraw-Hill Publication, New Delhi.
7.Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi.
8.Shikha Agarwal, Engineering Chemistry- Fundamentals and applications, Cambridge Publishers - 2015.
9.WILEY, Engineering Chemistry, Wiley India, New Delhi 2014.
Syllabus for Unit Test:
Unit Test -1 :UNIT – I to III
Unit Test -2 :UNIT – IV to VI
Topics for project based Learning for Applied Chemistry
1. Powder Coating methods used for prevention of metals from corrosion
2. Metallic Coating methods used for prevention of metals from corrosion
3. Analysis of various water contaminants
4. Treatment of water by Zeolite method.
5. To find various sources of air pollutants and its analysis.
6. Methods of estimation of CO, NO _x
7. Construction and Working of - Acid and Alkaline Storage Battery
8. Construction and Working of Dry Cell, Ni-Cd Batteries
9. Manufacturing of Portland Cement.
10. To study the properties and applications of Portland cement.
11. Preparation of alloys – Fusion method, Electro deposition method.
12. To study Composition, Properties & Application of (i) Brass (ii) Bronze (iii)Duralumin
13. To study manufacturing of mild steel.
14. To analyze waste water .
15. To determine hardness of water and its ill effects.

Syllabus
Programme: B. Tech. Civil Sem - II Course (2021)

Course: Statics and Dynamics		
TEACHING SCHEME:	EXAMINATION SCHEME:	Total CREDITS: 05
Theory: 04 Hours / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory:04
Practical: 02 Hours / Week	Term Work: 25 Marks	Term work: 01
Course Pre-requisites: The students should have knowledge of		
1	Physics-Forces, Newton's law of motion, Concept of physical quantities, their units and conversion of units, Scalar and Vector	
2	Mathematics-Algebra, Geometry, Concept of differentiation and integration	
Course Objective:		
	The student should be able to determine effect of forces on rigid objects in static and dynamic state.	
Course Outcomes: The student will be able to		
1	calculate resultant and apply conditions of equilibrium.	
2	calculate friction force and its effect.	
3	analyze the truss	
4	calculate centroid and moment of inertia.	
5	evaluate kinematic effect of forces	
6	evaluate kinetic effect of forces	
Course Content:		
Unit - I	Resultant and Equilibrium Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	(08Hrs)
Unit - II	Friction Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts.	(08 Hrs)
Unit - III	Analysis of Truss Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	(08 Hrs)
Unit - IV	Centroid and Moment of Inertia Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	(08 Hrs)
Unit - V	Kinematics of a Particle Cartesian components, Normal and Tangential components of motion, Relative motion, Dependent motion, Motion of a Projectile,	(08 Hrs)
Unit - VI	Kinetics of a Particle D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	(08 Hrs)
Assignments:		
	1) Explain different types of forces and types of supports.	
	2) Calculate resultant of given force system	

Syllabus
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	3) Calculate support reactions of the beam	
	4) What is equilibrium? What are conditions of equilibrium?	
	5) Calculate friction force for Blocks and Ladders.	
	6) Calculate tension on sides of Belts.	
	7) Calculate forces in members of truss.	
	8) Calculate centroid of given area.	
	9) Calculate moment of inertia of given area.	
	10) Calculate relative velocity of bodies.	
	11) Calculate motion and path of projectile.	
	12) Apply D'Alemberts Principle to solve given problem.	
	13) Apply Work-Energy Principle to solve given problem.	
	14) Apply Impulse-Momentum Principle to solve given problem.	
	15) Calculate velocity of bodies after impact.	
Term Work: The term-work shall consist of -		
	Part-A: Minimum Five experiments from list below.	
	1) Study of equilibrium of concurrent force system in a plane	
	2) Determination of reactions of Simple and Compound beam.	
	3) Determination of coefficient of friction for Flat Belt.	
	4) Determination of coefficient of friction for Rope.	
	5) Determination of Centroid of line or plane elements.	
	6) Study of Curvilinear motion.	
	7) Determination of Coefficient of Restitution.	
	Part-B: Minimum Five graphical solutions of the problems on different concepts in course content.	
Reference Books:		
	1) Hibbeler R.C., "Engineering Mechanics (Statics and Dynamics)", McMillan Publication	
	2) Beer F.P. and Johnston E.R., "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Tata McGraw Hill Publication.	
	3) Bhavikatti S.S. and Rajashekarappa "Engineering Mechanics", K.G., New Age International (P) Ltd.	
	4) Shames I.H., "Engineering Mechanics (Statics and Dynamics)", Prentice Hall of India (P) Ltd.	
	5) Singer F.L., "Engineering Mechanics (Statics and Dynamics)", Harper and Row Publication	
	6) Meriam J.L. and Kraige L.G., "Engineering Mechanics (Statics and Dynamics)", John Wiley and Sons Publication	
	7) Timoshenko S.P. and Young D.H., "Engineering Mechanics (Statics and Dynamics)", McGraw Hill Publication	
	8) Tayal A.K., "Engineering Mechanics (Statics and Dynamics)", Umesh Publication	
	9) Mokashi V.S., "Engineering Mechanics-I and II (Statics and Dynamics)", Tata McGraw Hill Publication	
Syllabus for Unit Test:		
	Unit Test -1 :UNIT – I to III	
	Unit Test -2 :UNIT – IV to VI	
Topics for Project based Learning for Statics and Dynamics		

Syllabus
Programme: B. Tech. Civil Sem - II Course (2021)

1. Prepare model for various types of beams.
2. Prepare model for various types supports.
3. Prepare chart for various types of force system with suitable real-life examples.
4. Collect the various situations where varignon's theorem is used.
5. Prepare model or chart for equilibrium system of forces of various engineering applications.
6. Prepare chart for different types for trusses with showing various members.
7. Prepare prototype model of any one type of truss.
8. Calculate the forces in members of truss by using analytical method and check it graphically (At least three problems for different types of trusses)
9. Prepare chart of method of joint and method section for analysis of truss with stepwise procedure.
10. Prepare prototype models of the basic geometrical figures and locate the centroid of them.
11. Prepare prototype models of the I and T section and locate the centroid of them.
12. Prepare chart for parallel axis and perpendicular axis theorem with suitable example.
13. Prepare chart regarding the types of friction in various field conditions.
14. Prepare chart for application of friction.
15. Prepare chart for derivation of tangential and normal acceleration.
16. Prepare chart related to projectile motion with suitable example.
17. Development of excel sheet for projectile motion (at least three problems).
18. Development of excel sheet for work energy principle (at least three problems).
19. Prepare chart for work energy and Impulse momentum principle with suitable example.
20. Development of excel sheet for calculation of coefficient of restitution (at least three problems)

Syllabus
Programme: B. Tech. (Civil) – Sem - II CBCS 2021 Course

Basic Land Surveying		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED: 05</u>
Theory: 04Hours / Week	End Semester Examination: 60 Marks	Theory: 04 Credits
Practical: 02Hours / Week	Internal Assessment: 40 Marks	
	Termwork & Practical:: 75 Marks	TW & PR: 01 Credits
Course Pre-requisites:		
The Students should have knowledge of		
1.	Basic Mathematics and geometry	
Course Objectives:		
	To develop the knowledge of basic Surveying techniques required for various construction projects.	
Course Outcomes:		
On completion of the course, the students will be able to:		
1.	Use instruments for linear measurements and prismatic compass for angular measurements.	
2.	Use instruments for levelling and compute reduced levels of ground points	
3.	Use Vernier theodolite for angular measurements and for other applications.	
4.	Use of Tacheometer for computation of distances and reduced levels. Use plane table and its accessories for surveying.	
5.	Set out simple circular curves by various methods.	
6.	Conduct surveys for various construction projects and explain use of modern instruments.	
UNIT - I	Linear measurements and Compass survey	(8Hours)
	Principle, objectives and classification of Surveying. Linear measurements, methods, types of tapes, ranging, field work and plotting. Principle and working of EDM. Compass Survey: types of meridians and bearings, construction and use of prismatic compass, local attraction and its correction, dip and declination.	
UNIT - II	Vertical measurements	(8Hours)
	Introduction, types of levels, principle axes of levels, auto level and its working, temporary and permanent adjustments of auto-level, types of levelling staves, computation of reduced levels, profile levelling and cross sectioning. Contouring – direct and indirect methods, uses of contour maps. Introduction to trigonometrical levelling.	
UNIT - III	Theodolite Survey	(8Hours)
	Study and use of Vernier 20” theodolite, principle axes and temporary adjustments, measurements of horizontal angles by repetition and reiteration method, measurement of vertical angles and other uses, theodolite traversing: computation of consecutive and independent coordinates, adjustment of closed traverse by transit and Bowditch rule, simple cases of omitted measurements.	
UNIT - IV	Tacheometry and Plane Table Survey	(8Hours)

Syllabus
Programme: B. Tech. (Civil) – Sem - II CBCS 2021 Course

	Principle of stadia tacheometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points. Plane table survey, equipment's their uses, methods of plane table survey- radiation, intersection, traversing and resection, errors and precision of plane table survey.	
UNIT - V	Curves	(8Hours)
	Necessity of providing curves, simple circular curves, elements, setting out circular curves by radial and perpendicular offsets, offsets from long chord and offsets from chords produced. Angular method of deflection angles. Transition curves, necessity and types.	
UNIT - VI	Construction Survey and modern equipment's	(8Hours)
	Setting out buildings, survey for roads and tunnels, survey for drainage line, location of bridge piers. Introduction to Total station and its uses, use of digital planimeter for area measurement, study and use of toposheets.	
Assignments:		
1	Computation of corrected bearings of the traverse by different methods.	
2	Solving problems on calculation of reduced levels by different methods.	
3	Preparing contour map of the area from the given spot levels.	
4	Solving problems on trigonometrical leveling.	
5	Computations of independent coordinates of a closed traverse.	
6	Solving problems on omitted measurements.	
7	Calculation of reduced level and distance of a point by tacheometry.	
8	Write details of survey for drainage line with proper sketches.	
Term Work: The term work shall consist of Field book and drawing containing record of (any 12) exercises and project listed below.		
1	Linear measurements with tape and accessories.	
2	Study and use of Prismatic compass.	
3	Study and use of auto level and double check leveling	
4	Compound leveling and fly leveling, calculation by rise and fall method.	
5	Study and use of 20" Vernier Theodolite.	
6	Measurement of horizontal angle of triangle by repetition method and applying check.	
7	Measurement of vertical angle by transit Theodolite	
8	Trigonometrical levelling by transit Theodolite.	
9	Project 1 Road project of minimum length of 250 M including fixing of alignment, profile leveling and cross sectioning.(Two full imperial drawing)	
10	Project 2 Theodolite traverse survey of closed traverse for minimum 0.5	

Syllabus
Programme: B. Tech. (Civil) – Sem - II CBCS 2021 Course

	hectares area including building roads etc. (One full imperial drawing)	
11	Computation of horizontal distance and elevation of points by tachometry for horizontal and inclined sights.	
12	Introduction and study of outfit of plane table and method of radiation.	
13	Intersection method of plane table survey.	
14	Closed plane table traverse survey around a small four-sided building.	
15	Setting out simple circular curve by Rankin's method of deflection angle	
Text Books		
1	Surveying and Levelling Vol I and. II-T.P. Kanetkar and S.V. Kulkarni.	
2	Surveying Vol. I & II - Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain.	
3	Surveying for Engineers- John Uren & Bill Price- Palgrave Macmillan	
4	Plane Surveying- A.M.ChandraNew age International Publishers	
5	Surveying and Levelling- N. N. Basak, Tata Mc-Graw hill	
6	Surveying Vol. I & II - Dr. K. R. Arora.	
Reference Books:		
1	Surveying: Theory and practice-James M. Anderson, Edward M. Mikhail	
2	Surveying theory and practices-Devis R. E., Foot F.S.	
3	Plane and Geodetic Surveying for Engineers. Vol. I -David clark.	
4	Principles of Surveying. Vol. I - J.G.Olliver, J.Clendinning	
5	Surveying Vol. I & II -S.K.Duggal, Tata Mc-Graw Hill.	
6	Surveying and Levelling - Subramanian, oxford University Press.	
Syllabus for :		
Unit Test-I	UNIT – I, II, III	
Unit Test-II	UNIT- IV,V,VI	
Project List :		
Unit I	Linear measurements and Compass survey	
1	Collect Information of Linear measurement techniques/ instruments from old age till 21 st century, write report along with photos	
2	Conduct closed traverse by prismatic compass and do the necessary calculations	
Unit II	Vertical measurements	
3	Prepare counter sheet by using Excel	
4	Collect Information of Vertical measurement techniques/ instruments from old age till 21 st century, write report along with photos	
5	Vist to laboratory and collect information of levelling instrument and make ppt.	
Unit III	Theodolite Survey	
6	Make a PPT on Problem Solved by Bowditch Rule and present it in class	

Syllabus
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7	Make a PPT on Problem Solved by transit Rule and present it in class	
8	Leaflet on uses of Theodolite	
Unit IV	Tacheometry and Plane Table Survey	
9	Write a report on- “ Is Tacheometry and Plane table are required in today’s digital world?”	
10	PPT on working of plane table	
11	Make vedio – of your own demonstrating parts and working of Tacheometry, share it with your classmate and take feed back	
12	Digital booklet on numerical of Tacheometry share it with your classmate and take feed back	
Unit V	Curves	
13	Take Photograph of Curves of road you usually use and make a poster and display it on Notice Board.	
14	Digital booklet on numerical of Rankine’s method of Curves share it with your classmate and take feed back	
15	Digital booklet on numerical of offset from long cord method of Curves share it with your classmate and take feed back	
Unit VI	Construction Survey and modern equipment’s	
16	Collect information of latest surveying instrument : its cost, salient features and image and prepare Chart and display it on notice board.	
17	Prepare Digital Chart on Importance of Basic Land Surveying in Civil Engineering share it and collect feed back	
18	Present your idea of modification of any survey instrument in front of class.	
19	Collect information on various software available for surveying	
20	Prepare leaflet on Surveying for various projects.	

Draft Syllabus

Programme: B.Tech Civil (2020)

Sem - II (Civil)

Course: Construction Design & Drawing		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED: 04</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03 Credits
Practical: 2 Hours / Week	Term Work and Oral : 50 Marks	Term Work and Oral : 1 Credits
Course Pre-requisites: The students should have knowledge of		
1	Building Construction, Building materials, Knowledge of Engineering Graphics	
Course Objectives:		
	To make the student illustrate the process of building planning and building byelaws	
Course Outcomes: The student will be able to		
1	apply various Principals of planning and building byelaws.	
2	apply design considerations for climate, ventilation, Noise & Acoustics in building planning.	
3	apply design considerations for various building services & fire protection in building planning.	
4	apply design considerations for plumbing services in building planning.	
5	Understand the concept of .development plan	
6	define the legal aspects of plan sanctioning.	
Course Content:		
UNIT - I	Buildings Planning and Regulations Principles of planning for building, Integrated approach in Built Environment. Building Rules Regulations and Byelaws necessity, (National Building Code), plot size, open space around the building. FSI, Building line, control line. Height, room size, Built up area, floor area, carpet area. Rules of lighting ventilation, Drainage and Sanitation; Principles of Architectural design – form, function, utility, aesthetics.	(06 Hours)
UNIT - II	Types of Buildings (a)Types of Residential Building units – Bungalows, Twin bungalows, Row houses, Apartments; Requirements of Public buildings - Educational buildings, buildings for health care, industrial buildings and commercial buildings; Types of drawings - Submission drawings, working drawings and Architectural drawings, Perspective drawings. (b) Concept of ECO building, Green buildings, Intelligent building, Low Cost Housing, Planning considerations in High rise buildings.	(06 Hours)
UNIT - III	Climate, Ventilation and Acoustics Elements of climate, thermal design Principles, Heat exchange of building, Thermal insulation of roof and wall. Function of ventilation, stack effect wind effect, Mechanical ventilation, Air conditioning systems. Effect of noise, Noise control sound insulation, Acoustics reverberation Sabine's formula, acoustical defects, conditions of good acoustics.	(06 Hours)
UNIT - IV	Building Services Constructional requirements for different building services like Electrical, Telecommunication services, Circulation-Lift Types and Capacity, escalators,	(06 Hours)

Draft Syllabus

Programme: B.Tech Civil (2020)

Sem - II (Civil)

	Entertainment services. Fire Protection – Fire safety, fire load, grading of occupancies by fire load, fire escape elements. Plumbing services, fixtures and fastenings, Layout of water supply & drainage system, Rate of water supply, storage and distribution arrangement, Plumbing systems.	
UNIT - V	Necessity and evolution of town planning in India. Development plan and its importance, Various surveys for development plan Objectives and Contents of DP, Land use zoning, Concept of regional plan.	(06 Hours)
UNIT - VI	Legal Aspects of Plan Sanctioning Role of Plan Sanctioning Authority for layout, co-op Housing societies and apartments. Ownership of land, plot, 7/12 abstract, meanings of different terms of 7/12 abstract (Khasra), 6-D form, list of documents to be submitted along with building Plan for sanction from the authority. TDR, certificate of commencement and completion, various no objection certificates to be produced, format of permissions from pollution control board, MSEB, Water Supply and Drainage Department, State or National Highway Department.	(06 Hours)
Assignments: Students should perform theoretical / experimental assignment/s from the list below		
1	Assignment on Building Bye laws for residential buildings	
2	Requirements of Green and intelligent buildings	
3	Describe principles of Thermal design of buildings.	
4	Prepare a layout for water supply and drainage of residential building.	
5	Assignment on Development plan of a city	
6	State and describe various legal documents for building construction.	
Term Work:		
	Preparation of working drawings of any one of the buildings listed below: a) Residential Building b) Commercial Building c) Educational Building d) Industrial Building e) Recreational Building f) Health Club	
	Sheets to be drawn 1) Plan/Typical floor plan to a suitable scale. 2) Elevation and section to a suitable scale. 3) Site plan showing water supply and Drainage 4) Foundation Plan to a suitable scale.	
Text Books:		
1. S.P. Bindra S.P. Arora, “Building Construction”, Laxmi Publication		
2. M. L. Shah, C. M. Kale, S. Y. Patki, “Building Drawing with integrated approach to Built Environment”, Tata McGraw Hill Publishers		
3. Rangwala, “Town Planning”, Charaotar Publications		
Reference Books:		
1. IS provisions “National Building Code”		

Draft Syllabus

Programme: B.Tech Civil (2020)

Sem - II (Civil)

2. “Development Control Rules” of local plan sanctioning authority	
3. Calendar, “Time Saver Standards for Architectural Design”, Tata McGraw Hill Publishers	
4. Merit, “Building Design and Construction”, Tata McGraw Hill Publishers	
Syllabus for	
Unit Test-I	UNIT – I, II, III
Unit Test-II	UNIT- IV, V, VI

Project Based Learning

- 1 Study of National Building code of India to find Building Bye laws for planning residential buildings.
2. With the help of 3 different case studies of residential buildings study the application of Principles of building planning.
- 3 Preparing a measured drawing of a two bed room residential building (Plan, Elevation and section)
- 4 Take case study of green building and study provisions with reference to energy saving, solid waste management, recycling of water , use of green building materials.
- 5 With the help of site visit determine planning requirements for health care buildings and prepare a report.
6. With the help of site visit determine planning requirements for commercial buildings and prepare a report.
- 7 Study the architectural and working drawings for a building construction project and prepare a report.
- 8 With the help of site visit prepare a plumbing layout of a residential building and study various fixtures for plumbing.
- 9 Study of fire safety arrangements for high rise buildings and prepare a report.
- 10 Study the process of preparing development plan of a city and prepare a report.
- 11 With the help of case study prepare a report on zoning in Development plan.
- 12 With the help of site visit determine planning requirements for recreational buildings and prepare a report.
13. Take a case study of intelligent building and study various provisions and prepare a report.
- 14 Study the foundation plan of a residential building and prepare a report on lineout of a building.
- 15 Study the electrical layout plan of a building construction project and prepare a report.
16. Study of various legal documents such as 7/12 extract, TDR certificate, completion certificate.
17. With the help of site visit determine planning requirements for primary school building and prepare a report.
18. Study development control rules of the local authority and prepare a report.
- 19 With the help of site visit determine planning requirements for high rise building and prepare a report.
- 20 Study of Landscape details in a residential complex and prepare a report.

Draft Syllabus

Programme: B.Tech Civil (2020)

Sem - II (Civil)

Syllabus
Programme: B. Tech. Civil Sem - II Course (2021)

Course: Civil Engineering Software – I (AutoCAD)		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED: 01</u>
Practical: 02 Hours / Week	Term Work & Practical : 50 Marks	TW & PR :01
Course Pre-requisites: The students should have knowledge of		
1	Knowledge of basic building aspects	
2	Knowledge of various building components.	
3	Knowledge of various building symbols	
Course Objectives:		
	To make student capable of drawing any kind of Engineering drawing using AutoCAD.	
Course Outcomes: The student will be able to		
1	draw various Engineering drawing using AutoCAD.	
2	draw various elements of a building.	
3	draw various elevation and sections of the building.	
4	Draw and explain various modelling concepts of building construction and building drawing by using AutoCAD.	
Course Content:		
UNIT - I	Introduction to AutoCAD and Command: Introduction to AutoCAD, Basic AutoCAD commands- Line, Circle, Polyline, Rectangle, Polygon, Array, Trim, Offset, Fillet, Changers, Units, Limits, Move, Copy, Paste, Drawing space, Layout, Model.	
UNIT - II	Simple Plan Drawing: Small bungalow plan scaled print out on A3 sheet, 1 BHK and 2 BHK Flats and bungalow plans, Elevation and Section.	
UNIT - III	3D Drawing: 1 BHK Bungalow plans, 3D Truss, 3D Industrial shed, Steel drawing for bungalow.	
Term Work:		
	The term-work shall consist of:	
	1) AutoCAD Drawing of small objects	
	2) AutoCAD Drawing of plan, elevation and section of small building.	
	3) AutoCAD 3D view of small building.	
Text Books:		
“ Mastering AutoCAD 2016 and AutoCAD LT 2016 by Goerge Omura”		
“ Mastering AutoCAD 2017 and AutoCAD LT 2017 by Goerge Omura”		
“ Mastering AutoCAD 2018 and AutoCAD LT 2018 by Goerge Omura”		
“AutoCAD 2018 Instructor perfect paperback by james A. Leach”		
“Beginning AutoCAD Exercise workbook 2018 by Cheryl R. Shrock”		
Reference Books:		
“AutoCad : 2D Reference guide : 1 Paperback=1 january 2010 by C. S. Changeriya”		
“AutoCAD 14 (The Complete Reference) Paperback – Import, 1 December 1998 by David S. Cohn”		

Syllabus
Programme: B. Tech. Civil Sem - II Course (2021)

Course: Object-Oriented Programming (Using C++)		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical: 2 Hours / Week	Term Work: 25 Marks	Term Work: 1
Course Pre-requisites:		
1	The students should have basic Knowledge of “C” programming language.	
Course Objective:		
	Students will be able to do basic program in C++	
Course Outcomes: The student will be able to		
1	Explain different Concepts of OOP, Characteristics of OOP.	
2	Demonstrate the use of Data type , Keywords ,Tokens and Control Structures to Solve given Problem.	
3	Demonstrate the use of functions to solve real world problem.	
4	Compare different types of inheritance to solve given problem.	
5	Explain different Types of Constructor and Destructor.	
6	Develop OOP applications using file Handling.	
Course Content:		
Unit -I	Introduction to Object Oriented Programming: Introduction to Object Oriented Programming, Basic Concept of OOP, Characteristics of OOP, Need for OOP, Benefits of OOP, Object Oriented Languages, Applications of OOP.	
Unit -II	Beginning with C++: Overview of C++, Sample C++ Program, C++ statements, Structure of C++ program, Creating source file , compiling and Linking C verses C++, C++ Characteristics, Structure of C++ program, Tokens, Keywords , Identifiers and Constants, Data Types ,Declaration of variables, Dynamic initialization of variables, Control Structures.	
Unit -III	Functions in C++: Function Prototyping, Call by Reference, Inline functions, Default arguments, Function Overloading , Friend and Virtual Functions . Classes and Objects: Class specification , Class Objects , Scope resolution operator, Access specifies Public, Private, Protected, Defining member Functions, Nesting of Member Functions, Private Member Functions, Static Data Members , Static Member Functions,	
Unit - IV	Inheritance and Polymorphism: Defining Derived Classes, Types of Inheritance, Virtual Base Class, Abstract class. Polymorphism: Base class, Virtual Functions, Pure Virtual Functions, Calling a virtual function through a base class reference, Early and Late Binding.	
Unit - V	Constructors and Destructors: Constructors, Parameterized constructors, Default Constructors, Copy constructor, Dynamic Initialization of Objects, Destructors.	
Unit - VI	Managing Console I/O operations: C++ Stream Classes, Unformatted I/O Operations, Working with Files, Opening and Closing a file, Formatted I/O.	

Syllabus
Programme: B. Tech. Civil Sem - II Course (2021)

Term Work:		
1.	Study of different Object Oriented Programming Concept ,Application and benefits of OOP.	
2.	Write a C++ program to find whether given number is perfect number or not.	
3.	Write a C++ Program to find Fibonacci Series.	
4.	Write a C++ Program to find Area of Circle and Triangle Using concept of Function Overloading.	
5.	Write a C++ program for simple Calculator using Class and Object Concept.	
6.	Write a C++ Program for Employee Management System Using Single inheritance, Multiple inheritance and Multilevel inheritance.	
7.	Write a C++ Program to implement Concept of Constructor and Destructor.	
8.	Write a C++ Program for Storing Student Information with the help of File reading and Writing Operations.	
Reference Books:		
1)	Herbert Schildt, "The Complete Reference C++", 4thEdition, Mc Graw Hill, 2003.	
2)	Stanley. B. Lippmann, Josee Lajoie, Barbara. E. Moo, "C++ Primer", 5th Edition, Pearson Education, 2013.	
3)	Scott Meyers:"Effective C++",Third Edition, Addison-Wesley, 2005.	
4)	E. Balaguruswamy, "Object Oriented Programming using C++", 4th Edition, Mc Graw Hill, 2010	

Bharati Vidyapeeth (Deemed To Be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Civil) –CBCS 2021 Course

**Program: B. Tech. Civil
Course**

Sem: III

CBCS2021

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1.		Mechanics of Solids	3	2	1	60	40	25	-	-	125	3	1	1	5
2.		Construction Equipment & Methods	4	2	-	60	40	25	-	-	125	4	1	-	5
3.		Fluid Mechanics	4	2	-	60	40	-	50	-	150	4	1	-	5
4.		Economics & Finance	3	-	-	60	40	-	-	-	100	3	-	-	3
5.		Concrete Technology*	4	2	-	60	40	-	50	-	150	4	1	-	5
6.		Vocational Course-I : Computer Aided Building Planning and Design (Revit,BIM)	-	-	-	-	-	-	50	-	50	-	2	-	2
7.		Civil Engineering Software – II (AutoCAD 3D)	-	4	-	-	-	-	75	-	75	-	2	-	2
8.		Data Analytics Using Python	-	2	-	-	-	25	-	-	25	-	1	-	1
9.		MOOCs-I	-	-	-	-	-	-	-	-	-	-	-	-	2
		Total	18	14	1	300	200	75	225	-	800	19	08	1	30
		Environmental studies**	-	-	-	100	-	-	-	-	-	-	-	-	-

*Industry Taught Course – I

**Mandatory Audit course with 100 marks end semester examination

Bharati Vidyapeeth (Deemed To Be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Civil) –CBCS 2021 Course

Program: B. Tech. Civil

Sem: IV

CBCS2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1.		Vector Calculus and Differential equations	3	-	-	60	40	--	--	--	100	3	--	--	3
2.		Open Channel flow and Hydraulic Machinery	4	2	-	60	40	--	50	--	150	4	1	--	5
3.		Geomechanics	4	2	--	60	40	--	50	--	150	4	1	-	5
4.		Analysis of Determinate Structures	3	-	1	60	40	--	--	--	100	3	-	1	4
5.		Planning & Management of Construction Projects*	4	2	-	60	40	--	50	--	150	4	1	-	5
6.		Vocational Course-II :Plumbing Engineering	--	--	-	-	-	--	50	--	50	--	2	-	2
7.		Construction Practices in Civil Engineering	-	4	-	-	-	50	--	--	50	--	2	-	2
8.		Civil Engineering Software – III (Hecras)	--	4	--	-	-	--	50	--	50	-	2	-	2
9.		Social Activity- I	--	--	--	-	-	--	--	--	--	-	-	-	2
		Total	18	14	1	300	200	50	250		800	18	9	1	30
		Disaster Management **				100									

*Industry Taught Course – II

**Mandatory Audit course with 100 marks end semester examination

Programme: B. Tech. (Civil) Sem – III (2021)

COURSE: MECHANICS OF SOLIDS		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 03 Hours / Week Tutorial: 01 Hour / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03 Tutorial: 01
Practical: 02 Hours / Week	Term Work: 25 Marks	TW :01
Course Pre-requisites: The students should have knowledge of		
1	Statics and Dynamics	
2	Mathematics-Algebra, Geometry, Concept of differentiation and integration	
Course Objective:		
	The student should be able to calculate stresses developed in the material.	
Course Outcomes: The student will be able to		
1	determine axial stresses in the member.	
2	draw shear force and bending moment diagram for determinate beams.	
3	calculate bending stresses and deflection of beam.	
4	calculate shear stresses due to shear force and torsion.	
5	calculate critical load on column.	
6	compute principal stresses using analytical and graphical method.	
Course Content:		
Unit-I	<p>Simple Stresses and Strains Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law;</p> <p>Stresses due to Axial Load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section</p>	(06Hrs)
Unit-II	<p>Shear Force and Bending Moment Diagram Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments Bending moment and loading diagram from given shear force diagram.</p>	(06 Hrs)
Unit-III	<p>Bending Stresses and Deflection of Beam Bending Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section.</p> <p>Deflection of Beams: Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve.</p>	(06 Hrs)

Unit-IV	Direct and Torsional Shear Stress Shear Stresses: Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section Torsion of Circular Shafts: Theory, assumptions and derivation of torsional formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in solid, hollow, solid, homogeneous and composite cross sections subjected to twisting moment.	(06 Hrs)
Unit-V	Combined Stresses and Axially Loaded Column Direct and bending stresses for eccentrically loaded short column, Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections. Axially loaded columns: concept of critical load and buckling, Euler's formula for buckling load with hinged ends, concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula	(06 Hrs)
Unit-VI	Principal Stresses and Principal Planes Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion.	(06 Hrs)
Internal Assessment:		
	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV, V, VI
Assignments: Students should complete assignments from		
1	Calculate the different stresses for determinate and indeterminate members.	
2	Draw the shear force and bending moment diagram for different types loading acting on simply supported, compound and cantilever beam.	
3	Draw the bending stress distribution diagram for different cross section.	
4	Determination of slope and deflection of beam for various types of loading acting on beam.	
5	Draw the shear stress distribution diagram for different cross section.	
6	Calculate load carrying by column by using Euler's and Rankine Theory.	
7	Calculate principal stress, normal and tangential stress by analytical and graphical method.	
Term Work: The term-work shall consist of Minimum Eight experiments from list below.		
1	Tension test on mild steel	
2	Tension test on tor steel	
3	Direct Shear (Single & Double) test on mild steel	
4	Bending test on timber	
5	Torsion test on mild steel	

6	Impact tests (Izod & Charpy) - Mild Steel, Aluminium, Brass, Copper
7	Hardness test (Rockwell)- mild steel, aluminium, brass copper
8	Compressive Strength of brick
9	Construction of Mohr's Circle for calculation of principal stresses.
10	Development of an excel sheet for calculation of stresses at a point in cross section for given loadings.
11	Development of an excel sheet for calculation of principal stress at a point.

Reference Books:

1	Beer F.P. and Johnston E.R., "Mechanics of Materials", McGraw Hill Publication
2	Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication
3	Gere J.M. & Timoshenko S.P., "Mechanics of Materials", CBS Publishers & Distributors
4	Bansal R.K., "Strength of Materials", Laxmi Publications.
5	Ramamrutham S. "Strength of Materials" Dhanapat Rai Publications.
6	Bhavikatti S.S "Strength of Materials", New Age Publications

Topics for project based Learning for Mechanics of Soilds

1.	Draw the stress strain curve of mild steel and tor steel by using excel.
2.	Collect the IS code related to testing of material and specifications for any five materials.
3.	Prepare the chart for various types of stresses and strain with suitable example.
4.	Development of an excel sheet for calculation of Elastic constants, Thermal stresses with suitable example.
5.	Market survey for structural materials (at least ten materials)
6.	Prepare the chart for Shear force and bending moment diagram for simply supported beam (At least Five problems with different types of loading)
7.	Prepare the chart for Shear force and bending moment diagram for Cantilever beam (At least Five problems with different types of loading).
8.	Prepare the chart for Shear force and bending moment diagram for overhanging beam (At least Five problems with different types of loading)
9.	Development of an excel sheet for calculation of bending stresses for different sections. (At least three problem)
10.	Prepare the chart for derivation of flexural formula and bending stress distribution diagram for different section.
11.	Prepare the chart for deflection and slope of simply supported beam (at least five problems with different types of loading)
12.	Prepare the chart for deflection and slope of cantilever beam (at least five problems with different types of loading)
13.	Prepare the chart for derivation of shear stress formula and shear stress distribution diagram for different section.
14.	Prepare the chart for derivation of torsional formula.
15.	Development of an excel sheet for calculation of direct and bending stress in section. (At least three problem)
16.	Prepare the chart for core section (square, rectangular, circular, hollow rectangular and hollow circular).
17.	Development of an excel sheet for load carrying capacity of column by using Euler's theory. (At least three problem)
18.	Collect the photographs along with justification of (a) failure of short and long column (b) Failure of beam in bending and shear.
19.	Draw the Mohr's circle (at least five problems)

20. Prepare the chart for Calculation of normal and shear stress by using graphical method.

Programme : B.Tech. (Civil) Sem. – III (2021)

Course: Construction Equipment & Methods

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS: 05</u>
Theory: 04 Hours / Week	Semester End Examination: 60 Marks	Theory: 04
Practical: 02 Hours / Week	Internal Assessment: 40 Marks	
	Term Work: 25 Marks	Term Work: 01

Course Pre-requisites: The students should have knowledge of

- 1 Building Construction Practices, Building Planning & Design.
- 2 Engineering Economics.
- 3 Concrete Technology.

Course Objective:

Students should get knowledge of Construction Operation Equipment & different methods of advanced construction techniques, tunneling, concreting & dewatering.

Course Outcomes:The student will be able to

- 1 explain various advanced construction techniques.
- 2 apply different construction techniques for underwater construction.
- 3 identify and find output of earth moving equipment.
- 4 describe hoisting & conveying equipment.
- 5 Understand equipment key features, cost and find out its performance.
- 6 describe dewatering, paving equipment & concrete pumps

Course Content:

Unit-I	Advanced Construction Techniques: Construction - Light, Medium & Heavy duty. Launching of Girders, Precast Techniques, Tunnel Driving techniques, Tunnel boring machines (Open & Shield), Road Headers & Boomers, Shotcreting & Guniting. Trenchless Technology, Micro Tunneling. Pneumatic Drilling equipments. Drill & Blast method.	(08 Hrs)
Unit-II	Under Water Construction: Cofferdams Dams & Caissons – Definition, Classification & its use. Dredging Techniques. Construction under deep water (Tremie Method). Classification & different types of Piles, Sheet Piles, Pile driving techniques, Negative skin friction. Use of special types of Formwork. Jetties.	(08 Hrs)
Unit-III	Earth Work Machineries: Fundamentals of Earth work operations. Earth Moving Operations - Types of Earth Work Equipment -Tractors, Motor Graders, Scrapers, Front end loaders – Dozer, Excavators, Rippers, Front Shovel, Back Hoe, Loaders, trucks, dumpers and hauling equipment, Compacting Equipment - Tamping Rollers, Smooth Wheel Rollers, Sheepsfoot Roller, Pneumatic-tyred Roller, Vibrating Compactors, Vibrocompaction methods. Finishing equipment.	(08 Hrs)
Unit-IV	Hoisting & Conveying Equipments: Hoisting & Transporting equipment; types (Derrick, Tower & Mobile), factors affecting for selection. Conveying equipments-: belt, apron, vibrating, pneumatic, flight & spiral or screw conveyors. Hauling	(08 Hrs)

- equipments. Crushers & its types.
- Unit-V Equipment Management & Economics:** (08 Hrs)
 Planning Process of Equipment. Identification – Selection of Equipment - Maintenance Management. Cost Control of Equipment. Safety Management, Equipment cost -: Ownership cost, Operating Cost, Equipment Life and Replacement Analysis. Depreciation Analysis, Safety Management of equipments.
- Unit-VI Dewatering, Paving Equipments & Concrete Pumps:** (08 Hrs)
 Dewatering Techniques; Electro-osmosis method, Well Point System, Paving Equipments; Types, Uses. Asphalt Pavers, Slip Form Pavers, Concrete Pavers. Pumps; Types & Uses. Pumps for concreting.

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Assignments –

- Write short notes on -:
 - Shotcreting
 - Guniting
 - Trenchless technology
 - Drill & Blast method
 - Pneumatic drilling equipments
- Define & differentiate between Cofferdams & Caissons & briefly explain piles & its Classification.
- List out difference between crawler and pneumatic type of wheels?
- Compare belt conveyor with other types of conveyors?
- What are the various equipments used for compacting? Explain them.
- Explain launching of girders.
- What are the different types of equipments used for trenching and tunneling?
- What is Well point system?
- Describe various methods for tunneling in hard rocks.

Term work - :

- Collection of pamphlets and information regarding various construction techniques equipment (Information pertaining to the following aspects should be collected)
 - Types, Different makes of the equipment
 - Useful Life and area of use
 - Equipment performance data
- In context of tunneling, enlist and explain different tunnel driving techniques & tunnel boring machines.

3. Classify, discuss briefly various earth work machineries (any five) & factors affecting in selection including their economics.
4. Classify & explain various hoisting & conveying equipment. Discuss in detail about factors affecting in selection of them & its economics.
5. Explain crushers & its types in detail.
6. Enlist & explain with neat diagrams, different dewatering techniques (electro-osmosis method, well point system).
7. Write a brief note on Pumps & its types. Discuss in detail about various pumps used for concreting.
8. Prepare a Power Point presentation (P.P.T.) on any of the topic of your choice from the entire syllabus after getting approval of topic from your subject teacher.
9. Site Visit report to be prepared after visiting the site covering topics mentioned in syllabi.

Textbooks -:

1. Peurifoy, R., Schexnayder, C., Shapira, A., & Schmitt, R. (2011). "Construction Planning, Equipment, and Methods" (8th ed.). McGraw-Hill.
2. Gransberg, D. D., Popescu, C. M., & Ryan, R. C. (2006). "Construction equipment management for engineers, estimators, and owners" (2nd edition). CRC Press.

Reference Books:

1. Mahesh Verma, "Construction Equipment & Planning & Application", Metropolitan Book Company Private Ltd., New Delhi.
2. Peurifoy Robert L., William B. Ledbetter, "Construction Planning Equipment Methods", McGraw Hill Book Company.
3. Russel James E., "Construction Equipment", Reston Publishing Company.
4. Shetty M.S., "Concrete Technology – Theory & Practice", S. Chand & Company Private Limited.
5. S.C. Sharma & Khanna, "Construction Equipments & its Management",
6. V.R. Phadke "Construction Machinery & Works Management".
7. Day, D. A., & Benjamin, N. B. H. (1991). "Construction equipment guide" (2nd edition). John Wiley & Sons.
8. Harris, F. (1994). "Modern construction and ground engineering equipment and methods" (2nd ed.). Pearson Longman.
9. Nunnally, S. W. (2011). "Construction methods and management" (8th edition.). Prentice Hall.

Project Based Learning topics - :

1. Construction Technology used in defense war fields.
2. Low cost housing - Construction of a low cost house.

3. Tunnel design.
4. Use of dampers in high rise buildings
5. Construction of Overhead Bridge process. (Case study).
6. The invention of slip form technique and cost savings (case study).
7. PILE Construction Technique.
8. Construction techniques used in Empire State Building and Burj Khalifa.
9. For the construction project what capital cost has to be taken in consideration (Case study)?
10. List out some of the software used in the construction sector to estimate cost and monitoring expenses of machineries and perform one application of it on construction site/project?
11. What are the health and safety duties in relation to concrete pumping work? What is to be involved in managing risks associated with concrete pumping?
12. What are the parameters for Selection of Tunneling Method and Parameters Effecting Ground Settlements
13. How to choose the right conveyor system? How much do conveyor systems cost?
14. Why is electro-osmosis (dewatering) so effective in clayey and heterogeneous soils. Explain with a case study?
15. Explain methods of launching girders at a metro rail site in India.
16. How do real estate development and precast concrete elements fit together? Are there any limitations regarding the construction of houses?
17. Construction of Emergency Temporary structures and facilities (Jumbo COVID hospital etc.).
18. What are the hazards associated with construction of cofferdam?
19. What are the different methods of blasting?
20. Explain Mechanical Dredging Operations for Removal of Reservoir Sediment.

Programme: B. Tech (Civil) Sem – III (2021)

COURSE: FLUID MECHANICS		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 04 Hours / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
Practical: 02 Hours / Week	Term Work & Oral : 50 Marks	Term Work & Oral: 01
Course Pre-requisites: The students should have knowledge of		
1	Engineering Mathematics	
2	Engineering Physics	
Course Objective:		
	To make the student understand the scope and application of Fluid Mechanics	
Course Outcomes: The student will be able to		
1	describe basic properties of fluids and measure its properties in static conditions	
2	apply knowledge of fluid kinematics and dynamics conditions.	
3	analyse physical phenomenon dimensionally	
4	explain laminar flow and flow through pipes.	
5	explain of boundary layer theory.	
6	describe turbulent flow	
Course Content:		
Unit-I	Properties of Fluids & Statics : Scope and application of fluid mechanics, Physical properties of fluids, Newton's Law of Viscosity, Dynamic & Kinematic Viscosity, Classification of fluids. Statics: Pressure density height relationship & Measurement, Hydrostatic pressure on a plane, Centre of pressure, Buoyancy, Stability of floating bodies, Metacentre and Metacentric height.	(08 Hrs)
Unit-II	Kinematics Types of flow, path lines and streak lines, stream lines, Stream Tube, Continuity Equation in 1-D and 3-D, Velocity potential, Stream functions, Circulation and Vorticity, Concept and Application of Flow Net.	(08 Hrs)
Unit-III	Energy Relationships Derivation of Bernoulli's Equation from Newton's 2nd Law , Limitations, Modified form of Bernoulli's Equation, Total energy and Hydraulic Grade line, Impulse momentum equation..	(08 Hrs)
Unit-IV	Dimensional Analysis and Model Studies Dimensional homogeneity, important dimensionless parameters, Dimensional analysis using Buckingham's theorem, Model studies, Similitude, Model laws, Types of models.	(08 Hrs)
Unit-V	Fundamental of Pipe Flow & Boundary layer theory Reynolds experiment, Classification of Flows based on Reynolds Number, Moody's Diagram, Laminar flow in circular pipe, Hagen Poiseuille's Equation, Introduction to Boundary Layer Theory, Concept of boundary layer, Development of Boundary layer over a flat plate, Laminar and transitional boundary layer, laminar sub layer, General characteristic of	(08 Hrs)

	boundary layer, Boundary layer thickness, Velocity distributions within boundary layer	
Unit-VI	Turbulent flow & Pipe Flow Problems Characteristics of turbulent flow- Instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, Darcy- Weisbach equation, Flow through pipes: Energy losses in pipe flow, parallel and series pipes, Equivalent Pipe Concept, Pipe network Analysis, Siphons, Hydraulic transmission through pipes, three reservoir problems.	(08 Hrs)
Internal Assessment:		
	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV, V, VI
Assignments: Students should complete assignments from		
1	Solution of numerical problems asked in recent three years of BVU question papers.	
2	Solution of questions asked in recent three years BVU question papers	
3	Report of new topic being discussed in reputed research journals related to fluid mechanics	
4	Mini projects such as collection of information, Brochure, Data, on a topic related to fluid mechanics.	
5	Writing of industrial applications of various topics of syllabus.	
6	Design of new experiments related to fluid mechanics.	
7	Collection of two fluid mechanics NPTEL videos and demonstration of it.	
8	Collection of information about fluid mechanics equipment's /machinery/materials related to fluid mechanics.	
9	Collection of information about fluid mechanics phenomenon and its explanation.	
10	Collection of data of different fluids with reference to their properties.	
Term Work: The term-work shall consist of Minimum Eight experiments from list below.		
1	Determination of Viscosity	
2	Study of Pressure Measuring Devices	
3	Study of Stability of Floating Bodies	
4	Verification of Bernoulli's Theorem.	
5	Calibration of C_d of Venturimeter	
6	Calibration of C_d of Orifice	
7	Calibration of C_d Notch	
8	Study of Laminar flow Using Heleshaw's Apparatus	
9	Study of Laminar flow Using Reynold's Apparatus	
10	Design of Venturimeter (As per IS Code)	
11	Design of Weir (As per IS Code)	
Oral: The Oral examination will be based on above term work and course content.		
Reference Books:		
1	Garde R. J. and Mirajgaonkar "Engineering Fluid Mechanics" ScitechPulication	
2	C.P.Konthadraman "Fluid Mechanics And Machinery" New Age Publications	
3	S. Ramamurtham "Hydraulics and Fluid Mechanics and Fluid Machines" Dhanpat Rai Publishing Company	
4	R. K. Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publications	
5	R.K. Rajput "Fluid Mechanics" S Chand Publications	

6	Garde R. J. and Mirajgaonkar “Fluid Mechanics Through Problems” , New Age International New Delhi
7	Modi P.N. and Seth S.M. “ Fluid Mechanics” Standard Book House
Topics for Project Based Learning for Fluid Mechanics	
1	Determining physical properties of 3 different Fluids. (Specific Weight, Mass Density, specific volume , specific gravity)
2	Determining kinematic viscosity at different temperatures of 3 different fluids (Lubricating oils, Cooking oil,)
3	Collection of Newtonian fluid, non Newtonian Fluid, Ideal Plastics and Thixotropic Fluids one each and studying properties of fluids.
4	Based on pressure density height relationship, prepare a sheet showing water pressure on wall of dam of different heights.
5	Prepare a model of a ship showing different Metacentric heights
6	Prepare a model ship showing stable, unstable equilibrium (C.G. and C.P.)
7	Demonstrate and verify Bernoullies theorem using other equipments (Wind Tunnel, etc.)
8	Collection of information and presentation of working of any hydraulic equipment (JCB, Earth moving machinery etc.)
9	Calculation of Energy losses in pipe flow for different flow conditions.
10	Calculation of Coefficient of discharge of Venturimeter by taking 10 different flow readings.
11	Calculation of Coefficient of velocity of Venturimeter by taking 10 different flow readings.
12	Calculation of Coefficient of discharge of Notch by taking 10 different flow readings.
13	Preparing different shaped acrylic notches to measure discharge and calibrating it.
14	Calculate Energy losses in domestic pipe line with given data.
15	Preparing a acrylic model for a dam and testing it.
16	Find Metacentric Height of body containing liquid. Discuss the difference with reference to normal case.
17	Prepare a model Orifice Meter device in a UPVC pipe length.
18	Prepare a model of U Tube manometer
19	Prepare a model of U Tube inclined Manometer
20	Prepare a model of U Tube Micromanometer

Programme: B. Tech (Civil) Sem – III (2021)

COURSE: ECONOMICS & FINANCE		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 03 Hours / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory:03
Course Pre-requisites: The students should have knowledge of		
1	Construction Design & Drawing	
2	Basic Mathematics	
Course Objective:		
	To make students understand engineering economics and financial management.	
Course Outcomes: The student will be able to		
1	explain the concept of Engineering Economics.	
2	estimate time value of money.	
3	select best project.	
4	find out depreciation cost.	
5	prepare balance sheet.	
6	generate finance for organization.	
Course Content:		
Unit-I	Engineering Economics: Introduction, Definition of Economics, Importance of Engineering economics, basic economics concept-Human wants. Utility, value, cost, price, capital, wealth, equilibrium etc. law of demand, elasticity of demand. The law of supply. Factors influencing production: land, labour, capital and organization	(06 Hrs)
Unit-II	Cash Flow: Basic principles, time value of money, cash flow diagram. Equivalence single payment in the future, present payment compare to uniform series payment. Future payment compare to uniform series payment.	(06 Hrs)
Unit-III	Project Economics and Analysis: Comparison of alternatives, net present value present, future and annual worth method of comparing alternatives, internal rate of return. Break even analysis. Benefit cost ratio	(06 Hrs)
Unit-IV	Depreciation and Value Engineering: Depreciation and methods of depreciations. Inflation, value engineering and value analysis	(06 Hrs)
Unit-V	Financial Management: Financial management, construction accountancy charts of accounts, financial statement, profit and loss account, balance sheet of construction Industry.	(06 Hrs)
Unit-VI	Project Budgeting: Types of capitals, fix and working capital, debentures, shares, public deposits. Forms of foreign capital, money and capital market in India. New economic policy. Role of financial institutions in economic development,	(06 Hrs)

Internal Assessment:		
	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV, V, VI
Assignments: Students should complete assignments from		
1	Preparation of cash flow diagrams and finding out time value of money	
2	Comparison of different projects by different methods	
3	Benefit cost analysis of project	
4	Determination depreciation value of equipment	
5	Preparation of balance sheet for project	
6	Assignment on value analysis	
7	Numerical on engineering economics	
Reference Books:		
1	Blank, L. T. and Tarquin, A. J., “Engineering Economy”, Fourth Edition, WCB/McGraw-Hill, 1998	
2	Bose, D. C., “Fundamentals of Financial management”, 2nd ed., PHI, New Delhi, 2010.	
3	Boyer, C. B. and Merzbach, U. C., “A History of Mathematics”, 2nd ed., John Wiley & Sons, New York, 1989	
4	Gould, F. E., “Managing the Construction Process”, 2nd ed., Prentice Hall, Upper Saddle River, New Jersey, 2002.	
5	Gransberg, D. G., Popescu, C. M. and Ryan, R. C., “Construction Equipment Management for Engineers, Estimators, and Owners, CRC/Taylor & Francis, Boca Raton, 2006.	
6	Harris, F. ,McCaffer, R. and Edum- Fotwe, F., “Modern Construction Management”, 6th ed., Blackwell Publishing, 2006.	
7	Jha, K. N., “Construction Project Management, Theory and Practice”, Pearson, New Delhi, 2011.	
8	Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P., “Engineering Economic Analysis”, Oxford University Press, 2010	
9	Ostwald, P. F., “Construction Cost Analysis and Estimating”, Prentice Hall, Upper Saddle River New Jersey, 2001	
10	Peterson, S. J., “Construction Accounting and Financial Management”, Pearson Education Upper Saddle River, New Jersey, 2005	
Topics for project-based Learning for Economics and finance.		
1. The impact of fiscal deficit on economic performance in developing countries. A case study of India.		
2. The effect of taxation on the Indian economic growth.		
3. Privatization of public enterpriser and its implication on economic policy and development.		
4. The impact of capital market on the economic growth in India.		
5. The role of Indian stock exchange in industrial development.		
6. The impact of foreign direct investment on the Indian economy.		
7. Foreign direct investment and employment generation in India.		

8. The role of small business in poverty alleviation.
9. Demand and its determinants.
10. Working capital management.
11. Infrastructure and economic development.
12. Project on supply and its determinants.
13. Depreciation
14. Project selection methods.
15. Time value of money
16. Financial management.
17. New economic policy of India.
18. Forms of foreign capitals.
19. Instrument in capital market (shares).
20. Money Market.

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COURSE: CONCRETE TECHNOLOGY		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 04 Hours / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory :04
Practical: 02 Hours / Week	Term Work & Oral: 50 Marks	TW & OR: 01
Course Pre-requisites: The students should have knowledge of		
1	Building Materials	
2	Fundamentals of Civil Engineering	
Course Objective:		
	The student should know qualities & properties of concrete.	
Course Outcomes: The student will be able to		
1	test ingredients of concrete	
2	measure workability of concrete.	
3	measure strength of hardened concrete.	
4	describe durability of concrete	
5	apply special concreting techniques	
6	design of concrete mix	
Course Content:		
Unit-I	Constituent of Concrete: Cement - Chemical composition, hydration, heat of hydration, hydrated structure, types of cement, testing of cement as per Indian standard. Aggregates - Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, various grading, and grading requirements, sampling & testing as per Indian Standards. Water - General Requirements & limiting values of impurities.	(08 Hrs.)
Unit-II	Fresh concrete: Methods of mixing, transporting, and placing of concrete. Workability – Definition and requirement, factors affecting workability, various tests as per IS and ASTM. Segregation and bleeding, stiffening, re-tempering. Curing: necessity and various methods, micro-cracking. Admixture for concrete.	(08 Hrs.)
Unit-III	Hardened concrete: Compressive and tensile strength and their relationship, tests as per IS and ASTM. Factors affecting strength – water cement ratio, gel space ratio, aggregate cement ratio, properties of ingredients, effect of age, maturity, aggregate cement-paste inter-face, various finishes of concrete. Introduction to aspects of elasticity, shrinkage, and creep. Tests for strength of concrete: Destructive, semi destructive, and non-destructive tests with their limitations, test methods as per IS Code.	(08 Hrs.)

Unit-IV	Durability and permeability of concrete: Definitions, causes, carbonation, cracking Concrete in Aggressive Environment: Alkali – Aggregate Reaction, Sulphate Attack, Chloride Attack, Acid Attack, Effect of Sea Water, Special Coating for Water Proofing, Sulphate Chloride and Acid Attack.	(08 Hrs.)
Unit-V	Special Concrete: Behavior and characteristics of high strength concrete, High Performance Concrete, Fiber Reinforced Concrete, Mass Concreting, Light Weight Concrete, and Concrete for Precast. Special concreting techniques: Pumped concrete, concrete, underwater concrete, pre-placed concrete, vacuum dewatered concrete, hot and cold weather concreting, Ready mix concrete.	(08 Hrs.)
Unit-VI	Concrete Mix Design: Principles of Mix Proportioning, Probabilistic Parameters, Factors Governing Selection of mix. IS Method of Concrete Mix Design, Variability of Test Results, Acceptance Criteria, Various IS Code Provisions.	(08 Hrs.)
Internal Assessment:		
	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV, V, VI
Assignments: Students should complete assignments from		
1	Assignment based on Unit- I	
2	Assignment based on Unit- II	
3	Assignment based on Unit- III	
4	Assignment based on Unit- VI	
5	Assignment based on Unit- V	
6	Assignment based on Unit- VI	
Term Work: The term-work shall consist of from list below.		
A	Test on Aggregate (Minimum 4)	
1	Moisture content, Water Absorption	
2	Specific Gravity of Aggregate	
3	Fineness Modulus of Aggregate	
4	Aggregate Impact Test	
5	Aggregate Crushing Test	
6	Flakiness Index, Elongation Index	
B	Test on Cement (Minimum 3)	
1	Fineness of Cement	
2	Standard consistency and Setting time of Cement.	
3	Compressive strength of Cement	
4	Soundness of Cement	
C	Tests on Concrete (Minimum 3)	
1	Effect of admixture on workability of concrete	
2	Compressive Strength of Concrete	
3	Flexural strength of concrete	

4	Rebound Hammer Test
Oral: The Oral examination will be based on above term work and course content.	
Reference Books:	
1	M S Shetty; 'Concrete Technology', S. Chand Publication New Delhi
2	P Kumar Mehta, 'Monteiro; Concrete Technology', Indian Concrete Institute
3	A. M. Neville; 'Properties of Concrete', Pearson Education
4	A R Santhakumar; 'Concrete Technology', Oxford University Press
5	M L Gambhir; 'Concrete Technology', Tata McGraw Hill
6	IS 456-2000 Indian Standard Plain and Reinforced Concrete - Code of Practice
7	IS 269-1989 Indian Standard Ordinary Portland Cement, 33 Grade — Specification
8	IS 516-1959 Indian Standard Methods of Tests For Strength of Concrete
Topics for Project based learning:	
1.	Market survey, report writing and cost analysis to select types of cements for various construction works.
2.	Site visit to RMC plant (nearby), observations, records and field test of cement.
3.	Conduct various tests as per IS in laboratory on aggregates with reference to syllabus
4.	Site visit to under construction to collect detail information about the ingredients of concrete mix.
5.	Market survey, report writing and cost analysis of Aggregates for various construction works.
6.	Write report on Principal concrete properties affected by the properties of aggregates
7.	Writing complete report and procedure of fresh concrete.
8.	Site visit to nearby RMC plant and draw flow chart.
9.	Conduct various tests on workability of Concrete with reference to syllabus.
10.	Site visit to under construction to observe the quality of fresh concrete.
11.	Market survey of various admixtures used in fresh concrete and writing proper report on each admixture.
12.	Report writing and tests on different grades of concrete.
13.	Report writing and non-destructive tests on hardened concrete of different types.
14.	Preparing Report on all types of Destructive Test conducted in Laboratory.
15.	Report on conducting various tests on Durability and Permeability of Concrete.
16.	Report writing and tests on effect on concrete of Aggressive Environment.
17.	Report on use of different types of admixtures on different grades of concrete.
18.	Site visit and market survey report writing on Special type of Concreting.
19.	Report writing on effects of Mix Design on Special Concreting.
20.	Preparation of Mix Design for Special Type of Concrete and visiting site and getting all information of mix design used on actual site.

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COURSE: COMPUTER AIDED BUILDING PLANNING AND DESIGN (REVIT, BIM)		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical: -- Hours / Week	Term Work & Oral: 50 Marks	TW & OR: 02
Course Pre-requisites: The students should have knowledge of		
1	Building Planning and Design	
2	AutoCAD 2D	
Course Objective:		
	The student should be able to prepare building models using Autodesk Revit	
Course Outcomes: The student will be able to		
1	Prepare Architectural working drawing	
2	Draw and modify in Revit Architecture	
3	Edit and modify elements using modify tools	
4	Prepare models of building components	
5	Prepare 3d drawing rendering of 3d models	
6	Explain use of Building Information Modelling and Prepare cost estimating	
Course Content:		
Unit-I	Introduction to BIM and Autodesk Revit: Overview of Revit Architecture Interface, Starting Projects, Viewing Commands, Introduction to Architectural working drawing, Representing Standard base 2D drafting	(8 Hrs)
Unit-II	Basic Drawing in Revit: Drawing Elementary CADD command - Line, Polyline, Polygon, Circle, Polyline, arc, ellipse, Text- Single Text, Multitext, Dtext, Using General Drawing Tools, Editing Elements using tools	(8 Hrs)
Unit-III	Using Modify Tools in Revit: Using General Drawing Tools, Editing Elements using tools, Working with Basic Modify Tools-Erase, Move, Copy, Mirror, Offset, Scale, Stretch, Chamfer, fillet & explode, Working with Additional Modify Tools	(8 Hrs)
Unit-IV	Modelling in Revit: Modelling Walls, Doors and Windows, Floors, Stairs, Railing, Preparing utilization of architectural working drawing	(8 Hrs)
Unit-V	Model Rendering: Practice on 3D drawing & designing, Rendering of 3D model (Light, Material & Landscaping)	(8 Hrs)
Unit-VI	Introduction to BIM: Software Tools, BIM and Project Delivery, BIM and Cost Estimating	(8 Hrs)
Term Work: The term-work shall consist of-		
1	Prepare basic 2D plan using Elementary CADD command	
2	Creating Sheets and adding floor plans and scaling respectively	
3	Prepare different items of building using different materials	
4	Prepare Detail layout plan in Revit	

5	Creating rendering Images and exporting to JPEG
6	Prepare Cost Estimate for two storey Building
<i>Reference Books:</i>	
1	Daniel John Stine, “Autodesk Revit for Architecture Certified User Exam Preparation (Revit 2019 Edition)”, .
2	Prof. Sham Tickoo, “Exploring Autodesk Revit 2021: For Architects and Building Designers”, BPB Publications.
3	Eddy Krygiel, “Mastering Autodesk Revit Architecture”, Sybex Publication.

Programme: B. Tech. (Civil) Sem – III (2021)

COURSE: CIVIL ENGINEERING SOFTWARE – II (AUTOCAD 3D)		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical: 04 Hours / Week	Term Work & Oral: 75 Marks	TW&OR :02
Course Pre-requisites: The students should have knowledge of		
1	Building Planning and Design	
2	Proficiency in producing 2D drawings in AutoCAD	
Course Objective:		
	The student should be able to prepare 3D models of construction projects	
Course Outcomes: The student will be able to		
1	draw various Engineering drawing using AutoCAD 3D	
2	draw various 3D elements of a building from 2d profiles.	
3	draw various 3D elevation and sections of the building.	
4	draw and explain various modelling concepts of building construction and building drawing by using AutoCAD 3D.	
5	draw using different types of materials	
6	Render 3D models and scale printing of 3D models	
Course Content:		
Unit-I	Introduction to 3D Modelling: Introduction to AutoCAD 3D, Creating solid primitives, Mesh primitives Working in 3D, Commands for Editing in AutoCAD 3D	(8 Hrs)
Unit-II	Modelling Workflow: Creating models from 2D profiles, Creating composite models	(8 Hrs)
Unit-III	Editing Models: Adding detail to your solid models, Editing solid models-Walls, Windows, Door etc	(8 Hrs)
Unit-IV	Visualization: Using visual styles, Using lights for Different view angles	(8 Hrs)
Unit-V	Visualization: Using materials for different Items- Walls, Flooring, Door, Windows, Paints etc.	(8 Hrs)
Unit-VI	AutoCAD 3D Model Rendering Process, Scale Printing of 3D Models in AutoCAD	(8 Hrs)
Term Work: The term-work shall consist of -		
1	Preparation of 3D solid Primitives & Mesh Primitives	
2	Preparation of 3D models from 2D profiles	
3	AutoCAD 3D Drawing of a plan, elevation, and section of small building.	
4	Preparation of AutoCAD 3D views of small building.	
5	Use of different Materials for Items.	
6	3D Model rendering & Scale Printing of models.	

	Oral: The Oral examination will be based on above term work and course content.
	<i>Reference Books:</i>
1	Goerge Omura “Mastering AutoCAD 2018 and AutoCAD LT 2018, Sybex
2	James A. Leach “AutoCAD 2018 Instructor perfect paperback,SDC Publications
3	Cheryl R. Shrock “Beginning AutoCAD Exercise workbook 2018,Industrial Press Inc., U.S.
4	James A. Leach , Shawna Lockhart, “AutoCAD 2018 Instructor”, SDC Publications

Programme: B. Tech. (Civil) Sem – IV (2021)

Course: Vector Calculus and Differential equations		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 3
Course Pre-requisites: The students should have knowledge of		
1	differentiation, integration, and differential equation	
2	basic knowledge of vector algebra	
Course Objectives:		
	To form mathematical model and solve mathematical problem in Civil Engineering	
Course Outcomes: The student will be able to		
1	Form mathematical modelling of systems using differential equations and solve the differential equations	
2	Apply mathematical modeling to physical systems using ordinary differential and evaluate particular solution.	
3	Apply mathematical modeling of systems using partial differential equations and solve the partial differential equations	
4	Apply Vector differentiation and integration that finds applications in solid mechanics, fluid flow, heat problems and potential theory etc.	
5	Apply vector integral calculus to solve various problems in Civil Engineering.	
6	Analyze the numerical data by applying statistical methods	
Course Content:		
UNIT - I	Linear Differential Equations (LDE) Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE.	(06 Hrs.)
UNIT - II	Applications of DE Modeling of problems on bending of beams, whirling of shafts and mass spring systems. Applications of ODE to problems of Civil and allied engineering	(06 Hrs.)
UNIT - III	Applications of PDE Solution of Partial Differential Equations (PDE): Wave equation, 1D and 2D-Heat equation by using Separation of variables, Applications of PDE to problems of Civil and allied engineering	(06 Hrs.)
UNIT - IV	Vector Differential Calculus Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities	(06 Hrs.)
UNIT - V	Vector Integral Calculus	(06 Hrs.)

	Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem. Applications to problems in Fluid Mechanics, Continuity equations, Streamlines, Equations of motion, Bernoulli's equations	
UNIT - VI	Statistics and Probability Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates. Theorems and Properties of Probability, Probability Density Function, Probability Distributions: Binomial, Poisson, Normal and Hypergeometric; Test of Hypothesis: Chi-Square test.	(06 Hrs)
Unit Tests:		
Unit Test I: Unit I to Unit III		
Unit Test II: Unit IV to VI		
Textbooks:		
1. Peter V. O'Neil Advanced Engineering Mathematics by (Cengage Learning).		
2. Erwin Kreyszig Advanced Engineering Mathematics by (Wiley Eastern Ltd.).		
Reference Books:		
1. B.V. Raman Engineering Mathematics by Tata McGraw-Hill.		
2. M. D. Greenberg Advanced Engineering Mathematics, 2E, by Pearson Education		
3. Wylie C.R. & Barrett L.C. Advanced Engineering Mathematics, McGraw-Hill, Inc.		
4. B. S. Grewal Higher Engineering Mathematics by Khanna Publication, Delhi.		
5. P. N. Wartikar & J. N. Wartikar Applied Mathematics Volumes I and II Pune Vidyarthi Griha Prakashan, Pune		
Project Based learning topics for Vector Calculus and Differential equations:-		
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable		
1. Method of variation of parameters		
2. Cauchy's linear differential equation		
3. Legendre's linear differential equation		
4. Bending of beam		
5. Mass spring system		
6. Wave equation		
7. One dimensional heat equation		
8. Laplace equation		
9. Directional derivative		
10. Curl and divergence		
11. Work done		
12. Gauss divergence theorem		
13. Stokes theorem		
14. Central tendency		
15. Measures of dispersion		

16. Skewness and kurtosis
17. Theoretical probability distributions

Programme: B. Tech. (Civil) Sem – IV (2021)

Course: Open Channel Flow and Hydraulic Machinery		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS:</u>
Theory: 04 Hours / Week Tutorial: 02 Hours/week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work & Oral : 50 Marks	Theory: 04 Term work & Oral :01
Course Pre-requisites: The students should have knowledge of		
1	Fluid Mechanics basics, Types of flows, friction.	
2	Basic knowledge of Water retaining structure like dam, weir etc. irrigation channel.	
3	Basic knowledge of Drag & lift, unsteady flow.	
4	Basic knowledge of Hydro power plant.	
5	Basic knowledge of pumps.	
Course Objective:		
To impart knowledge of open channel flows and hydraulic machinery to students.		
Course Outcomes: The student will be able to		
1	Design most efficient channel section, find critical depth of a flow.	
2	Understand and apply knowledge of various flow profile and their characteristics.	
3	Find energy dissipated in a hydraulic jump.	
4	Calculate forces on vanes for different conditions.	
5	Understand and apply knowledge of turbines.	
6	Understand and apply knowledge of pumps.	
Course Content:		
UNIT - I	Uniform Flow in Open Channels Basic Equations: Continuity Equation, Bernoulli's Equation, & Momentum Equation as applied to open channel one dimensional flow, Velocity distribution in open channel, Chezy's & Manning's formulae, factors affecting Manning's roughness coefficient, Normal depth, Conveyance Section factor, Most efficient channel section, Specific Energy, Specific Energy diagram, Depth-Discharge diagrams, alternate depths, Critical depth, Critical slopes, Froude number, Specific Force, Specific force diagrams, Conjugate depths, Depth-Discharge diagrams with respect to specific force.	(08Hrs)
UNIT - II	Gradually Varied Flow in Open Channels Gradually and rapidly varied flows, their examples, Basic assumptions in the derivation of GVF, Differential equations of GVF, Various GVF profiles, and their characteristics, Computations of GVF	(08Hrs)
UNIT - III	Rapidly Varied Flow Hydraulic Jump in Rectangular and Trapezoidal channels, Classification & Practical uses of Jump, Examples of occurrence of Hydraulic Jump, Conjugate Depths, Energy Dissipation in Hydraulic Jump, Location of Jump, Non Contact Flow measurement Devices for measurement of velocity and discharge in open Channels, Methods Stream gauging	(08Hrs)
UNIT - IV	Unsteady Flow Types, Flow through openings under varying head, Flow Compressibility, Celerity of Elastic Pressure Waves, Water Hammer Phenomenon, Rigid & Elastic water Columns Theories, Simple cases neglecting Friction, rapid acceleration of flow due to sudden opening of valve, surge tanks and their functions, Location and	(08Hrs)

	Classification. Fluid Flow around Submerged Bodies: Practical problems involving fluid flow around submerged bodies, Definition & Expression for Drag, lift, drag coefficient, Types of Drag.	
UNIT - V	Impact of Jet and Turbines Impact of Jet: Force Exerted due to impact of jet on stationary and moving flat and curved plates using linear momentum Principle, Principle of angular momentum, Euler's Momentum Equation for Turbines. Element of Hydropower plant, Hydraulic turbines, Heads & efficiencies, Governing of turbines, Design of Pelton Wheel, Cavitations in turbines, Performance of turbines, Prediction of performance in terms of unit quantities and specific quantities, specific speed.	(08Hrs)
UNIT - VI	Centrifugal Pump Theory of centrifugal pump, Centrifugal head due to rotation, Heads & efficiencies, .Design of Pumps Cavitations, Prediction of performance in terms of specific quantities, specific speed, characteristic curves.	(08Hrs)
Internal Assessment:		
	Unit Test -1	UNIT – I to III
	Unit Test -2	UNIT – IV to VI
Assignments (Any Six)		
1	Solve Four Numerical to find out Critical Depth.	
2	Solve Numerical on GVF to find out flow profiles	
3	Solve Numerical on Hydraulic Jump to find out dissipation of energy.	
4	Solve Numericals to find out forces on different types of vanes.	
5	Solve Numericals on design of Turbines.	
6	Solve Numericals on design of Pumps.	
7	Collection & Study of Information Brochure about different Hydraulic Machineries.	
8	Collection & Study of Information Brochure about Hydraulic Lab Supply Companies	
9	Solve Numericals of Drag & Lift	
Term Work (Any Eight)		
1	Flow around aerofoil.	
2	Flow around a Circular Cylinder.	
3	Impact of jet around flat / curved plate.	
4	Performance Curves of Hydraulic Turbine. Constant Head Characteristic Curve	
5	Characteristics of Centrifugal Pump.	
6	Uniform flow formulae of open channel.	
7	Velocity distribution in open channel flow	
8	Hydraulic jump as energy dissipater	
9	Characteristics of various GVF profiles	
10	Design of Hydraulic Centrifugal Pump	
11	Design of Hydraulic Turbine.	
12	GVF Computations by Direct Step Method	
13	Site Visit	
Oral: The Oral examination will be based on above term work and course content.		
Text Books:		

1	Garde R. J., Mirajgaonkar A. G., "Engineering Fluid Mechanics", Scitech Publication, Chennai
2	Rangaraju K. G., "Open Channel Flow", Tata McGraw Publication
3	Streeter Wylie, "Fluid Mechanics", Tata McGraw Publication
4	Subramanyam K., "Open Channel Flow", Tata McGraw Publication
5	Ven Te Chow, "Open Channel Hydraulics", Tata McGraw Publication
6	Zoeb Husain, Zaniel Alimuddin, "Basic Fluid Mechanics and Hydraulic Machines" BSP Books Pvt. Ltd.
Reference Books	
1	Fox, McDonald, Pritchard, "Fluid Mechanics SI Version" Willey Student Edition
2	Frank M. White, "Fluid Mechanics", McGraw Hills Series
3	C P Konthadraman, R Roodramoorthy, "Fluid Mechanics & Machinery" New Academic Science
Topics for Project Based Learning for Open Channel Flow and Hydraulic Machinery	
1	Prepare a model of Undershot wheel
2	Prepare a model of turbine with curved blades
3	Prepare a model of orifice meter in UPVC pipe
4	Prepare a model of Symmetric aerofoil and test it
5	Prepare a model of asymmetric aerofoil and test it.
6	Prepare a model of Prepare a model of reaction turbine.
7	Prepare a model with hemispherical cups
8	Prepare a smoke to visualize flow pattern around the aerofoil.
9	Prepare a aerofoil model wrapped with cotton fibers around it to visualize turbulent flow in wind tunnel.
10	Prepare a model of Venturimeter conforming to standards.
11	Prepare a flat plate and curved vane (outside) model to be tested in Impact of Jet Apparatus.
12	Prepare a U tube manometer
13	Prepare a U tube inclined manometer
14	Prepare a U tube micro manometer
15	Prepare a Inverted U tube manometer
16	Prepare a detailed drawing for making hydraulic bench consisting of Venturimeter, orifice meter, and head loss through pipe fittings experiments.
17	Locate separation point of an aerofoil experimentally.
18	Locate separation point of a cylinder experimentally.
19	Calculate head loss for a centrifugal pump in water supply use.
20	Compare the drag forces on various shapes experimentally (Sphere, plate, etc)

Programme: B. Tech. (Civil) Sem – IV 2021

Course: Geomechanics		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 04 Hours / Week	Semester End Examination: 60Marks Internal Assessment: 40Marks	Theory:04
Practical: 02 Hours / Week	Term Work & Oral: 50Marks	TW & OR:1
Course Pre-requisites: The students should have knowledge of		
1	Statics and Dynamics	
2	Mathematics	
3	Fluid mechanics	
Course Objective:		
	To make student capable to determine the index and engineering properties of soil and use of soil as a construction material.	
Course Outcomes: The student will be able to		
1	identify and classify the soil according to formation of soil and its properties.	
2	determine index properties of soil.	
3	calculate coefficient of permeability and effective stresses of soil.	
4	calculate the geostatic stresses and OMC of soil by various methods.	
5	analysis of shear parameters of soil by various method.	
6	compute lateral earth pressure on retaining wall.	
Course Content:		
UNIT – I	Introduction of Geomechanics and soil classification	(08Hrs)
	Introduction to Geomechanics Engineering and its applications to Civil Engineering, Types of soil structure, Field identification of soils basic definitions, three and two phase system of soil, soil classification systems – USCS, IS, HRB, Textural classification, Activity of clay, Sensitivity of clay, Thixotrophy of clay	
UNIT - II	Index Properties of Soil	(08Hrs)
	Index properties of soil – Water content, specific gravity, particle size distribution, Consistency limits, density, relative density, Relationship between index properties of soil.	
UNIT - III	Permeability and Seepage	(08Hrs)
	soil water, permeability-Basic Definition, Darcy's law, factors affecting permeability. Laboratory measurement of permeability: Constant head method and Falling head method as per IS 2720. Total, Neutral and effective stress-principle of effective stress, head gradient and potential, seepage pressure, Upward flow condition, 2 D flow, Laplace equation, flow net:- Characteristics and uses.	
UNIT - IV	Compaction and Stress Distribution	(08Hrs)
	Compaction: - Laboratory compaction tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Field compactions equipments Stresses in soil: Geostatic Stresses, stress distribution, Bossinque's	

	Theory for point load, Westergaard's theory		
UNIT - V	Shear Strength of Soil		(08Hrs)
	<p>Introduction- Shear strength an Engineering Property. Mohr's stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure. Peak and Residual shear strength, factors affecting shear strength. Stress-strain behaviour of sands and clays</p> <p>Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests.</p>		
UNIT - VI	Earth Pressure		(08Hrs)
	<p>Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory : Earth pressure on Retaining wall due to submerged backfill. Backfill with uniform surcharge, backfill with sloping surface, layered backfill.</p>		
Internal Assessment:			
	Unit Test 1	Unit I to III	
	Unit Test 2	Unit No IV to VI	
Assignments:			
1	Study of various relationship between weight and volume, numerical based on it and classification of soil		
2	Study of determination of different index properties of soil and numerical based on it.		
3	Study of permeability and numerical based on it.		
4	Study of compaction of soil and numerical based on it.		
5	Determination of shear parameter of soil by various methods and numerical based on it.		
6	Numerical problem based on calculation of lateral earth pressure on retaining wall.		
Term Work:			
	The term-work shall consist of minimum Eight experiments from list below, out of which first four are compulsory .		
1	Determine water content of given soil sample by oven drying method		
2	Determine specific gravity of given soil by pycnometer method		
3	Determine of consistency limits of soil – Liquid, plastic and shrinkage limit.		
4	Determine the shear parameters of given soil by Direct shear test.		
5	Determine dry unit weight of soil in field by core cutter or sand replacement method.		
6	Determine co-efficient of permeability by constant head test or falling head test of given soil sample.		
7	Determine MDD and OMC by standard proctor test and Modified proctor test of given soil sample.		
8	Determine grain size distribution of given soil sample by mechanical sieve analysis.		

9	Determine the shear parameters of given soil by Unconfined Compression Strength of soil.	
10	Determine the shear parameters of given soil by Triaxial Shear Test	
11	Determine the shear parameters of given soil by Vane Shear Test	
Oral/Practical:		
	The oral examination based on above term work.	
Reference Books:		
1) Punmia B.C., "Soil Mechanics and Foundation Engineering" Laxmi Publications		
2) K. R. Arora, "Soil Mechanics & Foundation Engineering,		
3) C. Venkatramiah, "Geotechnical Engineering", New Age International Publishers		
4) Das, B.M., "Principles of Geotechnical Engineering", Thomson Asia		
5) Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers.		
6) Joseph E. Bowels, "Soil mechanics and Foundation Engineering", Tata McGraw Hill Publications Company, New Delhi		
Topics for project based learning for Geomechanics		
1. Prepare the chart of different classification of soils.		
2. Collection the information about soil deposits in various regions of India and show in the map of India		
3. Prepare the chart of different types of soil structure.		
4. Calculate the water content and specific gravity of soil (take at least three different soil sample)		
5. Calculate the consistency limit and flow index of soil (take at least three different soil sample)		
6. Prepare chart showing all basic index properties of soil.		
7. Draw the particle size distribution curve for soil by using excel (take at least two different soil sample)		
8. Prepare the chart for relationship between index properties of soil.		
9. Compare the constant head and falling head method.		
10. Prepare the chart for soil water and permeability of soil.		
11. Draw the flow net for sheet pile or earthen dam.		
12. Compute the permeability of stratified soil deposits by using excel.		
13. Prepare the chart of derivation of Laplace equation for two-dimensional flow.		
14. Compare the standard proctor and modified proctor test.		
15. Collection of information and photographs of machines used for compaction of soil.		
16. Draw the optimum moisture curve for compaction of soil by using excel.		
17. Draw the Mohr's stress circle for triaxial shear test and unconfined compression test.		
18. solution of problems on shear strength parameter by using graphical method. (At least three problem).		
19. Prepare the chart showing lateral earth pressure distribution diagram on retaining wall in various conditions.		
20. Contribution of various scientists in estimation of active and passive earth pressure on retaining wall.		

Programme : B.Tech (Civil) Sem – IV (2021)

COURSE: ANALYSIS OF DETERMINATE STRUCTURES

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS:</u>
Theory: 03 Hours / Week	Semester End Examination: 60 Marks	Theory: 03
Tutorial: 01 Hour / Week	Internal Assessment: 40 Marks	Tutorial: 01

Course Pre-requisites: The students should have knowledge of

- 1 Statics and Dynamics
- 2 Mechanics of Solids

Course Objective:

The student should be able to calculate member forces and deflection of determinate beams, trusses and arches.

Course Outcomes: The student will be able to

- 1 Determine degree of indeterminacy of structures.
- 2 Deflection of joints of determinate truss.
- 3 Construct Influence line diagram for forces in beams.
- 4 Calculate maximum forces in beams using Influence line diagram.
- 5 Calculate maximum forces in truss member using Influence line diagram.
- 6 Calculate forces in three hinged arch.

Course Content:

Unit-I	Basic Concepts Classification of structures, Types of structures, skeletal structures; members and member forces, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Deflected shape of beams and frames.	(06 Hrs)
Unit-II	Strain Energy and Deflection of Truss Strain Energy: Concept of strain energy; Modulus of Resilience; Strain energy due to axial force, shear force, bending moment and torsional moment. Deflection of joints of determinate truss using Castigliano's first theorem	(06 Hrs)
Unit-III	Influence Line Diagrams for beams: Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams. Muller-Breslau's principle and its application to above beams.	(06 Hrs)
Unit-IV	Application of Influence Line Diagrams for rolling loads on beams: Rolling loads - Use of influence line diagram for determination of SF and BM in beams due to UDL shorter than span, UDL longer than span, Series of concentrated loads. Conditions for maximum SF and maximum BM values	(06 Hrs)
Unit-V	Influence Line Diagrams and its application for truss: Influence line diagram for axial forces in members of plane determinate trusses. Use of influence line diagram for determination of member forces of plane determinate trusses under dead load and live load.	(06 Hrs)

Unit-VI Analysis of Three Hinged Arch**(06 Hrs)**

Concept and types of arches, Three hinged arches – analysis, Calculation of horizontal Thrust, Radial Shear, Normal Thrust and BM at a cross section.

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Assignments:

Students should complete assignments from

1. Draw different types of structures - space, plane, trusses, beams and frames
2. Draw deflected shapes of different types of structures.
3. Calculate degree of static indeterminacy.
4. Calculate degree of kinematic indeterminacy.
5. Calculate deflection of truss using Castigliano's first theorem.
6. Draw ILD for beams for reaction, SF and BM
7. Calculate maximum SF & BM due to moving loads on beam.
8. Draw ILDs for members of the Truss
9. Calculate maximum axial force in truss due to moving loads.
10. Analyse of three hinged arch

Reference Books:

- 1 Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication
- 2 Aslam Kassimali, “Structural Analysis”, Cengage Learning.
- 3 Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication
- 4 Bhavikatti S.S., “Structural Analysis- I and II”, Vikas Publication.
- 5 Pandit G. S. & Gupta S. P., “Theory of Structures Vol-I and Vol-II”, Tata McGraw Hill Publication
- 6 Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company
- 7 Prakash Rao D. S., “Structural Analysis”, Universities Press Publication
- 8 Menon Devdas “Structural Analysis”, Alpha Science International Publication.
- 9 Khurmi R.S. “Theory of Structures”, S. Chand Publication

Topics for Project Based Learning:

- 1 Make model of different types of supports
- 2 Make model of different types of structure
- 3 Prepare PPT on different types of structures - space, plane, trusses, beams and frames
- 4 Prepare chart for different types of structures - space, plane, trusses, beams and frames
- 5 Make model of beam and frame with different types of supports
- 6 Prepare animated PPT to show deflected shapes of different types of structures.
- 7 Prepare PPT on degree of static indeterminacy
- 8 Prepare PPT on degree of kinematic indeterminacy
- 9 Make skeletal model of truss
- 10 Analyse truss using software.
- 11 Prepare PPT on deflection of truss
- 12 Prepare PPT on ILD of truss

- 13 Prepare chart on ILD of truss
- 14 Draw an ILD of truss using software
- 15 Prepare PPT on ILD of beams
- 16 Prepare chart on ILD of beams
- 17 Draw an ILD of beams using software
- 18 Make model on Muller-Breslau's principle
- 19 Make model of three hinged arch
- 20 Prepare PPT on analysis of three hinged arch
- 21 Prepare chart on analysis of three hinged arch

Programme: B. Tech. (Civil) Sem – IV (2021)

Course: Planning & Management of Construction Projects		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 04 Hours / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
Practical: 02 Hours / Week	Term Work & Oral: 50 Marks	TW & OR: 1
Course Pre-requisites: The students should have knowledge of		
1	Building Construction.	
2	Building Planning and Design	
Course Objective:		
	To prepare the student to analyze the network and monitor and control the civil engineering projects.	
Course Outcomes: The student will be able to		
1	prepare organization chart.	
2	Explain bar charts and elements of network	
3	prepare a network and analyze by CPM and PERT methods.	
4	update network and carryout resource allocation	
5	carry out material management	
6	check quality parameters in construction process.	
Course Content:		
UNIT – I	Project Management: Basics of Management, Modern scientific management (Contribution by Fayol, F.W. Taylor, Mayo) Importance, Objectives and functions of Management, Importance of organizational structure, types of organizations, Site Layout.	(08 Hrs)
UNIT - II	Planning & Scheduling: Work breakdown structure, Introduction to Gantt /Bar Charts and its limitations, Milestone Charts, Development of Network Problems, Elements of Network-Event, Activity, Dummy, Types of Networks, Network Rules Microsoft Office Project: Introduction to MS Project	(08 Hrs)
UNIT - III	Network Analysis: Critical Path Method (CPM), Types of Floats, Program Evaluation, and Review Technique (PERT), Time Computations, Slack.	(08 Hrs)
UNIT - IV	Project Monitoring & Control Resource Allocation, Resource Smoothing and Leveling, Crashing of Network, Direct Cost and Indirect Cost, Cost Slope, Updating of Network.	(08 Hrs)
UNIT - V	Material Management: Objectives of material management, material requirement, scheduling, monitoring, inventory control, inventory classification, inventory management, inventory models, economic order quantity, ABC analysis.	(08 Hrs)
UNIT - VI	Total Quality Management:	(08 Hrs)

	Importance of Total Quality Management in Construction Process and Steps Involved, Concept of Quality Control, Quality Assurance, Quality Management and TQM, Six Sigma Concept. MIS -Introduction, Necessity of in Management	
Syllabus for Unit Test:		
	Unit Test -1	UNIT – I to III
	Unit Test -2	UNIT – IV to VI
Term Work: The term-work shall consist of -		
	1) Assignment on different types of organization and their flowcharts.	
	2) Assignment on bar chart and milestone chart.	
	3) Assignments on CPM.	
	4) Assignments on PERT.	
	5) Assignment on crashing of network.	
	6) Assignment on updating of network.	
	7) Assignment on MS Project.	
	8) Mini Project- Preparation Network and analysis for a building construction project and finding out different types of floats.	
Oral:		
	The Oral examination is based on above term work and course content.	
Reference Books:		
	1. Construction Engineering and Management by S. Seetharaman, Umesh Publications, New Delhi.	
	2. PERT & CPM principles & applications by L.S. Srinath, affiliated East West press Pvt. Ltd., New Delhi.	
	3. Project Planning & control with PERT & CPM by Dr. B.C. Punmia, K.K. Khandelwal, Laxmi Publications (P) Ltd, New Delhi.	
	4. Construction Project Management Planning, Scheduling, and controlling by K.K. Chitkara TMH Publishing Company, New Delhi	
	5. Civil Engineering Project Management by Alan C. Twort& J. Gordon Rees, Elsevier	
	6. Project Planning, Analysis selection, Implementation & Review by Prasanna Chandra, Tata McGraw Hill, New Delhi	
Topics for Project Based Learning:		
1.	Prepare a detailed site layout for any one type of Constriction project.	
2.	Prepare a detailed Organizational Structure for at least two types of Projects.	
3.	Prepare two detailed Projects in Microsoft Office Project.	
4.	Prepare a work breakdown structure for two different type of construction projects.	
5.	Prepare two detailed bar charts for any type of construction Project.	
6.	Prepare a detailed Milestone chart for Infrastructure project.	
7.	Prepare a detailed project analysis using Critical Path Method for two different Projects.	
8.	Prepare a detailed project analysis using Program Evaluation and Review Technique for two different types of research projects.	
9.	Prepare a detailed report on use and application of time computation in network analysis for construction projects.	

10.	Prepare a detailed report on the benefit of use of different types of Floats on Critical Path Method for analysis of construction projects.
11.	Prepare a detailed report on resource allocation in two different types of Construction Projects.
12.	Prepare a detailed report on use of resource smoothing and levelling on construction projects.
13.	Prepare a report on Crashing of Network for Construction Projects with use of Direct cost, Indirect Cost and Cost slope.
14.	Prepare a report on controlling of raw material and work in progress inventory for a construction project.
15.	Prepare a report on use of Inventory Models in Construction Projects.
16.	Prepare a project report on use of inventory control and classification for different types of construction projects.
17.	Prepare a detailed report on Importance on application of Total Quality Management for different types of Construction Projects.
18.	Prepare a report on use of Six Sigma Concept in Construction Projects.
19.	Prepare a report on necessity and use of MIS in Construction Management.
20.	Prepare a report on necessity and use of Quality Control and Quality Assurance for different construction projects.

B. Tech. (Civil) –Sem IV -2021 Course

Plumbing Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: -- Hours / Week	Term work & Oral: 50 Marks	Term work & Oral: 02

Course Pre-requisites:

The Students should have knowledge of

1. Basic Civil Engineering. and Civil Engineering Drawing Knowledge
2. Knowledge of Building Planning and Designing.

Course Objectives:

To develop the knowledge of basic Plumbing Engineering techniques required for various construction projects.

Course Outcomes:

On completion of the course, the students will be able to:

1. Identify and select proper tools and use them for the given plumbing work
2. Select appropriate pipes and carry out pipe fitting after carrying out operations like cutting, bending, threading, joining, aligning and other necessary operations
3. Erect simple water supply system. Trace leakage and repair water supply system
4. Plan, prepare and inspect domestic drainage system
5. Select and install sanitary appliances
6. Install heating appliances like geyser, etc.

UNIT - I Introduction to Plumbing System

Introduction to Plumbing System: Cold Water, Gray Water System, Sewage System, Hot Water Circulating System, Irrigation System, Storm Water System
Common Sanitary Fixture Details: Lavatories, Water Closet, Showers, Sinks, Bathtubs, Bidets, Urinals, Floor drains, Layout of Sanitary fixtures in toilet
Formula for flow through pipes: Darcy formula, Chezy's formula, Manning's formula, Hazen formula, Reynolds number (Laminar and Turbulent Flow)
Drainage System: Soil Pipe System, Waste Pipe System, Vent Pipe System, Types of Pumps, Pump Laws, Pump in series and parallel

UNIT - II	Water System
	<p>Cold Water System :Domestic Water Tank (or) Underground reservoirSizing, Elevated Roof Tank (storage cistem) orOverhead tank Sizing, Cold Water Pipe Sizing inB uilding as per flow rate and fixture Unit Method(WFU), Minimum number of smaller diameterwater pipes that can be connected to bigger pipes.Plumbers Chart for Pipe Sizing, Box Formula, Boosterpump sizing & transfer, Pump Sizing(HPWatts), Auto Pneumatic, System & Pressure Tank Sizing,External Water Supply, Pipe Sizing, Pump RoomDesign with valve connection detail, Design of External Water System</p> <p>Gray Water System: Grey water cycle, Water Tank Sizing, Booster PumpCalculation, Grey water pipe sizing, Flush Water, Potable and non potable loop pipe sizing (Software).</p> <p>Hot Water System: Hot Water System Designing, Estimating Hot WaterDemand, Calculating the Capacity of Non-Central &Central Water Heaters, Hot Water Pipe Sizing, Hot Water Circulating Pump Design, Up feed System, Down feed System & Combination of Up feed andDown Feed System, Solar Water heater (EnergySaving Calculation).</p> <p>Irrigation System: Garden Water Supply and Fountain, Garden Water Supply and Fountain pipe sizing, Calculation ofstorage tank, Garden water fountain designing &pump selection</p> <p>Drainage System: Soil and Waste water drain calculation in buildingvertical stack, Branch drain / Discharge pipe,horizontal drain, Fixture unit rating, Maximumnumber of discharge unit allowed in stack, Design ofhorizontal drains by discharge unit method(DFU),Invert level & Slope calculation, Sump Pit Sizing,Submersible Sump Pump Sizing, Design of Septic tank, Soak away pits, Dispersion trenches, Oil andGrease Interceptor Designing, Designing of commonappurtenances, Inspection Chambers and Junctionmanholes, External foul water drainage for building.</p> <p>Storm water System: Designing of Storm water Drainage system inbuilding, Sizing of Rain Water Gutters, External Storm water drainage system Designing.</p>
UNIT - III	Water Balancing Calculation
	Water Balancing Calculation. WTP(Water Treatment Plant), STP(Sewage Treatment Plant), Green Building (Water Saving Calculation), Plumbing Designing for High Rise Building, PRV Calculations
UNIT - IV	Tendering Requirements
	Understanding the tendering requirements, Quantity take off, Preparing Inquiry for Suppliers & Finalizing the suppliers, Final Billing & Quotations finalization
UNIT - V	Preparation of purchase orders
	Preparation of purchase orders, Quotation Evaluation Sheet

UNIT - VI	Plumbing Design Drawing and site Installation
	Representation of Concepts Design Drawing, Design Drawing & Shop Drawing, Location maps, Site Plan, Plan of Roof, Floor plan of the building, Enlarge floor plan of toilet kitchen, Plan elevation & cross section of structures including reinforcement details, Detailing of Plumbing services and preparing plumbing drawing, Isometric Drawings, Riser Diagram, Site Installation Procedure :Testing, Adjusting, Balancing Concept & Process. Installation & Inspection. Safety Measures. Pressure Testing. Testing & Commissioning. Tracking List.
Term Work: The term work shall consist of File and drawing containing record of (any 6) exercises out of which Term work No 6 and 7 are compulsory and project, listed below.	
1. Introduction of available codes in plumbing.	
2. Report on necessity of traps, intercepts and vents	
3. Roles of plumbing contractor and plumbing consultants	
4. Report on Plumbing fixtures and fittings and explain any ten.	
5. Report on materials for water supply and drainage	
6. Detailed hydraulic design for plumbing of G+1 Bungalow	
7. Design solar water piping for G+1 Bungalow	
8. Detailed Plumbing design for high rise structure	
9. Drafting purchase orders for Plumbing Project	
10. Project 1: This syllabus will followed by a live project and a 2 Days Workshop on project implementation OR Project 1: Site Visit and report on site visit	
11. Project 2 :Plumbing Design Drawing and site Installation For a G+1 Bungalow	
Text Books	
1. “Plumbing Engineering, Theory and Practice” by Subhash Patil. SEEMA Publishers Mumbai	
2. “ Plumbing Engineering” by Deolalikar	
Reference Books:	
1. “Plumbing, Sanitation and Domestic Engineering” Volume – 1to 4 by G. S. Williams, Mc Graw Hill	
2. “Plumbing, Sanitation and Domestic Engineering, Data Sheets & Wall Charts” by G. S. Williams, Mc Graw Hill	
3. Codes -- Uniform Plumbing Code-India	

Programme: B. Tech. (Civil) Sem – IV 2021
Course: CONSTRUCTION PRACTICES IN CIVIL ENGINEERING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS ALLOTTED</u>
Practical: 04 Hrs/Week	Term Work –50 marks	Term Work:02

Course Pre-requisites:

The Student Should have knowledge of

1.	Fundamental of Civil engineering.
2.	Building Construction
3.	Engineering mathematics.
4.	Concrete Technology
5.	Building Planning, Designing and Bylaws

Course Objective

1.	To make students understand Civil Engineering Practices.

Course Outcomes

The students will be able to

1.	setout of foundation for buildings.
2.	carry out testing of construction materials
3.	manage inventory on site.
4.	maintain quality control on site.
5.	work as a site engineer

List of Practical (Any 15)

1	Testing of concrete cubes of different grades.
2	Slump test on concrete and effect of plasticizers.
3	Study of reinforcement and its bending for different structural members.
4	Study of various of drawings required on construction sites (Compulsory)
5	Setting out and layout of building foundation.

6	Study of formwork& scaffolding. (Compulsory)
7	Construction of different types of brick masonry bonds, study of recent types of bricks and blocks (Compulsory)
8	Study of plastering & pointing. (Compulsory)
9	Study of different types of tiles. (Compulsory)
10	Introduction - Water supply & sanitary fittings and appliances (Compulsory)
11	Concealed construction practices.
12	Types of paints. (Compulsory)
13	Methods of Waterproofing of toilets & roofs. (Compulsory)
14	Study of Deck Slab
15	Study of stock register format and daily report. (Compulsory)
16	Study of construction of concrete walls
17	Study of precast techniques (Compulsory)
18	Study of Advance Water proofing Techniques
Reference Books:	
1.	A to Z Building Construction by Mantri publication.
2.	My Construction Practices by R.B. Chaphalkar.

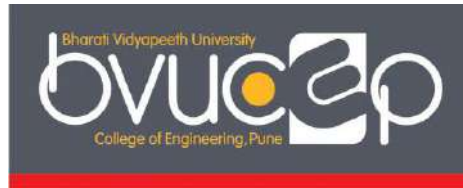
Programme: B. Tech (Civil) Sem – IV 2021

Course: Civil Engineering Software III HEC-RAS		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical: 04 Hours / Week	Term Work & Oral: 50 Marks	TW & OR:02
Course Pre-requisites: The students should have knowledge of		
1	Basic Knowledge of open channel flow	
2	Direct step method of Gradually Varied flow	
3	HEC-RAS 4.0 and above with PC	
Course Objective:		
	The student should be able to determine flow profiles for given flow conditions	
Course Outcomes: The student will be able to		
1	determine critical depth of flow	
2	determine normal depth of flow	
3	determine depth of flow for uniform flow conditions	
4	determine critical depth of flow in case of confluence of channel.	
5	determine normal depth of flow in case of confluence of channel	
6	determine depth of flow in case of confluence of channel for uniform flow conditions	
Term Work: The term-work shall consist of -		
	1) Analyse a rectangular channel for critical depth.	
	2) Analyse a rectangular channel for normal depth.	
	3) Analyse a trapezoidal channel for critical depth..	
	4) Analyse a trapezoidal channel for uniform depth.	
	5) Analyse a rectangular channel for uniform depth.	
	6) Analyse a trapezoidal channel for normal depth.	
	7) Analyse the flow for uniform depth at a confluence of two channels..	
	8) Analyse the flow for critical depth at a confluence of two channels.	
Oral/Practical: The Oral examination is based on above term work.		



Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune



B.Tech. (Computer Engineering)
Program Curriculum
(2021 Course)

VISION OF UNIVERSITY:

Social Transformation Through Dynamic Education.

MISSION OF UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination
- To offer education to the students in a conducive ambience created by enriched infrastructure! and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities
- To make available quality education to the students of rural, tribal, and other deprived sections of the population

VISION OF THE INSTITUTE:

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE:

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research, and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To pursue and excel in the endeavour for creating globally recognised Computer Engineers through Quality education.

MISSION OF THE DEPARTMENT

- To impart engineering knowledge and skills conforming to a dynamic curriculum.
- To develop professional, entrepreneurial & research competencies encompassing continuous intellectual growth.
- To produce qualified graduates exhibiting societal and ethical responsibilities in working environment.

PROGRAM EDUCATIONAL OBJECTIVES

The students of B.TECH. (COMPUTER ENGINEERING), after graduating with Bachelor of Technology degree in Computer Engineering, will able to

1. Demonstrate technical and professional competencies by applying engineering fundamentals, computing principles and technologies.
2. Learn, Practice, and grow as skilled professionals/entrepreneur/researchers adapting to the evolving computing landscape.
3. Demonstrate professional attitude, ethics, understanding of social context and interpersonal skills leading to a successful career.

PROGRAM SPECIFIC OUTCOMES

1. To design, develop and implement computer programs on hardware towards solving problems.
2. To employ expertise and ethical practise through continuing intellectual growth and adapting to the working environment.

PROGRAM OUTCOMES

- a. Apply the knowledge of mathematics, science, engineering fundamentals, and computing for the solution of complex engineering problems.
- b. Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using computer engineering foundations, principles, and technologies.
- c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
- d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.
- g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.
- h. Apply ethical principles while committed to professional responsibilities and norms of the engineering practice.
- i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- j. Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- k. Apply the engineering and management principles to one's work, as a member and leader in a team.
- l. Recognise the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CORELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Programme Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Knowledge	✓											
Problem Analysis		✓										
Design/Development of Solutions			✓									
Conduct Investigations of Complex Problems				✓								
Modern Tool Usage					✓							
The Engineer and Society						✓						
Environment and Sustainability							✓					
Ethics								✓				
Individual and Teamwork									✓			
Communication										✓		
Project Management and Finance											✓	
Life-Long Learning												✓

DEFINITION OF CREDITS:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
2 Hour Practical (P) per week	1 credit
4 Hours Practical (P) per week	2 credits

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Breakup of Credits
1	Basic Science Course (BSC)	26
2	Engineering Science Course (ESC)	10
3	Core Courses (CC)	143
4	Elective Courses (EC)	10
5	Project (PROJ)	18
6	Internship (INT)	03
7	Vocational Course (VC)	08
8	Massive Open Online Course (MOOC)	06
9	Research Paper Publication (Research)	02
10	Social Activities (SA)	04
11	Mandatory Course (MC)	Non-Credit
12	Internal Assessment (IA)	-
13	University Examination (UE)	-
TOTAL		230

DISTRIBUTION OF COURSE COMPONENTS

Sr. No.	Category	Number of Courses
1	Basic Science Courses (BSC)	07
2	Engineering Science Course (ESC)	02
3	Core Courses (CC)	36
4	Elective Courses (EC)	02
5	Project (PROJ)	04
6	Internship (INT)	01
7	Vocational Courses (VC)	04
8	Massive Open Online Courses (MOOC)	03
9	Research Paper Publication (Research)	01
10	Social Activities (SA)	02
11	Mandatory Courses (MC)	02
TOTAL		64

Program: B.TECH. (Computer Engineering) Semester - I 2021 Course

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Schemes (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P (TW/PR/OR)	T	Total
1	Mathematics for Computing - I	3	-	1	60	40	-	-	-	100	3	-	1	4
2	Organic and Electrochemistry	3	2	-	60	40	25	-	-	125	3	1	-	4
3	Digital Electronics	4	2	-	60	40	25	-	-	125	4	1	-	5
4	Classic Data Structures	4	2	-	60	40	-	-	50	150	4	1	-	5
5	Computational Thinking and Programming Concepts	4	2	-	60	40	-	-	100	200	4	1	-	5
6	Programming Technologies and Tools Laboratory- I	-	4	-	-	-	-	-	50	50	-	2	-	2
		18	12	1	300	200	50	-	200	750	18	6	1	25

Program: B.TECH. (Computer Engineering) Semester - II 2021 Course

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Schemes (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P (TW/PR/OR)	T	Total
1	Mathematics for Computing - II	3	-	1	60	40	-	-	-	100	3	-	1	4
2	Physics for Computing Systems	3	2	-	60	40	25	-	-	125	3	1	-	4
3	Numerical Computation	4	-	-	60	40	-	-	-	100	4	-	-	4
4	Electrical Technology	4	2	-	60	40	25	-	-	125	4	1	-	5
5	Paradigms of Programming	4	2	-	60	40	-	-	50	150	4	1	-	5
6	Programming Technologies and Tools Laboratory - II	-	4	-	-	-	-	-	50	50	-	2	-	2
7	Computer System Workshop Technology	-	2	-	-	-	-	-	100	100	-	1	-	1
		18	12	1	300	200	50	-	200	750	18	6	1	25

Program: B.TECH. (Computer Engineering) Semester - III 2021 Course

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Schemes (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P (TW/PR/OR)	T	Total
1	Discrete Mathematics and Applications	3	-	1	60	40	-	-	-	100	3	-	1	4
2	Data Structures and Algorithmic Thinking	4	2	-	60	40	-	-	50	150	4	1	-	5
3	Computer Organisation and Design	4	2	-	60	40	-	-	50	150	4	1	-	5
4	Computer Networks	3	2	-	60	40	-	-	50	150	3	1	-	4
5	Software Engineering*	4	4	-	60	40	-	50	-	150	4	2	-	6
6	Programming Technologies and Tools Laboratory - III	-	4	-	-	-	-	-	50	50	-	2	-	2
7	Vocational Course - I	-	-	-	-	-	-	50	-	50	-	2	-	2
8	MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	2
9	Environmental Studies** (Mandatory Audit Course)	-	-	-	100	-	-	-	-	-	-	-	-	-
		18	14	1	300	200	-	100	200	800	18	9	1	30

*Industry Taught Course - I

** 100 Marks Theory Examination

Vocational Course - I

S. No.	Course Name	Offered By	Offered By	Offered By
1	Internet of Things (IOT)	UCI Education of Continuing Education	IIT Kharagpur	Eit Digital
2	Cloud Fundamentals	IIT Kharagpur	Amazon	Google Cloud
3	Web Programming Fundamentals	HarvardX	IBM	Johns Hopkins University
4	Linux and Git	Google	Linux Foundation	IIT, Bombay
5	Excel Skills for Business	Macquarie University	IBM	PwC

Program: B.TECH. (Computer Engineering) Semester - IV 2021 Course

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Schemes (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P (TW/PR/OR)	T	Total
1	Probability and Statistics	3	-	-	60	40	-	-	-	100	3	-	-	3
2	Models of Computation	3	-	1	60	40	-	-	-	100	3	-	1	4
3	Computer Operating System	3	2	-	60	40	-	-	50	150	3	1	-	4
4	Database Management System	3	2	-	60	40	-	-	50	150	3	1	-	4
5	Wireless Communication	4	2	-	60	40	-	50	-	150	4	1	-	5
6	Design Thinking and Communication*	2	4	-	-	-	-	-	50	50	2	2	-	4
7	Programming Technologies and Tools Laboratory - IV	-	4	-	-	-	-	-	50	50	-	2	-	2
8	Vocational Course- II	-	-	-	-	-	-	50	-	50	-	2	-	2
9	Social Activities - I	-	-	-	-	-	-	-	-	-	-	-	-	2
10	Disaster Management** (Mandatory Audit Course)	-	-	-	100	-	-	-	-	-	-	-	-	-
		18	14	1	300	200	-	100	200	800	18	9	1	30

*Industry Taught Course - II

** 100 Marks Theory Examination

Vocational Course - II

S. No.	Course Name	Offered By	Offered By	Offered By
1	Introduction to Programming with MATLAB	By Vanderbilt University	IIT Delhi	IIT Madras
2	Introduction to AR/VR/MR/XR	University of Michigan	Unity	IIT Madras
3	Software Design and Architecture	University of Alberta	University of Colorado System	IIT Madras
4	Microservices	Google cloud	University of Alberta	IBM
5	Embedded Systems Essentials with Arm	University of Colorado Boulder	Arm	IIT Delhi

Program: B.TECH. (Computer Engineering) Semester - V 2021 Course

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Schemes (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P (TW/PR/OR)	T	Total
1	Algorithm Design and Analysis	3	2	-	60	40	-	-	50	150	3	1	-	4
2	Computer and Information Security*	3	2	-	60	40	25	-	-	125	3	1	-	4
3	Compiler Engineering	4	-	-	60	40	-	-	-	100	4	-	-	4
4	Data Warehousing and Mining	3	2	-	60	40	25	-	-	125	3	1	-	4
5	Microprocessors and Microcontrollers	3	2	-	60	40	-	-	50	150	3	1	-	4
6	Programming Technologies and Tools Laboratory - V	-	4	-	-	-	-	-	50	50	-	2	-	2
7	Project-I Stage-I	-	2	-	-	-	-	100	-	100	-	2	-	4
8	Vocational Course- III	-	-	-	-	-	-	50	-	50	-	2	-	2
9	MOOC-II	-	-	-	-	-	-	-	-	-	-	-	-	2
		16	14		300	200	50	150	150	850	16	10	-	30

* Industry Taught Course - III

Vocational Course - III

S. No.	Course Name	Offered By	Offered By	Offered By
1	Data Science	Databricks	IBM	IIT Madras
2	UI / UX Design	University of Michigan	California Institute of the Arts	Google
3	iOS App Development	University of Toronto	LearnQuest	CurtinX
4	IoT Networking	University of Illinois at Urbana-Champaign	AWS	University of Colorado Boulder
5	Software Project Management	University of Alberta	University of Virginia	Google

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Schemes (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P (TW/PR/OR)	T	Total
1	Big Data Analytics	4	2	-	60	40	-	-	50	150	4	1	-	5
2	Essentials of Internet of Things	3	2	-	60	40	25	-	-	125	3	1	-	4
3	Graphics Techniques and GPU	3	2	-	60	40	25	-	-	125	3	1	-	4
4	Mobile Architecture and Programming*	4	2	-	60	40	-	-	50	150	4	1	-	5
5	Quantitative Techniques, Communication and Values	2	2	-	60	40	-	-	-	100	3	-	-	3
6	Project-I Stage- II	-	2	-	-	-	-	100	-	100	-	4	-	4
7	Internship	-	-	-	-	-	-	50	-	50	-	3	-	3
8	Vocational Course- IV	-	-	-	-	-	-	50	-	50	-	-	-	2
		16	12		300	200	50	200	100	850	17	11	-	30

* Industry Taught Course - IV

Vocational Course - IV

S. No.	Course Name	Offered By	Offered By	Offered By
1	Full Stack Development	IBM	IIT Madras	The Hong Kong University of Science and Technology
2	Quantum Computing	Saint Petersburg State University	IIT Bombay	PurdueX
3	Cyber Security	IBM	New York University	Uttarakhand Open University, Haldwani
4	NoSQL	IBM	MongoDB Inc	AWS
5	Agile Development & Management	University of Virginia	University of Minnesota	IBM

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Schemes (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P (TW/PR/OR)	T	Total
1	Artificial Intelligence*	4	2	-	60	40	-	-	100	200	4	1	-	5
2	Virtualisation and Cloud Computing	4	2	-	60	40	-	50	-	150	4	1	-	5
3	Scalable Computing	4	2	-	60	40	-	50	-	150	4	1	-	5
4	Elective - I	4	-	1	60	40	-	-	-	100	4	-	1	5
5	Programming Technologies and Tools Laboratory - VI	-	4	-	-	-	-	-	50	50	-	2	-	2
6	Project-II Stage - I	-	4	-	-	-	-	200	-	200	-	4	-	4
7	MOOC-III	-	-	-	-	-	-	-	-	-	-	-	-	2
8	Research Paper Publication	-	-	-	-	-	-	-	-	-	-	-	-	2
		16	14	1	240	160	-	300	150	850	16	9	1	30

* Industry Taught Course - V

Elective - I	Software Testing and Quality Assurance	Mobile Operating System	Fundamentals of Fog and Edge Computing	System Thinking
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Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Schemes (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P (TW/PR/OR)	T	Total
1	Machine Learning*	4	2	-	60	40	-		100	200	4	1	-	5
2	Data Storage Networking	4	2	-	60	40	-	50		150	4	1	-	5
3	Data Visualisation	4	2	-	60	40	-	-	50	150	4	1	-	5
4	Elective - II	4	-	1	60	40	-	-	-	100	5	-	-	5
5	Programming Technologies and Tools Laboratory - VII	-	4	-	-	-	-	-	50	50	-	2	-	2
6	Project-II Stage - II	-	4	-	-	-	-	200	-	200	-	6	-	6
7	Social Activities - II	-	-	-	-	-	-	-	-	-	-	-	-	2
		16	14	1	240	160	-	250	200	850	17	11	-	30

* Industry Taught Course - VI

Elective - II	Intelligent Autonomous Systems & Robotics	Deep Learning	Blockchain and Cryptocurrencies	Docker and Kubernetes
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List of MOOCs

1. Scalable Data Science from IITKGP
2. Technology Forecasting for strategic decision making
3. Hardware modelling using Verilog from IITKGP
4. Information Security and Cyber Forensics from Devi Ahilya Viswavidyalaya, Indore
5. Introduction to Industry 4.0 and Industrial Internet of Things from IITKGP
6. Components and Applications of Internet of Things from Indian Institute of Technology Patna
7. Data Science for Engineers from IITM
8. Innovation and Information Technology Management from Indian Institute of Management Bangalore
9. Reinforcement Learning from IITM
10. Deep Learning – IIT Ropar from Indian Institute of Technology, Ropar
11. Software Testing from IITB
12. Foundations of Cryptography from Indian Institute of Technology Bangalore
13. Social Networks from IIT Ropar
14. Introduction to Parallel Programming in OpenMP from Indian Institute of Technology Delhi
15. Artificial Intelligence Search Methods for Problem Solving from IITM
16. User-centric Computing for Human-Computer Interaction from Indian Institute of Technology Guwahati
17. C Programming and Assembly Language from IITM
18. Evolutionary Computation for Single and Multi-Objective Optimization from Indian Institute of Technology Guwahati
19. Multi-Core Computer Architecture – Storage and Interconnects from IITG
20. Advanced Computer Architecture from Indian Institute of Technology Guwahati
21. Parameterized Algorithms from IITM
22. Randomized Methods in Complexity from Indian Institute of Technology Kanpur
23. Deep Learning for Computer Vision from IIT Hyderabad
24. Advanced Graph Theory from Indian Institute of Technology Kanpur
25. Algorithms for protein modelling and engineering from IITKGP
26. Tools in Scientific Computing from Indian Institute of Technology, Kharagpur
27. Natural Language Processing from IITKGP
28. Traditional and Non-Traditional Optimization Tools from Indian Institute of Technology, Kharagpur
29. Introduction to Quantum Computing: Quantum Algorithms and Qiskit from IBM and IITM
30. Fuzzy Logic and Neural Networks from Indian Institute of Technology, Kharagpur
31. Reinforcement Learning from Indian Institute of Technology Madras
32. GPU Architectures and Programming from Indian Institute of Technology, Kharagpur

33. Information Security - Secure Systems Engineering from Indian Institute of Technology Madras
34. AI: Constraint Satisfaction from Indian Institute of Technology Madras
35. Real Time Operating System from Indian Institute of Technology, Kharagpur
36. Management Information System from Indian Institute of Technology, Kharagpur

B.TECH. (Computer Engineering)

SEMESTER - I

COURSE SYLLABUS

Mathematics for Computing - I

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination	60 Marks	Lecture	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
		Total	100 Marks	Total	04

Course Objectives:

- Linear equations and its basis and dimension.
- Linear mapping and its matrix representation.
- Orthogonalization and diagonalization of matrices.

Prerequisite:

Knowledge of algebra of matrices and determinants

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply rank of matrix in solving system of equations.
2. Identify basis and dimension of matrix.
3. Solve problems on kernel and image of linear transformation.
4. Apply linear operator to represent matrix.
5. Evaluate orthogonalization of inner product space.
6. Use methods to find eigen values and eigen vectors.

Unit I System of Linear Equation 06 Hours

Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

Unit II Vector Spaces 06 Hours

Definition, linear combination, spanning sets subspaces, linear dependence and independence, basis and dimension, rank of matrix.

Unit III Linear Mapping 06 Hours

Linear mapping, Kernel and image of linear mapping, rank and nullity of a linear mapping, singular and non-singular linear mapping.

Unit IV Linear mapping and matrices 06 Hours

Matrix representation of linear operator, change of base, similarity matrices

Unit V Inner Product space and orthogonalization 06 Hours

Inner product space, Cauchy-schwarz equality, Orthogonality, Orthogonal sets and bases, projections, Gramschidt orthogonalization, orthogonal and positive definite matrices, matrix representation of inner product

Unit VI Diagonalisation: Eigen values and eigen vectors 06 Hours

Characteristic polynomial, Cayley-Hamilton theorem, eigen values and eigen vectors, properties.

Textbooks

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi GrihaPrakashan, Pune, 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi

3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.

Reference Books

1. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
2. Michael Greenberg, Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

Project Based Learning - Provisional List of Projects

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Gauss Elimination method.
2. LU-decomposition method
3. Rank of matrix
4. Linear combination
5. Basis and dimension
6. Spanning sets
7. Kernel and image of linear transformation
8. Rank-nullity theorem
9. Non-singular linear mapping
10. Linear operator
11. Similarity matrices
12. Change of base
13. Cauchy Schwarz equality
14. Orthogonality
15. Gram Schmidt Orthogonalization
16. Matrix representation of matrix
17. Cayley-Hamilton theorem
18. Eigen values and Eigen vectors

(Note: - *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit - I, Unit - II, Unit - III
Unit - IV, Unit - V, Unit - VI

Organic and Electrochemistry

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	04

Course Objectives:

The student should acquire the knowledge of

- To develop the interest among the students regarding chemistry and their applications in engineering.
- To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
- The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the computing field.

Prerequisite:

Basic Chemistry

Course Outcomes: On completion of the course, students will have the ability to:

1. Differentiate between ionic and covalent bonding and classify the bonding in a compound as ionic or covalent.
2. Develop a working knowledge of the twelve fundamental principles of green chemistry and what it is all about.
3. Apply standard reduction potential data to determine the relative strength of oxidizing/reducing agents
4. Demonstrate the knowledge of polymer materials for futuristic engineering applications
5. Describe the properties of materials and Application of semiconductor electronics
6. Describe the manufacturing and refining process of fuels and lubricants

Unit I Chemical Bonding in Molecules

06 Hours

MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

Unit II Green Chemistry

06 Hours

Introduction, Twelve Principles of Green chemistry, numerical on atom economy, synthesis, adipic acid and indigo. Organic dye- Traditional methods of organic dye. Green solvents (ionic liquid supercritical CO₂), and products from natural materials.

Unit III Electrochemistry

06 Hours

Electrochemical cells and Galvanic cells, EMF of a cell, Single electrode potential, Nernst equation, Electrochemical series, Types of electrodes, Reference electrodes, pH, pOH, acids and basis, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Li-Ion Batteries, Li-Po Batteries.

Unit IV Polymers for The Electronics Industry **06 Hours**

Polymers, Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p- phenylene), Polyheterocyclic systems, Polyaniline Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications.

Unit V Semi-Conductors, Insulators and Superconductors **06 Hours**

Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators, or Dielectrics.

Unit VI Fuels & Lubricants **06 Hours**

Classification of fuels, Calorific values, Comparison between solid, liquid, and gaseous fuels, Theoretical calculation of calorific value of a fuel, Selection of coal, analysis of coal, Natural Gas, Producer gas, water gas, Lubricants, Mechanism of lubrication, classification of lubricants, lubricating oils, Solid lubricants, Greases or Semi-Solid lubricants, Synthetic lubricants, Lubricating emulsions, Properties of lubricating oils.

Textbooks

1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008.
2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G.Cowie, Blackie Academic & Professional, 1994.
3. A Textbook of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004
4. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.

Reference Books

1. Inorganic Chemistry (4th edition), D. F. Shriver and P. W. Atkins, Oxford University, Oxford, 2006.
2. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003.
3. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978.

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

List of Laboratory Exercises

1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. To determine strength of acid by pH - metric Titration
4. To measure the Conductance of a solution by conductometric titration
5. Measurement of Surface tension of a given liquid by Stalagmometer.
6. Determination of viscosity of a given liquid by Ostwald's Viscometer.
7. Determination of Saponification value of an oil sample.
8. To determine alkalinity water sample
9. Determination of Hardness of water sample by EDTA method.
10. Determination of Chloride content in water sample by precipitation titration method

11. To determine strength of acid by pH – metric Titration
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin
13. To study set up of Daniel cell.

Project Based Learning - Provisional List of Projects

1. Green Chemistry approach to Nano-Structured Electronics
2. Assessment of Environmentally Benign Photopolymers as an Alternative to the Use of Formaldehyde Based Textile Finishing Agents
3. Solvent-Free Synthesis of Phthalocyanines
4. Synthesis of Conjugated Polymers and Molecules Using Sugar Reagents and Solventless Reactions
5. Environmentally Benign Control of Polymer Solubility: Photoresist Materials Using DNA Mimics
6. Enzymatic Synthesis of Non-Formaldehyde Phenolic Polymers: Control of Hydrogen Peroxide Concentration.
7. The materials chemistry and electrochemistry of lithium and sodium-ion batteries
8. Electroplating- the principles, how different metals can be used and the practical applications
9. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing and Powder Coating Projects.
10. To determine calorific value of a fuel by any suitable method
11. To study various properties of lubricants
12. To study various types of lubricants and its properties.
13. To determine quality of coal sample & its analysis.
14. To study mechanism of lubrication.
15. To study coal analysis & its significance.

Note: - Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Digital Electronics

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	05

Course Objectives:

- To present the Digital fundamentals, Boolean algebra, and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To understand the various semiconductor memories and related technology

Prerequisite:

Mathematics and Elementary Physics

Course Outcomes: On completion of the course, students will have the ability to:

1. Comprehend different number systems and Boolean algebraic principles.
2. Apply logic design minimization techniques to simplify Boolean expressions
3. Analyse and design combinational logic circuits.
4. Demonstrate the operations of systems with sequential circuit elements.
5. Comprehend characteristics and structure of Programmable Logic Devices and Memory.
6. Draw ASM charts for sequential circuit design.

Unit I Digital systems

08 Hours

Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers, 1's complement and 2's complement.

Binary Arithmetic: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division.

Digital Codes: BCD code, Excess-3 code, Gray code and ASCII code.

Logic Gates: Logical Operators, Logic Gates-Basic Gates, Universal Gates, realization of other gates using universal gates.

Unit II Logic Design Minimization

08 Hours

Boolean algebra, De Morgan's Theorems, Standard representation of logic functions, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using Karnaugh-Maps up to 4 variables Don't care condition, Quine-McCluskey Method.

Unit III Combinational Circuits

08 Hours

Binary and BCD arithmetic, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Code converters

Multiplexers, De multiplexer, Decoder (IC 74138) and their use in combinational logic design, Priority Encoder, Digital Comparators, Parity generators and Checker (IC 74180), ALU.

Unit IV Sequential Circuits **08 Hours**

Flip-flop: SR, JK, D, T flip flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop.

Registers: Buffer register, Shift register.

Counters: Asynchronous counters, Synchronous counters, Modulus counters

Unit V FSM and ASM charts **08 Hours**

Introduction to FSM, Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization, ASM chart notations, ASM block, State diagram, ASM chart for sequential circuits, Multiplexer Controller.

Unit VI Memory and PLD: **08 Hours**

Semiconductor memories: memory organization, memory expansion, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM.

Programmable logic devices: Study of PROM, PAL, PLAs. Architecture of PLA, designing combinational circuits using PLDs.

Textbooks

1. M. Morris Mano and M. D. Ciletti, Digital Design, Pearson Education.
2. RP Jain, Modern Digital Electronics, Tata McGraw Hill Publication.
3. F.J. Hill and G.L. Peterson, Switching Theory and Logic Design, John Wiley
4. J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2

Reference Books

1. David J. Comer, Digital Logic & State Machine Design, Oxford University Press.
2. Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill.

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit

List of Laboratory Exercises

1. Verify truth tables of logic gates. (AND, OR, XOR, NOT, NAND, NOR). Simplify the given Boolean expression using K-map and implement using gates
2. State De-Morgan's theorem and write Boolean laws. Implement NAND and NOR as Universal gates.
3. Design (truth table, K-map) and implement half and full adder/ subtractor.
4. Design (truth table, K-map) and implement 4-bit BCD to Excess-3 Code converters.
5. Study of magnitude Comparator using IC 7485
6. Implement of logic functions using multiplexer IC 74151 (Verification, cascading & logic function implementation)
7. Implement logic functions using 3:8 decoder IC 74138.
8. Verify truth tables of different types of flip flops.
9. Design (State diagram, state table & K map) and implement 3 bits Up and Down Asynchronous and Synchronous Counter using JK flip-flop
10. Design and implement modulo 'n' counter with IC 7490.

Project Based Learning - Provisional List of Projects

1. Survey report of basic gates ICs 7432, 4011, 4050, 4070,4071,40106
2. Implement combinational logic Circuit of given Boolean Equation.
3. Implement Half Adder and Half Subtractor.

4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX
10. Implement 7 segment decoder driver using IC 7447.
11. Build a Decade counter and Up-Down Counter.
12. Build a Shift Registers: SISO and SIPO
13. Implement the Johnson Counter and Ring Counter.
14. Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.
15. Implement given Boolean Function using PLA. (Function and Equation will be given by Subject Teacher)

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Classic Data Structures

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Practical	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objectives:

The course focuses on enabling students to understand how data is stored in computer programs using data structures and facilitate them to use and build fundamental data structures.

Prerequisite:

Programming Basics

Course Outcomes: On completion of the course, students will have the ability to:

1. Compare and contrast the interfaces and internal representation of several linear abstract data types.
2. Solve given problems using array
3. Implement Stacks in a high-level programming language
4. Use and Implement Queues in a high-level programming language
5. Use and Implement lists in a high-level programming language
6. Demonstrate the ability to analyse, design, apply and use data structures and algorithms to solve engineering problems.

Unit I Introduction to Data structures & Arrays

08 Hours

Need of Data structure, Classification of Data Structures, Static Data Organization, Operations on Data Structures, Abstract data Types (ADT).

Arrays: Introduction, Array Operations, representation of Arrays in Memory, Array with Functions, One- & Two-dimensional array in function, Implementation of One- & Two-Dimensional Arrays in Memory.

Applications: string handling, polynomial equation solving, sparse matrix multiplication, tic-tac-toe, and data visualization

Unit II Stacks

08 Hours

Stack Definition and Structure, Operations on Stacks – create stack, Push stack, Pop stack, Stack top, Empty Stack, stack count, Destroy Stack, Array and Linked Representation, Types of Notations – Prefix, Infix and Postfix, Applications of Stack: Reversing Data, Converts Decimal to Binary, Parsing, Postponement, expression Conversion, and evaluation.

Unit III Queue

08 Hours

Queue: Introduction, Definition, ADT for queue, Storage Methods, Queue Operations, Enqueue, Dequeue, Queue front, Queue rear, Queue Example, Create Queue, priority Queue, Circular Queue.

Application of Queue: Categorising Data, Queue Simulation.

Unit IV Linear Lists

08 Hours

Introduction, singly linked list, Circularly Linked List, Doubly Linked lists, Basic operations, - Insertion, Deletion, retrieval, traversal, create List, insert node, delete node, List Search, Empty list, Destroy list.

Unit V Linked Stacks and Linked Queues**08 Hours**

Introduction, Operations on Linked stacks and Linked Queues, Dynamic Memory management and Linked Stacks, Implementation of Linked Representations.

Unit VI Overview of Real time Applications of Linear Data Structures**08 Hours**

Stacks - Balancing of Symbols, Infix to Postfix, Evaluation of Postfix expression, Implementing Function Calls, Finding of Spans, undo sequence in text editor, Matching Tags in HTML and XML.

Linked List - Implement Stack using Linked List.

Queues - Scheduling Jobs, Simulation of real-world queues such as ticket counter or first come first served scenarios, Asynchronous Data Transfer.

Textbooks

1. Brassard & Bratley, —Fundamentals of Algorithmics, Prentice Hall India/Pearson Education, ISBN 13-9788120311312.
2. Horowitz and Sahani, —Fundamentals of Data Structures in C++, University Press, ISBN 10: 0716782928 ISBN 13: 9780716782926.
3. Goodrich, Tamassia, Goldwasser, —Data Structures and Algorithms in C++, Wiley publication, ISBN-978-81-265-1260-7
4. Data Structure and Algorithmic Thinking with Python, CareerMonk Publications, Narasimha Karumanchi, 2016

Reference Books

1. Richard F Gilberg & Behrouz A Forouzan, Data Structures (A Pseudocode Approach with C), second edition, Cengage Learning, 2004.
2. PAI, Data Structures, Tata McGraw-Hill Education, 2008
3. Mayank Patel, Data Structure and Algorithm With C, Edu creation Publishing, 2018
4. Thomas H. Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 2001.

List of Assignments

1. Show how you can efficiently implement one stack using two queues.
2. What is the most appropriate data structure to print elements of queue in reverse order?
3. You are given a pointer to the first element of a linked list L. There are two possibilities for L, it either ends (snake) or its last element points back to one of the earlier elements in the list (snail). Give an algorithm that tests whether a given list L is a snake or a snail.
4. Check whether the given linked list is either NULL-terminated or ends in a cycle (cyclic).
5. Find nth node from the end of a Linked List
6. Simulate real world queues such as ticket counter.

List of Laboratory Exercises

1. Study assignment on programming IDE Tools
2. Write a program to implement one dimensional array.
3. Write a program to design tic-tac-toe game
4. Write a program to perform basic operation on stack.
5. Write a program to convert and evaluate polish notations.
6. Write a program to perform basic operation on stack.
7. Write a program to implement Priority queue & Double Ended Queue.
8. Write a program to perform basic operation on circular queue.
9. Write a program to implement hashing technique.

10. Write a program to implement searching and sorting techniques

Project Based Learning - Provisional List of Projects

1. Expression Evaluation
2. Traffic Management System
3. Library Management System
4. Employee Record System
5. Dictionary
6. Calendar Application
7. Medical Store Management System
8. Cricket Score Sheet
9. Bank Management System
10. Telephone directory

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Computational Thinking and Programming Concepts

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture	04 Hours/Week	University Examination	60 Marks	Lecture	04
Practical	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Practical	100 Marks	Practical	01
		Total	200 Marks	Total	05

Course Objective

The aim of this course is to make students to think in a computational manner to a point where they can derive simple algorithms and code the programs to solve some basic problems in their domain of studies.

Prerequisite:

-

Course Outcomes: On completion of the course, students will have the ability to:

1. Formulate a problem and express its solution in such a way that a computer can effectively carry it out.
2. Apply the Computational Thinking (CT) concepts on case studies/problem-based scenarios through hands-on practice of the CT processes.
3. Write algorithm and pseudo code for the identified strategy
4. Use Abstraction and Modelling.
5. Solve given problems through scratch based graphical programming tool
6. Demonstrate logical and algorithmic thinking.

Unit I Overview of Problem Solving

08 Hours

Problem Solving Concepts: Formal Problem Definition, Challenges in Problem Solving, Problem solving with Computers, Framework for Problem Solving. Introduction to Problem solving tools: Flowcharts, algorithm, pseudocode, Data structures.

Unit II Logical and Algorithmic Thinking

08 Hours

Inductive Vs Deductive arguments, Logic, Boolean Logic, Symbolic Logic, Logical operators and their symbols, Propositional Logic
Algorithmic Thinking: Algorithms, Intuition vs precision, defining algorithms, Algorithm constructs, Controlling algorithm execution, Complex conditionals.

Unit III Overview of Computational Thinking

08 Hours

About Computational Thinking, Data Representation and Abstraction - Problem formulation, Devising a Solution, Decomposition, Pattern recognition, Generalisation, Evaluation.

Unit IV Overview of Programming Concepts

08 Hours

Scratch Programming - Working of Scratch, Scratch tool, Motions and Drawing, Looks and Sound, Procedures, Variables, Making decisions, Loops, String Processing, Lists.
Introduction to higher level programming languages like C, Python, C++ and its constructs.

Unit V Limits of Computation

08 Hours

Capacity Measurement in Computers, Estimate of Physical limitations, Benchmarks, Counting the performance, impractical algorithms, Metaphysical limitations, Impossible algorithms.

Unit VI Computational Thinking in Software Development

08 Hours

Effective Building Blocks: Basic Algorithms Constructs, Program State, Code Organization, Using Abstractions and Patterns, Effective Modelling: Objectives, Entities, Relationship, Processes, Usage and General Advice. Testing and Evaluating Programs, Anticipating Bugs, Syntax vs semantic errors, Defensive programming, Verification and validation, Testing the Parts, Testing the Whole, Debugging Case Study: Home Automation System

Textbooks

1. Computational Thinking, By Peter J. Denning and Matti Tedre, The MIT Press Essential Knowledge series
2. Computational Thinking and Coding for Every Student, Jane Krauss, Kiki Prottzman by Corwin Publishers
3. Computational Thinking for the modern problem solver, David D riley, Kenny A Hunt, CRC Press, 2014
4. Computational thinking a beginner's guide to problem solving and programming, Karl Beecher, BCS Learning & Development, 2017

Reference Books

1. How to Solve it by Computer by R. G. Dromey, 1e, Pearson Education.
2. Learn to program with Scratch, Majed Marji, no starch press, 2014
3. Let Us C, Yashavant Kanetkar, Infinity Science Press, 2008
4. Let Us C++, Yashavant Kanetkar, BPB Publications, 1999
5. Introduction to Computation and Programming Using Python, Mit Press, John Guttag, 2016

List of Assignments

1. The Following problems can be solved using SCRATCH Tool: Create a function block that calculates the force needed to accelerate 2,000 kg car 3 m/s²
2. Write different procedures to draw each letter of your name. Name each procedure for the letter that it draws. Then write a script that calls these procedures so you can draw your name on the Stage
3. Write a program that prompts the user to enter five test scores between 1 and 10. The program will then count the number of scores that are greater than 7
4. The Pythagorean theorem states that if a and b are the lengths of the legs of a right triangle and c is the length of the hypotenuse (the longest side), then $a^2 + b^2 = c^2$. Write a program that gets three numbers from the user and determines whether they could represent the sides of a right triangle.
5. Create two lists for storing the items sold in a grocery store and their corresponding prices. Write a program that asks the user to enter an item's name and then displays that item's price, if it is found in the list.
6. Write a program that prompts the user to enter the highest and lowest temperatures for the 12 months of a year. Store the input values in two lists.

List of Laboratory Exercises

1. WAP to SWAP (interchange) 2 numbers without using third variable
2. WAP to find the sum and average of values appearing at the positions divisible by 3 in the given sequence of n values
3. WAP that receives any year from the keyboard and uses a function to determine whether the year is a leap year or not.
4. WAP that uses a function that converts a lowercase character to its uppercase
5. WAP to read n numbers and count even and odd numbers.

6. WAP that uses a recursive function to convert given decimal number into its binary equivalent.
7. WAP to use the suitable function to obtain the prime factors recursively.
8. WAP that uses a function that prints the nth element of Fibonacci series using recursion method.
9. WAP that uses a function to calculate the sum of n odd integers.
10. WAP that uses a function power that calculates the power of a given number.

Project Based Learning - Provisional List of Projects

1. Identify any patterns in the problem.
2. Build Model for various Mathematical Formulas
3. Study the friendship link of any social networking site.
4. Using primary data source study, the voting patterns of our country.
5. Analyse how algorithms effect social media feeds
6. Visualize and Interpret performance of Athlete for any Sport
7. Modularize a given problem into sub problems.
8. Analyse the next moves of a player for Game of Chess
9. Devise a strategy to compute Result of a particular Class
10. Library Management System

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Programming Technologies and Tools Laboratory - I

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Practical:	04 Hours/Week	Term Work & Practical	50 Marks	Practical	02
		Total	50 Marks	Total	02

Course Objective

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also, by learning the basic programming constructs they can easily switch over to any other language in future.

Prerequisite:

-

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the knowledge of C programming Concepts
2. Develop C programs
3. Define Data types and use them in data processing programs.
4. Trace the execution of programs written in C language
5. Write functions and implement.
6. Analyse and interpret the concept of declarations, initialization, operations on pointers and their usage.

Unit I Basics and Operators

08 Hours

General problem-solving strategies, Top-down design, Introduction to program Planning tools- algorithm, flowcharts, and pseudo codes. Introduction to Logic Structures: Sequential structure, Decision Structure, Loop Structure. Features of C, basic concepts, structure of C program, program, declarations, variables, data types, expressions, operator's assignment, arithmetic, relational, logical, increment and decrement, precedence of operators, type conversions, scanf and printf functions

Unit II Control structures

08 Hours

if-else, nested if-else, cascaded if-else and switch statement. C Conditional control structures: for, while do-while Unconditional control structures: break, continue, goto statement.

Unit III Arrays and strings

08 Hours

Declaration initialization of one-dimensional Array, two-dimensional array, accessing array elements, Character Array/String, Character - Handling Library Functions, Standard Input/Output Library Functions for string.

Unit IV Functions and structures

08 Hours

What is a Function, Benefits of a Function, Function Terminology, Array of Structures, How does Function Works , Scope and Lifetime of Variables in function ,Storage Classes of Variables , Call by value and call by reference ,Recursion ,Overview of Structures , Defining and Using a Structure , Structures within a Structure

Unit V Pointers

08 Hours

Declaring and Initializing Pointers, Function and Pointer Parameters, Pointer Arithmetic, Pointer and Arrays, Two Dimensional Arrays and Pointers.

Unit VI Files**08 Hours**

FILE, Opening and Closing of Files, Writing and Reading in Text Format, Writing and Reading in Binary Format, Command Line Arguments

Textbooks

1. Let Us C by Yashavant Kanetkar, 13e, BPB Publication.
2. Brain W.Kernighan & Dennis Ritchie, C Programming Language, 2nd edition, PHI
3. E.Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill
4. How to Solve it by Computer by R. G. Dromey, 1e, Pearson Education.

Reference Books

1. C: The Complete Reference by Herbert Schildt.

List of Laboratory Exercises

1. Write a program to read a four-digit integer and print the sum of its digits.
2. Use recursive function calls to evaluate $F(x) = x - x^3 / 3! + x^5 / 5! - x^7 / 7! + \dots$
3. WAP to print the table of n.
4. Write a 'C' Program to evaluate Ackerman Function
5. Given a list of marks ranging from 0 to 100, write a program to compute and print the number of students:
 - (a) who have obtained more than 80 marks,
 - (b) who have obtained more than 60 marks,
 - (c) who have obtained more than 40 marks,
 - (d) who have obtained 40 or less marks,
 - (e) in the range 81 to 100,
 - (f) in the range 61 to 80,
 - (g) in the range 41 to 60, and
 - (h) in the range 0 to 40.
6. Make a Book Shop Inventory. The list should include details such as author, title, price, publisher, stock position. When a particular title and author name is given as input the program should reply whether it is in the list or no. If not, appropriate message should be displayed.
7. Write a program to find the total number of characters in a file.
8. Write a function which takes to integer as argument and return their average in float. WAP to test this function.
9. WAP to read n numbers and count even and odd numbers
10. Write a function which takes to integer as argument and return their sum. WAP to test this function.

Project Based Learning - Provisional List of Projects

1. Hangman Game
2. Modern Periodic Table
3. Pacman Game
4. Personal Diary Management System
5. Phonebook Application
6. Quiz Game
7. School Billing System
8. Snake Game
9. Telecom Billing System
10. Tic-Tac-Toe Game
11. Typing Tutor

B.TECH (Computer Engineering)
SEMESTER - II
COURSE SYLLABUS

Mathematics for Computing - II

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination	60 Marks	Lecture	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
Total			100 Marks	Total	04

Course Objectives:

To equip students with knowledge of:

- Fourier series and integral transforms.
- Multiple integrals and its applications.
- Vector calculus and its applications.

Prerequisite:

The students should have knowledge of vector algebra, derivative, and integration.

Course Outcomes: On completion of the course, students will have the ability to:

1. Use periodic functions as fourier series.
2. Apply methods of finding fourier and Z-transforms.
3. Apply methods of laplace transform of piecewise continuous functions.
4. Identify concepts of double and triple integrals.
5. Apply vector derivative for physical quantities.
6. Evaluate line, surface, and volume integrals.

Unit I Fourier Series

06 Hours

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis

Unit II Fourier and Z-Transform

06 Hours

Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory

Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit III Laplace Transform and its application

06 Hours

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit IV Multiple Integrals and their Application

06 Hours

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, moment of inertia, centre of gravity

Unit V Vector Differential Calculus

06 Hours

Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit VI Vector Integral Calculus and Applications

06 Hours

Line, Surface, and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problem in engineering.

Textbooks

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi GrihaPrakashan, Pune, 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
2. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit

Project Based Learning - Provisional List of Projects

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Fourier series
2. Harmonic analysis
3. Fourier transform
4. Z-Transform
5. Laplace transform technique to solve ODE
6. Multiple Integral to evaluate area and volume
7. Directional derivative
8. Divergence and curl
9. Greens theorem
10. Gauss Divergence Theorem
11. Stokes theorem
12. Unit step function
13. Solenoidal and irrotational fields
14. Simple difference equation
15. Periodic functions

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit - I, Unit - II, Unit - III
Unit - IV, Unit - V, Unit - VI

Physics for Computing Systems

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	04

Course Objective

To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Computer Engineering and Science.

Prerequisite:

Basic understanding of physics and calculus.

Course Outcomes: On completion of the course, students will have the ability to:

1. Interpret the properties of charged particles to develop modern instruments such as electron microscopy.
2. Appraise the wave nature of light and apply it to measure stress, pressure, and dimension etc.
3. Summarise the structure and properties of lasers to their performance and intended applications.
4. Classify the optical fibre, understanding the structure, types, and its applications in the field of communication.
5. Solve quantum physics problems to micro level phenomena and solid-state physics
6. Explain mechanical properties of solid matter and connect to applications in the field of engineering.

Unit I Modern Physics

06 Hours

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Separation of isotopes by Bainbridge mass spectrograph, Cathode ray tube (CRT).

Unit II Wave Optics

06 Hours

Interference: Interference of waves, interference due to thin film (Uniform and nonuniform (only formula-no derivation is expected), Newton's ring, Applications of interference (optical flatness, highly reflecting films, non-reflecting coatings).

Diffraction: Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima

Polarisation: Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.

Unit III Lasers

06 Hours

Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO₂ laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/industry, medicine, Computers)

Unit IV Fibre Optic**06 Hours**

Principle of fibre optics, Construction, Numerical Aperture for step index fibre; critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibres, Fibre optic communication system, advantages, and disadvantages of fibre optics.

Unit V Quantum Mechanics**06 Hours**

Dual nature of matter, DeBroglie's hypothesis, Heisenberg's uncertainty principle with illustrations, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, step potential and potential barrier (analytical discussion), tunnelling effect.

Unit VI Solid state physics**06 Hours**

Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell, and its characteristics.

Textbooks

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid-State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics -David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum.

List of Laboratory Exercises

1. Study of lissajous figure by Cathode Ray Oscilloscope (CRO)
2. Determination of e/m by Thomson method
3. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings
4. Determination of wavelength of light using diffraction grating
5. Determination of resolving power of telescope
6. Determination of thickness of a thin wire by air wedge
7. Determination of refractive index for O-ray and E-ray
8. Determination of divergence of a laser beam
9. Particle size by semiconductor laser
10. Determination of wavelength of laser by diffraction grating
11. To study Hall effect and determine the Hall voltage
12. Calculation of conductivity by four probe methods
13. Study of solar cell characteristics and calculation of fill factor
14. Determination of band gap of semiconductor
15. Determination of Planck's Constant by photoelectric effect

Project Based Learning - Provisional List of Projects

1. Measurement and effect of environmental noise in the college
 2. Design and simulation of automatic solar powered time regulated water pumping
 3. Solar technology: an alternative source of energy for national development
 4. Design and construction of digital distance measuring instrument
 5. Design and construction of automatic bell ringer
 6. Design and construction of remote-control fan
 7. Design and construction of sound or clap activated alarm
 8. Electronic eye (Laser Security) as auto switch/security system
 9. Electric power generation by road power
 10. Determination of absorption coefficient of sound absorbing materials
 11. Determination of velocity of O-ray and E-ray in different double refracting materials
 12. Need of medium for propagation of sound wave
 13. Tesla Coil
 14. Thin film interference in soap film-formation of colours
 15. LiFi- wireless data transfer system using light
- (Note: - *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Numerical Computation

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Lecture:	Hours/Week		Marks		Credits
	04 Hours/Week	University Examination	60 Marks	Lecture	04
		Internal Assessment	40 Marks		
		Total	100 Marks	Total	04

Course Objective

To equip students with the knowledge of:

- Numerical methods to solve linear and system of linear equations.
- Numerical methods for differentiation and integrations.
- Numerical methods for ordinary and partial differential equations

Prerequisite:

Mathematics for Computing - I

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply methods to solve linear and transcendental equations.
2. Solve system of linear equations.
3. Compute finite differences.
4. Apply method for numerical differentiation and integration.
5. Solve ordinary differential equations numerically.
6. Apply methods to solve partial differential equations.

Unit I Solution of Algebraic and Transcendental Equation 08 Hours

Bisection method, Method of false position, Newton's method and Newton-Raphson method, Approximate solution of equation – Horner's method

Unit II Solution of Linear Simultaneous Equation 08 Hours

Gauss elimination method, Gauss-Jordan method, Crout's triangular method, Iterative method of solution- Jacobi iteration method, Gauss-Seidal iteration method, Relaxation method

Unit III Finite Differences 08 Hours

Forward difference operator, Backward difference operator, Central difference operator, Newton's interpolation formula, Newton's forward-backward-central interpolation formula, Sterling formula, Bessel's formula, Interpolation with unequal intervals.

Unit IV Differentiation and Integration 08 Hours

Newton-Cotes's formula, Trapezoidal rule, Simpson one-third rule, Simpson three-eighth rule, Weddle's rule.

Unit V Numerical Solution of ODE 08 Hours

Picard's methods, Taylor series method, Euler's method, Modified Euler's method, Runge - Kutta method, Predictor-corrector method, Milne's method. Adams-Bash fourth method, Second-order differential equation

Unit VI Finite Difference Methods 08 Hours

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain - One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods - One dimensional wave equation by explicit method

Textbooks

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
3. S. S. Shastri, Introduction to Numerical Methods, PHI Publication.
4. V. Rajaraman, Computer Oriented Methods, 3rd Edition, PHI Publication.

Reference Books

1. Steven C Chapra, Numerical Methods for Engineers, 5th Edition, McGraw Hill Publication
2. James F. Epperson, An Introduction to Numerical Methods and Analysis, 2nd Edition, Wiley Publication.

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit.

Project Based Learning - Provisional List of Projects

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Bisection method
2. Newton Raphson's method
3. Horner's method
4. Crouts triangular method
5. Gauss Seidel method
6. Jacobi Method
7. Interpolation
8. Trapezoidal Rule
9. Simpson's rules
10. Euler method
11. Runge kutta method
12. Finite difference technique
13. Crank Nicolson method
14. Predictor Corrector method
15. Relaxation method

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit - I, Unit - II, Unit - III

Unit - IV, Unit - V, Unit - VI

Electrical Technology

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	05

Course Objective

To equip students with the knowledge of power system basics, magnetic circuits electrical machines, transformers, wiring, measurements, illumination, and batteries.

Prerequisite:

-

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the various parameters related to magnetic circuit.
2. Describe basic concepts of AC fundamentals and circuits.
3. Illustrate constructional features and describe different parameters of transformer.
4. Describe basic concepts of power system and three phase circuits.
5. Demonstrate AC and DC electrical machines.
6. Classify types of batteries.

Unit I Magnetic Circuits

08 Hours

Magnetic effect of electric current, Cross & Dot Convention, Right hand thumb rule, Concept of flux, flux linkages, magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability Kirchoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling.

Unit II AC Fundamentals and circuits: AC Fundamentals

08 Hours

Sinusoidal, square, and triangular waveforms – average and effective values, form and peak factors, concept of phasor, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth, and quality factor (simple numerical problems).

Unit III Single Phase Transformer

08 Hours

Faradays law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance, coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e.m.f. equation, voltage ratio, current ratio, KVA rating, determination of efficiency and regulation by direct load test, equivalent circuit, power losses, (simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections.

Unit IV Introduction to Power System and Three Phase

08 Hours

Circuits: General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only) Power generation to distribution through

overhead lines and underground cables with single line diagram. Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line, and phase voltage/current relations, three phase power and its measurement (simple numerical problems).

Unit V Electrical Machines

08 Hours

DC & AC: Principles of electromechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics, and applications of dc motors (simple numerical problems). single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).

Unit VI Batteries

08 Hours

Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.

Textbooks

1. B.L.Theraja, A Textbook of Electrical Technology, Vol.1, S.Chand & Company Ltd. New Delhi
2. V.K.Mehta, Basic Electrical Engineering, S Chand & Company Ltd. New Delhi.
3. J.Nagarath and Kothari, Theory and applications of Basic Electrical Engineering, Prentice Hall of India Pvt. Ltd.

Reference Books

1. Electrical Technology - Edward Huges (Pearson)
2. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
3. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
4. Electrical, Electronics Measurements and Instruments - (Satya Prakashan)

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit.

List of Laboratory Exercises

1. Plotting B-H characteristics for a material.
2. Load test on single phase transformer.
3. Testing and maintenance of batteries.
4. Verification of voltage and current relationships in star and delta connected 3-phase networks.
5. Load test on DC machine.
6. To find the performance of series R-L-C circuit at different condition
7. OS & SC test on single phase transformer to find efficiency and regulation
8. Speed control of DC motor
9. Study of different types of starters for DC & AC Machine
10. Load test on 3 phase Induction moto

Project Based Learning – Provisional List of Projects

1. Building a small resistive load lamp bank
2. Building a small resistive load lamp bank for various types of connections like series, parallel, star, delta
3. Building a small inductive load lamp bank for various types of connections like series, parallel, star, delta
4. Building a small capacitive load lamp bank for various types of connections like series, parallel, star, delta
5. Building a small resistive load lamp bank
6. Building a staircase wiring model on a board
7. Building a Go down wiring model on a board
8. Rewinding of a choke
9. Rewinding of a small transformer
10. Building a small rectifier circuit on bread board
11. Building a mobile charger circuit on a bread board
12. Building an electric buzzer circuit
13. Building a solar charger for mobile phone
14. Building a small wind turbine
15. Small Agricultural pump model with DC motor
16. Small Agricultural pump model with AC motor

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Paradigms of Programming

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Practical	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objective

The course aim to make students aware of various programming paradigms and emphasising on using object-oriented approach to solve real world problems.

Prerequisite:

-

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the knowledge of different programming paradigms.
2. Demonstrate the concepts of Object-Oriented Paradigm.
3. Develop programs using object-oriented approach
4. Develop small size programs using different programming language and Paradigm
5. Compare the strengths and weakness of different programming language specific to application context
6. Recognize the concepts of same kind from different programming languages and paradigms

Unit I Overview of programming paradigms 08 Hours

Basic elements of programming languages, compiled vs. interpreted, syntax, semantics, data types, Imperative languages and non-imperative, Scripting languages, Data-oriented languages, Object-oriented languages, Event-driven Programming

Unit II Functional Programming 08 Hours

Definition of a function: domain and range, total and partial functions, strict functions, Recursion, Referential transparency

Unit III Logic Programming 08 Hours

Basic constructs, Facts, rules, queries, processing, goals, predicates, variables, existential queries, conjunctive queries, Definition, and semantics of a logic program.

Recursive programming: Computational model of logic programming

Unit IV Object Oriented programming 08 Hours

Basic concepts: objects, classes, methods, overloading methods, messages inheritance: overriding methods, single inheritance, multiple.

inheritance Interfaces (e.g., in Java), encapsulation, polymorphism.

Unit V Overview of Languages 08 Hours

Ruby: basic concepts, interpreter, strings, control structures, conditionals, loops, (duck) typing, arrays, hashes, symbols.

Prolog: structures, matching structures, equality, comparison operators, arithmetic's, lists, splitting lists, enumerating lists.

Haskell: introduction, basic concepts, basic functions, conditionals, lists, ranges, list comprehension, basics of the type system, modules

Unit VI Advanced Programming

08 Hours

Concurrent programming, serial vs. parallel programming, process communication, basic concepts, data types, atoms, variables, pattern matching, lists, tuples- Database Programming

Erlang - Erlang: modules, functions, local functions, multiple matching possibilities, recursive functions, function evaluation, guards, control structures, anonymous functions, higher-order functions, lists and higher-order functions.

Textbooks

1. Seven Languages in Seven Weeks, Bruce A. Tate, Pragmatic Bookshelf, 2010
2. Programming Languages: Principles and Paradigms, Maurizio Gabrielli, Simone Martini, Springer, 2010
3. Programming Languages - Principles and Paradigms, Allen B. Tucker, Robert E. Noonan: (2nd ed.) McGraw-Hill, 2007
4. Clark R. G., Comparative Programming Languages, Addison-Wesley (3rd Ed.), 2000.
5. Mitchell, J. C. Concepts in Programming Languages, Cambridge University Press, 2002
6. Sebesta, R. W., Concepts of Programming Languages, Global Edition, Addison-Wesley (11th Ed.) 2016
7. Programming Languages: Concepts and Constructs; 2nd Edition, Ravi Sethi, Pearson Education Asia, 1996.

Reference Books

1. Programming Language Principles and Practice by KC Louden
2. Language manuals and on-line resources for programming languages, tools, and projects.

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit

List of Laboratory Exercises

1. Write a Simple Program (as given by course coordinator) in Ruby
2. Write a simple Program (as given by course coordinator) in Prolog
3. Write a simple Program (as given by course coordinator) in Haskell
4. Write a simple Program (as given by course coordinator) in Erlang
5. Write a program to Implement Concept of Class and Objects.
6. Write a Program to Implement Concept of Method Overloading and Method Overriding
7. Write a program to implement Concept of Inheritance.
8. Write a program to implement Concept of Interface.
9. Write a program to implement Concept of Recursive Function.
10. Study of Database Programming Language approach.

Project Based Learning - Provisional List of Projects

Use the best programming paradigm for the following:

1. Operations on Matrix
2. Recursion
3. Referential transparency
4. The countdown problem
5. tic-tac-toe
6. Lazy evaluation strategy

7. Assume that you have a list of temperature readings from several cities in the world. Some of them are in Celsius and some in Fahrenheit. First let us convert them all to Celsius, then let us print the data neatly.
8. Implement a better password protection scheme: In the program {User, Password} pairs are sent in plain text over the net. Implement a scheme where the password is never stored, instead store the MD5 checksum of the password and transmit this over the net.
9. All users have the same rights: Implement a scheme whereby different users are restricted to which directories they may access.
10. Files are sent as atomic actions: Files are read, transmitted, and written as atomic actions. This may not work if the files become very large. Implement a scheme for sending the files in smaller chunks. Implement a scheme whereby an FTP transfer can be aborted and restarted in the case where we transfer very large files.

Programming Technologies and Tools Laboratory – II

<u>Teaching Scheme</u>		<u>Examination Scheme</u>	<u>Credit Scheme</u>	
	Hours/Week		Marks	Credits
Practical:	04 Hours/Week	Term Work & Practical	50 Marks	Practical 02
		Total	50 Marks	Total 02

Course Objective

The course focuses on making students learn and practise the Object-Oriented programming, to use concepts and solve the problems.

Prerequisite:

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Course Outcomes: On completion of the course, students will have the ability to:

1. Choose and apply different Concepts of OOP
2. Demonstrate the use of functions to solve real world problem
3. Identify and apply the concept of Access Specifiers, Scope Resolution operator, Data Abstraction
4. Compare different types of inheritance to solve given problem.
5. Develop applications with constructor and polymorphism.
6. Develop OOP applications using file Handling and Exception handling.

Unit I Introduction to Object Oriented Programming with C++ 08 Hours

Introduction to Object Oriented Programming, Basic Concept of OOP, Need for OOP, Benefits of OOP, Object Oriented Languages, Applications of OOP. C versus C++, C++ Characteristics, Structure of C++ program, Tokens, Keywords, Identifiers and Constants, Data Types, Declaration of variables, Dynamic initialization of variables, Control Structures

Unit II Functions in C++ 08 Hours

The Main Function, Function Prototyping, Call by Reference, Inline functions, Default arguments, Function Overloading, Operator Overloading, Operator precedence, Math library functions, Friend and Virtual Functions.

Unit III Classes and Data Abstraction 08 Hours

Class specification, Class Objects, Scope resolution operator, Access specifiers Public, Private, Protected, Defining member Functions, Nesting of Member Functions, Private Member Functions, Static Data Members, Static Member Functions, Data hiding.

Unit IV Inheritance 08 Hours

Defining Derived Classes, Types of Inheritance, Virtual Base Class, Abstract class. Inheritance and protected members, protected base class inheritance, Inheriting multiple base classes, Templates: Class template, class template with parameter, function template, function template with parameter.

Unit V Constructor and destructor 08 Hours

Types of Constructors, Types of copy constructor, constructor overloading, constructor with default parameter, dynamic initialisation of objects, destructor.

Polymorphism: Base class, Virtual Functions, Pure Virtual Functions, Calling a virtual function through a base class reference, Early and Late Binding.

Unit VI Managing, I/O and Working with Files

08 Hours

C++ stream classes, Unformatted IO operations, formatted IO operations, Classes for file stream operations, opening and closing files, Different File Operations in C, Exception handling in C++.

Textbooks

1. E. Balaguruswamy, "Object Oriented Programming using C++", 4th Edition,Mc Graw Hill, 2010.
2. The C++ Programming Language, Bjarne Stroustrup.

Reference Books

1. Yashwant Kenetkar," Let us C++",1stEd., Oxford University Press (2006)
2. Bjrane Stroustrup, "C++ Programming language",3rd edition, Pearson education Asia (1997)

List of Laboratory Exercises

1. Explain basic concept of OOP, characteristics of OOP, Difference between C and CPP.
2. Demonstrate Basic simple CPP Program and Program related Control structures in CPP.
3. Demonstrate Concept of Function in CPP.
4. Demonstrate Concept of Inline Function in CPP.
5. Demonstrate Concept of Function Overloading and Operator Overloading in CPP.
6. Demonstrate Concept of Class and Object with the help of Scope Resolution Operator in CPP.
7. Demonstrate Concept of Different types of inheritance in CPP.
8. Demonstrate Concept of Constructor and Destructor in CPP
9. Demonstrate Concept Friend and Virtual Function in CPP
10. Demonstrate Concept of File handling and Exception handling in CPP.

Project Based Learning - Provisional List of Projects

1. Billing Application
2. Traffic Management System
3. Library Management System
4. Employee Record System
5. Security System
6. Calendar Application
7. Medical Store Management System
8. Cricket Score Sheet
9. Bank Management System
10. Telecom Billing System

Computer System Workshop Technology

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Practical:	02 Hours/Week	Term Work & Practical	100 Marks	Practical	01
		Total	100 Marks	Total	01

Course Objective

This course focuses on enabling students to identify the hardware components of computer, assembling them, running diagnosis, carry out system configurations and installing system and user applications necessary for computing courses.

Prerequisite

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Course Outcomes: On completion of the course, students will have the ability to:

1. Identify the architecture of a computer and its different components, including their technology evolution.
2. Apply their knowledge about computer peripherals to identify problems.
3. Install and uninstall given software step-by-step
4. Demonstrate the working of Internet
5. Prepare document using Latex
6. Use GitHub tool for coding and collaboration.

Unit I Computer Hardware

06 Hours

Introduction to hardware components, random access memory (RAM), Types of RAM & their speed, tips for buying RAM, how to add memory to a computer, problems when installing memory, Central Processing Unit (CPU), Types Of CPU: considerations when buying a new CPU (Types & Differences), different speeds available for CPU and what do they mean, 32 Bit vs 64 Bit – Which One to Choose & Why? How to choose a CPU type for different needs? Graphic Card & Types, how to install a Graphics Card, installing a CD or DVD burner, Jumper Switch settings, Hard Disk upgrade, Different ports and why we use them - USB, PS2, DivX, Graphic card & types, Virtual Memory and how to configure it for optimum system performance.

Unit II Assembly of Computer and Software Installations

06 Hours

Assembling the motherboard, replacing fan, how to avoid common mistakes during assembly, Installation of system software: Operating system (Windows and Linux), Installation's step for operating system, Dual booting, Configure the BIOS, Installation of Antivirus, Installation of the open-source software such as Scilab, Latex, Installation of Ms Office.

Unit III Basic Diagnostic of Hardware and Software

06 Hours

Diagnosis of Power Up problem, Boot Drive, Errant Keyboard, mouse problems, slow computer performance, Computer freezes and displays BSOD (Blue screen of death), no display on monitor, no sound, computer rebooting or turning itself off, how to troubleshoot a computer that does not boot, Registry Cleaner.

Unit IV Computer Network Environments

06 Hours

Network connecting devices. Configure the TCP/IP setting, connect to Local Area Network and access the Internet, Configuring Wireless network. Server and Its Configuration, Email Clients, Browsers, Office tools, customize web

browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers, Browsing netiquettes and cyber laws. Cloud Access Tools.

Unit V Configuration of External devices

06 Hours

Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader, Connecting and Using Projectors.

Unit VI Productivity Tools

06 Hours

Open-Source Tools Such as Latex, GitHub, Latex: Format words, lines, and paragraphs, design pages, create lists, tables, references, and figures in LATEX. Introduction to LaTeX Packages and classes. Using Git, Version Control Systems, interacting with GitHub, Reverting Changes, Creating Pull Requests.

Textbooks

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. PC Hardware and A+Handbook - Kate J. Chase PHI (Microsoft)
3. LaTeX Companion - Leslie Lamport, PHI/Pearson
4. Scilab, from theory to practice Scilab: I. Fundamentals Perrine Mathieu, Philippe Roux 2016
5. ISBN: 978-2-8227-0293-5

Reference Books

1. Computer Fundamentals, MS Office, and Internet & Web Technology by Dinesh Maidasani.
2. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. - CISCO Press, Pearson Education.
3. <https://nptel.ac.in/courses/106/105/106105081/>
4. <http://nptel.ac.in/courses/106105084/>

List of Laboratory Exercises

1. Demonstrate the Computer Hardware Components and explain its working.
2. Demonstrate the Networking Components and explain its working.
3. Installation of operating system MS windows, Unix on the personal computer
4. Installation of Application software Scilab, Latex, MS office on the personal computer
5. Troubleshooting hardware related problem.
6. Customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
7. Execution of Important "layout" and formatting commands in Latex,
8. Installation of Antivirus and customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms
9. Using Scilab commands, perform basic arithmetic and matrix operations
10. Create a Scilab script file to display product of a matrix A and inverse of A.

Project Based Learning - Provisional List of Projects

1. Collect specifications of similar types of hardware and software and prepare report comparing them
2. Assembling and disassembling the PC back to working condition.
3. Installation of operating systems LINUX on Server and different packages on a PC.

4. Practice hardware troubleshooting exercises related to various components of computer like monitor, drives, memory devices, printers etc. and software troubleshooting related to BIOS etc
5. To start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of?
6. Cyber Hygiene: Installing antivirus for Windows.
7. Prepare the report of need of programming language in 21st century.
8. Collect various types of computer hardware and prepare summary report
9. Prepare Seminar report using LaTeX
10. Prepare Project report using LaTeX

B.TECH (Computer Engineering)
SEMESTER - III
COURSE SYLLABUS

Discrete Mathematics and Applications

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Hours/Week		Marks		Credits	
Lecture:	03 Hours/Week	University Examination	60 Marks	Lecture	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
		Total	100 Marks	Total	04

Course Objective

The courses emphasise on mathematical foundation required for computing enabling the students to develop logical thinking, reasoning, and problem-solving skills.

Prerequisite:

Elementary Linear Algebra, Mathematics for Computing-I

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the ability to write and evaluate a proof technique.
2. Apply the basic principles of set theory to analyse the data relationship and prove basic properties of set.
3. Demonstrate an understanding of relations and functions to determine their properties.
4. Apply the knowledge of Boolean algebra for building basic electronic and digital circuits.
5. Solve problems of combinatorics and recurrence relations.
6. Model problems in Computer Science using graphs and trees.

Unit I Mathematical Logic

06 Hours

Propositional Logic, Predicate logic, First order logic, Rules of inference, Introduction to proof techniques, resolution, Mathematical induction, Methods of proofs, Applications.

Unit II Set Theory

06 Hours

Types of sets, Sets operations and laws, Algebra of Sets, Multisets, Application of the principle of inclusion and exclusion.

Number Theory: Modular arithmetic, prime numbers, and properties, GCD, Chinese remainder theorem, Solving congruences, Applications of congruences Cryptography.

Unit III Relations

06 Hours

Basic definition, properties and types of relations, relations and digraphs, paths in relations and digraphs, equivalence and partially ordered relations, Transitive closure and Warshall's algorithm.

Functions: Types of functions, Identity functions, Composition of functions, Mathematical functions, Pigeonhole principle.

Unit IV Algebraic Structures

06 Hours

Isomorphism and Homomorphism Groups, Algebraic Structures with Binary Operations, rings, Cyclic groups, codes.

Lattice: Posets and Hasse Diagrams, Lattice as an algebraic system, Properties of lattices.

Group Codes: The Communication Model and Basic notion of Error Correction, Generation of Codes, Parity Checks, Error recovery in group codes.

Unit V Combinatorics and Recurrence Relations

06 Hours

Combinatorics: Permutations, Sum rule, Product rule, Combinatorial proofs.

Recurrence Relations: Linear Recurrence relation, Second order recurrence relations with constant coefficients, Applications of Recurrence relation.

Unit VI Graph Theory and Application

06 Hours

Definition, Degree, Types, Paths, Circuits, Operations on graphs, and Graph Models, Isomorphism, Connectedness, Planar graphs and their properties, Eulerian and Hamiltonian graphs.

Trees: Basic properties of trees, Binary trees, Application: Graph and Networks: Minimum Spanning Tree, Shortest Path, Huffman coding.

Textbooks

1. J.P. Tremblay and Manohar: Discrete mathematical structures with application to Computer Science, McGraw hill- New Delhi.
2. B. Kolman and R.C. Busby: Discrete mathematical structures for computer science Prentice Hall, New-Delhi.
3. S. Malik and M. K. Sen Discrete Mathematics, Cengage Learning India Pvt. Ltd.

Reference Books

1. Kenneth H. Rosen, Discrete Mathematics, and its applications Eighth Edition McGraw Hill Education
2. Stanat and McAlister, Discrete Mathematics for Computer Science, PHI
3. R.M. Somasundaram Discrete Mathematical Structures, Prentice Hall India Learning Private Limited

List of Assignments

1. Given a fact or a statement prove or disprove using suitable technique.
2. Write the given English language sentences represent in the Symbolic logic
3. Given the statement forms Infer the validity of the statement form
4. Draw a Hasse diagram and find chains and antichains
5. Find the number of ways for any event or given sample space.
6. Given a problem represent in a graph and compute the optimal solution
7. Given a communication network find the path between the given nodes

Project Based Learning - Provisional List of Projects

1. Discrete Mathematics in Railway Planning using graph theory and linear algebra.
2. Object transformations using linear algebra.
3. Discrete mathematics in cryptography.
4. In Google maps to determine fastest driving routes and times.
5. In image processing
6. In relation database using sets.
7. In cyber security using graph theory.
8. Shortest path between two cities using a transportation system.
9. Data compression system with the help of Huffman coding.
10. Find the shortest tour that visits each of a group of cities only once and then ends in the starting city using graphs.

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Data Structures and Algorithmic Thinking

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Practical	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objective

The course enables students to perform tasks that facilitates them to understand interaction between the algorithms and the structure of the data being analysed by these algorithms. This course also focuses to train students in process of algorithmic thinking enabling them to build simpler solutions to various computational problems.

Prerequisite:

Classical Data Structure, Computational Thinking and Programming Concepts, Programming Technologies, and Tools Laboratory 3

Course Outcomes: On completion of the course, students will have the ability to:

1. Comprehend the real time problem.
2. Practise and apply Iterative Thinking
3. Practise and apply Recursive Thinking
4. Demonstrate the use of ADTs,
5. Develop code to illustrate sorting and searching algorithms.
6. Apply algorithms and data structures in various real-life software problems.

Unit I Recursion and Backtracking

08 Hours

Introduction to recursion, why recursion, Format of a Recursive Function, Recursion and Memory, Recursion Vs. Iteration, Algorithms of Recursion, Recursion problems and Solutions.

Introduction to Backtracking, Algorithms of Backtracking, Backtracking problems, and Solutions.

Unit II Trees

08 Hours

Introduction to Trees, Binary Trees, Types of Binary Trees, Properties of Binary Trees, Binary Tree Traversals, Generic Trees (N-ary Trees), Threaded Binary Tree Traversals (Stack or Queue-less Traversals), Expression Trees, XOR Trees, Binary Search Tree, Balanced Binary Search Trees, Adelson-Velskii and Landis (AVL) Trees.

Unit III Priority Queues & Heaps and Disjoint Sets ADT

08 Hours

Introduction to Priority Queues, Priority Queue ADT, Priority Queue Applications, Priority Queue Implementations, Heaps and Binary Heaps, Heapsort, Priority Queue problems and Solutions.

Disjoint Sets ADT - Introduction, Equivalence Relations and Equivalence Classes, Disjoint Sets ADT, Trade-off in Disjoint Sets ADT implementations, Fast UNION Implementation - Slow Find and Quick Find.

Unit IV Graphs Algorithm

08 Hours

Introduction to Graphs, Application of Graphs, Graph Representation, Graph Traversals, Topological Sort, Shortest Path Algorithms, Minimal Spanning Tree, Graph Algorithm problems & Solutions.

Unit V Sorting and Searching**08 Hours**

Introduction to Sorting, Classification of Sorting algorithms, Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Merge Sort, Heap Sort, Quick Sort, Tree Sort, Comparison of Sorting algorithms, Linear Sorting Algorithms, Counting Sort, Bucket Sort, Radix Sort, Topological Sort, External sorting. Introduction to Searching, Types of Searching, Unordered searching, ordered linear search, Binary search, Interpolation search, Comparison of searching algorithm.

Unit VI Maps, Hash tables and Skip Lists**08 Hours**

Introduction - Hashing, Hash Tables - Hash Functions, Collision Handling schemes, Load Factors, Rehashing, and Efficiency. Map ADT Introduction, Counting Word Frequencies, Sorted Maps, Sorted Search Tables, Skip Lists - Search and Update Operations in a skip list.

Textbooks

1. Data Structures: A Pseudo code approach with C, R. Gillberg, B. Forouzn
2. Data structures using C and C++ by Langsam, Augenstein, Tenenbaum, PHI publication
3. Data Structure and Algorithmic Thinking with Python, CareerMonk Publications, Narasimha Karumanchi, 2016

Reference Books

1. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, John Wiley & Sons, 2013
2. Think Data Structures- Algorithms and Information Retrieval in Java, Allen B. Downey, O'Reilly, 2017

List of Assignments

1. Write algorithm, pseudocode, and code to solve Recursion Problems like - Towers of Hanoi, whether given array is in sorted order.
2. Write algorithm, pseudocode, and code to solve Backtracking Problems like - Generate all the binary strings with n bits. Assume A [0.. n - 1] is an array of size n, generate all the strings of length k drawn from 0... k - 1.
3. Write algorithm, pseudocode, and code to solve problems like - Give an algorithm for finding maximum element in binary tree.
4. Write algorithm, pseudocode and code to solve AVL Trees problems - Given a height h, give an algorithm for generating the HB(h). HB(h) is generating full binary tree.
5. Prove, is there a min-heap with seven distinct elements so that the pre-order traversal or it gives the elements in sorted order?
6. Travelling Salesperson Problem: Find the shortest path in a graph that visits each vertex at least once, starting and ending at the same vertex'?

List of Laboratory Exercises

1. Finding the length of connected cells of 1s (regions) in a matrix of 0s and 1s.
2. Give an algorithm for finding the maximum element in binary tree without recursion.
3. Give an algorithm for searching a element in binary tree.
4. Give an algorithm for finding the diameter of the binary tree. The diameter of a tree (sometimes called the width) is the number of nodes on the longest path between two leaves in the tree.
5. Implement the Algorithm for Building Expression Tree from Postfix Expression
6. Write and implement an algorithm for deleting an arbitrary element from min heap.

7. Write and implement an algorithm for checking whether a given graph G has simple path from source s to destination d. Assume the graph G is represented using the adjacent matrix.
8. Perform DFS on given graph C.
9. Count the number of connected components of Graph G which is represented in the adjacent matrix.
10. Merging K sorted lists: Given K sorted lists with a total of n elements, write an algorithm to produce a sorted list of all n elements.

Project Based Learning - Provisional List of Projects

1. Design and development of Student attendance system using array data structure.
2. Design and development of Car rental system using Singly linked list (SSL) data structure.
3. Design and development of Inventory management system using suitable data structure.
4. Comparative study of student management system using array, queue, and stack.
5. Design phone dictionary using doubly linked list (DLL).
6. Design and implement of dictionary using hierarchical data structure.
7. Design and implement of expression solver using stack.
8. Design and development quizer (quiz conduction application).
9. Design and development of subject recommendation system.
10. Design and development of Sudoku Solver.

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Computer Organisation and Design

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Practical	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objective

This course aims at providing comprehensive understanding of the organization and architecture of modern-day computers, emphasizing both fundamental principles and role of performance parameters in driving computer design.

Prerequisite:

Digital Electronics

Course Outcomes: On completion of the course, students will have the ability to:

1. Analyse the design issues in terms of speed, technology, cost, performance
2. Understand the architecture and functionality of central processing unit.
3. Learn design approaches implementing control unit
4. Discuss the concept of memory organization.
5. Describe structure and functions of I/o module and Peripherals.
6. Infer Performance Enhancement of Processor

Unit I Computer arithmetic and performance

08 Hours

Computer organization and system architecture, Structure and functions, Von Neumann Architecture, IAS machine. Computer Performance Measurement, Aspects & Factors affecting Computer Performance, MIPS & MFLOPS, designing for performance, fixed and floating-point representations, IEEE 754 format. Booths Algorithm for Signed Multiplication, Restoring and Non-Restoring Division Algorithms.

Unit II Central Processing Unit

08 Hours

Introduction to x86 microprocessor, Architecture, register organization, Segmentation, Instruction execution cycle, addressing modes, and Instruction set. Instruction Formats, Instruction Types, the Instruction Cycle, and Instruction Pipelining, RISC Vs. CISC Architecture

Unit III Control Unit

08 Hours

Instruction Cycle & Micro Operations, Functional Requirements & Operations of the Control Unit, Block Schematic & Control Signals, Single Bus Processor Organization, Control Signal example with Micro Operations and Register Transfer. Control Unit Design Methods - Hardwired Control and Micro-Programmed Control Microinstructions & Formats, Control Memory, Microinstruction Sequencing, Sequencing Techniques, Address Generation, Microinstruction Execution, Microinstruction Encoding

Unit IV Memory

08 Hours

Characteristics of Memory Systems, Internal and External Memory Types. Memory Hierarchy, Principle of Locality, Cache Memory - Basics, Performance Metrics & Improvements, Organization and Mapping Techniques, Handling Cache Misses & Writes, Replacement Algorithms, Cache Controllers

Unit V I/O organization**08 Hours**

Structure and functions of I/o Module, Peripheral devices and their characteristics, Input-output subsystems, I/O device interface, Programmed I/O, Interrupt driven I/O, DMA, Buses-SCSI, USB

Unit VI Performance enhancement of processors**08 Hours**

CPU Performance and its Factors, Evaluating Performance, Enhancing Performance - Pipeline Processing, instruction pipelining, pipeline stages and hazards, The ARM Cortex-A8 and Intel Core i7 Pipelines, Parallel Processing Concepts - Flynn's classifications, Cache coherence in multiprocessor systems, Specialized Architectures - Multi-core systems

Textbooks

1. William Stallings. "Computer organization and architecture: designing for performance". Pearson Education India, 2010
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky. "Computer Organization", McGraw Hill, 2011.
3. Computer System Architecture M. M. Mano: 3rd ed., Prentice Hall of India, New Delhi, 1993.
4. Computer Architecture and Organization, John P. Hayes.

Reference Books

1. A. S. Tanenbaum "Structured Computer Organization", 4th Edition, Prentice Hall of India, 1991 ISBN: 81-203-1553-7.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.

List of Assignments

1. Describe structure of IAS computer with neat block diagram.
2. Describe architecture of 8086 with neat block diagram.
3. Draw and Explain Hardware implementation of Booth's algorithm for signed number multiplication
4. Draw flowchart for Booth's Algorithm for multiplication and perform 9×-6
5. Draw and Explain Hardwired control unit using a. Delay element method or b. Sequence Counter method
6. Explain Direct mapping and set associative mapping of cache memory in detail with suitable example

List of Laboratory Exercises

1. Write an Assembly Language program to display system time on screen.
2. Write an Assembly Language program to add and subtract two 8-bit numbers.
3. Write an Assembly Language program to determine 2's complement of a number
4. Write an assembly language program for BCD addition and subtraction.
5. To Apply Booth's Algorithm for illustrating multiplication of signed numbers.
6. To design and illustrate Restoring Division Algorithm.
7. To design and illustrate Non-Restoring Division Algorithm.
8. To design 4-bit ALU (VLAB)
9. Study of Memory Design (VLAB)
10. To design Direct mapped Cache and associative cache (VLAB)

Project Based Learning - Provisional List of Projects

Write program to generate assembly code from prefix code.

1. Simulate a word multiplier.
2. Simulate a word divider.

3. Suggest a high-speed addition method and logic for 4-bit addition
4. Design and implement an arbitrary precision four function calculator.
5. Simulate modern traffic control system.
6. Suggest and design a minimal cpu architecture for controlling the washing machine.
7. Write/create/research a tool for benchmarking of a hardware (CPU).
8. Implement quick sort using assembly language.
9. Implement binary search using assembly language.
10. Implement matrix multiplication using assembly language
11. Microprocessor based automatic attendance recorder
12. Microprocessor based furnace temperature controller.

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Computer Networks

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Practical	50 Marks	Practical	01
		Total	150 Marks	Total	04

Course Objective

This Course emphasis on all theoretical concepts and practical aspects of networking. This course enables the students to understand the networking hardware & concepts through using network simulators.

Prerequisite

Computer System Workshop Technology.

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the knowledge of computer networking.
2. Elucidate detailed structure of physical and data link layers
3. Demonstrate the knowledge of about Network and Transport Layers.
4. Elucidate the details of Session and Presentation Layers
5. Illustrate the functionality of Application layer
6. Recite the fundamentals of wireless network.

Unit I Fundamentals of Networking

06 Hours

History of network and internet, need of network, Types of networks, Networking hardware, Information transmission, Transmitter, Receiver, Introduction to networking applications and simulators, Introduction to OSI reference model, Introduction to TCP/IP model, Introduction to internet and working of Internet, Introduction to network security, IEEE standards for networking

Unit II Physical and Data Link Layers

06 Hours

Ethernet, LLC, MAC, Framing, Channel Allocation schemes, Error Control, Flow Control, Error Detection and correction, Physical Layer protocols, Data Link layer protocols

Unit III Network and Transport Layers

06 Hours

Network Layer: Network Packet structure and formation, routing algorithms, congestion control algorithms, quality of service, IP Addressing, Subnets, configuring network settings, Network problem solving.
Transport Layers: Segmentation, Congestion control, Connection oriented and connection less services, Network and Transport Layer Protocols.

Unit IV Session and Presentation Layers

06 Hours

Session Layer: Session management, synchronization, Dialog control, Presentation Layer: Encryption-decryption, Compression, File formats, Translation, Session and Presentation Layer protocols, Session and Presentation Layer protocols.

Unit V Application Layer

06 Hours

DNS, URL, Data Cache and streaming, Web Applications, Web browser working, Cloud services, User interface and User interaction, Mail systems, Support of file formats, Application Layer protocols

Unit VI Network Security

06 Hours

Firewall, Types of Firewalls, Cryptography, Symmetric Key Algorithm, Public Key Algorithm, Digital Signatures, Public Key Management, Communication Security, Authentication protocols.

Textbooks

1. Data and computer communications, William Stallings, 10th edition, Pearson
2. Computer networking: a top-down approach, James f. Kurose, Keith w. Ross, 6th edition, Pearson.
3. Computer Networks, Tanenbaum, 5th Edition, Pearson

Reference Books

1. Data communication & networking, Forouzan, 5th edition, McGraw-Hill.
2. Computer Networking Beginners Guide, Russell Scott, 1st edition, Stefano Cardinale

List of Assignments

1. Explain in detail the types of Networks.
2. Consider the real time scenario to explain the error correction and detection.
3. Compare: Connection oriented and Connection less services
4. Consider the real time scenario to explain the role of Session and Presentation Layer in networking
5. Explain in detail: How does the web browser work?
6. Explain in detail: The role of Network Security in computing.

List of Laboratory Exercises

1. Introduction to Computer Network and Network Simulators.
Networking devices, Addresses, Network Security, Internet working, Network Simulators: Cisco Packet Tracer, Netemul, NetSim.
2. Network configuration of PCs and other networking devices
Configuring Computer and Router via OS UI and commands, Networking commands
3. Network configuration of PCs and other networking devices using network simulators.
Observing and configuring PCs, Routers, Switch, Hub, and other networking devices using network simulators
4. Establishment of simple LAN network using real time devices and network simulators.
Establishment of simple LAN network using actual devices like PCs, Switch, Router and through network simulators
5. Communication between two or multiple systems using network simulators.
Establishment of network where two network systems can communicate with each other. Use of PCs, Switch etc. in network simulator.
6. Broadcasting using network simulators.
Establishing network to broadcast the information using network simulator. Use of PCs, Switch and Hub in the network simulator.
7. Establishment of different networks and communication between them using real time devices and network simulators.
Establishment of different networks and communication between using actual devices like PCs, Switch, Router and through network simulators
8. Understanding Protocols of Transport Layer using Network Simulators
Understanding Transport Layer protocols TCP, UDP using networking simulators
9. Implementation of Client-Server Architecture for Same Network using Network Simulators and Programming

Implementing some services of Server with protocols like FTP, HTTP, and others.
Use of PCs, Servers, Switch in Network Simulator. Socket Programming: Use of Python, C, C++, Java for implementing Client Server architecture.

10. Implementation of Client-Server Architecture for different Networks using Network Simulators.

Implementing some services of Server with protocols like FTP, HTTP, and others for different networks. Use of PCs, Servers, Switch and Router in Network Simulator.

11. Understanding Web Browser structure and working
Web browser structure, source code loading, UI generation, Information loading into application layer, file format support and Complete working of web browser.
12. Establishment of wireless network
Establishment of wireless networking using actual devices and via network simulator. Use of Laptops and Wifi Router.

Project Based Learning - Provisional List of Projects

1. IP based patient monitoring system
2. Configuring Internet Router
3. Configuring Network Switch
4. Home Automation system using Wi-Fi
5. Wireless Weather monitoring system using Raspberry pi.
6. Smart Traffic control system
7. Smart energy meter for homes
8. Analysis of IPv4/IPv6 protocols
9. Web System Security.
10. Personalized Web Search with Location Preferences

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Software Engineering

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination	60 Marks	Lecture	04
Practical:	04 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Oral	50 Marks	Practical	02
		Total	150 Marks	Total	06

Course Objective:

The course emphasises on the building blocks, importance and need of software engineering. It focuses on the various processes, methods, and practices for developing software which makes software engineering as a specific discipline. This course includes elaboration on each phase of software development life cycle methodologies and practices. It further covers the essential knowledge required to ensure the quality and maintenance of developing and developed software.

Prerequisite:

-

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply the Software Engineering approach to software design and development.
2. Apply the Essential processes of SDLC.
3. Demonstrate the knowledge of requirement elicitation by classifying and documenting the requirements
4. Demonstrate software design by modelling artifacts for gathered requirements & analysis.
5. Apply testing strategies and create test cases and test suites
6. Use the project management concepts and tools for managing software project.

Unit I Overview of Software Engineering & Its Methodologies 08 Hours

Defining Software Engineering, Software Engineering Principles, Software Engineering Ethics, Software Process, Project, Product and People.

Overview of Software development lifecycle methodologies: Waterfall, Agile, Lean, Iterative, Spiral, DevOps.

Unit II Requirements and Design 08 Hours

Expressing Requirements, Types of Requirements, Feasibility Study, Elicitation Techniques. Requirements Analysis - Structured Analysis, Object Oriented Modelling, Other Approaches. Requirement Specification, Requirement Validation, Requirement Engineering Tools (CASE).

Software Design: Principles of Software Design, Data Design, Architectural Design, Component Level Design, Object-oriented design, Design Notations, User Interface Design

Unit III Coding and Testing 08 Hours

Coding Guidelines, Coding Methodology, Programming Practice - Top-down, bottom-up, structured programming, information hiding programming, Code verification Techniques, Introduction to No-Code Development approach and tools.

Testing: Software test Characteristics, Test plan, Test Case Design, Testing Strategies, Testing Techniques, Debugging Process, and strategies.

Unit IV Software Quality and Maintenance **08 Hours**

Quality Concepts, ISO 9126 Quality Factors, Mc Call's Quality Factors, SQA plan, SQA Activities, Software Reviews, Sig Sigma & ISO 9000 Quality Standards, capability maturity model, Software Reliability.

Maintenance: Factors affecting software Maintenance, Types of software Maintenance, Software Maintenance Lifecycle.

Unit V SCM and Re-engineering **08 Hours**

Software Configuration Management - Basics, SCM Planning, Project Library, SCM Process - Configuration Identification, Change Control, Version Control, SCM Tools (CASE).

Software re-engineering: Objectives, Principles of Re-engineering, Levels of Abstraction, Software Re-engineering process Model, Business Process Re-Engineering.

Unit VI Software Planning and Cost Estimation **08 Hours**

Responsibility of Software Project Manager, Project Planning, Project Scheduling, People capability maturity model, Risk Management.

Cost Estimation - Basics, Estimation of Resources, Product Cost Factors, Cost Estimation Process, Constructive Cost Model, Function Point Analysis, Decomposition techniques- Problem based Estimation, Process based estimation, use case-based estimation.

Textbooks

1. Fundamentals Of Software Engineering, Rajib Mall Phi Learning, 02-Apr-2014, Isbn 8120348982, 9788120348981
2. "Software Engineering: Principles and Practices, 2nd Edition by Rohit Khurana, Khurana Rohit · 2010, Vikas Publishing House Pvt Limited", ISBN: 9788125939467
3. Software Engineering principles and practices, Rajesh Narang, 2015 McGraw Hill Education, ASINB014ULF4R8

Reference Books

1. Software Engineering: A Practitioner's Approach, By Roger Pressman and Bruce Maxim, McGraw Hill, 9th Edition, ISBN10: 1259872971
2. Software Engineering, by Ian Sommerville, Pearson; 10th edition, ISBN-10: 0133943038

List of Assignments

1. A mini project will be given to the students based on which they need to prepare the following
 - a. Choosing the appropriate SDLC method to develop the given project.
 - b. Develop the project plan along with feasibility study and estimations
 - c. Prepare the Software requirement Specification document
 - d. Prepare the Software Detailed Design Document
 - e. Prepare test cases
 - f. Use CASE tools to perform all the above tasks.

List of Laboratory Exercises

1. Present a Case study on Agile methodology
2. Present a Case study on DevOps
3. For the given project, perform requirement elicitation using tools and prepare SRS.
4. Prepare case study on Tools used to create Unified Modelling Language.
5. Design Structure Model for the given SRS using UML tool.
6. Design Behaviour model for the given SRS using UML tool

7. Prepare the Testcases using the Junit.
8. Prepare case study on Tools used to prepare project Plan.
9. Prepare a case study on Automated testing Tools.
10. Prepare a case study on Total quality management.

Project Based Learning - Provisional List of Projects

1. Flight Vehicle and Aircraft Systems Engineering.
2. Skyscraper
3. Software piracy protection system
4. e-Learning platform
5. Bug tracker
6. Railway tracking and arrival time prediction system
7. Employee management system
8. Camera motion sensor system
9. Operating System task monitoring application
10. Data leakage detection system

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit - I, Unit - II, Unit - III

Unit - IV, Unit - V, Unit - VI

Programming Technologies and Tools Laboratory – III

<u>Teaching Scheme</u>		<u>Examination Scheme</u>	<u>Credit Scheme</u>	
	Hours/Week		Marks	Credits
Practical:	04 Hours/Week	Term Work & Practical	50 Marks	Practical 02
		Total	50 Marks	Total 02

Course Objective:

The course aims to make students aware of python programming.

Prerequisite:

-

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the knowledge of using data structures in python.
2. Demonstrate the characteristics of object-oriented Python
3. Perform basic operations on file.
4. Understand and implement error and exception handling
5. Design basic GUI using Python Tkinter
6. Implement database connectivity using MySql and SQLite.

Unit I Python Language Basics

08 Hours

Python Interpreter, Running IPython Shell, Running Jupyter Notebook, Tab Completion, Introspection, The %run Command, Executing Code from the Clipboard, Terminal Keyboard Shortcuts, About Magic Commands, Language Semantics, Scalar types, Control flow.

Data Structures and Sequences – Tuple, List, built in sequence functions, dict, set, strings.

Unit II Functions, Modules, Packages

08 Hours

Functions – def statement, returning values, parameters, arguments, local variables, global variables and global statement, Doc Strings, Decorators, lambda, iterators and generators, Modules, Packages.

Unit III Object-Oriented Approach

08 Hours

Classes - A simple class, defining methods, the constructor, Member variables, calling methods, Adding inheritance, Class variables, Class methods and static methods, Properties, Interfaces, New style classes, Doc strings for classes, Private members.

Scope & Namespaces, object, instantiations, Inheritance, Multiple inheritance, Constructors, operator overloading.

Unit IV File Handling and Error

08 Hours

Python file handling: File handling modes, Text & Binary Files – Reading, Writing and Delete.

Error and exception handling: Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User-defined Exceptions, Defining Clean-up Actions, Predefined Clean-up Actions.

Unit V Python Tkinter

08 Hours

Event Driven Programming, GUI frameworks-Tkinter, Windows and windows attribute, Component, Tk widgets-Ttk and Tix widgets, Geometry Management, Events & Binding Functions, simple GUI applications development.

PyGtk – Simple message box, text input dialog box, file selection dialog box.
EasyGUI - Example

Unit VI Backend and Database

08 Hours

Tornado for windows, building python HTTP web server (GET method), Parameter and Python API (resource and query), Building a JSON GET & POST API, the GET and POST API from JavaScript/HTML
SQLite, MySQL -Environment Setup, Database Connection, CRUD operations.

Textbooks

1. Python 3 Object-oriented Programming Second Edition, Dusty Phillips, Packt Publishing
2. MySQL for Python: Database Access Made Easy,
3. Python GUI Programming with Tkinter, Alan D. Moore, O'Reilly Media, Inc.

Reference Books

1. Introduction to Computation and Programming Using Python, John V Guttag, Prentice Hall of India
2. Python Essential Reference 4th Edition, David Beazley, Pearson Education.

List of Laboratory Exercises

1. Study about Anaconda python software.
2. Write a program to understand the control structures of python
3. Write a program to learn different types of structures (list, dictionary, tuples) in python
4. Write a program to learn concept of functions scoping, recursion, and list mutability.
5. Write a program to understand working of exception handling and assertions.
6. Write a program to perform basic operations on text files.
7. Write a program to implement HTTP server using Python
8. Write a program to implement basic GUI application with database connectivity using SQLite
9. Write a program to learn GUI programming using Tkinter
10. Write a program to implement basic GUI application with database connectivity using MySql

Project Based Learning - Provisional List of Projects

1. Design and development of Mad Libs generator.
2. Design and development of electronic mail system (Read, write, send and delete operations).
3. Design and development of store billing system.
4. Design and development of typing speed check web application.
5. Design and development of windows application for music player.
6. Design and development of windows Quiz Application.
7. Design and development of web application for daily expense tracker.
8. Design and development of student portfolio management & CV generator system.
9. Design and development of windows based to do list or sticky notes.
10. Design and development of assignment plagiarism checker

B.TECH (Computer Engineering)
SEMESTER - IV
COURSE SYLLABUS

Probability and Statistics

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination	60 Marks	Lecture	03
		Internal Assessment	40 Marks		
		Total	100 Marks	Total	03

Course Objectives:

To equip students with the knowledge of:

- Probability theory and expected value.
- Probability distribution and its applications.
- Multiple regression and ANOVA.

Prerequisite:

Elementary Mathematics

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply Bayes theorem to find probability.
2. Compute mathematical expectations.
3. Identify various theoretical distributions.
4. Use correlation coefficient to interpret numerical data.
5. Use regression to estimate the dependent variable.
6. Apply concept of graph in optimization.

Unit I Probability Theory

06 Hours

Definition of probability: classical, empirical, and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities

Unit II Random Variable and Mathematical Expectation.

06 Hours

Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Joint and marginal probability distributions, Properties of expectation and variance with proofs, Examples

Unit III Theoretical Probability Distributions

06 Hours

Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution

Unit IV Correlation

06 Hours

Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples

Unit V Linear Regression Analysis

06 Hours

Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y , Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient

Unit VI Multiple Regression and AVOVA

06 Hours

Multiple regression & multiple correlation, Analysis of variance (one way, two ways with as well as without interaction)

Textbooks

1. S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House.
2. G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas and co.
3. Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines
4. Kishor S. Trivedi, "Probability, Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, Wiley India Pvt. Ltd.

Reference Books

1. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, 3 rd Edition, Wiley Publication
2. I.R. Miller, J.E. Freund, and R. Johnson. Fun "Probability and Statistics for Engineers" (4th Edition)

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit.

Project Based Learning - Provisional List of Projects

Students are expected prepare report on any one topic, write its definition, applications and analyse the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. Bayes theorem
2. Additive and multiplicative law of probability
3. Mathematical expectation
4. Joint and marginal probability distribution
5. Theoretical probability distribution
6. Coefficient of correlation
7. Regression estimates
8. Simple regression model
9. Multiple regression model
10. One way ANOVA
11. Two-way ANOVA
12. Correlation
13. Multiple correlation

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Models of Computation

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Tutorial:	01 Hours/Week	Internal Assessment:	40 Marks	Tutorial	01
Total			100 Marks	Total	
				Total	04

Course Objective:

This course enables students to understand any problem by developing abstract models of computing machines and reasoning about their compute efficiency.

Prerequisite:

Discrete Mathematics, Data Structure and Algorithmic Thinking

Course Outcomes: On completion of the course, students will have the ability to:

1. Define and describe formal models of computation
2. Illustrate examples of languages and computational problems appropriate to different models of computation.
3. Demonstrate the relationships between language classes and regular expression.
4. Design grammars and recognizers for different formal languages
5. Design Language Acceptability by Turing Machine
6. Use models of computation to understand the compiler basics

Unit I Basic Concepts and Automata Theory

06 Hours

Introduction to Theory of Computation- Automata, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non-Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ϵ -Transition, Equivalence of NFA's with and without ϵ -Transition, Finite Automata with output- Moore machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata

Unit II Regular Languages

06 Hours

Definition and Examples. Conversion of RE to FA, FA to RE, algebraic laws, applications of RE. Pumping lemma for regular languages and applications. Closure properties of regular Languages Union, Concatenation, Complement, Intersection and Kleene closure. Decidability- Decision properties

Unit III Context Free Grammar (CFG)

06 Hours

Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms-Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs

Unit IV Push Down Automata (PDA)

06 Hours

Introduction, Pushdown Automata (PDA), Transition Diagrams, Functions and Tables, Deterministic Push-down Automata (DPDA) - definition, Nondeterministic Pushdown Automata (NPDA), Equivalence of context free grammars and PDA, properties of context free languages. Introduction to Post Machines (PMs).

Unit V Turing Machine Model

06 Hours

The Turing Machine Model and Definition of TM, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Halting Problem

Unit VI Basics of Compiler

06 Hours

Introduction to Natural language Processing, Syntax analysis language definition. Primitive recursive functions - Recursive and recursively enumerable languages - Universal Turing machine. Lexical analyser, Text editor, and searching using RE.

Textbooks

1. Theory Computation, Vivek Kulkarni, Oxford higher education
2. Theory of Computer Science (Automata, Language & Computation) K. L. P. Mishra & N. Chandrasekaran, PHI Second Edition
3. Theory of Computer Science, E.V. Krishnamurthy, EWP Publication
4. Introduction to languages and the theory of computation by Jhon C Martin Mc Graw Hill
5. Introduction to Automata Theory, Languages, and Computation (third edition), by John Hopcroft, Rajeev Motwani, Jeffrey Ullman, Addison Wesley, 2007.

Reference Books

1. Introduction to Automata Theory, Hopcroft Ullman, Languages & Computations, Narosa
2. Introduction to Computer Theory, Daniel A. Cohen, Wiley Publication
3. Theory of Computation, Dexter C. Kozen, Springer Science & Business Media, 2006

List of Assignments

1. Study of JFLAP tool for Constructing FA
2. Construct regular expressions defined over the alphabet $\Sigma = \{a, b\}$, which denote the given languages.
3. Translate the following Mealy machine into its equivalent Moore machine.
4. Write a context-free grammar (CFG) which generates the language L denoted by: $(a+ b)^* bbb(a+ b)^*$
5. Construct a PDA that accepts the language defined by the following regular grammar.
6. Design a TM to recognize an arbitrary string divisible by 4, from $\Sigma = \{0, 1, 2\}$.

Project Based Learning - Provisional List of Projects

1. Develop a tool to illustrate the algorithm for converting an arbitrary NFA to a DFA.
2. Develop a tool to draw a transition diagram for any given DFA.
3. Approximation algorithms
4. Greedy algorithms.
5. Enumeration of finite automata
6. Enumeration of PDA
7. Enumeration of Turing machines
8. Ambiguous grammars
9. Disambiguation of Grammars
10. Enumeration of Context-free languages
11. Enumeration of Turing machines
12. Universal Turing machines.
13. Randomized Turing machines
14. NP Complete Algorithm

15. Problem solvability using Reduction
16. Design of TM to emulate a finite automaton
17. Design of TM to emulate a PDA
18. Complexity analysis of encryption algorithms using TM.
19. Design of TM to perform sorting
20. Design TM to perform searching.

Syllabus for Unit Tests

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Computer Operating System

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Hours/Week		Marks		Credits	
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work & Practical	50 Marks		
		Total	150 Marks	Total	04

Course Objective;

The course focuses on the concepts of operating systems enabling students to understand and apply the principles, structure and functioning of Operating system.

Prerequisite:

Computer architecture and Design, Data structures and algorithms, Programming Skills.

Course Outcomes: On completion of the course, students will have the ability to:

1. To learn and apply the Concepts of operating system
2. Infer the concept of process, thread and Inter process communication
3. Outline the concept of concurrency and deadlocks.
4. Analyse of Memory Management and Virtual Memory
5. Utilize the concepts of I/O System for communication
6. Illustrate the Issues in real time operating system.

Unit I Functionalities & Services of an Operating System 06 Hours

Architecture of OS, Goals & Structures of O.S, Basic functions, System Calls & Types, Process Concept, Process Control Block, Linux System calls for Process creation, Inter Process Communication using Shared memory / Message passing.

Unit II Concurrency, Multithreaded programming 06 Hours

Benefits, challenges, models, Pthreads library in Linux: thread creation, cancellation, thread specific data, Thread pools, Signal handling, Scheduling: Pre-emptive, non-pre-emptive algorithms FCFS, SJF, SRT, RR, Thread scheduling: contention scope, Pthread support for scheduling

Unit III Deadlock 06 Hours

Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, Producer Consumer problem (multi-threaded) example Deadlock characterization, Resource graph, Avoidance & Prevention, Safe state, Banker's algorithm, recovery schemes

Unit IV Storage Management 06 Hours

Memory management, logical v/s physical address space, Segmentation, Paging, Page table structures, Virtual memory, Page replacement strategies, File Systems, file operations, types, access methods, Directory structure, Mounting file systems.

Unit V I/O Systems 06 Hours

File concept, Access methods, Directory structure, Filesystem mounting, Protection, Directory implementation, Allocation methods, Free-space management, Disk scheduling, Disk management, Swap-space management, Protection.

Unit VI Issues, Protection and Security

06 Hours

Features of real-time kernels. Real-time CPU scheduling and real-time performance issues, Goals of protection; Domain of protection; Protection models; Security, problems, and threats; Authentication; and Encryption.

Textbooks

1. Operating System Concepts, 9th edition Peter B. Galvin, Greg Gagne, Abraham Silberschatz, John Wiley & Sons, Inc.

Reference Books

1. Modern Operating Systems -By Andrew S. Tanenbaum (PHI)
2. Operating Systems 5th Edition, William Stallings, Pearson Education India

List of Assignments

1. Write in detail about the Quality (Computer Architecture) based on Features and Functionality of latest OS.
2. Discuss in detail the Concurrency mechanism and Multithreaded programming achieved in latest any OS.
3. Explain the mechanism of process and processor management in Unix/Linux OS
4. Discuss in detail the mechanism used for memory management in Linux OS
5. Elaborate in detail the user interface concepts of Linux OS.
6. Write in detail about the Quality (Security Threats) based on Features and functionality of latest OS

List of Laboratory Exercises

1. Basic functionalities and functions of operating system.
2. Write Shell Script to copy the file system from two directories to a new directory in such a way that only the latest file is copied in case there are common files in both the directories.
3. Implementation of FCFS (First Come First Serve) CPU Scheduling.
4. Implementation of SJF (Shortest Job First) CPU Scheduling.
5. Implementation of Round Robin (RR) CPU Scheduling.
6. Producer Consumer Problem Using Semaphores
7. Bankers Algorithm for Deadlock Avoidance
8. Algorithm for Deadlock Detection
9. Page Replacement Algorithms FIFO and LRU
10. Implement Virtualization strategy related to resources.

Project Based Learning - Provisional List of Projects

1. Explore the architectures, features, and functions of open-source operating systems
2. Design the Processes and thread management with deadlock's, synchronization
3. Design Pre-emptive Priority Scheduling algorithm implementation in any language.
4. Java program to analyse page fault for a given page frame using NRU with paging.
5. The project on simulating the multiprogramming of a specific operating system and dealing with CPU scheduling and Job scheduling.
6. Design the project that computes FCFS, SSTF, and SCAN disk-scheduling algorithms
7. Operating Systems mini project to explore the different algorithms of main memory page replacement
8. Develop a client server application to show the inter process communication.
9. Build a file system using the FUSE library.
10. Write a shell interpreter for LINUX.

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Database Management System

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work & Practical	50 Marks		
		Total	150 Marks	Total	04

Course Objective:

Introduction to databases mainly focus on relational models and relation database design. The course enables students with the knowledge models, design paradigms and structured query language. This course introduces students to Semantic Modelling, principles of database management systems (DBMS), DBMS architecture, Database Design, data storage and query processing and transaction management. Further, the course also introduces advanced database systems.

Prerequisite:

Mathematics for Computing-I, Data Structure and Algorithmic Thinking.

Course Outcomes: On completion of the course, students will have the ability to:

1. Design a Relational Database by applying the principles of Database Design
2. Compare and Contrast File Processing and Database Processing
3. Convert the Database Design into Relational Tables as per the application requirement
4. Apply the normalisation to Database Design.
5. Use and relate the concept of transaction, concurrency control and recovery in database.
6. Write queries and commands using Structured query language (SQL)

Unit I Overview of Database Systems:

06 Hours

Knowing Database and Database Management system (DBMS), Role and Advantages of DBMS, Problems with Traditional File System Processing, types of databases, Database System Architecture - Conceptual Level, External Level, Internal Level, Mappings, Database Users, 2 Tier Architecture and 3 Tier Architecture. Introduction to Relational Databases: Relations and Relvars, Defining Relations, Optimisation.

Unit II Relational Model:

06 Hours

Values Vs Variables, Types Vs Representations, Type Definition, Operators, Type Generators, Tuples, relation types, Relation Values, Relation variables, Relational Algebra - Syntax and Semantics, Operations, Relational Calculus - Tuple Calculus, Calculus Vs Algebra, Integrity - Predicates and Propositions, Checking Constraints, Constraint classification scheme, Views - Definition, View retrievals and Updates

Unit III Database Design:

06 Hours

Semantic Modelling - Entity Relationship and Extended Entity Relationship model, Functional Dependencies - Trivial and non-trivial dependencies, Closure of a set of dependencies, closure of a set of attributes, Boyce Codd Normal Form, Normalisation - 1NF, 2NF, 3NF, BCNF, higher Normal Forms.

Unit IV Storage and Querying:

06 Hours

JBOD, RAID, Files, Data Dictionary storage, Storage Access, Indexing & Hashing - Basics, Ordered Indices, B+ Tree index Files, B Tree Index Files, Multiple Key Access, Static Hashing and Dynamic Hashing, Bitmap Indices.

Querying - Measures of Query Cost, Selection Operation, Sorting, Join Operation.

Unit V Transaction Management:

06 Hours

Transactions Overview, Transaction Properties, Transaction Log, Concurrency control - Lost Updates, Uncommitted Data, the scheduler, Locking Methods, Time Stamping Methods, Recovery, Isolation Levels, System Recovery, Media Recovery, Savepoints, Serializability.

Unit VI Overview of Advanced Databases:

06 Hours

Object Oriented Database, Distributed Databases, Logic Based Databases, Temporal Databases, Decision support systems. The Information System Design: System Development Life Cycle, Database Lifecycle, Conceptual Design, Logical Design, Database Design Strategies, Centralized vs Decentralised Design, NoSQL

Textbooks

1. Database System Concepts by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, 6th Edition, McGraw-Hill Education, 2010.

Reference Books

1. C.J. Date, An Introduction to Database Systems, 8/e, Pearson Education, 2004.
2. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management (7/e), Cengage Learning, 2007.

List of Assignments

The assignments will be based on a mini project for developing a Database for a system like Student Database Management system, Online Retail Database, Medical record Database etc. There will be tasks that will be allocated to the students like

1. Use the Relational Algebra.
2. Design the EER model
3. Convert the EER model to Relational Tables
4. Apply the Normalisation
5. Create the Tables using SQL and using graphical database building tools.
6. Populate and retrieve the data from tables based on requirements.

List of Laboratory Exercises

1. To study about the Database Management Software Tools and Structured Query Language
2. To Write Data Definition Language queries.
3. To Write Data Query Language queries.
4. To Write Data Control Language queries.
5. To query relational tables using nested queries and Aggregate functions.
6. To perform queries using views.
7. To demonstrate the different types of Joins.
8. Find Results for the questions asked related to the given relational Schema: Employee and Department.
9. Find Results for the questions asked related to the given relational Schema: Publications.
10. To Use MongoDB and perform CRUD operations on it.

Project Based Learning - Provisional List of Projects

RDBMS Design and implementation of various Management database systems:

1. Medical Health record management system

2. Patient detail management system
3. Student Management System
4. On-Demand Online Video Streaming
5. Sports
6. Finances Management System
7. Grocery Management System
8. Weather Management System
9. Web Database system
10. E-commerce Database system.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit - I, Unit - II, Unit - III

Unit - IV, Unit - V, Unit - VI

Wireless Communication

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment:	40 Marks		
		Term Work & Oral	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objective:

The course focuses on the fundamentals of wireless communications and provides an overview of existing and emerging wireless communication Technology and networks.

Prerequisite:

Computer Network, Physics for Computing Systems

Course Outcomes: On completion of the course, students will have the ability to:

1. Use of basic concepts and principles of wireless communication
2. Illustrate knowledge of Medium Access Control
3. Recite the working of Telecommunication Systems
4. Recite the functioning and use the satellite and broadcast systems
5. Apply and use Wireless networks.
6. Illustrate the working of Mobile IP and TCP in wireless communication.

Unit I Introduction to Wireless Communication

08 Hours

Wireless Communication Applications, Open research topics, reference model, Frequencies for Radio transmission – regulations, Signals, Antennas, Signal Propagation – Path Loss of radio signals, Signal propagation effects, multi-path propagation, multiplexing – Space Division Multiplexing, Frequency division multiplexing, time division multiplexing, code division multiplexing. Modulation – Amplitude shift keying, Frequency shift keying, Phase shift keying, Multi carrier modulation. Spread Spectrum – Direct sequence spread spectrum; Frequency hopping spread spectrum.

Unit II Medium Access Control

08 Hours

Specialized MAC requirement, Hidden terminal, and exposed terminals, near and far terminals, SDMA, FDMA, TDMA – Fixed TDM, Classical ALOHA, Slotted ALOHA, Carrier Sense multiple access, Demand assigned multiple access, packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, CDMA – Spread Aloha multiple access, Comparison of SDMA/TDMA/FDMA/CDMA

Unit III Telecommunication Systems

08 Hours

GSM – Mobile services, System architecture, Radio Interface, Protocols, Localisation & calling, Handover, Security.
DECT – System architecture, Protocol architecture
UMTS and IMT – 2000 – UMTS system architecture, UMTS radio interface

Unit IV Satellite Systems and Broadcasting Systems

08 Hours

Primer – Orbital aspects, GEO, LEO, MEO, Line of Sight, Routing, Localisation, Handover, Examples.
Broadcast Systems – Cyclical repletion of data, Digital Audio broadcasting – Multimedia object transfer protocol, Digital Video broadcasting – data broadcasting, high speed internet access.

Unit V Wireless LAN**08 Hours**

Infra-red Vs Radio Transmission, Infrastructure and Ad-hoc network, IEEE 802.11 – System Architecture, Protocol Architecture, Physical layer, Medium Access control layer, MAC management, 802.11a, 802.11b.

Bluetooth – Architecture, Radio Layer, Baseband Layer, Link Manager protocol, L2CAP, Security, IEEE 802.15.

Unit VI Mobile Communication Layers**08 Hours**

Mobile IP – Entities and terminologies, IP packet delivery, Agent discovery, Registration, Tunnelling, and encapsulation, IPV6, DHCP.

Traditional TCP – Congestion control, slow start, fast retransmit/fast recovery, Indirect TCP, Snooping TCP, Mobile TCP.

Introduction to 4G, LTE network and 5G communication.

Textbooks

1. Mobile Communications, 2nd Edition, Jochen H. Schiller, Pearson Education, 2003

Reference Books

1. Wireless Communication, Theodore S. Rappaport, Prentice Hall
2. Andreas.F. Molisch, –Wireless Communications, John Wiley – India, 2006.
3. Wireless Communications and Networking, Vijay Garg, Elsevier
4. Wireless Communication –Andrea Goldsmith, Cambridge University Press, 2011
5. David Tse and Pramod Viswanath, –Fundamentals of Wireless Communication, Cambridge University Press, 2005
6. Dennis Roddy, Satellite Communications Systems, John Wiley & Sons, Ltd 5th Edition

List of Assignments

1. Discuss Comparison of Wireless Technologies in Industrial Application
2. What medium access methods are in use today in wireless networks.
3. Discuss any one System architecture of any latest telecommunication System.
4. Discuss any one latest Digital Audio broadcasting techniques
5. Elaborate latest Protocol Architecture used in practical world.
6. Introduction to 5G networks in Mobile Communication.

List of Laboratory Exercises

1. Introduction to wireless simulation.
2. Configuring wireless networking devices using simulation tool.
3. Establishing wireless LAN network using simulation tool.
4. Configuring wireless router using simulation tool.
5. Case studies on different wireless generations
6. Case studies on IEEE 802.11 Wireless LAN
7. Case studies on different wireless generations.
8. Case studies on short range wireless network
9. Realistic Studies on Wireless Structural Control.
10. Case Studies of Wireless LAN Problems.
11. Case studies on IEEE 802.11 Wireless LAN
12. Case Study of Security Issue in the Wireless Communication System.

Project Based System - Provisional List of Projects

1. Vehicle Tracking System.
2. Accident Identification System.
3. Wireless Camera Position System.
4. Remote Home Security System.

5. Wireless Voting Machine.
6. Wireless Security System.
7. Video Signal Transmitter.
8. Audio Signal Transmitter.
9. RFID based Ambulance Flashing Light with Beeper
10. Bluetooth based Garage Door Opening

Syllabus for Unit Tests:

Unit Test -1

Unit - I, Unit - II, Unit - III

Unit Test -2

Unit - IV, Unit - V, Unit - VI

Design Thinking and Communication

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	02 Hours/Week	Term Work & Practical	50 Marks	Lecture	02
Practical:	04 Hours/Week			Practical	02
		Total	50 Marks	Total	04

Course Objective:

This course focuses on enabling students to use design thinking as a problem-solving tool that includes principles like Human centred, Collaborative teamwork, learning by doing, embrace experimentation, understand patterns relationship and Systems, visualise and present.

Prerequisite:

-

Course Outcomes: On completion of the course, students will have the ability to:

1. Use the design thinking approach.
2. Understand and represent the unique needs of customers
3. Apply Empathy and visual thinking within the context of design thinking.
4. Create physical prototypes / a visual representation of an idea
5. Apply Design thinking for problem solving
6. Create a design thinking culture to drive innovation in an organisational setup

Unit I Design Thinking Background

06 Hours

Definition of Design Thinking, Business uses of Design Thinking, Variety within the Design Thinking Discipline, Design Thinking Mindset.

Fundamental Concepts within the context of design thinking: Empathy, Ethnography, Divergent Thinking, Convergent thinking, Visual Thinking, Assumption testing, Prototyping, Validate

Unit II Resources and Processes

06 Hours

Design Thinking Resources: Human resources, Preferred space, Materials commonly used, dynamic between design thinking teams & organisation.

Design Thinking Processes: Variety of design thinking approaches - Double Diamond approach, d.school 5-stage approach, designing for growth approach, role of Project management within design thinking.

Unit III Process Stages of Designing for Growth

06 Hours

Practice "What Is", "What If", "What wows", "What works" process stage activities to develop a product.

Customer requirement - Knowing Your Users Identifying Needs of Customers Designing with Empathy Designing for Diversity & Inclusion, Customer needs and market, Types of product users Customer needs analysis

Unit IV Design Thinking Tools and Methods

06 Hours

Purposeful Use of Tools and Alignment with Process - Visualization, Journey Mapping, Value Chain Analysis, Mind Mapping, Brainstorming, Concept Development, Assumption Testing, Rapid Prototyping, Customer Co-creation, Learning Launch.

Unit V Design for Services

06 Hours

New Product Development Processes, Design for Products & Services, Sustainability through Design Thinking, Lean & Agile Product/ Service Design, Service development process, Service cycle experience map, Product vs. service systems, Service innovation examples.

Unit VI Innovation

06 Hours

Product Development Processes Innovation Project Lifecycle, Innovation Management Models, Frugal Innovation, Entrepreneurship Vs Intrapreneurship, Innovation for Growth Data-driven Innovation Systematic innovation process: Altitude case study.

Textbooks

1. Designing for growth: A design thinking tool kit for managers”, by Jeanne Liedtka and Tim Ogilvie., 2011, ISBN 978-0-231-15838-1
2. The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems”, by Michael Lewrick, Patrick Link, Larry Leifer., 2018, ISBN 978-1-119-46747-2
3. Presumptive design: Design provocations for innovation”, by Leo Frishberg and Charles Lambdin., 2016, ISBN: 978-0-12-803086-8

Reference Books

1. “Systems thinking: Managing chaos and complexity: A platform for designing business architecture.”, “Chapter Seven: Design Thinking”, by Jamshid Gharajedaghi, 2011, ISBN 978-0-12-385915-0
2. "Cross-Cultural and User-Centred Design Thinking in a Global Organization: A Collaborative Case Analysis.”, by Abildgaard, Sille Julie J., and Bo T. Christensen., She Ji: The Journal of Design, Economics, and Innovation 3.4 (2018): 277-289.
3. "Design Thinking: A Method or a Gateway into Design Cognition?.”, by Gabriela Goldschmidt, She Ji: The Journal of Design, Economics, and Innovation 3.2 (2017): 107- 112

List of Laboratory Exercises

1. The Laboratory Exercises will consist of case studies related to problem solving through design thinking. Some of the Case studies are given below:
2. Design thinking applied in product creation like, Mobile and TVs
3. Problem statement like the following will be given to students. For the given case study and simple problems, the students should be able to:
 - a. Complete Design Research plan
 - b. Identifying insights and opportunities
 - c. Perform Ideation and prototype
 - d. Test Final ideas
 - e. Peer feedback and group discussion
 - f. Presentation
 - g. Journey mapping and idea generation
 - h. Develop Presentations in small groups.
 - i. Final Presentations
4. Which principles and approaches in DT can be found in more holistic human-centred software development approaches and how do they differ?
5. How can artefacts with similar purposes, but different forms, be integrated?
6. How can problems be efficiently classified?
7. What are typical project situations which influence the choice of a strategy?

8. Which methods in DT can be found in / reused for other software engineering disciplines (e.g., HCI, TDD)? How do these methods differ? How can they be integrated?
9. How can artefacts, roles, and methods be seamlessly integrated? Which artefacts do overlap? Are shifts in roles and responsibilities necessary? How can milestones be efficiently defined?
10. How can resulting processes be integrated (into the overall life cycle) - for instance SCRUM? How can resulting processes be tailored?
11. The pandemic is forcing us re-evaluate safety of public health vis-a-vis the urban design, public spaces, mobility, products, and services etc. Their existing design does not ensure safety against the risk of virus transmission. Even as the threat of pandemic looms large, scenes of uncontrolled public gathering is common.
12. How to enhance the everyday commuter experience at the Mumbai Local network of Indian Railways (one of the largest and oldest in the country)

Project Based Learning - Provisional List of Projects

1. Demonstrates with a real time scenario, how understanding your customer, or subject, can completely change the perception towards a problem.
2. Show how design thinking can help redefine the values.
3. Using a real time scenario, show how problems affecting diverse groups of people.
4. Show how Issues relating to college culture can be fixed through design thinking.
5. How design thinking helps in educational advances. Cite some real time scenarios.
6. How design thinking enables Entrepreneurial initiatives. Cite some real time scenarios.
7. How design thinking is used for bringing about innovation. Illustrate with real time scenario.
8. Research how design thinking is helping medical breakthroughs. Illustrate with real time scenario.
9. How design thinking reduces the risk associated with launching new ideas, products, and services. Illustrate with real time scenario.
10. Research How to use Design Thinking for software development projects.

Programming Technologies and Tools Laboratory - IV

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Hours/Week				Credits	
Practical:	04 Hours/Week	Term Work & Practical	50 Marks	Practical	02
		Total	50 Marks	Total	02

Course Objective

The course enables students to implement object-oriented designs with Java.

Prerequisite

Programming Technologies and Tools Laboratory – I, Programming Technologies, and Tools Laboratory – II, Paradigms of Programming.

Course Outcomes: On completion of the course, students will have the ability to:

1. Analyse the basics of Java programming.
2. Identify class, objects for real time problems.
3. Make use of constructor, Garbage Collector, and methods of string class.
4. Explore the concept of inheritance and polymorphism with the help of real time applications.
5. Handle the exception with exception handling mechanism and multi-threading programming.
6. Design the graphical user interface by using Applets and AWT.

Unit I JAVA Primer

08 Hours

Introduction: History and Features of Java, Internals of Java Program, Difference between JDK, JRE and JVM, Internal Details of JVM.

Basics of Java Language-Variable and Reserve / Keywords present in Java, Primitive Data types, Java Operators, Decision making and branching statements in Java

Unit II Classes, Objects and Methods:

08 Hours

Creating a Class, Visibility/Access Modifiers, Encapsulation, Methods: Adding a Method to Class, returning a Value, adding a Method That Takes Parameters, 'this' Keyword, Method Overloading, Object Creation, Using Object as a Parameters, Returning Object, Array of Objects, Memory Allocation: 'new', Static Data Members, Static Methods,

Unit III Constructors, Destructors and String Handling

08 Hours

Use of Constructor, Characteristics of Constructors, Types of Constructors, Constructor Overloading, Constructor with Default Arguments, Symbolic Constants, Garbage Collection, Destructors and Finalizers.

String Handling: String: Immutable String, String Comparison, String Concatenation, Substring, Methods of String class, String Buffer class, StringBuilder class, Creating Immutable class, to String method

Unit IV Inheritance and Polymorphism

08 Hours

Use of Inheritance, Types of Inheritance in Java, Role of Constructors in inheritance, Polymorphism in OOP, Types of Polymorphism, static and dynamic polymorphism, Overriding Super Class Methods. Use of "super" keyword. Interfaces, Implementing interfaces.

Unit V Exception Handling and Multithreaded programming**08 Hours**

Exception Handling: try and catch block, catch block, Nested try, finally block, throw keyword, Exception Propagation, throws keyword, Exception Handling with Method Overriding, Custom Exception.

Introduction to threads, life cycle of a thread, thread states, thread properties, methods in Threads and Runnable, setting priority of threads, synchronization and inter thread communication Life Cycle of a Thread

Unit VI Designing Graphical User Interfaces in Java**08 Hours**

Applet and its use Design Patterns using Applet and JApplet. Run Applet application by browser and applet tool. Applet Architecture. Parameters to Applet Life Cycle of Components and Containers Basics of Components Using Containers Layout Managers and userdefined layout. BorderLayout, FlowLayout, GridLayout, GridBagLayout, BoxLayout. AWT Components Adding a Menu to Window Extending GUI Features Using SWING Components Designing GUI. Advanced swing components like JProgressBar, JSlider, JRadioButton, JTree, JTable, JToggleButton.

Textbooks

1. E. Balaguruswamy, "Object Oriented Programming Using C++ and Java", Tata McGrawHill
2. Steven Holzner et al. "Java 2 Programming", Black Book, Dreamtech Press, 2009.

Reference Books

1. Java The complete reference, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd. 9th edition, 2014, ISBN: 978-0-07-180856-9 (E-book)
2. Object-Oriented Design Using Java, Dale Skrien, McGraw-Hill Publishing, 2008, ISBN - 0077423097, 9780077423094
3. Mitsunori Ogihara, "Fundamentals of Java Programming", Springer; 2018, ISBN 978-3-319-89490-4
4. Brahma Dathan Sarnath Ramnath, "Object-Oriented Analysis, Design and Implementation an Integrated Approach", Springer; 2nd ed. 2015, ISSN 1863-7310 ISSN 2197-1781 (electronic) Undergraduate Topics in Computer Science ISBN 978-3-319-24278-1, ISBN 978-3-319-24280-4.
5. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, Pearson Education, India.
6. J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey
7. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India

List of Laboratory Exercises

1. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
2. Write a Java program that describes a class person. It should have instance variables to record name, age, and salary. Create a person object. Set and display its instance variables.
3. Write a Java program that creates a class circle with instance variables for the centre and the radius. Initialize and display its variables
4. Write a Java program that counts the number of objects created by using static variable.
5. Write a Java program to demonstrate the constructors in java.
6. Write a Java program to demonstrate the constructor overloading.
7. Write a Java program to display the use of this keyword

8. Write a Java program that checks whether a given string is a palindrome or not.
9. Write an application that creates an interface' and implements it
10. Write a program that can count the number of instances created for the class.
11. Write an application that executes two threads. One thread displays —Every 1000 milliseconds and other displays —B every 3000 milliseconds. Create the threads by extending the Thread class.
12. Create an abstract class shape. Let rectangle and triangle inherit this shape class. Add necessary functions.
13. Write an application that shows the usage of try, catch, throws and finally.
14. Write an Applet that displays —Hello World|| (Background colour-black, text colour-blue and your name in the status window.)
15. Develop a scientific calculator using swings.

Project Based Learning - Provisional List of Projects

1. Airline reservation system
2. Course management system
3. Data visualization software
4. Electricity billing system
5. e-Healthcare management system
6. Email client software
7. Library management system
8. Network packet sniffer
9. Online bank management system
10. Online medical management system

B. Tech-Electronics & Telecommunication Engineering

STRUCTURE

Bharati Vidyapeeth (Deemed to be) University, Pune
Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – I (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme (Hrs. / Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW&OR	TW&PR	Total	L	P TW/OR R/PR	T	Total
1	Linear Algebra and Calculus	03	00	01	60	40	00	00	00	100	03	00	01	04
2	Physics for Electronics Engineering	03	02	00	60	40	50	00	00	150	03	01	00	04
3	Electrical Technology	04	02	00	60	40	50	00	00	150	04	01	00	05
4	Elementary Electronics	04	02	00	60	40	00	50	00	150	04	01	00	05
5	'C' Programming	04	02	00	60	40	50	00	00	150	04	01	00	05
6	MATLAB Fundamentals	00	04	00	00	00	50	00	00	50	00	02	00	02
Total		18	12	01	300	200	200	50	00	750	18	06	01	25

Bharati Vidyapeeth (Deemed to be) University, Pune.
Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – II (2021 Course)														
Sr. No .	Name of the course	Teaching Scheme (Hrs. / Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW& PR	Total	L	P TW/O R/PR	T	Total
7	Differential Equations and Complex Analysis	03	00	01	60	40	00	00	00	100	03	00	01	04
8	Chemistry of Electronic Materials	03	02	00	60	40	50	00	00	150	03	01	00	04
9	Digital Electronics	04	02	00	60	40	00	50	00	150	04	01	00	05
10	Semiconduct or Devices and Circuits-I	04	02	00	60	40	00	00	50	150	04	01	00	05
11	Python Programming	04	02	00	60	40	50	00	00	150	04	01	00	05
12	Computer Aided Drafting	00	04	00	00	00	50	00	00	50	00	02	00	02
	Total	18	12	01	300	200	150	50	50	750	18	06	01	25

Bharati Vidyapeeth (Deemed to be) University, Pune
Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – III (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme (Hrs. / Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR R/PR	T	Total
13	Advanced Mathematics- for Electronics	03	00	01	60	40	00	00	00	100	03	00	01	04
14	Semiconductor Devices and Circuits-II	04	02	00	60	40	00	00	50	150	04	01	00	05
15	Signals and Linear Systems	04	02	00	60	40	25	00	00	125	04	01	00	05
16	Network Analysis and Synthesis	04	02	00	60	40	00	00	50	150	04	01	00	05
17	Database Management Systems*	03	02	00	60	40	25	00	00	125	03	01	00	04
18	EDA Tool Practices	00	02	00	00	00	50	00	00	50	00	01	00	01
19	PCB Design and Soldering	00	04	00	00	00	00	50	00	50	00	02	00	02
20	Vocational Course - I: Networking	00	00	00	00	00	00	50	00	50	00	02	00	02
21	MOOC-I	00	00	00	00	00	00	00	00	00	00	00	00	02
22	Environmental Studies** (Mandatory Audit Course)	00	00	00	00	00	00	00	00	00	00	00	00	00
	Total	18	14	01	300	200	100	100	100	800	18	09	01	30

*Industry taught course-I

**100 marks end semester exam

Bharati Vidyapeeth (Deemed to be) University, Pune

Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – IV (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW&OR	TW&PR		Total	L	P TW/OR/ PR	T
23	Control Systems and Application	04	02	00	60	40	25	00	00	125	04	01	00	05
24	Integrated Circuits and Applications	04	02	00	60	40	00	00	50	150	04	01	00	05
25	Electromagnetics and Transmission Lines	03	00	01	60	40	00	00	00	100	03	00	01	04
26	Analog Communication	04	02	00	60	40	00	50	00	150	04	01	00	05
27	Data Science*	03	02	00	60	40	25	00	00	125	03	01	00	04
28	Advanced Computer Programming	00	04	00	00	00	00	50	00	50	00	02	00	02
29	Sensor Modelling and Simulation Laboratory	00	02	00	00	00	00	50	00	50	00	01	00	01
30	Vocational Course-II Calibration and repair of lab equipments	00	00	00	00	00	00	50	00	50	00	02	00	02
31	Social Activities-I	00	00	00	00	00	00	00	00	00	00	00	00	02
32	Disaster Management** (Mandatory Audit Course)	00	00	00	00	00	00	00	00	00	00	00	00	00
	Total	18	14	01	300	200	50	200	50	800	18	09	01	30

*Industry taught course-II

**100 marks end semester exam

Bharati Vidyapeeth (Deemed to be) University, Pune.

Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – V (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR		Total	L	P TW/OR/ PR	T
33	Embedded systems	03	02	00	60	40	00	50	00	150	03	01	00	04
34	Digital Communication System	03	02	00	60	40	25	00	00	125	03	01	00	04
35	Power Electronics	03	02	00	60	40	25	00	00	125	03	01	00	04
36	Microwave and Antenna	04	02	00	60	40	00	50	00	150	04	01	00	05
37	Data Communication and Networking *	03	00	00	60	40	00	00	00	100	03	00	00	03
38	Microcontroller Programming	00	04	00	00	00	00	00	50	50	00	02	00	02
39	Project-I Stage –I	00	02	00	00	00	00	100	00	100	00	04	00	04
40	Vocational course III: PLC	00	00	00	00	00	00	50	00	50	00	02	00	02
41	MOOC- II	00	00	00	00	00	00	00	00	00	00	00	00	02
	Total	16	14	00	300	200	50	250	50	850	16	12	00	30

*Industry taught course-III

Bharati Vidyapeeth (Deemed to be) University, Pune

Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – VI (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR		Total	L	P TW/OR/PR	T
42	Photonics	04	02	00	60	40	25	00	00	125	04	01	00	05
43	Quantitative techniques, Communication and Values	02	02	00	60	40	00	00	00	100	03	00	00	03
44	Digital Signal Processing	03	02	00	60	40	25	00	00	125	03	01	00	04
45	CMOS Design	04	02	00	60	40	00	50	00	150	04	01	00	05
46	Internet of Things*	03	00	00	60	40	00	00	00	100	03	00	00	03
47	VHDL	00	02	00	00	00	00	00	50	50	00	01	00	01
48	Project-I Stage-II	00	02	00	00	00	00	100	00	100	00	04	00	04
49	*Vocational 4: Web App development	00	00	00	00	00	00	50	00	50	00	02	00	02
50	*** Internship	00	00	00	00	00	00	50	00	50	00	03	00	03
	Total	16	12	00	300	200	50	250	50	850	17	13	00	30

*Industry taught course-IV

Bharati Vidyapeeth (Deemed to be) University, Pune

Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – VII (2021 Course)

Programme :B.Tech (E &Tc) Sem – VII (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW&OR	TW & PR		Total	L	P TW/OR/P R	T
51	Soft Computing	04	02	00	60	40	00	00	50	150	04	01	00	05
52	Radio Frequency Engineering	04	00	01	60	40	00	00	00	100	04	00	01	05
53	Elective- I	04	02	00	60	40	00	50	00	150	04	01	00	05
54	Industrial Wireless Sensor Network*	04	02	00	60	40	00	50	00	150	04	01	00	05
55	Project II Stage I	00	04	00	00	00	00	200	00	200	00	04	00	04
56	Electronic Product Design	00	04	00	00	00	00	100	00	100	00	02	00	02
57	Research paper publication	00	00	00	00	00	00	00	00	00	00	00	00	02
58	MOOC-III	00	00	00	00	00	00	00	00	00	00	00	00	02
	Total	16	14	01	240	160	00	400	50	850	16	09	01	30

Elective-I

- 1) Telecom Network Management
- 2) Advanced Embedded System Design
- 3) Image processing

*Industry taught course-V

Bharati Vidyapeeth (Deemed to be) University, Pune
Faculty of Engineering & Technology

Programme: B.Tech (E & Tc) Sem – VIII (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR		Total	L	P TW/OR/PR	T
59	Mobile Communication	04	02	00	60	40	00	50	00	150	04	01	00	05
60	Satellite Communication & Radar	04	02	00	60	40	00	00	50	150	04	01	00	05
61	Elective II	04	02	00	60	40	00	50	00	150	04	01	00	05
62	Cyber security*	04	00	01	60	40	00	00	00	100	04	00	01	05
63	Cloud Computing	00	04	00	00	00	00	100	00	100	00	02	00	02
64	Project -II Stage-II	00	04	00	00	00	00	200	00	200	00	06	00	06
65	Social Activities-II	00	00	00	00	00	00	00	00	00	00	00	00	02
	Total	16	14	01	240	160	00	400	50	850	16	11	01	30

Elective-II

- 1) Software Defined Radio
- 2) Automotive Electronics
- 3) Computer Vision

*Industry taught course-VI

SEMESTER:- I
SYLLABUS

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. Sem. I: Electronics & Telecommunication Engineering
SUBJECT: - LINEAR ALGEBRA and CALCULUS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 00	Internal Assessment: 40 Marks	
Tutorial: 01		Credits: 01
		Total Credit: 04
Course Pre-requisites: Class XII Mathematics		
Course Objectives:		
1.	To teach the differential calculus.	
2.	To teach linear algebra and linear transformation.	
3.	To introduce ordinary differential equations.	
Course Outcomes: After learning this course students will be able to		
1	Evaluate the matrices and its application to the system of linear equations.	
2	Evaluate vector spaces and linear transformation	
3	Solve numerical problems involving differential calculus.	
4	Compute maxima, minima, and multiple integrals.	
5	Evaluate the theorems in integral Calculus.	

6	Use the methods of first order and first-degree differential equation.	
UNIT – I	Linear algebra: Matrices	(06 Hours)
	Algebra of Matrices, System of Linear Equations, Linear Dependence and Independence, rank, row operations and Gauss elimination, Applications to systems of linear equations, Cayley – Hamilton Theorem	
UNIT – II	Vector space and Linear Transformations	(06 Hours)
	Vector spaces, subspaces, Eigen values and Eigen Vectors and their basic properties, Linear and Orthogonal Transformations, rank -nullity theorem, Existence and Uniqueness Theorem for Linear Systems, product spaces, Gram-Schmidt process, Diagonalization	
UNIT - III	Differential Calculus	(06 Hours)
	Limits of sequences and functions, continuity, uniform continuity and differentiability, Mean value theorems, L' Hospital's Rule. Euler's Theorem on Homogeneous Functions. Taylor's theorem with proof, Partial derivatives, Chain rule.	
UNIT -IV	Maxima and Minima for several	(06 Hours)
	Maxima, minima, saddle points. gradient, directional derivatives, Lagrange multipliers, Exact differentials, Errors, and approximations. Repeated and multiple integrals applications to volume, surface area, moments of inertia, etc.	

UNIT -V	Integral Calculus	(06 Hours)
	Riemann integral and the fundamental theorem of integral calculus, Rolle's theorem, Applications to length, area, volume, surface area of revolution. Moments, centers of mass and gravity.	
UNIT -VI	Ordinary differential equation	(06 Hours)
	Ordinary differential equations of the 1st order, exactness and integrating factors, applications of first order and first-degree differential equation in orthogonal trajectories and electrical circuits. Picard's iteration method.	
Topics for projects based learning*		
1. Cramer's rule		
2. System of linear equations solution		
3. Rank of matrix		
4. Gauss elimination		
5. LU-decomposition method		
6. Dimension and basis		
7. Gram Schmidt Orthogonalization		
8. rank -nullity theorem		
9. Euler's Theorem on Homogeneous Functions		
10. Maxima and minima for two variable function		
11. Eigen values and Eigen vectors		
12. Multiple integrals applications		
13. Formation of differential equation		
14. Linear differential equation		
15. Kirchhoff's voltage law		
*Students in a group of 3 to 4 shall complete any one project from the above list		

Textbooks/Reference Books
1.'Advanced Engineering Mathematics' by Erwin reyszig
2.'Advanced Engineering Mathematics' by Dennis G. Zill and Warren S. Wright
3.AppliedMathematics(VolumesIandII)byP.N.Wartikar&J.N.Wartikar
4.HigherEngineeringMathematicsbyB.S.Grewal
5.HigherEngineeringMathematicsbyB.V.Ramana
6.AdvancedEngineeringMathematics

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B. Tech. Sem. I: Electronics & Telecommunication Engineering		
SUBJECT: - PHYSICS FOR ELECTRONICS ENGINEERING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW: 50 Marks	Credit: 01
		Total Credit: 04
Course Pre-requisites:		
	Basic Physics and Calculus.	
Course Objectives:		
	To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Electronics and Telecommunication.	
Course Outcomes:		
After learning this course students will be able to		
1	Demonstrate the knowledge of properties of charged particles and their use in modern instruments	
2	Solve the quantum physics problems at micro level phenomena.	
3	Explain mechanical properties of solid matter and connect to applications in the field of engineering.	
4	Demonstrate the working of PN junctions in semiconductor devices under various conditions.	

5	Demonstrate the wave nature of light and apply it to measure stress, pressure and dimension.	
6	Analyze the problems associated with architectural acoustics and give their remedies.	
UNIT – I	Modern Physics	(06 Hours)
	Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, TEM, SEM and EDS, Separation of isotopes by Bainbridge mass spectrograph, CRT.	
UNIT – II	Quantum mechanics	(06 Hours)
	Dual nature of matter, concept of wave packet, group and phase velocity and relation between them, Physical significance of wave function, Schrodinger's time dependent and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, Applications of Schrodinger's Equation: Infinite Potential Well and the Potential Barrier.	
UNIT - III	Solid state Electronics-I	(06 Hours)
	Superconductors, properties, Meissner effect, Type I and Type II superconductors, BCS theory of superconductivity (Qualitative) - High T _c superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation. Formation of Energy Bands, E-k Diagram, Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac Distribution, Conductivity in conductor and semi-conductors.	

UNIT -IV	Solid State Electronics-II	(06 Hours)
	Review of intrinsic and Extrinsic semiconductors, The n_0 and p_0 equations, Drift and Diffusion Currents, Regeneration process, Recombination Process, Derivation of Current Continuity Equation, Position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Minority Carrier injection and recombination in Homogeneous Semiconductor, p-n junction formation, Band structure of p-n junction diode under forward and reverse biasing, Junction Capacitance, Photovoltaic effect, Solar cell and its characteristics.	
UNIT -V	Interference, Diffraction and Polarization	(06 Hours)
	<p>Interference: Interference due to thin film of uniform thickness, engineering applications of interference (optical flatness, non-reflecting coatings).</p> <p>Diffraction: Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima.</p> <p>Polarization: Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism</p>	
UNIT -VI	Acoustics	(06 Hours)
	Elementary Acoustics, reverberation and reverberation time, Sabine's formula, pressure and intensity level, different types of noise and their remedies, Electro Acoustic transducers	

	(piezoelectric transducers, electrostatic transducer, magnetic transducer, magneto strictive transducer), Types of Microphones, Loudspeaker, stereophony, sound recording and Sound reinforcement systems.	
<u>Lab Experiment</u> :(Any Eight of the Following)		
1. Study of Lissajous figure by Cathode Ray Oscilloscope (CRO)		
2. Determination of e/m by Thomson method.		
3. Plotting the hysteresis loop for given magnetic material.		
4. To study Hall effect and determine the Hall voltage.		
5. Calculation of conductivity by four probe methods.		
6. Study of solar cell characteristics and calculation of fill factor.		
7. Determination of band gap of semiconductor.		
8. Determination of radius of Plano convex lens/wavelength of light/Flatness testing by Newton's rings		
9. Determination of wavelength of light using diffraction grating.		
10. Determination of resolving power of telescope.		
11. Determination of thickness of a thin wire by air wedge.		
12. Determination of refractive index for O-ray and E-ray.		
13. To determine the velocity of sound.		
14. Measurement of average SPL across spherical wavefront and behavior with the distance.		
15. Expansion chamber muffler: investigation of muffler response as a filter in the low frequency approximation by determining insertion loss.		
16. Interference of sound using PC speakers.		
Assignments		
Six assignments to be given by the subject teacher (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum		
Topics for projects based learning*		
1. Design and simulation of automatic solar powered time regulated water pumping		

2. Solar technology: an alternative source of energy for national development
3. Comparison of various method used in measuring the gravitational constant g
4. Possible effects of electromagnetic fields (emf) on human health
5. The design and construction of the hearing aid device
6. Design and construction of digital distance measuring instrument
7. Design and construction of automatic bell ringer
8. Design and construction of sound or clap activated alarm
9. Electronic eye (Laser Security) as autoswitch/security system
10. Electric power generation by road power
11. Wireless power transfer
12. Determination of velocity of O-ray and E-ray in different double refracting materials
13. Quantum confinement effect in wide band semiconductors
14. Tesla Coil
15. LiFi- wireless data transfer system using light
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. A Textbook of Engineering Physics, <u>M N Avadhanulu</u> , <u>P G Kshirsagar</u> and <u>TVS Arun Murthy</u> , S. Chand Publishing (2018).
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, <u>Arthur Beiser</u> , <u>Shobhit Mahajan</u> and <u>S. Rai Choudhury</u> , McGraw Hill Education (2017)
Reference Books:
1. Fundamentals of Physics, <u>Jearl Walker</u> , <u>David Halliday</u> and <u>Robert Resnick</u> , John Wiley and Sons (2013)
2. Optics, <u>Francis Jenkins</u> and <u>Harvey White</u> , Tata Mcgraw Hill (2017)
3. Principles of Physics, <u>John W. Jewett</u> , Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid-State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)

10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

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**B. Tech. Sem. I: Electronics & Telecommunication Engineering
SUBJECT: - ELECTRICAL TECHNOLOGY**

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination: 60 Marks	Credits :04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW: 50 Marks	Credit: 01
		Total Credits: 5
Course Pre-requisites:		
	Physics and Mathematics	
Course Objectives:		
1.	To introduce fundamental concepts, various laws-principles and theorems associated with electrical systems.	
2.	To impart basic knowledge of all electrical quantities such as current, voltage, power, energy, frequency along with different types of fields.	
3.	To provide knowledge about fundamental parameters such as resistance, inductance and capacitance and magnetic circuits, AC and DC circuits	
4.	To provide knowledge of Electrical Measurement technique and Electrical Safety Practices.	
Course Outcomes: After learning this course students will be able to		
1	Calculate the circuit parameters using dc network theorems.	
2	Demonstrate the knowledge of various parameters related to magnetic circuit and single-phase ac circuits.	
3	Classify the various parameters of 3-phase AC circuits and apply the concepts of single-phase transformer.	

4	Demonstrate the knowledge of various power generation and transmission techniques.	
5	Explain the Construction and working principle of DC and AC machines.	
6	Apply the various measurement techniques of circuit parameters and safety norms.	
UNIT – I	DC Circuit Analysis and Network Theorems:	(08 Hours)
	Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements, source transformation. Kirchhoff's laws; loop and nodal methods of analysis; star-delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem (simple numerical problems).	
UNIT – II	Magnetic Circuit and Single-Phase AC Circuits	(08 Hours)
	Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling Single Phase AC Circuits: AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, quality factor (simple numerical problems)	
UNIT - III	Three Phase AC Circuits:	(08 Hours)
	Three Phase AC Circuits: Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line, and phase voltage/current relations (Simple derivations), three-phase power and its measurement (simple numerical problems). Single Phase Transformer: Principle of operation, construction, e.m. f. equation, equivalent	

	circuit, power losses, efficiency (simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections	
UNIT -IV	Power Generation and Power System	(08 Hours)
	<p>Power Generation: Power Generation techniques using conventional (Hydro, Thermal, nuclear, Gas) & non-conventional resources (Solar, Wind, biogas).</p> <p>Introduction to Power System: General layout of electrical power system and functions of its elements, standard transmission, and distribution voltages, layout. Concept of grid (elementary treatment only)</p>	
	DC Machines and AC Machines	(08 Hours)
	<p>DC Machines: Principles of electromechanical energy conversion, DC machines: types, Construction & working, e. m. f. equation of generator and torque equation of motor, speed control, characteristics and applications of dc motors (simple numerical problems).</p> <p>AC Machines: Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only)</p>	
UNIT -VI	Electrical Measurement technique	(08 Hours)
	<p>Electrical Measurement technique: Electrical instruments such as wattmeter, energy meter, tong-tester, megger, and power analyzer. Measurement of circuit parameters like resistance, inductance and capacitance using DC and AC bridges.</p> <p>Electrical Safety Practises: Electric shock, precautions against shock, First aid for electric shock other hazards of electrical laboratories & safety rules, Objectives of Earthing, types of earthing;</p>	

	pipe and plate earthing, Residual current circuit breaker (RCCB).	
Term Work:		
1. Find the current in the given network using Super position Theorem		
2. Find the current in the given network using Thevenin's and Notton's Theorem		
3. To Plot the B-H characteristics for a magnetic material		
4. To find the voltage and current relationships in R-L series, R-C series, R-L-C series circuit		
5. To find the voltage and current relationships in R-L-C series resonance circuit.		
6. Verification of voltage and current relationships in star and delta connected 3-phase networks		
7. To find efficiency and regulation of single-phase transformer		
8. To control the speed of DC shunt motor using fulx control and armature voltage control method.		
9. To control the speed of DC shunt motor using fulx control and armature voltage control method.		
10. Find the unknown resistance using Kelvin's double bridge.		
11. Find the unknown inductance using Anderson's bridge.		
12. Measurement of power and energy in single phase ac circuit.		
Note: The term work shall be the record of minimum eight experiments performed from the above list.		
Topics for projets based learning*		
1.Design a small circuit for superposition theorem.		
2. Design small circuit to study Thevenin's Theorem.		
3. Design Small circuit to study Norton's Theorem.		
4. Design small circuit to study R-C series circuit.		
5. Design small circuit to study R-L series circuit.		
6. Design small circuit to study R-L-C series circuit.		
7. Design of Tesla Coil.		
8. Design small two winding transformer.		
9. Design small electromagnet.		
10. Design a small doorbell.		

11. Design of wireless power transmission.
12. Design of electric buzzer.
13. Design of small wind farm.
14. Design of small solar power plant.
15. Design of small galvanometer.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text-books:
1. Electrical Technology - Edward Huges (Pearson
1. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
2. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
Reference Books:
1. Principles of Electronics-Dr. H. M. Rai (Satya Prakashan)
2. Electronic Devices and Circuit Theory- R. L. Boylestad and L. Nashelsky (PHI)
3. Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)
4. Principles of Communication Engineering - Anokh Singh, A. K. Chhabra (S Chand)
5. Electrical Technology - Volume I & volume – II by B L Theraja and AK Theraja(<i>S Chand</i>)

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**B. Tech. Sem. I: Electronics & Telecommunication Engineering
SUBJECT: - ELEMENTRY ELECTRONICS**

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW & OR: 50 Marks	Credit: 01
		Total Credit: 05
Course Pre-requisites:		
	Physics, Chemistry, Mathematics (Class XII)	
Course Objectives:		
1.	To teach the construction, working, ratings and application of passive devices like resistors, capacitors, inductors, transformers, and relays	
2.	To introduce types of Voltage and current sources	
3.	To teach the construction, working and ratings of devices like PNjunction diode, Schottky diode, Zener diode, bipolar junction transistor	
4.	To teach the construction, working and ratings of field effect transistor and MOSFET	
5.	To teach the construction, working and ratings of optoelectronic devices like LDR, LED, phototransistor, and photovoltaic cell	
6.	To introduce the concept of grounding and shielding, PCB layout design, PCB fabrication process, with the aid of an EDA tool.	

Course Outcomes: After learning this course students will be able to		
1	Classify resistors, capacitors, inductors, and transformer based on their construction, types and ratings and analyze simple circuits consisting of passive devices	
2	Analyze circuits using voltage and current sources	
3	Classify active devices based on their types and ratings and plot their characteristic curves	
4	Classify optoelectronic devices based on their types and ratings and plot their characteristic curves.	
5	Use the concepts of grounding and shielding while designing PCB, explain the PCB design and fabrication and assembly process	
6	Use EDA tools for designing single sided PCB for simple circuits	
UNIT – I		
	Passive Electronic Components	(08 Hours)
	Introduction to the concept of active and passive electronic devices, Types of resistors, construction, ratings and typical applications, Types of capacitors, construction, ratings and typical applications, Types of inductors, construction, ratings and typical applications, Types of transformers, construction, ratings and typical applications, Construction of relays, types and ratings, Analysis of series and parallel resistors and capacitor circuits	
UNIT – II		
	Sources	(08 Hours)
	Types of voltage and current sources (AC and DC), Concept of ideal and non-ideal voltage source, Concept of ideal and non-ideal current source, Series and parallel combinations of sources, Loading effect, Dependent voltage and current sources, Electrochemical cells and batteries, Types and characteristics, Regulation concept (Line regulation, load regulation, temperature stability factor)	

UNIT - III	Diodes and BJT	(08 Hours)
	Classification of material based on band gap theory, Types of semiconductors (p-type and n-type), PN junction diode and its characteristics, Schottky diode, Zener diode, Diode models, Concept of DC and AC load line and ratings of PN junction diode, Introduction to BJT (NPN and PNP) and its construction and working mechanism, BJT configurations and their input and output characteristics, Types and ratings of BJT	
UNIT -IV	FET and MOSFET	(08 Hours)
	Construction and working mechanism of FET, Input and output characteristics of FET, FET configurations, Ratings of FET, Construction and working of DMOSFET and EMOSFET, Characteristics of DMOSFET and EMOSFET, Configurations and ratings of EMOSFET	
UNIT -V	Opto-Electronics	(08 Hours)
	Construction and working of LDR and its characteristics, simple application, Construction and working of LED and its characteristics and ratings, Photo-transistor and its characteristics, Introduction to the concept of electrical isolation and its importance, Construction of opto-isolator(opto-coupler) and its ratings, Construction and working of photovoltaic cell and its characteristics and ratings	
UNIT -VI	PCB (Printed Circuit Board)	(08 Hours)
	Concept of grounding, shielding and its importance, building blocks of PCB (track, pads, fills) and design rules, PCB fabrication and assembly, Introduction to EDA tool for artwork design of a simple single sided PCB Soldering: Types of solder alloys, soldering equipment, specifications of solder alloys	
<u>List of experiments:</u>		

1. Study of resistors, capacitors, and inductors
2. Plot V-I Characteristics of PN Junction Diode
3. Plot V-I Characteristics of Zener Diode
4. Plot Input and Output Characteristics of BJT in CE Configuration
5. Plot Transfer and output characteristics of FET
6. Plot Transfer and output characteristics of EMOSFET
7. Plot characteristics of LDR
8. Plot characteristics of Opto-isolator
9. Study of Relays
Topics for projects based learning*
1.Survey report of types of resistors, capacitors, transformers their form factors, specifications and price
2.Survey report of types of batteries, their form factors, specifications and price
3.Survey report of types of low power relays, their form factors, specifications and price
4.Survey report of types of diodes, BJT, MOSFET, their form factors, specifications and price
5.Build a shunt regulator and measure its line and load regulation
6.Build a full-wave rectifier with capacitor input filter and test it
7.Build a small signal voltage amplifier (BJT) and test it
8.Build a switch using BJT, MOSFET, relay and test it
9.Build a simple day light switch with an LDR, BJT and Relay
10.Build a motion sensor switch
11.Build a fire alarm circuit
12.Implement and test a given circuit on a general purpose PCB

13. Build a simple water level indicator
14. Build a simple temperature indicator
15. Build a LED Light Bulb Circuit
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books/ Reference Books:
1. Passive Components for Circuit Design, Ian Sinclair, 1st Edition 2000, ISBN: 9780750649339, Newnes
2. Grob's Basic Electronics, Mitchel Schultz, 11th Edition, 2010, ISBN-13: 978-0-07-351085-9, McGraw Hill
3. Fundamentals of Electronic Devices and Circuits, David A. Bell, 5th Edition, 2008, Oxford University Press,
4. Microelectronics Circuits, Adel S. Sedra & Kenneth C. Smith, 7th Edition, 2015, Oxford University Press
5. Linden's Handbook of Batteries, Thomas Reddy, 4th Edition, 2010, ISBN: 978-0-07-162419-0, McGraw Hill
6. Printed circuit boards: design, fabrication, assembly and testing, Raghbir Singh Khandpur, 2006, ISBN 10:0071464204, McGraw Hill
7. The Circuit Designer's Companion, Peter Wilson, 4th Edition, 2017, ISBN: 978-0-08-101764-7, Newnes

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B. Tech. Sem. I: Electronics & Telecommunication Engineering

SUBJECT: - C PROGRAMMING

<u>TEACHING SCHEME:</u>			<u>EXAMINATION SCHEME:</u>			<u>CREDITS ALLOTTED:</u>		
Theory: 04			End Semester Examination: 60 Marks			Credits: 04		
Practical: 02			Internal Assessment: 40 Marks					
Tutorial: 00			TW: 50 Marks			Credit: 01		
						Total Credit: 5		
Course Pre-requisites:								
			Flow charts					
Course Objectives:								
			<ul style="list-style-type: none"> • A student will gain a thorough understanding of the fundamentals of C programming. • A student will be able to code, compile, and test C programs. • A Student will be able to solve Problems using C language. 					
Course Outcomes: After learning this course students will be able to								
1	Apply the basic concepts of programming using C language.							
2	Write basic programs using conditional statement.							
3	Use 2 D Array in programming							
4	Create functions and Pass parameters.							
5	Construct structures using Pointers.							
6	Apply basic concepts of graphics using C language.							
UNIT – I								
Introduction Basic of C						(08 Hours)		

	Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators Managing input and output operations, Sample programs.	
UNIT – II	Conditional Statements and Loops	(07 Hours)
	Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, sample programs	
UNIT - III	Arrays & Strings	
	Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, , Array applications: Matrix Operations.	(08 Hours)
UNIT -IV	Functions & Pointers	(07 Hours)
	Basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, , recursive functions, Recursive solutions for Fibonacci series, example c programs. Passing arrays & strings to functions.	
UNIT -V	Pointers and Structures	(10 Hours)
	Derived types- structures- declaration, definition, and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, bit-fields, program applications. Different types of stacks and queues.	

UNIT -VI	Basic of Graphics	(08 Hours)
	Introduction, what is computer Graphics? Area of Computer Graphics. Graphics programming, initializing the graphics, C Graphical functions, simple programs	
<u>List of Experiments:</u>		
1.	<ul style="list-style-type: none"> ▪ Write a C program to take user Input and print it on the screen. ▪ Write a C program to perform addition or subtraction of two numbers. ▪ Write a C program to find whether the number is Odd or Even. ▪ Write a C program to find out Prime numbers. ▪ Write a C program to find out Fibonacci series. 	
2.	<ul style="list-style-type: none"> ▪ Write C programs to print different patterns. ▪ Write a C program to do factorial using recursion. ▪ Write a C program to find out Armstrong number 	
3.	<ul style="list-style-type: none"> ▪ Write a C program to sort the array in Ascending & Descending order. ▪ Write C programs to perform operations on 2-D arrays. ▪ Write a C program to perform different operations on strings. 	
4.	<ul style="list-style-type: none"> ▪ Use of Pointers ▪ Write a C program to swap numbers using pointers. 	

5.	Write a C program to show the use of pointers in arrays.
6.	Write a C program to use functions using pointers.
7.	Write a C program to create student mark sheet using structures.
8.	Write a C program to show the use of structure using pointers.
9.	Write a program showing functions of Graphics programming
10.	Mini Project.
Topics for projects based learning*	
1.Employee Record System Project	
2. Build Calculator (GUI Optional)	
3. Customer Billing System Project:	
4. Medical Store Management System Project	
5. Currency Converter (GUI Optional)	
6. Modern Periodic Table (GUI Optional)	
7. Number System Conversion Project	
8. Phone book / Contact Management System	
9. 100 Years Calender	
10. Hospital Management System Project	
11. Customer Billing system	
12. Tic Tac Toe Game (GUI Optional)	
13. Departmental Store Management.	
14. Build Rock , Paper & Scissors Game (GUI Optional)	
15. Bank Management System	
*Students in a group of 3 to 4 shall complete any one project from the above list	
Text Books:	
1. Programming in ANSI C – E Balagurusamy (5 th Edition-TMH)	

2. C Graphics & Projects – By B M Havaladar

Reference Books:

1. Let Us C- Yashwant Kanitkar

2. Computer Graphics – By Hearn & Baker

3. The C Programming Language. 2nd Edition By Brian Kernighan and Dennis Ritchie

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College of Engineering, Pune

B. Tech. Sem. I: Electronics & Telecommunication Engineering
SUBJECT: -MATLAB FUNDAMENTALS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 04	Internal Assessment: 00	
Tutorial: 00	TW: 50 Marks	Credit: 02
		Total Credit: 02
Course Pre-requisites:		
	Mathematics (Class XII) and Linear Algebra and Calculus	
Course Objectives:		
1.	To teach basics of MATLAB software and programming.	
2.	To teach the students Vectors, Arrays and Strings in programming	
3.	To introduce Conditional Statements, Loops and Functions	
4.	To teach the students to perform different operations on Matrices in programming.	
5.	To introduce MATLAB Simulink.	
6.	To introduce MATLAB GUI.	
Course Outcomes: After learning this course students will be able to		
1	Use MATLAB for basic programming.	

2	Use Vectors, Arrays and Strings in programming.
3	Apply knowledge of conditional statements, loops, and functions in programming.
4	Use different operations of Matrices in programming.
5	Design different models using MATLAB Simulink.
6	Design GUI for different applications.
<u>List of experiments:</u>	
1. Introduction to MATLAB	
a) Basics of MATLAB	
2. Commands, Variables and Operators.	
a) Write a program to perform arithmetic and logical operations on scalar data.	
b) Write a program to display sine and cos wave of particular amplitude and frequency.	
3. Vectors	
a) Write a program to find addition, subtraction, multiplication, transpose, and magnitude of given vector.	
b) Write a program to find mean, standard deviation, and variance of given vector.	
4. Conditional Statements and Functions	
a) Write a program to show use of if-then-else statement and while loop	
b) Write a program to import and export data from .csv file.	
5. Arrays and Strings	
a) Write a program to display data using string.	
b) Write a program to compare two given arrays or array elements.	
6. Operations on Matrix	

- a) Write a program to find transpose, determinant, concatenation, and inverse of given matrix.
- b) Write a program to solve given linear equation.

7. GUI

- a) To introduce basics of GUI
- b) To design GUI for any one of the programs mentioned above.

8. Simulink

- a) To introduce basics of Simulink
- b) Develop a model to differentiate and integrate sine wave using Simulink.

Text Books:

1. MATLAB for Beginners-A Gentle Approach, Peter I. Kattan, 2010, ResearchGate publication
2. Getting started with MATLAB, RudraPratap, 2010, Oxford university press.

Reference Books:

1. A Guide to MATLAB, Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, 3rd Edition, Cambridge University Press.
2. Introduction to MATLAB for Engineers, William J. Palm, 3rd Edition, McGraw-Hill Education.

SEMESTER:- II
SYLLABUS

**Bharati Vidyapeeth
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College of Engineering, Pune**

**B. Tech. Sem. II: Electronics & Telecommunication Engineering
SUBJECT: - DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS**

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 00	Internal Assessment: 40 Marks	
Tutorial: 01		Credits: 01
		Total Credit: 04
Course Pre-requisites:		
	Class XII Mathematics, Linear Algebra and calculus	
Course Objectives:		
1.	To introduce ordinary differential equations for higher order.	
2.	To introduce partial differential equations.	
3.	To introduce complex analysis and conformal mapping.	
4.	To teach sequences, series, and series expansion.	
5.	To introduce ordinary differential equations for higher order.	
6.	To introduce partial differential equations.	
Course Outcomes: After learning this course students will be able to		
1	Solve higher differential equations by different methods	

2	Solve partial differential equations by different methods	
3	Demonstrate the methods of Complex Analysis technique.	
4	Implement the Complex Analysis for potential application	
5	Demonstrate the knowledge of series and sequences.	
6	Solve series expansion problems.	
UNIT – I		
	Ordinary linear differential equations	(06 Hours)
	Ordinary linear differential equations of nth order, solution of homogeneous and non-homogeneous equations. Operator method. Methods of undetermined coefficients and variation of parameters, Systems of differential equations. Mass spring system.	
UNIT – II		
	Partial Differential Equations	(06 Hours)
	Partial differential equations, variable separable method, complementary function and particular integral, initial and boundary value problems (wave equation, 1-D and 2-D heat Equation).	
UNIT - III		
	Complex Differentiation and Integration	(06 Hours)
	Algebra of Complex Number (Polar and exponential form, Power and roots, Regions in a complex plane), Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Singularities, Residues, Poles and Zeros of Analytic Functions, The Residue Theorem	

UNIT -IV	Conformal mapping	(06 Hours)
	G Geometry of analytic functions: conformal mapping, points linear fractional transformations, conformal mapping for other function. Conformal mappings to potential problems: electrostatic fields, use of conformal mapping: modelling, heat problems, fluid flow, Poisson's Integral formula for potentials, General properties of harmonic functions, uniqueness theorem for the Dirichlet problem.	
UNIT -V	Sequences and Series	(06 Hours)
	Review of sequences, series and convergence tests, Power Series, Power Series Expansions of Analytic Functions, Taylor Series (Taylor's Theorem with Proof), Laurent series (Laurent's Theorem without Proof), Leibnitz's Theorem, Maclaurin's Series	
UNIT -VI	Series Expansion	(06 Hours)
	Multiplication, Division, Integration and Differentiation of Power Series, methods for solutions of ordinary differential equations. Legendre equation and Legendre polynomials, Bessel equations and Bessel functions of first and second kind. Orthogonal sets of functions	
Topics for projects based learning*		
1. Use MATLAB to formulate and solve types of differential equations - Initial value problems and Delay differential equations		
2. Use MATLAB to formulate and solve types of differential equations - Boundary value problems and Partial differential equations		
3. Ordinary Differential Equation (ODE) solvers in MATLAB, solve initial value problems with a variety of properties		
4. Ordinary Differential Equations EULER methods		

5. Ordinary Differential Equations Using built-in function
6. Differential Equations in Python
7. Differential Equations with ODE in Python
8. Partial Differential Equations in Python
9. Solving partial differential equations
10. Complex Line Integration
11. Multi dimensional Conformal mapping
12. Sequences & Series using matlab
13. Sequences and Series -circle packing method
14. An End-to-End Project on Time Series Analysis and Forecasting with Python
15. Time Series Analysis in Python
16. Time Series Classification (with Python)
17. Taylor series with Python
18. Program to print binomial expansion series
*Students in a group of 3 to 4 shall complete any one project from the above list
Textbooks/Reference Books
1. 'Advanced Engineering Mathematics' by Erwin reyszig
2. 'Advanced Engineering Mathematics' by Dennis G. Zill and Warren S. Wright
3. Applied Mathematics (Volumes I and II) by P.N. Wartikar & J.N. Wartikar
4. Higher Engineering Mathematics by B.S. Grewal
5. Higher Engineering Mathematics by B.V. Ramana
6. Advanced Engineering Mathematics

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B. Tech. Sem. II: Electronics & Telecommunication Engineering
SUBJECT: - Chemistry of Electronic Materials

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 02	Internal Assessment: 40 Marks	
Tutorial:00	TW: 50 Marks	Credit: 01
		Total Credit: 04
Course Pre-requisites:		
	Basic knowledge of chemistry, Electrochemical series, Electrode potential, Primary and secondary cells, Capacitor, insulator, classification, and properties of polymers.	
Course Objectives:		
	<ul style="list-style-type: none"> • To develop the interest among the students regarding chemistry and their applications in engineering • To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field. • The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the field such as E&TC Engineering 	
Course Outcomes: After learning this course students will be able to		
1	Demonstrate the knowledge of Electrical Insulating Materials with its applications.	
2	Demonstrate the knowledge about Dielectric Strength and Insulation Breakdown for various engineering applications.	
3	Apply the knowledge of crystallography to study of crystal structure	
4	Apply the knowledge Solid Solutions and Two-Phase Solids.	
5	Demonstrate the concept of the battery with its applications	
6	Demonstrate the concepts of spectroscopy and thermogravimetry for various engineering applications.	

UNIT – I	Electronic Materials 1	(06 Hours)
	Electrical Insulating Materials: Introduction - Requirements. Classification based on Substances: Gaseous, Liquid and Solid Insulating Materials. Preparation, Properties and Applications of Ceramic Products: White Wares and Glass - Transformer Oil. Electrical Resistivity: Factors influencing Electrical Resistivity of Materials - Composition, Properties and Applications of High Resistivity Materials: Manganin - Constantan - Molybdenum Disilicide – Nichrome.	
UNIT – II	Electronic Materials 2	(06 Hours)
	Dielectric Strength and Insulation Breakdown: Dielectric Strength: Definition, Dielectric Breakdown and Partial Discharges: Gases, Dielectric Breakdown: Liquids, Dielectric Breakdown: Solids, Capacitor Dielectric Materials: Typical Capacitor Constructions, Dielectrics: Comparison. Piezoelectricity, Ferroelectricity, and Pyroelectricity: Piezoelectricity: Quartz Oscillators and Filters, Ferroelectricity, and Pyroelectricity Crystals, Introduction to Compound Semiconductors.	
UNIT - III	Electronic Materials 3	(06 Hours)
	The Crystalline State: Types of Crystals, Crystal Directions and Planes, Allotropy and Carbon, Crystalline Defects and Their Significance: Point Defects: Vacancies and Impurities, Line Defects: Edge and Screw Dislocations, Planar Defects: Grain Boundaries, Crystal Surfaces and Surface Properties, Stoichiometry, Nonstoichiometric, and Defect Structures, Single- Crystal Czochralski Growth. Glasses and Amorphous Semiconductors: Glasses and Amorphous Solids, Crystalline and amorphous Silicon.	
UNIT -IV	Phase rule and Polymers	(06 Hours)
	Solid Solutions and Two-Phase Solids: Isomorphous Solid Solutions: Isomorphous Alloys, Phase Diagrams: Cu–Ni and Other Isomorphous Alloys, Binary Eutectic Phase Diagrams and Pb–Sn Solders. Polymers, Preparation, Properties and Applications of SF ₆ , Epoxy Resin, Conduction Mechanism, Preparation of Conductive Polymers, Polyacetylene, Poly (P- Phenylene), Polyhetrocyclic Systems, Polyaniline, Poly (Phenylene Sulphide), Poly (1,6-Heptadiyne),	

	Applications.	
UNIT -V	Electrochemistry	(06 Hours)
	Introduction, Acids and Bases, Concept of pH and pOH and Numerical Electrode Potential, Electrochemical Cell, Concentration Cell, Reference Electrodes, Overvoltage, Fuel Cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Coin Cell Batteries, Ni-Cd Batteries, Ni-MH Batteries, Li-Ion Batteries, Li-Po Batteries.	
UNIT -VI	Instrumental Methods of Analysis	(06 Hours)
	Introduction, Absorption of Radiation, Instrumentation and Applications of UV-Visible Spectrophotometer and IR Spectrophotometer. Thermal Methods of Analysis TGA, DTA, DSC, Sensors: Oxygen and Glucose Sensor.	
Term Work:		
1. To measure the absorbance of the sample at different wavelengths.		
2. Verification of Beer-Lambert's Law.		
3. Determination of Viscosity Average Molecular Weight of Polymer		
4. Determination of Viscosity of Organic Solvents		
5. To find the tensile strength of polymer.		
6. To determine the pH value of given solutions using pH meter.		
7. To determine pH of soil		
8. To find EMF of the cell.		
9. To calculate the Equilibrium constant.		
10. To predict the spontaneity of the cell reaction.		
11. To learn the specific charge/discharge characteristics of a Lithium- ion (Li- ion) battery through experimental testing of a remote triggered Li- ion Battery.		
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin.		
13. To study set up of Daniel Cell		

Topics for projects based learning*
1. To Prepare and for synthesis of the following polymers,
a. Bakelite
b. Polystyrene
c. Epoxy Resin
2. Synthesis properties and applications of polymer.
3. To Prepare one component system with an example
4. To Prepare two component system with an example 5. How to Make a Battery with Metal, Air, and Saltwater 6. Use a Microbial Fuel Cell to Create Electricity from Waste
7. To Prepare fuel cell
8. To prepare lead acid storage battery. 9. To prepare Oxidic Nanomaterials for High Density Storage in Li-ion Batteries
10 Electrochemical forming is a unique additive manufacturing method which uses electrochemical technologies to manufacture, layer-by-layer, parts of complex geometry.
11. The materials chemistry and electrochemistry of the lithium-air battery
12. . Challenges facing all-solid-state batteries
13. The materials chemistry and electrochemistry of lithium and sodium-ion batteries
14 Electroplating- the principles, how different metals can be used and the practical applications.
15. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing and Powder Coating Projects
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008.
2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G.Cowie, Blackie Academic & Professional, 1994.
3. A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004
4. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.
5. Chemical sensors and Biosensors, Fundamentals and applications, Florinel Gabriel Banica, Wiley.

6. Microelectronics Circuits, Adel S. Sedra & Kenneth C. Smith, 7th Edition, 2015, ISBN 978-0-19-933913-6, Oxford University Press

Reference Books:

1. Inorganic Chemistry (4th edition), D. F. Shriver and P. W. Atkins, Oxford University, Oxford, 2006.

2. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003.

3. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978.

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B. Tech. Sem. II: Electronics & Telecommunication Engineering
SUBJECT: - DIGITAL ELECTRONICS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW& OR: 50 Marks	Credit:01
		Total Credit: 05
Course Pre-requisites:		
	Fundamentals of Number Systems.	
Course Objectives:		
1.	To present the Digital fundamentals, Boolean algebra, and its applications in digital systems	
2.	To familiarize with the design of various combinational digital circuits using logic gates	
3.	To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits	
4.	To understand the various semiconductor memories and related technology	
5.	To introduce the electronic circuits involved in the making of logic gates	
Course Outcomes: After learning this course students will be able to		
1	Demonstrate the knowledge of Digital fundamentals and Boolean algebra.	
2	Apply different minimization techniques on Boolean expression and design logic diagram	
3	Analyze & design digital combinational circuits such as of multiplexers, demultiplexers, encoder, decoder, and arithmetic circuits	

4	Demonstrate the knowledge of operations of basic types of flip-flops & the design of FSM.	
5	Analyze & design digital Sequential circuits such as Shift Registers and Counters	
6	Classify the characteristics of different logic families, PLDs, Semiconductor memories and their applications.	
UNIT – I	Introduction to Digital Systems:	(08 Hours)
	<p>Introduction to Digital electronics Fundamentals</p> <p>Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers, 1's complement and 2's complement.</p> <p>Binary Arithmetic: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division,</p> <p>Digital Codes: BCD code, Excess-3 code, Gray code, Binary to Excess -3 code conversion and vice versa, ASCII code, EBCDIC code.</p> <p>Logic Gates: Logical Operators, Logic Gates-Basic Gates, Active high and Active low concepts, Universal Gates, and realization of other gates using universal gates, Gate Performance Characteristics and Parameters</p>	
UNIT – II	Boolean Algebra:	(08 Hours)
	<p>Boolean Expressions and Truth Tables, Rules and laws of Boolean algebra, Demorgan's Theorems, Duality Theorem, Simplification of Boolean functions by Boolean laws, Shannon's Theorem.</p> <p>Boolean Function minimization Technique: Introduction: Minterms and sum of minterm form, Maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4/variable K-maps, grouping of variables in K-maps, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc Cluskey Method</p>	
UNIT - III	Combinational Logic Design	
	<p>Introduction to Combinational Circuits, Adders: Half-Adder and Full-Adder, Subtractors- Half and Full Subtractor; Parallel adders: Ripple Carry and Look-Ahead Carry Adders.</p>	(08 Hours)

	BCD adder, BCD subtractor, Parity Checker/Generator, Multiplexer, Demultiplexer, Encoder, Priority Encoder; Decoder, BCD to Seven segment Display Decoder, ALU, Code converters, Magnitude comparators	
UNIT -IV	Sequential Logic Design	(08 Hours)
	Introduction to Sequential Circuits: 1 Bit Memory Cell, Latches: SR latch, Gated latch, Flip-Flops: Types of Flip Flops -RS, T, D, JK, Triggering of Flip Flops, Master-Slave JK Flip flop, Characteristic table of Flip-flop, excitation table of Flip-flop, Study of timing parameters of flip-flop.	
UNIT -V	Shift Registers and Counters:	(08 Hours)
	Data transmission in shift register: SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. Counters: synchronous counter and asynchronous counter. Introduction to FSM: Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization, Effect of clock skew and clock jitter on synchronous designs (Metastability)	
UNIT -VI	Logic Families and Memory Technology:	(08 Hours)
	Logic Family: Digital IC specification terminology, Logic families: TTL, CMOS, ECL families, Interfacing of TTL to CMOS & CMOS to TTL. Programmable logic devices: Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs. Semiconductor memories: Classification and characteristics of memory, different types of RAMs, ROMs and their applications	
List of Practicals to be performed in the laboratory		

1. Study of basic gates using TTL, CMOS: 7432, 4011, 4050, 4070,4071,40106 and Universal Gates.
2. K map-based implementation of combinational logic
3. Design and implementation of Half and Full Adder, Half and Full Subtractor
4. Study of four-bit parallel Adder / Subtractor using IC 7
5. Design and implementation of Code Converters (Binary to Gray, Excess 3 to Binary)
6. Design and implementation of Magnitude Comparator
7. Implementation of combinational logic using MUX
8. Study of Decoder and DEMUX
9. Study of 7 segment decoder driver.
10. Study of Flip Flops (SR FF, D FF, JK FF, T FF)
11. Study of Shift Registers
12. Study of Up-Down Counter and Johnson Counter.
13. Study of Static I/O and transfer Characteristic of TTL
Note: The term work shall be the record of minimum eight experiments performed from the above list
Topics for projects based learning*
1. Survey report of basic gates ICs 7432, 4011, 4050, 4070,4071,40106
2. Implement combinational logic Circuit of given Boolean Equation.
3. Implement Half Adder and Half Subtractor.
4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX
10. Implement 7 segment decoder driver using IC 7447.
11. Build a Decade counter and Up-Down Counter.
12. Build a Shift Registers: SISO and SIPO
13. Implement the Johnson Counter and Ring Counter.

14. Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.
15. Implement given Boolean Function using PLA.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. R.P. Jain, —Modern digital electronics, 3rd edition, 12th reprint Tata McGraw Hill Publication
2. Anand Kumar, —Fundamentals of digital circuits, 1st edition, Prentice Hall of India, 2001
3. P.Raja, - Digital Electronics, Second Edition, Scitech Publication (India) Pvt.Ltd.
Reference Books:
1. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
2. J.F.Wakerly “Digital Design: Principles and Practices”, 3rd edition, 4th reprint, Pearson Education, 2

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B. Tech. Sem. II: Electronics & Telecommunication Engineering
SUBJECT: - SEMICONDUCTOR DEVICES AND CIRCUITS-I

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 04		End Semester Examination: 60 Marks		Credits: 04	
Practical: 02		Internal Assessment: 40 Marks			
Tutorial: 00		TW & PR: 50 Marks		Credit: 01	
				Total Credit: 5	
Course Pre-requisites:					
		Elementary Electronics, EDA Tool Practice			
Course Objectives:					
1.		To introduce the methods of analysis, design, and simulation of diode circuits			
2.		To introduce the methods of analysis, design, and simulation of BJT biasing circuits			
3.		To introduce methods to analyze and design and simulate BJT amplifier circuits			
4.		To introduce methods to analyze and design and simulate JFET circuits			
5.		To introduce methods to analyze and design and simulate MOSFET circuits			
6.		To introduce the concept of current mirror and transistorized voltage regulator circuits			
Course Outcomes: After learning this course students will be able to					
1		Analyze and design the diode circuits			
2		Analyze and design the BJT biasing circuits			

3	Analyze and design the BJT amplifier circuits	
4	Analyze and design the JFET circuits	
5	Analyze and design the MOSFET circuits	
6	Analyze and design the current mirror and transistorized voltage regulator circuits	
UNIT – I		
DIODE CIRCUITS		(08 Hours)
	Analysis and design of Rectifier circuits (HWR, FWR, Bridge, Dual Complementary), Capacitor input filter, Clippers, Clampers, Voltage Multipliers, Special diodes (Zener diodes, Schottky diodes, Gold-diffused diodes), Switching circuits, Simple shunt regulator using Zener diode (analysis and design)	
UNIT – II		
BJT CIRCUITS I		(08 Hours)
	Need of biasing circuits, Analysis, and design of BJT biasing circuits like fixed bias, collector to base bias, voltage divider bias, split-supply bias, Concept of DC load line, Concept of stability factor, Derivation of stability factor	
UNIT - III		
BJT CIRCUITS II		(08 Hours)
	Concept of AC load line, BJT as two-port networks, BJT Models small signal models (h-parameter, Ebers-Moll, hybrid π and T), Analysis of CE, CB, CC Amplifiers (Derivation of Z_i , Z_o , A_v , A_i and A_p), Frequency response of BJT amplifiers, Single stage CE voltage amplifier design, large signal BJT model, BJT as switch, power BJT	
UNIT -IV		
JFET CIRCUITS		(08 Hours)

	Analysis and design of JFET biasing (Fixed bias, Self-bias, Voltage divider bias), JFET models, Analysis of CS, CD, CG Amplifiers, Frequency response of JFET amplifiers, Single stage CS amplifier design, FET as switch.	
UNIT -V	MOSFET CIRCUITS	(8 Hours)
	EMOSFET biasing (Fixed bias, negotiated bias/Voltage divide bias), DC load line, MOSFET models, Analysis of MOSFET amplifiers, Single stage CS amplifier design, Frequency response of MOSFET amplifiers, MOSFET as switch, Power MOSFET	
UNIT -VI	OTHER TRANSISTOR CIRCUITS	(08 Hours)
	Concept of current mirror, Analysis of Widlar current source (BJT and MOSFET), Wilson current mirror (BJT and MOSFET), Gilbert gain cell, Series pass transistor voltage regulator, Variable output voltage regulator	
<u>List of experiments:</u>		
1. Observe and measure outputs for rectifier circuits		
2. Observe and measure outputs clipper, clamper, voltage multiplier circuits		
3. Construct BJT biasing circuits (Fixed, Collector to base bias circuit, Voltage divider bias circuit and verify the Q-point.		
4. Measure and plot the frequency response of single stage CE voltage amplifier		
5. Construct FET biasing circuits (Fixed, self-bias circuit, Voltage divider bias circuit and verify the Q-point.		
6. Measure and plot the frequency response of single stage JFET CS voltage amplifier		

7. Construct MOSFET biasing circuits (Fixed, Voltage divider bias circuit and verify the Q-point.
8. Measure and plot the frequency response of single stage MOSFET CS voltage amplifier
9. Construct BJT and MOSFET switch circuits and compare the performance (power dissipation, transient response)
10. Measure and plot regulation characteristics of shunt regulator, series pass transistorized voltage regulator
Topics for projects based learning*
1. Build a voltage quadrupler circuit
2. Build a low current, regulated power supply
3. Build a diode, BJT tester
4. Latching burglar alarm
5. Moisture detector
6. Voltage controlled variable gain amplifier
7. Wind shield wiper control
8. Metal detector
9. Car battery charger
10. Under-voltage/Over-voltage indicator
11. Crystal oscillator
12. DC Flasher with adjustable ON/OFF times
13. Emergency Light
14. Simple intercom
15. Water level indicator with alarm
*Students in a group of 3 to 4 shall complete any one project from the above list
Reference Books:
1. Fundamentals of Electronic Devices and Circuits, David A. Bell, 5 th Edition, 2008, ISBN:0195425235, 9780195425239, Oxford University Press.
2. Microelectronics Circuits, Adel S. Sedra & Kenneth C. Smith, 7 th Edition, 2015, ISBN 978-0-19-933913-6, Oxford University

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B. Tech. Sem. II: Electronics & Telecommunication Engineering
SUBJECT: - PYTHON PROGRAMMING

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 04		End Semester Examination: 60 Marks		Credits: 04	
Practical: 02		Internal Assessment: 40 Marks			
Tutorial: 00		TW: 50 Marks		Credits :01	
				Total Credits :5	
Course Pre-requisites:					
		Basic programming.			
Course Objectives:					
		<ul style="list-style-type: none"> • This course will introduce the concepts of Python language as software development tool. • To gain practical experience in Python programming including fundamental concepts, OOPs, Exception handling, Graphics. 			
Course Outcomes: After learning this course students will be able to					
1	Apply the basic concepts of Python programming.				
2	Write basic programs using control statements.				
3	Use exception handling in Python programs.				
4	Apply object-oriented programming concepts in Python.				
5	Write Python program for simple applications using existing libraries.				

6	Write simple graphics programs.	
UNIT – I	Python Basics	(08 Hours)
	Python Introduction ^[1] , Python Installation ^[1] , Relational operators, Bit-wise operators, Logical operators Python Data Types - Numbers (Integer, Floating Point, Complex Numbers), Strings, Lists, Tuples, Dictionaries, List comprehensions, Python Control Statements	
UNIT – II	Python Core	(08 Hours)
	Python Modules & Functions, Lambda, Scope, Python File Handling, Python Regular Expressions, Sequence Types, Input and output, Recursion, Flow Control, Immutable and Mutable Objects	
UNIT - III	Python Exception Handling	(08 Hours)
	Meaning of Exception, Exception Hierarchy Diagram, Types of Exception- Checked Exception, Unchecked Exception ^[1] , Exception Handling -TRY, CATCH, FINALLY, Raising an Exception, User Defined Exceptions	
UNIT -IV	OOPS, UML & OOAD	(08 Hours)
	Object Oriented Programming (OOPs) - Class & Object, Abstraction, Inheritance, Polymorphism, Encapsulation ^[1] , Object Oriented (OO) Modelling ^[1] , Object Oriented Analysis & Design (OOAD)	

UNIT -V	Python Multi-Threading	(08 Hours)
	Threads in Python [L1][SEP](a) Kernel Threads [L1][SEP](b) User Space Threads or User Threads, Advantages of Threading, Thread States: Life Cycle of a Thread, Thread & Threading Modules, Forking & Synchronizing Threads,Networking	
UNIT -VI	Python Packages and Graphics	(08 Hours)
	Numpy: Introduction, data-types, arrays, arrays manipulation, plotting, testing and debugging, Sharing Data using Sockets, Simple applications of python, Scipy, TKinter	
<u>Term Work:</u> Any 8 of below given list		
1. Evaluate any given expression involving arithmetic operators.		
2. Evaluate any given expression involving logical operators.		
3. Develop python functions to produce given patterns such as diamond, pyramid, triangles.		
4. Usage of different functions present in “math” module.		
5. Write a function that takes two numbers as input parameters and returns their least common multiple.		
6. Write a function that takes two numbers as input parameters and returns their greatest common divisor.		
7. Write a program that takes a sentence as an input and displays the number of words in the sentence.		
8. Ways to sort list of dictionaries by values in Python – Using lambda function.		
9. Write program using “matplotlib” module.		
10. Write program using “NUMPY” module.		
11. Write program using “Scipy” module.		

12. Write program using “TKinter” module.

Topics for projects based learning*

1. Create a Tic-tac-toe game (GUI optional)
2. Build a password encryptor with Hashing.
3. Build Product Price Comparison using webscraping.
4. Create a google image downloader
5. Create a Snake & Ladders game (GUI optional)
6. Build a contact book using indexing
7. Build What’s the word game
8. Build Rock, Paper & Scissors game
9. mp3 file organizer - rebuild a music library's structure from mp3 tag data, and reorganize them in folders. Use Multithreading concepts
10. Create an FTP server
11. Build a functional calculator (GUI optional)
12. Python Email Automation
13. Create a Currency converter (GUI optional)
14. Face Detection using Cv2
15. Biometric Fingerprint detection

*Students in a group of 3 to 4 shall complete any one project from the above list

Text Books:

1. Sheetal Taneja, Naveen Kumar, Python Programming, A modular approach, Pearson publication

Reference Books:

1. Learning Python 5th Edition, O'Reilly Publication
2. Beginning Python: From Novice to professional, by Magnus Lie Hetland, Third Edition, Apress Publication
3. Learning with Python by Allen Downey, Jeffrey Elkner, Chris Meyers, Dreamtech Publication

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. II: Electronics & Telecommunication Engineering
SUBJECT: - COMPUTER AIDED DRAFTING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 00	End Semester Examination: 00	Credits:00
Practical: 04	Internal Assessment: 00	
Tutorial: 00	TW: 50 Marks	Credit: 02
		Total Credit: 02
Course Pre-requisites:		
	Mathematics (Class XII)	
Course Objectives:		
1.	To teach the students Fundamentals of engineering drawing and curves	
2.	To introduce the students Isometric views and projection	
3.	To teach the students Projections of points, lines, planes & solids	
4.	To introduce the students Use of CAD tools.	
Course Outcomes: After learning this course students will be able to		
1	Apply dimensioning methods and drawing of engineering curves.	
2	Draw orthographic projections using I st angle and III rd angle projection Methods*.	
3	Draw Isometric views from given orthographic projections*.	

4	Draw projection of Lines, its traces and projections of planes*.
5	Create projection of different solids*.
6	Develop lateral surfaces of solids*.
*Using CAD tools	
UNIT – I	Lines and Dimensioning in Engineering Drawing and Engineering Curves
	Different types of lines used in drawing practice, Dimensioning–linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Ellipse by Arcs of Circles method, Concentric circles method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone & cylinder. Introduction to Auto CAD commands.
UNIT – II	Orthographic Projection
	Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views, and types of cutting planes and their representation, hatching of sections. (Also using AutoCAD commands)
UNIT - III	Isometric Projections
	Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view.

	(Also using AutoCAD commands)	
UNIT -IV	Projections of Points & Lines	
	Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines. (Also using AutoCAD commands)	
UNIT -V	Projections of Planes	
	Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP. (Also using AutoCAD commands)	
UNIT -VI	Projections of Solids	
	Projection of prism, pyramid, cone, and cylinder by rotation method. (Also using AutoCAD commands)	
<u>List of sheets:</u>		
1. Types of lines, Dimensioning practice, free-hand lettering, 1 st and 3 rd angle methods symbol.		
2. Engineering curves.		
3. Orthographic Projections.		
4. Isometric views.		

5. Projections of Points and Lines and planes.
6. Projection of Solids.
7. Enclosure design
<u>Term work:</u>
Term work shall consist of half imperial size or A2 size (594 mm x 420 mm) sheets.
All sheets should complete in drawing hall manually and sheet no 2-7 also completed using AutoCAD with printout on A2 size papers.
Text Books/Reference Books:
3. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publishing house, Anand India,
4. "Text Book on Engineering Drawing", K. L. Narayana & P. Kannaiah, Scitech Publications, Chennai.
5. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi,
6. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.
7. "Engineering Drawing", M. B. Shah and B.C. Rana, 1 st Ed, Pearson Education, 2005
8. "Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10 th Edition, S. K. Kataria and Sons, 2005
9. "Engineering Drawing", P. J. Shah, C. Jamnadas and Co., 1 st Edition, 1988

B. Tech-Electronics & Telecommunication Engineering

STRUCTURE

Bharati Vidyapeeth (Deemed to be) University, Pune
Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – III (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme (Hrs. / Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW& PR	Total	L	P TW/O R/PR	T	Total
13	Advanced Mathematics- for Electronics	03	00	01	60	40	00	00	00	100	03	00	01	04
14	Semiconductor Devices and Circuits-II	04	02	00	60	40	00	00	50	150	04	01	00	05
15	Signals and Linear Systems	04	02	00	60	40	25	00	00	125	04	01	00	05
16	Network Analysis and Synthesis	04	02	00	60	40	00	00	50	150	04	01	00	05
17	Database Management Systems*	03	02	00	60	40	25	00	00	125	03	01	00	04
18	EDA Tool Practices	00	02	00	00	00	50	00	00	50	00	01	00	01
19	PCB Design and Soldering	00	04	00	00	00	00	50	00	50	00	02	00	02
20	Vocational Course - I: Networking	00	00	00	00	00	00	50	00	50	00	02	00	02
21	MOOC-I	00	00	00	00	00	00	00	00	00	00	00	00	02
22	Environmental Studies** (Mandatory Audit Course)	00	00	00	00	00	00	00	00	00	00	00	00	00
	Total	18	14	01	300	200	100	100	100	800	18	09	01	30

*Industry taught course-I

**100 marks end semester exam

Bharati Vidyapeeth (Deemed to be) University, Pune

Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – IV (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW&OR	TW&PR		L	P TW/OR/ PR	T	Total
23	Control Systems and Application	04	02	00	60	40	25	00	00	125	04	01	00	05
24	Integrated Circuits and Applications	04	02	00	60	40	00	00	50	150	04	01	00	05
25	Electromagnetics and Transmission Lines	03	00	01	60	40	00	00	00	100	03	00	01	04
26	Analog Communication	04	02	00	60	40	00	50	00	150	04	01	00	05
27	Data Science*	03	02	00	60	40	25	00	00	125	03	01	00	04
28	Advanced Computer Programming	00	04	00	00	00	00	50	00	50	00	02	00	02
29	Sensor Modelling and Simulation Laboratory	00	02	00	00	00	00	50	00	50	00	01	00	01
30	Vocational Course-II Calibration and repair of lab equipments	00	00	00	00	00	00	50	00	50	00	02	00	02
31	Social Activities-I	00	00	00	00	00	00	00	00	00	00	00	00	02
32	Disaster Management** (Mandatory Audit Course)	00	00	00	00	00	00	00	00	00	00	00	00	00
	Total	18	14	01	300	200	50	200	50	800	18	09	01	30

*Industry taught course-II

**100 marks end semester exam

Bharati Vidyapeeth (Deemed to be) University, Pune.

Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – V (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR		Total	L	P TW/OR/ PR	T
33	Embedded systems	03	02	00	60	40	00	50	00	150	03	01	00	04
34	Digital Communication System	03	02	00	60	40	25	00	00	125	03	01	00	04
35	Power Electronics	03	02	00	60	40	25	00	00	125	03	01	00	04
36	Microwave and Antenna	04	02	00	60	40	00	50	00	150	04	01	00	05
37	Data Communication and Networking *	03	00	00	60	40	00	00	00	100	03	00	00	03
38	Microcontroller Programming	00	04	00	00	00	00	00	50	50	00	02	00	02
39	Project-I Stage –I	00	02	00	00	00	00	100	00	100	00	04	00	04
40	Vocational course III: PLC	00	00	00	00	00	00	50	00	50	00	02	00	02
41	MOOC- II	00	00	00	00	00	00	00	00	00	00	00	00	02
	Total	16	14	00	300	200	50	250	50	850	16	12	00	30

*Industry taught course-III

Bharati Vidyapeeth (Deemed to be) University, Pune

Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – VI (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR		Total	L	P TW/OR R/PR	T
42	Photonics	04	02	00	60	40	25	00	00	125	04	01	00	05
43	Quantitative techniques, Communication and Values	02	02	00	60	40	00	00	00	100	03	00	00	03
44	Digital Signal Processing	03	02	00	60	40	25	00	00	125	03	01	00	04
45	CMOS Design	04	02	00	60	40	00	50	00	150	04	01	00	05
46	Internet of Things*	03	00	00	60	40	00	00	00	100	03	00	00	03
47	VHDL	00	02	00	00	00	00	00	50	50	00	01	00	01
48	Project-I Stage-II	00	02	00	00	00	00	100	00	100	00	04	00	04
49	*Vocational 4: Web App development	00	00	00	00	00	00	50	00	50	00	02	00	02
50	*** Internship	00	00	00	00	00	00	50	00	50	00	03	00	03
	Total	16	12	00	300	200	50	250	50	850	17	13	00	30

*Industry taught course-IV

Bharati Vidyapeeth (Deemed to be) University, Pune

Faculty of Engineering & Technology

Programme :B.Tech (E &Tc) Sem – VII (2021 Course)

Programme :B.Tech (E &Tc) Sem – VII (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW&OR	TW & PR	Total	L	P TW/OR/PR	T	Total
51	Soft Computing	04	02	00	60	40	00	00	50	150	04	01	00	05
52	Radio Frequency Engineering	04	00	01	60	40	00	00	00	100	04	00	01	05
53	Elective- I	04	02	00	60	40	00	50	00	150	04	01	00	05
54	Industrial Wireless Sensor Network*	04	02	00	60	40	00	50	00	150	04	01	00	05
55	Project II Stage I	00	04	00	00	00	00	200	00	200	00	04	00	04
56	Electronic Product Design	00	04	00	00	00	00	100	00	100	00	02	00	02
57	Research paper publication	00	00	00	00	00	00	00	00	00	00	00	00	02
58	MOOC-III	00	00	00	00	00	00	00	00	00	00	00	00	02
	Total	16	14	01	240	160	00	400	50	850	16	09	01	30

Elective-I

- 1) Telecom Network Management
- 2) Advanced Embedded System Design
- 3) Image processing

*Industry taught course-V

Bharati Vidyapeeth (Deemed to be) University, Pune
Faculty of Engineering & Technology

Programme: B.Tech (E & Tc) Sem – VIII (2021 Course)														
Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)					Total Marks	Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR		Total	L	P TW/OR/PR	T
59	Mobile Communication	04	02	00	60	40	00	50	00	150	04	01	00	05
60	Satellite Communication & Radar	04	02	00	60	40	00	00	50	150	04	01	00	05
61	Elective II	04	02	00	60	40	00	50	00	150	04	01	00	05
62	Cyber security*	04	00	01	60	40	00	00	00	100	04	00	01	05
63	Cloud Computing	00	04	00	00	00	00	100	00	100	00	02	00	02
64	Project -II Stage-II	00	04	00	00	00	00	200	00	200	00	06	00	06
65	Social Activities-II	00	00	00	00	00	00	00	00	00	00	00	00	02
	Total	16	14	01	240	160	00	400	50	850	16	11	01	30

Elective-II

- 1) Software Defined Radio
- 2) Automotive Electronics
- 3) Computer Vision

*Industry taught course-VI

SEMESTER:- III
SYLLABUS

**Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune**

**B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: - ADVANCED MATHEMATICS FOR ELECTRONICS**

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 00	Internal Assessment: 40 Marks	
Tutorial: 01		Credit:01
		Total Credits: 04
Course Pre-requisites:		
	Class XII Mathematics, Linear Algebra and calculus, Differential equation, and complex analysis	
Course Objectives:		
1.	To introduce the concept of Fourier series.	
2.	To introduce Transforms like Fourier Transform, Laplace Transform and Z Transform.	
3.	To teach vector analysis.	
4.	To introduce optimization and graph theory.	
5.	To teach probability and statistics.	
Course Outcomes: After learning this course students will be able to		
1	Apply Fourier series for solving engineering problems.	
2	Solve numerical problems involving Fourier Transform.	
3	Demonstrate the knowledge of Laplace Transform and Z Transforms.	

4	Apply the concept of optimization and graph theory.	
5	Apply vector analysis for engineering problems.	
6	Solve numerical problems based on probability and statistics.	
UNIT – I	Fourier Series	(06 Hours)
	Definition, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, expansions of odd and even periodic functions, Half range series. application to difference equations and Markov chains, Fourier series and KL expansion, Fourier series with an emphasis on the application of solving engineering problems, Develop Fourier series expansion of a function over the given interval.	
UNIT – II	Fourier Transform	(06 Hours)
	Fourier transforms, Fourier transform of random process, Fourier sine and cosine transforms, Inverse Fourier, Sine and Cosine Transforms, complex form of Fourier integral, Finite Fourier sine and cosine transforms. Properties of Fourier transform.	
UNIT - III	Laplace Transform & Z Transform	(06 Hours)
	Laplace Transform: Definition, transforms of elementary functions, properties of Laplace transforms, transforms of derivatives, Properties of Laplace transforms, transforms of integral, periodic functions, Inverse Laplace transforms, Inverse Laplace transforms by using partial	

	fractions, Properties of LT. Z Transform: Definition, properties of z transform, Z Transform of basic sequences, Z transform of some standard discrete function inverse Z transform	
UNIT -IV	Optimization and graphs	(06 Hours)
	Basics of optimization, Unconstrained optimization: method of steepest descent, linear programming, simplex method, and difficulties. G Graphs and digraphs, shortest path problems, complexities, Bellman's principle, Dijkstra's Algorithm, shortest spanning trees: greedy algorithm, Prim's algorithm, flows in networks, maximum flow: Ford-Fulkerson algorithm	
UNIT -V	Vector Analysis	(06 Hours)
	Coordinate system, inter-conversion of coordinate systems, Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stokes' theorems.	
UNIT -VI	Probability and Statistics	(06 Hours)
	Mean, median, mode, standard deviation, combinatorial probability, probability distributions, binomial distribution, Poisson distribution, exponential distribution, normal distribution, joint and conditional probability, relation of joint and conditional probability, higher order stats	
Topics for projects based learning*		

1. Energy Flow in an Ecosystem: Graphical model
2. Plane Geometry and Vectors
3. Bipartite graph
4. Trellis (graph)
5. Seven Bridges of Königsberg
6. Three-cottage problem
7. Shortest path problem
8. A system of electric charges has a charge density $\rho(x,y,z)$ and produces an electrostatic field $E(x,y,z)$ at points (x,y,z) in space. Gauss' Law states that $\iint_{\Sigma} E \cdot d\sigma = 4\pi \iiint_S \rho dV$ for any closed surface Σ which encloses the charges, with S being the solid region enclosed by Σ . Show that $\nabla \cdot E = 4\pi\rho$. This is one of Maxwell's Equations
9. Show that the gradient of a real-valued function $F(\rho,\theta,\phi)$ in spherical coordinates is:
10. Applications of Vector Fields: in Mechanics
11. Applications of Vector Fields: Electric and Magnetic fields
12. Applications of Vector Fields: Fluids motions
13. Applications of Vector Fields: Heat transfer
14. Routing problems (e.g. Hamiltonian paths, travelling salesman problem)
15. Graph colorings (4-color theorem, chromatic polynomial)
*Students in a group of 3 to 4 shall complete any one project from the above list
Textbooks/Reference Books
1.'Advanced Engineering Mathematics' by Erwin reyszig
2.'Advanced Engineering Mathematics' by Dennis G. Zill and Warren S. Wright
3.AppliedMathematics (VolumesIandII)byP.N.Wartikar&J.N.Wartikar
4.HigherEngineeringMathematicsbyB.S. Grewal
5.HigherEngineeringMathematicsbyB.V. Ramana

6. Advanced Engineering Mathematics

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. Sem. III: Electronics & Telecommunication Engineering		
SUBJECT: - SEMICONDUCTOR DEVICES AND CIRCUITS II		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW &PR: 50 Marks	Credit: 01
		Total Credit: 5
Course Pre-requisites:		
	Network theory-Current divider rule, Voltage divider rule, KVL, KCL, Network theorems, h-parameters, passive elements and their response (initial final conditions), Semiconductor theory, semiconductor devices like diodes, BJT, FET, MOSFET, Biasing methods, Single stage amplifier-design and analysis	
Course Objectives:		
	<p>The objective of this course is to cover performance evaluation of various amplifiers by</p> <ul style="list-style-type: none"> • Introducing a concept of the multistage amplifiers, parameter evaluation and related design aspects of multistage amplifiers with the help of derivations. • Teaching a concept of the feedback in the amplifiers, feedback topologies with the help of derivations and their advantages and disadvantages. • Gauging the efficiencies of various types of power amplifiers with the help of derivations. • Teaching a concept and design of the RC and LC oscillators with the help of derivations. • Introducing a concept and types of the differential amplifiers, current mirrors. • Introducing a concept and types of the tuning amplifiers. 	

Course Outcomes: After learning this course students will be able to		
1	Analyze and design discrete multistage amplifier.	
2	Analyze and design negative feedback amplifier.	
3	Classify and analyze discrete power amplifiers.	
4	Analyze and design discrete oscillator circuits.	
5	Analyze various types of the differential amplifiers.	
6	Analyze the effect of tuning in the amplifiers, and the applications where the tuning amplifiers are useful.	
UNIT – I		
UNIT – I	Multistage Amplifiers	(08 Hours)
	Need of the Multistage amplifiers, Types of Multistage Amplifiers-Cascade and Cascade, Cascade-Coupling methods, Frequency response, Parameter evaluation - R_i , R_o , A_v , A_i & Bandwidth for general multistage amplifier, Choice of the transistor configuration in cascade amplifier, Analysis & design of direct coupled, RC coupled (Low frequency, high frequency, and medium frequency analysis), transformer coupled (Low frequency, high frequency and medium frequency analysis) amplifier. Darlington Amplifier, Design of Cascade amplifier	
UNIT – II		
UNIT – II	Negative feedback Amplifiers	(08 Hours)
	Types of basic Amplifiers, Concept and types of feedback, Transfer gain with feedback, Negative feedback topologies with their block Schematics, Effect of negative feedback on Input impedance; Output impedance; Gain and Bandwidth with derivation, Analysis of one circuit for each feedback topology for input impedance, output impedance, gain and bandwidth.	

UNIT - III	Power Amplifiers	(08 Hours)
	Need of Power amplifiers, classification; applications; advantages of power amplifiers - Class A, Class B, Class C, class D and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull; Class AB Complementary symmetry and Quasi – complementary. Efficiency analysis for Class A transformer coupled amplifier, Class B push – pull amplifier. Comparison of efficiencies of other configurations. Distortion in amplifiers; concept of Total Harmonic Distortion (THD).	
UNIT -IV	Oscillators	(08 Hours)
	Concept of Positive feedback, Condition, and principle of oscillations (Barkhausen criterion), Classification of oscillators, Design analysis of RC and LC oscillators, RC oscillators: Phase shift, Wien bridge Oscillators; LC Oscillators: Hartley, Colpitt's and Clap; Piezo-electric effect in crystals and Crystal Oscillator.	
UNIT -V	Differential Amplifiers	(08 Hours)
	Limitations of CE amplifier, Split supply biasing, Differential amplifier configurations, Dual Input, balanced output differential amplifier, Dual input, unbalanced output differential amplifier, Single input, balanced output differential amplifier, Single input, unbalanced output differential amplifier, FET differential amplifiers, Constant current bias, Current mirrors (revision), Differential mode gains, common mode gain, CMRR calculation, Derivation for output voltage, input and output impedances	

UNIT -VI	Tuned Amplifiers	(08 Hours)
	Introduction, Q-factor, small signal tuned amplifiers, Effect of cascading Single tuned amplifiers on Bandwidth, Effect of cascading Double tuned amplifiers on Bandwidth, Stagger tuned Amplifiers, Comparison of Tuned amplifiers, large signal tuned amplifiers, Stability of Tuned amplifiers, Neutralization	
<u>Term Work:</u> Any 8 of below given list		
1. To find the gain and bandwidth of a 2-stage CE RC coupled amplifier.		
2. To find the gain and bandwidth of a 2-stage transformer coupled amplifier.		
3. To find the gain of a direct coupled amplifier.		
4. To find the gain and bandwidth of a voltage series negative feedback amplifier.		
5. To find the gain and bandwidth of a voltage shunt negative feedback amplifier.		
6. To find the gain and bandwidth of a currentseries negative feedback amplifier.		
7. To find the gain and bandwidth of a current shunt negative feedback amplifier.		
8. To study the response of a Class A direct coupled/ transformer coupled amplifier.		
9. To study the response of a Class B power amplifier.		
10. To find the oscillations frequency of the RC amplifiers-RC phase shift/ Wien bridge oscillator.		
11. To find the oscillations frequency of LC amplifiers-Colpitt's Oscillator/Hartley Oscillator.		
12. To plot frequency response of tuned amplifiers.		
Topics for projects based learning*		
1.Prepare survey report on types of multistage amplifiers.		

2. Build and analyze the 2-stage RC coupled amplifier.
3. Build and analyze the 2-stage transformer coupled amplifier.
4. Build and analyze the 2-stage direct coupled amplifier.
5. Prepare survey report on types of negative feedback amplifiers.
6. Build and analyze 2-stage voltage series negative feedback amplifier.
7. Build and analyze single stage current series negative feedback amplifier.
8. Build and analyze single stage voltage shunt negative feedback amplifier.
9. Build and analyze 2-stage current shunt negative feedback amplifier.
10. Prepare survey report on types of power amplifiers.
11. Implement and analyze class A direct coupled power amplifier.
12. Implement and analyze class B push pull power amplifiers.
13. Prepare survey report on types of oscillators.
14. Implement RC phase shift oscillator and verify it for oscillations frequency.
15. Prepare survey report on types of differential amplifier.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. S. Salivahanan and N Suresh Kumar, 'Electronic devices and circuits', Mc Graw Hill Education India Private Limited, Third Edition.
Reference Books:
1. Ramakant A.Gayakwad “Op-amps and Linear Integrated Circuit Technology”Fourth edition
2. Adel S. Sedra, Kenneth C. Smith “Microelectronic Circuits” Oxford series in Electrical and computer engineering

**Bharati Vidyapeeth
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**B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: - SIGNALS AND LINEAR SYSTEMS**

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 04		End Semester Examination: 60 Marks		Credits: 04	
Practical: 02		Internal Assessment: 40 Marks			
Tutorial: 00		TW: 25 Marks		Credit: 01	
				Total Credit: 05	
Course Pre-requisites:					
Linear algebra, calculus, MATLAB fundamentals, Differential equations, and complex analysis					
Course Objectives:					
1.	To teach the basic concepts of signals.				
2	To introduce the basic concepts of systems analysis				
3	To introduce the tools in the time and frequency domain.				
4	To provide knowledge of correlation function and sampling.				
Course Outcomes: After learning this course students will be able to					
1	Characterize and analyze the properties of signals.				
2	Classify the systems and analyze in time domain using convolution.				
3	Apply Fourier transform for analysis of LTI systems.				

4	Apply Laplace transform for analysis of LTI systems.	
5	Apply discrete transforms for analysis of LTI systems.	
6	Evaluate the effects of sampling on signal and describe the auto correlation and cross correlation between signals.	
UNIT – I	Introduction to signals	(08 Hours)
	Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic, energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.	
UNIT – II	Classification of systems	(08 Hours)
	Definition, Classification of System, System Interconnections, state space analysis, Linear & non -linear, Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.	
UNIT - III	Continuous Time System Analysis	(08 Hours)
	Response of LTI Systems to exponential signals, periodic signals. Derivation Fourier series, Discrete time Fourier series and properties, Fourier Transforms, Duality and Parseval's theorem, Fourier analysis examples: Output of LTI Systems Described by Differential, convolution with FT , unit step response of RC circuit, filtering, FT of Gaussian Pulse, Example of the brain waves.	
UNIT -IV	Laplace Transform and Application	(08 Hours)
	Review of Laplace transform and properties, Concept of ROC and properties of ROC, pole	

	zero concepts. Transfer function and condition of stability, Application of Laplace transforms to the LTI system analysis, Convolution with LT, Inversion using duality, Laplace Transform of electrical Circuit, example of control system, calculation of harmonic vibration of the beam, Mathematical models of physical system- Electrical & Mechanical System	
UNIT -V	Discrete Transforms and Applications	(08 Hours)
	Z-Transform: The Region of Convergence for the Z-Transform, Application of Z-Transform to the LTI system analysis. Discrete time Fourier transform, Properties of DTFT, Fast Fourier transform algorithm, Use of FFT in Windows Media Player.	
UNIT -VI	Correlation and Spectral Density	(08 Hours)
	Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.	
<u>Term Work:</u> Any 8 of below given list		
1. Perform the operations on signals		
2. Perform the convolution of signals using formula using MATLAB.		
3. Analyze the synthesis of signals using Fourier Series.		
4. Find the Fourier Transform using MATLAB.		
5. Find the Laplace Transform using MATLAB.		

6. Find the Z-Transform using MATLAB.
7. Find the autocorrelation of sine sequence $x[n]$ with frequency 50Hz and sampling frequency 200Hz, using MATLAB.
8. Find the cross correlation for different signals.
9. Find the Inverse Fourier Transform using MATLAB.
10. Find the Inverse Laplace transform using MATLAB.
11. Find the inverse Z Transform using MATLAB.
12. Find the circular convolution using MATLAB.
Topics for projects based learning*
1. Signals In Natural Domain
2. Signal operations for navigation/obstacle detection
3. Speech production
4. Speech hearing
5. LTI Systems – Eigenfunctions, System Described by differential Equation, Homogenous and Particular Solution
6. LTI Systems-Convolution applications,
7. Periodic Convolution applications,
8. BIBO Stability applications
9. z-Transform Applications– Impulse Response of LTI System Described by Difference Equation
10. Complex Exponential Fourier Series and Trigonometric Fourier Series of Periodic Triangular Wave, Periodic Convolution
11. Real life example on DTFT – Sampling
12. Group/ Phase Delay for LTI systems
13. Implement DFT in Matrix form
14. Implement IDFT in Matrix form
15. FAST FOURIER TRANSFORM ANALYZER
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. Roberts M. J., Signals & Systems, TMH.
2. Oppenheim, Wilsely&Nawab, Signals & Systems, MGH.
Reference Books:

1. B.P.Lathi, Signal Processing & Linear Systems, Berkeley Cambridge, 1998 Edition.

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B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: - NETWORK ANALYSIS AND SYNTHESIS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW & PR: 50 Marks	Credit: 01
		Total Credits: 5
Course Pre-requisites:		
	Knowledge of KCL and KVL Laws from ‘Electrical Technology’, Linear Differential Equations, Systems of Linear Equations and complex numbers from ‘Differential Equations and Complex Analysis’	
Course Objectives:		
	<p>The objective of this course is to cover various methods to find the network parameters as listed below:</p> <ul style="list-style-type: none"> • To teach how to find network parameters (voltages, currents, power) in a given passive circuit by the use of methods- MeshAnalysis, Node Analysis and Network Theorems. • To teach how to find voltages and currents in a given circuit by formulating the network equilibrium equations by the use of graph theory. • To teach how to find the transient response of the series RLC circuits by the use of homogeneous and non-homogeneous equations. • To introduce the resonance phenomenon, curves and related parameters in a given series and a parallel resonant circuit with the help of derivations. • To introduce the two port network parameters, their interrelationships, and interconnections with the help of derivations. 	

	<ul style="list-style-type: none"> To teach how to design a constant K prototype low pass, high pass, band pass and a band stop passive filters for different bandwidths by using filter topologies.
Course Outcomes: After learning this course students will be able to	
1	Analyze passive circuits using Mesh Analysis, Node Analysis and Network Theorems.
2	Apply graph theory by formulating the network equilibrium equations for circuit analysis.
3	Perform Transient Analysis of the Series Reactive Circuits
4	Sketch the resonance curves for a given series and parallel resonant circuits.
5	Compute two port parameters for a given network
6	Design constant-k prototype low pass, high pass, band pass and band stop passive filters.
UNIT – I	DC circuit Analysis and Network Theorems (08 Hours)
	KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Network Theorems- Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem
UNIT – II	Formulation of network equilibrium equations using Graph Theory (08 Hours)
	Network Graph, tree, co-tree & loop, Incidence Matrix, Tie-set matrix, Cut-set matrix, Formulation of the equilibrium equations in the matrix form, Solution of the resistive and non-resistive networks, Principle of Duality
UNIT - III	Transient Analysis of the Series Reactive Circuits (08 Hours)

	Initial Conditions in the networks, A procedure for evaluating initial conditions, the step response in RC, RL, RLC circuits using classical method and using Laplace Transform for driven and undriven circuits, Time specifications of RLC circuits, Concept of the natural frequency and damping frequency, Zeta.	
UNIT -IV	Resonance in Series and Parallel RLC Circuits	(08 Hours)
	Resonant condition, Quality factor, Resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. Effect of Generator resistance on bandwidth and Selectivity, Comparison of series and parallel resonant circuits, Applications of resonant circuits	
UNIT -V	Two Port Networks	(08 Hours)
	Concept of Two port network, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Reciprocity and Symmetry conditions, Interconnections of two-ports, Analysis of some circuits using two port network parameters theory.	
UNIT -VI	Passive Filter Analysis	(08 Hours)
	Filter Fundamentals, Electrical Properties-Image impedance, Characteristic impedance, Propagation constant, Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters, Applications of passive filters.	

Term Work: Any 8 of below given list
1. To verify Thevenin's and Norton's Theorem for a given circuit.
2. To verify Superposition and Reciprocity Theorem for a given circuit.
3. To find the resonant frequency of a series RLC circuit.
4. To find the resonant frequency of a parallel RLC circuit.
5. To find the Z parameters of a given two port network.
6. To find the Y parameters of a given two port network.
7. To find the H parameters of a given two port network.
8. To find the ABCD parameters of a given two port network.
9. To find the cut-off frequency and to plot the frequency response of a constant-k LPF.
10. To find the cut-off frequency and to plot the response of a constant-k HPF.
11. To find the cut-off frequencies and to plot the frequency response of a constant-k BPF.
12. To find the cut-off frequencies and to plot the frequency response of a constant-k BSF.
Topics for projects based learning*
1. Build and analyze resistive circuit for current usage.
2. Build and analyze resistive circuit for voltage usage.
3. Build and analyze resistive circuit for power usage.
4. Implement the series RL circuit and verify the initial and final conditions of it.
5. Implement the series RC circuit and verify the initial and final conditions of it.
6. Build and verify series resonance circuit.
7. Build and verify parallel resonance circuit.
8. Verify Z parameters for unknown circuit.
9. Verify Y parameters for unknown circuit.

10. Verify H parameters for unknown circuit.
11. Verify ABCD parameters for unknown circuit.
12. Design and implement prototype Low pass filter and verify its bandwidth.
13. Design and implement prototype High pass filter and verify its bandwidth.
14. Design and implement prototype Band pass filter and verify its bandwidth.
15. Design and implement prototype Band stop filter and verify its bandwidth.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
Reference Books:
1. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)
2. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
3. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition

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B. Tech. Sem. III: Electronics & Telecommunication Engineering		
SUBJECT: - DATABASE MANAGEMENT SYSTEMS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW: 25 Marks	Credit: 01
		Total Credits: 04
Course Pre-requisites:		
	Python Programming	
Course Objectives:		
1	To provide a strong formal foundation in database concepts, technology, and practice	
2	To give systematic database design approaches covering conceptual design, logical design, and an overview of physical design	
3	To have good understanding of different type of databases.	
4	To learn a powerful, flexible, and scalable general-purpose database to handle big data	
Course Outcomes: After learning this course students will be able to		
1	Design E-R Model for given requirements and convert the same into database tables.	
2	Apply BCNF Algorithm for Decomposition	

3	Use SQL for query processing.	
4	Use algorithms to solve scheduling conflict	
5	Apply Concurrency algorithm in distributed database	
6	Use NOSQL in database creation.	
UNIT – I		
UNIT – I	Introduction to Databases	(06 Hours)
	Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables, Introduction to normalization.	
UNIT – II		
UNIT – II	Relational Database Design	(06 Hours)
	Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Relational Integrity: Domain, Referential Integrities, Enterprise Constraints, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF, Modeling Temporal Data	
UNIT - III		
UNIT - III	SQL AND PL/SQL	(06 Hours)
	SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries. PL/SQL: concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, roles and privileges, Embedded SQL, Dynamic SQL.	

UNIT -IV	Database Transactions and Query Processing	(06 Hours)
	Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Timestamping Methods, Recovery methods: Shadow-Paging and Log-Based Recovery, Checkpoints, Query Processing, Query Optimization, Performance Tuning	
UNIT -V	Parallel and Distributed Databases	(06 Hours)
	Introduction to Database Architectures: Multi-user DBMS Architectures, Case study- Oracle Architecture. Parallel Databases: Speedup and Scale up, Architectures of Parallel Databases. Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Data Storage, Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database. Cloud database examples.	
UNIT -VI	NoSQL Database	(06 Hours)
	Introduction to NoSQL Database, Types, and examples of NoSQL Database- Key value store, document store, graph, Performance, Structured verses unstructured data, Distributed Database Model, CAP theorem and BASE Properties, Comparative study of SQL and NoSQL, NoSQL Data Models, Case Study- unstructured data from social media. Introduction to Big Data, HADOOP: HDFS, MapReduce. JSON	
<u>List of Experiments:</u>		
1. Write a query to display all the columns from salesman table. First create a Salesman table.		
2. Design and Develop SQL DDL statements which demonstrate the use of SQL objects such as Table, View, Index, Sequence, Synonym		
3. Design at least 10 SQL queries for suitable database application using SQL DML statements: Insert, Select, Update, Delete with operators, functions, and set operator.		

4. Design at least 10 SQL queries for suitable database application using SQL DML statements: all types of Join, Sub-Query and View.

5. Unnamed PL/SQL code block: Use of Control structure and Exception handling is mandatory.

Write a PL/SQL block of code for the following requirements: -

1. Schema:

1. Borrower(Rollin, Name, Date of Issue, NameofBook, Status)

2. Fine(Roll.no, Date, Amt)

- Accept roll.no & name of book from user.
- Check the number of days (from date of issue), if days are between 15 to 30 then fine amount will be Rs 5 per day.
- If no. of days > 30, per day fine will be Rs 50 per day & for days less than 30, Rs. 5 per day.
- After submitting the book, status will change from I to R.
- If condition of fine is true, then details will be stored into fine table.

Frame the problem statement for writing PL/SQL block in line with above statement.

6. Cursors: (All types: Implicit, Explicit, Cursor FOR Loop, Parameterized Cursor) Write a PL/SQL block of code using parameterized Cursor, that will merge the data available in the newly created table Rollcall with the data available in the table Rollcall. If the data in the first table already exist in the second table, then that data should be skipped. **Frame the separate problem statement for writing PL/SQL block to implement all types of Cursors in line with above statement. The problem statement should clearly state the requirements.**

7. PL/SQL Stored Procedure and Stored Function. Write a Stored Procedure namely proc_Grade for the categorization of student. If marks scored by students in examination is ≤ 1500 and marks ≥ 990 then student will be placed in distinction category if marks scored are between 989 and 900 category is first class, if marks 899 and 825 category is Higher Second Class Write a PL/SQL block for using procedure created with above requirement. Stud_Marks(name, total_marks) Result (Roll, Name, Class) Frame the separate problem statement for writing PL/SQL Stored Procedure and function, inline with above statement. The problem statement should clearly state the requirements

8. PL/SQL Stored Procedure and Stored Function. Write a Stored Procedure namely proc_Grade for the categorization of student. If marks scored by students in examination is ≤ 1500 and marks ≥ 990 then student will be placed in distinction category if marks scored are between 989 and 900 category is first class, if marks 899 and 825 category is Higher Second Class Write a PL/SQL block for using procedure created with above requirement. Stud Marks (name, total marks) Result (Roll, Name, Class) Frame the separate problem

statement for writing PL/SQL Stored Procedure and function, in line with above statement. The problem statement should clearly state the requirements
9. Write a program to implement Mogo DB database connectivity with python Implement Database navigation operations (add, delete, edit etc.) using ODBC/JDBC.
10. Implement MYSQL/Oracle database connectivity with python Implement Database navigation operations (add, delete, edit,) using ODBC/JDBC
11. Mini Project:
Topics for projects based learning*
<p>1. Library Management System</p> <p>An online library management system offers a user-friendly way of issuing books and viewing different books and titles available under a category. This type of Management Information System (MIS) can be easily developed. And SQL queries enable quick retrieval of the required information.</p>
<p>2. Centralized College Database</p> <p>A college has academic departments, such as the Department of English, Department of Mathematics, Department of History, and so on. And each department offers a variety of courses. Now, an instructor can teach more than one course. Let's say a professor takes a class on Statistics and on Calculus.</p>
<p>3. Student Database Management</p> <p>Similarly, you can do a student record-keeping project. The database would contain general student information (such as name, address, contact information, admission year, courses, etc.), attendance file, marks or result file, fee file, scholarship file, etc. An automated student database streamlines the university administration process to a considerable degree.</p>
<p>4. Online Retail Application Database</p> <p>As e-commerce experiences remarkable growth around the world, online retail application databases are among the most popular SQL project ideas.</p>
<p>5. Inventory Control Management</p> <p>Inventory control is the process of ensuring that a business maintains an adequate stock of materials and products to meet customer</p>

demands without delay
<p>6. Hospital Management System</p> <p>It is a web-based system or software that enables you to manage the functioning of a hospital or any other medical setup. It creates a systematic and standardized record of patients, doctors, and rooms, which can be controlled only by the administrator.</p>
<p>7. Railway System Database</p> <p>In this database system, you need to model different train stations, railway tracks between connecting stations, the train details (a unique number for each train), rail routes and schedule of the trains, and passenger booking information.</p>
<p>8. Payroll Management System</p> <p>It is one of the most preferred SQL database project ideas due to its extensive usage across industries. An organization's salary management system calculates the monthly pay, taxes, and social security of its employees.</p>
<p>9. An SMS-based Remote Server Monitoring System</p> <p>Such systems are particularly beneficial for large corporate organizations having massive data centers and multiple servers. Since these servers host many applications, it becomes tricky to monitor their functionality. Usually, when a server is down or has crashed, the clients inform the organization about it.</p>
<p>10. Blood Donation Database</p> <p>This database would store interrelated data on patients, blood donors, and blood banks.</p>
<p>11. Art Gallery Management Database</p> <p>If you are running an art store, you can also organize and manage all your customer information, including names, addresses, the amount spent, liking and interests.</p>
<p>12. Cooking Recipe Portal</p> <p>This is another application of SQL databases in the creative field. You can model a web portal where a stored procedure will display your cooking recipes under different categories.</p>

13. Carbon Emissions Calculator

Lately, environmental conservation has been receiving a lot of attention globally. You can also contribute to the cause by developing a web application that measures the carbon footprint of buildings.

14. A Voice-based Transport Enquiry System

This innovative tool helps you save time while travelling. You would have noticed long queues outside the transport controller's office at public transport terminals. This is where commuters make inquiries about the different types of transport facilities available. In this scenario, technology-enabled transport enquiry systems can result in huge savings of time and effort. You can develop an automated system for bus stands, railway stations, and airports that can receive voice commands and answer in a voice-based format.

15. Pharmacy Management System

Pharmacy Management System is the process of ensuring that a business maintains an adequate stock of medicines and tablets to meet customer demands without delay

*Students in a group of 3 to 4 shall complete any one project from the above list

Text Books:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81-7808-861-4
3. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN10: 0321826620, ISBN-13: 978-0321826626

Reference Books:

1. C J Date, "An Introduction to Database Systems", Addison-Wesley, ISBN: 0201144719
2. S.K.Singh, "Database Systems : Concepts, Design and Application", Pearson, Education, ISBN 978-81-317-6092-5
3. Kristina Chodorow, Michael Dirolf, "MongoDB: The Definitive Guide", O'Reilly Publications, ISBN: 978-1-449-34468-9.
4. Adam Fowler, "NoSQL For Dummies", John Wiley & Sons, ISBN-1118905628
5. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereopty Limited, ISBN: 1743045743, 9781743045749
6. Joy A. Kreibich, "Using SQLite", O'REILLY, ISBN: 13:978-93-5110-934-1
7. Garrett Grolemond, "Hands-on Programming with R", O'REILLY, ISBN : 13:978-93- 5110-728-6

**Bharati Vidyapeeth
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**B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: EDA TOOL PRACTICES**

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 02	Internal Assessment: 00	
Tutorial: 00	TW: 50 Marks	Credit: 01
		Total Credit: 01
Course Pre-requisites:		
	Elementary Electronics, Electrical Technology.	
Course Objectives:		
1	To introduce the students to transient analysis of electronic circuits using simulation software (EDA tool)	
2	To teach the students to carry out AC analysis of amplifiers using simulation software (EDA tool)	
3	To introduce the students to simulation tools for basic analog electronic circuits	
4	To introduce the students to simulation tools for basic digital electronic circuits	
5	To teach the students to use virtual instruments in an EDA tool	
6	To train the students to troubleshoot basic circuits with an EDA tool	
Course Outcomes: After learning this course students will be able to		
1	Perform Transient Analysis of simple circuits using EDA tool.	
2	Perform AC Analysis of simple circuits using EDA tool.	

3	Use an EDA tool for simulating basic analog electronic circuits.
4	Use an EDA tool for simulating basic digital electronic circuits.
5	Use virtual instruments in an EDA tool for analyzing and testing basic electrical and electronic circuits.
6	Use EDA tool for troubleshooting basic circuits.
<u>List of experiments:</u>	
1. Study of an EDA tool, concept of simulation, different types of analyses, simulation errors	
2. Study and use virtual instruments, signal, and power sources	
3. Verify Basic circuit laws and theorems using MULTISIM	
4. Construct diode circuits and simulate the same	
5. Construct and analyze BJT biasing circuits	
6. Construct single stage CE amplifier circuit and carry out transient and AC analysis	
7. Implement Boolean equations and implement the same using basic logic gates	
8. Implement circuits with multiplexers and decoders	
9. Troubleshooting a given circuit using EDA tool	
Reference Books:	
4. Circuit Analysis with Multisim, David Báez-López Félix E. Guerrero-Castro, Morgan & Claypool Publishers.	
5. Advanced Circuit Simulation Using Multisim Workbench, David Báez-López Félix E. Guerrero-Castro, Morgan & Claypool Publishers	

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**B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: - PCB DESIGN AND SOLDERING**

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 00		End Semester Examination: 00		Credits: 00	
Practical: 04		Internal Assessment: 00			
Tutorial: 00		TW & OR: 50 Marks		Credit:02	
				Total Credit: 02	
Course Pre-requisites:					
		Elementary Electronics			
Course Objectives:					
1		To introduce the basic building blocks for PCB artwork design			
2		To train the student to create simple PCB artwork design using an PCB design tool			
3		To expose the students to soldering process and tools			
4		To train the students to make reliable solder joints			
5		To train the students to de-solder the solder joints			
6		To teach the art of inspecting solder joints			
Course Outcomes: After learning this course students will be able to					
1		Demonstrate the knowledge of selecting proper PCB primitives (track width, pad size, hole size, clearance between pads and tracks,			

	footprints)
2	Use PCB design software for simple single sided PCB artwork design
3	Identify and select appropriate soldering tools for the soldering job
4	Use solder iron for soldering through hole components
5	Use solder iron and de-solder pump /wick for de-soldering through hole components
6	Perform electrical (continuity) and visual inspection for solder joints
<u>List of experiments:</u>	
1. Design a simple (only discrete components) single sided PCB using PCB design software (PCB artwork design flow)	
2. Design a single sided PCB using PCB design software for a circuit with IC components	
3. Design a double-sided PCB using PCB design software	
4. Study and use of tools like solder iron (types and temperature profile), wire-strippers, cutters	
5. Study of solder alloys, flux and rosin	
6. Solder basic electronic components like resistors, capacitors, IC bases (through hole)	
7. Use de-solder pump/wick for de-soldering components	
8. Carry out electrical continuity test and visual inspection for a soldered board	
Reference Books:	
1. Getting Started with Soldering: A Hands-On Guide to Making Electrical and Mechanical Connections, Marc de Vinck, Maker Media, Inc, 2017	
2. Soldering in electronics assembly, MIKE JUDD, Keith Brindley, Newnes,1999	

3. Printed Circuits Handbook, Clyde F. Coombs, Jr., McGraw-Hill, 2008

4. User Manual for the selected PCB Design Software

5. Getting Started with Soldering: A Hands-On Guide to Making Electrical and Mechanical Connections, Marc de Vinck, Maker Media, Inc, 2017

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B. Tech. Sem. III: Electronics & Telecommunication Engineering
SUBJECT: - NETWORKING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 00	Internal Assessment: 00	
Tutorial: 00	TW & OR: 50 Marks	Credit: 02
		Total Credit: 02
Course Pre-requisites:		
The Students should have knowledge of		
1.	Understanding of personal computers and operating systems	
Course Objectives:		
1	To explain the fundamental concepts of networking	
2	To educate with the architecture, protocols, and networking	
3	To update the trends in innovation approach towards development of high-speed networks	
4	To analyze the challenges involved in developing TCP/IP suite	
5	To compare wired and wireless real networks	
6	To explain network security system	
Course Outcomes: After learning this course students will be able to		
1	Design, install, and troubleshoot networks	

2	Identify the protocol in networking	
3	Analyze the required technical competencies for traffic management to embark on growing career as Network Engineer/ Network Administrator	
4	Demonstrate the knowledge of TCP and its application scenarios	
5	Compare different constraints in wired and wireless domain	
6	Identify the systems, protocols, and mechanisms to support network security	
UNIT – I		
	Network & Service	
	Approaches to Network design, Network topologies and design constraints, Transmission media – unguided and guided, OSI Reference Model; TCP/ IP protocol suite, Application Layer Protocols and TCP/IP. Peer-to-peer protocols, Service Models, ARQ Protocols and reliable data transfer service, sliding Window Flow Control.	
UNIT – II		
	Medium Access Control Protocol	
	Multiple access communication, Random access scheduling approaches to medium access control, Delay performance of MAC and channelization schemes, LAN Access methods, Introduction to LAN, MAN, WAN Standards, FDDI, WLAN, Hubs, Bridges and Switches Ethernet networking.	
UNIT - III		
	Packet Switching Networks	
	Network Services and Internal Network Operation, Packet Network Topology, Routing in packet Networks, shortest path Algorithms, and Introduction to traffic management & QoS.	

UNIT -IV	TCP/IP Architecture	
	Medium Access control (MAC) sub layer: MAC protocols: ALOHA, Slotted ALOHA, The Internet Protocol, IP addressing and subnetting, Limitations of IPv4 and Introduction to IPv6, User Datagram protocol, Transmission Control Protocol, Introduction to Internet Routing Protocols.	
UNIT -V	Wireless Routing Protocols and Wired Connectivity	
	Introduction to radio transmissions, Packet radio Routing Internet based mobile ad-hoc networking, communication strategies, routing algorithms Destination sequenced Distance Vector (DSDV), Dynamic source Routing (DSR), Ad-hoc On demand Distance Vector (AODV) & Temporarily Ordered Routing algorithm (TORA), Quality of service. Introduction to optical network, SONET / SDH, Broadcast and select WDM Networks	
UNIT -VI	Network Security & Software Defined Networks	
	Introduction to security, Security approaches, Principles of security, Types of Security attacks, Cryptography: plain text and cipher text, substitution techniques, encryption, and decryption, Software Defined Network: Comparison between SDN and traditional networks, SDN controller, Switch design, Switch Protocols, Control Overhead & Handoff algorithms.	
List of Experiments:		
1. Connecting two or more computers using RJ45		

2. Implementation of bus topology in MATLAB/ NS-2.
3. Implementation of star topology in MATLAB/ NS-2.
4. Simulation of sliding window protocolsMATLAB/ NS-2.
5. Describe functions of OSI layers and its architecture.
6. Explain TCP / IP protocol suite.
7. Explain cryptography, symmetric-key algorithms.
8. Simulation of basic optical network using Optisystem.

Text Books:

1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education
2. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013
3. William Stallings, High speed Networks TCP/IP & ATM Design Principles, PH, NY

Reference Books:

1. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education
2. Rottinghous, John W., and James F. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

SEMESTER:- IV
SYLLABUS

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. Sem. IV: Electronics & Telecommunication Engineering
SUBJECT: - CONTROL SYSTEMS AND APPLICATIONS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial: 00	TW: 25 Marks	Credit: 01
		Total Credit: 05
Course Pre-requisites:		
The Students should have knowledge of		
1.	Basic knowledge of signals.	
2.	Basic mathematical tools like Laplace transform	
3.	Basic knowledge of software like MATLAB	
Course Objectives:		
	<ul style="list-style-type: none"> • To provide in depth knowledge of the various types of control systems and determination of transfer function using different methods. • To analyze the first order and second order system in time domain. • To introduce the concept of different types of controllers and compensators. • To analyze the control system in frequency domain. 	

	<ul style="list-style-type: none"> • To analyze the digital control systems in time domain. • To provide state variable analysis. 	
Course Outcomes: After learning this course students will be able to		
1	Identify various control systems and determine the ‘Transfer Function’ of a system using block diagram reduction technique and signal flow graph.	
2	Determine the time response for different system, the errors in various control systems; evaluate the stability of a system using Routh’s Stability Criterion and analysis graphical technique such as root locus.	
3	Demonstrate the knowledge of control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID and compensators.	
4	Determine frequency response and different graphical methods like Bode plot and polar plot.	
5	Calculate the time response for digital control systems and design digital control system.	
6	Implement the state variables for state variable model for linear as well as digital control systems.	
UNIT – I	Introduction to Control System	(08 Hours)
	Introduction to analog as well as digital control system, Classification of Control System, control problem, Feedback and Non-feedback Systems, Transfer Function, Block diagram and signal flow graph analysis, Pulse transfer function, Sampled Signal Flow Graph.	
UNIT – II	Time Domain Analysis	(08 Hours)
	Time response of first order & second order system using standard test signal, steady state errors	

	and error constants, Root locus techniques- Basic concept, rules of root locus, application of root locus techniques for control system, Hurwitz and Routh stability criteria.	
UNIT - III	Controllers and Compensators	(08 Hours)
	Effect of Poles and Zeros on the System Stability, Types of Compensators, Lead, Lag, Lead-Lag Compensators design, Control actions – On/Off, P, PI, PD, PID. PLC Architecture, Introduction to Ladder Diagram, Examples of ladder diagram.	
UNIT -IV	Frequency Domain Analysis	(08 Hours)
	Relationship between time & frequency response, Polar plots, Bode plot, stability in frequency domain, Nyquist stability criterion.	
UNIT -V	Digital control systems	(08 Hours)
	Time Response of discrete time systems: Time response specifications, Steady state error, error constants, time response for 1st order and 2nd order systems. Design of sampled data control system: Root locus technique, Bode plot, Nyquist stability criteria, lead compensator design using Bode plot, lead compensator design using Bode plot, lead compensator design using Bode plot.	
UNIT -VI	State variable analysis	(08 Hours)
	State variable representation-Conversion of state variable models to transfer functions- Conversion of transfer functions to state variable models-Solution of state equations-Concepts of	

	Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback.	
<u>Term Work:</u> Any 8 of below given list		
1. Unit Step and Impulse response of the Transfer function using MATLAB.		
2. Transient response of second order system using MATLAB		
3. To draw Root Locus theoretically (analog and digital) and verify it using MATLAB.		
4. To draw Bode plot theoretically (analog and digital) and verify it using MATLAB.		
5. Magnitude and phase plot of Lead network (analog and digital).		
6. Magnitude and phase plot of Lag network (analog and digital).		
7. To study architecture of PLC.		
8. Ladder diagram example using Virtual Lab		
9. Implementation of DOL Starter Virtual Lab		
10. Implementation of On-Delay Timer Virtual Lab		
11. Implementation of Off-Delay Timer Virtual Lab		
12. Implementation of Up-Down Counter Virtual Lab		
13. Implementation of PLC Arithmetic Instructions Virtual Lab		
14. Implementation of PID Controller Virtual Lab		

Topics for projects based learning*

1. Maintaining constant speed (cruise control) and constant temperature (climate control) and maintaining pressure
2. Engine control, steering control, suspension control
3. Control skidding (antiskid system)
4. Automatic warehousing
5. Inventory control
6. Automation of farming
7. Commercial rail transportation
8. Biomedical CS
9. Design and Experimentation of Cable-Driven Platform Stabilization and Control Systems
10. Minimization of Energy Consumption in Underfloor Heating Systems
11. Automatic Water Pump Controller
12. Design, Analysis and Testing of a Flapping Wing Miniature Air Vehicle
13. Design Cognitive mobile robot model
14. PLC Based Performance Analysis Of Range Sensors For A Real-Time Power Plant Coal Level Sensing System.
15. Mine Water Level Fuzzy Control System Design Based On PLC.

*Students in a group of 3 to 4 shall complete any one project from the above list

Text Books:

1. I.J. Nagrath, M.Gopal “Control Systems Engineering”, 5th Edition, New Age International Publication
2. Schaum’s Series book “Feedback Control Systems”.
3. Les Fenical “Control Systems”, 1st Edition, Cengage Learning India.
4. R. Anandanatarajan, P. Ramesh Babu, “Control Systems Engineering”, Scitech Publications

Reference Books:

1. Norman S. Nise “Control Systems Engineering”, 4th edition, Wiley edition.
2. Samarjeet Ghosh, “Control Systems Theory & Applications”, 1st edition, Pearson education.
3. S.K. Bhattacharya, “Control Systems Engineering”, 1st edition, Pearson education.

4. Hackworth, "Programmable Logic Controller", 1st edition, Pearson education.

Bharati Vidyapeeth
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B. Tech. Sem. IV: Electronics & Telecommunication Engineering		
SUBJECT: - INTEGRATED CIRCUITS AND APPLICATION		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial:00	TW & PR: 50 Marks	Credit: 01
		Total Credit: 5
Course Pre-requisites:		
	SDC-I, SDC-2, Electronics Network Theory	
Course Objectives:		
1.	To introduce the OPAMP and its internal building blocks	
2.	To provide the basics of analysis and design of linear and nonlinear applications of Op-Amp	
3.	To introduce the students to design of active filters	
4.	To introduce the students to analysis and design of OPAMP based waveform generators	
5.	To introduce the Timer IC 555 and its applications	
6.	To introduce PLL, Three terminal voltage regulators and ADC/DAC and their applications	
Course Outcomes: After learning this course students will be able to		
1	Visualize the internal blocks of a typical OPAMP IC and interpret the OPAMP parameters	
2	Analyze and design linear and nonlinear applications of OP-AMP.	

3	Analyze and design first and second order active filters using OP-AMP..	
4	Analyze and design Waveform Generators using OP-AMP.	
5	Design of multivibrators using Timer IC 555	
6	Demonstrate knowledge of Phase Locked Loop IC 565 and its application and design linear power supply using three terminal voltage regulators, classify ADC and DAC devices	
UNIT – I		
UNIT – I	OPAMP Internals	(08 Hours)
	Amplifier types (voltage, current, transconductance, trans resistance), Limitations of CE amplifiers, Block diagram of OPAMP, Differential amplifier with and without constant current tail (review), Level Shifter, Complementary Symmetry Output power amplifier, Frequency compensation, Ideal and practical characteristics of OPAMP, Parameters of practical OPAMP, Offset voltage balancing.	
UNIT – II	Linear Applications of OPAMP-I	(08 Hours)
	DC and AC inverting amplifier, DC and AC Non-Inverting Amplifier, DC and AC Voltage Follower circuit, Summing Amplifier, Difference Amplifier, Instrumentation Amplifier, I-V and V-I converters	
UNIT - III	Linear Applications of OPAMP-II	(08 Hours)
	Integrator, Differentiator, Active Filters, Log, and anti-log amplifiers	
UNIT -IV	Non-Linear Applications of OPAMP	(08 Hours)
	Comparator and Schmitt Trigger circuit, Window detector, Precision rectifiers, Peak detector,	

	Sample and Hold circuit	
UNIT -V	Waveform Generators	(08 Hours)
	Positive Feedback and Barkhausen criteria, Wein bridge oscillator, RC Phase shift oscillator, Colpitts oscillator, Hartley oscillator, square wave generator, Triangular wave generator, IC 555 astable and monostable circuits	
UNIT -VI	Voltage Regulators, PLL and Mixed Signal Circuits	(08 Hours)
	Three terminal IC voltage regulators, Voltage Controlled Oscillator and Phase Locked Loop, Parameters of DAC, Digital-to-Analog Converters (Binary weighted, R-2R ladder network type), Analog to Digital Converters (Flash, Successive Approximation, Integrating) Parameters of ADC, Introduction to sigma-delta ADC.	
<u>List of experiments:</u>		
1. Design, build and test DC inverting, non-inverting, and voltage follower circuits		
2. Design, build and test AC inverting, non-inverting and voltage follower circuits, plot frequency response		
3. Design, build and test inverting, non-inverting summing amplifier circuits		
4. Design, build and test integrator circuit and plot frequency response		
5. Design, build and test differentiator circuit and plot frequency response		
6. Design, build and test 1st order active LPF and HPF and plot frequency responses		
7. Design, build and test Wein bridge oscillator		
8. Design, build and test RC phase shift oscillator		
9. Design, build and test astable multivibrator using IC555		

10. Measure line and load regulation of three terminal regulator
Topics for projects based learning*
1. Audio Mixer
2. Stereo Pre-amplifier
3. Graphic Equalizer
4. Burglar alarm
5. Tachometer
6. Universal Battery charger
7. Function Generator
8. Fixed voltage regulated power supply
9. Variable output voltage regulated power supply
10. Dual polarity regulated power supply
11. Electronic stethoscope
12. Digitally selectable precision attenuator
13. Bridge amplifier for stereo
14. Bar graph battery voltage indicator
15. Touch sensitive switch
*Students in a group of 3 to 4 shall complete any one project from the above list
Textbooks:
1. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2008, ISBN:0195696131, 9780195696131, Oxford University Press
2. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, 4th Edition, McGraw-Hill

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering
SUBJECT: - ELECTROMAGNETICS AND TRANSMISSION LINE

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination: 60 Marks	Credits: 03
Practical: 00	Internal Assessment: 40 Marks	
Tutorial: 01		Credits:01
		Total Credit: 04
Course Pre-requisites:		
	Fundamentals of Vector Analysis and Mathematical Calculus	
Course Objectives:		
	<ul style="list-style-type: none"> • To analyze basic Electrostatic laws such as Coulomb's law and Gauss law • To compute boundary conditions with electrostatic parameters • To analyze basic Magnetostatic laws such as Biot-Savart's Law and Ampere's Law • To evaluate Maxwell's equation • To demonstrate wave propagation through different media • To examine transmission Line and impedance matching techniques 	
Course Outcomes: After learning this course students will be able to		
1	Analyze electric field in different field distributions	

2	Identify the Electrostatic parameters	
3	Analyze magnetostatic field in different field distributions	
4	Evaluate time varying Electric and Magnetic Fields	
5	Characterize wave equation	
6	Compute Transmission Line and its applications	
UNIT – I	Electrostatic-I	(06 Hours)
	Coulomb's law, Electrostatic Field Intensity, Calculation of Electric field for: infinite line, surface, volume charge distribution, Electric flux density, Concept of Divergence, Gauss Law, Application of Gauss's law for: point, infinite line, infinite sheet, uniformly charged sphere.	
UNIT – II	Electrostatic-II	(06 Hours)
	Electric Potential, Relation between Electric Field and Potential, Energy Density, Resistance, Capacitance, Boundary Condition	
UNIT - III	Magnetostatics	(06 Hours)
	Biot-Savart's Law, Application of Biot-Savart's Law, Stoke's Theorem, Ampere's Law, Application of Ampere's Law, Forces due to Magnetic Field, Boundary Conditions, Inductor, and Inductance. Standard inductance configurations: Toroid, Solenoid. Materials in magnetic fields.	

UNIT -IV	Time Varying Fields and Maxwell's Equation	(06 Hours)
	Faraday's Law, Transformer and Motional Electromotive Forces, Displacement Current, Maxwell's Equation in both differential form and integral form.	
UNIT -V	Wave Propagation/ Uniform Plane Wave	(06 Hours)
	Wave Propagation in Lossy Dielectrics, Plane Waves in Lossless Dielectrics, Plane Waves in Free Space, Plane Waves in Good Conductors, Power and Poynting Vector, Reflection of a Plane Wave at Normal Incidence.	
UNIT -VI	Transmission Lines and Impedance Matching Techniques	(06 Hours)
	Transmission Line Parameters, Transmission Line Equations, Input Impedance, Standing Wave Ratio and Power, Smith Chart, Stub Matching Technique, QWT, Single Stub Matching, Double Stub Matching, EMC-EMI, Types of EMC.	
<u>List of Tutorials:</u>		
1. Application of Stoke's theorem.		
2. Application of Gauss's law		
3. Energy stored in capacitor.		
4. Application of Poission's and Laplace's equations.		
5. Boundary conditions for magnetic fields.		
6. Poynting theorem and their applications.		

7. Applications of Smith Chart.
8. Simulation on Electromagnetic Interference and Compatibility
Topics for projects based learning*
1.Design Electrostatic Speakers using the concept of Electrostatic Forces and Energy
2. Study the Faraday Cage
3. Build Lightning Rod
4. Study and survey on Xerography – Electrostatic Imaging
5. Design any Electrostatic Filters
6. Design a gauge that is sensitive to the fluid level in the capacitive gauge.
7. Calculate characteristic impedance and propagation speed of a coaxial cable based on measured dimensions
8. Design a metal detecting device based on mutual inductance
9. Design a non-contact probe that can detect the presence and polarity of a static (or slowly varying) electric field in air
10. Design a non-contact AC current meter
11. Study and survey on Heart Defibrillators
12. Study and survey on Hard Disk Reading and writing process
13. Design Metal detectors
14. Study and survey on Magnetic Resonance Imaging (MRI)
15. Design Magnetic Brakes
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1.Matthew N. O. Sadiku, “Principles of Electromagnetics”, 4th Edition, Oxford University Press.
Reference Books:
1. John D. Kraus “Electromagnetic”, McGraw Hill.
2. William Hyte “Electromagnetic Engineering”, McGraw Hill
3. Edminister J.A, Electromagnetics, Tata McGraw-Hill.

4. R.K Shevgaonkar, Electromagnetic waves, Tata McGraw-Hill.

5. S Salivahanan & S Karthie, "electromagnetic Field Theory" Vikas Publishing House Ltd.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering
SUBJECT: - ANALOG COMMUNICATION

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination: 60 Marks	Credits: 04
Practical: 02	Internal Assessment: 40 Marks	
Tutorial:00	TW & OR: 50 Marks	Credit: 01
		Total Credit: 5
Course Pre-requisites:		
	Signals and Linear Systems.	
Course Objectives:		
1.	To introduce essential components of communication system.	
2.	To teach the students DSB-FC modulation and demodulation and its mathematical background	
3.	To teach the students DSB-SC & SSB modulation and demodulation and its mathematical background	
4.	To teach the students frequency modulation and demodulation and its mathematical background	
5.	To introduce the students working of radio receivers.	
6.	To introduce the students analog to digital conversion technique in communication system	
Course Outcomes: After learning this course students will be able to		
1	Identify the basic components and effect of noise on communication system	
2	Demonstrate the knowledge of DSB-FC modulation and demodulation and its mathematical background	

3	Demonstrate the knowledge of DSB-SC & SSB modulation and demodulation and its mathematical background
4	Demonstrate the knowledge of frequency modulation and demodulation and its mathematical background
5	Identify components of communication receiver system.
6	Demonstrate the knowledge of Pulse Modulation technique
UNIT – I Principles of Communication Systems (08 Hours)	
	Review of signals and systems, Frequency domain of signals, Block schematic of communication system, base band signals, RF bands, Necessity of modulation, Types of channels, Noise types - Internal & External, Noise Calculations, Signal to Noise ratio, Noise figure, Noise Temperature
UNIT – II Amplitude Modulation-I (08 Hours)	
	Amplitude Modulation principles, Representation of AM, Frequency spectrum & BW, Modulation index, % modulation, Power relations in AM, Trapezoidal patterns-, high- and low-level AM transmitters, DSB-FC Generation-linear and non-linear modulator, Linear modulators- low- and high-level linear modulators, Non-linear modulators- square law modulator and switching modulator, DSB-FC Demodulation- square law detector and envelope/diode detector.
UNIT - III Amplitude Modulation-II (08 Hours)	
	DSB-SC Principles, DSB-SC Generation Methods: Multiplier modulator, linear modulator, non-linear modulator and switching modulator, DSB-SC Demodulation-synchronous and coherent detection, SSB Principles, SSB Generation Methods: Filter method, phase shift method & the

	third method,SSB Demodulation, Comparison of AM,DSB-SC and SSB, Independent sideband system (ISB), Vestigial sideband (VSB).	
UNIT -IV	Frequency Modulation	(08 Hours)
	Angle Modulation, Principles, mathematical analysis of FM, frequency deviation and percentage modulation, modulation index, deviation ratio, Bessel function,BW requirements, Narrow band & wide band FM, Pre-emphasis and de-emphasis, FM modulators - Direct & Indirect modulator, Direct modulator- varactor diode modulator, reactance modulator-frequency stabilized reactance modulator, Indirect modulator- Armstrong method, FM demodulators - Direct & Indirect detector, Types of direct detectors, Indirect detector-phase locked loop.	
UNIT -V	Radio Receivers	(08 Hours)
	Block diagram of AM receiver- TRF and Super heterodyne receiver,FM receiver, receiverperformance and measurement parameters: Sensitivity, Selectivity, fidelity, Image Frequency Rejection, Automatic Gain Control (AGC)- simple and delayed AGC, IF Amplifiers, Tracking- Two point and three-point tracking, Mixers-separately excited mixers and self-excited mixers.	
UNIT -VI	Pulse Modulation	(08 Hours)
	Sampling process, Sampling Theorem,Nyquist criteria, Sampling types: Natural & flat top sampling, aliasing error and aperture effect, Pulse Modulation-PAM modulator & demodulator, PWM modulator& demodulator, PPM modulator& demodulator, Comparison of PAM,PWM and	

	PPM, Multiplexing, TDM- transmitter and receiver, FDM- transmitter and receiver.	
<u>List of experiments:</u>		
1. Write a MATLAB program for generation of AM signal		
2. Write a MATLAB program for generation of DSB-SC signal		
3. Write a MATLAB program for generation of FM signal		
4. To perform Amplitude Modulation and Demodulation.		
5. To perform DSB-SC Modulation & Demodulation.		
6. To perform Frequency Modulation and Demodulation		
7. To perform sampling and Reconstruction of a signal.		
8. To perform Pulse Amplitude Modulation (PAM.)		
9. To perform Pulse Width Modulation (PWM)		
10. To perform Pulse Position Modulation (PPM)		
Topics for projects based learning*		
1. Survey report on types of noise and its impact on communication system		
2. Survey report on types of AM modulators and demodulators		
3. Build simple AM transmitter system using linear modulator		
4. Build simple AM transmitter system using non-linear modulator		
5. Build simple AM receiver system		
6. Survey report on types of FM modulators and demodulators		

7. Build simple FM transmitter system using direct modulator
8. Build simple FM transmitter system using indirect modulator
9. Build simple FM receiver system using direct demodulator
10. Build simple FM receiver system using indirect demodulator
11. Build a circuit for sampling and reconstruction of a signal.
12. Build the Pulse Amplitude Modulation circuit
13. Build the Pulse Width Modulation circuit
14. Build the Pulse Position Modulation circuit
15. Build the Pulse Position demodulation circuit
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. Electronics Communication System, George Kennedy, 4th Edition, Tata McGraw Hill Publication.
2. Modern Digital and analog Communication System, B.P.Lathi, Oxford University press.
Reference Books:
1. Principles of Communication Systems, Taub & Schilling, Tata McGraw-Hill Publication.
2. Communication Systems, Simon Haykin, 4th Edition, John Wiley & Sons.
3. Electronics Communications, Dennis Roddy, John Coolen, 4th Edition- Pearson Education.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering
SUBJECT: - DATA SCIENCE

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 03		End Semester Examination: 60 Marks		Credits: 03	
Practical: 02		Internal Assessment: 40 Marks			
Tutorial: 00		TW: 25 Marks		Credits: 01	
				Total Credits: 04	
Course Pre-requisites:					
		Python Programming and DBMS.			
Course Objectives:					
		<ul style="list-style-type: none"> • To acquire in-depth understanding of the fundamental concepts in data modeling, data analysis, statistics, machine learning techniques. • To strengthen the analytical and problem-solving skill through developing real time Use cases. • To gain practical experience in programming tools for data sciences, database systems, machine learning and Visualization tools. • To empower students with tools and techniques for handling, managing, analyzing and interpreting data. 			
Course Outcomes: After learning this course students will be able to					
1	Develop a schema design, perform ETL operations with normalized techniques.				
2	Visualize the data and detect anomalies with the help of statistical methods.				
3	Implement ANOVA test, Regression & Dimensionality Reduction Techniques.				

4	Model different machine learning algorithms and draw predictive outcomes.	
5	Develop an interactive and functional Dashboard using Power BI.	
6	Visualize the data using Power BI	
UNIT – I	Fundamentals of Data Analysis using MySQL	(06 Hours)
	Introduction to Data Science, DBMS approach to analytics, ER Diagram and Schema design, Normalization techniques, data cleaning and transforming – Extract, Transform & Load.	
UNIT – II	Data Analysis and Visualization with Excel, Python	(06 Hours)
	with Excel: Descriptive statistics, Outlier detection, Visualization: Box plot, Line chart, Pie chart, Bar charts, Histogram. With Python: Pandas and Numpy, Data modelling and transforming, dealing with null values, different data types, preparing data for the model, Visualization with Matplotlib, Seaborn.	
UNIT - III	Advanced Statistics	(06 Hours)
	Analysis of Variance (ANOVA), Regression Analysis: linear regression, multiple linear, and non-linear regression, Dimension Reduction Techniques.	
UNIT -IV	Machine Learning-I	(06 Hours)
	Introduction to Supervised and Unsupervised Learning, Clustering, Decision Trees, Random Forest, Multiple Linear Regression, Logistic Regression, Linear Discriminant Analysis	

UNIT -V	Machine Learning-II	(06 Hours)
	Time Series Forecasting: Introduction to Time Series, Correlation, Forecasting, Autoregressive models; Model Validation, Handling Unstructured Data.	
UNIT -VI	Data visualization using Power BI	(06 Hours)
	Introduction to Power BI, Basic charts and dashboard, Descriptive Statistics, Dimensions and Measures, Visual analytics: Storytelling through data, Dashboard design & principles.	
<u>Term Work:</u> Any 8 of below given list		
1. SQL - Northwind Trader Database: Schema Design, Normalization & Cleaning.		
2. Northwind Trader Database: Querying.		
3. Statistics & Visualization with Excel.		
4. Handling data using Python Pandas – Load (Multiple sources such as – Excel, SQL, CSV, URL), Transform.		
5. Exploratory Data Analysis & Visualization using Python.		
6. Machine Learning [Supervised] – Regression (Linear, Logistic & Multi-Linear.		
7. Machine Learning [Supervised] – Classification (Logistic Regression, Decision Tree & Random Forest, KNN, K Mean Clustering, SVM).		
8. Machine Learning [Time series] – ECG Analysis.		
9. Machine Learning – Titanic Dataset Analysis (EDA)-1 .		
10. Machine Learning – Titanic Dataset Analysis (Visualization & Prediction)-2.		

11. Power BI – Input & Transforming Data.
12. Power BI – Creating Visuals & Reports.
13. Power BI – Dashboard.
Topics for projects based learning*
1. Design/Model a database without normalizing from scratch and create an E-R diagram as schema. Apply normalization techniques to previous created tables and perform Data Wrangling & Data Cleaning.
2. Implement an Email automation system using SQL & Python.
3. Create a Spotify Music Analysis visualization using Python pandas.
4. Create a Crypto currency Analysis visualization using Python pandas.
5. Build a Netflix like Movie recommendation model using Machine Learning.
6. Build a Song recommendation model using Machine Learning.
7. Build a Book recommendation model using Machine Learning.
8. Create a Credit Card Fraud Detection system using Machine Learning Algorithms.
9. Create a cheque clearance model using Machine Learning Algorithm.
10. Twitter Sentiment Analysis.
11. Uber Dataset Time Series Analysis.
12. Build a dynamic functional ChatBot using reddit conversations as dataset.
13. Build a Machine Learning Model with Health Care Data.
14. Create an interactive Super Store Dataset using PowerBI.
15. Create a Dashboard on Covid Vaccine Tracker using PowerBI.
*Students in a group of 3 to 4 shall complete any one project from the above list
Text Books:
1. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Mueller, Sarah Guido, O'Reilly Publication.

2. Practical Statistics for Data Scientists by Peter Bruce, Andrew Bruce, O'Reilly Publication.

3. Microsoft Power BI Quick Start Guide: Build dashboards and visualizations to make your data come to life, by Devin Knight , Brian Knight, Packt Publishing.

Reference Books:

1. Python Machine Learning By Example: The easiest way to get into machine learning, by Yuxi (Hayden) Liu, Packt Publishing.

2. Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence, by Brett Powell, Packt Publishing.

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B. Tech. Sem. IV: Electronics & Telecommunication Engineering
SUBJECT: - ADVANCED COMPUTER PROGRAMMING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 04	Internal Assessment: 00	
Tutorial: 00	TW & OR: 50 Marks	Credit: 02
		Total Credit: 02
Course Pre-requisites:		
1.	C programming.	
Course Objectives:		
	<ol style="list-style-type: none"> 1. To introduce the basic building blocks for JAVA programming 2. To teach the concept of multithreading and exception handling. 3. To teach the lambda functions. 4. To train the student to use java script. 5. To train the student to use HTML. 	
Course Outcomes: After learning this course students will be able to		
1	Demonstrate the knowledge of basic programming in JAVA.	
2	Implement the concept of multithreading and exception handling.	

3	Use the lambda functions.
4	Implement the concept of JavaScript.
5	Implement the concept ofHTML.
6	Design webpage using JavaScript and HTML.
<u>Term Work:</u> Any 16 of below given list	
1. Introduction to basics of JAVA and JAVA installation.	
2. WAP to implement static and non-static members and their execution control flow.	
3. WAP to implement wrapper class.	
4. WAP to implement flow control statements, looping statements and arrays.	
5. WAP to implement:	
a. Inheritance	
b. Abstraction	
6. WAP to implement:	
a. Polymorphism	
b. Encapsulation	
7. WAP to implement exception handling and assertions.	
8. WAP to implement multithreading.	
9. WAP to implement callable and future.	
10. WAP to implement string handling.	

11. WAP to implement IO streams.

12. WAP to implement collection Array List.

13. WAP to implement collection LinkedList.

14. WAP to implement lambda functions with predicates.

15. WAP to implement lambda functions with streams.

16. WAP to implement annotations.

17. WAP to implement the basics of HTML

18. WAP to implement the basics of java script

19. WAP to implement handling of events and errors, debugging with java scripts.

20. A mini-project to create Web Pages using HTML and JavaScript.

Text Books:

1. Programming with Java: A Primer, 3E by E Balagurusamy, Tata McGraw Hill Publishing Company.

Reference Books:

1. Java Complete Reference, Herbert Schildt, McGraw Hill Publishing Company

2. Java: How to Program by Deitel and Deitel

3. Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI”, BPB Publication.

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. IV: Electronics & Telecommunication Engineering
SUBJECT: - SENSOR MODELLING AND SIMULATION LABORATORY

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 02	Internal Assessment: 00	
Tutorial: 00	TW & OR: 50 Marks	Credit: 01
		Total Credit: 1
Course Pre-requisites:		
	signals and systems and control systems.	
Course Objectives:		
1.	To introduce the transducers and sensors which will help direct measurement of electronic, electrical, and communication parameters.	
Course Outcomes: After learning this course students will be able to		
1	Characterize the temperature sensors.	
2	Simulate the performance of a bio-sensor.	
3	Measurement of level in a tank using capacitive type level probe.	
4	Characterize the LVDT	
5	Design an orifice plate for a typical application.	

6	Simulate the performance of a chemical sensor.
7	Characterize the strain gauge sensor.
List of Practicals to be performed in the laboratory	
1. To learn the various static and dynamic characteristics of measurement systems.	
2. Characterize the temperature sensor (RTD) on virtual lab	
3. Measurement of level in a tank using capacitive type level probe on virtual lab	
4. Characterize and analyze the working of the LVDT.	
5. Characterize the strain gauge sensor.	
6. To measure and study of Pressure indicator With Pressure Output in percentage	
7. To measure and study of Flow Indicator with Flow rate, Totalizer	
8. To measure and study of Level Indicator with MM, CM and percentage	
9. To study Inductive rotor position sensor with four inductive coils using MATLAB	
10. To study Electrothermal converter using MATLAB.	
11. To study Rotary transformer for measurement of angle of rotation using MATLAB	
12. To study Exponential light-emitting diode with optical power output port using MATLAB	
Text Books&Reference Books:	

1. H. S. Kalsi, "Digital Instrumentation", Tata McGraw Hill

2. Clyde F. Coombs "Electronic Instrumentation Handbook" McGraw Hill

3. Cooper Helfric, "Electronic Instrumentation & Measurement Techniques", Prentice
Hall Publication

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. IV: Electronics & Telecommunication Engineering		
SUBJECT: - Calibration and Repair of Lab Equipments		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 00	End Semester Examination: 00	Credits: 00
Practical: 00	Internal Assessment: 00	
Tutorial: 00	TW & OR: 50 Marks	Credit: 02
		Total Credits: 2
Course Pre-requisites:		
	Fundamentals of Electrical Engineering, Basic Electronics, Digital Electronics	
Course Objectives:		
	<ul style="list-style-type: none"> To teach the student to use and measurement of Lab Equipment's. To teach measurement characteristics of Lab Equipment's To provide the basics knowledge of analysis and design of Lab Equipment's. To train the students for troubleshoot Lab Equipment's. To train the students for repair Lab Equipment's. To train the students for calibrate Lab Equipment's. 	
Course Outcomes: After learning this course students will be able to		
1	Identity and detect fault in power supply.	
2	Analyze and repair True RMS meter and DMM.	
3	Analyze and repair of Energy meter	

4	Identify and detect fault in Different Indicators.
5	Identify and repair different faults in function generator and Oscilloscope.
6	Measure and Repair Electrosmog Meter.
Term Work:	
	1. Troubleshoot and Repair of power supply.
	2. Troubleshoot and Repair megger digital.
	3. Troubleshoot and Repair Digital Multi-Meter.
	4. Troubleshoot and Repair True RMS meter.
	5. Troubleshoot and Calibrate 1 phase and 3 phase Energy meter.
	6. Troubleshoot and Calibrate Pressure indicator.
	7. Troubleshoot and Calibrate Flow Indicator.
	8. Troubleshoot and Calibrate Level Indicator.
	9. Troubleshoot and Repair function generator
	10. Troubleshoot and Repair CRO and DSO
	11. Troubleshoot and Repair ELECTROSMOG Meter
Text Books:	
	6. “Troubleshooting Electronic Equipment” by R. Khandpur
	7. “How to Diagnose and Fix Everything Electronic” , Second Edition by Michael Jay Geier
Reference Books:	
	1. H. S. Kalsi, “Digital Instrumentation”, Tata McGraw Hill

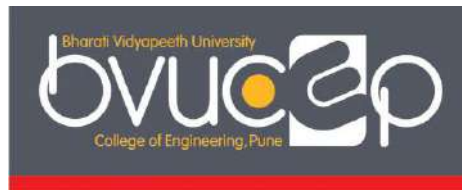
2. Clyde F. Coombs "Electronic Instrumentation Handbook" McGraw Hill

3. Cooper Helfric, "Electronic Instrumentation & Measurement Techniques", PrenticeHall Publication



Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune



B.Tech. (Computer Science and Engineering)
Program Curriculum
(2021 Course)

VISION OF UNIVERSITY:

Social Transformation through Dynamic Education

MISSION OF UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination.
- To offer education to the students in a conducive ambience created by enriched infrastructure and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities.
- To make available quality education to the students of rural, tribal and other deprived sections of the population.

VISION OF THE INSTITUTE:

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE:

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research, and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To be focused on innovative and quality education in computer science and engineering that prepares professionals for development of society.

MISSION OF THE DEPARTMENT

- To provide academic environment for the development of skilled professionals
- To cultivate research culture that contributes to the sustainable development of the society.
- To enhance academic and industry collaborations for global exposure.

PROGRAM EDUCATIONAL OBJECTIVES

The students of B.TECH. (Computer Science and Engineering), after graduating will able to,

1. Demonstrate technical and professional competencies by applying Engineering Fundamentals, knowledge of computing and technologies.
2. Exhibit effective personality, good communication and team building skills
3. Adopt to the latest trends in the field of computer science and engineering.

PROGRAM SPECIFIC OUTCOMES

1. To design, develop and implement computer programs on hardware towards solving problems.
2. To employ expertise and ethical practice through continuing intellectual growth and adapting to the working environment.

PROGRAM OUTCOMES

- a. Apply the knowledge of mathematics, science, engineering, and computing to provide a solution of complex engineering problems.
- b. Identify, analyse complex engineering problems to derive conclusions using computer science and engineering knowledge.
- c. Outline resolutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration, societal, and environmental considerations.
- d. Use existing research knowledge and research techniques including design of experiments, data analysis, and synthesis to provide valid inferences.
- e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools.
- f. Apply inferences obtained by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the subsequent responsibilities relevant to the professional engineering practice.
- g. Recognize the impact of the professional engineering solutions in societal and environmental contexts to demonstrate the knowledge for sustainable development.
- h. Apply ethical principles and execute professional ethics and responsibilities and norms of the engineering practice.
- i. Work effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary surroundings.
- j. Talk effectively on complex engineering activities with the engineering community such as being able to comprehend and write effective reports and design documentation, make effective presentations.
- k. Prove knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team.
- l. Recognise the need for and have the preparation and ability to engage in independent and life-long learning in context of technological change.

CORELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Programme Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Knowledge	✓											
Problem Analysis		✓										
Design/Development of solutions			✓									
Conduct Investigations of Complex Problems				✓								
Modern Tool Usage					✓							
The Engineer and Society						✓						
Environment and Sustainability							✓					
Ethics								✓				
Individual and teamwork									✓			
Communication										✓		
Project management and finance											✓	
Life-long learning												✓

DEFINITION OF CREDITS:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
2 Hour Practical (P) per week	1 credit
4 Hours Practical (P) per week	2 credit

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Breakup of Credits
1	Basic Science Course (BSC)	19
2	Engineering Science Course (ESC)	16
3	Core Course (CC)	144
4	Elective Course (EC)	10
5	Project (PROJ)	18
6	Internship (INT)	3
7	Vocational Course (VC)	8
8	MOOCs (MOOC)	6
9	Research Paper Publication (Research)	2
10	Social Activity (SA)	4
11	Mandatory Course (MC)	Non-Credit
12	Internal Assessment (IA)	-
13	University Examination (UE)	-
TOTAL		230

DISTRIBUTION OF COURSE COMPONENTS

Sr. No.	Category	Number of Courses
1.	Basic Science Course	5
2.	Engineering Science Course	4
3.	Core Courses	34
4.	Elective Course	2
5.	Project	4
6.	Internship	1
7.	Vocational Course	4
8.	MOOCs	3
9.	Research Paper Publication	1
10.	Mandatory Course	2
TOTAL		60

Program: B.TECH. (Computer Sci. and Engineering) Semester - I CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Mathematics for Computing-I	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Internet Programming	4	2	-	60	40	-	50	-	150	4	1	-	5
3		Organic and Electrochemistry	3	2	-	60	40	25	-	-	125	3	1	-	4
4		Digital Electronics	4	2	-	60	40	50	-	-	150	4	1	-	5
5		Programming and Problem Solving	4	4	-	60	40	-	50	50	200	4	2	-	6
6		Computer Aided Drafting	-	2	-	-	-	25	-	-	25	-	1	-	1
		Total	18	12	1	300	200	100	100	50	750	18	6	1	25

Program: B.TECH. (Computer Sci. and Engineering) Semester - II CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Mathematics for Computing-II	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Probability and Statistics	4	2	-	60	40	-	-	50	150	4	1	-	5
3		Physics for Computing Systems	3	2	-	60	40	25	-	-	125	3	1	-	4
4		Electrical Technology	4	2	-	60	40	25	-	-	125	4	1	-	5
5		Linear Data Structures	4	4	-	60	40	-	50	50	200	4	2	-	6
6		Computer Systems Workshop Technology	-	2	-	-	-	-	-	50	50	-	1	-	1
		Total	18	12	1	300	200	50	50	150	750	18	6	1	25

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Non-Linear Data Structures	3	4	1	60	40	-	-	50	150	3	2	1	6
2		Discrete Mathematical Structures	3	2	-	60	40	-	50	-	150	3	1	-	4
3		Machine Organization and Microprocessor	4	2	-	60	40	-	-	50	150	4	1	-	5
4		Software Engineering	4	2	-	60	40	-	-	50	150	4	1	-	5
5		Object Oriented Methodology*	4	4	-	60	40	-	-	50	150	4	2	-	6
6		Vocational Course-I	-	-	-	-	-	-	50	-	50	-	2	-	2
7		MOOC -I	-	-	-	-	-	-	-	-	-	-	-	-	2
8		Environmental Studies** (Mandatory Audit Course)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total	18	14	1	300	200	-	100	200	800	18	11	1	30

*Industry Taught Course- I

** 100 Marks Theory Examination

Vocational Course - I

Sr. No	Name of the Course	Offered by	Offered by	Offered by
1	Introduction to logic and Critical Thinking	Duke University	University Of Auckland via FutureLearn	Microsoft
2	Statistics with R	Harvard University	E&ICT academy IIT Kanpur	IBM
3	Full Stack Development	IIT Roorkee	Full Stack Academy	ORACLE
4	Objective C	IIT Kanpur	University of California,	Microsoft
5	MATLAB and Simulink hands on	E&ICT academy IIT Kanpur	MathWorks	MATLAB

Program: B.TECH. (Computer Sci. and Engineering) Semester - IV CBCS 2021 Course

Sr. No	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Theory of Computation	3	-	1	60	40	-	-	-	100	3	-	1	4
2		System Programming and Operating System	4	4	-	60	40	-	-	50	150	4	2	-	6
3		Computer Graphics and Multimedia	4	2	-	60	40	-	-	50	150	4	1	-	5
4		Design of Algorithms	3	-	-	60	40	-	-	-	100	3	-	-	3
5		Database Systems*	4	4	-	60	40	-	-	50	150	4	2	-	6
6		CSE Skill Lab-I	-	4	-	-	-	-	50	50	100	-	2	-	2
7		Vocational Course-II	-	-	-	-	-	-	50	-	50	-	2	-	2
8		Social Activities-I	-	-	-	-	-	-	-	-	-	-	-	-	2
9		Disaster Management ** (Mandatory Audit Course)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total	18	14	1	300	200	-	100	200	800	18	9	1	30

*Industry Taught Course- II

** 100 Marks Theory Examination

Vocational Course – II

Sr. No	Name of the Course	Offered by	Offered by	Offered by
1	Angular JS	E &ICT academy, IIT Kanpur	Johns Hopkins University	Sun Microsystems
2	Project management	Toronto (USA)	Google	Microsoft
3	Front End Web UI Framework And tools	Hongkong University of Science and Technology	Google	Google Digital Garage
4	Programming for problem solving	E &ICT academy, IIT Kanpur	IIT Kharagpur,	IBM
5	MERN stack Developer	E &ICT academy, IIT Kanpur	Hongkong University of Science and Technology	Brain Mentors Pvt. Ltd.

Program: B.TECH. (Computer Sci. and Engineering) Semester - V CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Software Testing and Quality Assurance	3	2	-	60	40	25	-	-	125	3	1	-	4
2		Big Data Analytics	3	-	-	60	40	-	-	-	100	3	-	-	3
3		Human Machine Interaction	3	-	-	60	40	-	-	-	100	3	-	-	3
4		Computer Networks	4	2	-	60	40	25	-	-	125	4	1	-	5
5		Artificial Intelligence*	3	4	-	60	40	-	-	50	150	3	2	-	5
6		CSE Skill Lab -II	-	4	-	-	-	-	50	50	100	-	2	-	2
7		Project-I Stage -I	-	2	-	-	-	-	100	-	100	-	4	-	4
8		Vocational Course-III	-	-	-	-	-	-	50	-	50	-	2	-	2
9		MOOC -II	-	-	-	-	-	-	-	-	-	-	-	-	2
		Total	16	14	-	300	200	50	200	100	850	16	12	-	30

*Industry Taught Course- III

** 100 Marks Theory Examination

Vocational Course – III

Sr. No	Name of the Course	Offered by	Offered by	Offered by
1	Android Application Development	Stanford/IIT Kanpur	IIT Bombay	IBM
2	UX Design	IIT Bombay	UX Academy	Google
3	Shell Programming	IIT Bombay	E & ICT IIT Kanpur	Red Hat Labs
4	Node JS, Express and MongoDB	E & ICT IIT Kanpur	The Hong Kong University of Science and Technology	Microsoft
5	JOOMLA	E & ICT IIT Kanpur	IIT Bombay	IBM

Program: B.TECH. (Computer Sci. and Engineering) Semester - VI CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Business Intelligence System*	4	2	-	60	40	25	-	-	125	4	1	-	5
2		Cryptography and Network Security	3	2	-	60	40	25	-	-	125	3	1	-	4
3		Natural Language Processing	3	-	-	60	40	-	-	-	100	3	-	-	3
4		Design Thinking	4	-	-	60	40	-	-	-	100	4	-	-	4
5		CSE Skill Lab -III	-	4	-	-	-	-	50	50	100	-	2	-	2
6		Quantitative Techniques, Communication and Values	2	2	-	60	40	-	-	-	100	3	-	-	3
7		Vocational Course-IV	-	-	-	-	-	-	50	-	50	-	2	-	2
8		Project-I Stage -II	-	2	-	-	-	-	100	-	100	-	4	-	4
9		Internship	-	-	-	-	-	-	50	-	50	-	3	-	3
		Total	16	12	-	300	200	50	250	50	850	17	13	-	30

***Industry Taught Course- IV**

**** 100 Marks Theory Examination**

Vocational Course – IV

Sr. No	Name of the Course	Offered by	Offered by	Offered by
1	Advanced cloud Computing	E & ICT IIT Kanpur	IBM	IIT Roorkee
2	Accredited professional SCRUM master	University of Westminster	Microsoft	National Research Tomsk State University
3	Cloud and DevOps Architect	IIT Delhi	Oracle	University of California, Davis
4	AWS Certified Solution Architecture	IIT Kanpur	IBM	AWS Academy
5	Express JS Framework	IIT Kanpur	Oracle	University of Michigan

Program: B.TECH. (Computer Sci. and Engineering) Semester - VII CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Machine Learning	4	2	1	60	40	-	-	50	150	4	1	1	6
2		Internet of Things *	4	2	-	60	40	-	50	-	150	4	1	-	5
3		Optimization Techniques	4	-	-	60	40	-	-	-	100	4	-	-	4
4		Elective I	4	2	-	60	40	-	50	-	150	4	1	-	5
5		CSE Skill Lab-IV	-	4	-	-	-	-	50	50	100	-	2	-	2
6		Project -II Stage-I	-	4	-	-	-	-	200	-	200	-	4	-	4
7		Research Paper Publication	-	-	-	-	-	-	-	-	-	-	-	-	2
8		MOOC -III	-	-	-	-	-	-	-	-	-	-	-	-	2
		Total	16	14	1	240	160	-	350	100	850	16	13	1	30

***Industry Taught Course- V**

Elective I	Deep learning	Game Theory	Semantic Web	Text Mining
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Program: B.TECH. (Computer Sci. and Engineering) Semester - VIII CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Data Visualization & Reporting	4	-	1	60	40	-	-	-	100	4	-	1	5
2		Augmented and Virtual Reality	4	2	-	60	40	-	50	-	150	4	1	-	5
3		Block Chain and Digital Currency*	4	2	-	60	40	-	50	-	150	4	1	-	5
4		Elective -II	4	2	-	60	40	-	50	-	150	4	1	-	5
5		CSE Skill Lab-V	-	4	-	-	-	-	50	50	100	-	2	-	2
6		Project -II Stage-II	-	4	-	-	-	-	200	-	200	-	6	-	6
7		Social Activities-II	-	-	-	-	-	-	-	-	-	-	-	-	2
		Total	16	14	1	240	160	-	400	50	850	16	11	1	30

***Industry Taught Course- VI**

Elective -II	Pattern Recognition	Industrial IOT	Knowledge Management System	Information Retrieval
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List of MOOC Courses

Sr. No.	Subject Name	Institute
1.	Computational Complexity	IIT Hyderabad
2.	Parameterized Algorithms	IIT Gandhinagar IMSC
3.	In order of preference: Algorithmic Puzzles Algorithms Implemented Data Structures and Algorithms with C++ and Python Algorithms for Competitive Programming	IIT Gandhinagar
4.	Introduction to Quantum Computing: Quantum Algorithms and Qiskit	IBM and IITM
5.	Secure Computation: Part I	IIITB
6.	NOC:Artificial Intelligence Search Methods For Problem Solving	IIT Madras
7.	NOC:Computer Graphics	IIT Guwahati
8.	NOC:Object Oriented System Development using UML, Java and Patterns	IIT Kharagpur
9.	NOC:Data Structure and Algorithms using Java	IIT Kharagpur
10.	NOC:Deep Learning for Computer Vision	IIT Madras
11.	NOC:Bandit Algorithm (Online Machine Learning)	IIT Bombay
12.	NOC:Google Cloud Computing Foundation Course	IIT Kharagpur
13.	NOC:Computer Aided Applied Single Objective Optimization	IIT Guwahati
14.	NOC:An Introduction to Artificial Intelligence	IIT Delhi
15.	NOC:User-centric Computing for Human-Computer Interaction	IIT Guwahati
16.	NOC:Introduction to Blockchain Technology and Applications	IIT Kanpur
17.	NOC:Arithmetic Circuit Complexity	IIT Kanpur
18.	NOC:GPU Architectures and Programming	IIT Kharagpur
19.	NOC:Introduction to Database Systems	IIT Madras
20.	NOC:Foundations of Cryptography	IIIT Bangalore
21.	NOC:Modern Application Development	IIT Madras
22.	NOC:Data Analytics with Python	IIT Roorkee
23.	NOC:Computer Integrated Manufacturing	IIT Kanpur
24.	NOC:An Introduction to Programming Through C++	IIT Bombay
25.	NOC:DemystifyingNetworking	IIT Bombay
26.	NOC:Discrete Mathematics	IIT Guwahati
27.	NOC:Advanced Computer Architecture	IIT Guwahati
28.	NOC:Operating System Fundamentals	IIT Kharagpur

29. NOC:Deep Learning
30. NOC:Computer Vision

IIT Kharagpur
IIT Kharagpur

B.TECH (Computer Science and Engineering)

SEMESTER – I

COURSE SYLLABUS

Mathematics for Computing-I

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
		Total	100 Marks	Total	04

Course Objective:

- Linear equations and its basis and dimension.
- Linear mapping and its matrix representation.
- Orthogonalization and diagonalisation of matrices

Prerequisite:

The students should have knowledge of algebra of matrices and determinants.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply rank of matrix in solving system of equations.
2. Identify basis and dimension of matrix.
3. Solve problems on kernel and image of linear transformation.
4. Apply linear operator to represent matrix.
5. Evaluate orthogonalization of inner product space.
6. Use methods to find eigen values and eigen vectors.

Unit I

06 Hours

System of Linear Equation: Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

Unit II

06Hours

Vector Spaces: Definition, linear combination, spanning sets subspaces, linear dependence and independence, basis and dimension, rank of matrix.

Unit III

06 Hours

Linear Mapping: Linear mapping, Kernel and image of linear mapping, rank and nullity of a linear mapping, singular and non-singular linear mapping.

Unit IV

06 Hours

Linear mapping and matrices: Matrix representation of linear operator, change of base, similarity matrices.

Unit V

06 Hours

Inner Product space and orthogonalization: Inner product space, Cauchy-schwarz equality, orthogonality, orthogonal sets and bases, projections, Gramschidt orthogonalization, orthogonal and positive definite matrices, matrix representation of inner product.

Unit VI

06Hours

Diagonalisation: Eigen values and eigen vectors: Characteristic polynomial, Cayley-Hamilton theorem, eigen values and eigenvectors, properties.

Textbooks

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013
2. .B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

4. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.

Reference Books

1. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
2. Michael Greenberg, Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit

Project Based Learning

Students are expected to prepare a report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Gauss Elimination method.
2. LU-decomposition method
3. Rank of matrix
4. Linear combination
5. Basis and dimension
6. Spanning sets
7. Kernel and image of linear transformation
8. Rank-nullity theorem
9. Non-singular linear mapping
10. Linear operator
11. Similarity matrices
12. Change of base
13. Cauchy Schwarz equality
14. Orthogonality
15. Gram Schmidt Orthogonalization
16. Matrix representation of matrix
17. Cayley-Hamilton theorem
18. Eigen values and Eigen vectors

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Internet Programming

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks	Credits	
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work & Oral	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objectives:

To introduce students about all web programming languages with detailed study about HTML, CSS, DHTML, XML and DNS.

Prerequisite:

Basic knowledge about computers, web applications and internet.

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the fundamentals of programming languages.
2. Implement the Hyper Text Markup Language.
3. Use of Cascading Style Sheets in web page development.
4. Elucidate with implementation of Dynamic Hyper Text Markup Language.
5. Apply the knowledge to implement the Extensible Markup Language.
6. Implement the Hyper Text Transfer Protocol and DNS.

Unit I

08 Hours

Introduction to internet programming: Computer Network, working of internet, Web applications, Introduction to web programming languages: HTML, DHTML, JSP, PHP, Role of the Server on the internet, Introduction to JSP, Introduction about Node JS and angular JS

Unit II

08 Hours

Hyper Text Markup Language: Introduction to HTML, Tags, Div Span, Lists, Images, Hyperlink, Table, Iframe, Form, Headers, all content with HTML5

Unit III

08 Hours

Cascading Style Sheets: Introduction to CSS, Syntax, Selectors, background, Text Fonts, Lists Tables, Box Models, Display Positioning, Floats.

Unit IV

08 Hours

Dynamic Hyper Text Markup Language: Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models

Unit V

08 Hours

Extensible Markup Language: Introduction of XML- Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, XML Objects, Checking Validity, Understanding XLinks, XPointer, Event-driven Programming, XML Scripting, XML with Style Sheet Technologies- Concept of XSL, XML Schema, Importance of XML schema, Creating Element in XML Schema, XML Schema Types.

Unit VI

08 Hours

Hyper Text Transfer Protocol and DNS: DNS, WWW, HTTP, HTTPs, XML HTTP Request- Introduction, XML Http Request, The XML Http Request Object, Events for the XML Http Request Object, Request Object for XML Http Request, Response Object for XML HttpRequest, Complete working of web browser

Textbooks/ Reference Books:

1. HTML & CSS: The Complete Reference, Fifth Edition Paperback by Thomas Powell, McGraw Hill Education.

- 2.HTML & XHTML: The Complete Reference, byThomas Powell, Mc Graw Hill Education, McGraw-Hill Education.
- 3.XML: The Complete Reference, by Heather Williamson, McGraw Hill Education.
- 4.HTTP Pocket Reference (Pocket Reference (O'Reilly)), Clinton Wong, O'Reilly Publication.
- 5.HTML & XHTML: The Definitive Guide, 5th Edition, by Bill Kennedy and Chuck Musciano, O'Reilly Publications.

List of Assignments:

(Course coordinator can design his/her own theory assignment. Following are samples of theory assignments.)

1. Explain the role of web programming languages in internet.
2. Explain any five HTML tags with example.
3. Consider any web-based example to explain the role of CSS in web programming.
4. Explain the role of DHTML in web programming and web applications.

List of Laboratory Exercises:

1. Introduction to web format files and file extensions.
2. Implementation of simple HTML page.
3. Implementation of Images and Tables.
4. Implementation of frames.
5. Implementation of form.
6. Implementation of CSS.
7. Implementation of DHTML.
8. Implementation of XML.
9. Develop the web page with any scenario where HTML, CSS, XML will be used.
10. Develop any web project for any website or any portal.
11. Case Study on web programming languages.
12. Case Study on any web project

Project Based Learning

1. Website Development Hotel management
2. Website Development Personal Website
3. Website Development Organization website
4. Website Development Dummy Ecommerce website
5. Website Development Login page with user credentials
6. Development of a Employee Interests Survey form / Student survey form
7. Technical documentation page
8. Create image slider
9. Railway concession form
10. Website development for personal portfolio

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit – VI

Organic and Electrochemistry

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work	25 Marks	Practical	01
		Total	125 Marks	Total	04

Course Objectives:

The student should acquire the knowledge of

- To develop the interest among the students regarding chemistry and their applications in engineering.
- To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
- The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the computing field.

Prerequisite:

Basic Chemistry

Course Outcomes: On completion of the course, students will have the ability to:

1. Differentiate between ionic and covalent bonding and classify the bonding in a compound as ionic or covalent.
2. Develop a working knowledge of the twelve fundamental principles of green chemistry and what it is all about.
3. Apply standard reduction potential data to determine the relative strength of oxidizing/reducing agents
4. Demonstrate the knowledge of polymer materials for futuristic engineering applications
5. Describe the properties of materials and Application of semiconductor electronics
6. Describe the manufacturing and refining process of fuels and lubricants

Unit I

06 Hours

Chemical Bonding in Molecules: MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra, and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

Unit II

06 Hours

Green Chemistry: Introduction, Twelve Principles of Green chemistry, numerical on atom economy, synthesis, adipic acid and indigo. Organic dye- Traditional methods of organic dye. Green solvents (ionic liquid supercritical CO₂), and products from natural materials.

Unit III

06 Hours

Electrochemistry: Electrochemical cells and Galvanic cells, EMF of a cell, Single electrode potential, Nernst equation, Electrochemical series, Types of electrodes, Reference electrodes, pH, pOH, acids and basis, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Li-Ion Batteries, Li-Po Batteries.

Unit IV

06 Hours

Polymers for The Electronics Industry: Polymers, Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p- phenylene), Polyheterocyclic systems, Polyaniline Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications.

Unit V

06 Hours

Semi-Conductors, Insulators and Superconductors: Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process

Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators, or Dielectrics.

Unit VI

06 Hours

Fuels & Lubricants: Classification of fuels, Calorific values, Comparison between solid, liquid, and gaseous fuels, Theoretical calculation of calorific value of a fuel, Selection of coal, analysis of coal, Natural Gas, Producer gas, water gas, Lubricants, Mechanism of lubrication, classification of lubricants, lubricating oils, Solid lubricants, Greases or Semi-Solid lubricants, Synthetic lubricants, Lubricating emulsions, Properties of lubricating oils.

Textbooks:

1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGraw Hill, 2008.
2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G. Cowie, Blackie Academic & Professional, 1994.
3. A Textbook of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004
4. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.

Reference Books:

1. Inorganic Chemistry (4th edition), D. F. Shriver and P. W. Atkins, Oxford University, Oxford, 2006.
2. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003.
3. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978.

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

Project Based Learning

1. Green Chemistry approach to Nano-Structured Electronics
2. Assessment of Environmentally Benign Photopolymers as an Alternative to the Use of Formaldehyde Based Textile Finishing Agents
3. Solvent-Free Synthesis of Phthalocyanines
4. Synthesis of Conjugated Polymers and Molecules Using Sugar Reagents and Solventless Reactions
5. Environmentally Benign Control of Polymer Solubility: Photoresist Materials Using DNA Mimics
6. Enzymatic Synthesis of Non-Formaldehyde Phenolic Polymers: Control of Hydrogen Peroxide Concentration.
7. The materials chemistry and electrochemistry of lithium and sodium-ion batteries
8. Electroplating- the principles, how different metals can be used and the practical applications
9. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing and Powder Coating Projects.
10. To determine calorific value of a fuel by any suitable method
11. To study various properties of lubricants
12. To study various types of lubricants and its properties.
13. To determine quality of coal sample & its analysis.
14. To study mechanism of lubrication.
15. To study coal analysis & its significance.

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. To determine strength of acid by pH – metric Titration
4. To measure the Conductance of a solution by conductometric titration
5. Measurement of Surface tension of a given liquid by Stalagmometer.
6. Determination of viscosity of a given liquid by Ostwald's Viscometer.
7. Determination of Saponification value of an oil sample.
8. To determine alkalinity water sample
9. Determination of Hardness of water sample by EDTA method.
10. Determination of Chloride content in water sample by precipitation titration method

11. To determine strength of acid by pH – metric Titration
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin
13. To study set up of Daniel cell.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Digital Electronics

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objective:

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To understand the various semiconductor memories and related technology

Prerequisite:

Mathematics and Elementary Physics

Course Outcomes: On completion of the course, students will have the ability to:

1. Comprehend different number systems and Boolean algebraic principles.
2. Apply logic design minimization techniques to simplify Boolean expressions
3. Analyse and design combinational logic circuits.
4. Demonstrate the operations of systems with sequential circuit elements.
5. Comprehend characteristics and structure of Programmable Logic Devices and Memory.
6. Draw ASM charts for sequential circuit design.

Unit I

08 Hours

Digital systems: Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers, 1's complement and 2's complement.

Binary Arithmetic: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division.

Digital Codes: BCD code, Excess-3 code, Gray code and ASCII code.

Logic Gates: Logical Operators, Logic Gates-Basic Gates, Universal Gates, realization of other gates using universal gates.

Unit II

08 Hours

Logic Design Minimization: Boolean algebra, De Morgan's Theorems, Standard representation of logic functions, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using Karnaugh-Maps up to 4 variables Don't care condition, Quine-McCluskey Method.

Unit III

08 Hours

Combinational Circuits: Binary and BCD arithmetic, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Code converters Multiplexers, De multiplexer, Decoder (IC 74138) and their use in combinational logic design, Priority Encoder, Digital Comparators, Parity generators and Checker(IC 74180), ALU

Unit IV

08 Hours

Sequential Circuits: Flip- flop: SR, JK, D, T flip flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop.

Registers: Buffer register, Shift register.

Counters: Asynchronous counters, Synchronous counters, Modulus counters

Unit V

08 Hours

FSM and ASM charts: Introduction to FSM, Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization, ASM chart notations, ASM block, State diagram, ASM chart for sequential circuits, Multiplexer Controller.

Unit VI

08 Hours

Memory and PLD: Semiconductor memories: memory organization, memory expansion, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM.

Programmable logic devices: Study of PROM, PAL, PLAs. Architecture of PLA, Designing combinational circuits using PLDs.

Textbooks:

1. M. Morris Mano and M. D. Ciletti, Digital Design, Pearson Education.
2. RP Jain, Modern Digital Electronics, Tata McGraw Hill Publication.
3. F.J. Hill and G.L. Peterson, Switching Theory and Logic Design, John Wiley
4. J.F. Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2

Reference Books:

1. David J. Comer, Digital Logic & State Machine Design, Oxford University Press.
2. Digital Integrated Electronics- H. Taub & D. Shilling, Mc Graw Hill.

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit

Project Based Learning

1. Survey report of basic gates ICs 7432, 4011, 4050, 4070, 4071, 4010
2. Implement combinational logic Circuit of given Boolean Equation.
3. Implement Half Adder and Half Subtractor.
4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX
10. Implement 7 segment decoder driver using IC 7447.
11. Build a Decade counter and Up-Down Counter.
12. Build a Shift Registers: SISO and SIPO
13. Implement the Johnson Counter and Ring Counter.
14. Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.
15. Implement given Boolean Function using PLA. (Function and Equation will be given by Subject Teacher)

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Verify truth tables of logic gates. (AND, OR, XOR, NOT, NAND, NOR). Simplify the given Boolean expression using K-map and implement using gates
2. State De-Morgan's theorem and write Boolean laws. Implement NAND and NOR as Universal gates.
3. Design (truth table, K-map) and implement half and full adder/ subtractor.
4. Design (truth table, K-map) and implement 4-bit BCD to Excess-3 Code converters.
5. Study of magnitude Comparator using IC 7485
6. Implement of logic functions using multiplexer IC 74151 (Verification, cascading & logic function implementation)
7. Implement logic functions using 3:8 decoder IC 74138.
8. Verify truth tables of different types of flip flops.
9. Design (State diagram, state table & K map) and implement 3 bit Up and Down Asynchronous and Synchronous Counter using JK flip-flop

10. Design and implement modulo 'n' counter with IC 7490.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

Programming and Problem Solving

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	04 Hours/Week	Internal Assessment	40 Marks	Practical	02
		Term Work & Oral	50 Marks		
		Term Work & Practical	50 Marks		
		Total	200 Marks	Total	06

Course Objective:

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Prerequisite:

Basic knowledge of mathematics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Describe the steps in problem-solving and write a pseudocode for a given problem.
2. Identify the suitable control structure and write a C code for the same.
3. Write the C code for a given algorithm.
4. Illustrate use of pointers and functions
5. Write programs that perform operations using derived data types.
6. Validate the logic building and code formulation by designing code capable of passing various test cases

Unit I

08 Hours

Introduction to Computer Problem Solving: The problem solving Aspect, Top Down Design, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms, Fundamental Algorithms:

General problem solving strategies: Introduction to program Planning tools- algorithm, flowcharts, and pseudo codes. Introduction to Programming Logic.

Unit II

08 Hours

Control structures: Features of C, basic concepts, structure of C program, program, declarations, variables, data types, expressions, operators assignment, arithmetic, relational, logical, increment and decrement, precedence of operators, type conversions, scanf and printf functions if-else, nested if-else, ladder if-else and switch statement. C Conditional control structures: for, while do-while Unconditional control structures: break, continue, goto statement.

Unit III

08 Hours

Arrays and strings: Declaration initialization of one dimensional Array, two dimensional array, accessing array elements, Character Array/String, Character - Handling Library Functions, Standard Input/Output Library Functions for string.

Unit IV

08 Hours

Functions and structures: What is a Function , Benefits of a Function , Function Terminology , Array of Structures, How does Function Works , Scope and Lifetime of Variables in function ,Storage Classes of Variables , Call by value and call by reference ,Recursion ,Overview of Structures , Defining and Using a Structure , Structures within a Structure.

Unit V

08 Hours

Pointers: Declaring and Initializing Pointers, Function and Pointer Parameters, Pointer Arithmetic, Pointer and Arrays, Two Dimensional Arrays and Pointers.

Unit VI

08 Hours

Files : FILE , Opening and Closing of Files , Writing and Reading in Text Format, Writing and Reading in Binary Format, Command Line Arguments

Textbooks:

1. Let Us C by Yashavant Kanetkar, 13e, BPB Publication.
2. Brain W. Kernighan & Dennis Ritchie, C Programming Language, 2nd edition, PHI.
3. E. Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill.
4. How to Solve it by Computer by R. G. Dromey, 1e, Pearson Education.

Reference Books:

1. C: The Complete Reference by Herbert Schildt.

List of Assignments:

1. Write a pseudocode and draw a flowchart for a given problem.
2. Justify the selection of appropriate control structure
3. Write a function to check whether the string is palindrome.
4. List and explain the working of standard string I/O functions.
5. Define a dynamic array to store the student record.
6. List and explain the different modes of opening file.

Project Based Learning

1. Calendar using C
2. Snake Game
3. Cricket score display
4. Quiz game
5. Phone-book application
6. Election System
7. Simple Result system
8. Typing Tutor
9. Bill Calculator
10. Grade Calculator
11. CGPA Calculator
12. Digital Clock
13. Contact Management System
14. IP finder
15. Bank Management System.
16. Departmental Store Management.
17. Hangman Game Project.
18. Library Management System

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Describe the problem-solving steps.
2. Write a pseudocode and draw a flowchart.
3. Use mathematical operators and basic data types.
4. Demonstrate use of control structures.
5. Demonstrate use of logical operators.
6. Solve the real time problem using single and two dimensional array.
7. Perform the operations on string.
8. Solve the problems using recursive and non-recursive functions.
9. Solve the problems using dynamic memory allocations.
10. Perform the operations on files.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit - VI

Computer Aided Drafting

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Hours/Week				Credits	
Practical:	02 Hours/Week	Term Work	25 Marks	Practical	01
		Total	25 Marks	Total	01

Course Objectives:

To provide knowledge about

- Fundamentals of engineering drawing and curves
- Isometric views and projection
- Projections of points, lines, planes & solids
- Use of CAD tools.

Prerequisite:

Basics of Mathematics at Secondary School Level

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand dimensioning methods and drawing of engineering curves.
2. Draw orthographic projections using 1st angle method of projection.
3. Draw Isometric views from given orthographic projections.
4. Draw projection of Lines, its traces and projections of planes.
5. Draw projection of different solids.
6. Draw development of lateral surfaces of solids.

Unit I

04 Hours

Lines and Dimensioning in Engineering Drawing and Engineering Curves:

Different types of lines used in drawing practice, Dimensioning—linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

Ellipse by Arcs of Circles method, Concentric circles method. Involute of a circle, Cycloid.

Introduction to Auto CAD commands.

Unit II

04 Hours

Orthographic Projections: Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.(Using AutoCAD commands)

Unit III

04 Hours

Isometric Projections: Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view.(Using AutoCAD commands)

Unit IV

04 Hours

Projections of Points & Lines: Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only). (Using AutoCAD commands).

Unit V

04 Hours

Projections of Planes: Projections of Planes, Inclination of the plane with HP, VP. (Using AutoCAD commands)

Unit VI

04 Hours

Projections of Solids: Projection of prism, pyramid, cone and cylinder by rotation method. (Using AutoCAD commands)

Textbooks:

1. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publishing house, Anand India,
2. "AutoCAD 2020 Beginning and Intermediate", Munir Hamad, Mercury Learning & Information Publication, 2019.
3. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.

Reference Books:

1. "Textbook on Engineering Drawing", K. L. Narayana & P. Kannaiah, Scitech Publications, Chennai.
2. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
3. "Engineering Drawing", M. B. Shah and B.C. Rana, 1st Ed, Pearson Education, 2005.
4. "Engineering Drawing", P. J. Shah, C. Jammadasand Co., 1st Edition, 1988.
5. "Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10th Edition, S. K. Kataria and Sons, 2005.

List of Laboratory Exercises:

1. Types of lines, Dimensioning practice, free-hand lettering, 1nd and 3rd angle methods symbol.
2. Engineering curves.
3. Orthographic Projections.
4. Isometric views.
5. Projections of Points and Lines and planes.
6. Projection of Solids.

B.TECH (Computer Science and Engineering)

SEMESTER – II

COURSE SYLLABUS

Mathematics for Computing - II

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
Total			100 Marks	Total	04

Course Objectives:

- Fourier series and integral transforms.
- Multiple integrals and its applications.
- Vector calculus and its applications.

Prerequisite:

The students should have knowledge of vector algebra, derivative and integration.

Course Outcomes: On completion of the course, students will have the ability to:

1. Use periodic functions as Fourier series.
2. Apply methods of finding Fourier and Z-transforms.
3. Apply methods of Laplace transform of piecewise continuous functions.
4. Identify concepts of double and triple integrals.
5. Apply vector derivative for physical quantities.
6. Evaluate line, surface and volume integrals.

Unit I

06 Hours

Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis

Unit II

06 Hours

Fourier and Z-Transform: Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit III

06 Hours

Laplace Transform and its application: Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump,. Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit IV

06 Hours

Multiple Integrals and their Application: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, moment of inertia, centre of gravity

Unit V

06 Hours

Vector Differential Calculus: Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit VI

06 Hours

Vector Integral Calculus and Applications: Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problem in engineering.

Textbooks:

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi GrihaPrakashan, Pune, 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
2. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.

List of Assignments:

Six assignments to be given by the course coordinator one from each unit.

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Fourier series
2. Harmonic analysis
3. Fourier transform
4. Z-Transform
5. Laplace transform technique to solve ODE
6. Multiple Integral to evaluate area and volume
7. Directional derivative
8. Divergence and curl
9. Greens theorem
10. Gauss Divergence Theorem
11. Stokes theorem
12. Unit step function
13. Solenoidal and irrotational fields
14. Simple difference equation
15. Periodic functions

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Probability and Statistics

TEACHING SCHEME

EXAMINATION SCHEME

CREDIT SCHEME

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
				<u>Credits</u>	
Lecture:	4 Hours/Week	End Semester Examination:	60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks		
		Term Work & Practical:	50 Marks	Practical	1
		Total:	150 Marks	Total	5

Course Objectives:

- Probability theory and expected value.
- Probability distribution and its applications.
- Multiple regression and ANOVA.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply Bayes theorem to find probability.
2. Compute mathematical expectations.
3. Identify various theoretical distributions.
4. Use correlation coefficient to interpret numerical data.
5. Use regression to estimate the dependent variable.
6. Apply concept of graph in optimization.

Unit I

08 Hours

Probability Theory: Definition of probability: classical, empirical, and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities

Unit II

08 Hours

Random Variable and Mathematical Expectation. Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Joint and marginal probability distributions, Properties of expectation and variance with proofs, Examples

Unit III

08 Hours

Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution

Unit IV

08 Hours

Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation Coefficient, Properties of Karl Pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples...

Unit V

08 Hours

Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient

Unit VI

08 Hours

Multiple Regression and AVOVA: Multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction)

Textbooks

- 1.S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House.
- 2.G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas and company.
- 3.Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines
Kishor S. Trivedi, "Probability, Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, Wiley India Pvt. Ltd.
- 5.Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction to Probability And Statistics, 3rd Edition, Wiley Publication
- 6.I.R. Miller, J.E. Freund and R. Johnson. Fun "Probability and Statistics for Engineers" (4th Edition)

List of Theory Assignments

One assignment on each unit

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and analyse the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. Bayes theorem
2. Additive and multiplicative law of probability
3. Mathematical expectation
4. Joint and marginal probability distribution
5. Theoretical probability distribution
6. Coefficient of correlation
7. Regression estimates
8. Simple regression model
9. Multiple regression model
10. One way ANOVA
11. Two way ANOVA
12. Correlation
13. Multiple correlation

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list.

List of Laboratory Experiments (The course co-ordinator may frame 8-10 experiments)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Physics for Computing Systems

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	04

Course Objective:

To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Computer Engineering and Science.

Prerequisite:

Basic understanding of physics and calculus.

Course Outcomes: On completion of the course, students will have the ability to:

1. Interpret the properties of charged particles to develop modern instruments such as electron microscopy.
2. Appraise the wave nature of light and apply it to measure stress, pressure, and dimension etc.
3. Summarise the structure and properties of lasers to their performance and intended applications.
4. Classify the optical fiber, understanding the structure, types, and its applications in the field of communication.
5. Solve quantum physics problems to micro level phenomena and solid-state physics
6. Explain mechanical properties of solid matter and connect to applications in the field of engineering.

Unit I

06 Hours

Modern Physics Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Separation of isotopes by Bainbridge mass spectrograph, Cathode ray tube (CRT).

Unit II

06 Hours

Wave Optics: Interference of waves, interference due to thin film (Uniform and nonuniform (only formula-no derivation is expected), Newton's ring, Applications of interference (optical flatness, highly reflecting films, non-reflecting coatings). Diffraction Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima Polarisation, Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.

Unit III

06 Hours

Lasers : Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO2 laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, Computers)

Unit IV

06 Hours

Fibre Optic: Principle of fibre optics, Construction, Numerical Aperture for step index fibre; critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibres, Fibre optic communication system, advantages, and disadvantages of fibre optics.

Unit V

06 Hours

Quantum Mechanics: Dual nature of matter, DeBroglie's hypothesis, Heisenberg's uncertainty principle with illustrations, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, step potential and potential barrier (analytical discussion), tunnelling effect.

Unit VI

06 Hours

Solid state physics: Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

Textbooks:

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books:

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
2. Optics, Francis Jenkins and Harvey White, Tata McGraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

Project Based Learning

1. Measurement and effect of environmental noise in the college
2. Design and simulation of automatic solar powered time regulated water pumping
3. Solar technology: an alternative source of energy for national development
4. Design and construction of digital distance measuring instrument
5. Design and construction of automatic bell ringer
6. Design and construction of remote control fan
7. Design and construction of sound or clap activated alarm
8. Electronic eye (Laser Security) as autos witch/security system
9. Electric power generation by road power
10. Determination of absorption coefficient of sound absorbing materials
11. Determination of velocity of O-ray and E-ray in different double refracting Materials.

12. Need of medium for propagation of sound wave
13. Tesla Coil
14. Thin film interference in soap film-formation of colours
15. LiFi- wireless data transfer system using light

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Study of lissajous figure by Cathode Ray Oscilloscope (CRO)
2. Determination of e/m by Thomson method
3. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings
4. Determination of wavelength of light using diffraction grating
5. Determination of resolving power of telescope
6. Determination of thickness of a thin wire by air wedge
7. Determination of refractive index for O-ray and E-ray
8. Determination of divergence of a laser beam
9. Particle size by semiconductor laser
10. Determination of wavelength of laser by diffraction grating
11. To study Hall effect and determine the Hall voltage
12. Calculation of conductivity by four probe method
13. Study of solar cell characteristics and calculation of fill factor
14. Determination of band gap of semiconductor
15. Determination of Planck's Constant by photoelectric effect

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit:- Unit -I, Unit-II Unit-III
Unit – IV, Unit – V, Unit - VI

Electrical Technology

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	05

Course Objective:

To study of power system basics, magnetic circuits electrical machines, transformers, wiring, measurements, illumination and batteries.

Prerequisite: NIL

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the various parameters related to magnetic circuit.
2. Describe basic concepts of AC fundamentals and circuits.
3. Illustrate constructional features and describe different parameters of transformer.
4. Describe basic concepts of power system and three phase circuits.
5. Demonstrate AC and DC electrical machines.
6. Classify types of batteries.

Unit I

08 Hours

Magnetic Circuits: Magnetic effect of electric current, Cross & Dot Convention, Right hand thumb rule, Concept of flux, flux linkages, magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability Kirchhoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling.

Unit II

08 Hours

AC Fundamentals and circuits: AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasor, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems).

Unit III

08 Hours

Single Phase Transformer: Faradays law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance, coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e .m. f. equation, voltage ratio, current ratio, KVA rating, determination of efficiency and regulation by direct load test, equivalent circuit, power losses, (simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections.

08 Hours

Unit IV

Introduction to Power System and Three Phase: Circuits: General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only) Power generation to distribution through overhead lines and underground cables with single line diagram. Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three phase power and its measurement (simple numerical problems).

Unit V

08 Hours

Electrical Machines: DC & AC: Principles of electromechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics, and applications of dc motors (simple numerical problems). single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).

Unit VI

08 Hours

Batteries: Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.

Textbooks:

1. B.L.Theraja, A Textbook of Electrical Technology, Vol.1, S.Chand & Company Ltd. New Delhi
2. V.K.Mehta, Basic Electrical Engineering, S Chand & Company Ltd. New Delhi.
3. J.Nagarath and Kothari, Theory and applications of Basic Electrical Engineering, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Electrical Technology - Edward Huges (Pearson)
2. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
3. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
4. Electrical, Electronics Measurements and Instruments - (Satya Prakashan)

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit.

Project Based Learning

1. Building a small resistive load lamp bank
2. Building a small resistive load lamp bank for various types of connections like series, parallel, star, delta
3. Building a small inductive load lamp bank for various types of connections like series, parallel, star, delta
4. Building a small capacitive load lamp bank for various types of connections like series, parallel, star, delta
5. Building a small resistive load lamp bank
6. Building a staircase wiring model on a board
7. Building a Go down wiring model on a board
8. Rewinding of a choke
9. Rewinding of a small transformer
10. Building a small rectifier circuit on bread board
11. Building a mobile charger circuit on a bread board
12. Building an electric buzzer circuit
13. Building a solar charger for mobile phone
14. Building a small wind turbine
15. Small Agricultural pump model with DC motor
16. Small Agricultural pump model with AC motor

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Plotting B-H characteristics for a material.
2. Load test on single phase transformer.
3. Testing and maintenance of batteries.
4. Verification of voltage and current relationships in star and delta connected 3-phase networks.
5. Load test on DC machine.
6. To find the performance of series R-L-C circuit at different condition
7. OS & SC test on single phase transformer to find efficiency and regulation
8. Speed control of DC motor
9. Study of different types of starters for DC & AC Machine
10. Load test on 3 phase Induction motor.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Linear Data Structures

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	04 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Oral	50 Marks	Practical	02
		Term Work & Practical	50 Marks		
		Total	200 Marks	Total	06

Course Objective:

The objective of the course is to provide the students in-depth knowledge of different Linear Data structures and their use to solve the programming problems.

Prerequisite: Basic knowledge of computer

Course Outcomes: On completion of the course, students will have the ability to:

1. Use appropriate data structure to solve a particular problem
2. Demonstrate the use of linked list and compare it with array.
3. Demonstrate the use of stack as an ADT.
4. Perform the operations on queue.
5. Apply the searching and sorting algorithms
6. Demonstrate the use of Files and different File Organizations

Unit I

08 Hours

Introduction to Data structures: Introduction to algorithm, Algorithm analysis, Big O Notations, Need of Data structure, Classification of Data Structures, Operations on Data Structures. **Arrays:** Introduction, Array Operations, representation of Arrays in Memory, One- & Two-dimensional array in function, Implementation of One- & Two-Dimensional Arrays in Memory, Abstract Data Types.

Unit II

08 Hours

Linear Lists: Introduction, Singly linked list, Circularly Linked List, Doubly Linked lists, Basic operations, - Insertion, Deletion, retrieval, traversal, create List, insert node, delete node, List Search, Empty list, Destroy list, Applications of Linked List

Unit III

08 Hours

Stacks: Stack Structure, Operations on Stacks – create stack, Push stack, Pop stack, Array and Linked Representation, operations (For both array and Linked representation), Types of Notations, Applications of Stack: Reversing Data, Converts Decimal to Binary, Parsing, Postponement.

Unit IV

08 Hours

Queue: Introduction, Definition, Storage Methods Queue Operations- Enqueue, Dequeue, Queue front, Queue rear, Queue Example, Create Queue, priority Queue, Circular Queue, Application of Queue: Categorising Data, Queue. Simulation, Array and Linked representation of queue (operations on array and Linked representation).

Unit V

08 Hours

Implementation & Application: Searching: Linear Search, Binary Search, Hashing: Introduction. Hash Tables, Hash Functions, Collision, Applications
Sorting – Selection Sort, Bubble Sort, Insertion Sort, Merge Quick Sort, Shell Sort

Unit VI

08 Hours

Files and Organization: Introduction, Data Hierarch, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Sequential Organization, Relative File Organization, Indexed Sequential File Organization.

Textbooks:

1. Richard F Gilberg & Behrouz A Forouzan, Data Structures (A Pseudocode Approach with C), second edition, Cengage Learning, 2004.
2. PAI, Data Structures, Tata McGraw-Hill Education, 2008
3. Data Structures Using C, Reema Thareja, OXFORD University Press

Reference Books:

1. Mayank Patel, Data Structure and Algorithm With C, Educreation Publishing, 2018
2. Thomas H. Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 2001.

List of Assignments:

1. Write an algorithm for a given problem and analyse its complexity
2. Describe representation of a linked list in the memory and Write a pseudocode to perform deletion operation on list.
3. Illustrate the use of stack to solve the Tower of Hanoi problem.
4. Write a pseudocode to perform operations on priority queue.
5. Compare bubble sort and selection sort
6. Describe the sequential file organization.

Project Based Learning

1. Expression Evaluation
2. Traffic Management System
3. Library Management System for a small library in a department
4. Employee Record System
5. Dictionary
6. Calendar Application
7. Medical Store Management System
8. Cricket Score Sheet
9. Bank Management System that handles only savings account
10. Ticket booking system for bus

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Use of array and operations on Array.
2. Operations on singly and doubly linked list.
3. Polynomial operations using linked list.
4. Create stack and demonstrate its use.
5. Develop a priority queue and perform the operations.
6. Demonstrate the use of different file organizations.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Computer System Workshop Technology

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Practical:	02 Hours/Week	Term Work & Practical	50 Marks	Practical	1
		Total	50 Marks	Total	01

Course Objective:

Provide student a much-needed knowledge of computer hardware and networking, enabling them to identify computer hardware, software and network related problems, and develop an ability to use the basics of computing, necessary for computing courses

Prerequisite:

Basic knowledge of Computer and Electronics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify the architecture of a computer and its different components, including their technology evolution.
2. Apply their knowledge about computer peripherals to identify problems.
3. Install and uninstall given software step-by-step.
4. Learn the working of Internet.
5. Prepare document using Latex.
6. Learn GitHub tool for coding and collaboration.

Unit I

04 Hours

Computer hardware peripherals: Introduction to hardware components, random access memory (ram), Types Of RAM & their speed, tips for buying ram, how to add memory to a computer, problems when installing memory, Central Processing Unit (CPU), Types Of CPU: considerations when buying a new CPU (Types & Differences), different speeds available for CPU and what do they mean, 32 Bit vs 64 Bit – Which One To Choose & Why? How to choose a CPU type for different needs? Graphic Card & Types, How to install a Graphics Card, Installing a CD or DVD burner, Jumper Switch settings, Hard Disk upgrade, Different ports and why we use them - USB, PS2, DivX, Graphic card & types, Virtual Memory and how to configure it for optimum system performance.

Unit II

04 Hours

Assembly of Computer and Software Installations: Assembling the motherboard, Replacing fan, how to avoid common mistakes during assembly, Installation of system software: Operating system (Windows and Linux), Installations step for operating system, Dual booting, Configure the BIOS, Installation of Antivirus, Installation of the open source software such as Scilab, Latex Installation of Ms Office.

Unit III

04 Hours

Basic Diagnostic of Hardware and Software :Diagnosis of Power Up problem, Boot Drive, Errant Keyboard, mouse problems, slow computer performance, Computer freezes and displays BSOD (Blue screen of death), no display on monitor, no sound, computer rebooting or turning itself off, how to troubleshoot a computer that does not boot, Registry Cleaner

Unit IV

04 Hours

Computer network environments: Network connecting devices. Configure the TCP/IP setting, connect to Local Area Network and access the Internet, Configuring Wireless network. Server and Its Configuration, Email Clients, Browsers, Office tools, customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers, Browsing netiquettes and cyber laws. Cloud Access Tools

Unit V

04 Hours

Configuration of External devices: Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader etc

Unit VI

04 Hours

Productivity tools: Open Source Tools Such as Latex, GitHub LaTeX: Format words, lines, and paragraphs, design pages, create lists, tables, references, and figures in LATEX. Introduction to LaTeX Packages and classes. Using Git, Version Control Systems, interacting with GitHub, Reverting Changes, Creating Pull Requests.

Textbooks:

1. Introduction to Information Technology, IITL Education Solutions limited, Pearson Education.
2. PC Hardware and A Handbook – Kate J. Chase PHI (Microsoft).
3. LaTeX Companion – Leslie Lamport, PHI/Pearson.
4. <https://nptel.ac.in/courses/106/105/106105081/>.
5. <http://nptel.ac.in/courses/106105084/>.
6. <https://guides.github.com/>.
7. Introduction to Linux: Installation and Programming B Venkateswarlu, BS Publication.

Reference Books:

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
2. Computer Fundamentals, MS Office and Internet & Web Technology by Dinesh Maidasani.

Project Based Learning

1. Collect specifications of similar types of hardware and software and prepare report comparing them
2. Assembling and disassembling the PC back to working condition.
3. Installation of operating systems LINUX on Server and different packages on a PC.
4. Practice hardware troubleshooting exercises related to various components of computer like monitor, drives, memory devices, printers etc. and software troubleshooting related to BIOS etc
5. To start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of?
6. Cyber Hygiene: Installing antivirus for Windows.
7. Prepare the report of need of programming language in 21st century.
8. Collect various types of computer hardware and prepare summary report
9. Prepare Seminar report using LaTeX
10. Prepare Project report using LaTeX

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Demonstrate the Computer Hardware Components and explain its working.
2. Demonstrate the Networking Components and explain its working.
3. Installation of operating system MS windows, Unix on the personal computer
4. Installation of Application software Scilab, Latex, MS office on the personal computer
5. Troubleshooting hardware related problem.
6. Customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
7. Execution of Important “layout” and formatting commands in Latex,
8. Installation of Antivirus and customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms
9. Assignment on Pull request, code review and collaboration using GitHub.
10. Demonstrate the Computer Hardware Components and explain its working.

B.TECH (Computer Science and Engineering)

SEMESTER – III

COURSE SYLLABUS

Non-Linear Data Structure

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	04 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
Tutorial:	01 Hours/Week	Term work & Practical	50 Marks	Practical	02
		Total	150 Marks	Total	06

Course Objective:

The objective of the course is to provide the students the knowledge of different Non-linear data structures and how to use these to solve real world problems.

Prerequisite:

Basic Knowledge of Algorithm, programming fundamentals, Data types.ADT, Linear data Structure.

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify and Apply appropriate algorithms on the graph to solve real world problems.
2. Demonstrate the use of trees and binary search trees to solve the real world problem.
3. Compare the different types of trees like AVL trees, BTree,B+ Tree, red Black tree and select an appropriate one to solve a particular one
4. Perform insertion and deletion operation on heap.
5. Apply appropriate hash function for a search process.
6. Explains the use of dictionaries and concept of text processing.

Unit I

06 Hours

Graphs: Introduction to Non-Linear data structure, Graphs, Representation of graph, AND/OR Graphs, ADT for Graph, Traversing a Graph, Dijkstra's Algorithm, Minimum Spanning Trees.

Unit II

06 Hours

Trees: Introduction, Binary Trees, Binary Tree Representation, Tree Traversal Algorithms, Threaded Binary Tree, Binary Search Tree, Operations on Binary Search Tree, Huffman's Algorithm.

Unit III

06 Hours

Special forms of trees: AVL Trees, m-way Search Trees, B Trees, B+ Trees, Red Black Tree, 2-3 Trees, Splay Trees, Applications of Trees.

Unit IV

06 Hours

Heaps:Heaps as priority queues, Heap Implementation, Insertion and Deletion operations, binary heaps, binomial and Fibonacci heaps, heapsort, heaps in Huffman coding.

Unit V

06 Hours

Hashing: Introduction, Hash functions, Collision Resolution Strategies, Types of Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit VI

06 Hours

Dictionaries & Text Processing: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries, Text Processing: String +Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard tries, Suffix Tries, The Huffman Coding Algorithm.

Textbooks:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.
3. Fundamentals of Data Structures in C by Horowitz, Sahni & Anderson-Freed, 2e Universal Press

Reference Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press, 3/e, 2009.
2. A. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, Data Structures Using C and C++, Prentice Hall, 3/e.

List of Assignments:

The following are some sample assignments. The course co-ordinator will frame one assignment on each unit for internal assessment.

1. Apply the shortest path algorithm on the given graph.
2. Apply the appropriate algorithm and find the solution for the problem.
3. Generate Huffman code
4. Write a pseudocode for tree traversal operation
5. Explain the concept of linear probing
6. Explain the steps in text processing

Project Based Learning

1. Hashing for cryptography
2. Payroll system
3. Network route identifier
4. Path finder
5. Telephone directory
6. Library Management system
7. Document indexing
8. Data Compressor
9. Railway reservation system
10. Supermarket stock management

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Apply Graph traversal technique.
2. Demonstrate use of Dijkstra's Algorithm.
3. Perform operations on binary search trees.
4. Perform on Tree Traversal Algorithms.
5. Applications and Demonstration on different types of trees.
6. Perform the operations on Heaps.
7. Apply Hash Function to solve the real time problem.
8. Demonstrate use of dictionaries and concept of text processing.
9. Mini Project

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Discrete Mathematical Structures

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Oral	50 Marks	Practical	01
		Total	150 Marks	Total	04

Course Objective:

The objective is to provide a mathematical foundation and skills those are required in further study of Computer Science and Engineering. The course Discrete Mathematical Structures deals with discrete objects, countable sets. It helps to develop logical thinking and a wide variety of real-world applications to computer science. It is a very good tool for improving reasoning and problem-solving capabilities.

Prerequisite:

Basic knowledge of Elementary Linear Algebra, Numerical Mathematical Computation, Programming basics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the ability to write the sentences in the symbolic logic and evaluate a proof technique.
2. Apply the basic principles of set theory to analyse the data relationship and prove basic properties of set.
3. Analyse the properties of relations and functions to determine their properties.
4. Apply the knowledge of Boolean algebra for building basic electronic and digital circuits.
5. Solve problems of combinatorics and recurrence relations.
6. Model problems in Computer Science using graphs and trees.

Unit I

06 Hours

Mathematical Logic: Propositional Logic, Predicate logic, First order logic, Rules of inference, Introduction to proof techniques, resolution, Mathematical induction, Methods of proofs.

Unit II

06 Hours

Set Theory: Types of sets, Sets operations and laws, Algebra of Sets, Multisets, Application of the principle of inclusion and exclusion.

Number Theory: Modular arithmetic, prime numbers, and properties, GCD, Chinese remainder theorem, Extended Euclidean algorithm.

Unit III

06 Hours

Relations: Basic definition, properties and types of relations, relations and digraphs, paths in relations and digraphs, equivalence and partially ordered relations, Transitive closure and Warshall's algorithm.

Functions: Types of functions, Identity functions, Composition of functions, Mathematical functions, Pigeonhole principle.

Unit IV

06 Hours

Algebraic Structures: Isomorphism and Homomorphism, Groups, Algebraic Structures with Binary Operations, rings, Cyclic groups, codes.

Lattice: Posets and Hasse Diagrams, Lattice as an algebraic system, Properties of lattices. Group Codes: The Communication Model and Basic notion of Error Correction, Generation of Group codes, Parity Check, Error Recovery

Unit V

06 Hours

Combinatorics and Recurrence Relations:

Combinatorics: Permutations, Sum rule, Product rule, Combinatorial proofs.

Recurrence Relations: Linear Recurrence relation, Second order RR with constant coefficients, Applications of Recurrence Relation.

Concepts of Graphs and Trees: Definition, Degree, Types, Operations on graphs, Paths, Circuits, Connectedness, Planar graphs and their properties, Eulerian and Hamiltonian graphs. Trees: Basic properties of trees, Binary trees, Application: Minimum Spanning Tree, Shortest Path.

Textbooks:

1. J.P. Tremblay and Manohar: Discrete mathematical structures with application to Computer Science, McGraw hill- New Delhi.
2. Kolman and R.C. Busby: Discrete mathematical structures for computer science Prentice Hall, New-Delhi.
3. Malik and M. K. Sen: Discrete Mathematics, Cengage Learning India Pvt. Ltd.
4. R.M. Somasundaram: Discrete Mathematical Structures, Prentice Hall India Learning Private Limited.
5. C.L.Liu, Elements of Discrete Mathematics, second edition, McGraw-Hill Book Company.

Reference Books:

1. Kenneth H. Rosen: Discrete Mathematics and its applications Eighth Edition McGraw Hill Education.
2. Stanat and McAlister: Discrete Mathematics for Computer Science, PHI.

List of Assignments:

The following are some sample assignments. The course co-ordinator will frame one assignment on each unit for internal assessment.

1. Given a fact or a statement prove or disprove using suitable technique.
2. Write the given English language sentences represent in the Symbolic logic.
3. Given the statement forms Infer the validity of the statement form.
4. Draw a Hasse diagram and find chains and antichains.
5. Find the number of ways for any event or given sample space.
6. Given a problem represent in a graph and compute the optimal solution.
7. Given a communication network find the path between the given nodes.

Project Based Learning

1. Discrete Mathematics in Railway Planning using graph theory and linear algebra.
2. Object transformations using linear algebra.
3. Discrete mathematics in cryptography.
4. In Google maps to determine fastest driving routes and times.
5. In image processing
6. In relation database using sets.
7. In cyber security using graph theory.
8. Shortest path between two cities using a transportation system.
9. Data compression system with the help of Huffman coding.
10. Find the shortest tour that visits each of a group of cities only once and then ends in the starting city using graphs.

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Perform set Operations.
2. Compute a power set of a given set.
3. List various properties of Relation and construct a program to evaluate it with a program.
4. Apply Warshall's algorithm to compute a Transitive Closure of a given relation entered by the user.(Use any suitable programming language).
5. Solve a programming problem based on application of Eulerian and Hamiltonian Graph.
6. Develop a program using RSA algorithm.
7. Develop a program to apply different algorithms on graph and solve areal tie problem.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Machine Organization and Microprocessor

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks	Practical	01
		Term Work & Practical	50 Marks	Total	05
		Total	150 Marks		

Course Objective:

The course would provide students with an understanding of the design of fundamental blocks used in organization of computer system and interfacing techniques of these blocks to achieve different configurations of Machine organization. Students will learn the basic operations of computing hardware and how it interfaces to software.

Prerequisite:

The students should have basic Knowledge Digital electronics and logic design.

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the architecture and functional blocks of Computer System.
2. List the functional requirements for implementing ALU.
3. Discuss design approaches implementing control unit.
4. Analyse the characteristics and hierarchy of memory system.
5. Describe Peripherals and Input-Output organization.
6. Describe the concepts of parallel processing and pipelining.

Unit I

08 Hours

CPU:-Machine architecture and organization, Von Neumann architecture Structure of IAS machine, memory, input-output subsystems, control unit. Introduction to 80x86 microprocessor, Architecture, Register organization, Segmentation, Instruction execution cycle, Addressing modes, and Instruction set. Instruction Formats, Instruction Types.

Unit II

08 Hours

ALU:-Computer arithmetic, Signed number representation, fixed and floating point representations, character representation. Integer addition and subtraction, signed number multiplication, Booth's multiplier it's Hardware Implementation, Restoring and Non-restoring Division techniques, floating point arithmetic, IEEE 754 format.

Unit III

08 Hours

Control Unit :- Design approaches, Instruction cycle and micro operations, Control signals and timing sequence, design of Hardwired Control unit
Micro instructions and micro program, Organization and Optimization of micro-programmed Control unit, Microinstruction Sequencing, Sequencing Techniques, Address Generation, Microinstruction Execution, Microinstruction Encoding.

Unit IV

08 Hours

Memory:- Characteristics of Memory system, Memory hierarchy, Cache memory, cache size and block size, mapping functions, replacement algorithms, cache coherency, Multilevel Caches, Cache Coherence, Snooping & MESI Protocols, Memory Segmentation & Interleaved Memory System.

Unit V

08 Hours

I/O organization: - I/O module, Peripheral devices and their characteristics, Input-output subsystems, I/O device interface, I/O transfers, interrupt driven and DMA transfer, I/O device interfaces – SCSI, USB, Fire wire.

Unit VI

08 Hours

Parallel Organization – Overview of Instruction Pipelining, Performance Improvement, Flynn’s classification for Multiple Processor Organizations, Closely and Loosely Coupled Multiprocessors Systems, Symmetric Multiprocessor (SMP) Organization, Multithreading – Fine Grained, Coarse Grained & Simultaneous (SMT) Threading, Chip Multiprocessing, Cluster Configuration, UMA, NUMA & CC-NUMA. Multicore Architectures – Hardware & Software Issues in Multicore Organization.

Textbooks:

1. William Stallings. “Computer organization and architecture: designing for performance”. Pearson Education India, 2010
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky. “Computer Organization”, McGraw Hill, 2011.
3. Computer System Architecture M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.
4. Computer Architecture and Organization, John P. Hayes.

Reference Books:

1. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
2. David A. Patterson, John L. Hennessy. “Computer organization and design: the hardware/software interface”. Elsevier, 2011

List of Assignments:

1. Describe the structure of IAS computer with neat block diagram.
2. Describe architecture of 8086 with neat block diagram.
3. Explain the concept of Segmentation and state its advantages and disadvantage.
4. Draw and explain working of Micro programmed Control Unit.
5. Describe structure of IAS computer with neat block diagram.
6. Describe architecture of 8086 with neat block diagram.

Project Based Learning

1. Automatic night lamp with morning alarm
2. Traffic light with sensor + 7segment
3. Multi pattern running lights.
4. .Washing machine
5. Simple Lock Using Keypad and 7 segment
6. Electronic quiz table
7. Electronic Digital Clock
8. .temperature controller
9. Plant Irrigation System
10. Car Parking Management
11. Customer counter for supermarket
12. Electronic queue management system in food stall
13. Safety box
14. Shop lot automatic door with 7segment display
15. Bank queue management system
16. Water level controller
17. Automatic home system
18. Commuter system
19. Automatic room light control
20. Elevator control system

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Write an Assembly Language program to display system time on screen.
2. Write an Assembly Language program to add and subtract two 8 bit numbers.
3. Write an Assembly Language program to determine 2's complement of a number
4. Write an assembly language program for BCD addition and subtraction.
5. To Apply Booth's Algorithm for illustrating multiplication of signed numbers.
6. To design and illustrate Restoring Division Algorithm.
7. To design and illustrate Non-Restoring Division Algorithm.
8. To design 4 bit ALU (VLAB)
9. Study of Memory Design (VLAB)
10. To design Direct mapped Cache and associative cache (VLAB)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit – VI

Software Engineering					
<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work & Practical	50 Marks	Practical	01
		Total	150Marks	Total	05

Course Objective:

The main purpose of this course is to impart knowledge on the basic principles of software development life cycle.

Prerequisite:

Programming paradigms, Basic mathematical ability

Course Outcomes: On completion of the course, students will have the ability to:

1. Outline the basic concepts of software engineering lifecycle.
2. Analyse and categorize the requirements of software systems.
3. Design the software qualitatively.
4. Implement the software with the standard guidelines.
5. Validate the software with standard testing techniques.
6. Demonstrate troubleshooting of software application.

Unit I

08 Hours

Introduction:

Software and Software Engineering: The Nature of Software, The Software Process, Software Myths.

Process Models: A Generic Process Model, Prescriptive Process Models, Specialized Process Models, The Unified Process.

Agile Development: Agility, Agility and the Cost of Change, Agile Process, Agile Process Models.

Unit II

08 Hours

Requirement engineering and modelling:

Understanding Requirements: Requirements Engineering, Eliciting Requirements, Building the use case, Building Analysis Model, negotiating requirements and Validating Requirements. Drafting the software requirement specification.

Requirement Analysis and Modelling: Domain Analysis, Object Oriented Analysis, Scenario based Modelling, Class Based Modelling, Behaviour Modelling. CASE Tools.

Unit III

08 Hours

Software project management: Introduction to Software Project Management, Selection of a Project Approach, Project Estimation Techniques, Project Planning and Project Scheduling, Project Organization and Team Structures, Risk Management, Resource Allocation, Project Monitoring and Control, Software Configuration Management, Software Quality Management, CASE Tool.

Unit IV

08 Hours

Design

Design Concepts: The Design Process, Design Model - Data Design model, Architecture Design model, Transform and Transaction Flow, Interface design Flow, Component Level and Deployment level design elements.

Design Concepts – Abstraction, Architecture, Patterns, Modularity, Functional Independence, Refinement, Refactoring, Object-Oriented Design Concepts. CASE Tools in Software Design.

Unit V**08 Hours****Coding and Testing:**

Coding Approach, Coding Standards, Error, Bug, Defects.
Software Testing Life Cycle, Software Testing Principles, Verification and Validation,
Types of Testing, White Box Testing techniques, Black Box Testing techniques,
Testing OO Applications, Website Testing, CASE Tool.

Unit VI**08 Hours**

Implementation and maintenance: Software Maintenance-Software Supportability.
Reengineering-Business Process Reengineering- Software Reengineering- Reverse
Engineering, Restructuring.

Forward Engineering- Economics of Reengineering.

Textbooks:

1. Roger S, “Software Engineering – A Practitioner’s Approach”, seventh edition, Pressman, 2010.
2. Pearson Edu, “Software Engineering by Ian Sommerville”, 9th edition, 2010.

Reference Books:

1. Van Vliet, “Software Engineering: Principles and Practices”–, 2008.
2. Richard Fairley, “Software Engineering Concepts”, 2008..

List of Assignments:

1. Presentation on one topic related to this syllabus.
2. Conducting six Multiple choice question online test on each unit
3. Prepare a report based on the understanding by viewing the NPTEL videos of this subject.
4. Perform the following Assignments:
 - i. Suggest Which SDLC model will be used to develop ATM software? Justify?
 - ii. Develop Requirement Specification for ATM Software.
 - iii. Design the Class Diagram and Use case Diagram for ATM software.
 - iv. Discuss on Automated Software Testing. Create Test cases for Functionality of ATM software using a Test Tool (Test Link).
 - v. Discuss and Prepare IEEE Quality Document for ATM software.
 - vi. Prepare a Gantt chart using MS Project CASE Tool for a small Project.

Project Based Learning

1. ATM system
2. Online Banking system
3. Airline reservation system
4. Railway reservation system
5. Library Management System
6. College Management System
7. Hospital Management system
8. Traffic Monitoring System
9. Hotel Management System
10. Bus ticket reservation system
11. Online shopping system

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. For the given system, students are required to identify and document the Requirements Specifications.
2. To study and explore the working of any UML modelling CASE Tools.
3. For the given system, students are required to Model UML Use Case Diagrams and Capture the Use Case Scenarios.
4. For the given system, students are required to create data models like ER and EER.
5. For the given system, students are required to Model UML State chart and Activity diagrams.
6. For the given system, students are required to Model UML Class and sequence diagrams.
7. For the given system, students are required to Model UML collaboration, Component and Deployment diagrams.
8. To study and explore the working of any Software Testing CASE Tools.
9. For the given system, students are required to design and execute the test suites.
10. Prepare a case study on Agile Methodologies.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

Object Oriented Methodology

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	04 Hours/Week	Internal Assessment	40 Marks	Practical	02
		Term Work & Practical	50 Marks	Total	06
		Total	150 Marks		

Course Objective:

- To teach fundamentals of object-oriented concepts and programming.
- To apply the concepts of object-oriented paradigm.
- To develop object-oriented programming skills.
- To design and implement applications for real life problems by using object-oriented programming.

Prerequisite:

Paradigms of Programming.

Course Outcomes: On completion of the course, students will have the ability to:

1. Analyse the basics of object-oriented programming with Java.
2. Identify class, objects, methods for real time problems.
3. Make use of constructor, garbage collector and methods of string class.
4. Explore the concept of inheritance and polymorphism with the help of real time applications.
5. Handle exception with exception handling mechanism and understand the concept of multithreading.
6. Design the graphical user interface by using Applets AWT and SWING.

Unit I

08 Hours

Introduction: History and Features of Java, Difference between Java, C, C++, Internals of Java Program, Difference between JDK, JRE and JVM, Internal Details of JVM, Basics of Java Language-Variable and Reserve / Keywords present in Java, Primitive Data types, Java Operators, Decision making and branching statements in Java.

Unit II

08 Hours

Classes, Objects and Methods: Creating a Class, Visibility/Access Modifiers, Encapsulation, Methods: Adding a Method to Class, returning a Value, adding a Method That Takes Parameters, 'this' Keyword, Method Overloading, Object Creation, Using Object as a Parameters, Returning Object, Array of Objects, Memory Allocation: 'new', Static Data Members, Static Methods.

Unit III

08 Hours

Constructors, Destructors and String Handling: Use of Constructor, Characteristics of Constructors, Types of Constructor, Constructor Overloading, Constructor with Default Arguments, Symbolic Constants, Garbage Collection, Destructors and Finalizers.
String Handling: String: Immutable String, String Comparison, String Concatenation, Substring, Methods of String class, String Buffer class, StringBuilder class, Creating Immutable class, to String method.

Unit IV

08 Hours

Inheritance and Polymorphism: Use of Inheritance, Types of Inheritance in Java, Role of Constructors in inheritance, Polymorphism in OOP, Types of Polymorphism, static and dynamic polymorphism, Overriding Super Class Methods. Use of "super" keyword. Interfaces, Implementing interfaces.

Unit V

08 Hours

Exception Handling and Multithreaded programming:

Exception Handling: try and catch block, catch block, Nested try, finally block, throw keyword, Exception Propagation, throws keyword, Exception Handling with Method Overriding, Custom Exception

Introduction to threads, life cycle of a thread, thread states, thread properties, methods in Threads and Runnable, setting priority of threads, synchronization and inter thread communication Life Cycle of a Thread.

Unit VI

08 Hours

Designing Graphical User Interfaces in Java: Applet and its use, Design Patterns using Applet and JApplet. Run Applet application by browser and applet tool. Applet Architecture. Parameters to Applet Life Cycle.

Basics of Components Using Containers, Layout Managers and User defined layout. Border Layout, Flow Layout, Grid Layout, Grid bag Layout, Box Layout. AWT Components, Adding a Menu to Window, Extending GUI Features Using SWING, Components Designing GUI, Advanced swing components like Progress, JSlider, JRadioButton, JTree, JTable, JToggle Button, etc.

Textbooks

1. E. Balaguruswamy, "Object Oriented Programming Using C++ and Java", Tata McGrawHill
2. Steven Holzner et al. "Java 2 Programming", Black Book, Dreamtech Press, 2009.

Reference Books

1. Java The complete reference, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd. 9th edition, 2014, ISBN: 978-0-07-180856-9 (E-book).
2. Object-Oriented Design Using Java, Dale Skrien, McGraw-Hill Publishing, 2008, ISBN - 0077423097, 9780077423094.
3. MitsunoriOgihara, "Fundamentals of Java Programming", Springer; 2018, ISBN 978-3-319-89490-4.
4. Brahma DathanSarnathRamnath, "Object-Oriented Analysis, Design and Implementation An Integrated Approach", Springer; 2nd ed. 2015, ISSN 1863-7310 ISSN 2197-1781 (electronic) Undergraduate Topics in Computer Science ISBN 978-3-319-24278-1, ISBN 978-3-319-24280-4.
5. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, PearsonEducation, India.
6. J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
7. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.

List of Assignments:

1. Write a program to implement Class and object.
2. Write a program to differentiate between method overloading and method overriding.
3. Write a program to implement Constructor Overloading
4. Write a program to implement different Types of Inheritance in Java
5. Write a program to implement concept of Exception Handling &Multithreaded Programming
6. Write a program to use different controls of AWT classes.
7. Write a program to implement Applet swings.

1. Project Based Learning

1. **Smart City Project**
2. Currency Converter
3. Online Exam Project in Java
4. Moving Balls mini project using Java Applet
5. Text Editor in Java using AWT controls.
6. Album Manager Project in Java
7. Vehicle Management System in Java
8. Music Player project in Java
9. Student Management System Project in Java
10. Simple Calculator project in Java
11. Image to PDF Converter in java
12. Simple Chat System
13. Online Quiz project
14. Pong game in java
15. Tokenize implementation.

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises

1. Write a program that checks whether a given string is a palindrome or not.
2. Write a program that describes a class person. It should have instance variables to record name, age and salary. Create a person object. Set and display its instance variables.
3. Write a program that creates a class circle with instance variables for the centre and the radius. Initialize and display its variables.
4. Write a program that counts the number of objects created by using static variable.
5. Write a program to demonstrate the constructors in java.
6. Write a program to demonstrate the constructor overloading.
7. Write a program to display the use of this keyword.
8. Write a program to implement Class and Inheritance Concept.
9. Write an application that creates an interface' and implement it.
10. Write a program that can count the number of instances created for the class.
11. Write a program to implement the concept of Multithreaded Programming.
12. Create an abstract class shape. Let rectangle and triangle inherit this shape class. Add necessary functions.
13. Write an application that shows the usage of try, catch, throws and finally.
14. Write an Applet that displays —Hello World (Background colour-black, text colour-blue and your name in the status window).
15. Develop mini project using Applet and Swings.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

B.TECH (Computer Science and Engineering)

SEMESTER – IV

COURSE SYLLABUS

Theory of Computation

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
		Total	100 Marks	Total	04

Course Objective:

This course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton and Turing machine. This subject not only forms the basic models of computation, it also includes the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc.

Prerequisite:

Discrete Mathematics

Course Outcomes: On completion of the course, students will have the ability to:

1. Estimate the importance of automata theory in designing computer languages.
2. Demonstrate and understand the relationships between language classes and regular expression
3. Design grammars and recognizers for different formal languages
4. Identify the equivalence of languages described by pushdown automata
5. Evaluate the Language Acceptability by Turing Machine
6. Explain the basics of compiler

Unit I

06 Hours

Preliminaries and Finite state machines: Introduction to Theory of Computation- Automata, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ϵ -Transition, Equivalence of NFA's with and without ϵ -Transition, Finite Automata with output- Moore machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata.

Unit II

06 Hours

Regular Languages -Definition and Examples. Conversion of RE To FA, FA to RE, algebraic laws, applications of RE. Pumping lemma for regular languages and applications. Closure properties of regular Languages Union, Concatenation, Complement, Intersection and Kleene closure. Decidability- Decision properties.

Unit III

06 Hours

Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF),Chomsky Hierarchy, Programming problems based on the properties of CFGs.

Unit IV

06 Hours

Push Down Automata (PDA): Introduction, Pushdown Automata (PDA), Transition Diagrams, Functions and Tables, Deterministic Push- down Automata (DPDA) - definition, Nondeterministic Pushdown Automata (NPDA), Equivalence of context free grammars and PDA, properties of context free languages. Introduction to Post Machines (PMs).

Unit V

06 Hours

Turing Machines: The Turing Machine Model and Definition of TM, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction,

Modifications of Turing Machine, Composite and Iterative Turing machines, Multi Tape Turing machine, Multi Stack and Multi Track Turing machine, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Halting Problem.

Unit VI

06 Hours

Applications: Applications of Regular expressions, Lexical analyser, Text editor, and searching using RE, Context free grammar, Basics of parsing techniques, application of leftmost and rightmost derivations during parsing, Primitive recursive functions, Recursive and recursively enumerable languages, Introduction to Natural language Processing.

Textbooks:

1. Vivek Kulkarni "Theory Computation" Oxford higher education
2. Theory of Computer Science (Automata, Language & Computation) K. L. P. Mishra & N. Chandrasekaran, PHI Second Edition.
3. E.V. Krishnamurthy, "Theory of Computer Science", EWP Publication.

Reference Books:

1. Hopcroft Ullman, "Introduction to Automata Theory, Languages & Computations, Narosa.
2. Daniel A. Cohen, "Introduction to Computer Theory", Wiley Publication.
3. Automata Theory, Languages, and Computation, John E. Hopcroft Cornell University, Rajeev Motwani Stanford University, Jeffrey D. Ullman Stanford University, 3rd Edition.

List of Assignments:

1. Study of JFLAP tool for Constructing FA.
2. Construct regular expressions defined over the alphabet $\Sigma = \{a, b\}$, which denote the given languages.
3. Translate the following Mealy machine into its equivalent Moore machine.
4. Write a context-free grammar (CFG) which generates the language L denoted by: $(a+ b)^*bbb(a+ b)^*$.
5. Construct a PDA that accepts the language defined by the following regular grammar.
6. Design a TM to recognize an arbitrary string divisible by 4, from $\Sigma = \{0, 1, 2\}$.

Project Based Learning

1. Develop a tool to illustrate the algorithm for converting an arbitrary NFA to a DFA .
2. Develop a tool to draw a transition diagram for any given DFA.
3. Approximation algorithms
4. Greedy algorithms.
5. Enumeration of finite automata
6. Enumeration of PDA
7. Enumeration of Turing machines
8. Ambiguous grammars
9. Disambiguation of Grammars
10. Enumeration of Context-free languages
11. . Enumeration of Turing machines
12. . Universal Turing machines.
13. Randomized Turing machines
14. NP Complete Algorithm
15. Problem solvability using Reduction
16. Design of TM to emulate a finite automata
17. . Design of TM to emulate a PDA
18. Complexity analysis of encryption algorithms using TM.
19. . Design of TM to perform sorting
20. Design TM to perform searching.

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

System Programming and Operating System

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	End Semester Examination:	60 Marks		
Practical:	04 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work & Practical	50 Marks	Practical	02
		Total	150 Marks	Total	06

Course Objectives:

- To help the students understand functioning of various system programs and Compiler, Loaders and Linkers.
- To help students for different concepts of operating system and management with file system.

Prerequisite:

Knowledge of Microprocessor concepts and Assembly language and Concept of system software, application software, knowledge of input output devices and its usage.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply fundamental concepts and practical skills of system programming.
2. Design and Demonstrate working of assemblers, Loaders and Linkers.
3. Compare and evaluate different scheduling algorithms.
4. Outline the concept of concurrency and deadlocks.
5. Analyse of Memory Management and Virtual Memory.
6. Prepare a comparison report of different operating system.

Unit I

08 Hours

Introduction to Systems Programming: Introduction: Components of System Software, Language Processing Activities, Fundamentals of Language Processing. Assemblers: Elements of Assembly language programming. Simple assembler scheme, Structure of an assembler, Design of single and two pass assembler. Macro Processors: Macro Definition and call, Macro expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a two-pass macro-processor, Case study related to unit contents.

Unit II

08 Hours

Compiler, Loaders and Linkers: Compilers: Basic compilers function, Phases of compilation, memory allocation, compilation of expression, Compilation of expressions, compilation of control structures, Code of optimization. Loaders: Loader Schemes: Compile and go, General Loader Scheme, Absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, Design of an absolute loader. Linkers: Relocation and linking concepts, Design of linker, self-relocating programs, Static and dynamic linker, Case study related to unit contents.

Unit III

08 Hours

Introduction to OS and Process management: Introduction to OS: Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S. Process Management: Process Concept, Process states, Process control, Threads, Scheduling: Types of scheduling: Pre-emptive, Nonredemptive, Scheduling algorithms: FCFS, SJF, RR, Case study on Unix /Linux OS.

Unit IV

08 Hours

Concurrency control: Concurrency: Interprocess communication, Mutual Exclusion, Semaphores, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock,

Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Case study related to unit contents.

Unit V

08 Hours

Memory Management: Basics of memory management, Swapping, Memory Allocation, Paging, Segmentation, Virtual memory, Demand Paging, Page replacement, Page replacement algorithms – Optimal FIFO, LRU, LRU approximation, Allocation of frames, Case study related to unit contents.

Unit VI

08 Hours

Input and Output, File System: I/O management & Disk scheduling: I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS), RAID, Disk Cache. File Management: Concepts, File Organization, File Directories, File Sharing, Record Blocking, Allocation methods, Free Space management, Case study related to unit contents.

Textbooks:

1. System Programming by John J. Donovan, TATA McGRAW-HILL Edition.

Reference Books:

1. Operating System Concepts, 9th edition Peter B. Galvin, Greg Gagne, Abraham Silberschatz, John Wiley & Sons, Inc.
2. Operating Systems 5th Edition, William Stallings, Pearson Education India.
3. D. M. Dhamdhere : “Systems programming and operating system”, Tata McGraw Hill.

List of Assignments:

1. Describe the types of errors that can be identified in the process of language translation. Illustrate the same with example
2. Explain the different types of optimization techniques
3. Compute average waiting time and average response time for the given set of processes.
4. Apply page replacement algorithm and compute the number of page faults.
5. Case study 1
6. Case study 2

Project Based Learning

1. Develop Heap Memory Manager in C
2. Design the Processes and thread management with deadlock's, synchronization
3. Design Preemptive Priority Scheduling algorithm implementation in any language.
4. Java program to analyze page fault for a given page frame using NRU with paging.
5. The project on simulating the multiprogramming of a specific operating system and dealing with CPU scheduling and Job scheduling.
6. Design the project that computes FCFS, SSTF, and SCAN disk-scheduling algorithms
7. Operating Systems mini-project to explore the different algorithms of main memory page replacement
8. Develop any one project on one or two pass assemblers.
9. design a simple language and develop a compiler for the three-address code generation and evaluation using Lex and Yacc.
10. Construct a parser that recognizes a specific language.

Note:- *Students in a group of 3 to 4 shall complete any one project from the above list.

List of Laboratory Exercises:

1. Design one pass assembler
2. Design two pass assembler
3. Write a program to create Dynamic Link Library for any mathematical operation and write an application program to test it
4. Write a program using Lex specifications to implement lexical analysis phase of compiler to count no. of words, lines and characters of given input file.
5. Implement UNIX system calls like ps, fork, join, exec family, and wait for process management.
6. Implementation of various scheduling algorithm.
7. Implementation of Banker's algorithm.
8. Find out the page fault of any given string.
9. Implementation of various Page replacement Algorithm.
10. Study assignment on process scheduling algorithms for latest OS.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Computer Graphics and Multimedia

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Lecture:	04 Hours/Week	End Semester Examination:	60 Marks		Credits
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work & Practical	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objectives:

- To introduce the principles of computer graphics and the components of a graphics system.
- To introduce basic algorithms for drawing line, circle and curves.
- To develop understanding of the basic principles of 2D and 3D computer graphics and how to transform the shapes to fit them as per the picture definition.
- To introduce multimedia architecture and hardware.
- To introduce multimedia file formats.

Prerequisite:

Knowledge of C programming language, Linear Algebra.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply fundamental concepts and practical skills in computer graphics.
2. Design and apply two-dimensional graphics.
3. Implement and use classic and modern algorithms and data structures in computer graphic to 3-D geometry.
4. Apply Illumination and colour models.
5. Identify suitable file format to develop a multimedia application.
6. Design Basic 3- D Scenes using Blender.

Unit I

08 Hours

Introduction to computer graphics and devices: Introduction to computer graphics, Graphics Primitives: Raster scan & random scan displays, display processor, display file structure, Output primitives, points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives. GRAPHIC DEVICES Cathode Ray Tube, Quality of Phosphors, CRTs for Colour Display, Beam Penetration CRT, The Shadow -Mask CRT, Direct View Storage Tube, Tablets, The light Pen, Three Dimensional Devices.

Unit II

08 Hours

Two-dimensional graphics: Two dimensional geometric transformations — Matrix representations and homogeneous coordinates, composite transformations; Two-dimensional viewing — viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations — point, line, and polygon clipping algorithms.

Unit III

08 Hours

Three-dimensional graphics: Three dimensional concepts; Three-dimensional object representations — Polygon surfaces- Polygon tables- Plane equations — Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations — Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modelling transformations — Translation, Rotation, Scaling, composite transformations; Three-dimensional viewing — viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

Unit IV

08 Hours

Illumination and colour models: Light sources, basic illumination models, halftone patterns and dithering techniques; Properties of light, Diffused illumination, point

source illumination, Standard primaries and chromaticity diagram; Intuitive colour concepts, RGB colour model, YIQ colour model, CMY colour model ,HSV colour model; Colour selection, ray tracing.

Unit V

08 Hours

Multimedia system design & multimedia file handling: Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Multimedia databases. Compression and decompression – Data and file format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval technologies.

Unit VI

08 Hours

Hypermedia: Multimedia authoring and user interface-Hypermedia messaging - Mobile messaging – Hypermedia message component – Creating hypermedia message – Integrated multimedia message standards– Integrated document management – Distributed multimedia systems. CASE STUDY: BLENDER GRAPHICS Blender Fundamentals—Drawing Basic Shapes— Modelling—Shading & Textures.

Textbooks

1. Donald Hearn and Pauline Baker M, Computer Graphics”, Prentice Hall, New Delhi, second edition.
2. Andleigh, P. K and KiranThakrar, Multimedia Systems and Design, PHI, 2015.

Reference Books

1. Foley, Vandam, Feiner and Hughes, Computer Graphics: Principles and Practice, 2nd Edition, Pearson Education, 2003.
2. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, Fundamentals of Computer Graphics, CRC Press, 2010.

List of Assignments:

1. Study on any latest data generating device in computer Graphics .
2. Describe in detail any one color model process.
3. Using the determinant to calculate the signed areas, determine whether the point $p=[23]T$ is in the triangle formed by the points $s=[22]T$, $t=[51]T$ and $r=[35]T$. Show all of your work.
4. Elaborate in detail the any one curve generation methods.
5. Describe how Multimedia system architecture process is used in real time.

Project Based Learning

1. Helicopter game
2. Sinking Ship
3. Scientific calculator
4. Traditional wall Clock
5. Tower of Hanoi game
6. Windmill
7. Steam engine
8. Traffic signal
9. Aquarium
10. Prepare a PowerPoint Presentation
11. Mobile app for online shopping
12. Arrival and departure of the train with announcement and signal
13. Mobile application for online tour guidance app
14. Create a small video on the given topic
15. Story tell mobile app

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Study of Fundamental Graphics Functions.
2. Implementation of Line drawing algorithms: DDA Algorithm, Bresenham's Algorithm.
3. Implementation of Circle drawing algorithms: Bresenham's Algorithm, Mid-Point Algorithm.
4. Programs on 2D and 3D transformations.
5. Write a program to implement Cohen Sutherland line clipping algorithm.
6. Using Flash/Maya perform different operations (rotation, scaling move etc..) on objects Create a Bouncing Ball using Key frame animation and Path animation.
7. Write a program to make wave audio file.
8. Write a program to create links in HTML.
9. Write a program to create file split.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Design of Algorithms

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture	03 Hours/Week	End Semester Examination: 60 Marks			
		Internal Assessment:	40 Marks	Theory	03
		Total	100 Marks	Total	03

Course Objective:

The Course gives an overview of about the Performance and Analysis of Algorithms.

Prerequisite:

The students should possess the knowledge of Data Structures and Discrete Mathematics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Analyze the asymptotic performance of algorithms by providing Optimal Solution.
2. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Analyze the performance of Greedy Methods and describe its limitations.
4. Analyse Dynamic Programming Problems.
5. Solve Problems using Backtracking Approach.
6. Compare NP-Hard, NP-Complete Problems and Online Algorithms.

Unit I

06 Hours

Models of Computation: Algorithm Specification, Pseudocode Conventions Recursive Algorithms, PERFORMANCE ANALYSIS, Space Complexity Time Complexity Asymptotic Notation, Practical Complexities, Performance Measurement Randomized Algorithms Iterative Algorithms: Measures of Progress and Loop Invariants. Steps to develop Iterative Algorithms.

Unit II

06 Hours

Divide-and-Conquer: Binary Search Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement: Best Case and Worst-Case Analysis. Strassen's matrix Multiplication.

Unit III

06 Hours

The Greedy Method: Knapsack Problem, Job Sequencing with deadlines, Minimum-Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Single-Source Shortest Paths.

Unit IV

06 Hours

Dynamic Programming: Multistage graph, All Pairs Shortest paths, Single-Source Shortest Path, Optimal Binary search trees, 0/1-knapsack, The Traveling Salesperson Problem, Basic Traversal and Search Technique.

Unit V

06 Hours

Backtracking: Backtracking: The General Method, The 8- Queens Problem, Sum of Subsets, Graph Colouring, and Hamiltonian Cycles. Branch and Bound: Least Cost (LC) Search, The 15-puzzle Control abstraction of LC Search, Bounding, FIFO Branch and Bound, LC Branch and Bound.

Unit VI

06 Hours

Files: NP-HARD AND NP-COMPLETE PROBLEM Algorithm Complexities: Nondeterministic Algorithms, The classes NP-Hard and NP- Complete, Cook's Theorem, NP-Hard Graph Problems, NP-Hard Scheduling Problems, NP-Hard Code Generation Problems. Approximation Problems. Online Algorithms: The Online Paging Problem, Adversary Models, Paging against an Oblivious Adversary, Relating the Adversaries, The Adaptive Online Adversary, The k-Server Problem

Textbooks:

1. Alfred Aho, John E. Hopcroft, "Design and Analysis of Computer Algorithms", Pearson Education.
2. Thomas Cormen, Charles E Leiserson, Ronald Rivest, "Introduction to Algorithms, Tata Mc-Graw Hill Publication, Second Edition.
3. Rod Stephens, "Essential Algorithms: A Practical Approach to Computer Algorithms", John Wiley and Sons Publications.
4. Jon Kleinberg, Eva Tardos, " Algorithm Design", Pearson Education.
5. Robert Sedgewick, Philippe Flajolet, "An Introduction to the Analysis of Algorithms", Addison-Wesley Publication, Second Edition.
6. Jeff Edmonds, How to think about Algorithms, York University, Cambridge University Press.
7. Python Algorithms: Mastering Basic Algorithms in the Python Language, by Magnus Lie, Hetland ,APress.
8. Ian Parberry and William Gasarch, WProblems on Algorithms, Second Edition, Prentice Hall Inc.
9. Rajeev Motwani, PrabhakarRaghavan, Randomized Algorithms, Cambridge University Press.

Reference Books:

1. ElitzHorowith and SartajSahani, S. Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications.

List of Assignments:

1. Calculate the space complexity of various algorithms.
2. Implement Knapsack Algorithm.
3. Implement Prim's Algorithm
4. Implement Kruskal's Algorithms
5. Study and analysis of 8-Queens Problem.
6. Implement Optimal Binary Search Tree.

Project Based Learning

1. Design a Sudoku using Recursion
2. Design a Phonebook
3. Simulate 15 Puzzle Problem
4. Design Tic Tac Toe
5. Travelling Salesman Problem
6. Design a board for simulating N-Queen Problem
7. Implement Multistage Graphs
8. Prime Number Generator
9. Random Number Generator
10. Devise and algorithm for large sparse matrix multiplication

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Database Systems

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Lecture:	04 Hours/Week	End Semester Examination:	60 Marks	Credits	
Practical:	04 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work & Practical	50 Marks	Practical	02
		Total	150 Marks	Total	06

Course Objective:

This course focuses on the core principles and techniques required in the design and implementation of database systems.

Prerequisite:

Discrete mathematics, Data structures and Programming languages.

Course Outcomes: On completion of the course, students will have the ability to:

1. Use the basic concepts of Database Systems in Database design.
2. Design a Database using ER Modelling
3. Apply SQL queries to interact with Database.
4. Apply normalization on database design to eliminate anomalies.
5. Analyse database transactions and can control them by applying ACID properties.
6. Investigate the knowledge about emerging trends in the area of database for unstructured data and applications for it.

08 Hours

Unit I

Introduction to Databases and Database Design: Introduction, purpose of database system, Data Independence, view of data, Database System architecture- Levels, Mappings, Database users and DBA, applications of DBMS, The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction., Database Design Process, ER Diagrams - Entities, Attributes, Relationships, Constraints, keys, extended ER features, Generalization, Specialization, Aggregation, Conceptual design with the E-Rmodel.

Unit II

Relational Model: Introduction to the relational model, Integrity constraints over relations, enforcing integrity constraints, querying relational data, Logical database design: E-R to relational, Introduction to views, Destroying/altering tables and views.
Relational Algebra and Calculus: Preliminaries, relational algebra operators, relational calculus - Tuple and domain relational calculus, expressive power of algebra and calculus.

08 Hours

Unit III

Schema Refinement and Normal Forms: Introduction to schema refinement, functional dependencies, reasoning about FDs. Normal forms: 1NF, 2NF, 3NF, BCNF, properties of decompositions, normalization, schema refinement in database design, case studies.

08 Hours

Unit IV

SQL: Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All, view and its types. transaction control commands – Commit, Rollback, Save point, cursors, stored procedures, Triggers.

08 Hours

Unit V**08 Hours**

Transactions Management: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, Serializability, recoverability, implementation of isolation, transaction definition in SQL, testing for Serializability.
Concurrency Control and Recovery System: Concurrency control, lock based protocols, time-stamp based protocols, validation based protocols, multiple granularity. Recovery system - failure classification, storage structure, recovery and atomicity, log- based recovery, shadow paging, buffer management, failure with loss of non-volatile storage, advanced recovery techniques, remote backup systems.

Unit VI**08 Hours**

Emerging Database Technologies: Introduction to unstructured data, NOSQL, Introduction to unstructured data, NOSQL, spatial and geographic databases, Database Analysis Tools multimedia databases, Massive Datasets and Hadoop.

Textbooks:

1. Raghurama Krishnan, Johannes Gehrke , Database Management Systems, 3rd edition, Tata McGraw Hill, New Delhi,India.
2. ElmasriNavate, Fundamentals of Database Systems, Pearson Education,India.

Reference Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2005), Database System Concepts, 5th edition, McGraw-Hill, New Delhi,India.
2. Peter Rob, Carlos Coronel (2009), Database Systems Design, Implementation and Management, 7thedition.

List of Assignments:

1. Define Database. Explain Importance of Data Models in detail
2. Write a short note on Following:
 - a) Relational Algebra and Calculus
 - b) Integrity Constraints
3. Define Normalization. Explain all Normal forms in detail
4. Explain DDL, DML and DCL in detail.
- 5.Explain ACID properties of TCL in detail.\
6. Explain NOSQL and Database Analysis Tools in detail.

Project Based Learning

1. Inventory Management System.
2. Online Jewelry Shopping System
3. Library Management System
4. Online Examination System
5. Hospital Management System
6. Railway Reservation System
7. Payroll Management System
8. Cooking Recipe Portal
9. Art Gallery Management System
10. Student Database Management System
11. Restaurant Management Database System
12. Electric Bill System Database
13. Online Examination System
14. Event Management System
15. Attendance Management System

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

Laboratory Exercises:

1. Draw E-R Diagram and extended ER Diagram (as given by course coordinator) on given System.
2. Demonstrate Queries on Relational Algebra(as given by course coordinator).
3. To discuss normalization and build normalized schema (as given by course coordinator)on given System.
4. Write a SQL Statement ((as given by course coordinator) on DDL,DML and DCL.
5. Demonstrate Queries on Joins(as given by course coordinator).
6. Demonstrate Queries on aggregate functions(as given by course coordinator).
7. Use WEKA tool to derive analytical model for the given dataset.
8. Case study on NOSQL database: MongoDB.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

CSE Skill Lab - I

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Practical:	04 Hours/Week	Term Work & Oral	50 Marks	Practical	02
		Term Work & Practical	50 Marks		
		Total	100 Marks		

Course Objective:

The objective of this course is to impart students with the knowledge to setup the development environment, design and develop dynamic database driven web applications using PHP.

Prerequisite:

1. Create PHP programs that use various php library functions,
2. Design interactive forms using PHP.
3. Implement various operations on arrays and control structures in PHP
4. Create database and demonstrate the manipulation of Files, Directories and relational data.
5. Implement cookies and session
6. Develop dynamic web Content.

Unit I

08 Hours

Introduction to Dynamic Web Content & Environment: Overview of HTTP & HTML, Request/Response Procedure, Advantage of PHP, MySQL, JavaScript, CSS & HTML 5, The Apache Web Server, Overview of Open Source. Basics of WAMP, MAMP,LAMP, Installation, Accessing document root, Working Remotely – Looking In, Using FTP, Using IDE.

Unit II

08 Hours

Introduction to PHP, Expression & Control Flow: Incorporating PHP within HTML, Structure of PHP – Comments, Basic Syntax, variables, operators, Assignments, multiline commands, constants, echo & print commands, Functions, variable Scope. Expressions: TRUE or FALSE, Literals & Variables. Operators: Precedence, Associativity, Relational Operators. Conditionals – if, else, elseif, switch operator. Looping: While, do-while, breaking out of loop, continue statement

Unit III

08 Hours

PHP Functions, Objects & Arrays:PHP Functions: Defining, returning a value, Returning an Array, do not Pass arguments by reference, Returning Global Variables, Include statement: include once, require &require once.
PHP Objects: Declaring a class, creating an object, accessing objects, constructors, PHP 5 Destructors, writing methods, declaring properties & constants, inheritance. Arrays: Basic Access, foreach as loop, multidimensional Arrays, Using Array functions.

Unit IV

08 Hours

PHP in Action & Introduction to MySQL:UsingPrintf, Date and Time Functions, File handling, System Calls.Introduction to MySQL: Basics, Database Terms, Accessing MySQL via Command line, MySQL Commands, Data types, Indexes, MySql Functions, Accessing Mysql via PhpMyAdmin, Primary Keys, Relationships, Select Queries, creatingmysqldump, backup file, dumping data in CSV format.

Unit V

08 Hours

Cookies, Sessions, Authentications and Accessing: Using cookies in PHP, HTTP Authentication, Using Sessions. Accessing: Querying a MySQL Database with PHP – The Process, create login file, connecting to database, Practical Example, Preventing Hacking Attempts: Using Placeholders, HTML Injection. Building Forms, Retrieving submitted Data.

Unit VI

08 Hours

Exploring JavaScript: JavaScript and HTML Text – using within a Document Head, Older & Nonstandard Browsers, Including Javascripts, debugging Javascript errors, using variables, semicolon, variables, operators, variable typing, functions, global variables, local variables, Document Object Model, Document.write.

Textbooks:

1. Learning PHP, MySQL & Javascript, Robin Nixon, OREILLY, 4th Edition, 2015.
2. Head First PHP & MySQL-Lynn Beighley & Michael Morrison-O'Reilly.
3. PHP: A Beginner's Guide-Vikram Vaswani- McGraw-Hill Education.

Reference Books:

1. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill.
2. The Joy of PHP Programming: A Beginner's Guide – Alan Forbes, BeakCheck LLC, 6th edition.

List of Laboratory Exercises:

1. Write a PHP function to count total number of vowels from the string. Accept a string using HTML form.
2. Write a PHP script to print Fibonacci series.
3. Create a student registration form using text box, check box, radio button, select, submit button. Display the user inserted value in new PHP page.
4. Write a program to perform the following operations on an associative array.
Display elements of an array along with their keys.
Display size of array.
Delete an element from an array from the given index.
5. Write a Program to insert a roll no and student name in a database (use PostgreSQL data to create a database).
6. Write PHP script to demonstrate passing variables with cookies.
7. Implement Admin login/logout functionality and cookie wherever required.
8. Write a PHP script to connect MYSQL server from your web application. Write a PHP script to create and drop database.
9. Create database using phpMyAdmin. Write a program to read input data from table and display the information in tabular form.
10. Develop PHP application using forms and database.

Project Based Learning

1. Design personal website using HTML and CSS
2. Login page with user credentials and data base
3. Drawing palette based web page
4. Student registration form with data base connectivity
5. Dummy social networking website
6. Image editing using we page
7. Animation based website
8. Simple game website
9. Ecommerce website with data base connectivity
10. Any Complete web project with real time database connectivity
11. Login authentication
12. Design Survey Form
13. Quiz Game
14. Implement Employee Management System
15. Social Media Dashboard
16. Search Application
17. E-Commerce Website
18. Develop Freelance platform

19. Hospital Management System

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.

Program: B.TECH. (ELECTRICAL)

Semester - I

CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/ OR/ PR		
1		Partial differentiation and complex numbers	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Modern Physics	3	2	-	60	40	50	-	-	150	3	1	-	4
3		Electromagnetics and its applications	4	2	-	60	40	25	-	25	150	4	1	-	5
4		Solid State Devices & Electronic Circuits	4	2	-	60	40	25	-	25	150	4	1	-	5
5		Computer Architecture & Data Structures with C	4	2	-	60	40	25	25	-	150	4	1	-	5
6		Electrical Workshop Practices	-	4	-	-	-	50	-	-	50	-	2	-	2
Total			18	12	1	300	200	175	25	50	750	18	6	1	25

Program: B.TECH. (ELECTRICAL)

Semester - II

CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/ OR/ PR		
1		Mathematics for electrical engineering	4	-	1	60	40	-	-	-	100	4	-	1	5
2		Electro-Chemistry	3	2	-	60	40	50	-	-	150	3	1	-	4
3		Instrumentation & Measurements	4	2	-	60	40	25	-	25	150	4	1	-	5
4		Industrial Safety Practices	3	2	-	60	40	25	25	-	150	3	1	-	4
5		Object oriented programming with C++	4	2	-	60	40	25	-	25	150	4	1	-	5
6		Simulation & Programming	-	4	-	-	-	25	-	25	50	-	2	-	2
Total			18	12	1	300	200	150	25	75	750	18	6	1	25

Bharati Vidyapeeth Deemed to be University, Pune
Faculty of Engineering & Technology
Programme :B.Tech (Electrical Engineering) Sem – I (2021 Course)

Partial Differentiation and Complex Numbers		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours/Week	End Semester Examination : 60 Marks	Theory : - 03
Tutorial: 01 Hours/Week	Continuous Assessment: 40 Marks	Tutorial : - 01
		Total : - 04
Course Pre-requisites:		
The Students should have knowledge of		
	Basics of Complex number, derivatives and integration.	
Course Objectives:		
	To study	
	<ul style="list-style-type: none"> • Ordinary and partial differentiation. • Vector calculus and its applications. • Complex differentiation and integration. 	
Course Outcomes: Students will be able to		
1.	Understand methods of finding nth derivative of functions.	
2.	Understand methods of finding partial derivatives.	
3.	Understand the method of locating stationary points and value.	
4	Understand line, surface and volume integral.	
5	Understand the analytic functions.	
6	Understand methods of evaluating contour integration	
UNIT - I	Differential Calculus and Expansion Of Functions:	(06 Hours)
	Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem, Taylor's Series and Maclaurin's Series.	
UNIT - II	Partial Differentiation And Applications:	(06 Hours)
	Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.	
UNIT - III	Jacobian and Maxima And Minima:	(06 Hours)
	Jacobians and their applications, Chain Rule, Functional Dependence. Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.	
UNIT - IV	Vector Integral Calculus and Applications:	(06 Hours)
	Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problems in Fluid Mechanics, Continuity equations, Streamlines, Equations of motion, Bernoulli's equation.	
UNIT - V	Complex Variables:	(06 Hours)
	Function $f(z)$ of complex variable, limit, continuity and differentiability of $f(z)$, Analytic function, necessary and sufficient conditions for $f(z)$ to be analytic (without proof), Cauchy-Riemann equations in Cartesian coordinates (without proof) Milne-Thomson method to determine analytic function $f(z)$ when real part (u) or Imaginary part (v) or its combination ($u + v$ or $u-v$) is given, Harmonic function, Harmonic conjugate and orthogonal trajectories.	
UNIT - VI	Complex Integration:	(06 Hours)
	Line Integral, Cauchy's Integral theorem for simple connected and multiply connected regions (without proof), Cauchy's Integral formula (without proof). Taylor's and Laurent's series (without proof). Definition of Singularity, Zeroes, poles of $f(z)$, Residues, Cauchy's Residue Theorem (without proof).	
Project based learning:		
	<ol style="list-style-type: none"> 1. Finite order differentiation of standard functions 2. Leibnitz theorem 3. Errors and Approximation 4. Total derivative 5. Implicit functions 6. Maxima and minima for function of two variables 	

7. Lagrange method of Undetermined multipliers
8. Continuity Equation
9. Bernoulli's Equation
10. Harmonic function
11. Singularities
12. Cauchy Residue Theorem
13. Taylor's and Laurent's series
14. Green's lemma
15. Gauss divergence theorem
16. Stokes theorem
17. Orthogonal Trajectories
18. Analytic functions

Text Books:

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
2. Peter V. O'Neil Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
3. Michael Greenberg Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Modern Physics

Modern Physics		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination : 60 Marks	Theory : - 03
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical : - 01
	Term Work: 50 Marks	Total : - 04
Course Pre-requisites:		
The Students should have knowledge of		
	Basic understanding of Physics and Calculus.	
Course Objectives:		
	To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Electrical and Computational Engineering.	
Course Outcomes: Students will be able to		
1.	Interpret the electric and magnetic fields and apply the principles of Coulomb's Law and Gauss's law to electric fields in various coordinate systems.	
2.	Summarize the magnetism, different magnetic materials and its properties.	
3.	Explain mechanical properties of solid matter, and connect to applications in the field of engineering.	
4.	Interpret the properties of nucleus and apply it for socioeconomic purposes.	
5.	Interpret the superconductivity and perfect diamagnetism, and give a qualitative description of the Meissner effect and its applications.	
6.	Summarize the structure and properties of lasers to their performance and intended applications such as optical fiber in the field of communication.	
UNIT - I	Electromagnetic Theory:	(06 Hours)
	Introduction of Electrostatics: electric charge and electric field, electric potential, electric dipole, Gauss's law for electric field on integral form, Capacitors, electrostatic energy. Stationary electromagnetism: magnetic fields and flux density and magnetic forces, Ampere's law for B-field in integral form, Electromagnetic induction: Faraday's and Lenz' laws, self and mutual inductance.	
UNIT - II	Magnetism and Dielectric Materials:	(06 Hours)
	Origin of magnetism, Classification of magnetism on the basis of permeability (qualitative), Domain theory of ferromagnetism, Hard and soft magnetic materials, Dielectric parameter (Dielectric constant, Electric displacement, Polarization & Polarizability), Types of polarization and dielectric materials, temperature and frequency effect, Applications of magnetic devices: transformer cores, magnetic storage.	
UNIT - III	Solid State Physics:	(06 Hours)
	Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.	
UNIT - IV	Nuclear and Particle Physics:	(06 Hours)
	Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions (Stellar reaction), Merits and demerits of nuclear energy, Fundamental forces, Particle physics, Quark model, Neutrino properties and their detection.	
UNIT - V	Superconductivity:	(06 Hours)
	Introduction to superconductivity; Properties of superconductors: zero electrical resistance, critical fields, persistent current, Meissner effect- Type I and Type II superconductors, Low and high temperature superconductors (introduction and qualitative), AC/DC Josephson effect; SQUID: basic construction and principle of working, Applications of SQUID, Applications of superconductors.	
UNIT - VI	Laser and Fibre Optics:	(06 Hours)
	Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine,	

Computers). Principle of fibre optics, Construction, Numerical Aperture for step index fibre, critical angle, angle of acceptance, types of optical fibres, Fibre optic communication system, advantages and disadvantages of fibre optics.	
Term Work:	
The term work shall consist of record of minimum eight experiments from below list.	
1. Study of changing magnetic flux and induced current associated with Faraday's Law of Induction.	
2. Plotting the hysteresis loop for given magnetic material	
3. To study Hall effect and determine the Hall voltage	
4. Calculation of conductivity by four probe method	
5. Study of solar cell characteristics and calculation of fill factor	
6. Determination of band gap of semiconductor	
7. Determination of divergence of a laser beam	
8. Particle size by semiconductor laser	
9. Determination of wavelength of laser by diffraction grating	
Project based learning:	
1. Construction and application of heat sensor in process control	
2. Design and simulation of automatic solar powered time regulated water pumping	
3. Solar technology: an alternative source of energy for national development	
4. The study on the effect of length on the resistance of a copper wire (verification of ohms law r directly proportional to l)	
5. Possible effects of electromagnetic fields (emf) on human health	
6. Design and construction of digital distance measuring instrument	
7. Design and construction of remote control fan	
8. Design and construction of sound or clap activated alarm	
9. Electronic eye (Laser Security) as autoswitch/security system	
10. Electric power generation by road power	
11. Wireless power transfer	
12. Determination of velocity of O-ray and E-ray in different double refracting materials	
13. Small wind turbines as a source of electricity	
14. Tesla Coil	
15. LiFi- wireless data transfer system using light	
Text Books:	
1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)	
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)	
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)	
Reference Books:	
1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)	
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)	
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)	
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)	
5. Principles of Solid State Physics, H. V. Keer, New Age International (1993)	
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)	
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)	
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)	
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)	
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Electromagnetics And Its Applications

Electromagnetics And Its Applications		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS:</u>
Lectures: 04 Hours / Week	End Semester Examination: 60 Marks	Theory: 04
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25 Marks PR:25 Marks	Total: 05
Course Pre-requisites:		
1. Students should have basic knowledge of physics i.e. electrical energy and power, magnetism, electrostatics, magnetic materials, magnetic fields, electromagnetic theory etc.		
2. Students should have basic knowledge of mathematics i.e. trigonometric functions, matrices, complex numbers, differentiation and integration, vectors etc.		
Course objectives:		
To introduce fundamental concepts of DC Circuit Analysis and Network Theorems, Magnetic circuit and Electromagnetic Induction, AC Fundamentals & Single-Phase AC Circuits, Three Phase AC Circuits, Transformer, Performance and testing of transformer.		
Course Outcomes:		
The students will be able to		
1.	Evaluate D.C. circuits using network theorems.	
2.	Understand theory of electromagnetic induction.	
3.	Describe and estimate single-phase A.C. circuits.	
4.	Analyze and evaluate three-phase A.C. circuits.	
5.	Illustrate constructional features and describe different parameters of transformer.	
6.	Identify and analyze performance of transformer.	
Topics covered		
UNIT - I	DC Circuit Analysis and Network Theorems: Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, KCL and KVL, Super node and Super mesh analysis, Network reduction using series-parallel and star-delta transformation, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem. (Simple numerical problems).	(08 Hours)
UNIT - II	Magnetic circuit and Electromagnetic Induction Magnetic Circuit: flux, flux density, field strength, analogy between electric & magnetic circuits, Right hand thumb rule, magnetic leakage, B-H curve, Magnetic hysteresis, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling, Series and parallel magnetic circuit and simple numericals. Electromagnetic Induction: Faraday's Law of EMI, Statically and dynamically induced emf, Lenz's Law, Self-Inductance, Coefficient of Self-inductance (L), Mutual inductance, Coefficient of Mutual inductance (M), Sign and dot convention, self-induced EMF and mutually induced EMF, Coefficient of Coupling, Inductance, Energy Stored in Magnetic Field. (Simple numerical problems).	(08 Hours)
UNIT - III	AC Fundamentals & Single-Phase AC Circuits: AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, (simple numerical problems).	(08 Hours)
UNIT -IV	Three Phase AC Circuits: Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, 3-ph balanced AC Circuits, three-phase power and its measurement (simple numerical problems).	(08 Hours)
UNIT-V	Transformer: Single phase transformer: construction, principle of operation, equivalent circuit, phasor diagram, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Concept of ideal transformer. Three phase transformers: Introduction, Three phase transformer connections, Auto-transformer. Welding transformer.	(08 Hours)
UNIT-VI	Performance and testing of transformer Transformer on no load, Transformer on load, Efficiency of transformer, Condition for maximum efficiency, All-day efficiency, Parallel operation of single-phase transformers, Parallel operation of	(08 Hours)

	three-phase transformers. (simple numerical problems).	
	Transformers tests:Open circuit or No-load test, Separation of core losses,Short circuit or impedance test, Regulation of transformer, Sumpner or Back-to-back test. Determination of Efficiency & Regulation by direct load test.	

List of Practical's to be performed in the laboratory:

1.	Plotting B-H characteristics for a material.
2.	Verification of Kirchhoff's Laws.
3.	Verification of Superposition Theorem.
4.	Verification of Thevenin's Theorem.
5.	Verification of Maximum Power Transfer Theorem.
6.	Identify performance of R-L series, R-C series, R-L-C series circuit.
7.	Identify performance R-L-C parallel circuit.
8.	Verification of voltage and current relationships in star and delta connected 3-phase networks.
9.	Open circuit or No-load test on transformer.
10.	Direct loading test on single phase transformer.
11.	Sumpner or Back-to-back test on transformer.
12.	Determination of Efficiency & Regulation by direct load test.

Note:The term work shall be the record of minimum eight experiments performed from the above list.

Project based learning: Student shall demonstrate minimum one concept based on syllabus topic.

1.	Demonstration of principle of electromagnetism & it's applications.
2.	Study and understand practical specifications of transformer.
3.	Demonstration of phenomenon of electromagnetic induction.
4.	Demonstration of electromagnetism and its applications by using professional software tool.
5.	Home automation system using IoT
6.	Smart Energy meter using GSM
7.	Solar and Smart energy systems
8.	Automatic Solar Tracker
9.	PCB Manufacturing
10.	Smart Calling Bell
11.	Wireless Power transmission
12.	Gas Leakage Detector
13.	Fire detection system 10. Smart Traffic Lighting System
14.	Home automation system using IoT

Note:The term work shall be the record of minimum eight experiments performed from the above list.

Reference Books:

1.	Electrical Technology - Edward Huges (Pearson)
2.	Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
3.	Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
4.	Principles of Electronics-Dr. H. M. Rai (SatyaPrakashan)
5.	Electronic Devices and Circuit Theory- R. L. Boylestad and L. Nashelsky (PHI)
6.	Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)
7.	Principles of Communication Engineering - Anokh Singh, A. K. Chhabra (S Chand)
8.	A Textbook of Electrical Technology Volume- I, -B.L.Theraja.S.Chand and Company Ltd., New Delhi
9.	A Textbook of Electrical Technology Volume- II, -B.L.Theraja.S.Chand and Company Ltd., New Delhi
10.	Basic Electrical Engineering-V.K.Mehta,Rohit Mehta,S.Chand and Company Pvt Ltd., New Delhi
11.	Electromagnetics and Applications-David H. Staelin, Department of Electrical Engineering and Computer Science Massachusetts Institute of Technology Cambridge, MA(2011)

Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Solid State Devices & Electronic Circuits

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hrs/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25 Marks PR: 25 Marks	Total: 05

Course Pre-requisites:

The Students should have knowledge of

- | | |
|----|--|
| 1. | Fundamentals of Electrical Engineering |
| 2. | Fundamentals of semiconductor physics. |

Course Objectives:

- | | |
|--|---|
| | 1. To study different solid state electronics devices and various electronic systems using these devices and understand the principle of electronic circuits. |
|--|---|

Course Outcomes: After learning this course students will be able to

- | | |
|---|--|
| 1 | Explaining the basic semiconductor devices. |
| 2 | Illustrate active and passive filters. |
| 3 | Explaining about amplifiers and oscillators |
| 4 | Outlining operational amplifiers |
| 5 | Apply amplifiers for creating generalized linear applications. |
| 6 | Illustrating specialized IC applications. |

UNIT - I	Review of semiconductor devices	(08 Hours)
	Rectifier diode Zener diode, Tunnel diode, Schottky diode, LED, PIN diode, photodiode, SCR, TRIAC their symbol, construction, principle of operation characteristics, specifications, mathematical equations and applications. BJT-CE, CB, CC configurations, BJT biasing, FET-biasing, MOSFET biasing, Difference between BJT and FET , Basics of NMOS,PMOS, CMOS. Concept of Device modeling. World wide main manufacturers of various solid state devices.	
UNIT - II	Active & Passive filters	(08 Hours)
	Working of C, L, PI filters, Types of filters: low pass filter, high pass filter, band pass filter , band stop filter, band reject filter, all pass filter. Difference between active and passive filters. Advantages and applications of active and passive filters. Voltage regulators, types and working principle, Block diagram of Regulated DC power supply- Types- Operation of Zener diode voltage regulator, Transistor series voltage regulator, Comparison of series and shunt voltage regulator, use of negative feedback, block diagram and working of SMPS.	
UNIT -III	Amplifiers and oscillators	(08 Hours)
	Frequency response of BJT and MOSFET amplifier. Single stage Transistor amplifier-load line analysis, voltage gain, classification of amplifiers, amplifier equivalent circuit. Multi-stage Transistor Amplifier-RC coupled transistor amplifier, Transformer and direct coupled amplifiers, comparison of different types of coupling. Transistor audio power amplifiers, difference between voltage and power amplifier, classification of power amplifier. Amplifiers with negative feedback. Sinusoidal Oscillators- LC tank circuit, various of types and circuits of Oscillators such as, Hartely oscillator. Phase shift oscillator-Wien bridge oscillator.	
UNIT -IV	Operational Amplifier	(08 Hours)
	Concept of virtual short, The ideal Op-amp, equivalent circuit of Op-amp, ideal voltage transfer curve, open loop Op-amp amplifier configurations-The differential amplifier, The inverting amplifier, The non-inverting amplifier. OP-amp parameters, Block diagram representation of feedback configurations-voltage series feedback amplifier, voltage shunt feedback amplifier, differential amplifiers, Frequency response, high frequency Op-amp, Op-amp as adder and subtractor. Various Op-amp ICs and their manufacturers.	
UNIT - V	General Linear Applications	(08 Hours)
	DC and AC amplifiers, AC amplifier with single supply voltage, The peaking amplifier, Summing, Scaling and averaging amplifiers, Inverting configuration, Non-inverting configuration, Differential	

	configuration, instrumentation amplifiers, logarithmic amplifier, voltage to current converter, current to voltage converter, the integrator, the differentiator, comparators and oscillators. Schmitt trigger circuit, Electrical applications of linear circuits Concept of amplifier against step up transformer in electrical engineering. , Role of solid state devices in electrical engineering.	
UNIT -VI	Specialized IC application	(08 Hours)
	The 555 timer as monostable, astable multivibrantor, applications of monostable and astable multivibrator phase locked loops operating principle , 565 PLL applications, Power amplifiers – power amplifiers using power busters, monolithic power amplifier, voltage regulators –fixed, adjustable, switching and special voltage regulator and commonly ICs used in each type. Various manufacturers and cost of commonly used regulators and timer ICs.	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
1. Study of JFET drain and transfer characteristics.		
2. JFET biasing arrangement Graphical method		
3 Build and Test JFET CS amplifier.		
4 Find performance parameters for JFET amplifier - A_v , R_i , R_o		
5 Simulation of JFET CS amplifier using multisim/spice.		
6 Find performance parameters for JFET amplifier - A_v , R_i , R_o and compare with theoretical and practical results.		
7 Input and Output Characteristics of BJT CE configuration. Find h-parameters from characteristics.		
8 Build and Test BJT in CE amplifier and find performance parameters - A_v , R_i , R_o , A_i		
9 Simulation of BJT CE amplifier using multisim/spice		
10 Study of MOSFET drain and transfer characteristics		
11 Voltage follower by Op-amp.		
12 Inverting amplifier by Op-amp.		
13 Non-inverting amplifier by Op-amp.		
14 Summing amplifier by Op-amp.		
15 Difference amplifier by Op-amp.		
16 Study of any five ICs studied in the subject – relevant diagrams, costing, various configurations, manufacturers, main specifications and introduction of their data sheet.		
17 Self arranged industrial visit to any electronics industry and report writing on same.		
18 Attending seminar session / IEEE conference session/ local conference session/webinar/ talks by any electronics related expert and writing report on same		
Project Based Learning:		
1.Simple LED blinking block.		
2.Simulation of logic gates.		
3.Study of automatic light control.		
4.Design of half wave rectifier (simulation or hardware).		
5. Regulated power supply.		
6.Circuit designing , simulation and electrical parameter measurement.		
7. Application of transistor as a switch.		
8.Study of JFET characteristics using software simulation.		
9. Application of MOSFET as switch.		
10.Application of Op-amp as non-inverting amplifier		
11.Design of inverting amplifier.		
12. Design of non-inverting amplifier.		
13. Design of Op-amp as adder.		
14. Design of Op-amp as subtractor.		
15 Design of Op-amp as difference amplifier.		
Text Books:		
1. Neamen- Semiconductor Physics and DevicesTMH		
2. Bhattacharya & Sharma- Solid State Electronic Devices-Oxford		
3. Maini & Agrawal- Electronics Devices and Circuits-Wiley		
4. Principles of Electronics- V.K.Mehta. S. Chand & Company Limited.		
5. OP-Amps & Linear Integrated Circuits- Ramakant A. Gayakwad		
6. Opearational amplifiers by D.Roychaudhari		

Reference Books:

1. Milman, Halkias & Jit- Electronics Devices and Circuits-TMH
2. Bell-Electronics Devices and Circuits-Oxford
3. Singh & Singh-Electronics Devices and Integrated Circuits-PHI
4. Bogart, Bisley & Rice-Electronics Devices and Circuits-Pearson
5. Kasap-Principles of Electronic Materials and Devices-TMH
6. Boylestad & Nashelsky- Electronics Devices and Circuit Theory-Pearson
7. Salivahanan, Kumar & Vallavaraj- Electronics Devices and Circuits-TMH

Unit Tests:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Computer Architecture & Data Structures with C

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours/Week	End Semester Examination: 60 Marks	Theory: 04
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25 Marks & OR: 25 Marks	Total: 05

Course Pre-requisites:

The Students should have knowledge of

Computer System, Applications of Computers and Computer operations.

Course Objectives:

To learn the basic structure and operations of a computer.
Understand and memory and I/O organization of a typical computer system.
Understand the basics and applications of Data Structure.

Course Outcomes: After learning this course students will be able to

1	Explain the basic structure of Computer system and its operation
2	Illustration of Computer Processor and Control Unit
3	Identify Parallelism and Memory Organization
4	Identify the basics of C Programming
5	Discuss the concept of Data Structures
6	Study of Linear and Non Linear Data Structure

UNIT – I	Basic Structure of Computer System	(08 Hours)
	Computational model, Evolution of computer architecture, Functional Units- Basic Operational Concepts, Performance, Instructions: Language of the Computer, Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.	
UNIT - II	Processor and Control Unit	(08 Hours)
	A Basic MIPS implementation - Building a Datapath - Control Implementation Scheme - Pipelining - Pipelined datapath and control - Handling Data Hazards & Control Hazards - Exceptions.	
UNIT -III	Parallelism and Memory Organization	(08 Hours)
	Parallel processing challenges – Flynn’s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors. Memory Hierarchy - memory technologies - cache memory - measuring and improving cache performance - virtual memory, TLB’s - Accessing I/O Devices - Interrupts - Direct Memory Access - Bus structure - Bus operation - Arbitration - Interface circuits - USB.	
UNIT -IV	C Programming basics	(08 Hours)
	Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.	
UNIT - V	Functions, Pointers, Structures And Unions	(08 Hours)
	Functions – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic. Structures and unions – definition – Structure within a structure – Union – Programs using structures and Unions – Storage classes, Pre-processor directives.	
UNIT -VI	Linear and Non Linear Data Structure	(08 Hours)
	Arrays and its representations – Stacks and Queues – Linked lists – Linked list-based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition. Trees – Binary Trees – Binary tree representation and traversals – Binary Search Trees – Applications of trees. Set representations – Union-Find operations. Graph and its representations – Graph Traversals.	

Term Work:	
The term work shall consist of record of minimum eight experiments.	
<ol style="list-style-type: none"> 1. Study of peripherals, components of a Computer System 2. Study of Binary and Decimal Inter-Conversion system. 3. Study of Binary Addition 4. Study of Binary Subtraction. 5. Study Booth's Multiplication algorithm 6. Study of Restoring Division 7. Study of Non Restoring Division Algorithm 8. Study of Logisim Tool. 9. Realization of the basic logic and universal gates 10. Design of half-adder circuit using basic gates 11. Design of full-adder circuit using basic gates. 12. Program to create & manipulate database using structure 13. Program to add two polynomial using array of structure. 14. Program to implement primitive operation on Sequential file. 15. Program to search for record from a given list of records stored in array using i) Linear search ii) Binary search 16. Program to sort an array of names using i) Bubble sort ii) Insertion sort iii) Quick sort 	
Project based learning:	
<ol style="list-style-type: none"> 1) Development of Phone Book Application in C 2) Development of Temperature Conversion Table 3) Study of Mother Board components. 4) C- Programming experiments 5) Write a C program to add, subtract multiply and divide two non-zero numbers. 6) Write a C program to print all odd numbers from 1 to 100 using for loop and even numbers using while loop. 7) Write a C program to create a menu of math operations using switch case and do-while loop. The program should input 1-2 numbers and give options like square, cube, exponent (x^y or y^x), multiply, divide. ensure non zero numbers. 8) Write a C program to copy all numbers in an array to another array in reverse order and display the result. 9) Write a C program to find the factorial of a given number using recursive function. 10) Write a C program to reverse the string(in the same space) and print the resultant string. Make use of pointers. 11) Project work (Options) : 12) Phonebook application (Non persistent) 13) Temperature conversion table (-50C to 150C) 14) Customer billing system. 15) Bus/ Airplane seat reservation system. 	
Text Books:	
1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann / Elsevier, 2009.	
2. PradipDey and Manas Ghosh, —Programming in C, Second Edition, Oxford University Press, 2011.	
3. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008.	
Reference Books:	
1. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.	
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.	
3. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.	
4. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.	
5. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996	
Unit Tests:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Electrical Workshop Practices		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: - NA	End Semester Examination: - NA	NA
Practical: 04 Hours / Week	Continuous Assessment: -	
	TW: 50 Marks	02 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Basic concepts of electrical engineering.	
Course Objectives:		
	1. To make the students familiar with construction, working and maintenance of electrical appliances in daily use	
	2. To prepare students for working on different hardware projects by developing hardware skills.	
Course Outcomes:		
After successful completion of this course, student will be able to		
1.	Understand the use of electrical safety devices	
2.	Understand the working of electrical tools and their applications	
3.	Understand various electrical accessories and their applications	
4	Undertsand various types of wiring and luminaries.	
5	Undertsand overhauling of a motor / generator	
6	Undertsand electric vehicle, various motors and batteries	
Instructions:		
	<ul style="list-style-type: none"> • Term work shall consist of reports for minimum five exercises. • The exercise must be carried out in a group of maximum 4 students. • Students should write the procedure, observations and conclusion in the form of report which will be evaluated for term work. 	
Content		
I	Electrical Safety Devices and methods awareness Various safety devices for protection of electrical installation, earthing rods, megger, insulation tester, etc. Various safety devices used for first aid and electric fire hazards. Artificial respiration. Electrical safety devices for working on over head lines, inspection of overhead lines with drones, thermal camera Operation of safety equipment, Operation of fire equipment, high voltage maintenance uniform, maintenance with drones and helicopters	
II	Study of Electrical tools Acquaintance of various tools for wiring such as wire stripper, bearing puller, hand drilling machine, pliers etc. and various electrical measuring instruments such as digital and analogue multi-meter, ammeters, voltmeters, wattmeter, frequency meters, phase sequence meters, tong tester, etc. Study of various tools for wiring such as wire stripper, bearing puller, hand drilling machine, pliers etc Study of various electrical measuring equipment such as digital and analogue multi-meter, ammeters, voltmeters, wattmeter, frequency meters, phase sequence meters, tong tester, megger, test lamp, insulation tester, earthing rods, thermal camera etc. Bread board assembly and general-purpose PCB soldering and de-soldering Dismantling and assembly of switchgears in simple electrical installations. Development of hardware kit for DC circuit and network theorems. Development of combined $\pm 12V$, $\pm 5V$ regulated power supply. Development of mobile charger Development of extension board Cable jointing and termination kit	
III	Electrical accessories Soldering kit. s electrical power supplying equipments), Wiring of distribution box . contactors, with wiring. distribution box with MCB, ELCB, RCCB and MCCB. Assembly of star delta starter, autotransformer starter, DOL and 3 point starter with NVC connections and overload operation. Energy meter, Soft starters switches, various sensors temperature sensors, pressure sensors, speed sensors, moisture sensors, humidity sensors, various types of anemometers, solar panel concept of electrical supply ac supply, dc supply, three phase ac supply, electricity bill Electrical components and materials Types of cables, Cable jointing and termination kit, wires, light sources, resistors, capacitors, inductors. transformer, variac, d.c.power supply, insulators, insulating and conducting materials, Gang operated device	

IV	Wiring and luminaries Batten wiring, plastic casing and capping wiring, wooden casing and capping wiring, cleat wiring, conduit wiring, concealed conduit wiring, Wiring of 40 W fluorescent lamp Halogen lamp, sodium vapor lamp, LED lamp, Metal Halide lamps, mercury lamp
V	Overhauling of a motor / generator (hands on experience) Induction motor, synchronous motor, brushless DC motor, dc motor, single phase, three phase Motor rewinding Design and fabrication of reactor/ electromagnet for different inductance values. Design and fabrication of single phase Induction motor / three phase induction motor / alternator,
VI	Electric vehicle and batteries Brushless DC motor, Reluctance motor, Synchronous reluctance motor Harness wiring, Maintenance of electric vehicle, Battery management system
VII	Electric motors <ol style="list-style-type: none"> 1. Dismantle and assemble any available electric motor from above list 2. Removing the old winding of motor 3. Familiarity with rewinding machine 4. Rewinding of electric motor. 5. Maintenance of motor for different faults.
VIII	Domestic appliances for Heating purpose - Water heater, Geyser, Room heater, Electric iron, Oven, Microwave oven <ol style="list-style-type: none"> 1. Maintenance of water heater, 2. Maintenance of Geyser 3. Maintenance of room heater for different faults. 4. Dismantle and assemble the electric iron. 5. Maintenance of electric iron for different faults. 6. Maintenance of oven 7. Maintenance of microwave oven Domestic appliances for Cooling purpose - Refrigerator, Air conditioner <ol style="list-style-type: none"> 1. Maintenance of refrigerator 2. Maintenance of water cooler 3. Check and replace thermostat and relay of refrigerator. 4. Maintenance of window air conditioner 5. Split air conditioner 6. Central air conditioning system Domestic appliances using Motors - Mixer, Grinder Washing machine, ceiling fan, table fan, blower fan, water pump <ol style="list-style-type: none"> 1. Dismantle and assemble the ceiling fan. 2. Dismantle and assemble the table fan. 3. Dismantle and assemble the blower fan. 4. Connection of table and ceiling fans with regulators. 5. Maintenance of ceiling and table fan for different faults 6. Testing of different parts of washing machine. 7. Preventive Maintenance and maintenance of of water pump, 8. Preventive Maintenance and maintenance of washing machine for different faults. 9. Dismantle and reassemble mixer and grinder. 10. Check and replace thermostat and relay of refrigerator. 11. Check the internal connections and identify the fault in microwave oven. 12. Maintenance of refrigerator for different faults. 13. Maintenance of oven for different faults. 14. Maintenance of mixer and grinder for different faults. Domestic appliances for Energy storage - SMPS, UPS <ol style="list-style-type: none"> 1. Practical study of SMPS. 2. Practical study of UPS. 6. Practical study of home inverter.
IX	Electrical workshop visit Study of trouble shooting of electrical equipment based on actual visit to repair workshop.
	List of experiments / jobs to be prepared by students Note : -List of practicals / jobs is not restricted to following topics. Faculty can add new experiment / job related to subject to encourage project based learning. <ol style="list-style-type: none"> 7. Students have to prepare any one job from each group of the given list
	Group 1 wiring and cables

	<ol style="list-style-type: none"> 1. Prepare a batten wiring sample 2. Prepare conduit wiring sample 3. Staircase wiring model 4. Go down wiring model 5. Drawing cross sectional view of different types of cables. <p>Group 2 Rewinding</p> <ol style="list-style-type: none"> 6. Rewinding of choke 7. Manufacturing small transformer <p>Group 3 Renewable Generation</p> <ol style="list-style-type: none"> 8. Preparation of kit for application of small solar panel 9. manufacturing of small horizontal axis wind turbine model 10. manufacturing of small vertical axis wind turbine model <p>Group 4 maintenance of home appliance</p> <ol style="list-style-type: none"> 11. Maintenance of Ceiling fan 12. Maintenance of table fan <p>Group 5 laboratory equipment maintenance</p> <ol style="list-style-type: none"> 13. Maintenance of dimmerstat 14. Dismantle and assemble any available electric motor from above list 15. Study of electricity bill, computation of electricity bill for home for given load 16. Study of specification of all electrical equipment like motors, , generator, transformer, appliances <p>Group 6 charger and battery</p> <ol style="list-style-type: none"> 17. Power supply for charging mobile phones 18. Energy audit preliminary energy audit of any industry 19. Maintenance of battery lead acid battery. Keep level of acid in the lead acid battery using distilled water <p>20. Group 6 load bank and earth resistance</p> <ol style="list-style-type: none"> 21. Preparation of lamp bank with facility of different types of connections 22. Preparation of inductive lamp with facility of different types of connections 23. Preparation of 3 phase Capacitive bank 24. preparation of bridge rectifier using bread board 25. Measurement of earth resistance with earth tester for different types of soils like sand dry soil, wet soil <p>Group 7 maintenance of electrical accessories</p> <ol style="list-style-type: none"> 26. Development of small solar pumping system model 27. Dismantling and assembly of relay 28. Dismantling and assembly of contactor 29. Development of extension board <p>Group 9 industrial visit</p> <ol style="list-style-type: none"> 8. Industrial visit cable manufacturing plant/ transformer manufacturing plant
	<p>Project based learning:</p> <ol style="list-style-type: none"> 1. Prepare a batten wiring sample 2. Prepare conduit wiring sample 3. Rewinding of choke 4. Manufacturing small transformer 5. Preparation of kit for application of small solar panel 6. Industrial visit cable manufacturing plant/ transformer manufacturing plant 7. Maintenance of Ceiling fan 8. Maintenance of table fan 9. Maintenance of dimmerstat 10. Dismantle and assemble any available electric motor from above list 11. Staircase wiring model 12. Go down wiring model 13. Study of electricity bill, computation of electricity bill for home for given load 14. Measurement of earth resistance with earth tester for different types of soils like sand dry soil, wet soil 15. Power supply for charging mobile phones 16. Energy audit preliminary energy audit of any industry 17. Maintenance of battery lead acid battery. Keep level of acid in the lead acid battery using distilled water 18. Preparation of lamp bank with facility of different types of connections 19. Preparation of inductive lamp with facility of different types of connections 20. preparation of bridge rectifier using bread board 21. manufacturing of small horizontal axis wind turbine model 22. manufacturing of small vertical axis wind turbine model

	23. Development of small solar pumping system model 24. Dismantling and assembly of relay 25. Dismantling and assembly of contactor 26. Development of extension board 27. Study of specification of all electrical equipment like motors, , generator, transformer, appliances 28. Drawing cross sectional view of different types of cables.
	1. Reference Books:
	2. S. Rao, Testing Commissioning Operation and Maintenance of Electrical Equipment, Khanna publishers.
	3. S. K. Shastri – Preventive Maintenance of Electrical Apparatus – Katson Publication House.
	4. B. V. S. Rao – Operation and Maintenance of Electrical Equipment – Asia Publication.
	5. S. L. Uppal, Electrical Wiring and Costing Estimation, Khanna Publishers, New Delhi.
	6. Surjit Singh, Electrical wiring, Estimation and Costing, Dhanpat Rai and company, New Delhi.
	7. Raina K.B. and Bhattacharya S.K., Electrical Design, Estimating and Costing, Tata McGraw Hill, New Delhi
	8. Hand book of condition monitoring by B. K. N. Rao, Elsevier Advance Tech., Oxford (UK).
	9. B.L.Theraja,A.K.Theraja , “Electrical Technology”, Vol-II, S.Chand publication.
	10. A.K.Sawhney, “A Course in Electrical and Electronic measurements and Instrumentation”, Dhanpat Rai publication.
	11. Uppal , Electricl estimation and costing
	12. Arora, Electrical estimation and costing

Bharati Vidyapeeth Deemed to be University, Pune
Faculty of Engineering & Technology
Programme :B.Tech (Electrical Engineering) Sem – II (2021 Course)

Mathematics for Electrical Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours/Week	End Semester Examination : 60 Marks	Theory : - 04
Tutorial: 01 Hours/Week	Continuous Assessment: 40 Marks	Tutorial : - 01
		Total : - 05

Course Pre-requisites:

The Students should have knowledge of

Algebra of matrices, probability and numerical methods for algebraic equations.

Course Objectives:

To study

- Rank of matrix and test consistency of system of linear equations.
- Fourier series and Fourier transform technique.
- Finite difference methods, probability theory and graph theory.

Course Outcomes: Students will be able to

1. Understand rank of matrix and test consistency of system of linear equations.
2. Understand to represent periodic function as Fourier series.
3. Understand the methods to find Fourier and Z transform.
4. Understand various numerical technique for ordinary and partial differential equation..
5. Understand the hypothesis techniques.
6. Understand the concept of graph and its applications of tree.

UNIT - I	Linear Algebra: Matrices:	(08 Hours)
	Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering	
UNIT - II	Fourier Series and its applications:	(08 Hours)
	Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis	
UNIT - III	Fourier Transform and Z-Transform:	(08 Hours)
	Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations	
UNIT - IV	Finite Difference Methods:	(08 Hours)
	Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.	
UNIT - V	Probability and Probability Distributions:	(08 Hours)
	Probability, Bayes Theorem, Probability density function, Probability distributions: Binomial, Poisson, Normal, Test of hypothesis: Chi-square test, t-test.	
UNIT - VI	Graph theory:	(08 Hours)
	Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity, Euler and Hamilton paths, planar graphs, graph coloring, introduction to trees, application of trees.	

Project based learning:

1. Eigen values and Eigen vectors
2. Cayley Hamilton theorem
3. System of linear equations
4. Fourier Series
5. Harmonic Analysis
6. Wave equation
7. One Dimensional Heat Equation
8. Two Dimensional Heat Equation

9. Coefficient of variation
10. Reliability of regression estimates
11. Chi square test
12. Theoretical probability distribution
13. Bayes theorem
14. Isomorphism of graphs
15. Coloring of graphs
16. Planer graph

Text Books:

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42th Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
2. Peter V. O'Neil Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
3. Michael Greenberg Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Electro-Chemistry

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours/Week	End Semester Examination : 60 Marks	Theory : - 03
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks	Practical : - 01
	Term Work: 50 Marks	Total : - 04

Course Pre-requisites:

The Students should have knowledge of

Basic understanding of Chemistry, Electrochemical series, Electrode potential, Primary and secondary cells.
Definition of corrosion, Terms related Nano-science.

Course Objectives:

- To develop the interest among the students regarding chemistry and their applications in engineering.
- To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
- The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the field such as Electrical Engineering.

Course Outcomes: Students will be able to

1. Understand the concept of the battery with its applications.
2. Understand different types of Hydrogen storage systems for various engineering applications.
3. Understand and apply the knowledge of Processes of nanotechnology.
4. Apply the knowledge of industrial chemical process to study process instrumentation with safety.
5. Understand types of corrosion control measures for various engineering applications.
6. Understand importance of Green Chemistry for Clean Technology.

UNIT - I	Battery and its Types:	(06 Hours)
	Introduction, Batteries and Battery Technology- characteristics, specifications and applications, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Lead acid battery, Coin Cell Batteries, Ni-Cd Batteries, Ni-MH Batteries, Li-Ion Batteries, Li-Po Batteries. Basic Maintenance of Batteries.	
UNIT - II	Energy Storage Systems:	(06 Hours)
	Introduction, Fuel cell, Types and Examples of Fuel Cells, Applications and limitations of Fuel Cells, Flywheel energy storage system. Hydrogen storage with types and reactions:- Physical storage- Metal Hydride and Carbon nano-fibers; Chemical storage :- Sodium boro-hydride and Alkali metal hydrides.	
UNIT - III	Nano-Science and Technology:	(06 Hours)
	Introduction, Nanotechnology applications -Energy sector:- Nano-batteries, Wind power generations – nano-generators, Solar paints or photovoltaic paints – can replace solar panels and Electronic sector:- Nano-RAM etc. Material self assembly, Molecular Vs material self assembly, Self assembling materials, Two dimension assemblies, Meso-scale self assembly (MESA), Coercing colloids, Processes of nanotechnology, Processes used in bottom up approach [sol-gel processing, chemical vapor deposition (CVD), plasma or flame spraying synthesis, laser pyrolysis] Nano-material, Nano-crystals,/Nano-particles, Nanostructure.	
UNIT - IV	Industrial Chemical Process:	(06 Hours)
	Introduction, classification of chemical industries, material of construction and selection of materials, process instrumentation, safety, fire protection and waste disposal, Electro-thermal industries: Introduction, classification and advantages of electric furnace.	
UNIT - V	Protective Coatings:	(06 Hours)
	Introduction, Metallic coatings, Hot dipping :- Galvanising and Tinning Anodizing, Electroplating, Methods of cleaning articles before electro-deposition, Electroplating methods, Electro-less plating, Some other metallic coatings, applications of protective coatings in electrical industry, Chemical conversion coatings, Organic Coatings, Paints, Varnishes, Enamels, Special paints.	
UNIT - VI	Green Chemistry for Clean Technology:	(06 Hours)
	Introduction, Twelve Principles of Green chemistry, Efficiency parameters of reactions, numerical on atom economy, Synthesis by using Traditional and Green pathway for Adipic acid and Indigo, Disadvantages and Advantages related to synthesis method, Green solvents (Ionic liquid supercritical	

	CO ₂) and products from natural materials.	
Term Work:		
The term work shall consist of record of all eight experiments from below list.		
1.	Variation of cell potential in Zn/Zn ²⁺ Cu ²⁺ /Cu with change in concentration of electrolytes (CuSO ₄ or ZnSO ₄) at room temperature.	
2.	Setting of a Galvanic Cell and determination of cell voltage.	
3.	Synthesis of Ni-SiO ₂ nano-composites by Sol-Gel technique.	
4.	To obtain metallic coating on base metal by using the methods, Electroplating and Electro-less plating.	
5.	Determination of rate of corrosion of aluminium in acidic and basic medium.	
6.	Preparation of Grignard Reagent with A Greener Alternative.	
7.	To coat copper and zinc on iron plate using electroplating.	
8.	Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nano-particles.	
Project based learning: Students have to complete any six assignments from the list given below:		
1.	Assignment on Acid and Alkaline Storage Battery, Dry Cell and Lead acid battery.	
2.	Assignment on Hydrogen storage with types and reactions.	
3.	Assignment on Processes used in bottom up approach.	
4.	Assignment on material of construction and selection of materials in Industrial chemical process.	
5.	Assignment on Coin Cell Batteries, Ni-Cd Batteries and Ni-MH Batteries.	
6.	Assignment on Molecular Vs material self assembly.	
7.	Assignment on Organic Coatings, Paints, Varnishes, Enamels, Special paints for corrosion prevention.	
8.	Assignment on types of Hot dipping :- Galvanising and Tining.	
9.	Assignment on Green solvents and products from natural materials.	
10.	Assignment on Synthesis by using Traditional and Green pathway for Adipic acid and Indigo.	
Text Books:		
1.	Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 1992.Jain P.C & Jain Monica	
2.	Introduction to Nanotechnology, C. P. Poole Jr. , F. J. Owens, Wiley Interscience, 2003	
3.	Nanotechnology Science, Innovation and Opportunity, L. E. Foster, Pearson Education, 2007	
4.	Engineering Chemistry- Fundamentals and applications, Cambridge Publishers - 2015.Shikha Agarwal	
5.	A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004	
Reference Books:		
1.	Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013	
2.	Austin G.T, Shreve's "Chemical Process Industries", 5th ed., McGraw Hill [1984]	
3.	Faith W.L., K., Keyes D.B. and Clark R.L., "Industrial Chemicals" John Wiley [1975]	
4.	Environmental Chemistry – A. K. De, 5th Edition (New age international publishers)	
5.	Environmental Chemistry with Green Chemistry A. K Das , Books and Allied (P) Ltd	
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Instrumentation and Measurements		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours/Week	End Semester Examination: 60 Marks	Theory: 04
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25 Marks PR: 25 Marks	Total: 05
Course Pre-requisites:		
The Student should have knowledge of		
1.	Basic electrical Engineering Parameters such as Voltage, Current, Power, Energy, etc.	
Course Objectives:		
	This course introduces knowledge about electrical measurements and instrumentation. The course is designed to learn different methods of measurements of various electrical parameters and also to learn the different physical parameters with the help of the various measurement and instrumentation techniques.	
Course Outcomes: After learning this course students will be able to		
1	Explain the importance of measurement and able to find the resistance, inductance and capacitance using various methods.	
2	Explain the construction, working principle of wattmeter and Energy meter and apply the knowledge to measure the power and energy.	
3	Draw block diagram, state specifications, functions of various digital/automated meters, harmonic analyzer. Observe the waveforms and measure the voltage, current, phase and frequency on CRO and to use DSO.	
4	Define, classify transducers and measure the displacement, level and flow using various methods.	
5	Explain principle of operation, characteristics of Pressure, temperature, velocity transducers and different methods of measurement.	
6	Illustrate and explain types of display devices and recorders.	
UNIT – I	Measurement of circuit parameters	(08 Hours)
	<p>Introduction: Classification of measuring instruments, Static characteristics: Error in measurements, sources of error. Dynamic characteristics: standard. Instrument transformers.</p> <p>Measurement of Resistance – Classification of resistances, Measurement of medium resistance – Ammeter-voltmeter method, Wheatstone bridge. Measurement of Low resistance – Kelvin Double bridge. Measurement of high resistance – difficulties, use of guard circuit, Methods: direct deflection, loss of charge, Megger. Measurement of earth resistance – Fall of potential method, earth tester. Localization of cable faults.</p> <p>Measurement of Inductance and Capacitance</p> <p>AC Bridges: Introduction, sources and detectors for ac bridge, general equation for bridge balance. General form of ac bridge. Measurement of Inductance: Maxwell’s Inductance, Hay’s bridge, Anderson’s Bridge, Owen’s bridge.</p> <p>Measurement of Capacitance- De Sauty’s bridge, Schering Bridge, High voltage Schering bridge.</p>	
UNIT - II	Measurement of Power and Energy	(08 Hours)
	<p>Measurement of Power: Construction, working principle, torque equation, advantages/disadvantages, errors and their compensation of dynamometer type wattmeter, low power factor wattmeter, Active & reactive power measurement in three phase balanced & unbalanced system (one wattmeter and two wattmeter methods), Power Measurement using Instrument Transformer, Three Phase wattmeter.</p> <p>Measurement of energy: Energy Meters in AC circuits, Single Phase Induction Type Energy Meter - Construction, principle of operation, torque equation of induction type energy meter, errors and adjustments. Three phase three wires, and three phase four wire energy meter, electronic energy meter</p>	
UNIT - III	Electronic Devices and Signal Analyzer’s	(08 Hours)
	<p>Electronic Voltmeters and their Advantages, Vacuum Tube Voltmeters, difference Amplifier Type Voltmeters, DC Voltmeters with direct Coupled Amplifier, Measurement of Power at Audio and Radio Frequencies. Concept of: Numeric meter & its types (TOD, ABT, Prepaid & panel mounted meters. Measurement of power & energy by sampling technique automatic meter reading (AMR) and advanced metering infrastructure (AMI), Meter reading instrument (MRI). Wave Analyzers – Frequency Selective Wave Analyzers and Heterodyne Wave Analyzers and its applications.</p>	

	Harmonic Distortion Analyzer, Spectrum Analyzer, Standing Wave Ratio, Power Analyzer. CRO and Digital Storage Oscilloscope – Principle of operation and waveform reconstruction.	
UNIT - IV	Displacement, Level and Flow Measurement	(08 Hours)
	Introduction to Transducers, classification, basic requirements for transducers and Advantages of Electrical Transducers. Displacement measurement: Potentiometer as displacement transducer, Strain Gauge: Theory of Strain Gauges, Types of strain gauges: Un-bonded and Bonded types their construction, working, advantages and disadvantages, load cell, LVDT & RVDT – construction, working, application, null voltage, specifications, advantages/disadvantages, effect of frequency on performance. Capacitive transducers – Advantages, Disadvantages and Applications. Level measurement: Introduction and importance of level measurement, level measurement methods: mechanical, hydraulic, pneumatic, Electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors Measurement of flow – Rate of flow, Turbine Meter, Electromagnetic Flow Meters, Hot Wire Anemometer, Ultrasonic Flow Meter.	
UNIT - V	Pressure, Temperature and Velocity Measurement	(08 Hours)
	Pressure Measurement: Introduction, Types of Pressure Measurements Devices, Pressure Measurement using Electrical Transducers as Secondary Transducers. Low Pressure (vacuum) Measurement – Thermocouple Vacuum Gauge, Pirani Gauges and Ionization Type Vacuum. Temperature Measurement: Electrical Resistance Thermometer, Platinum Resistance Thermometer, Semiconductor Thermometers, Thermocouples, Thermistors, Quartz Crystal Thermometers, Bimetallic Thermometers. Electrical methods of temperature measurement – signal conditioning of industrial RTDs and their characteristics – 3 lead and 4 lead RTDs. Measurement of Velocity – Measurement of Linear Velocity: Electromagnetic transducers, Moving Magnet Type, Moving Coil Type, Measurement of Angular Velocity: Electrical Tachometers. Electromagnetic Tachometer Generators. Photoelectric Tachometer.	
UNIT - VI	Display Devices and Recorders	(08 Hours)
	Display Devices: Introduction, electrical Indicating Instruments. Digital Instruments: Advantages of Digital Instruments. Digital versus Analog Instruments. Digital Display Methods, Digital display Units, Rear Projector Display, Light Emitting Diodes (LED), Liquid Crystal Diodes (LCD), Resolution, Sensitivity, accuracy and specifications of Digital Meters. Recorders: Necessity of Recorders. Recording Requirements. Analog Recorders. Graphic Recorders. Strip Chart Recorders, Null Type Recorders, X-Y Recorders, Ultraviolet Recorders, Direct Recorders.	

Term Work:

The term work shall consist of record of minimum eight experiments.

3. Measurement of resistance by Kelvin double bridge/ Wheatstone bridge/Ammeter-voltmeter method
4. Measurement of capacitance and loss angle by Schering Bridge.
5. Measurement of inductance by Anderson's bridge/ Maxwell's Inductance Bridge.
6. Measurement of resistance, capacitance and inductance using LCR meter.
7. To measure power in three phases balanced load by one wattmeter method.
8. To measure power in three phase balanced/ unbalanced load by two wattmeter method.
9. To measure reactive power in three phase circuit by one wattmeter method.
10. To calibrate single phase energy meter at (i) unity power factor (ii) 0.5 lagging power factor (iii) 0.5 leading power factor (analog /Digital)
11. Measurement of Voltage, current and resistance using digital voltmeter and digital multimeter.
12. To study and analyze the various electrical parameters using Power Analyzer.
13. To study the observation of waveforms on CRO, measurements of voltage and current, measurement of phase and frequency using CRO / digital storage oscilloscope
14. Displacement measurement using LVDT.
15. Strain measurement using strain gauge.
16. Study of process control application of using the instrumentation kit.
17. Measurement of Pressure using Bellows, Bourdon gauge, Diaphragm.
18. Calibration of vacuum gauge using vacuum gauge tester.
19. Characterization of RTD (PT100)

Project Based learning topics

1. Measurement of voltage and current using instrument transformers
2. Calibration of voltmeter, ammeter, wattmeter (Using power analyser)

3. Measurement of earth resistance
4. Measurement of insulation resistance.
5. Design / development / simulation of measurement of any physical parameter using transducer/s.
6. Demonstration of 7 segment LED for measurement
7. Selection of digital instrument for specific application using user manual / data sheet

Text Books:

1. A Course in Electrical and Electronic measurements & Instrumentation – by A. K. Sawhney, Dhanpat Rai & Sons.
2. Electronic Instrumentation: H.S. Kalsi – THM, 2nd Edition 2004.
3. A Course in Electronic and Electronic measurements by J. B. Gupta, S. K. Kataria & Sons.

Reference Books:

1. Electrical Measurement & Measuring Instruments Fifth edition, by E. W. Golding & Widdies, A. H. Wheeler & Co. Ltd.
2. Electronic measurement and instrumentation by Dr. Rajendra Prasad, Khanna Publisher, New Delhi.
3. Introduction to Measurements and Instrumentation, Second Edition by Ghosh, PHI Publication.
4. Introduction to Measurements and Instrumentation by Anand. PHI Publication

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Industrial Safety Practices

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS:
Lectures: 03Hours / Week		End Semester Examination: 60 Marks	Theory:03
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	Practical: 01
		Term Work: 25 Marks Oral: 25 Marks	Total: 04
Course Pre-requisites:			
Students should have basic knowledge of safety practices			
Course Objectives:			
1. To make students aware about the hazards while working in industry and respond appropriately in an emergency.			
2. To help prevent workplace injuries, illnesses and fatalities.			
3. To reduce and remove existing dangers to improve working conditions.			
Course Outcomes:			
Students are expected to:			
1	To understand importance of safety		
2	To understand process safety management		
3	To evaluate safety in hazardous area		
4	To apply the knowledge of Industrial safety engineering		
5	To review of IE rules and acts and their significance		
6	To analyse case studies on Industrial Safety Practices		
Topics covered			
UNIT - I	Importance of Safety: Health and environment. Health safety and environmental policy, fundamentals of safety, classification of accidents, Managements responsibility, objectives of safety management, National safety council, Employees state insurance act 1948, approaches to prevent accidents, principles of safety management, safety organization, safety auditing, maintenance of safety, measurements of safety performance, industrial noise and noise control, Industrial Psychology, Industrial accidents and prevention.		(06 Hours)
UNIT - II	Process safety management: Process safety management, legal aspects of safety, safety with respect to plant and machinery, the explosive act 1884, Petroleum act 1934, personal protective equipment, classification of hazards, protection of respiratory system, work permit system, hazards in refineries and process plants, safety in process plants, pollution in some typical process industry. Safe working practices, housekeeping, safe working environment, safety device and tools, precaution in use of ladders, safety instruction during crane operation, safety instruction for welding, burning and cutting and gas welding equipment, electrical safety, case studies, safety in use of electricity, electric shock phenomena, occurrence of electric shock, medical analysis of electric shock and its effect, safety procedures in electric plants, installation of Earthing system.		(06 Hours)
UNIT - III	Safety in hazardous area: Hazard in industrial zones, classification of industrial Enclosures for gases and vapors. Mechanical, Chemical, Environmental and Radiation hazards, Machine guards and safety devices, slings, load limits, lifting tackles and lifting equipment, hydrostatic test, Chemical hazards, industrial toxicology, toxic chemicals and its harmful effects on humans, factors influencing the effect of toxic materials, Units of concentration, control measure, environmental hazards, devices for measuring radiation, safety analysis and risk analysis, risk management, First aid, Safety measures to avoid occupational diseases.		(06 Hours)
UNIT -IV	Industrial Safety Engineering: Industrial Lighting : Purpose of lighting, Uses of good illumination, recommended optimum standards of illumination, Design of lighting installation, Standards for lighting and colour. Vibration and Noise : Activities related to vibrations, its impact on human health, abatement Sources, effects of noise on man, Measurement and evaluation of noise, Silencers, Practical aspects of control of noise. Safety at various Industries: Agro-Industry, Sugar Industry, Textile Industry etc.		(06 Hours)
UNIT-V	Review of IE rules and acts and their significance: Objective and scope –ground clearances and section clearances – standards on electrical safety -		(06 Hours)

	safe limits of current, voltage –Rules regarding first aid and fire fighting facility. The Electricity Act, 2003.	
UNIT-VI	Case studies on Industrial Safety Practices: Case studies in various industries like: Processing industry, Hazardous material industry, Engineering applications industry etc	(06 Hours)
Practicals:		
List of Practical's to be performed in the laboratory:		
<ol style="list-style-type: none"> 1. Demonstration and training of how to use breathing apparatus, 2. Demonstration and training of Emergency evacuation drill, 3. Train students how to rescue employees using emergency rescue equipments inside confined space. 4. With the help of gas detector train students check the level of oxygen and other, Gases in industries, 5. Training of using of windo meter to measure speed level of wind, 6. Train students use noise level meter and find out different level of noise of different equipments and teach them how to be safe, 7. Train students how to use personal protective equipment , 8. First Aid training and demonstration. 		
Project based learning:		
<ol style="list-style-type: none"> 1. Study of Home And Industrial Safety Using Fire And Gas Detection System kit/system 2. Industrial IoT Safety project (IIOT): Industrial Internet of Things using Arduino & ESP8266 3. Study of Anti-Collision Light : LGKT017 Simple Circuit Project 4. Study of First Aid Kits & Construction Safety 5. Study of Personal Protective Equipment (PPE) Kit for industry 6. Study of Electrical Safety Kit for industry 7. Case studies on – Learning industrial Safety through films/Videos 8. Case studies on – Learning industrial Safety through posters/charts 9. Case studies on – Learning industrial Safety through periodicals, research publications 10. Conducting electric safety audit of any institute/Engineering college 11. Conducting power quality audit of any institute/Engineering college 12. Auto power supply control from 4 different sources 13. Over Voltage/Under Voltage Electrical Appliance Protector 14. ATM Machine Gate Security System 15. Do-it-yourself intelligent camera 		
Note:		
The term work shall be the record of minimum eight experiments performed from the above list.		
Project based learning: Student shall demonstrate minimum one concept based on syllabus topic.		
Reference Books:		
<ol style="list-style-type: none"> 1. Industrial safety management By: L.M. Deshmukh Publishers: Tata McGraw Hill ,New Delhi Year: 2006 Edition: First 2. Industrial safety health and environment Management system By: R.K. Jain & Sunil S. Rao Publishers: Khanna Publishers Year: 2008 Edition: Second 		
Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Object Oriented Programming with C++		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours/Week	End Semester Examination: 60 Marks	Theory : - 04
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks	Practical : - 01
	TW: 25 Marks, PR : 25 Marks	Total : - 05
Course Pre-requisites:		
The Students should have knowledge of		
1.	C Programming	
Course Objectives:		
	This course introduces knowledge about language C++ and various parameters associated with programming with C++. The object oriented programming with C++ plays important role in creating platform for other advanced programming languages. This course is considered as strong foundation for software related advancements.	
Course Outcomes: Students will be able to		
1.	Define and describe the basic terms and ideas about object oriented approach along with important paradigms.	
2.	Illustrate the function of various classes and objects under object oriented approach with C++	
3.	Analyze the significance of inheritance and its application.	
4	Describe polymorphism along with hierarchies, categorization, methods of polymorphism.	
5	Describe various files and examine them under object oriented approach followed by exception handling.	
6	Explore concept of pointer, arrays and their significance in C++ programming.	
UNIT - I	Introduction to Object Oriented Programming:	(08 Hours)
	Introduction to Object Oriented Approach, Overview of other paradigms {Functional, Data decomposition}, Basic terms and ideas about Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++, cin, cout, new, delete, operators.	
UNIT - II	Classes and Objects:	(08 Hours)
	Encapsulation, Information hiding, Abstract data types, Object & classes, Attributes, Methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, Instantiation of objects, Default parameter value, Object types, C++ garbage collection, Dynamic memory allocation, Meta class / abstract classes.	
UNIT - III	Inheritance:	(08 Hours)
	Inheritance, Defining derived classes & Visibility modes, Single, Multilevel, Multiple, Hierarchical and Hybrid inheritance, Virtual base classes & Abstract classes- , Constructors in derived classes, Nesting of classes.	
UNIT - IV	Polymorphism:	(08 Hours)
	Composition Vs. Classification, Hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric Polymorphism.	
UNIT - V	Files and Exception Handling in C++ programming:	(08 Hours)
	Object oriented Language, Application of OOP, Introduction to C++, Application of C++, Program Features, Comments, Output Operators, Iostream File, Namespace, Return Type of main (), Exception handling, Generic Classes, Throwing an exception, catching an exception: The try block, Exception handlers, Termination vs. Resumption, Exception specification, rethrowing an exception, uncaught exceptions, Standard exceptions, Programming with exceptions.	
UNIT - VI	Pointers:	(08 Hours)
	Introduction to Pointer, Declaration and Initialization of Pointer; Dynamic memory allocation/deallocation operators: new, delete; Pointers and Arrays: Array of Pointers, Pointer to an array (1 dimensional array), Function returning a pointer, Reference variables and use of alias; Function call by reference. Pointer to structure: De-reference/Deference operator: *, ->; self referential structure.	
Term Work:		
The term work shall consist of record of minimum eight experiments from below list.		
1. Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.		

2. Write a C++ program to declare Struct. Initialize and display contents of member variables.
3. Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.
4. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
5. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).
6. Write a C++ to illustrate the concepts of console I/O operations.
7. Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.
8. Write a C++ program to allocate memory using new operator.
9. Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)
10. Write a C++ program to create an array of pointers. Invoke functions using array objects.
11. Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.

Assignments: (Project based learning)

1. Phone book
2. Temperature conversion table
3. Calculator
4. Games (Snake etc.)
5. Student data
6. Student report card system
7. Calendar
8. Personal Diary Management System
9. Bus reservation system
10. Library management system
11. Face detection using C++
12. Digital clock in C++
13. Attendance management system
14. Students' attendance system
15. Biometric system

Text Books:

1. E. Balagurusamy – Object Oriented Programming with C++, Fifth edition, Tata McGraw Education Hill , 2011.
2. Ashok N. Kamthane, Object oriented Programming with ANSI & Turbo C++, First Edition, Pearson India

Reference Books:

1. Robert Lafore, Object Oriented Programming in Turbo C++, First Edition, Galgotia Publications.
2. D Ravichandran, Programming with C++, Second edition, Tata McGraw- Hil
3. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education. C++ Programming Lab Manual / II-I SEM / 2019-20 Page 9
4. OOP in C++, 3rd Edition, T. Gaddis, J. Walters and G. Muganda, Wiley Dream Tech Press.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Simulation And Programming

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: NA		End Semester Examination: 00 Marks	
Practical: 04		Continuous Assessment: 00 Marks	
		TW: 25 Marks PR: 25 Marks	Credit: 02
Course Pre-requisites:			
The Students should have knowledge of			
1.	Students should have knowledge of Fundamentals of Electrical Engineering, basic mathematics and basic computer operation		
Course Objectives:			
	The course introduces fundamental concepts of simulation and programming for problem solving		
Course Outcomes: After learning this course students will be able to			
1	Describe the concept of simulation		
2	Identify and apply knowledge of software simulation		
3	Describe and Analyze Programming Techniques using application software's.		
4	Describe fundamental concepts of MATLAB Simulink		
5	Apply knowledge MATLAB Simulink in Electric Applications		
6	Elaborate the scope and applications of PCB design		
UNIT – I	Introduction to Simulation:		
	<p>What is simulation: Modeling basics, computer simulation (Popularity and advantages, different kinds of simulation), How simulation gets done (by hand, programming in general languages, simulation languages, high level simulators, Uses of simulations (past , present, future).</p> <p>Fundamentals of simulation: Goals of simulation study, Analysis options(educated guessing, queueing theory, mechanistic simulation), Pieces of simulation model(entities, attributes, variables, resources, queues, statistical accumulators, events, simulation clock, starting and stopping), Event driven hand simulation, Event and process oriented simulation Randomness in simulation, Simulation with spread sheets, conducting simulation studies.</p>		
UNIT - II	Software Tools and Simulation:		
	<p>Types of Analysis: Bias point, Time domain, AC Sweep, DC Sweep, Parametric, Monte Carlo, Noise analysis.</p> <p>Schematic Design: Introduction, Description of P-Spice, Types of analysis, Description of simulation software tools (like OrCAD / PROTEL / Proteus / Microcap) Schematic Description: Introduction, Input files, element values, Nodes, circuit elements, sources, output variables, format of circuit and output files, drawing the schematic, Design rule Check (DRC), Netlist details.</p>		
UNIT -III	Introduction to MATLAB programming:		
	Introduction, starting and ending a MATLAB session, Fundamentals of MATLAB programming (MATLAB variables, arrays, matrices, matlab operators- arithmetic, relational, logical, MATLAB graphics(plots, subplots, other types of plots), benchmarking and looping functions(branching functions, looping functions), miscellaneous functions(string function, input/output function), <i>examples on above topics</i> , advantages of MATLAB, limitations of MATLAB, various matlab commands & their explanation. Introduction to GUI.		
UNIT -IV	MATLAB Simulink Basics:		
	Introduction, Introduction to simulink, starting simulink, simple examples on starting a simulink, solving differential equations in simulink, Commonly used blocks, application block sets (power system toolbox) , user defined functions, Simulink modeling.		
UNIT - V	MATLAB Basic Electrical Engineering Applications:		
	Basic electrical engineering applications(introduction, elementary definitions, basic waveforms, average value -RMS value -peak value, ohms law, Kirchhoff's laws, independent and dependent Dc sources, series and parallel circuits, resonance phenomenon, network theorems, apparent power-active		

	power-reactive power, three phase source and load simulation, transformers. Application related to Wind and Solar.	
UNIT -VI	PCB Design and its Applications:	
	Simulation of following circuits: half wave & full wave rectifier, Zener shunt regulator, transistorized RC coupled amplifier, clipper and clamper. Introduction to PCB design.	
Term Work: The term work shall consist of record of minimum eight experiments and not limited to		
List of experiments:		
<ol style="list-style-type: none"> 1. Schematic drawing & component symbol creation 2. Hierarchical schematic drawing 3. Simulation and analysis (bias point analysis, time domain, AC sweep, DC sweep, parametric) of :RLC Circuit. 4. Experiments based on PCB design which would include component placement, setting design rules, auto routing and interactive routing. 5. Experiments based on noise analysis and Monte-carlo analysis 6. To simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing xy and x!. 7. To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors 8. To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers. 9. To accept a number from user and print digits of number in a reverse order. 10. To input binary number from user and convert it into decimal number. 11. Experiment on unit 3: Listing of some common MATLAB commands and executing with examples 12. Experiment on unit 4 : Basic simulation projects 13. Experiment on unit 5: Solving network theorems using MATLAB 		
Project based learning:		
1) Project based on Network Theorems in MATLAB		
2) Design of Regulated Power supply in Proteus		
3) Design of Electronic circuitry for household applications in Proteus		
4) Design of Household applications on PCB		
5) Design of Electrical based applications in MATLAB		
Text book:		
1. M. H. Rashid 'Introduction to P-spice using OrCAD for circuits and Electronics' –Pearson Education		
Reference Books:		
<ol style="list-style-type: none"> 1. User manuals of PROTEL, PROTEUS, OrCAD, Microcap. 2. W.C. Bosshart 'Printed Circuit Boards-Design & Technology' –Tata McGraw-Hill Publication. 3. R. G. Dromey, "How to Solve it by Computer", Pearson Education India; 1st edition, ISBN10: 8131705625, ISBN-13: 978-8131705629 Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978- 0132492645 4. Romano Fabrizio, "Learning Python", Packt Publishing Limited, ISBN: 9781783551712, 1783551712 5. Paul Barry, "Head First Python- A Brain Friendly Guide", SPD O'Reilly, 2nd Edition, ISBN:978-93-5213-482-3 6. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, ISBN-10: 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943 7. Jeeva Jose, P. Sojan Lal, "Introduction to Computing & Problem Solving with Python", Khanna Computer Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978- 9382609810 8. Simulation with Arena by W.David Kelton, randall P. Sadowski, nancy B. Swets(Mc Graw Hill international edition) 9. MATLAB and SIMULINK for engineers by Agam Kumar Tyagi (Oxford University Press). 10. MATLAB and its Applications in Engineering by Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma(Pearson India Education Services Pvt Ltd.) 11. Introduction to MATLAB programming toolbox and sumulink by Jaydeep Chakravorthy (University Press India Private Limited) 		
Assignments:		
Assignments should be able to verify course outcome and skills of group work, communication skills. One assignment on each unit (total 6 assignments).		

Program: B.TECH. (ELECTRICAL)

Semester - III CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/ OR/ PR		
1		DC & AC Machines	3	2	1	60	40	25	-	25	150	3	1	1	5
2		Power system Engineering	4	2	-	60	40	25	25	-	150	4	1	-	5
3		Design of Electrical Installations	3	2	-	60	40	25	-	-	125	3	1	-	4
4		Computational Algorithms	4	2	-	60	40	25	25	-	150	4	1	-	5
5		*Operating Systems	4	2	-	60	40	25	25	-	150	4	1	-	5
6		Application Softwares in Electrical Engineering	-	4	-	-	-	25	-	-	25	-	2	-	2
7		Vocational Course-I AutoCAD Electrical	-	-	-	-	-	25	25	-	50	-	2	-	2
8		MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	2
9		**Environmental Studies	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			18	14	1	300	200	175	100	25	800	18	9	1	30

* Industry Taught Course

**Mandatory Audit Course, Theory Exam of 100 Marks

Program: B.TECH. (ELECTRICAL)

Semester - IV CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/ OR/ PR		
1		Special Purpose Machines	4	2	-	60	40	25	-	25	150	4	1	-	5
2		Network & Synthesis	3	2	1	60	40	25	-	25	150	3	1	1	5
3		Power Electronics	4	2	-	60	40	25	-	25	150	4	1	-	5
4		*Industrial Organization & Financial Management	3	-	-	60	40	-	-	-	100	3	-	-	3
5		Database management system (SQL)	4	2	-	60	40	25	-	25	150	4	1	-	5
6		IT Practices	-	6	-	-	-	25	25	-	50	-	3	-	3
7		Social Activities-I	-	-	-	-	-	-	-	-	-	-	-	-	2
8		Vocational Course-II Solar Power plant designing	-	-	-	-	-	25	25	-	50	-	2	-	2
9		**Disaster Management	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			18	14	1	300	200	150	50	100	800	18	9	1	30

* Industry Taught Course

**Mandatory Audit Course, Theory Exam of 100 Marks

Bharati Vidyapeeth Deemed to be University, Pune
Faculty of Engineering & Technology
Programme :B.Tech (Electrical Engineering) Sem – III (2021 Course)

DC & AC Machines

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours/week	End Semester Examination: 60 Marks	Theory: 04
Practical: 02 Hours/week	Continuous Assessment: 40 Marks	Practical: 01
Tutorial: 1 Hour/Week	Practical: 25 Marks TW: 25Marks	Total: 05

Course Pre-requisites:

The Students should have knowledge of

- | | |
|-----------|--|
| 1. | Magnetic Physics, AC & DC Fundamentals |
| 2. | Basic laws of rotating machines like Faraday's Law, Lenze's Law, etc |
| 3. | Basics of Electrostatics and electromagnetic |
| 4. | Transformer operation |

Course Objectives:

This course introduces knowledge about rotating machines. The course is designed to learn DC and AC machines with their constructional feature, operating principles, performance characteristics and applications. Also, to learn the different tests on machines and various speed control techniques.

Course Outcomes: After learning this course students will be able to

- | | |
|----------|--|
| 1 | Describe the basics of dc machine, armature reaction, commutation, characteristics & applications of dc generators, dc motors & identify the different parts. |
| 2 | Apply the concepts of three phase induction motor and estimate the losses, different motor parameters. |
| 3 | Apply the concepts of induction machine and analyze the results using different tests, draw phasor diagram, state specifications. |
| 4 | Describe & identify the different parts of synchronous generators, different excitation systems, armature windings, estimate winding factor, impedance and reactance by different methods. |
| 5 | Draw the capability curves of synchronous generators; estimate the regulation by different methods and describe the methods of synchronizing alternators. |
| 6 | Describe working principle, characteristics and applications of synchronous motors |

UNIT – I	DC Machines	(06 Hours)
	Introduction, Basic Electromagnetic Laws, Emf induced in a coil rotating in a magnetic field, forces and torques in magnetic field systems, Energy balance, Energy in singly excited magnetic field systems. Construction of DC machines, E.M.F. equation of D.C. generator. Process of commutation & types, causes of bad commutation and remedies, Basic principle of working of DC motor, Significance of Back e.m.f., Torque equation, Types, characteristics and applications of d.c. motors, Starting, reversing and armature voltage and field control method of speed control, Armature reaction, Losses, efficiency, condition for maximum efficiency and maximum power output. Testing of DC motor: Brake test and Swinburne's test. Maintenance, types.	
UNIT - II	Induction Machines Part-I	(06 Hours)
	Construction of 3-phase induction motor, Concept of rotating magnetic field, Principle of Operation, Concepts of Speed & Slip, Frequency of rotor voltage & current, Power Flow Diagram & development of Equivalent Circuits, Losses, Relationship between rotor copper loss, rotor input & gross mechanical power developed, Efficiency, Torque–Slip/Speed characteristics, Effect of rotor resistance on Torque–Slip characteristics, Condition for maximum torque, Relations between starting, Full load & Maximum torque. Starters.	
UNIT - III	Induction Machines Part-II	(06 Hours)
	Open circuit and short circuit test, Circle diagram and computation of performance parameters, High Torque Cage Motors - Deep bar & Double cage rotor, Speed control mechanisms. Cogging & Crawling of induction motors, Applications. Maintenance of induction motor. Construction of single-phase induction motor, double revolving field theory, methods of self-starting and types: Resistance start, Capacitor start, Capacitor start-Capacitor run, Shaded Pole motor, equivalent circuit, torque-speed/slip characteristics, applications.	

UNIT - IV	Synchronous Generators Part-I	(06 Hours)
	Multiply excited magnetic field systems, Forces and torques in systems with permanent magnets, Dynamic equations, Winding in machines and materials used in electrical machines. Types of synchronous machines & their constructional features, Excitation Systems. Principle of working, Estimation of winding factor, EMF Equation, Rating of Generator, Generator on no load & balanced load, Armature reaction & its effect under load power factors, Synchronous Impedance, Equivalent Circuit & Phasor Diagram, Two Reaction Theory model, Estimation of Direct & Quadrature axes Synchronous Reactance by Slip Test, Phasor Diagram.	
UNIT - V	Synchronous Generators Part-II	(06 Hours)
	Power Flow (Transfer) Equations, Power – Power angle relation and Capability Curves of synchronous generators. DC resistance test, Open circuit Test & Short Circuit Test on synchronous generator, Determination of Voltage Regulation by direct load test & by Indirect Methods-EMF, MMF. Losses & Efficiency and Short Circuit Ratio. Parallel Operation of alternators - Necessity, Conditions, Concept of Infinite bus, alternators connected to infinite bus bar, Methods of synchronizing alternators (synchronizing lamps and synchro-scope), Significance of Synchronizing Power Coefficient.	
UNIT - VI	Three Phase Synchronous Motor	(06 Hours)
	Principle of operation, Methods of starting, Equivalent Circuit & Phasor Diagrams, Pull-in & Pull-Out Torque, Power Flow Equations, Operation with constant excitation & variable load and with Constant load & variable excitation (V Curves & Inverted V Curves), Phenomenon of Hunting & its remedies, Applications.	

Term Work:

The term work shall consist of record of minimum eight experiments. (Perform any 3 experiments from DC machines and any 2 experiments from induction machines and synchronous machines)

1. Identification of DC machine windings and resistances.
2. Speed control of D. C. Shunt motor by Armature and Field control.
3. Brake test on DC shunt motor
4. Swinburn's Test on DC shunt Motor.
5. Load Test on three phase induction motor
6. No load & Blocked Rotor Test on three phase induction motor: Determination of Equivalent Circuit Parameters/Plotting Circle diagram
7. Load test on single phase induction motor.
8. Direct loading test on alternator
9. Open circuit and short circuit test on alternator – regulation by emf and mmf method
10. Slip test on salient pole alternator – regulation by two reaction theory
11. Synchronization of alternator with bus bar
12. V-Curves of synchronous motor
13. Load test on synchronous motor

Project Based Learning :

1. Demonstration and operation of three and four point starter
2. Demonstration of reversing the direction of rotation of dc motor
3. Demonstration of verification of Electromagnetic laws
4. Demonstration of operation of Induction Motor as induction generator
5. To identify the windings of single phase induction motor, types of windings
6. MATLAB based project DFIG
7. Application based MATLAB Project:
 - i) Torque speed characteristics of DC Shunt motor for Centrifugal Pumps, Lifts, Weaving Machine, Lathe Machines, Blowers, Fans, Conveyors, Spinning machines, etc
 - ii) Torque speed characteristics of DC Series motor for vacuum cleaner, traction systems, sewing machines, cranes, air compressors etc.
 - iii) Analysis of performance characteristics of 3-phase induction motor – Squirrel Cage IM-for Pumps and submersible, Pressing machine, Lathe machine, Grinding machine, Conveyor, Flour mills, Compressor And other low mechanical power applications
Slip Ring IM-Steel mills, Lift, Crane Machine, Hoist, Line shafts and other heavy mechanical workshops etc
 - iv) Torque speed characteristics of single phase IM for fans, refrigerators, Air-conditioners, Vacuum cleaners, washing machines, centrifugal pumps, tools, small farming appliances, blowers etc
 - v) Similarly for Single phase IM
 - vi) Alternators

vii)	Synchronous motors
8.	Maintenance of Machines: Preparation of maintenance schedule of electrical motors of machine laboratory
9.	List the commonly used instruments for maintenance and find out the voltage between phases and between phase and neutral, test the continuity and insulation, measure earth resistance.
10.	List the commonly used tools for maintenance
11.	Dynamic Model of machines in MATLAB
Text Books:	
1.	Nagrath Kothari, "Electrical Machines", Tata McGraw Hill
2.	A. E. Fitzgerald, Charles Kingsley, Jr. Stephen D. Umans, "Electric Machinery", Tata McGraw Hill
3.	M.G. Say, " Alternating Current Machines", Pitman Publishing Ltd.
4.	Ashfaq Husain, "Electric Machines", Dhanat Rai & Co.
Reference Books:	
1.	Dr. S. K. Sen, "Electric Machinery", Wiley Eastern
2.	B. H. Deshmukh, "Electrical Technology", NiraliPrakashan
3.	M. G. Say, "Alternating Current Machines", McGraw Hill
4.	A. S. Langsdorff, "Theory of Alternator Current Machinery", Tata McGraw Hill
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

Power System Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours/Week	End Semester Examination: 60 Marks	Theory : - 04
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks	Practical : - 01
	Term Work : 25 Marks, Oral: 25 Marks	Total : - 05
Course Pre-requisites:		
The Students should have knowledge of		
1.	Electromagnetic energy conversion system	
2.	Electromagnetics and its applications	
Course Objectives:		
	This course introduces knowledge about electrical power generation, its transmission and distribution. The course is designed to learn different methods of power generation. Also it focuses on performance of transmission line and distribution system along with its design consideration.	
Course Outcomes: Students will be able to		
1.	Understand block diagrams and describe the function of components of various Power Generation techniques by Conventional energy Sources.	
2.	Understand block diagrams and describe the function of components of various Power Generation techniques by nonconventional energy Sources.	
3.	Define and analyze the significance of terms such as load factor , diversity factor etc on economics of power generation.	
4	Compute string efficiency, sag and R, L, C parameters of different types of transmission line. (Design transmission line model and understand mechanical components of transmission line.)	
5	Represent TEE and PI model of line and analyze the performance of transmission line.	
6	Explore different type of cables & its calculations along with the computation of performance of AC distribution.	
UNIT - I	Power Generation techniques by Conventional energy Sources	(08 Hours)
	Introduction to energy sources, selection of site – classification – general arrangements and operations – functions of each component – types of turbines – electric generators – advantages and disadvantages - list of major power stations : of Hydro electric , Thermal and Nuclear power plants in India with capacity. Basic layout and working of diesel and gas power plant. Concept of grid, types of grids.	
UNIT - II	Power Generation techniques by Non -Conventional energy Sources	(08 Hours)
	Different types of Nonconventional Energy Sources, Comparative benefits over conventional type, contribution of conventional & nonconventional energy sources, Solar energy – Its characteristics, basic concept of solar power plant, major solar power plants in India/world, Wind power plant– schematic arrangement - vertical axis, horizontal axis – electrical generator Hybrid solutions: Wind Turbine, diesel, WT-solar etc. – major wind farms in India / world, Power generation by bio gas, biomass, geothermal energy and tidal energy– its types, Magneto Hydro Dynamics (MHD), Concept of carbon credit.	
UNIT - III	Load Curves and Economic Aspects	(08 Hours)
	Load Curves: load curve – base load station and peak load station - demand factor – maximum demand – average demand – diversity of load – load factor – diversity factor – significance of high load factor & diversity factor – plant factor – capacity factor – connected load – load duration curve – integrated load duration curve – selection of units. (Simple numericals on various factors) Per capita energy consumption of developed & developing countries. Concept of cogeneration and captive generation.	
UNIT - IV	Design of Transmission Line	(08 Hours)
	Transmission Line Components and its types - Line Supports, Conductors, Insulators, Potential distribution over a string of insulators, methods of equalizing the potential, string efficiency. (Simple numericals) Circle Diagram Sag: Catenary curve – calculation of sag and tension – effects of wind and ice loading sag templates – vibration dampers for transmission lines. (Simple numericals) Corona and interference, Various effects – Skin, Proximity, Ferranti etc. Various Parameters of Transmission Line – Resistance, Inductance and capacitance and their calculation (Simple numericals). String efficiency and methods of improving string efficiency (Simple numericals).	

UNIT - V	Transmission Line Performance analysis :	(08 Hours)
	Circuit Representation of Transmission Line: Representation and performance of short, medium and long transmission line – Surge Impedance Loading (SIL), Characteristic Impedance, Generalized circuit constants: - Representation of tee and pi models of lines as two port networks – evaluation and estimation of ABCD constants (Simple numericals) –sending end and Receiving end.	
UNIT - VI	Underground Cables and Distribution System	(08 Hours)
	Underground Cables - Classification – construction - insulation resistance – capacitance – dielectric stress in single core cable (Simple numericals). Grading of cables. Laying of cables – Cable Terminations, cable jointing – causes of failure – cable faults and location of faults. Distribution System – Classification – A.C. distribution connection schemes - requirements of distribution system – design consideration – design of radial, ring distributors for concentrated, distributed loads.	
Term Work:		
The term work shall consist of record of minimum eight experiments from below list.		
<ol style="list-style-type: none"> 1. Measurement of A, B, C, D constants of short transmission line. 2. Measurement of A, B, C, D constants of Medium transmission line. 3. Measurement of A, B, C, D constants of Long transmission line. 4. Drawing Sheet on power generation by Conventional energy Sources 5. Drawing Sheet on power generation by nonconventional energy Sources 6. Drawing Sheet on types of insulator 7. Drawing Sheet on types of cables 8. Industrial visit to cable manufacturing company. 9. Industrial Visit report of HPS 10. Industrial Visit report of TPS / GAS PP 11. Industrial Visit report of WPS / Solar PP 12. Design analysis of transmission line model using any simulating software. 		
Project based learnings:		
<ol style="list-style-type: none"> 1. Sag calculations using MATLAB 2. String efficiency calculations using MATLAB 3. Load curve calculations using MATLAB 4. Creating small models of Hydroelectric power plant 5. Creating small models of Thermal power plant 6. Creating small models of Nuclear power plant 7. Creating small models of Solar power plant 8. Creating small models of Wind power plant 9. Creating small models of Solar-Thermal power plant 10. Creating small models of Gas-Turbine power plant 11. Creating small models of Biogas power plant 12. Creating small models of Biomass power plant 13. Creating small models of Diesel power plant 14. Creating small models of Geothermal power plant 15. Use of Google earth software to design of transmission line 		
Text Books:		
1. A Course in Power System - J. B. Gupta - S. K. Kataria & Son's		
2. V. K. Mehta, "Electrical Power System", S. Chand Publications		
3. R. K. Rajput, "A text book on Power System Engineering", Laxmi Publications (P) Ltd		
Reference Books:		
1. Electrical Power - S. L. Uppal - Khanna Publication		
2. Energy Technology - S. Rao, Dr. B B Panelkar - Khanna Publication		
3. A Course in Power Plant Engineering - Arrora, Domkundwar - Dhanpatrai & Co. Publications		
4. A Course in Electrical Power - Soni, Gupta, Bhatanagar - Dhanpatrai & Co. Publications		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Design of Electrical Installations		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25 Marks	Total: 04
Course Pre-requisites:		
The Students should have knowledge of		
1.	Fundamentals of Electrical Engineering	
Course Objectives:		
	<ol style="list-style-type: none"> 1. To understand the basic concepts of regarding design of electrical installations. 2. To enable candidate to understand service connections, domestic commercial and industrial installations. 3. To understand practical aspects of transformer commissioning & HT/LT distribution lines. 	
Course Outcomes: After learning this course students will be able to		
1	Explain electrical installation design methodology.	
2	Develop and design of service connections.	
3	Develop design of domestic and commercial installation.	
4	Develop and design of industrial installation.	
5	Illustrating transformer commissioning and HT/LT distribution lines.	
6	Explain contract and tendering.	
UNIT – I	Electrical Installation Design Methodology	(06 Hours)
	General rules of electrical installation design, Installed power loads - Characteristics and Power loading of an installation, Connection to the MV utility distribution network, Connection to the LV utility distribution network, LV Distribution, Protection against electric shocks and electrical fires, Sizing and protection of conductors, Energy Efficiency in electrical distribution, Characteristics of particular sources and loads, Green and economical energy-Photovoltaic installation.	
UNIT - II	Design of Service Connections	(06 Hours)
	Concept of service connection. Types of service connection and there features. Methods of installation of service connections. Difference between overhead and underground service connection. List of materials and accessories for service connections. IE rules for service connections. Electrical panel designing. Estimation and costing of service connections.	
UNIT -III	Design of Domestic and Commercial Installation	(06 Hours)
	Concept of domestic/commercial installation. The general IS codes regarding internal wiring. General rules while executing internal wiring of domestic/commercial installation. Computing the conductor size and the procedure for determines the size. Define the circuits and sub circuits. Drawing the layout of wiring. Describing the preparation of the estimate and cost of materials used for internal wiring of domestic/commercial buildings. Earthing in domestic/commercial installations. Sequence to be followed to prepare estimation. Compute simple problems. Study of domestic/commercial electricity bill.	
UNIT -IV	Design of Industrial Installation	(06 Hours)
	Concept of motor wiring circuit and single line diagram. Guidelines about power wiring and motor wiring. Design considerations of electrical installation in industry/factory/ workshop. Calculation of input current of the motor. Selection of size and rating of cable. Determination of rating of fuse. Determination of size of conductor. Sequence to be followed to prepare estimation. Proper method of earthing in industrial installation. Finding out estimation chart. IE rules for industrial wiring. Compute simple problems.	
UNIT - V	Transformer Commissioning & HT/LT distribution Lines	(06 Hours)
	Common Pre-commissioning Tests of Transformer, Buchholz Relay Test, Insulation Resistance (IR), Break-Down Voltage (BDV) Test, Voltage Ratio Test, Winding Resistance Measurement	

	<p>Test, Marshalling Box Scheme Check, Temperature Indicator Test, Off-Circuit Tap Selector (OCTS).</p> <p>Difference between HT/LT power, HT/LT power rates- domestic, commercial and industrial rates. Impact of increasing HT lines, Voltage level for HT/LT lines, LT/HT Lines and transmission lines, Loss reduction by improving ratio of HT/LT line in Electrical Distribution System.</p>	
UNIT -VI	Contracts And Tendering	(06 Hours)
	<p>Contracts, Tenders: Concept of contract & tenders, Types of contracts & contractors, Types of tenders, Requirement of valid contract and good contractor, Tender notice, Procedure for submission and opening of tenders, Comparative statement for selection of contractors, Role of Electrical inspector in design and installation and duties, Electrical Liasoning services.</p>	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> 1. Study of different IE rules. 2. Drawing sheet on wiring design of domestic installation. 3. Drawing sheet on wiring design of commercial installation. 4. Drawing sheet on wiring design of industrial installation. 5. Finding estimation chart for particular installation. 6. Drawing sheet on design of electrical installation. 7. Drawing sheet on design of HT/LT distribution lines. 8. Experiment to understand contracts/tender procedure by sample example. 		
Project Based Learning		
<ol style="list-style-type: none"> 1. Study-visit and prepare report to one domestic electrical installation under construction. 2. Study-visit and prepare report to one commercial electrical installation under construction. 3. Study-visit and prepare report to one industrial electrical installation under construction. 4. Prepare estimation chart of any one class room in the electrical department. 5. Visit and make report of roof top solar plant. 6. Study of IE rules and make a report on it. 7. Drawing single line diagram of electrical machine lab electrical wiring. 8. Study of Buchholz Relay of distribution transformer around college premises. 9. Do temperature indicator test of distribution transformer around college premises. 10. Do voltage ratio test of distribution transformer around college premises. 11. Perform Winding Resistance Measurement Test on distribution transformer around college premises. 12. Perform Insulation Resistance (IR) Test on distribution transformer around college premises. 13. Perform Break-Down Voltage (BDV) Test on distribution transformer around college premises. 14. Visit & study the electric sub-station in college premises. 15. Study of supply connection of your electrical lab. 16. Visit nearby HT line and study its operation. 17. Study Tender notice appeared in local newspaper & make report. 18. Meet Electrical Inspector and understand his/her duties. 		
Text Books:		
<ol style="list-style-type: none"> 1. Surjit Singh- "Electrical Estimation and Costing", Dhanpat Rai Publications. 		
Reference Books:		
<ol style="list-style-type: none"> 1. S.L.Uppal- "Electrical Wiring, Estimation & Costing", Khanna Publishers 2. B.V.S. Rao- "Operation & Maintenance of Electrical Equipments", (Vol 2) Media Promoters & Publishers Pvt.Ltd. 3. Raina.K.B. and Bhattacharya S.K., "Electrical Design Estimation & Costing", Tata McGraw Hill, New Delhi. 4. B.D.Arora- "Electrical Wiring Estimation & Costing-New Hights, New Delhi. 		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Computational Algorithms		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours/Week	End Semester Examination: 60 Marks	Theory : - 04
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks	Practical : - 01
	TW : 25 Marks, OR: 25 marks	Total : - 05
Course Pre-requisites:		
The Students should have knowledge of		
	Differentiation and integration of a single real variable, ordinary differential equations, Fundamentals of Programming languages: MATLAB (Introduction), Linear Algebra, Flowchart and algorithm basics.	
Course Objectives:		
	<ul style="list-style-type: none"> • To emphasize the need of computational techniques and analyze errors involved in the computation. • To provide sound knowledge of various numerical methods. • To apply various numerical methods to obtain solution of different types of equations such as transcendental, simultaneous, ODE etc. and also for interpolation, integration and differentiation. • To impart skills to develop programs using MATLAB 	
Course Outcomes: Students will be able to		
1.	Recall MATLAB Basics, implement basic principles of numerical methods and types of errors in computation and their causes of occurrence.	
2.	Identify various types of equations and apply appropriate numerical method to solve different equations.	
3.	Apply different numerical methods for interpolation, differentiation and numerical integration.	
4	Apply and compare various numerical methods to solve first and second order ODE.	
5	Apply and compare various numerical methods to solve linear simultaneous equations.	
6	Identify various statistical methods and demonstrate applications of algorithm in electrical engineering.	
UNIT - I	MATLAB Basics, Numerical Methods and Errors:	(08 Hours)
	MATLAB: Data types, Operator, Variables, Control Statements, Loops, Access Control, Arrays: Introduction, one and two dimensional arrays. Basic principle of numerical methods: Floating point algebra with normalized floating point technique, Significant digits. Errors: Different types of errors, causes of occurrence and remedies to minimize them. Generalized error formula.	
UNIT - II	Solution of Transcendental and polynomial equation and Curve Fitting:	(08 Hours)
	Solution of Transcendental and polynomial equation: Bisection, Secant, Regula-Falsi, Chebyshev and Newton-Raphson methods, Newton-Raphson method for two variables. Curve Fitting using least square approximation – First order and second order.	
UNIT - III	Interpolation and Numerical Differentiation:	(08 Hours)
	Interpolation: Difference operators, Introduction to interpolation - Newton's forward, backward interpolation formulae, Sterling's and Bessel's central difference formulae, Newton's divided difference formula, Lagrange's interpolation. Numerical Differentiation using Newton's forward and backward interpolation formulae.	
UNIT - IV	Solution of Ordinary Differential Equation(ODE) and Numerical Integration:	(08 Hours)
	Solution of First Order Ordinary Differential Equation (ODE) using Taylor's series method, Euler's, Modified Euler's methods, Solution of Second order ODE using 4th order Runge-Kutta method. Numerical Integration: Trapezoidal and Simpson's rules as special cases of Newton Cote's quadrature technique for single and double integrals.	
UNIT - V	Solution of linear simultaneous equation:	(08 Hours)
	Solution of simultaneous equation: Direct methods - Gauss and Gauss-Jordan elimination methods, concept of pivoting – partial and complete. Iterative methods – Jacobi and Gauss Seidel methods. Matrix Inversion using Jordon method and Eigen values using Power method.	
UNIT - VI	Statistical methods and Application of Algorithms in Electrical Engineering	(08 Hours)
	Statistical Methods: Random Sampling, Sample estimation, Hypothesis testing, Statistical quality control and Monte Carlo methods. Applications: Load Forecasting methods, Condition Monitoring, Battery Management System,	

Electrical Automation, Equation solving methods (simple numerical) for: Load Flow studies, Transient and Harmonic studies.	
Term Work:	
The term work shall consist of record of minimum eight experiments in MATLAB with flowchart and results from below list.	
<ol style="list-style-type: none"> 1. Solution of a polynomial equation using Birge-Vieta method. 2. Solution of a transcendental equation using Bisection or Regula-Falsi method. 3. Solution of two variable non-linear equation using N-R method. 4. Program for interpolation using Newton's forward or backward interpolation. 5. Program for interpolation using Lagrange's or Newton's Divided difference interpolation. 6. First order curve fitting using Least square approximation. 7. Solution of simultaneous equation using Gauss Seidel or Jacobi method. 8. Solution of simultaneous equation using Gauss elimination or Jordon method. 9. To find largest Eigen value using Power method. 10. Solution of Numerical Integration using Simpson's (1/3) rd or (3/8) th rule. 11. Solution of first order ODE using 4th order RK method or Modified Euler method. 	
Project Based Learning:	
<ol style="list-style-type: none"> 1. Develop an algorithm using any of the method for real time applications. 2. Write a review paper for comparative method based on any type of equations to obtain solution. 3. Develop an article for any method using multiple options in algorithm (loops, functions) and analyze the difference in result. 4. Identify applications in electrical engineering where errors are occurred and find solution how to minimize the errors. 5. Develop a web based application (static or dynamic model) for electrical application using relevant software. 	
Text Books:	
1. M. K. Jain, S.R.K. Iyengar, R. K. Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Publications.	
2. T. Veerarajan and T. Ramchandran, "Numerical Methods with Programs in C and C++", Tata McGraw Hill Publication.	
3. P.P. Gupta & G.S Malik, "Calculus of Finite Difference and Numerical Analysis", Krishna Prakashan Media Ltd, Meerut	
4. Dr. B. S. Grewal, "Numerical Methods in Engineering & Sciences", Khanna Publishers.	
5. E. Balagurusamy, "Numerical Methods", Tata McGraw Hill Publication.	
Reference Books:	
1. J. B. Scarborough, "Numerical Mathematical Analysis", Oxford & IBH, New Delhi.	
2. Steven Chapra, Raymond P. Canale, "Numerical Methods for Engineers", Tata McGraw Hill Publication.	
3. S.S. Sastry, "Introductory methods of Numerical Analysis", PHI Learning Private Ltd.	
4. P. Thangaraj, "Computer oriented Numerical Methods", PHI Learning Private Ltd.	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Industry Taught Course-I Operating Systems

Industry Taught Course-I Operating Systems		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hrs/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25 Marks, OR: 25 Marks	Total: 05
Course Pre-requisites:		
The Students should have knowledge of		
1.	Computer System, Applications of Computers and Computer operation's.	
Course Objectives:		
	To learn the basic structure and operations of a computer. Understand the memory and I/O organization and recent trends	
Course Outcomes: After learning this course students will be able to		
1	Discuss the operating system and their principles	
2	Analyze the process management system	
3	Elaborate the memory management system	
4	Analyze the I/O and file management system	
5	Analyze the recent trends and compare the future technologies	
6	Examine the various applications of computer systems.	
UNIT – I	OPERATING SYSTEM	(08 Hours)
	Computer System functions. The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines Evolution of Operating System.- Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.	
UNIT - II	PROCESS AND THREAD MANAGEMENT	(08 Hours)
	Processes-Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication; Threads- Overview, Multicore Programming, Multithreading Models; Thread and SMP Management. Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Monitors.	
UNIT -III	MEMORY MANAGEMENT	(08 Hours)
	Memory Management Requirements, Swapping, continuous memory allocation Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation. Virtual Memory: Hardware and Control Structures, Operating System Software, Linux Memory Management, Windows Memory Management, Android Memory Management.	
UNIT -IV	INPUT/OUTPUT AND FILE MANAGEMENT	(08 Hours)
	I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, Disk Cache, Linux I/O. File Management: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management, Linux Virtual File System, Android File Management.	
UNIT - V	TRENDS IN OPERATING SYSTEMS	(08 Hours)
	Linux Kernel Module Programming, Embedded Operating Systems: Characteristics of Embedded Systems, Embedded Linux, and Application specific OS. Basic services of NACH Operating System. Introduction to Service Oriented Operating System (SOOS), Introduction to Ubuntu EDGE OS, etc.	
UNIT -VI	LINUX SYSTEM AND CASE STUDY	(08 Hours)
	Basic Concepts of LINUX, Multifunction Server, Virtualization- Xen, VMware with Linux Host, Android operating system –Features, characteristics, Basic building blocks, Architecture, System services. Case Study: DOS and Windows Operating System, Unix Operating System	

Term Work:	
The term work shall consist of record of minimum eight experiments and not limited to	
1. Process control system calls	
2. Apply Banker's algorithm	
3. Inter process communication in Linux	
4. Linux Kernel configuration, compilation and rebooting from the newly compiled kernel. Requirements	
5. Kernel space programming	
6. Implementing a CPU scheduling policy in a Linux OS.	
7. Implementing a memory management policy in a Linux OS.	
8. Implementing a file system in a Linux OS.	
9. Apply disk Scheduling algorithms	
Project Based Learning	
1) To develop several system calls to enable user programs to interface with the file system.	
2) Functioning threading system- scheduling algorithm, interrupt handling.	
3) To enable the memory system by enabling virtual memory, including adding paging support, stack growth, memory mapped file support, and protects user level pages while in use by the kernel.	
Text Books:	
1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014.	
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons ,Inc., 9th Edition,2012.	
3. Maurice J. Bach, "Design of UNIX Operating System", PHI	
Reference Books:	
1. Dhananjay M Dhamdhere, 'Operating Systems - A Concept Based approach ', Tata McGraw, Hill publication	
2. Abraham Silberschatz, Peter B. Galvin & Grege Gagne (Wiley)'. Operating System Concepts '	
3. Sumitabha Das, 'Unix Concepts and Applications, Tata McGraw Hill	
4. Achyut S. Godbole, 'Operating System with case studies in Unix, Netware and Windows NT' Tata McGraw Hill	
5. Karim Yoghmour 'Embedded Android', O'Reilly Publication	
Syllabus for Unit Test:	
UnitTest-1	UNIT-I,UNIT-II, UNIT-III
UnitTest-2	UNIT-IV,UNIT-V,UNIT-VI

Application Softwares in Electrical Engineering

Application Softwares in Electrical Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 04 Hrs/Week	Term Work : 25 Marks	TW :- 02
Course Pre-requisites:		
The Students should have knowledge of		
	Basic Electric Machines, Magnetic Theory, Introduction to Electrical Power system , Structure of Electrical power system, Sources of Electrical Energy, Elements of Power system	
Course Objectives:		
	<ul style="list-style-type: none"> • Students will get well familiar with importance of electrical design, different design techniques and application of tools for electrical design and analysis. 	
Course Outcomes: Students will be able to		
1.	Relate the basic knowledge of electrical system with electrical design	
2.	Understand the importance of software tool and explore its GUI	
3.	Apply the knowledge of toolbar for understanding the design concept	
4	Identify various electrical applications as per software tools	
5	Discuss the methods of software simulation in electrical engineering	
6	Apply the knowledge for design and analysis of electrical machines	
UNIT - I Introduction to Electrical Design:		
	Introduction to Electrical System for Electrical Design and analysis, Application of Electrical Design, Purpose of Electrical Design, Basic Design philosophy, Importance of Results from design tools, design optimization, Standard Rules for Electrical Design.	
UNIT - II Introduction to ETAP Software:		
	Introduction to ETAP software, Importance of ETAP for System design, History of ETAP, Key features & Benefits of ETAP, Codes & Standards, Working with ETAP software- Starting ETAP software, Creating a new project, Changing the Project standard, File Management, Exploring GUI.	
UNIT - III Toolbar and Library for ETAP:		
	Toolbar Description - Project Toolbar, Theme Toolbar, System Toolbar, Mode Toolbar, Base & Revision Toolbar, Inserting Circuit Elements- Library for Circuit Elements, System Elements and Components, Element Classification - AC Elements , DC Elements , AC-DC Elements , Instrumentation Elements , Component Editor	
UNIT - IV Introduction to ANSYS Maxwell software:		
	Introduction to ANSYS Maxwell software and general applications, Applications of software in electrical engineering, Maxwell solvers-electric and magnetic solution, GUI, RMXprt tool, Introduction to 2D simulation, Introduction to 3D simulation.	
UNIT - V ANSYS Maxwell software simulation:		
	Finite element method, Selection of Geometry and solver types, Defining analysis plane, selection of solver, model units, Exploiting magnetic/excitation symmetry in model, Assigning material properties, Assigning excitation and boundary conditions, Model verification.	
UNIT - VI Electric Machine simulation:		
	Need for machine simulation, Applications of ANYSY Maxwell software for machine simulation, Design and analysis of any one electric machine using RMXprt tool, Maxwell 2D simulation, Maxwell 3D simulation, Discussion on simulations results.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments in ETAP and ANSYS with flowchart and results from below list.		
1.	Prepare the list of tools used for Electrical Design and Analysis	
2.	Prepare a new project and change the project standard using ETAP software	
3.	Study of system toolbars in details with its application in ETAP software	
4.	Study of system elements and components in ETAP software	
5.	Study of Library for ETAP software and its applications	

6. Study the components editor and its working in ETAP software
7. Design and analysis of any one conventional electrical motor using RMXprt tool.
8. Study of 2D model for any one conventional electrical motor using ANSYS Maxwell software.
9. Study of 3D model for any one conventional electrical motor using ANSYS Maxwell software
10. Design and analysis of any one special purpose machine using RMXprt tool.
11. Study of 2D model for any one special purpose machine using ANSYS Maxwell software.
12. Study of 3D model for any one special purpose machine using ANSYS Maxwell software.
Project based Learning:
<ol style="list-style-type: none"> 1. Obtain and prepare Single Line Diagram from any real time project in ETAP software without any errors. 2. Develop a substation SLD of any voltage level by giving suitable input parameters 3. Generate reports through above analysis and give presentation on the results obtained. 4. Designing Induction motor/BLDC motor/ Switched Reluctance motor as per specifications using RMXprt. 5. 2D model of assigned machine through ANSYS Maxwell software. 6. Develop an article based on any content related to ETAP software get it published in conference/technical journal, etc. 7. Develop an article based on any content related to ANSYS software get it published in conference/technical journal, etc.
Text Books:
<ol style="list-style-type: none"> 1. Hemchandra Madhusudan Shertukde, “Power Systems Analysis Illustrated with MATLAB and ETAP”, CRC Press, Taylor and Francis Group 2. Vivek Ravindran, Prajith Kumar, Sumit Tomar, “Modeling, Simulation and Optimization of a Power System Network: A case study using ETAP software”, LAP Lambert Academic Publishing. 3. John E.Matsson, “An introduction to ANSYS Fluent 2021”, SDC Publications. 4. Huei-Huang Lee, “Finite Element Simulations with ANSYS Workbench 2021 Theory, applications and case studies ”, SDC Publication.
Reference Books:
<ol style="list-style-type: none"> 1. T.Stolarski, Y.Nakasone,S.Yoshimoto “Engineering analysis with ANSYS software”, BH Publication. 2. Saeed Moaveni, “Finite Element Analysis Theory and application with ANSYS”, Third edition, Pearson publication . 3. Dr.Marius Rosu, Dr.Ping Zhou, Dr.Dingsheng Lin, “Multiphysics Simulation by Design for Electrical Machines, Power electronics and Drives”, IEEE Press Wiley.

Vocational Course-I AutoCAD Electrical

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
	TW: 25 Marks OR: 25 Marks	Credits: 02

Course Pre-requisites:

The Students should have basic knowledge of

- | | |
|-----------|--|
| 1. | A working knowledge of the AutoCAD software and electrical terminology |
|-----------|--|

Course Objectives:

	Navigate the AutoCAD Electrical user interface.
	’ standards.
	LC modules, and stand- alone
	PLC I/O points.

Course Outcomes: After learning this course students will be able to

1	Illustrate the basics of electrical drawings and list the common symbols in electrical drawings.
2	Explain the basics of schematics.
3	Construct the circuit and mark the cables.
4	Explain the panel layout and identify the components.
5	Explain the PLC, its layout, PLC parameter selection and connection of wires from source to equipment.
6	Compare and examine the generated report.

UNIT – I	Basics of electrical drawings	
	Need of Drawings, Electrical Drawings, Common Symbols in Electrical Drawings, Wire and its Types, Labeling. Design Environment, Basic Workflow, Project Manager, Project Drawing List, Moving Through a Project, Copy Projects, GUI .	
UNIT - II	Schematics	
	Single wires/components, referencing, Ladders, Wire Type, Wire Numbers, PLC I/O wire numbers, 3-Phase Circuits, Source and Destination Signal Arrows, Multi Wire 3-Phase Circuits, Point-2-Point Connectors.	
UNIT - III	Circuit and Cables	
	Cable markers, Fan In/Out, insert saved circuits, save circuits to ICON menu, circuit clipboard, circuit builder, copy component, align, delete component and attribute editing commands. 3 D model of electrical assembly. Drawings of electrical machines half sectional end and half sectional elevation.	
UNIT - IV	Panels	
	Panel Layout, Foot Prints, Footprints from Schematic list, Footprints from icon menu, Din rails, Balloons, Wire Annotations, Create Assembly, Editing & Modifying Footprints. Creating Own Footprint, Placing a Terminal. Terminal Editor	
UNIT - V	PLC	
	Generate PLC Layout Modules, PLC parametric selection, Module layout, Insert PLC modules, Edit PLC module, PLC Database File. Point to Point Wiring Tools, Introduction to Connector Diagrams, Inserting Connectors, Editing & Modifying Connectors, Link components by dashed lines, Grouping Wires	
UNIT - VI	Reports	
	Generate Reports, Types of schematic reports, Generate a schematic report, Types of panel reports, Generate a panel report, Run automatic reports, Automatic report generation, Audit: Missing Catalog, Electrical Audit, Signal Error/ List, Drawing Audit Import/Export: To Spreadsheet. From Spreadsheet	

Term Work:

The term work shall consist of record of minimum eight (2 based on schematics, 2 based on 3D model of electrical assembly, 2 based on panel layout and 2 based on PLC Circuit)sheets.

1. To create a schematic for 3 phase motor starters
2. To create a schematic drawing of any circuit of dc machines experiment
3. To create a schematic drawing of Load test on a Linear Induction Motor
4. To create a schematic drawing of Load test on a AC Series motor.
5. To Create schematic of the given circuit. Design the panel for the user and then generate the report for the components.
6. To draw the half sectional end and half sectional elevation of Squirrel cage motor
7. To draw the half sectional end and half sectional elevation of DC generator
8. To draw the detailed drawing of each part of single phase transformer
9. To draw the 3-phase, double layer lap winding with full pitch and chorded coils
10. To create a panel layout of 3 phase motor starters
11. To create a panel layout of Load test on a Linear Induction Motor
12. To create a panel layout of Load test on a AC Series motor.
13. Create the PLC circuit of the given figure

Text Book:

1. AUTOCAD ELECTRICAL 2016 BLACK BOOK By *Gaurav Verma CAD/CAM/CAE Expert Matt Weber CAD/CAE Expert (CAD/CAM/CAE Works, Georgia)*
2. AutoCAD Electrical 2019: Fundamentals with NFPA Standards: Autodesk Authorized Publisher
3. AutoCAD Electrical 2016 for Electrical Control Designers, Prof. Sham TickooPurdue University
4. Getting Started AutoCAD® Electrical 2005
5. AutoCAD Electrical 2012 User's Guide

Bharati Vidyapeeth Deemed to be University, Pune
Faculty of Engineering & Technology
Programme :B.Tech (Electrical Engineering) Sem – IV (2021 Course)

Special Purpose Machines

Special Purpose Machines		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25 Marks Oral: 25 Marks	Total: 05
Course Pre-requisites:		
The Students should have basic knowledge of		
1.	Electrical Machines (DC and AC) and Power Electronics.	
Course Objectives:		
	This course aims at understanding the construction, working principle, control, performance and applications of special purpose machines as an extension to the study of basic electrical machines.	
Course Outcomes: After learning this course students will be able to		
1	Explain construction, principal of operation and applications of special types of DC/AC machines.	
2	Explain types, characteristics and control methods of servo motors.	
3	Describe the types, characteristics of stepper motor and select the motor as per applications.	
4	Explain types, characteristics, applications and control methods of Reluctance motor.	
5	Describe construction, principal of operation and applications of Brushless DC Motor.	
6	Describe construction, principal of operation and applications of Permanent Magnet Synchronous Motor.	
UNIT - I	Special Types of DC/AC Machines	(08 Hours)
	Construction, operating principle, characteristics and applications of: Induction generator, Rosenberg Generator, three wire generator, Electric Welding Generator, Printed Circuit Board Motor, Universal motor, Linear induction motor, DYNA Motors, phase advancer, Rotary Amplifiers, Series Boosters.	
UNIT - II	Control Motors (Servo Motors)	(08 Hours)
	Servo Mechanism, fundamental characteristics, types – DC Servo Motors: field controlled, armature controlled and permanent magnet armature-controlled dc motor with schematic diagrams. AC Servo Motors: Construction, production of torque, torque speed characteristics, types, methods of control and applications.	
UNIT - III	Stepper Motor	(08 Hours)
	Constructional features – Principle of operation. Types of stepper motors-Variable reluctance motor, Hybrid motor, Permanent magnet motor. Single and multistack configurations. Theory of torque production, Torque equations – Modes of excitation. Characteristics of stepper motor - Static and dynamics characteristics. Concepts of lead angles, micro stepping, Drive circuits, Applications and selection of motor.	
UNIT - IV	Reluctance Motors	(8 Hours)
	Synchronous Reluctance Motor: Constructional features, Operating principle, Voltage and Torque Equations, Phasor diagram, performance characteristics and Applications. Switched Reluctance Motor: Constructional features, Principle of operation, Torque production, Steady state performance prediction, Analytical method. Power Converters and their controllers. Methods of Rotor position sensing, Sensor less operation, Characteristics and Closed loop control. Applications. Comparison between VR Stepper Motor and SR Motor	
UNIT - V	Brushless DC Motor	(8 Hours)
	Basic concepts, Magnetic materials. Brushless DC Motor: Construction, Principal of operation, Types, EMF and torque equations – Commutation - Power Converter Circuits and their controllers, Comparison with DC motor, Applications.	
UNIT - VI	Permanent Magnet Synchronous Motor	(8 Hours)
	Sinewave Motor/Permanent Magnet Synchronous Motors (PMSM): Ideal and practical	

	motor.Construction,Principle of operation, EMF and Torque equations, Armature MMF, Synchronous Reactance, Phasor diagram – Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements– Applications.	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> 1. Load test on a Universal Motor and determine the performance with dc/ac supply voltages. 2. Laboratory demonstration of Induction Generator. 3. Load test on a Linear Induction Motor and determine the speed thrust characteristic. 4. Laboratory demonstration of AC / DC Servo motor. 5. Experimental analysis of Stepper Motor Drive. 6. Load test in order to determine the performance characteristics of the Reluctance Motor. 7. To determine the d-axis and q-axis synchronous reactance of the Reluctance Motor. 8. Experimental analysis/simulation of Switched Reluctance Motor Drive. 9. Experimental analysis/simulation of Permanent Magnet BLDC Motor Drive 10. Experimental analysis/simulation of PMSM motor drive. 11. Load Characteristics of Brush less DC Motor. 12. Study of different software’s for design and analysis of special purpose machines. 13. Theoretical design of any one type of special purpose machine. 		
Project based learning: Student shall demonstrate minimum one concept based on syllabus topic.		
<ol style="list-style-type: none"> 1. Development of prototype of any one type of special purpose machine. 2. Practical study of any one type of special purpose machine. 3. Theoretical design/software simulation of any one type of special purpose machine. 		
Text Books:		
<ol style="list-style-type: none"> 1. K.Venkataratnam, ‘Special Electrical Machines’, Universities Press (India) Private Limited, 2008. 2. T. Kenjo, ‘Stepping Motors and Their Microprocessor Controls’, Clarendon Press London, 1984. 3. D.P. Kothari and I J Nagarath : ‘Electric Machines,’ Third Edn, Tata McGraw-Hill Pub.,2004. 4. V. K. Mehta, Principles of Electrical Machines, S Chand Publication. 5. B.L.Theraja,A.K.Theraja . ‘A Textbook of electrical technology-AC & DC Machines’ Volume-II, S.Chand publication. 6. Bhimbhra P. S., ‘Electrical Machine and Power Electronics’ Tata-McGraw Hill Publication. 7. Ashfaq Husain, “Electric Machines”, Dhanpat Rai and co. publications. 8. PrithwirajPurkait, Indrayudh Bandyopadhyay “Electrical Machines” Oxford University Press 9. Charles I. Hubert, “Electrical Machine, Theory, Operation, Applications, Adjustments and Control” Low Price Edition, Pearson Education. 		
Reference Books:		
<ol style="list-style-type: none"> 1. R.Krishnan, ‘Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application’, CRC Press, New York, 2001. 2. T.J.E. Miller, ‘Brushless Permanent Magnet and Reluctance Motor Drives’, Clarendon Press, Oxford, 1989. 3. P.P. Aearnley, ‘Stepping Motors – A Guide to Motor Theory and Practice’, Peter Perengrinus London, 1982. 4. T. Kenjo and S. Nagamori, ‘Permanent Magnet and Brushless DC Motors’, Clarendon Press, London, 1988. 5. E.G. Janardanan, ‘Special electrical machines’, PHI learning Private Limited, Delhi, 2014. 6. Ogata K., ‘Modem control Engineering’, Prentice Hall. 7. A. E. Fitzgerald, Charles Kingsley, Stephen Umans, ‘Electric Machinery’, Tata McGraw Hill Publication 8. P. C. Sen, “ Principles of Electrical Machines and Power Electronics”, John Willey & Sons 9. Ion Boldea, ‘Linear Electric Machines, Drives and Maglevs’, CRC Press 10. Daune C. Hanselman, “Brushless Permanent Magnet Motor Design” McGraw Hill, Inc. 		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Network & Synthesis

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	Theory : - 04
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical : - 01
Tutorial: 01 Hrs/Week	TW : 25 Marks, PR: 25 Marks	Total : - 05

Course Pre-requisites:

The Students should have knowledge of

Terminology of electrical networks, series and parallel combinations of resistance, Laplace transforms , linear differential equations.

Course Objectives:

- To develop the strong foundation for Electrical Networks.
- To develop analytical qualities in Electrical circuits by application of various theorems.
- To understand the behavior of circuits by analyzing the transient response using classical methods and Laplace Transform approach.
- To apply knowledge of laws and Network theory for analysis of 2-port networks and design of other circuits like filters.

Course Outcomes: Students will be able to

1. Calculate current/voltage in electrical circuits using simplification techniques, Mesh, Nodal analysis.
2. Calculate current/voltage in electrical circuits using Network theorems and understand the graph theory.
3. Analyze the response of RLC circuit with electrical supply in transient and steady state.
4. Apply Laplace transform to analyze behavior of an electrical circuit.
5. Derive formula and solve numerical of two port network and Design of filters.
6. Apply knowledge of network theory to find transfer function, poles and zeroes location to perform stability analysis and parallel resonance.

UNIT - I	Basics of Network with types, Mesh & Nodal Analysis	(06 Hours)
	Lumped and Distributed, Linear and Nonlinear, Bilateral and Unilateral, Time-variant and Time invariant. Independent and Dependent (controlled) voltage and current sources. Concept of voltage and current divider, Source transformation and shifting. Network Equations: Network equations on Loop basis and Node basis, choice between Loop analysis and Nodal analysis. Concept of super node and super mesh, mutual inductance, Dot convention for coupled circuits, Concept of duality and dual networks.	
UNIT - II	Network Theorems and Graph Theory:	(06 Hours)
	Network Theorems: Superposition, Thevenin's, Norton, Maximum Power Transfer Theorem, Reciprocity, Millman's theorems applied to electrical networks with all types of sources. Graph Theory: Tree, Co-tree, Incidence matrix, F-cutset Matrix, Tie set B Matrix	
UNIT - III	Transients in RLC circuit:	(06 Hours)
	Solutions of differential equations and network equations using classical method for R-L, R-C and R-L-C circuits with DC and sinusoidal excitation (under-damped, over-damped and critically damped conditions with derivation), Initial and Final Condition (series and parallel).	
UNIT - IV	Laplace Transform and its Applications:	(06 Hours)
	Basic Properties of Laplace Transform, Laplace Transform of Basic R, L and C components, Solutions of differential equations and network equations using Laplace transform method for RL, R-C and R-L-C circuits (series and parallel), Inverse Laplace transforms, transformed networks with initial conditions. Analysis of electrical circuits with applications of step, pulse, impulse & ramp functions, shifted & singular functions the convolution integral, application of initial and final value theorem, Application of Laplace transformation technique in electric circuit analysis.	
UNIT - V	Two port network and Filters:	(06 Hours)
	Two Port Network: Short circuit admittance, open circuit impedance, Hybrid parameters and transmission parameters, Interrelations between parameters. Filters: Introduction to passive filters, low pass filters, high pass filters and m-derived LPF and HPF filters and design.	
UNIT - VI	Network Functions:	(06 Hours)
	Poles and Zeros: Terminal pairs or ports, network functions for the one port and two ports, the	

calculation of network functions, general networks. Poles and zeros of network functions, Restrictions on poles and zeros locations for transfer functions and driving point function, Time – domain behavior from the pole and zero plot. Stability of active networks. Parallel Resonance, Resonance frequency, Quality factor, Current and resonance.	
Term Work:	
The term work shall consist of record of minimum eight experiments:	
<ol style="list-style-type: none"> 1. Verification of Superposition theorem in A.C. circuits. 2. Verification of Thevenin’s theorem in A.C. circuits. 3. Verification of Reciprocity theorem in A.C. circuits. 4. Verification of Millman’s theorem. 5. Verification of Maximum Power Transfer theorem in A.C. circuits. 6. Determination of time response of R-C circuit to a step D.C. voltage input. (Charging and discharging of a capacitor through a resistor). 7. Determination of time response of R-L circuit to a step D.C. voltage input. (Rise and decay of current in an inductive circuit). 8. Determination of time response of R-L-C series circuit to a step D.C. voltage input. 9. Determination of parameter of Two Port Network. 10. Determination of current under parallel Resonance condition. 11. Determination of Resonance, Bandwidth and Q factor of R-L-C series circuit. 	
Project based learning:	
<ol style="list-style-type: none"> 1. Prepare a hardware model based on any of the network theorem and calculate current flowing through the load. 2. Prepare a simulation model for the above hardware model in any software and compare the results with hardware model. 3. Develop an article based on hardware and software model and get it published in conference/technical journal, etc. 4. With the help of CRO perform transient analysis of voltage and current for any of the circuit. 	
Text Books:	
1. Network Analysis Third Edition by M. E. Van Valkenburg, Prentice Hall of India Private Limited.	
2. Network Analysis & Synthesis by G. K. Mittal, Khanna Publication.	
3. Network Analysis and Synthesis by Ravish R Singh, McGraw Hill.	
4. Introduction to Electric Circuits by Alexander & Sadiku, McGraw Hill.	
5. Introduction to Electric Circuits by S. Charkarboorty, Dhanpat Rai & Co.	
6. Fundamentals of Electrical Networks by B.R.Gupta & Vandana Singhal- S.Chand Publications	
7. Electrical Circuit Analysis 2nd Edition by P. Ramesh Babu, Scitech Publication India Pvt. Ltd.	
Reference Books:	
1. Network Analysis by Cramer , McGraw Hill Publication.	
2. Engineering Circuit Analysis by William H. Hayt, Jr. Jack E. Kemmerly, McGraw Hill Publication.	
3. Schaum's Outline of Electric Circuits, McGraw-Hill Education; 7 edition	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Power Electronics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	Theory: 04
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Practical: 01
	Term Work: 25 Marks Practical : 25 marks	Total: 05

Course Pre-requisites:

The Students should have knowledge of

1. Fundamentals of Electronics Engineering and Fundamentals of Electrical Engineering

Course Objectives:

To introduce basic knowledge of electronics devices used for control of power.

To describe characteristics and application circuits of SCR and other power devices.

Course Outcomes: After learning this course the students will be able to

1. To Understand the working and application of Power semiconductor devices
2. To Understand the working and application of AC to DC converters
3. To Understand the working and application of AC voltage controllers
4. To evaluate DC to DC converters
5. To study DC to AC inverters
6. To understand the applications of power Electronics

UNIT - I	Power semiconductor devices	(08 Hours)
	<p>Classification of power semiconductor devices Uncontrolled turn-on and turn-off (Diode), Controlled turn-on and uncontrolled turn-off (SCR, TRIAC), Controlled turn-on and controlled turn-off (BJT, MOSFET, Double-diffused MOSFET (DMOS), V shaped gate MOSFET (VMOS), CoolMOS, CoolSic (silicon carbide) MOSFET, CoolGan transistor (Gallium Nitride e-mode HEMTs), Insulated-gate bipolar transistor IGBT, static induction transistor SIT, GTO, Integrated gate-commutated thyristor IGCT, MOS-controlled thyristor MCT, static induction thyristor SITH), Continuous gate signal requirement (BJT, MOSFET, COOLMOS, IGBT, SIT), Diamond wafer technologies for semiconductor device applications, synthetic diamond semiconductor technology. Synthetic chemical-vapor-deposition (CVD) diamond semiconductor technology, Single crystal diamond wafers for high power electronics</p> <p>Thyristor Power Devices SCR - static and dynamic characteristics, specifications, two transistor analogy, gate characteristics, triggering circuits, protection of SCR, SITH Protection of power circuit from - over voltage, over current & temperature rise (thermal) Design of Snubber circuit.</p> <p>Transistor Power Devices MOSFET, IGBT, MCT, COOLMOS, SIT , Construction, Characteristics, Specifications, Safe Operating Areas, protection, switching action and their control circuit requirement, comparison and area of application of these devices, Diagram and working of Switched Mode Power supply (SMPS) and Uninterrupted Power Supply (UPS)</p>	
UNIT - II	AC to DC Convertors (Single phase and three phase)	(08 Hours)
	<p>Single phase convertor, three phase semi controlled and fully controlled bridges with R, RL and RLE loads, derivation of average and RMS output voltage and current, rectification and inversion mode of operation, concept of overlap angle and associated voltage drop calculation, dual convertor and selection of transformer and semiconductor devices for convertors. Total Harmonic Distortion (THD).</p>	
UNIT - III	AC Voltage Controllers	(08 Hours)
	<p>DIAC, TRIAC - construction, characteristics, four mode operation, specifications, triggering of TRIAC using DIAC, AC voltage regulator principle, single phase and three phase analysis with R and RL Load, Harmonics and ripple factor, Applications of two stage, three stage and multistage</p>	

	voltage controllers, derivation of average and RMS output voltage and current	
UNIT - IV	DC to DC Convertors	(08 Hours)
	Principle of operation of chopper, classification on the basis of operating quadrants control techniques, CLC, TRC, PWM and FM techniques, analysis of step up choppers and numerical with RLE load, area of application, necessity of input filter, derivation of average and RMS output voltage and current	
UNIT - V	DC to AC Inverters	(08 Hours)
	Single phase and three phase inverters principle of operation, VSI and CSI inverters, applications, operating frequency range. PWM inverters: single pulse, multi-pulse and sinusoidal pulse modulation, PWM techniques for voltage control and harmonic elimination.	
UNIT - VI	Applications of Power Electronics	(08 Hours)
	Power electronics for renewable energy systems., energy storage systems, smart cities, smart grids, power systems: FACTS, HVDC systems, etc., transport applications (electric vehicles, trains, aircrafts, ships, etc.), industrial applications., medical applications., in military applications. telecommunication applications., energy harvesting systems., consumable applications. home appliances. Wearable devices	

Term Work:

The term work shall consist of minimum eight experiments.

1. to study software based design of converter circuits
2. V-I Characteristic of SCR, DIAC & TRIAC
3. V-I characteristic of power semiconductor devices GTO, MOSFET, IGBT
4. 1 Phase half Controlled & Full controlled converter (R & RL Load)
5. 3 phase converter (R, RL, RLE Load)
6. Step down Chopper circuit (RC technique)
7. 3 phase Voltage Source transistorized inverter
8. Firing circuit for 3 phase converter
9. 1 phase or 3 phase AC voltage regulator
10. 3 phase AC – DC converter with RLE Load
11. 1 phase PWM bridge inverter

Project based learning:

1. Commutation circuit of SCR
2. Design of Snubber Circuit
3. Collection of data sheets of Power Devices
4. Matlab based experiments on power electronics
5. case study of a industry manufacturing convertors
6. to design and build a rectifier circuit in the laboratory
7. to design and build a ac to DC converter circuit in the laboratory
8. to design and build a DC to DC converter circuit in the laboratory
9. to design and build a Dc to AC inverter circuit in the laboratory
10. to design and build a circuit for application in solar energy in the laboratory
11. to design and build a circuit for application in wind energy in the laboratory
12. to design and build a circuit for application in energy storage system in the laboratory

Reference Books:

1. Vedam SubraManyam - "Power Electronics" - New Age international, New Delhi
2. Dubey, Donald, Joshi, Sinha - "Thyristerised Power Controller"- Wiley Eastern New Delhi
3. M. D Singh & K B Khandchandani, "Power Electronics" - Tata McGraw hill
4. Jai P Agarwal - "Power Electronics, Systems theory & design" LPE Pearson Education
5. L Umanand - "Power Electronic, Essentials & Applications" - Wiley publication
6. Randall , Shaffer - "Fundamental of Power Electronics with Matlab"
7. J. Michale, Jacob - "Power Electronics Principles & Applications"
8. V K Mehta – "Principles of Electronics" – S. Chand Publications

9. Bimal K Bose, Power Electronics in Renewable Energy Systems and smart grid technology and applications, IEEE Wiley	
10. Haithum ABU Rub, Power Electronics in Renewable Energy Systems and smart grid technology and applications, IEEE Wiley	
11. NPTEL website Video lectures by B. G. Fernandes	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Industry Taught Course-II Industrial Organization & Financial Management		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The students should have knowledge of professional skill development and basic management terms		
Course Objectives:		
	<ol style="list-style-type: none"> To understand the basic operations in any organization, technical skill sets required by people. To learn terms like Depreciation, Replacement engineering, Product Engineering, Production Planning and Inventory Control. To understand the Job Evaluation techniques, Personnel Management, Behavioral Aspects of Management and Operations Research. 	
Course Outcomes:		
The student will be able to		
1.	To understand the basic terms related to management like function, principles.	
2.	To understand various type of companies and the various financial aspects related with the company.	
3.	To understand the terms related with the depreciation, replacement and products of the company	
4	To understand the production and inventory related concept	
5	To understand the concepts of financial management and capital	
6	To understand the concepts of financial services, investment and stock market	
UNIT - I	Management	(06 Hrs)
	Introduction, Phases in Management: scientific management, Behavioral management and Information technology and operations research. Industrial Management, Contents and Principle of Management, Functions of Management: Planning, coordination, motivation and control. Leadership: Qualities of leader, Leading Process. Education and Training of Management. Elements of Quality Management System ISO 9001-2008. SAP, life insurance	
UNIT - II	Formation of Company and startups	(06 Hrs)
	Introduction, Company definition, Types of company Structure: Proprietorship, Partnership, Joint Stock companies, Limited and Unlimited Company, Private and Public, Corporative, Public, Private and Joint Sector, Trust and Holding Companies. Start ups Startup opportunities: The New Industrial Revolution – The Big Idea- Generate Ideas with Brainstorming- Business Startup – Ideation- Venture Choices – The Rise of The startup Economy -The Six Forces of Change – The Startup Equation- The Entrepreneurial Ecosystem -Entrepreneurship in India. Government Initiatives.	
UNIT - III	Depreciation, Replacement and Product Engineering	(06 Hrs)
	Introduction, objective of Business Enterprise, Depreciation and Depreciation Calculation, Estimation of Life of an Engineering Aspects, Replacement of Plant and Machinery, Product Classification, Initiation of Product, Production Analysis, simplifications and Standardization, Product Research, Production Planning and Inventory Control Introduction, Production System, Production Types, Production Planning functions, Efficiency of Production planning and Drawing Office Organization. Inventory Control Functions, Procedures for Purchase,	
UNIT - IV	Job Evaluation and Personnel Management	(06 Hrs)
	Introduction, Job Evaluations and Analysis, Classification of Job evaluation techniques, Evaluation of wages structures, system of merit rating, measurement of responsibility and wage incentives. Importance of personnel management, human relations, Functions of personnel management. , labour participation in management. Labour turnover, industrial disputes. Behavioral Aspects of Management and Operations Research Scientific management, Hawthorne Studies, Elton Mayo, Theory X and Theory Y, Herzberg's motivation and Hygiene Theory, Organizational goals and Culture. Stresses at workplace, Interpersonal Behavior, power and Politics in organization.,	
UNIT - V	Financial management and capital	(06 Hrs)
	Financial Management Micro Economics, Principles of Accounting, Quantitative Methods and Statistics Financial Modeling, Managerial Economics, Corporate Finance, Scope and Functions and role of Finance Managers, Scope of Finance; Financial Management	

	<p>Capital Classification of Capital, Capital Procurement, Cost of Capital, Cost of Capital; Cost of Debt; Cost of Preference Capital; Cost of Equity Capital; Approaches to Derive Cost of Equity; Weighted Average Working capital, Operating Cycle Method, : Management of Cash Motives for Holding Cash; Facets of Cash Management; Cash Planning;</p>	
UNIT - VI	Financial services, investment and stock market	(06 Hrs)
	<p>Meaning of financial services , types , players in financial services , merchant banking , Primary market : face value of shares , debenture issue of shares on premium , discount initial public offer (IPO) , Follow on public offer (FPO). Secondary market : differences between primary and secondary market , role of stock exchanges , demutualization of stock exchanges Derivatives : Types of derivatives optional premium , commodity exchange , commodity derivative Investment Need of Investment , Physical assets like real estate, gold / jewellery, commodities etc, Currency trading, Commodity market Stock market Share market basics B.S.E.. N.S.E : organizational structure , index construction , sensex , NIFTY , sectors, settlement , rolling settlement , pay in and pay out , no delivery period, auction of shares, investor protection, Dmat account, types of charges, primary and secondary market Intra-day trading, Chart study, Basics of Candle stick chart, analysis of candlestick chart, fifteen candle stick patterns,</p>	
Assignments (Project Based Learning): Students need to complete six assignments from following list		
1. Case study 1 study of a start up company		
2. Case study 2 study of human resource department of a company		
3. Case study 3 visit to Bank and study facilities		
4. Conducting an interview for a company		
5. Collecting information for Initiating a startup company in a group		
6. Fundamental Technical analysis of a share		
7. Online investment in commodity market		
8. Online currency trading		
9. Opening a saving bank account		
10. Online Opening of a dmat account,		
11. Opening a of a trading account		
12. Purchasing a share in intraday trading with minimum rupees to get introduction		
Text Books:		
1. S. K. Basu, K. C. Sahu, B. Rajiv “Industrial Organization and Management”, PHI learning Private Limited, New Delhi.		
2. “Industrial Engineering and Management”, O.P. Khanna, Dhanpat Rai & Sons. New Delhi.		
Reference Books:		
1. Herman B. Henderson, Albert E. Haas “Industrial Organization and Management Fundamentals”, Industrial Press.		
2. K.P. Kaur “Professional Management in Industrial Organisations”, , Deep and Deep Publications.		
3. Dr. Anil Kumar Dhagat Financial Management 2011, ISBN:9789350040225, 9350040220, Page count:564, May 2011, Publisher:Wiley India Pvt. Limited		
4. D Chandra Bose, “Fundamentals of financial management” PHI Learning Private limited		
5. Prasanna Chandra, “Financial Management Theory and Practice” Tata McGraw Hill Education Pvt. Limited. s edition ISBN:9789353166533, 9353166535, 2019		
6. Rodney Hobson Shares made Simple, Harryman house Ltd.		
7. Stock Market investing for begineers Tycho Press		
8. Robert A Schwartz, The economic function of Stock exchange, Springer		
9. Gagari Chakrabarti, Momentum trading on Indian Stock Market, Springer		
10. Gaourishankar Hiremath, Indian Stock Market, Springer		
11. Palgrave Mcmillan, Startups and innovation ecosystems in emerging markets, Springer		
12. Agnieszka Skala, Digital startups in transition economics, Palgrave Mcmillan, Springer		
13. Manuel Stagers, University Startups and spin offs, Apress		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Database Management System (SQL)

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Practical: 01
	TW: 25 Marks & PR: 25 Marks	Total: 05

Course Pre-requisites:

The Students should have knowledge of

- 1) Basic understanding of data and data structure
- 2) Basic understanding of programming language

Course Objectives:

- Identify various techniques to communicate with database.
- Relate relevant data for effective processing of data.
- Construct a database to maintain data adroitly.
- Study various queries and tools to deal with the data.
- Understand the relation between data set and respective means to access it.
- Understand influence of data in the effective development of software.

Course Outcomes: After learning this course students will be able to

- | | |
|----------|---|
| 1 | Design database to store data related with application. |
| 2 | Identify technique to deal with data |
| 3 | Extend power of SQL by adding programming paradigm |
| 4 | Predict suitable environment for data processing as per type data |
| 5 | Apply knowledge of DBMS to process the software efficiently |
| 6 | Discuss data computing techniques |

UNIT – I	Introduction to DBMS	(08 Hours)
	What is database management system, Use of database system, view of data, relational databases, database architecture, transaction management, Data Models The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction. Design of Database, ER Diagram Database design. ER Model: overview of ER-Model, Constraints, ER-Diagrams, Extended ER Diagrams.	
UNIT - II	Relational database model	(08 Hours)
	Logical view of data, keys, integrity rules. Design of Relational Database: features of good relational database design, Normalization (1NF, 2NF, 3NF, BCNF). Relational Algebra and Calculus Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities	
UNIT -III	Integrity Constraints	(08 Hours)
	What are constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views Introduction to SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	
UNIT -IV	PL/SQL	(08 Hours)
	Introduction ,Declaring Variables , Writing Executable Statements , Interacting with Oracle Server , Writing Control Structures , Working with Composite Data Types , Writing Explicit Cursors , Writing Implicit Cursors , Handling Exceptions , Creating Procedures , Creating Functions , Managing Subprograms , Creating Packages , More Package concepts , Oracle supplied Packages, Manipulating Large Objects , Creating Database Triggers.	
UNIT - V	Transaction management	(08 Hours)
	ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management	
UNIT -VI	Data Intensive Computing	(08 Hours)

	Introduction to big data, unstructured data processing using Hadoop , NoSQL database using MangoDB.	
Term Work:		
The term work shall consist of record of minimum eight experiments and not limited to		
List of experiments:		
1) Draw an ER Diagram to maintain database of Bank		
2) Normalize the database of Library, upto BCNF		
3) Perform the following operation for demonstrating the insertion, updation and deletion using the referential integrity constraints		
4) Calculate turnover of a banks in pune using group by query		
5) WAP to implement auto rollback option on deletion using trigger.		
6) WAP to implement Procedure to calculate square of a number.		
7) Implement implicit cursor using PL/SQL.		
8) Simulate two phase locking protocol on the database of Movie.		
9) Perform document processing using Mango DB,.		
10) Solve word count problem using Hadoop.		
Project Based Learning:		
1. Make a project to maintain employee data using files and dynamic object/structure. The project should be able to read, write, modify, add and search records. Also demonstrate the effect of performing change in employer data definition after few records have been added.		
2. Make an extended ER diagram for insurance management system. Transform this into relation design and implement these relations with appropriate domain and integrity constraints.		
3. Employ various data control restrictions on databases, relations and attributes of relations.		
4. Create a phonebook which enables user to save contacts with additional information and provides various retrieval mechanisms. Provisions should be made to view data in mutiple ways.		
5. Design and develop a library management system. The relations in the system should be normalised upto BCNF		
6. Design and develop a inventory management system and create multiple views on the relations so that users not authorised to edit the relations should be able to views the data.		
7. Implement of audit trails and backup on relations.		
8. Create a student result calculation system. However when updating final results after calculation should be only of stduents who paid complete fees, such that transaction of each row is executed seperately. Hint- use explicit cursor		
9. Develop a student data management system using hash files.		
10. Installation of a NoSQL database and implementing a simple student database to compare with SQL database.		
Text book:		
1. A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", Sixth Edition McGraw-Hill		
2. Oracle SQL and PL/SQL Guide Till 10gR2		
3. Ramkrishna R., Gehrke J., Database Management Systems, 3rd Edition, McGrawHill		
Reference Books:		
1. Rob, Coronel, "Database Systems", Seventh Edition, Cengage Learning.		
2. Bipin Desai, Introduction to Databse Management Systems.		
3. Groff James R., Paul Weinberg, LAN times guide to SQL.		
Syllabus for Unit Test:		
UnitTest-1	UNIT-I,UNIT-II, UNIT-III	
UnitTest-2	UNIT-IV,UNIT-V,UNIT-VI	

IT Practices

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 06 Hours / Week	Term Work : 25 Marks, Oral : 25 Marks	Total : - 03

Course Pre-requisites:

The Students should have knowledge of

1. C Programming

Course Objectives:

This syllabus is a comprehensive study of Core Java. It contains complete industrial Java topics to learn the Java programming language in detail. Java is object oriented, platform independent, simple, secure, architectural-neutral, portable, robust, multi-threaded, high performance, distributed and dynamic.

Course Outcomes: Students will be able to

1. Become familiar with the features of Java Language & fundamentals
2. Discover how to write Java code according to Object-Oriented Programming principles.
3. Become comfortable with concepts such as I/O operations in JAVA & multithreaded programming
4. Learn Java APIs for Collections, I/O Streams
5. Design GUI applications and Applets using AWT and Swing.
6. Develop Multithreaded and Networking applications.

UNIT - I	Java Language Environment & Java Fundamentals:	
	Object Oriented, Platform Independent, Automatic Memory Management, Compiled / Interpreted approach, Robust, Secure, Dynamic Linking, Multi-Threaded, Built-in Networking, Data types, Operators, Control Statements, Arrays, Enhanced for-loop, Enumerated types, Static import, Auto boxing, C-style formatted I/O, Variable arguments.	
UNIT - II	Packages & Exception Handling:	
	Why packages, Understanding Class path, Access modifiers & their Scope, When an exception occurs, Importance of Exception Handling, Exception Propagation, Exception Types, Using try and catch, throw, throws, finally, Writing User defined Exceptions	
UNIT - III	I/O Operations in Java & Multithreaded Programming:	
	Byte Oriented Streams, File Handling, Readers and Writers, Introduction to Multi-Threading, Understanding Threads & its States, Java Threading Model, Thread class & Runnable Interface, Thread Priorities, Thread Synchronization, Interthread Communication, Preventing Deadlocks.	
UNIT - IV	Java Util Package / Collections Framework:	
	Collection & Iterator Interface, Enumeration, List and Array List, Vector, Comparator, Set Interface & Sorted Set, Hashtable, Properties	
UNIT - V	Generics & Abstract Window Toolkit:	
	Introduction to Generics, Using Built-in Generics Collections, Writing Simple Generic Class, Bounded Generics, Wild Card Generics, Graphics, Color and Font, AWT Components/Controls, Event Handling & Layouts.	
UNIT - VI	Swing Programming:	
	Introduction to Swing & MVC Architecture, Light Weight Component, Swing Hierarchy, Atomic Components e.g. JButton, JList and more, Intermediate Container e.g. JPanel, JSplitPane and more, Top-Level Container e.g. JFrame and JApplet, Swing Related Events.	

Term Work:

The term work shall consist of record of minimum eight experiments from below list.

1. Write a Java program that takes a number as input and prints its multiplication table upto 10.
2. Implement a Java function that calculates the sum of digits for a given char array consisting of the digits '0' to '9'. The function should return the digit sum as a long value
3. Write a java program to implement the vectors.
4. Write a java program to open a file and display the contents in the console window.
5. Write a java program to read the student data from user and store it in the file.
6. Design a AWT program to print the factorial for an input value.
7. Design an AWT program to perform various string operations like reverse string, string concatenation etc.
8. Write a java program to implement exception handling.

Assignments: (Project based learning)

1. Write a Java program to print the area and perimeter of a circle.
2. Write a Java program to count the letters, spaces, numbers and other characters of an input string.
3. Write a java program to implement thread life cycle.
4. Write a java program to implement multithreading.
5. Write a java program to copy the contents from one file to other file.
6. Design an AWT application that contains the interface to add student information and display the same.
7. Design a calculator based on AWT application.
8. Design an AWT application to generate result marks sheet.

Text Books:

1. Vaishali Shah, Sharnam Shah, Core Java 8 for Beginners, First Edition, SPD, 2015
2. R. Nageswara Rao, Core Java: An Integrated Approach, First Edition, Dream Tech, 2008

Reference Books:

1. Herbert Schildt, Java: The Complete Reference, 9th Edition, McGraw Hill, 2014
2. Hortsman, Core Java, Volume I: Fundamentals, 9th Edition, Pearson, 2013

Vocational Course-II Solar Power Plant Designing

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
	TW: 25 Marks OR: 25 Marks	Credit: 02
Course Pre-requisites:		
The Students should have knowledge of		
1.	Energy Systems, potential and need of renewable energy.	
Course Objectives:		
	To understand the need and scope of cleaner sources of energy. To motivate the use of Solar and Solar based applications.	
Course Outcomes: After learning this course students will be able to		
1	Discuss the various energy systems and compare its need, adaptability and potential.	
2	Classify the energy sources and understand its capacity and applications.	
3	Discuss the need and various concepts related to Solar system's.	
4	Understand the basics of Solar Photovoltaic systems, examine its types and installations.	
5	Identify the need and scope of solar safety.	
6	Design of Solar Electric system and its applications	
UNIT – I	NEED OF ENERGY	
	Introduction, Definition of Power and energy, difference between power and energy, the role of energy in development, Limitation of renewable energy sources their usefulness seasonal nature, requirement, need for the use of new energy sources. Overview of Global Energy Scenario Various sources of Renewable energy. Potential of Renewable energy. Solar irradiance, irradiation, sun path diagram & peak sun hour	
UNIT - II	TYPES OF ENERGY SOURCES	
	Conventional energy sources Hydro Electric, Thermal, Nuclear, Non-Conventional Energy sources Bio-mass, geo-thermal, solar, wind energy, ocean energy, wave energy, advantages and disadvantages, challenges.	
UNIT -III	SOLAR SYSTEM	
	Solar system: Energy from the sun, solar window, atmospheric effects, diffused radiations, Air mass, effect of Air Mass, seasonal effects, environmental effects on standard test conditions.	
UNIT -IV	PRINCIPLES OF SOLAR PHOTOVOLTAIC SYSTEMS	
	Solar Photovoltaic energy conversion and utilization, solar power generation systems a) off-grid systems b) grid connected systems c) power control and management systems, economics of solar photovoltaic systems, World Energy Requirement, Energy and Role of Photovoltaic, Types of PV Installation, Common Systems type, GRID-TIED System, Hybrid Systems, Photovoltaic in Energy Supply, Types of the solar power plant, the concept of net & gross metering , Selection of inverter, module & balance of system , Array, string & cable layout-KW(rooftop) & MW(ground-mounted) System	
UNIT - V	SOLAR SAFETY	
	Electrical safety, electrical safety rules, simple first aid, general safety of tools and equipment, fire extinguishers, types of fire extinguishers, Guideline of Safety measurement in solar plant, Performance and monitoring system, ways to maximize energy, solar cell utility – scale system performance.	
UNIT -VI	Solar Electric System Installation and Service	
	Applications of Solar Water Heater, Solar lighting systems, Solar cooking, Roof Top, Solar Integration to grid. Design calculation for solar plant , Protection system, earthing calculation & cable sizing	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments and not limited to		
1) Study of Solar Photovoltaic Fencing 2) Study of Solar Cookers		

- 3) Study of Solar Water Heater
- 4) Study of Solar Dryer
- 5) Study of Solar Water Pumping System
- 6) Study of Solar Lighting System
- 7) Study of Solar Photovoltaic System
- 8) Study of Solar Distillation System
- 9) Study of Solar Pond
- 10) Visit to Renewable Energy Integrated Plant
- 11) Open circuit voltage of PV cells
- 12) Short Circuit Current of PV cells

Text book and Reference Books:

- 1) Solar Energy: Fundamentals and Applications Book by H. P Garg, Tata Mc Graw Hill Publishing Company Ltd.
- 2) From Sunlight to Electricity: A Practical Handbook on Solar Photovoltaic Applications Suneel Deambi, The Energy and Resources Institute, TERI
- 3) Solar Electricity Handbook - 2019 Edition: A Simple, Practical Guide to Solar Energy - Designing and Installing Solar Photovoltaic Systems. Michael Boxwell
- 4) Solar Energy: The Physics and Engineering of Photovoltaic Conversion, Technologies and Systems.

MOOC-I

Sr. No.	Title of Course
1	Fundamentals Of Electronic Materials and Devices
2	Introduction to Robotics
3	Product Design and Innovation
4	Non-Conventional Energy Resources
5	Steam and Gas Power Systems
6	Energy Resources and Conversion Processes
7	Sensors and Actuators
8	Elements of Solar Energy Conversion
9	Introduction to internet of things
10	Introduction to Industry 4.0 and Industrial Internet of Things
11	Introduction to Machine Learning
12	Programming, Data Structures and Algorithms Using Python

**B.TECH- ELECTRONICS &
COMMUNICATION ENGINEERING)**

STRUCTURE

Bharati Vidyapeeth (Deemed to be University) Pune.

Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication) Sem-I (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
1	Linear Algebra, Calculus & Solid Geometry	4	0	1	60	40	0	0	0	100	4	0	1	5
2	Chemistry & Economics of Material Science	4	2	0	60	40	50	0	0	150	4	1	0	5
3	Electronic Component & Devices	3	4	0	60	40	0	0	100	200	3	2	0	5
4	Electrical Technology	4	2	0	60	40	25	0	0	125	4	1	0	5
5	Computation & Programming Using C	3	4	0	60	40	0	75	0	175	3	2	0	5
Total		18	12	1	300	200	75	75	100	750	18	6	1	25

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Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication) Sem-II (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
6	Integral Transforms & Vector Calculus	4	0	1	60	40	0	0	0	100	4	0	1	5
7	Wave Theory & Photonics	4	2	0	60	40	50	0	0	150	4	1	0	5
8	Electronic Communication	3	4	0	60	40	0	100	0	200	3	2	0	5
9	Computer Aided Graphics	4	2	0	60	40	25	0	0	125	4	1	0	5
10	Python Programming	3	4	0	60	40	0	75	0	175	3	2	0	5
Total		18	12	1	300	200	75	175	0	750	18	6	1	25

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Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication Engineering) Sem-III (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
11	Probability & Statistics	4	0	1	60	40	0	0	0	100	4	0	1	5
12	Switching Theory & Logic Design	4	2	0	60	40	0	0	50	150	4	1	0	5
13	Analog Circuits & Applications	3	2	0	60	40	0	0	50	150	3	1	0	4
14	Signals & Systems	4	2	0	60	40	0	50	0	150	4	1	0	5
15	Process & Control System *	3	0	0	60	40	0	0	0	100	3	0	0	3
16	Vocational Course-I-PCB Design & Assembly	0	0	0	0	0	0	50	0	50	0	2	0	2
17	Data Structures	0	4	0	0	0	0	50	0	50	0	2	0	2
18	Database Management System	0	4	0	0	0	0	50	0	50	0	2	0	2
19	MOOC - I	0	0	0	0	0	0	0	0	0	0	0	0	2
20	Environmental Studies** (Mandatory Audit Course)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		18	14	1	300	200	0	200	100	800	18	9	1	30

* Industry taught course- I

**This course will have End semester examination of 100 marks

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Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication) Sem-IV (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
21	Digital Communication	3	2	0	60	40	0	50	0	150	3	1	0	4
22	Microcontroller & Applications	4	2	0	60	40	0	0	50	150	4	1	0	5
23	EM Waves & Propagation	4	0	1	60	40	0	0	0	100	4	0	1	5
24	Integrated Circuits & Amplifier Design	4	2	0	60	40	0	0	50	150	4	1	0	5
25	Essentials of Data Science*	3	0	0	60	40	0	0	0	100	3	0	0	3
26	Vocational Course-II Domestic Appliances & Maintenance	0	0	0	0	0	0	50	0	50	0	2	0	2
27	Java Programming	0	4	0	0	0	0	50	0	50	0	2	0	2
28	Linux Programming	0	4	0	0	0	0	50	0	50	0	2	0	2
29	Social Activity	0	0	0	0	0	0	0	0	0	0	0	0	2
30	Disaster Management** (Mandatory Audit Course)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		18	14	1	300	200	0	200	100	800	18	9	1	30

*Industry taught course-II

**This course will have End semester examination of 100 marks

Bharati Vidyapeeth (Deemed to be University) Pune.

Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication) Sem-V (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
31	Information Theory & Coding	3	2	0	60	40	25	0	0	125	3	1	0	4
32	Digital Signal Processing	4	2	0	60	40	0	50	0	150	4	1	0	5
33	Embedded System Design	3	2	0	60	40	0	0	50	150	3	1	0	4
34	Fuzzy Logic, Neural Networks & Genetic Algorithms	3	2	0	60	40	25	0	0	125	3	1	0	4
35	Telecom Switching Techniques*	3	0	0	60	40	0	0	0	100	3	0	0	3
36	Vocational Course-III -Calibration & Measuring Instruments	0	0	0	0	0	0	50	0	50	0	2	0	2
37	Project-I(Stage-I)	0	2	0	0	0	0	100	0	100	0	4	0	4
38	Web Development	0	4	0	0	0	0	50	0	50	0	2	0	2
39	MOOC-II	0	0	0	0	0	0	0	0	0	0	0	0	2
Total		16	14	0	300	200	50	250	50	850	16	12	0	30

*Industry Taught Course-III

Bharati Vidyapeeth (Deemed to be University) Pune.

Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication) Sem-VI (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
40	Computer Communication Networks	3	2	0	60	40	0	50	0	150	3	1	0	4
41	Cellular Technology & 4G	4	0	0	60	40	0	0	0	100	4	0	0	4
42	VLSI Design Technology	3	2	0	60	40	0	0	50	150	3	1	0	4
43	Quantitative Techniques Communication and Values	2	2	0	60	40	0	0	0	100	3	0	0	3
44	Industrial IOT&ML*	4	0	0	60	40	0	0	0	100	4	0	0	4
45	Vocational Course-IV RF Cell Planning & Drive Test Analysis	0	0	0	0	0	0	50	0	50	0	2	0	2
46	Project-I (Stage-II)	0	2	0	0	0	0	100	0	100	0	4	0	4
47	Internship**	0	0	0	0	0	0	50	0	50	0	3	0	3
48	Power Electronics	0	4	0	0	0	0	50	0	50	0	2	0	2
Total		16	12	0	300	200	0	300	50	850	17	13	0	30

*Industry taught course-IV

** Internship: It is mandatory to complete internship from reputed companies/industries.

Bharati Vidyapeeth (Deemed to be University) Pune.

Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication) Sem-VII (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
49	FTTH-Optical communication	4	2	0	60	40	0	50	0	150	4	1	0	5
50	Radar & Satellite Communication	4	0	1	60	40	0	0	0	100	4	0	1	5
51	AI & Data Mining*	4	2	0	60	40	50	0	0	150	4	1	0	5
52	Elective- I	4	2	0	60	40	0	50	0	150	4	1	0	5
53	Project –II(Stage-I)	0	4	0	0	0	0	200	0	200	0	4	0	4
54	Android Development	0	4	0	0	0	0	100	0	100	0	2	0	2
55	Research Paper Publication	0	0	0	0	0	0	0	0	0	0	0	0	2
56	MOOC-III	0	0	0	0	0	0	0	0	0	0	0	0	2
Total		16	14	1	240	160	50	400	0	850	16	9	1	30

*Industry taught course-V

Elective-I i) Augmented Reality & Virtual Reality
iv) Cyber Security & Forensics

ii) Data Centre Engineering
v) Wireless Robotics

iii) RF & Microwave Communication

Bharati Vidyapeeth (Deemed to be University) Pune.

Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication) Sem-VIII (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
57	Light Wave Communication	4	0	1	60	40	0	0	0	100	4	0	1	5
58	5G Architecture	4	2	0	60	40	50	0	0	150	4	1	0	5
59	Elective- II	4	2	0	60	40	0	0	50	150	4	1	0	5
60	Block Chain Technology*	4	2	0	60	40	0	50	0	150	4	1	0	5
61	Project-II(Stage-II)	0	04	0	0	0	0	200	0	200	0	6	0	6
62	Cloud Computing	0	04	0	0	0	0	100	0	100	0	2	0	2
63	Social Activity	0	0	0	0	0	0	0	0	0	0	0	0	2
Total		16	14	1	240	160	50	350	50	850	16	11	1	30

* Industry taught course-VI

Elective-II

i) Smart Cities

ii) Image Processing & Computer Vision

iii) Biomedical Electronics

iv) Software Defined Networks

v) Software Testing

B.TECH (SEM-I)

SYLLABUS

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. I Electronics & Communication Engineering LINEAR ALGEBRA, CALCULUS AND SOLID GEOMETRY		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination (UE): 60Marks	Credits: 04
Practical:--	Internal Assessment (IA): 40 Marks	
Tutorial: 01		Credit:01
	Total:100 Marks	Total Credits:05
Course Pre-requisites:		
The students should have knowledge of		
1	Basic algebra.	
2	Ordinary derivative.	
3	Plane geometry.	
Course Objectives:		
1	Rank, consistency of system of equations and concepts of solid geometry.	
2	Partial derivative and maxima, minima for several variable	
3	Methods of curve tracing and multiple integrals	
Course Outcomes: After learning this course students will be able to		
1	Apply & test rank of matrix for consistency of linear system.	
2	Understand the partial derivative and apply to find errors and approximate values.	
3	Test the functionality using Jacobian.	
4	Trace curves of various types of mathematical functions.	
5	Compute the coordinate system and apply it to locus problems.	
6	Evaluate multiple integrals and apply it evaluate area and volume.	
UNIT – I	Linear Algebra: Matrices	(08 Hours)
	Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering.	
UNIT – II	Partial Differentiation and its applications	(08 Hours)
	Functions of two or more variables, Partial derivatives,	

	Homogeneous functions, Euler's theorem, Total derivative, Change of variables, Errors and Approximations.	
UNIT -III	Jacobian and Maxima and Minima Multivariable Calculus	(08 Hours)
	Partial derivative, Jacobians and their applications, Chain Rule, Functional Dependence. Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.	
UNIT - IV	Fourier series, Integral Calculus and Curve Tracing	(08 Hours)
	Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis, Differentiation Under the Integral Sign, Error functions. Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.	
UNIT -V	Solid Geometry	(08 Hours)
	Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.	
UNIT - VI	Multiple Integrals and their Application	(08 Hours)
	Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values	
Text Books:		
1. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics" (Volumes I and II), 7 th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.		
References Books:		
1. B. S. Grewal, "Higher Engineering Mathematics", 42 th Ed., Khanna Publication, Delhi		
2. B.V. Ramana, "Higher Engineering Mathematics", 6 th Ed., Tata McGraw-Hill, New Delhi, 2008.		
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10 th Ed., John Wiley & Sons, Inc., 2015.		
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7 th Ed., Cengage Learning, 2012.		
5. Michael Greenberg, "Advanced Engineering Mathematics", 2 nd Ed., Pearson Education, 1998.		
Project based learning:		
1. Find the eigen values and eigen vectors of any random matrix		
2. Check the linear dependence / independence of vectors		
3. Check the consistency and solve the linear equations		
4. Solve the partial differential equations		
5. Find the error using the concept of total derivative		
6. Check the Functional Dependence using the concept of Jacobian		
7. Find the derivatives of error functions		
8. Find Maxima and Minima of functions of two variables		

9. Use differentiation under the integral Sign to solve integrals
10. Trace the Cartesian curves
11. Trace the polar curves
12. Find the equation of sphere, cone and cylinder using the concept of solid geometry
13. Find root mean square values using integrals
14. Find the volume using triple integrals
15. Find the area using double integral

Students in a group of 3 to 4 shall complete any one project from the above list.

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. Sem. I Electronics & Communication Engineering CHEMISTRY AND ECONOMICS OF MATERIAL SCIENCE		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits: 04
Practical:02	Internal Assessment (IA): 40 Marks	
Tutorial: --	TW:50 Marks	Credit: 01
	Total:150 Marks	Total Credits:05
Course Pre-requisites:		
The students should have knowledge of		
1	Structure property relationship, types of crystals, Capacitor, insulator, classification and properties of polymers, super capacitors, Green solvents	
Course Objectives:		
1	To develop the interest among the students regarding chemistry and their applications in engineering.	
2	To develop confidence among students about chemistry, how the knowledge of	
3	The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the field such as E&C Engineering.	
Course Outcomes: After learning this course students will be able to		
1	Describe the properties of materials and application of semiconductor electronics	
2	The student will able to understand various structure of polymers and their effect on different properties of polymers.	
3	Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro levels.	
4	To explain students the importance of economics and environmental issues in material science.	
5	Design and develop sensors using optical methods with desired properties.	
6	Identify the grand challenges of green chemistry and consider what it will take to resolve them.	
UNIT – I	Semiconductors, insulators and Superconductors	(08Hours)
	Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators or Dielectrics.	

UNIT – II	Polymers for the Electronics Industry	(08Hours)
	Definition, Classification, Chain Architecture (Linear/Branched, Tacticity, Isomerism), homopolymers, copolymers, graft copolymers and their characteristic properties in reference to their applications. Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p- phenylene), Polyhetrocyclic systems, Polyaniline, Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications	
UNIT -III	COMPOSITES	(08 Hours)
	Introduction of Composites, Classification of Composites, Organic Matrix Composites, Metal Matrix Composites (MMC), Ceramic Matrix Materials (CMM), Classification Based on Reinforcements, Fiber Reinforced Composites/Fibre Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Reinforced Composites (PRC), Classification Based on Reinforcements and Matrices, Classification Based On Matrices, Metal Matrix Composites (MMC), Advantages and Limitations of Composites, Materials, Limitations of Composites	
UNIT -IV	ECONOMICS OF ENGINEERING MATERIALS	(08 Hours)
	Introduction, economic considerations, green design, environmental and societal considerations of materials recycling of metals and non-metals recycling issues, limits of recycling, life cycle analysis and its use in design.	
UNIT -V	SENSORS	(08 Hours)
	MEMS, NEMS, Actuators, Biosensors, construction and working of Biosensors and classification of Biosensors, Advantages of Biosensors, Biochips or Biological computers.	
UNIT -VI	GREEN CHEMISTRY	(08 Hours)
	Introduction, Twelve Principles of Green chemistry, numericals on atom economy, synthesis, adipic acid and indigo. Green solvents (ionic liquid supercritical CO ₂), and products from natural materials.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. To determine strength of strong acid using pH meter		
2. Titration of a mixture of weak acid and strong acid with strong base using		

conductometer
3. Preparation of polystyrene
4. To determine molecular weight of a polymer by viscosity measurement
5. To determine radius of macromolecule polystyrene/ polyvinyl alcohol by viscosity measurement.
6. Study of corrosion of metals in medium of different pH.
7. To determine pH of soil
8. To determine Acidity of soil
9. Determine the surface concentration of 1-butanol in aqueous solution.
10. Preparation of a conducting polymer.
11. Preparation of Urea-formaldehyde resins
12. To determine strength of strong acid using pH meter
Text Books
1. Bhal & Tuli, "Text book of Physical Chemistry (1995)", S. Chand & Company, New Delhi.
2. S. S. Dara, "A textbook of Engineering Chemistry", McGraw-Hill Publication, New Delhi.
Reference Books:
1. Jain P.C & Jain Monica, "Engineering Chemistry", Dhanpat Rai & Sons, Delhi, 1992.
2. O. G. Palanna, "Engineering Chemistry", Tata McGraw-Hill Publication, New Delhi..
3. F. A. Cotton and G. Wilkinson, "Advanced Inorganic Chemistry (6th edition)", John Wiley
4. P. Ghosh, "Polymer Science and technology (2nd Edition)", Tata McGRAW Hill, 2008.
5. J.M.G.Cowie, "Polymers: Chemistry & Physics of Modern Materials (2nd edition)", Blackie Academic & Professional, 1994.
6. Shikha Agarwal, "Engineering Chemistry- Fundamentals and applications", Cambridge Publishers - 2015.
Project based learning:
1. To Prepare and for synthesis of the following polymers, a. Bakelite b. Polystyrene c. Epoxy Resin
2. Synthesis properties and applications of polymer.
3. To Prepare Glass Hybrid Fibres, Epoxy Composite material using Hand Layup Method
4 To Prepare Fibre Reinforced Composites.
5. To study - Bio diesel and Bio petrol & extraction process of Bio desial.
6. Effect of fertilizers in water
7. Preparation of Gold Nanoparticles Using Tea:
8. Determination of Mercury in Milk by Cold Vapor Atomic Fluorescence:
9. Nitration of Phenols Using $\text{Cu}(\text{NO}_3)_2$
10 Solvent less and One-Pot Synthesis of Cu(II) Phthalocyanine Complex:
11. Density Based Traffic Signal System using Microcontroller and IR Sensors
12 Solar Energy Measurement System using Microcontroller
13 To develop diagnostic biosensor.
14 Electrochemical 3D printing
15. Investigating cell mechanics with Fluid FM force spectroscopy.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. I Electronics & Communication Engineering ELECTRONIC COMPONENTS AND DEVICES		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination (UE): 60Marks	Credits : 03
Practical:04	Internal Assessment(IA):40 Marks	
	TW & Practical:100 Marks	Credits : 02
	Total Marks:200	Total Credits:05
Course Pre-requisites:		
The students should have knowledge of		
1	Class XII level Physics & Mathematics.	
Course Objectives:		
1	To make the students gain the knowledge of basic electronic passive components.	
2	To provide detailed description of PN junction behavior at the circuit level and its role in the operation of diodes as rectifiers, clippers and clampers	
3	To provide a comprehensive study of bipolar junction transistor.	
4	To learn and analyze transistor biasing circuits.	
5	To observe characteristics and working of FET and MOSFET	
6	To get familiarized with various optoelectronic devices.	
Course Outcomes: After learning this course students will be able to		
1	Identify various Passive components.	
2	Demonstrate knowledge of working of diode with applications such as rectifier, clipper and clamper.	
3	Analyze the characteristics of BJTs in various configurations (CB, CE, and CC).	
4	Design the biasing circuits like fixed bias and voltage divider bias.	
5	Describe the operation of FET and MOSFET.	
6	Demonstrate knowledge of working of optoelectronic devices.	
UNIT – I	Passive Components	(06 Hours)
	Introduction to the concept of active and passive electronic components, Resistors: types of resistors, construction and applications, Capacitor: types of capacitors, construction and applications, Inductor: types of inductors, construction and applications.	
UNIT –II	Diode and applications	(06 Hours)
	Classification of material based on band gap theory, types of	

	semiconductors (p-type and n-type), PN junction Diode: basic structure and operating principle, current-voltage characteristic, Zener breakdown, Avalanche breakdown. Diode Applications: Rectifier circuits: Half-wave and full-wave rectifiers. Full wave Rectifier with capacitor filter. Diode as clipper: series and parallel forms of clipper circuits, biased clipper, Diode as a clamper.	
UNIT -III	Bipolar Junction Transistor	(06 Hours)
	Introduction to Bipolar Junction Transistors, it's construction and working mechanism, configuration of BJT in Common Base, Common Emitter and Common Collector configuration. Input-output characteristics in all three configurations with relevant V-I expressions and definitions of DC gains.	
UNIT -IV	Transistor biasing and applications	(06 Hours)
	Need of biasing, DC load line analysis, operating point, Thermal runaway. Requirements of a biasing circuit, Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for biasing circuits, Transistor as an amplifier.	
UNIT -V	FET & MOSFET	(06 Hours)
	FET: Types of FET, JFET Structure, Construction and working mechanism of JFET, V-I characteristics and transfer characteristics, Parameters of JFET. MOSFET: Types of MOSFET, MOSFET Structure, Working of Depletion and Enhancement type MOSFETs, Drain and Transfer Characteristics of D-MOS and E-MOS.	
UNIT-VI	Optoelectronic devices	(06 Hours)
	Construction, V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optocoupler.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. To plot V-I characteristics of PN junction diode		
2. To plot V-I characteristics of half wave rectifier		
3. To plot V-I characteristics of Full wave rectifier using Capacitor filter.		
4. To plot input-output characteristics of CE configuration of BJT.		
5. To analyze biasing techniques of BJT: Fixed bias and voltage divider bias		
6. To plot frequency response of single stage CE amplifier and find its bandwidth		
7. To plot frequency response of single stage FET amplifier and find its bandwidth		

8.To plot optical characteristics of LED and LDR
9.To plot optical characteristics of Photodiode and phototransistor
10.To plot transfer characteristics of Optocoupler
Text Books:
1.Robert Boylestad, Electronic Devices and Circuit Theory, Pearson Publication.
2. V.K.Mehta, Principles of Electronics, S Chand & Company Ltd. New Delhi.
3. Millman,Halkies, Electronic Devices and Circuits, TMH publication
Reference Books:
1. Thomas L. Floyd , “Electronic Devices”, Pearson
2. Ben G. Streetman and Sanjay Banerjee, “Solid State Electronic Devices”, Pearson Education India
3. Malvino, “Electronic Principle”, McGraw Hill Education
4. Sedra & Smith, “Microelectronics Engineering”, Oxford University Press
Project Based Learning:
Build the following circuits -
1. PN junction diode in forward and reverse biasing mode.
2. Conversion of AC to pulsating DC using half wave rectifier.
3. AC to DC converter using Full wave rectifier (Center tap Transformer)
4. AC to DC converter using Bridge Rectifier with capacitor filter
5. BJT in CE configuration.
6. Check stability of operating point using fixed bias method.
7. Check stability of operating point using Voltage divider bias method.
8. BJT Amplifier circuit.
9. FET Amplifier Circuit.
10. Optical characteristics of LED and LDR.
11. Optical characteristics of Photodiode and Phototransistor.
12. Characteristics of optocoupler.
13. Zener diode in forward and reverse biasing mode.
14. BJTs as a digital switch
15. Automatic Street Light controller

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. I Electronics & Communication Engineering ELECTRICAL TECHNOLOGY		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination (UE): 60Marks	Credits : 04
Practical: 02	Internal Assessment (IA): 40 Marks	
Tutorial:-	TW: 25 Marks	Credit: 01
	Total Marks:125	Total credits:05
Course Pre-requisites:		
The Students should have knowledge of		
1	Basic physics.	
2	Basic mathematics	
Course Objectives:		
1	To study electrical circuit basics, network theorems, AC fundamentals, electrical machines, transformers, batteries, two port networks.	
Course Outcomes: After learning this course students will be able to		
1	To find voltages and currents in a given network using various network reduction techniques and network theorems	
2	To find parameters relating to a given series or a parallel resonant circuit.	
3	Outline magnetic circuits and types of transformer.	
4	Demonstrate AC and DC electrical machines.	
5	Classify types of batteries.	
6	To find any of the two port parameters of a given two port networks.	
UNIT – I	Introduction to Electrical Circuits and Network Theorems	(08 Hours)
	Circuit concepts, Voltage and Current Sources, Independent and Dependent sources, Voltage-Current relationship for passive elements, Source Transformation and Source shifting techniques, Network Reduction techniques-Series, Parallel, Series-Parallel, Star-to-Delta, Delta-to-Star Transformations, Kirchhoff's Laws, Node and Mesh Analysis, Super node and Super mesh. Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem	
UNIT –II	AC Fundamentals and circuits:	(08Hours)

	AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems)	
UNIT -III	Magnetic circuits and Types of Transformer:	
	Magnetic Circuit: Kirchhoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling. Faradays law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e .m. f. equation, voltage ratio, current ratio, KVA rating ,determination of efficiency and regulation by direct load test, equivalent circuit, power losses,(simple numerical problems), introduction to auto transformer, Three phase transformer and its different winding connections.	(08 Hours)
UNIT -IV	Electrical Machines: DC & AC:	(08 Hours)
	Principles of electro mechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics and applications of dc motors (simple numerical problems).Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).	
UNIT -V	Batteries	(08 Hours)
	Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, Charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.	
UNIT -VI	Two Port Networks	(08 Hours)

	Two port parameters: Z, Y, ABCD and H-parameters, Conditions for Reciprocity and Symmetry, Inter-relationship between two-port parameters, Interconnections between two port parameters.	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
1. To verify Thevenin's, Norton's and Superposition Theorem.		
2. To find Steady State response of RL,RC and RLC circuits		
3. To find resonant frequencies of series and parallel circuit.		
4. Load test on single phase transformer.		
5. OS & SC test on single phase transformer to find efficiency and regulation		
6. Load test on DC machine.		
7. Speed control of DC motor		
8. Study of different types of starters for DC & AC Machine		
9. Testing and maintenance of batteries		
10. To find Z and Y parameters of given two port networks.		
11. To find H and ABCD parameters of given two port networks.		
Text Books:		
1. B. L. Theraja, 'A Textbook of Electrical Technology', Vol.1, S. Chand &Company Ltd. New Delhi.		
2. V. K. Mehta, 'Basic Electrical Engineering', S Chand & Company Ltd. New Delhi.		
3. I. J. Nagarath and Kothari, 'Theory and applications of Basic Electrical Engineering', Prentice Hall of India Pvt. Ltd.		
4. D. Roy Choudhury, 'Network and Systems', New Age InternationalPublishers, Second Edition.		
5. Ravish Singh, 'Network analysis and Synthesis, M. Graw Hill Education (India) Private Limited.		
Reference Books:		
1. Edward Huges, 'Electrical Technology' Pearson		
2. D. P. Kothari, J Nagarath, 'Basic Electrical Engineering'. TMC		
3. M. E. Van Valkenburg, 'Network Analysis', PHI, 3rd Edition		
Project based learning:		
1. Design a small circuit to study superposition theorem.		
2. Design small circuit to study Thevenin's Theorem.		
3. Design Small circuit to study Norton's Theorem.		
4. Design small circuit to study R-C series circuit.		
5. Design small circuit to study R-L series circuit.		
6. Design small circuit to study R-L-C series circuit.		
7. Design of small R-L parallel circuit for study.		
8. Design of small R-C parallel circuit for study.		
9. Design of small R-L-C parallel circuit for study.		
10. Design small two winding transformer.		
11. Design small electromagnet.		
12. Design of small chemical battery.		
13. Design of small two port network for study of ABCD parameters.		
14. Design of small electric circuit to study Kirchhoff's voltage laws.		
15. Design of small electric circuit to study Kirchhoff's current laws		

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. I Electronics & Communication Engineering COMPUTATION AND PROGRAMMING USING C		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination(UE): 60Marks	Credits: 03
Practical: 04	Internal Assessment (IA): 40 Marks	
Tutorial:--	TW&Oral: 75 Marks	Credit: 02
	Total Marks:175 Marks	Total Credits:05
Course Pre-requisites:		
1	Students must possess knowledge about basic fundamentals of computer and professional Microsoft office development tools.	
Course Objectives:		
The students should have knowledge of		
1	This course will introduce the concepts of C language software development and compiling tool. By the end of the course, student will be familiar with various fundamentals of C- language.	
Course Outcomes: After learning this course students will be able to		
1	Understand the basic concept of C programming.	
2	Write basic programs using conditional statement.	
3	Use Array in programming.	
4	Use Functions in programming.	
5	Write basic programs using Pointers.	
6	Write basic programs using structures.	
UNIT – I	Introduction:	(06 Hours)
	Basic of C: Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators Managing input and output operations, Sample programs.	
UNIT – II	Conditional Statements and Loops:	(06 Hours)
	Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop.Nested loops, infinite loops, switch statement, sample programs.	

UNIT -III	Arrays & Strings	(06 Hours)
	Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Array applications: Matrix Operations.	
UNIT -IV	Functions:	(06 Hours)
	Basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, recursive functions, Recursive solutions for Fibonacci series, example c programs. Passing arrays & strings to functions.	
UNIT -V	Pointers:	(06 Hours)
	concepts, initialization of pointer variables, pointers and function arguments, passing by address, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays.	
UNIT -VI	Structures and Linked list	(06Hours)
	Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, program applications. Concept of linked lists, Types & Advantages linked list, creating a linked list, Inserting and Deleting linked list, Applications of linked list	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. Write a C program to take user Input and print it on the screen. a. Perform a C program to perform various mathematical and logical operations. b. Perform a C program to find whether the entered input number is Odd or Even.		
2. Perform a C program to find out Prime numbers.		
3. Write and perform C program to find out Fibonacci series.		
4. Perform and write a C program to find out Armstrong number.		
5. Perform a C programs to print different patterns.		
6. Perform and write a C program to do factorial using recursion.		
7. Perform a C program to sort the given array in Ascending & Descending order.		
8. Perform C programs to perform various operations on 2-D arrays		

9. Perform a C program to perform different operations on strings.
10. Use of Pointers a. Write a C program to swap numbers using pointers b. Write a C program to show the use of pointers in arrays. c. Write a C program to use functions using pointers.
11. Perform a C program to show the use of structure and linked list
12. Perform a C program to create student mark sheet using structures and linked list.
Text Books:
1. E Balagurusamy, “Programming in ANSIC”,5 th Edition-TMH
Reference Books:
1. Yashwant Kanitkar , “Let Us C”,PBP
Project based learning:
1. Bank Management System
2. Diary management System
3. Calendar using C
4. Contact Management System
5. Library Management System
6. Snake Game
7. Bus Reservation system
8. Customer Billing system
9. Hospital Management system
10. Cyber management
11. Cricket score display
12. Employee management system
13. Pacman Game
14. Quiz game
15. Phone-book application
16. Election System
17. Flight ticket booking
18. Tourism Management system
19. Simple Result system
20. Stock Management system

Students in a group of 3 to 4 shall complete any one project from the above list.

B.TECH (SEM-II)

SYLLABUS

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. Sem. II Electronics & Communication Engineering		
INTEGRAL TRANSFORMS AND VECTOR CALCULUS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits : 05
Practical:--	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credit : 01
	Total Marks: 100 Marks	Total Credits: 05
Course Pre-requisites:		
The students should have knowledge of		
1	Integrals.	
2	Fourier series.	
3	Vector algebra.	
Course Objectives:		
1	Methods to solve differential equations	
2	Various techniques of integral transform.	
3	line, surface and volume integrals.	
Course Outcomes: After learning this course students will be able to		
1	Implement the methods for first order first degree differential equation.	
2	Understand the modeling of physical systems and find the solutions.	
3	Solve the nth order linear differential equation.	
4	Compute the integral transform for various functions.	
5	Apply the Laplace transform for solving differential equations	
6	Understand vector calculus and apply it to evaluate line, surface and volume integrals.	
UNIT – I	Differential Equation	(08 Hours)
	Formation of the ordinary differential equations(ODEs), Solution of an ordinary differential equation, Equations of the first order and first degree, Linear differential equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations,	
UNIT–II	Applications of Differential Equation	(08 Hours)
	Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under	

	Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat.	
UNIT - III	Linear Differential Equations	(08 Hours)
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy’s & Legendre’s DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.	
UNIT -IV	Z-transform	(08 Hours)
	Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.	
UNIT -V	Laplace Transform	(08 Hours)
	Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT& inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.	
UNIT-VI	Vector Calculus	(08 Hours)
	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities. Line, Surface and Volume integrals, Work-done, Green’s Lemma, Gauss’s Divergence Theorem, Stoke’s Theorem, Applications to Problems in Electro-Magnetic Fields.	
Text Books:		
2. P. N. Wartikar and J. N. Wartikar, “Applied Mathematics (Volumes I and II)”, 7 th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.		
References Books:		
1. B. S. Grewal, “Higher Engineering Mathematics”, 42 th Ed., Khanna Publication, Delhi		
2. B.V. Ramana, “Higher Engineering Mathematics”, 6 th Ed., Tata McGraw-Hill, New Delhi, 2008.		
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10 th Ed., John Wiley & Sons, Inc., 2015.		

4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7 th Ed., Cengage Learning, 2012.
5. Michael Greenberg, "Advanced Engineering Mathematics", 2 nd Ed., Pearson Education, 1998.
Project based learning:
1. Formation of differential equations
2. Evaluate the electric circuit problem using differential equations
3. Evaluate the heat conduction in 1-D using differential equations
4. Evaluate the rectilinear motion problem using differential equations
5. Evaluate the simple harmonic problem using differential equations
6. Obtain the solution of Simultaneous & Symmetric Simultaneous DE
7. Obtain the solution of Simple Difference Equations using Z-transforms
8. Find the Directional Derivatives
9. Find work done using Green's theorem
10. Find scalar potential using vectors
11. Evaluating integrals using Green's theorem, Gauss's and stoke's theorem
12. Use Laplace transform to solve differential equations
13. Use Laplace transform to solve integrals equations
14. Use Fourier transform to solve integrals
15. Applications of vector integration to solve problems in Electro-Magnetic Fields.
16. Find the conditions for Solenoidal and irrotational vector fields

Students in a group of 3 to 4 shall complete any one project from the above list.

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. II Electronics & Communication Engineering		
WAVE THEORY AND PHOTONICS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits : 04
Practical:02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW:50 Marks	Credit: 01
	Total:150 Marks	Total Credits:05
Course Pre-requisites:		
The students should have knowledge of		
1	Students are expected to have a basic understanding of physics and calculus.	
Course Objectives:		
1	To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Electronics and Communication Engineering.	
Course Outcomes: After learning this course students will be able to		
1	Connect the problems associated with architectural acoustics and give their remedies and use ultrasonic as a tool in industry for non destructive testing.	
2	Summarize and solve the engineering problems on Electromagnetism	
3	Develop competency and understanding of the principles and applications of lasers and fiber optics.	
4	Solve quantum physics problems to electronic phenomena and solid state physics	
5	Apply the properties of photon in communication engineering	
6	Interpret the need, importance and scope of non conventional and alternate energy resources.	
UNIT – I	Acoustics and Ultrasonics	(08 Hours)
	Acoustics: Intensity, Loudness, Absorption coefficient and its determination, Reverberation and Reverberation time, Factors affecting acoustics of buildings and their remedies, Sources and impacts of noise, Sound level meter, Strategies on controlling noise pollution. Ultrasonic waves and properties, Methods of Ultrasonic production (Magnetostriction and Piezoelectric), Applications of Ultrasonics in Engineering and medicine.	

UNIT – II	Electromagnetic Wave	(08 Hours)
	Displacement current, Maxwell's equations (derivation), Wave equation for electromagnetic waves, Propagation in free space, Poynting theorem, Characteristic of Transverse electric and magnetic waves, Skin depth, Rectangular and circular waveguides.	
UNIT - III	Lasers and Fibre Optics	(08 Hours)
	Lasers introduction, Characteristics of Lasers, Einstein's coefficients and their relations, Lasing action, Working principle and components of CO ₂ Laser, Nd -YAG Laser, Semiconductor diode Laser, Excimer Laser and Free electron Laser, Applications in remote sensing. Principle of Optical fiber, Acceptance angle and acceptance cone, Numerical aperture, V-number, Types of optical fibers (Material, Refractive index and mode), Photonic crystal fibers, Fiber optic communication, Fiber optic sensors.	
UNIT - IV	Quantum Mechanics and Crystal Physics	(08 Hours)
	Quantum mechanics: Inadequacies of Classical Mechanics, De Broglie hypothesis for matter waves, Heisenberg's uncertainty principle, Schrödinger's wave equation, Particle confinement in 1D box (Infinite Square well potential). Crystal Physics: Crystal directions, Planes and Miller indices, Symmetry elements, Quasi crystals, Diamond and HCP crystal structure, Packing factor, Reciprocal lattice, Diffraction of X-rays by crystal planes, Laue method and powder method	
UNIT -V	Photonics	(08Hours)
	Quantum properties of radiation and matter, Photon properties, Duality nature of electromagnetic radiation, Group/phase velocity and dispersion, matter and its interaction, light modulation, Coherence-different types, Two-beam interference and interferometry, Multi-wave interference, Fabry-Perot interferometer, Fraunhofer diffraction, Fresnel diffraction, semiconductor junction characteristics, semiconductor light sources, semiconductor light detectors.	
UNIT - VI	Green Energy Physics	(08 Hours)
	Introduction to Green energy, Solar energy: Energy conversion by photovoltaic principle, Solar cells, Wind energy: Basic components and principle of wind energy conversion systems, Ocean energy: Wave energy, Wave energy conversion devices, Tidal energy, single and double basin tidal power plants, Ocean Thermal Electric	

	Conversion (OTEC), Geothermal energy: Geothermal sources (hydrothermal, geo-pressurized hot dry rocks, magma), Biomass: Biomass and bio-fuels, bio-energies from wastages, Fuel cells: H ₂ O ₂ , Futuristic Energy: Hydrogen, Methane Hydrates, Carbon capture and storage (CCS).	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
1. To determine the velocity of sound		
2. Measurement of average SPL across spherical wavefront and behaviour with the distance		
3. Expansion chamber muffler: investigation of muffler response as a filter in the low frequency approximation by determining insertion loss		
4. Interference of sound using PC speakers		
5. Determination of velocity of sound in liquid by ultrasonic interferometer		
6. Ultrasonic probe - a study		
7. Determination of divergence of a laser beam		
8. Particle size by semiconductor laser		
9. Determination of wavelength of laser by diffraction grating		
10. Determination of Planck's Constant by photoelectric effect		
11. To study Hall effect and determine the Hall voltage		
12. Calculation of conductivity by four probe method		
Text Books:		
1. M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, "A Textbook of Engineering Physics", S. Chand Publishing (2018)		
2. R K Gaur and S L Gupta, "Engineering Physics", Dhanpat Rai Publishing Co Pvt Ltd (2015)		
3. Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, "Concepts of Modern Physics", McGraw Hill Education (2017)		
Reference Books:		
1. Jearl Walker, David Halliday and Robert Resnick, "Fundamentals of Physics", John Wiley and Sons (2013)		
2. Francis Jenkins and Harvey White, "Optics", Tata Mcgraw Hill (2017)		
3. John W. Jewett, "Principles of Physics", Cengage publishing (2013)		
4. C. Kittel, "Introduction to Solid State Physics", Wiley and Sons (2004)		
5. H. V. Keer, "Principles of Solid State Physics", New Age International (1993)		
6. B. B. Laud, "Laser and Non-Linear Optics", New Age International Private Limited (2011)		
7. Dr. S. K. Kulkarni, "Nanotechnology: Principles and Practice", Capital Publishing Company (2014)		
8. C.M. Srivastava and C. Srinivasan, "Science of Engineering Materials", New Age International Pvt. Ltd. (1997)		
9. David R. Griffiths, "Introduction to Electrodynamics", Pearson (2013)		
10. Boyle, "Renewable Energy: Power for a Sustainable Future", Oxford University Press (2012)		
Project based learning:		
1. Measurement and effect of environmental noise in the college		
2. Construction and application of heat sensor in process control		
3. Design and simulation of automatic solar powered time regulated water pumping		
4. Solar technology: an alternative source of energy for national development		

5. The study on the effect of length on the resistance of a copper wire (verification of ohms law r directly proportional to l)
6. Possible effects of electromagnetic fields (emf) on human health
7. The design and construction of the hearing aid device
8. Design and construction of digital distance measuring instrument
9. Design and construction of automatic bell ringer
10. Design and construction of sound or clap activated alarm
11. Electronic eye (Laser Security) as autoswitch/security system
12. Determination of velocity of O-ray and E-ray in different double refracting materials
13. Quantum confinement effect in wide band semiconductors
14. Small wind turbines as a source of electricity
15. LiFi- wireless data transfer system using light

Students in a group of 3 to 4 shall complete any one project from the above list.

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. Sem. II Electronics & Communication Engineering		
ELECTRONIC COMMUNICATION		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination (UE): 60Marks	Credits : 03
Practical:04	Internal Assessment (IA): 40 Marks	
	TW & Oral: 100 Marks	Credits : 02
	Total Marks:200 Marks	Total Credits:05
Course Pre-requisites:		
The students should have knowledge of		
1	Solid State Devices	
2	Basic Physics	
3	Basic Mathematics	
Course Objectives:		
1	To introduce the concepts of analogue communication systems.	
2	To equip students with various techniques related to analogue communication such as modulation, demodulation.	
3	To study noise, transmission media etc.	
Course Outcomes: After learning this course students will be able to		
1	Outline the basic concept of communication system, need of modulation, some Terminologies in communication systems.	
2	Classify the transmission media used in communication system.	
3	Outline the different modern communication systems.	
4	Classify the different sources of noise.	
5	Classify & compare the amplitude modulation & demodulation techniques.	
6	Classify & compare the Angle modulation & demodulation techniques.	
UNIT – I	Fundamentals of Communication Engineering	(06 Hours)
	Signals:Basics of signal representation & its analysis, Bandwidth of Signals, Signal Shapes in Communication, Electromagnetic spectrum & typical applications, System: Baseband Systems, Pass band Systems, Communication System:Block diagram of communication systems, Analog Versus Digital Communication System, Modulation and Demodulation in Communication System, Need of Modulation, Classification of modulation techniques, Terminologies in Communication Systems.	

UNIT – II	Transmission Media and Propagation Mechanisms	(06 Hours)
	Wired Media: Twisted Pair, Optical fiber: Structure of a Fiber Optic Cable, Propagation Modes of Fiber Optic Cable, Calculation of Number of Modes in a Fiber, Optical Fiber Index Profile, Optical Fiber's Numerical Aperture (NA), Wireless Media, Wireless Propagation: Ground Wave Propagation, Sky Wave Propagation, Propagation Mechanism.	
UNIT - III	Modern Communication System	(06 Hours)
	Introduction to modern communication system: Operation of communication system, need of modern communications. Communication Technologies: The Internet, Basics of Networks, Optical communication: Introduction to optical communication, Development in optical communication, Wireless communications: Introduction to wireless communication, Wireless communication technologies, Mobile cellular communications, Satellite Communications: Basic principle of operation of satellite communication, Satellite orbits, Introduction to Underwater Communication, Radar.	
UNIT -IV	Noise	(06 Hours)
	Introduction, Sources of noise: External Noise, Internal Noise, Noise calculations(thermal noise),Noise figure: Signal to Noise ratio, definition of noise figure, Classification of noise figure, noise Figure from equivalent noise resistance, Noise Temperature.	
UNIT -V	Amplitude Modulation & Demodulation	(06 Hours)
	Amplitude Modulation: Introduction, Mathematical expression for AM, Modulation index, Frequency spectrum and bandwidth of AM, Time domain representation of AM Power relation in AM, Generation of AM signal: Double sideband full carrier (DSBFC), Double sideband suppressed carrier (DSBSC), SSB, Generation of SSB: Filter method, phase shift method, Third method, Block diagram & working principle of AM Transmitters, AM Receivers: Performance's characteristic of receivers, Tuned radio frequency (TRF) receiver, Super heterodyne receiver, Demodulation of AM Signal.	
UNIT -VI	Angle Modulation& Demodulation	(06 Hours)
	Introduction, Types of angle modulation techniques, Mathematical expression of FM, Modulation index for FM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Pre emphasis and de-emphasis, Generation of frequency modulation techniques: Direct method and indirect method, Pulse analog modulation techniques: Pulse Amplitude Modulation (PAM),Pulse	

	Width Modulation, Pulse Position Modulation, Demodulation of Pulse analog modulated signal, Comparison of AM, FM and PM, Block diagram & working principle of FM Transmitters, Block Diagram& working principle of FM receiver.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
12. Generate AM signals, study their time- and frequency-domain characteristics, and measure their modulation indices (Under modulation, Perfect modulation & Over modulation)		
13. Demonstrate the modulation & demodulation process of DSB-SC.		
14. Demonstrate the modulation & demodulation process of SSB-SC.		
15. Generate & analyze frequency modulated signal & demodulate using FM demodulator.		
16. Analysis of standard signals (square and triangular) and Modulated signals (all types of AM, FM) using spectrum analyzer.		
17. Demonstrate the Pulse Amplitude Modulation & demodulation & their waveforms.		
18. Demonstrate the Pulse Width Modulation & demodulation & their waveforms.		
19. Demonstrate the Pulse Position Modulation & demodulation & their waveforms.		
20. Examine the operation of PAM-TDM.		
21. Study of Super heterodyne (AM) Receiver.		
<u>Textbooks:</u>		
1. S.Haykin , “Communication System” (IV Edition), John Wiley & Sons.		
2. A.B. Carlson, “ Communication Systems”, McGraw-Hill.		
3. B.Lathi , “Modern Analog And Digital Communication Systems”, Oxford Univ.Press.		
4. Taub & Schilling , “Communication Systems”, TMH.		
5. Kennedy, Davis , “Electronic Communication Systems”, (4/e), McGraw Hill, Reprint 2008.		
6. Djafar K. Mynbaev, Lowell L. Scheiner, “Essentials of modern communications” , Wiley.		
<u>Reference Books:</u>		
1. Matin, Mohammad Abdul , “Communication Systems for Electrical Engineers” , springer.		
<u>Project Based Learning:</u>		
1. Testing the connectivity of circuit using DMM.		
2. Testing of devices using DMM.		
3. Construct a circuit for sound amplifier.		
4. Design of regulated power supply.		
5. Construct a circuit for Analog signal multiplier using Op-amp.		
6. Construct a circuit for Analog signal divider using Op-amp.		
7. Construct a circuit for Walkie-talkie.		
8. Construct a circuit for Wireless power transfer.		
9. Construct a circuit for Crystal oscillator tester.		
10. Construct a circuit for Mobile incoming call indicator.		
11. Construct a circuit for FM transmitter.		
12. Construct a circuit for AM Modulator.		
13. Construct a circuit for PAM Modulator.		
14. Construct a circuit for single transistor FM transmitter.		

15. Construct a circuit for solar energy operated mobile charger.

Students in a group of 3 to 4 shall complete any one project from the above list.

Bharati Vidyapeeth
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College of Engineering, Pune

B. Tech. Sem. II Electronics & Communication Engineering COMPUTER AIDED GRAPHICS		
<u>TEACHINGSCHEM</u> <u>E:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination (UE): 60Marks	Credits : 04
Practical:02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW: 25 Marks	Credit: 01
	Total Marks:125 Marks	Total Credits:05
Course Pre-requisites:		
The students should have knowledge of		
1	Mathematics	
Course Objectives:		
1	To understand the basic principles of engineering drawing and highlight the importance of Computer Aided Graphics in engineering.	
2	To develop the graphical skills for communication of concepts & idea through technical drawings.	
Course Outcomes: After learning this course students will be able to		
1	Understand the fundamental concepts of Drawing, different types of lines, curves and dimension technique with practical application.	
2	Understand the concept of Orthographic projections and apply it to draw detail views by using 1 st angle projection method.	
3	Understand the concept of isometric projection and apply it to construct 3D view of a component.	
4	Understand the concept of projections of Point, Line and plane; and apply to draw its projection by using 1 st angle projection method and to locate its traces	
5	Understand the concept of projections of different types of solids and apply to draw its projection by using 1 st angle projection method.	
6	Understand the concept of Development of Lateral surfaces; and apply to development of simple Solids.	
UNIT – I	Lines and Dimensioning in Engineering Drawing and Engineering Curves	(08 Hours)
	Introduction to Engineering Drawing, Types of lines and Dimensioning, Layout and size of drawing sheets, Scales Engineering Curves-Ellipse drawing by Focus-Directrix Circle Method and Concentric Circle Method, Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone and Cylinder. Introduction to Auto CAD commands.	

UNIT – II	Orthographic Projection	(08 Hours)
	Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections. (Also using AutoCAD commands)	
UNIT - III	Isometric Projections	(08 Hours)
	Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view. (Also using AutoCAD commands)	
UNIT - IV	Projections of Points, Lines and Planes	(08 Hours)
	Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only), Traces of lines. Projections of Planes -projection of perpendicular and oblique planes (polygonal and circular surfaces), Obtaining true shape of plane surface. (Also using AutoCAD commands)	
UNIT -V	Projection of Solids	(08 Hours)
	Introduction of solids- Types of solids, Projection of solid inclined both reference planes, Projection of common solids such as prism, pyramid, cylinder and cone. (Also using AutoCAD commands)	
UNIT - VI	Development of Lateral Surfaces of Solids	(08 Hours)
	Introduction to development of lateral surfaces and its Industrial application, draw the development of lateral surfaces of cone, pyramid and prism. (Also using AutoCAD commands)	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. Types of lines, Dimensioning practice, free-hand lettering, 1 nd and 3 rd angle methods symbol		
2. Engineering curves.		

3. Orthographic Projections.
4. Isometric views.
5. Projections of Points, Lines and planes.
6. Projection of Solids.
7. Development of lateral surfaces
Text Books:
1. N. D. Bhatt , “Elementary Engineering Drawing”, Charotar Publishing house, Anand India,
2. Munir Hamad , “AutoCAD 2020 Beginning and Intermediate” , Mercury Learning & Information Publication, 2019.
3. Venugopal K , “Engineering Drawing and Graphics” ,., New Age International publishers.
Reference Books:
1. K.L.Narayana & P. Kannaiyah , “Text Book on Engineering Drawing” , Scitech Publications, Chennai.
2. Warren J. Luzzader, “Fundamentals of Engineering Drawing”, Prentice Hall of India, New Delhi,
3. M. B. Shah and B.C. Rana, "Engineering Drawing", 1 st Ed, Pearson Education, 2005
4. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 st Edition, 1988
5. P.S.Gill , "Engineering Drawing (Geometrical Drawing)", 10 th Edition, S.K. Kataria and Sons, 2005
Project Based Learning
Following is the list topic for project based learning (Not Limited to) based on the syllabus contents:
1. To obtain industrial drawings to identify the types of lines, dimensioning methods and method of projection.
2. To develop the model/charts based on engineering curves.
3. To prepare model/chart for identification of engineering curves in nature for industrial, societal, etc application.
4. To demonstrate different methods of orthographic projection.
5. To demonstrate projection of Points.
6. To demonstrate projection of Lines.
7. To demonstrate projection of Planes.
8. To demonstrate projection of Solids.
9. To demonstrate developments of surfaces for solids.
10. To demonstrate industrial application of development of surfaces such as steam carrying pipes, Ducts of air conditioning systems, etc.
11. To demonstrate Isometric projection method through model of a cube.

Students in a group of 3 to 4 shall complete any one project from the above list

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. II Electronics & Communication Engineering PYTHON PROGRAMMING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination: 60 Marks	Credits : 03
Practical:04	Internal Assessment: 40 Marks	
Tutorial: --	TW& Oral: 75 Marks	Credits: 02
	Total Marks:175 Marks	Total Credits:05
Course Pre-requisites:		
The students should have knowledge of		
1	Students should have basic knowledge of programming.	
Course Objectives:		
1	This course will introduce the concepts of Python language software development tool. By the end of the course, student will be familiar with various fundamentals of Python language.	
Course Outcomes: After learning this course students will be able to		
1	Understand the basic concept of Python programming.	
2	Write basic programs using control statement.	
3	Use exception handling.	
4	Learn object oriented programming.	
5	Write basic programs using arrays.	
6	Use Python for simple applications.	
UNIT – I	Python Basics:	(06 Hours)
	Python Introduction, Python Installation, Relational operators, Bitwise operators, Logical operators Python Data Types - Numbers (Integer, Floating Point, Complex Numbers), Strings,Lists, Tuples, Dictionaries, List comprehensions, Python Control Statements	
UNIT – II	Python Core:	(06 Hours)
	Python Modules & Functions, Lambda, Scope, Python File Handling, Python Regular Expressions, Sequence Types, Input and output, Recursion, Flow Control, Immutable and Mutable Objects	
UNIT -	Python Exception Handling:	(06

III		Hours)
	Meaning of Exception, Exception Hierarchy Diagram, Types of Exception- Checked Exception, Unchecked Exception, Exception Handling -TRY, CATCH, FINALLY, Raising an Exception, User Defined Exceptions	
UNIT - IV	OOPS, UML & OOAD:	(06 Hours)
	Object Oriented Programming (OOPs) - Class & Object, Abstraction, Inheritance, Polymorphism, Encapsulation, Object Oriented (OO) Modelling, Object Oriented Analysis & Design (OOAD)	
UNIT - V	PYTHON MULTI-THREADING:	(06 Hours)
	Threads in Python (a) Kernel Threads(b) User Space Threads or User Threads, Advantages of Threading, Thread States: Life Cycle of a Thread, Thread & Threading Modules, Forking & Synchronizing Threads, Networking	
UNIT - VI	Python Packages and Graphics:	(06 Hours)
	Numpy: Introduction, datatypes, arrays, arrays manipulation, plotting, testing and debugging, Sharing Data using Sockets, pycharm in python, Simple applications of python	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. Evaluate any given expression involving arithmetic operators		
2. Evaluate any given expression involving logical operators		
3. Develop python functions to produce given patterns such as diamond, pyramid, triangles.		
4. Usage of different functions present in “math” module		
5. Write a function that takes two numbers as input parameters and returns their least common multiple.		
6. Write a function that takes two numbers as input parameters and returns their Greatest common divisor.		
7. Write a function that returns the sum of the digits of a number, passed to it as an argument.		
8. Write a program that takes a sentence as an input and displays the numbers of words in the sentence.		
9. Program to interchange first and last elements in a list		
10. program to print even numbers in a list		
11. Ways to sort list of dictionaries by values in Python – Using lambda function		
12. Example using “matplotlib” module		
13. Example using “NUMPY” module		
14. Evaluate any given expression involving arithmetic operators		
Text Books:		

2. Sheetal Taneja, Naveen Kumar, "Python Programming, A modular approach", Pearson publication
Reference Books:
1. Learning Python 5th Edition, Oreilly Publication.
2. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", Third Edition, Apress Publication
3. Allen Downey, Jeffrey Elkner, Chris Meyers, "Learning with Python", Dreamtech Publication.
4. Paul Berry, "Head-First Python: A Brain-Friendly Guide" (2nd Edition), O'Reilly Media
5. Magnus Lie Hetland, "Python Algorithms: Mastering Basic Algorithms in the Python Language", Apress Pub.
Project Based Learning
1. Design and development of Mad Libs generator.
2. Design and development of electronic mail system (Read, write, send and delete operations).
3. Design and development of store billing system.
4. Design and development of typing speed check web application.
5. Design and development of windows application for music player.
6. Design and development of windows Quiz Application.
7. Design and development of web application for daily expense tracker.
8. Design and development of student portfolio management & CV generator system.
9. Design and development of windows based to do list or sticky notes.
10. Design and development of assignment plagiarism checker.

Students in a group of 3 to 4 shall complete any one project from the above list

**B.TECH (ELECTRONICS AND
COMMUNICATION ENGINEERING)**

STRUCTURE

Bharati Vidyapeeth (Deemed to be University) Pune.

Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication Engineering) Sem-III (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
11	Probability & Statistics	4	0	1	60	40	0	0	0	100	4	0	1	5
12	Switching Theory & Logic Design	4	2	0	60	40	0	0	50	150	4	1	0	5
13	Analog Circuits & Applications	3	2	0	60	40	0	0	50	150	3	1	0	4
14	Signals & Systems	4	2	0	60	40	0	50	0	150	4	1	0	5
15	Process & Control System *	3	0	0	60	40	0	0	0	100	3	0	0	3
16	Vocational Course-I-PCB Design & Assembly	0	0	0	0	0	0	50	0	50	0	2	0	2
17	Data Structures	0	4	0	0	0	0	50	0	50	0	2	0	2
18	Database Management System	0	4	0	0	0	0	50	0	50	0	2	0	2
19	MOOC - I	0	0	0	0	0	0	0	0	0	0	0	0	2
20	Environmental Studies** (Mandatory Audit Course)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		18	14	1	300	200	0	200	100	800	18	9	1	30

* Industry taught course-I

**This course will have End semester examination of 100 marks

Bharati Vidyapeeth
Bharati Vidyapeeth (Deemed to be University) Pune.
Faculty of Engineering & Technology

Programme: B. Tech (Electronics & Communication) Sem-IV (2021 Course)

Sr. No.	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
		L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
												TW/OR/PR		
21	Digital Communication	3	2	0	60	40	0	50	0	150	3	1	0	4
22	Microcontroller & Applications	4	2	0	60	40	0	0	50	150	4	1	0	5
23	EM Waves & Propagation	4	0	1	60	40	0	0	0	100	4	0	1	5
24	Integrated Circuits & Amplifier Design	4	2	0	60	40	0	0	50	150	4	1	0	5
25	Essentials of Data Science*	3	0	0	60	40	0	0	0	100	3	0	0	3
26	Vocational Course-II Domestic Appliances & Maintenance	0	0	0	0	0	0	50	0	50	0	2	0	2
27	Java Programming	0	4	0	0	0	0	50	0	50	0	2	0	2
28	Linux Programming	0	4	0	0	0	0	50	0	50	0	2	0	2
29	Social Activity	0	0	0	0	0	0	0	0	0	0	0	0	2
30	Disaster Management** (Mandatory Audit Course)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		18	14	1	300	200	0	200	100	800	18	9	1	30

*Industry taught course-II

**This course will have End semester examination of 100 marks

B.TECH (SEM-III)

SYLLABUS

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. III Electronics & Communication Engineering PROBABILITY AND STATISTICS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits : 04
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credit : 01
	Total: 100 Marks	Total Credits: 05
Course Pre-requisites:		
The students should have knowledge of		
1	Measures of central tendency, dispersion, skewness and kurtosis.	
Course Objectives:		
1	To study probability distributions and testing of hypothesis.	
Course Outcomes: After learning this course students will be able to		
1	Understand discrete and continuous probability distributions.	
2	Identify standard probability distributions.	
3	Apply bivariate distributions.	
4	Apply sampling distributions.	
5	Understand concept of point estimation and interval estimation.	
6	Apply ANOVA for one way and two way distribution.	
UNIT – I	Probability and random variables	(08 Hours)
	Concept of probability, Random Variables, Probability Distributions and Expectation: Concept of a random variable, discrete probability distributions, continuous probability distributions, joint probability distributions, mean, variance, covariance.	
UNIT -II	Standard distributions	(08 Hours)
	Gaussian, exponential, Rayleigh, uniform, Bernoulli, binominal, Poisson, Normal, hyper geometric, discrete uniform and conditional distributions, . Functions of a random variable.	
UNIT -III	Joint Distributions	(08 Hours)

	Joint, marginal and conditional distributions, product moments, independent of random variables, bivariate normal distribution.	
UNIT -IV	Sampling Distributions	(08 Hours)
	The central limit theorem, distributions of the sample mean and the sample variance for a normal population, Chi-square, t and F distributions.	
UNIT -V	Estimation	(08 Hours)
	The methods of moments and the of maximum likelihood estimation, confidence intervals for the mean(s) and variance(s) of Normal populations.	
UNIT-VI	Testing of Hypothesis	(08 Hours)
	Null and Alternative hypotheses, the critical and acceptance regions, types of errors, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for onesample problems for normal populations, ANOVA I & ANOVA II.	
Text Books		
1. Rohatgi, V K. and Saleh , A. K. Md. Ehsanes, "An Introduction to Probability and Statistics", (John Wiley and Sons) , (2 nd edition)		
2. J.S. Milton & J.C. Arnold, "Introduction to Probability and Statistics" Tata McGrawHill Publication		
References Books		
1. H.J. Larson , "Introduction to Probability Theory and Statistical Inference" Wiley Publication.		
2. S.M.Ross, "Introduction to Probability and Statistics for Engineers and Scientists" Academic Press.		
Project Based Learning:		
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable.		
1) Find the stability of the data using coefficient of variation		
2) Use concept of correlation to find coefficient of correlation between different observations		
3) Use Rank correlation to find correlation for qualitative data		
4) Derive Spearman's Rank correlation		
5) Find the chance of happening particular event using Baye's theorem		
6) Use probability theory to estimate the life of electric equipments		
7) Find the height, weight of the population using the example of normal distribution		
8) Check the goodness of fit using chi-square distribution		
9) Perform ANOVA for single way classification data		
10) Perform ANOVA for two way classification data		
11) simple regression model		
12) Multiple regression model		

13) Coefficient of variation
14) Joint and marginal probability distribution
15) Standard probability distributions

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. III Electronics & Communication Engineering SWITCHING THEORY AND LOGIC DESIGN		
<u>TEACHINGSCHE ME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits : 04
Practical: 02	Internal Assessment (IA): 40 Marks	
Tutorial: --	TW & Practical:50 Marks	Credit : 01
	Total: 150 Marks	Total Credits:05
Course Pre-requisites:		
The Students should have knowledge of		
1	Fundamentals of Number Systems	
2	Knowledge of Boolean algebra laws.	
Course Objectives:		
1	To familiarize with various number representations and conversion between different representation in digital electronic circuits.	
2	To introduce the students to various logic gates, SOP, POS and their minimization techniques	
3	To analyze logic processes and implementation of logical operations using combinational logic circuits.	
4	To describe, analyze and design sequential circuits.	
Course Outcomes: After learning this course students will be able to		
1	Represent numerical values in various number systems and perform number conversions between different number systems.	
2	Apply knowledge of Boolean algebra and other minimization techniques for digital circuit design.	
3	To differentiate between logic families TTL and CMOS.	
4	Identify, formulate and solve a problem based on combinational circuits.	
5	Analyze and design a simple sequential logic circuit.	
6	Implement Digital circuits using VHDL systems	
UNIT – I	Number system & Codes:	(08 Hours)
	Binary number base conversion decimal, octal, hexadecimal numbers, 1's 2's Complement, signed binary numbers binary codes- BCD codes, Gray codes, Excess-3 code, ASCII code & codes for serial data transmission & storage	

	Logic Gates: Positive and Negative Logic, Various Logics Gates with IEEE/ANSI symbols, Boolean equations, truth table and IC Details. Universal Gates & Derived gates	
UNIT – II	Boolean Algebra and Simplification Techniques:	(08 Hours)
	De-Morgan’s theorem – switching functions Introduction, Postulates and Theorems, Various types of Boolean expressions, Simplification Techniques-K-map up to 4 variables, Product of Sum simplification & Sum of product simplification, Don’t care conditions, Quine Mc-Cluskey method	
UNIT - III	Combinational Logic Circuits:	(08 Hours)
	Combinational Circuits and its implementations, Arithmetic Circuits – Adders and Subtractors, BCD Adder, Look-Ahead Carry Generator, ALU, Multiplier, Magnitude comparator. Multiplexer, Encoders, Demultiplexers and Decoders, Parity Generation and Checking.	
UNIT - IV	Sequential Logic Circuits:	(08 Hours)
	R-S and D Flip-flop, Level Triggered and Edge-Triggered Flip-flops, J-K and T Flip-flop, Synchronous and Asynchronous Input, Flip-flop Timing Parameters, Application of Flip-flop. Ripple Counter, Synchronous Counter, Modulus Counter, Binary Ripple Counter, Synchronous Counters, UP/Down Counters, Decade and BCD Counters, Presettable Counters, Decoding Counter, Cascading Counter, Designing Counter with Arbitrary Sequences, Shift Register, Shift Register, Counters	
UNIT -V	Programmable Logic Devices, Memory & Logic Families:	(08 Hours)
	Memories: ROM,PROM,EPROM Programmable Logic Devices(PLD):Programmable Logic Array(PLA),Programmable Array Logic(PAL) CPLD-FPGA Logic Families: Significance of families, Characteristic parameters, Types of Logic Families: TTL,ECL Comparison between various logic families Interfacing. between CMOS and TTL logic families	
UNIT - VI	Introduction to VHDL:	(08 Hours)
	Introduction to VLSI design flow (with reference to an EDA tool),sequential, data flow and structural modeling, functions, procedures, , data objects types, attributes, packages and configurations	
<u>Term Work:</u>		

The term work shall consist of record of minimum eight experiments.
1. Implementation of Boolean functions using logic gates.
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. Function implementation using Multiplexer and Demultiplexer
6. BCD Adder/Subtractor using IC7483.
7.Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
8. Study of shift registers : Shift left , Shift right , parallelloading
9. To model 8:1 mux, 1:8 demux using VHDL.
10.Sequence generator using MS-JK flip flop IC's
Text Books:
1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12 th reprint TMH Publication, 2007
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI
3. J. Bhaskar, “VHDL Primer”, PHI, Third Edition (2009).
Reference Books:
1. J.F.Wakerly “Digital Design: Principles and Practices”, 3 rd edition, 4 th reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication
3. Morris Mano ‘Digital Design’ -- (Third Edition),.PHI
4. Thomas L Floyd & R.P Jain, “Digital Fundamentals” (Eight editions), Pearson
5. Stephen Brown & Zvonko Vranesic, “Fundamentals of Digital Logic Design with VHDL”, Second Edition, TMH(2009).
Project based learning:
1. To demonstrate the use of NAND as Universal Gate
2. Electronic Eye using basic gates.
3. Light sensor switch circuit using JK-Flip-Flop
4. Morning sun alarm circuit using IC-4011(quad NAND gate)
5. To demonstrate the use of IC 555 as a Pulse Generator Circuit
6. Automatic switch off battery charger using IC 555
7. Fluid Level Control Using IC 4093
8. A pseudo-random number generator
9. 2-Bit-Parallel-or-Flash-Analog-to-Digital-Converter
10. DigitalBank Token Number Display
11. Digital Object Counter
12. Asynchronous-Modulo-16-Down-Counter
13. Analog-Signals-Multiplier
14. 4-line to 16-line decoder Circuit using 7442
15. Simple Electronic Toggle Switch Flip Flop Circuit Using IC 4017

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. III Electronics & Communication Engineering ANALOG CIRCUITS AND APPLICATIONS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination(UE): 60 Marks	Credits : 03
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW & Practical: 50 Marks	Credit: 01
	Total: 150 Marks	Total Credits:04
Course Pre-requisites:		
The Students should have knowledge of		
1	Electronic components and devices.	
Course Objectives:		
1	To understand analysis of single stage and multistage transistor amplifier.	
2	To give a practical approach of analysis of feedback amplifiers ,power amplifiers and oscillators	
3	To understand analysis and design of voltage regulators.	
Course Outcomes: After learning this course students will be able to		
1	Describe and demonstrate BJT single stage amplifier, its hybrid equivalent and hybrid models.	
2	Analyze multistage amplifiers using BJT.	
3	Analyze the importance of negative feedback in amplifiers.	
4	Demonstrate and analyze power amplifier circuits in different modes of operation.	
5	Design various oscillator circuits using BJT.	
6	Design and analyze transistorized series and shunt voltage regulators.	
UNIT – I	Single stage Amplifiers	(06 Hours)
	Classification of Amplifiers – Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified Hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller's Theorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.	

UNIT – II	Multi Stage Amplifiers	(06 Hours)
	Need of Multistage amplifiers, Parameter evaluation such as R_i , R_o , A_v , A_i & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier	
UNIT - III	Feedback Amplifiers	(06 Hours)
	Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.	
UNIT -IV	Power Amplifiers	(06 Hours)
	classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis	
UNIT -V	Oscillators	(06 Hours)
	Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator	
UNIT -VI	Regulator	(06 Hours)
	Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's: 78XX, 79XX, 723, LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
1. Analysis of multistage LF amplifier, verification with theoretical values of A_{is} , A_{vs} ,		

R _i , R _o (overall) with square wave testing.
2. Input impedance improvement techniques for emitter follower.
3. Analysis of LF amplifier with negative feedback in Voltage series and current series topology.
4. Analysis of LF amplifier with negative feedback in Voltage shunt and current shunt topology.
5. Measurement of frequency of oscillations of RC Oscillators - phase shift and wien bridge
6. Measurement of frequency of oscillations of LC oscillators – Hartley, Colpitt
7. Biasing analysis of BJT power amplifier in class A, B, C.
8. Regulation characteristic of series and shunt regulators and calculation of S _v and R _o .
Text Books:
1. S. Salivahanan, Suresh Kumar Vallavaraj, “Electronic devices and circuits”, Mc Graw Hill Publication
2. Robert Boylestad, “Electronic Devices and Circuit Theory”, Pearson Publication
Reference Books:
1. Allen Mottershed , “Electronic Devices and Circuits”, PHI Publication
2. J.B. Gupta , “Electronic Devices and Circuits”, Kaison Educational Series
3. Raghbir Singh Khandpur, “Printed circuit boards: Design, fabrication, assembly and testing”, 2006, ISBN 10:0071464204,McGraw Hill
Project Based Learning:
Build the following circuits -
1. A single stage common emitter amplifier.
2. RC coupled multistage amplifier.
3. Darlington amplifier.
4. Voltage shunt negative feedback amplifier.
5. Current shunt negative feedback amplifier.
6. Voltage series negative feedback amplifier.
7. Current series negative feedback amplifier.
8. Class A, B, C power amplifier.
9. RC phase shift oscillator using BJT.
10. Colpitt’s oscillator using BJT.
11. Hartley oscillator using BJT.
12. Shunt voltage regulator using zener diode.
13. Series voltage regulator.
14. IC 723 as basic high/low voltage regulator with fold back current limiting.
15. Flashing LED using astable multi vibrator.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. III Electronics & Communication Engineering SIGNALS AND SYSTEMS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits : 04
Practical: 02	Internal Assessment(IA): 40 Marks	
	TW & Oral: 50 Marks	Credit : 01
	Total:150 Marks	Total Credits: 05
Course Pre-requisites:		
The students should have knowledge of		
1	Differential and Integral calculus	
2	Vector algebra and algebra of complex numbers	
Course Objectives:		
1	To understand the behavior of signals in time and frequency domain	
2	To understand the characteristics of LTI systems	
3	To analyze continuous and discrete time systems using different transform techniques.	
Course Outcomes: After learning this course students will be able to		
1	Classify signals and perform operations on signals.	
2	Analyze LTI systems using convolution.	
3	Apply Fourier series and Fourier Transform for analysis of signals.	
4	Analyze CT signals and systems using Laplace transform.	
5	Apply Z-transform for the analysis of DT signals and systems.	
6	Sample and reconstruct the signals using sampling technique.	
UNIT –I	Introduction and Classification of signals:	(08 Hours)
	Signals and Systems definition, Types of signals, continuous time and Discrete time signal operations, Amplitude scaling, Time shifting, Time reversal, Time scaling, Mathematical operations additions, subtraction, multiplication of signals, Classification of signals according to their property, Periodic/Aperiodic, Even/Odd, Energy/Power/Causal/Non causal, Deterministic/Random signals	
UNIT –	Time domain representation of LTI System:	(08

II		Hours)
	Introduction to systems, Classification of systems according to their properties, Linear/Nonlinear, Static /Dynamic, Time Invariant/Time-variant, Causal/non causal, Stable/Unstable, Invertible/Non Invertible systems, LTI system: Causality, stability, step response, impulse response, Convolution Integral, convolution sum using graphical method properties and applications.	
UNIT-III	Fourier Analysis of Signals: Fourier Series: - Review of Fourier series of CT and DT signals and its properties (No derivation), Exponential and Trigonometric Fourier series of periodic signals, Amplitude and phase spectra of periodic signals.	(08 Hours)
UNIT-IV	Application of Laplace Transform in Signal processing:	(08 Hours)
	Review of Bilateral and Unilateral Laplace Transform of signals, ROC and its properties. Laplace transforms of standard signals, Inverse Laplace Transform, Solution to differential equation, System transfer function and Response calculations, Poles and Zeros representation	
UNIT -V	Z-transform	(08 Hours)
	Z-transform, Region of convergence and its properties, Inverse z-transform, properties of z transform, relation between Z and Laplace Transform, Analysis and characterization of discrete time LTI systems using z-transform.	
UNIT-VI	Sampling and Correlation:	(08 Hours)
	Sampling theorem, sampling and reconstruction of signal from its samples using interpolation, Effect of under sampling, Correlation, Autocorrelation and cross-correlation of energy and power signals, properties of correlation functions, applications of Correlation, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum,	
<u>Termwork:</u>		
1. Introduction to MATLAB and its basic functions.		
2. Generate Continuous and discrete time signals.		
3. Perform signal operations on Continuous and discrete time signals.		
4. Find even and odd part of the signal and sequence and find real and imaginary parts of signal.		
5. Compute linear convolution and convolution integral of sequences/signals.		
6. Compute Fourier Transform and Inverse Fourier Transform of a given signal		

/sequence and plot its Magnitude and Phase Spectra.
7. To compute and plot the impulse response and pole-zero diagram of transfer function using Laplace transform.
8. To compute and plot the impulse response and pole-zero diagram of transferfunction using Z-transform.
9. Compute auto correlation and cross correlation between signals and sequences and verify its properties.
10. Verify sampling theorem and reconstruct the signal.
Text Books:
1. Oppenheim, Willsky, S.Hamid Nawab, “Signals and Systems”, PHI,2 nd edition, 2002.
2. M.J. Roberts, “Signals and Systems”, McGraw-Hill, 1 st edition,2003.
3. B.P Lathi, “Principles of linear systems and signals”, Oxford, 2nd edition,2009.
Reference Books:
1. Simon Haykin and Bary Van Veen, “Signals and Systems”, Wiley- India Publications
2. Michal J. Roberts and Govind Sharma, “Signals and Systems”, Tata Mc-Graw Hill Publications
Project Based Learning:
1. Generate basic signals using C / Python programming.
2. Perform multiple operations on signal using C or MATLAB.
3. Visualize signal/data in time and frequency domain using MATLAB.
4. Find the Trigonometric Fourier Series of a given Signal using C/Python/MATLAB.
5. Create Frame-Based Signals using MATLAB simulink.
6. Create Multichannel Signals by combining single channel signals using simulink.
7. Create Multichannel Signals by combining multichannel signals using simulink.
8. Inspect sample and frame rate using simulink.
9. Perform Linear Convolution of two sequences using SCILAB.
10. Represent, Play and plot audio signals with different sampling frequencies using MATLAB.
11. Study of Signal Processing Sound Effects: Introducing a delay, creating an echo effect by repeating the signal, time scaling, time reversal, volume scaling.
12. Create acoustic environment in Simulink.
13. Develop a Python application to generate digital signals.
14. Perform measurement using spectrum analyzer using MATLAB simulink.
15. Filter the frames of noisy wave using MATLAB.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. III Electronics & Communication Engineering PROCESS AND CONTROL SYSTEM		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination (UE): 60Marks	Credits: 03
Practical: --	Internal Assessment (IA): 40 Marks	
Tutorial: --		
	Total: 100 Marks	Total Credits: 03
Course Pre-requisites:		
The Students should have knowledge of		
1	Basic knowledge of signals.	
2	Basic mathematical tools like Laplace Transform.	
Course Objectives:		
1	This course provide in depth knowledge of various control system.	
2	It introduces the stability of system, transducers, DAS etc.	
Course Outcomes: After learning this course students will be able to		
1	Identify various control systems and determine the 'transfer function' of System using block diagram reduction and Signal flow graph.	
2	Determine the error in various control systems.	
3	Evaluate the stability of a system using Routh's stability criteria, root locus, bode plot etc.	
4	Illustrate different specifications of the system in frequency domain.	
5	Measure non-electrical quantities such as displacement, temperature, angular speed etc using suitable transducer.	
6	Compare various control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID.	
UNIT – I	Control System Classification	(06 Hours)
	Open loop, closed loop, Feedback and Non-feedback Systems, continuous, discrete, linear and non-linear control systems. Transfer Function, Analysis of T.F. using Block diagram and signal flow graph.	
UNIT– II	Time Domain Analysis	(06 Hours)
	Transient and steady state responses of first and second order	

	systems, steady state errors, control of transient response, Basic control actions and their effects on transient and steady state responses.	
UNIT-III	Stability	(06 Hours)
	Stability concepts, Routh Hurwitz criterion, Root loci, properties and construction of root loci, effects of adding of poles and zeros, root locus of conditionally stable systems.	
UNIT-IV	Frequency Domain Analysis	(06 Hours)
	Bode plot, gain, magnitude and phase shift plots, frequency domain specifications, peak resonance and resonant frequency of a second order system, gain margin and phase margin, conditionally stable system.	
UNIT -V	Transducers	(06Hours)
	Classification of Transducers and its Characteristics. RTD, Thermocouple, Thermister, capacitive transducer, LVDT, strain gauge, Electromagnetic flow-meter, Piezoelectric Accelerometer, tacho-generators. Internet Things (IoT) for wireless sensor networks.	
UNIT -VI	Controllers	(06Hours)
	Control actions – On/Off Controller, Proportional Controller, Integral Controller, Derivative Controller, Proportional- Integral(PI) Controller, Proportional-Derivative(PD) Controller, PIDController.	
<u>Assignments:</u>		
It shall consist of record of minimum six assignments.		
1. Transfer function of closed loop system.		
2. Transient response specifications of second order system.		
3. To draw Root Locus theoretically and verify it.		
4. To draw Bode plot theoretically and verify it.		
5. To study characteristics of temperature transducer.		
6. To Study characteristics of LVDT for displacement measurement.		
7. Study of Strain Guage.		
8. Internet Things (IoT) for wireless sensor networks.		
9. Study of Various Controllers.		
<u>Text Books:</u>		
1. A. K. Sawhney, “Electrical and Electronic Measurements and Instrumentation”, Dhanpat Rai and Co. Ltd		
<u>Reference Books:</u>		
1. J. Nagrath & M. Gopal, “Modern Control Engineering”, New Age International, New Delhi (Fifth Ediion)2007		

2. H S Kalsi, "Electronic Instrumentation", Tata McGraw-Hill.
3. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991
Project Based Learning:
1. Design of a Lead Compensator.
2. Design of a Lag Compensator.
3. Displacement measurement using "Linear Variable Differential Transformer".
4. Design of Temperature control system using RTD.
5. Design of Temperature measurement system using thermocouple.
6. Design of Temperature control system Using Thermistor.
7. Design of Load Cell using Strain Guage.
8. Application Internet Things (IoT) using wireless sensor.
9. Transient response analysis for second order system.
10. Design and Simulation of Root Locus for given system.
11. Design and Simulation of Bode plot for given system.
12. Design of on-off controller.
13. Design of Proportional controller.
14. Design of Integral controller.
15. Design of Proportional-Integral controller.
16. Design of Proportional-Integral-Derivative controller.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. III Electronics & Communication Engineering VOCATIONAL COURSE-I PCB DESIGN & ASSEMBLY		
<u>TEACHINGSCHE ME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: --	End Semester Examination(UE): --	
Practical: --	Internal Assessment(IA): --	
Tutorial: --	TW& Oral: 50 Marks	Credits : 02
	Total:50 Marks	Total Credits: 02
Course Pre-requisites:		
The Students should have knowledge of		
1	Basic knowledge of Electronic components.	
Course Objectives:		
1	Become familiar with the simulation software.	
2	Provide in depth knowledge of PCB design.	
3	Introduce the PCB manufacturing.	
Course Outcomes: After learning this course students will be able to		
1	Design electronic circuits, create a schematic, PCB layout.	
2	Become proficient with software skills using EDA tool, for drawing electronic circuit Schematic and PCB Layout.	
3	Fabricate a Prototype PCB using EDA tool.	
4	Demonstrate the knowledge of selecting proper PCB primitives.	
5	Use PCB design software for simple single sided PCB artwork design.	
6	Identify and select appropriate soldering tools for the soldering job.	
Unit-I	Component Selection	
	Principles and Process of Electronic Component Selection: Electrical parameters, Mechanical parameters. Performance, Quality, Availability and price, PCB footprint with Dual -in-Line Package (DIP) and surface mount Packages.(SMP)/ SMD.	
Unit-II	Schematic design	
	Electrical connection between different active and passive electrical components like resistors, capacitors, Integrated circuits IC. Connectivity and functionality between different components. Physical representation of all the electrical connections between active and passive components used in the schematic.	

Unit-III	Circuit Design	
	Design specification, Circuit Design theoretically and implementing on Breadboard, verification and testing.	
Unit-IV	PCB Design	
	Introduction to PCB Design using EDA tool. Design of single sided PCB, Design of Double sided PCB. Verification and testing. PCB Design Implementation with print-out or Gerber file.	
Unit-V	PCB fabrication	
	PCB Manufacturing Process Steps: Design and Output From File to Prototype machine/Film, Printing the Inner layers, Removing the Unwanted Copper, Layer Alignment and Optical Inspection, Layer-up and Bond, Drill, Plating and Copper Deposition, Outer Layer Imaging, Final Etching, Solder Mask Application, Surface Finishing, Electrical Test. PCB fabrication using Prototype machine/Chemical method.	
Unit-VI	Soldering of Component	
	Materials and Equipment: soldering iron, Rosin core solder, Sponge, Solder braid etc. PCB Protection Chemicals. Soldering and de-soldering of Components.	
PCB Plant Visit: At the end of course, students should visit to PCB manufacturing company.		
Text Books:		
1. R.S. Khandpur , “Printed Circuit Boards: Design, Fabrication, and Assembly” ,McGraw-Hill Electronic Engineering		
2. Coombs Clyde, “Printed Circuits Handbook”, McGraw-Hill Education		

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B. Tech. Sem. III Electronics & Communication Engineering DATA STRUCTURES		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory:--	End Semester Examination(UE): --	
Practical: 04	Internal Assessment(IA): --	
Tutorial: --	TW& Oral: 50 Marks	Credits:02
	Total:50 Marks	Total Credits: 02
Course Pre-requisites:		
The Students should have knowledge of		
1	Knowledge of C programming	
Course Objectives:		
1	This course provides in depth knowledge of the various types of data structures and various algorithms. Also it introduces the programming for linked list, stack, queues, graph and tree.	
Course Outcomes: After learning this course students will be able to		
1	Write a program using data structure and its types.	
2	Define various operations on linked and double linked lists.	
3	Implement stacks and queues involving linked list.	
4	Perform operations on a tree using linked lists.	
5	Create a graph using adjacency list & traverse it using BFS & DPS methods.	
6	Find the shortest path in each graph using algorithm.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. Program to search for record from a given list of records stored in array using i) Linear search ii) Binary search		
2. Program to sort an array of names using i) Bubble sort ii) Insertion sort iii) Quicksort		
3. Program to implement following operation on singly linked list: i) Create ii) Delete iii) Insert iv) Display v) Search		

4. Program to add two polynomials using linked list.
5. Program to implement stack using: i) Array ii) Linkedlist
6. Program to convert an infix expression to postfix expression & evaluate the resultant expression.
7. Program to Implement Queue using: (i) Array (ii) linked list
8. Program to create a Binary search tree & Perform following primitive operation on it: i) Search ii) Delete iii) Traversals (in order, pre-order, post-order-recursive) iv) Non-recursive in order traversal
9. Program to create a graph using adjacency list & traverse it using BFS & DPS methods
Text Books:
1. ISRD group ,“Data structure using C”,TMH.
2. Yashwant kanetkar “Data Structure through C” ,BPB Publication.
Reference Books:
1. AM Tanenbaum, Y Langsam and MJ Augustein "Data structure using C", Prentice Hall India.
2. Weiss, Mark Allen, “Data structure and Algorithm Analysis in C”, Addison Wesley.
3. Richard F Gilberg Behrouz A. Forouzan, Thomson,“Data structure – A Pseudocode Approach with C”, Cengage Learning India
4. Yashwant Kanetkar ,“Let us C” ,BPB Publication

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B. Tech. Sem. III Electronics & Communication Engineering DATABASE MANAGEMENT SYSTEM		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory:--	End Semester Examination(UE): --	
Practical: 04	Internal Assessment (IA): --	
Tutorial: --	TW Oral:50Marks	Credits:02
	Total:50 Marks	Total Credits: 02
Course Pre-requisites:		
The Students should have knowledge of		
1	Computational C.	
Course Objectives:		
1	To explain basic database concepts, applications, data models, schemas and instances.	
2	To demonstrate the use of constraints and relational algebra operations.	
3	Describe the basics of SQL and construct queries using SQL.	
4	To emphasize the importance of normalization in databases.	
5	To facilitate students in Database design	
6	To familiarize issues of concurrency control and transaction management	
Course Outcomes: After learning this course students will be able to		
1	Apply the basic concepts of Database Systems and Applications.	
2	Use the basics of SQL and construct queries using SQL in database creation and interaction	
3	Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system	
4	Analyze and Select storage and recovery techniques of database system.	
5	Use Algorithms to solve scheduling conflict.	
6	Apply Algorithms in distributed database.	
Experiment List		
1. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) Note: Student is required to submit a document by drawing ER Diagram to the Lab teacher.		
2. Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys) Note: Student is required to submit a document showing the database tables created from ER Model.		
3. Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form		

4. Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables
5. Practicing DML commands- Insert, Select, Update, Delete
6. Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION,
7. Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi)..
8. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
9. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger
10. Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.
11. Cursors- Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.
Text/Reference Books:
1.Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81
3. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley

B.TECH (SEM-IV)

SYLLABUS

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune

B. Tech. Sem. IV Electronics & Communication Engineering		
DIGITAL COMMUNICATION		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination (UE): 60Marks	Credits : 03
Practical: 02	Internal Assessment (IA) :40Marks	
Tutorial: --	TW & Oral: 50Marks	Credit: 01
	Total:150 Marks	Total Credits: 04
Course Pre-requisites:		
The Students should have knowledge of		
1	Electronic communication	
2	Signals & Systems	
3	Probability and Statistics	
Course Objectives:		
1	To understand the building blocks of digital communication system.	
2	To prepare mathematical background for communication signal analysis.	
3	To understand the basics of baseband and pass band digital communication systems.	
4	To acquire the knowledge of spread spectrum communication systems.	
Course Outcomes: After learning this course students will be able to		
1	Apply different sampling techniques to convert analog signal into discrete sequence	
2	Describe various CW modulation schemes	
3	Learn the generation and detection of band pass modulation techniques	
4	Identify the need of Multiplexing and Synchronization in digital communication and design Scrambler and Un-scrambler. Characterize, sketch various Line Codes	
5	Evaluate probability of error in various digital modulation techniques	
6	Describe the digital communication system with spread spectrum modulation	
UNIT – I	Pulse Modulation	(06 Hours)
	Introduction to Digital Communication System, digital representation of analog signal, advantages of digital communication. Pulse Modulation, Sampling Theorem (time domain analysis) ideal sampling, Natural sampling, Flat top sampling, aliasing effect and aperture effect. Nyquist criteria, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation.	

UNIT – II	Digital transmission of analog signals	(06 Hours)
	Quantization–Uniform, Non-Uniform, Companding, A-Law, μ Law, Pulse code modulation Delta Modulation, Differential Pulse Code Modulation.	
UNIT -III	Band pass Modulation Techniques	(06 Hours)
	ASK, PSK, FSK, Binary Phase shift keying, Differential Phase shift keying, Differential encoded PSK, Quadrature PSK, M-ary PSK, Quadrature Amplitude shift keying (QASK), Binary frequency shift keying, Minimum shift keying (MSK), signal space representation and constellation diagram	
UNIT -IV	Baseband Digital Transmission	(06 Hours)
	Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Inter-symbol Interference, Equalization.	
UNIT -V	Baseband Receivers	(06 Hours)
	Base band signal receiver, Probability of error, Optimum filter, White noise-Matched filter, probability of error of matched filter, correlation, FSK, PSK, non-coherent detection of FSK, DPSK, QPSK, Calculation of error probability for BPSK & BFSK, Signal space to calculate P_e .	
UNIT -VI	Spread Spectrum Techniques	(06 Hours)
	Introduction, Generation of PN Sequences and its properties, Direct Sequence Spread Spectrum Signals, Frequency Hopped Spread Spectrum Signals, Introduction to Multiple Access Techniques: CDMA, TDMA, FDMA.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. To verify the sampling theorem		
2. To perform Pulse Code Modulation System (PCM) System		
3. To analyze a Delta modulation system and interpret the modulated and demodulated waveforms		
4. To analyze Adaptive Delta modulation system and interpret the modulated and demodulated waveforms		
5. To analyze ASK (Amplitude Shift Keying) System with waveforms		
6. To analyze PSK (Phase Shift Keying) System with waveforms		
7. To analyze FSK (Frequency Shift Keying) System with waveforms		
8. To analyze of Quadrature Phase Shift Keying (QPSK) with waveforms		

9. To simulate any digital modulation scheme using MATLAB
10. To analyze waveforms of different Data Formats
Text Books :
1. Sklar, Bernard, "Digital Communications, Fundamentals & Applications," Second Edition, Prentice-Hall Inc., 2001.
2. Lathi B P, and Ding Z "Modern Digital and Analog Communication Systems," Fourth Edition, Oxford University Press.
3. Leon W. Couch, "Digital and Analog Communication Systems", Sixth Edition, Pearson Education, 2001.
Reference Books:
1. Haykin Simon, "Digital Communication Systems," Forth Edition, John Wiley and Sons, New Delhi.
2. Taub, D. Schilling, and G. Saha, "Principles of Communication Systems," Third Edition, Tata McGraw Hill.
3. John G. Proakis, "Digital Communication" ,Fifth Edition, Pearson Education.
Project Based Learning:
Implement following systems using matlab and simulink
1. Sampling of the given signal
2. Pulse Width Modulation generator
3. Pulse Position Modulation generator
4. Pulse Amplitude Modulation generator
5. Delta modulation system
6. Quantization of an audio signal
7. Pulse code modulation system
8. Frequency Shift Keying modulator
9. Amplitude Shift Keying modulator
10. Phase Shift Keying modulator
11. Quadrature Phase Shift Keying modulator
12. Unipolar RZ Line coding scheme
13. Bipolar RZ and NRZ line coding scheme
14. Random binary sequence generator
15. Generate the sound

Students in a group of 3 to 4 shall complete any one project from the above list.

Bharati Vidyapeeth
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B. Tech. Sem. IV Electronics & Communication Engineering MICROCONTROLLER & APPLICATIONS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits: 04
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW & Practical: 50 Marks	Credit: 01
	Total:150 Marks	Total Credits: 05
Course Pre-requisites:		
The students should have knowledge of		
1	Basics of Digital Logic Design.	
2	Basics of C programming	
3	Basic of Microprocessor architecture.	
Course Objectives:		
1	To introduce the operation of micro-controllers.	
2	To familiarize with the fundamentals of embedded system architecture, its basic hardware and software elements.	
3	To understand the concept of AVR Controller	
4	To introduce the AVR micro-controller with architecture and programming	
Course Outcomes: After learning this course students will be able to		
1	To describe the different Embedded processors with the specifications/Features.	
2	Give an overview on the architecture and basic concepts of 8051 micro-controller.	
3	To introduce interfacing of 8051.	
4	To describe the AVR Micro-controller architecture.	
5	To familiarize the AVR programming in C.	
6	To introduce the different communication protocols.	
UNIT – I	Review of Processor and Memory:	(08Hours)
	General-purpose processors, single-purpose processors, application specific processors, CISC and RISC processor architecture, memory devices, processor and memory selection for an embedded system, interfacing processor, memory and I/O devices, 8/16-bit microcontrollers.	
UNIT – II	8 Bit Micro Controller 8051:	(08 Hours)

	MCS 51 family architecture: Registers in MCS-51, Parallel I/O ports, Timers & Counters, Memory Organization, Pin Description, Instruction set, Addressing modes, Interrupts in MCS-51, Programming.	
UNIT- III	8051 Serial Communication & Interfacing of 8051	(08 Hours)
	Serial Communication of 8051: Basics, SBUF register, SCON and PCON registers, Modes of operation Simple program of serial communication. Interfacing of 8051 with devices: LED, LCD, keyboard, LM35 temperature sensor & A/D converter	
UNIT- IV	Introduction to AVR microcontroller	(08 Hours)
	Overview of AVR family, AVR Microcontroller architecture, status register, Special function registers, RAM, ROM & EEPROM space, On-Chip peripherals, ATmega32 pin configuration & function of each pin, Fuse bits of AVR.	
UNIT -V	AVR programming in C	(08 Hours)
	AVR Data types, AVR I/O port programming, Timer programming, Input capture and Wave Generator, PWM programming External Interrupt programming, ADC programming, EEPROM programming.	
UNIT- VI	Serial communication protocols	(08 Hours)
	UART protocol, I2C protocol, SPI protocol, Serial Port programming using polling and interrupt, I2C Programming, SPI Programming	
<u>Term Work:</u>		
1. Addition / subtraction / multiplication / division of 8/16 bit data using 8051		
2. Largest/smallest from a series using 8051.		
3. Generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface.		
4. To write a C program to demonstrate LED using 8051 Micro-controller development kit.		
5. To write a C program to demonstrate Seven Segment using 8051 Micro-controller development kit		
6. To write a program to demonstrate Stepper Motor using 8051 Micro-controller development kit.		
7. To write a program to demonstrate LCD using 8051 Micro-controller development kit.		
8. Installation of AVR STUDIO and familiarization of ATMega32 AVR Development Board.		
9. Stepper motor interfacing with ATMega32 in C with ATMega32.		
10. Timer to generate accurate delay using Interrupt in C with ATMega32		

11. Seven Segment Display interfacing with ATmega32 in C.
12. Timer to generate accurate delay using polling in C with ATmega32
13. 16x2 LCD interfacing with ATmega32 in C.
15. Interfacing with ATmega32 in C using I2C protocol
16. On-chip ADC for interfacing analog sensors in C with ATmega32.
Textbooks:
1. Muhammad Ali Mazidi, Janice Gillespie Mazidi, "The 8051 Microcontroller and Embedded System" Pearson Education.
2. Dhananjay Gadre, "Programming and Customizing the AVR Microcontroller", McGraw Hill Education
Reference Books:
1. Kenneth J. Ayala, "The 8051 Micro-controller – Architecture, Programming & Applications", Second Edition Penram International & Thomson Asia
2. Rajkamal, "Embedded System-Architecture, Programming and Design", TMH Publications, Edition 2003
3. Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, "The AVR Microcontroller and Embedded Systems Using Assembly and C", Pearson Education
Project Based Learning:
Build the following circuits -
1. 8 Channel Quiz Buzzer Circuit using Microcontroller 8051/AVR
2. 8 Channel Quiz Buzzer Circuit using Microcontroller 8051/AVR
3. Automatic Railway Gate Controller with High Speed Alerting System using Micro-controller 8051/AVR
4. Bidirectional Visitor Counter using Microcontroller 8051/AVR
5. Celsius Scale Thermometer using Microcontroller 8051/AVR
6. Digital Tachometer using Microcontroller 8051/AVR
7. Density Based Traffic Signal System using Microcontroller 8051/AVR
8. Digital Temperature Sensor using Micro-controller 8051/AVR
9. Digital Voltmeter using Microcontroller 8051/AVR
10. Line Following Robotic Circuit using Microcontroller 8051/AVR
11. Password Based Door Lock System using Microcontroller 8051/AVR
12. RFID based Attendance System using Micro-controller 8051/AVR
13. Remote Control Circuit through RF using Microcontroller 8051/AVR
14. Street Lights that Glow on Detecting Vehicle Movement using Micro-controller 8051/AVR
15. Sun Tracking Solar Panel using Micro-controller 8051/AVR
16. Temperature Controlled DC Fan using Microcontroller 8051/AVR
17. Ultrasonic Rangefinder using Microcontroller 8051/AVR
18. Water Level Controller using Microcontroller 8051/AVR
19. Water Level Indicator using Micro-controller 8051/AVR
20. Temperature based Ceiling Fan Speed Control System (230V AC Motor) using Micro-controller 8051/AVR

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. IV Electronics & Communication Engineering		
EM WAVES AND PROPAGATION		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits : 04
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: 01		Credits : 01
	Total:100 Marks	Total Credits: 05
Course Pre-requisites:		
The Students should have knowledge of		
1	Vector calculus and coordinate systems.	
2	Curl, Divergence and Gradient.	
3	Partial differential equations.	
Course Objectives:		
1	Provide fundamentals of Static Electromagnetic Fields.	
2	Explain basics of the vector Differential, Integral operators to Electromagnetic theory	
3	Electrostatic & Electromagnetic fields.	
4	Define and derive different laws in Electrostatic & Electromagnetic fields.	
5	Explain Maxwell's equations and concepts of transmission lines.	
6	Analyze techniques for formulating and solving problems in Electrostatic &	
Course Outcomes: After learning this course students will be able to		
1	Comprehend the fundamentals of Electrostatic and Electromagnetic fields.	
2	Apply Gauss' law, Ampere's Law, Biot-Savart law, Faraday's law and laws related with steady magnetic field while solving problems in Electrostatic and Electromagnetic fields.	
3	Develop field equations from understanding of Maxwell's Equations.	
4	Extend the knowledge of basic properties of transmission lines to analyze Electromagnetic wave propagation in generic transmission line geometries	
5	Demonstrate mathematical skills related with differential, integral and vector calculus.	
6	Apply radiation principles and concept of Antennas	
UNIT – I	Static Electric Fields	(08 Hours)
	Review of Co-ordinate systems, Coulomb's law, line, Surface & Volume Charge distribution. Electric Field Intensity, Electric Field	

	due to infinite line and surface charges, Electric Flux Density, Gauss law (differential and integral form) and its applications, Divergence Theorem, Electric Potential and gradient, Poisson's and Laplace Equations, Work done, Energy Density, Electric Dipole and moment. Polarization in Dielectrics, Boundary conditions for Dielectric and Dielectric, boundary conditions for Conductor and Dielectric, boundary conditions for Conductor and free space	
UNIT –II	Static Magnetic Fields	(08 Hours)
	Biot – Savart's law, Magnetic Field Intensity due to infinite and finite line. Ampere's Circuital Law in integral and differential form, Applications of Amperes Circuital law, Magnetic flux density, Stokes Theorem, vector magnetic potential, Magnetic Torque, moment and dipole, nature of magnetic material, magnetization, Magnetic boundary conditions.	
UNIT - III	Time Varying Fields & Maxwell's Equations	
	Faradays law of induced Emf, displacement current, Maxwell's Equations in point form & Integral form for various fields.	(08 Hours)
UNIT - IV	Wave Propagation and Uniform Plane waves	(08 Hours)
	Wave equations, wave propagation through different medium, wave propagation through free space , wave propagation through dielectric, wave propagation through conductors- skin depth, Poynting theorem, wave polarization, Reflection of plane wave from conducting medium, perfect dielectric., reflection of plane waves at normal incidence, reflection of plane waves at oblique incidence angles.	
UNIT -V	Transmission Lines	(08 Hours)
	Physical Description of Transmission line propagation, Transmission Line equations, Characteristic equation of infinite Transmission Line, Complex analysis of sinusoidal waves, Transmission lines equations & their solutions in phasor form, Uniform terminated 2 coefficient VSWR, smith chart (Numerical expected) and applications, transient analysis of transmission lines.	
UNIT -VI	Waveguides & Antenna Fundamentals	(08 Hours)
	Plane wave analysis of parallel-plate waveguide, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguide, EMI/EMC concepts, basic radiation principles, Hertzian dipole, magnetic dipole, thin wire antennas, antenna specifications, antenna arrays.	

List of Tutorials:

1. Find the Electric field intensity and electric flux density at a given point due to following charge distributions. (In all coordinate systems)
 - Point charges
 - Line charges (finite and infinite)
 - Surface charges (finite and infinite)
 - Mixed charges (Point charge, Line charge, Surface charge)
2. Application of Gauss's law
 - Given ρ_v (volume charge density) in a particular region, find \bar{D} (electric flux density) using Law at the given location.
 - Given ρ_s (surface charge density), find \bar{D} (electric flux density) using Gauss's Law at the given location.
 - Given \bar{D} (electric flux density), find total charge enclosed by the surface (Q), ρ_v (volume charge density) using Gauss's Law.(In all coordinate systems)
3. Find the electrostatic fields (Tangential and Normal) at the boundary between,
 - Free space and dielectric medium
 - Free space and conductor
 - Dielectric medium and conductor
 - Two dielectric media.
- 4 Find \bar{H} (Magnetic field intensity) and \bar{B} (Magnetic flux density) at a given point due to,
 - Infinitely long current carrying conductor
 - Finite current carrying conductor
 - Infinite conducting surface
 - Finite conducting surface
 - Different current carrying configurations (i.e. thin conductor, surface altogether)
- 5 For the following current carrying configurations, find the \bar{H} (Magnetic field intensity) in a given region (or point) using Ampere's circuital law.
 - Infinitely long current carrying conductor
 - Infinite cylindrical surfaces of different radii all centered at the same axis.
 - Spherical surfaces of different radii all centered at a given point.
6. Given \bar{H} (or \bar{E}) and the region properties (like ϵ , μ , σ etc.), find \bar{B} , \bar{D} and \bar{E} (\bar{H}) using Maxwell's equations. (In all coordinate systems).
7. Find attenuation constant, propagation constant, intrinsic impedance, values of E/H for different mediums like free space, conductors, and dielectrics.
8. Given the primary constants (R, L, G, C) along with the generator specifications and termination, find secondary constants (α , β , γ , Z_0) and other parameters like Velocity, wavelength, received voltage, received power, reflection coefficient etc.
9. Problems on Impedance matching and design of stub matching using Smith Chart.
10. Find cut-off frequency or waveguide dimensions or phase velocity for rectangular waveguides.

Text Books:

1. A. Murthi, "Electromagnetic fields", S. Chand.
2. Edminister J.A, "Electromagnetics", Tata McGraw-Hill.

Reference Books:

1. Hayt& Buck, “Engineering Electromagnetics”, 7th Edition, Tata McGraw-Hill
2. Kraus,Fleisch, “Electromagnetics with applications”, 5th Edition, McGraw Hill.
3. Jordan & Balmain, “Electromagnetic waves & radiating systems”, 2nd edition, PHI.
4. Matthew N.O. Sadiku, ”Principles of Electromagnetics”, 6 th edition, Oxford
Project Based Learning:
1. Plot Magnitude of a Vector & its Unit Vector MATLAB.
2. Simulate Coulomb Law on MATLAB & Scilab.
3. Plot different charge distributions viz. line charge, volume charge, surface charge in MATLAB.
4. Find & simulate Electric field intensity & flux density for given charge distributions.
5. Verify & plot Divergence theorem with Gauss law in SCILAB & MATLAB.
6. Design a code in SCILAB for relation between E & V, Electric Dipole visualization and verify Poisson’s & Laplace’s Equations.
7. Design & Verify boundary conditions between Free space- conductor-Dielectric in SCILAB.
8. Simulate Biot-Savart’s Law, Magnetic field intensity for different current distributions in SCILAB & MATLAB.
9. Design & Verify Magnetic boundary conditions in SCILAB
10. Visualize & Simulate Maxwell’s Equations for Time varying Fields in MATLAB & SCILAB
11. Visualize EM waves & Uniform Plane waves formation in MATLAB
12. Visualize & Simulate behavior of EM waves in good conductors Lossy-Lossless dielectrics in MATLAB & SCILAB.
13. Find out Transmission line parameters for given frequency in SCILAB, Visualize how standing waves generated & reflected on Transmission line in MATLAB
14. Visualize & plot SWR Circle, Impedance Matching, and reflection coefficient input impedance on SMITH CHART in MATLAB.
15. Visualize & plot Stub Matching problem of Transmission lines SMITH CHART in MATLAB.

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. IV Electronics & Communication Engineering INTEGRATED CIRCUITS AND AMPLIFIER DESIGN		
<u>TEACHINGSCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04	End Semester Examination(UE): 60Marks	Credits: 04
Practical: 02	Internal Assessment(IA): 40 Marks	
Tutorial: --	TW & Practical :50Marks	Credit: 01
	Total: 150 Marks	Total Credits: 05
Course Pre-requisites:		
The Students should have knowledge of		
1	Knowledge of KCL and KVL Law	
2	Basic knowledge of Op-Amp and its configurations	
Course Objectives:		
1	Familiar in the operational amplifier principle- analysis- design and application.	
2	Gain knowledge on the linear and nonlinear applications of operational amplifiers.	
3	Understand the theory and applications of Active filters and PLL.	
4	Familiar in the ADC- DAC and its classifications.	
5	Understand the few applications of specific ICs.	
Course Outcomes: After learning this course students will be able to		
1	Differentiate IC and Discrete components, understand manufacturing process of IC and analyze how monolithic components are being developed.	
2	Identify different configurations of op-amp analyze the parameters of op-amp and observe the frequency response of operational-amplifier	
3	Understand & demonstrate different applications based on operational-amplifier.	
4	Understand analog multiplier and PLL & demonstrate different applications based on it	
5	Differentiate A/D and D/A converter, understand their types and analyze their applications	
6	Demonstrate the applications of waveform generators, timers and voltage regulators	
UNIT – I	Basics of operational Amplifier	(08 Hours)
	Block diagram representation of a typical op-amp, Differential amplifier, Schematic symbol for op-amp, Definition of integrated	

	circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal & external offset voltage compensation, Frequency Response of an op-amp.	
UNIT –II	Operational Amplifier – Linear circuits	(08 Hours)
	Inverting amplifier, non-inverting amplifier, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Integrator, Differentiator, peak detector, clipper and clamper, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge.	
UNIT -III	Operational Amplifier - Non-linear circuits	(08 Hours)
	Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.	
UNIT -IV	Active filters and waveform generators	(08 Hours)
	First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Saw tooth wave generator and study of function generator IC 8038	
UNIT -V	Special function ICS	(08 Hours)
	IC 555- as Monostable and Astable Multivibrators and its applications. IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector.	
UNIT -VI	Interfacing circuits	(08 Hours)
	V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
1. To design and setup an inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, measure the gain.		
2. To demonstrate the use of op-amp as Integrator and Differentiator and draw frequency response.		
3. To demonstrate the use of op-amp as precision rectifier.		
4. To design and setup a Schmitt trigger, plot the input output waveforms and measure		

VUT and VLT.
5. Design and obtain the frequency response of second order Low Pass Filter (LPF) at a high frequency of 1KHz.
6. Design and obtain the frequency response of High Pass Filter (HPF) at a cut off frequency of 1KHz with pass band gain of 2.
7. To design and setup astable multivibrator using Op-amp 555, plot the waveforms and measure the frequency of oscillation
8. To obtain the output of voltage comparator and zero crossing detector.
9. Design instrumentation amplifier the with the help of three Op-amps inverting amplifier and also implement Wheatstone bridge and balance for null condition. (usingVLabs)
10. To design and study the frequency response of Summing Inverting Amplifier circuit.(usingVLabs)
11. Design and simulate triangular/square waveform generator using IC 741.(usingVabs)
12. To construct and study the voltage to current convertor.
13. To construct and study digital to analog converter circuit.
Text Books:
1. Ramakant A. Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4 th Edition,2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10 th edition, 2010
Reference Books:
1. David A. Bell, “Operational Amplifiers and Linear ICs”, Oxford publication,3 rd edition,2011
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, Tata McGraw Hill, 3 rd edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt.Ltd., 4 th edition, 2010
Project Based Learning:
1. To design and setup a non-inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, measure the gain.
2. To demonstrate the use of op-amp as clipper circuit.
3. Designoperational amplifier 741 tester which test op-amp 741 either is good or fault
4. Design and simulate Temperature to Voltage Converter Circuit.
5. To demonstrate the use of op-amp 741 as an Electronics Thermometer
6. IC 741 based circuit for dark Switch.
7. Hartley andColpittsoscillatorusingop-amp
8. Notch filters using op-amp.
9. Water Level based Alarm Circuit (using IC 555- AstableMultivibrator).
10. Digital Stop Watch
11. FM Radio using PLL.
12. ICL7107 (A/D converter) based Digital Voltmeter.
13. Dimmer circuit for LED Lamp (using IC 555)
14. Electronic Letter Box.
15. 4-line to 16-line decoder Circuit using 7442

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. IV Electronics & Communication Engineering		
ESSENTIALS OF DATA SCIENCE		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03	End Semester Examination(UE): 60Marks	Credits : 03
Practical: --	Internal Assessment(IA): 40 Marks	
Tutorial: --		
	Total:100 Marks	Total Credits: 03
Course Pre-requisites:		
The Students should have knowledge of		
1	Python programming	
2	Probability & Statistics	
Course Objectives:		
1	Introduce R as a programming language	
2	Introduce the mathematical foundations required for data science	
3	Introduce the first level data science algorithms	
4	Introduce a data analytics problem solving framework	
5	Introduce a practical capstone case study	
Course Outcomes: After learning this course students will be able to		
1	Describe a flow process for data science problems (Remembering)	
2	Classify data science problems into standard typology (Comprehension)	
3	Develop R codes for data science solutions (Application)	
4	Correlate results to the solution approach followed (Analysis)	
5	Assess the solution approach (Evaluation)	
6	Construct use cases to validate approach and identify modifications required (Creating)	
UNIT – I	Introduction to Data Science	(06 Hours)
	Data Science Fundamentals: Data, Data Science Process, Components of Data Science, Data Scientist roles and responsibilities, Introduction to R and R Studio, Variables and Datatypes in R, Data frames, Recasting and Joining of Data frames, Arithmetic, Logical and Matrix Operations in R, Advanced Programming in R: Functions, Data Visualization in R Basic Graphics.	

UNIT - II	Linear Algebra & Statistical Modeling for Data Science	(06 Hours)
	Linear Algebra for Data science, Solving Linear Equations, Linear Algebra - Distance, hyperplanes and half spaces, Eigen values, Eigenvectors, Statistical Modeling, Random Variables and Probability Mass/Density Functions, Sample Statistics, descriptive statistics, notion of probability, distributions, mean, variance, covariance, Hypotheses Testing, Type 1 and Type 2 errors. Testing for parameters of a normal distribution and for percentages based on a single sample and based on two samples. Introduction to the chi-squared test. The concept of p-value. Mean-square estimation and Kalman filtering.	
UNIT -III	Optimization for Data Science	(06 Hours)
	Optimization for Data Science, Unconstrained Multivariate Optimization Gradient (Steepest) Descent (OR) Learning Rule, Multivariate Optimization With Equality Constraints, Solving Data Analysis Problems.	
UNIT-IV	Regression and Classification	(06 Hours)
	Predictive Modeling, Linear Regression, Model Assessment, Diagnostics to Improve Linear Model Fit, Simple Linear Regression Model Building and assessment, Multiple Linear Regression, The least squares error criterion. Relation to maximum likelihood, Analysis of Variance (ANOVA), Logistic Regression, Logistic Regression Implementation in R, Classification , Classification using logistic regression, K - Nearest Neighbors, K-Means Clustering, K - means Implementation in R , Dimension Reduction Techniques.	
UNIT –V	Data Analysis and Visualization	(06Hours)
	Pandas and Numpy, Operating on Data in Pandas, Data modeling and transforming, dealing with null values, different data types, preparing data for the model, Visualization with Matplotlib, Seaborn, Data visualization using Power BI.	
UNIT - VI	Machine Learning	
	Introduction to Supervised and Unsupervised Learning, Clustering, Decision Trees, Random Forest, Time Series Forecasting: Introduction to Time Series, Correlation, Forecasting, Autoregressive models; Model Validation, Handling Unstructured Data, Neural networks, Support vector machine.	(06 Hours)
Text Books:		

1. Practical Statistics for Data Scientists by Peter Bruce, Andrew Bruce, O'Reilly Publication.
2. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas C. Mueller, Sarah Guido, O'Reilly Publication.
Reference Books:
1. Mohammed J. Zaki , Wagner Meira, “Data Mining and Machine Learning: Fundamental Concepts and Algorithms”, Jr,1 st Edition. Cambridge University Press
2. Trevor Hastie Robert Tibshirani, “The Elements of Statistical Learning: Data Mining, Inference, and Prediction”, Second Edition Springer Series in Statistics
3. Garrett Golemund and Hadley Wickham, “ R for Data Science”, O’Reilly Pub.
Project Based Learning:
1. Detecting Fake News with Python Dataset/Package: news.csv
2. Real-time Lane Line Detection in Python
3. Sentiment Analysis Project in Rwith Dataset/Package: janeaustenR
4. Build an application to detect colors with Beginner Data Science Project – Color Detection with OpenCV
5. Build a chatbot using Python– Chatbot with NLTK &Keras
6. Design Gender and Age Detection with Data Sciencewith OpenCV
7. Design & buildMovie Recommendation System Project in R
8. Build an application for Customer Segmentation with Machine Learning (K-means Clustering) using R
9. Create a Spotify Music Analysis visualization using Python pandas
10. Create a Crypto currency Analysis visualization using Python pandas.
11. Build a Song recommendation model using Machine Learning.
12. Build a Book recommendation model using Machine Learning.
13. Uber Dataset Time Series Analysis / Uber Data Analysis in R
14. Implement an Email automation system using SQL & Python
15. Practically implement the Deep Learning Project with Source Code Handwritten Digit Recognition with CNN

Students in a group of 3 to 4 shall complete any one project from the above list.

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B. Tech. Sem. IV Electronics & Communication Engineering VOCATIONAL COURSE-II DOMESTIC APPLIANCES AND MAINTENANCE		
<u>TEACHINGSCHE ME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: --	End Semester Examination(UE): --	
Practical: --	Internal Assessment(IA): --	
Tutorial: --	TW& Oral :50 Marks	Credits: 02
	Total: 50 Marks	Total Credits: 02
Course Pre-requisites:		
The Students should have knowledge of		
1	Basic Electronics	
Course Objectives:		
1	To identify and rectify the faults in domestic appliances like Washing machine, Microwave oven, Mixer, Grinder and Electric kettle.	
Course Outcomes: After learning this course students will be able to		
1	Identify and test passive and active electronics components & study of Multimeter	
2	Troubleshoot the faults in power supply circuits.	
3	Identify and test various mechanical and electrical modules of the washing machine.	
4	Identify electronic parts/components/modules of the Microwave oven.	
5	Identify and rectify the faults in mixer and grinder.	
6	Identify and rectify the faults in electric kettle.	
UNIT –I	Basic Electronic components & Multi meter	
	Different types of resistors, capacitors and inductors, Measurement of resistor using Color code, Measurement using LCR meter. Identify the power rating of components, Dismantle and identify the different parts of a relay, basics of Transformer, Multimeter.	
UNIT –II	Power supply	
	Testing of active components, Practice soldering and de-soldering techniques Assemble and test– half wave, full wave & bridge rectifier circuits with and without filter, different types of fixed positive and negative regulator ICs(78/79 series), Construct a fixed voltage regulator using 78xx/79xx series ICs, Variable voltage regulator using LM 723.	

UNIT -III	Washing Machine	
	Installation of front load washing machine Installation of top load washing machine, Identify the internal and external parts of semi-auto washing machine, Identify the internal and external parts of fully automatic washing machine, Operate semi-automatic washing machine, Operate fully-automatic washing machine, Rectify the fault leading to not working of control panel switches. Rectify the fault leading to not working of pulsator / agitator, Rectify the fault leading to spindrier not working, Rectify the fault leading to one side, rotation of motor. Rectify the fault leading to water inlet.	
UNIT -IV	Microwave oven	
	Internal and external parts of microwave oven. Identify the different touch pad controls their functions, Testing of high voltage diode. Identify the HV capacitor and discharge it. Rectify the fault leading to fuse blows off when cooking is initiated, Rectify the fault leading to not responding of touch switches(front panel). Rectify the fault leading to dead set. Rectify the fault leading to long cooking time. Precautions – importance of interlocking switch in performing maintenance.	
UNIT -V	Mixer and Grinder	
	Dismantle and identification of various parts, wiring, tracing of various controls, Electronic circuits in various types of Mixers/grinders, faults in various types of Mixers/grinders & rectification.	
UNIT -VI	Electric Kettle	
	Identify various components of Electric kettle, controls and trace the circuit and rectify the simulated faults	
List of Practicals:		
Practicals based on maintenance of appliances should be conducted		
Text Books:		
1. Shashi Bhushan Sinha, “Handbook of Repair and Maintenance of Domestic Electronics Appliances”, January 2016, BPB Publications.		
Reference Books:		
1. Michael Jay Geier, “How to Diagnose and Fix Everything Electronic”, Second Edition, Mc Graw Hill education.		

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B. Tech. Sem. IV Electronics & Communication Engineering JAVA PROGRAMMING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: --	End Semester Examination(UE): --	
Practical: 04	Internal Assessment(IA): --	
Tutorial: --	TW& Oral: 50 Marks	Credits: 02
	Total: 50 Marks	Total Credits: 02
Course Pre-requisites:		
The Students should have knowledge of		
1	Fundamentals of computing	
Course Objectives:		
1	To introduce object oriented programming concepts.	
2	To develop programming ability by learning advanced coding techniques.	
Course Outcomes: After learning this course students will be able to		
1	Demonstrate basic knowledge of object-oriented programming concepts.	
2	Write simple programs in Java.	
3	Get the knowledge of interfaces, packages and different file handing operations.	
4	Familiarize the concept of exception handling.	
5	Conceptualize the technique of multithreading programming.	
6	Apply Java for HTML and Applet applications.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments.		
	1. Write a Java Program to demonstrate the use of OOP features.	
	2. Write a Java Program to display pattern (Triangle, Pyramid) using different loops.	
	3. Write a Java program to differentiate between method overloading and method overriding.	
	4. Implementation of different string functions by using switch case.	
	5. Write a Java program to understand the use of String buffer class.	
	6. Write a Java Program implement multiple inheritances by using Interface.	
	7. Write a Java program to implement the concept of package.	
	8. Write a Java program to implement concept of Exception Handling.	
	9. Write a Java Program to perform different file operations.	

10. Write a program to implement multithreading.
11. Write a program to implement Frame and different graphics objects.
12. Write a program to implement Java Applet.
Textbooks:
1. E Balagurusamy, “Programming with Java: A Primer, 3E”, Tata McGraw Hill Publishing Company.
2. Herbert Schildt , “Java Complete Reference” , McGraw Hill Publishing Company
3. Deitel and Deitel , “Java: How to Program” , Deitel pub.
Reference Books:
1. Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI”, BPB Publication.

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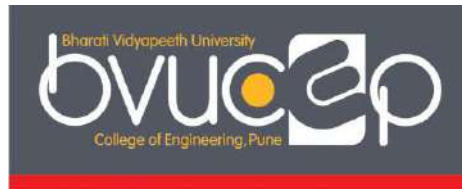
B. Tech. Sem. IV Electronics & Communication Engineering LINUX PROGRAMMING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: --	End Semester Examination(UE): --	
Practical: 04	Internal Assessment (IA): --	
Tutorial: --	TW& Oral:50 Marks	Credits:02
	Total: 50 Marks	Total Credits: 02
Course Pre-requisites:		
The Students should have knowledge of		
1	Computational C.	
Course Objectives:		
1	Make a Shell script executable. To demonstrate the use of constraints and relational algebra operations.	
2	Execute programs written in C under UNIX environment	
3	To use the following Bourne Shell commands: cat, grep, ls, more, ps, chmod, finger, ftp, etc. To facilitate students in Database design	
4	Learn tracing mechanisms (for debugging), user variables, Bourne Shell variables, read-only variables, positional parameters, reading input to a Bourne Shell script, command substitution, comments.	
Course Outcomes: After learning this course students will be able to		
1	To demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment	
2	To evaluate the concept of shell scripting programs by using an AWK and SED commands.	
3	To create the directory, how to change and remove the directory.	
4	To analyze the process of how the parent and child relationships	
5	To understand the concept of client-server communication by using sockets.	
6	Discuss shell programming in Linux operating system	
Experiment List		
1. a) Study of Unix/Linux general purpose utility command listman, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, log out,shutdown. b) Study of vi editor. c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system. d) Study of Unix/Linux file system (tree structure).		

e) Study of .bashrc, /etc/bashrc and Environment variables.
2. Write a C program that makes a copy of a file using standard I/O, and system calls
3. Write a C program to emulate the UNIX ls -l command.
4. Write a C program that illustrates how to execute two commands concurrently with a command pipe.
5. Ex: - ls -l sort
6. Write a C program that illustrates two processes communicating using shared memory
7. Write C program to create a thread using pthreads library and let it run its function.
8. Write a C program to illustrate concurrent execution of threads using pthreads library.
9. Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no: Write a shell script that delete all lines containing a specified word
10. Write a shell script that displays a list of all the files in the current directory; Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. whenever the argument is a file or directory.
11. Write a java script to find the number of characters, words and lines in a file? linked list respectively. Write a C Program that makes a copy of a file using standard I/O and system calls? Implement in C the following Unix commands using system calls A) cat B)mv
12. Write a C program that illustrates how an orphan is created; Write a program that illustrates how to execute two commands concurrently with a command pipe.? Write C programs that illustrate communication between two unrelated processes using named pipe.
13. Write a client and server programs (using c) for interaction between server andclient processes using Internet Domain sockets? Write a program to implement the shared memory. Write a client and server programs (using c) for interaction between server and client processes using Internet Domain sockets? . Write a C programthat illustrates two processes.
Text Books:
1. Cristopher Negus, “Red Hat Linux Bibl”e, Wiley Dreamtech India 2005 edition.
2. Yeswant Kanethkar, “UNIX Shell Programming”, First edition, BPB.
Reference Books:
1. Robert Love,” Linux System Programming”, O’Reilly, SPD.
2. W.R.Stevens,” Advanced Programming in the Unix environment”, 2nd Edition, Pearson Education.
3. W.R.Stevens , “Unix Network Programming”, PHI.
4. Graham Glass, King Ables, “Unix for programmers and users”, 3rd Edition, Pearson Education.



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College of Engineering, Pune



B.Tech. (Information Technology)
Program Curriculum (2021 Course)



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY),
COLLEGE OF ENGINEERING, PUNE**

Department of Information Technology

VISION OF UNIVERSITY:

Social Transformation Through Dynamic Education

MISSION OF UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination.
- To offer education to the students in a conducive ambiance created by enriched infrastructure! and academic facilities in its campuses.
- To bring education within the reach of rural, tribal, and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities.
- To make available quality education to the students of rural, tribal, and other deprived sections of the population.

VISION OF THE INSTITUTE

To be a world-class Institute for Social Transformation through Dynamic Education.

MISSION OF THE INSTITUTE

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet the needs of the profession and society.
- To provide an environment conducive to innovation, creativity, research, and entrepreneurial leadership.
- To practice and promote professional ethics, transparency, and accountability for social community, economic and environmental conditions.

Program Vision

To be a leading Program transforming students into skilled IT professionals.

Program Mission

- Amplify the student's technical skills by conducting continuing education programs, organizing and participating in various technical events.
- Provide comprehensive support in synchronization with industry to achieve professional and technological excellence.
- Provide an environment for effective social and ethical skills.

Program Educational Objectives:

PEO1: Cultivate IT, graduates, for industry pertaining to Information Technology solutions.

PEO2: Practice technical competency and teamwork abilities.

PEO3: Exhibit social responsibilities by following ethical practices in graduates' professional pursuits.

Program Specific Outcomes

- **PSO 1:** Use knowledge of core and allied courses for developing a computer-based system to deliver a quality product for real-world problems of society.
- **PSO 2:** Apply Modern IT tools and techniques for perusing their professional career by practicing effective communication with team members.
- **PSO 3:** Develop time-bound, cost-effective, and sustainable solutions by following professional ethics.

Program Outcomes

1. Apply knowledge of mathematics and computer science to analyze computer-based information systems.
2. Apply logical and programming skills to identify, formulate and analyze for solving computational problems.
3. Examine complex problems by a diagnosis of available information to provide an appropriate conclusion.
4. Design applications with suitable consideration of societal needs.
5. Use functional skills of modern IT tools and techniques for modeling and implementation.
6. Play the role of a team player to accomplish a common goal.
7. Convey technological concepts through significant documentation and presentation skills.
8. Demonstrate professional conduct by following norms of the engineering practice.
9. Apply software engineering methodologies for sustainable development.
10. Follow ethical and legal practices related to the functioning of the IT industry.
11. Apply management skills and techniques for creating time-bound and Cost-effective projects.
12. Exhibit lifelong learning by upgrading to state-of-the-art IT practices and Technology.

COURSE COMPONENTS OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Number of Courses
1	Basic Science Courses (BSC)	04
2	Engineering Science Course (ESC)	03
3	Core Course (CC)	38
4	Elective Course (EC)	02
5	Project (PROJ)	04
6	Internship (INT)	01
7	Vocational Course (VC)	04
8	Massive Open Online Course (MOOC)	03
9	Research Paper Publication (Research)	01
10	Social Activities (SA)	02
11	Mandatory Course (MC)	02
12	Internal Assessment (IA)	-
13	University Examination (UE)	-
TOTAL		64

**CREDIT DISTRIBUTION TO COURSE COMPONENTS OF UNDERGRADUATE
ENGINEERING PROGRAMME**

Sr. No.	Category	Breakup of Credits
1	Basic Science Course (BSC)	19
2	Engineering Science Course (ESC)	15
3	Core Course (CC)	145
4	Elective Course (EC)	10
5	Project (PROJ)	18
6	Internship (INT)	03
7	Vocational Courses (VC)	08
8	Massive Open Online Course (MOOC)	06
9	Research Paper Publication (Research)	02
10	Social Activities (SA)	04
11	Mandatory Course (MC)	Non-Credit
TOTAL		230

Program: B.TECH. (Information Technology)

Semester - I

CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Mathematics for Computing-I	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Physics for Computing System	3	2	-	60	40	25	-	-	125	3	1	-	4
3		Computer Aided Drafting	4	2	-	60	40	50	-	-	150	4	1	-	5
4		Digital Electronics	4	2	-	60	40	25	-	-	125	4	1	-	5
5		Structured Programming	4	2	-	60	40	-	-	100	200	4	1		5
6		Computer System Workshop Technology	-	4	-	-	-	-	-	50	50	-	2	-	2
Total			18	12	1	300	200	100	-	150	750	18	6	1	25

Program: B.TECH. (Information Technology)

Semester - II

CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Mathematics for Computing-II	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Organic and Electrochemistry	3	2	-	60	40	25	-	-	125	3	1	-	4
3		Electrical Technology	4	2	-	60	40	25	-	-	125	4	1	-	5
4		Object Oriented Programming	4	2	-	60	40	-	-	75	175	4	1	-	5
5		Programing Paradigms	4	2	-	60	40	-	50	-	150	4	1	-	5
6		Web Programming	-	4	-	-	-	-	-	75	75	-	2	-	2
		Total	18	12	1	300	200	50	50	150	750	18	6	1	25

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Discrete Structures and Graph Theory	4	2	-	60	40	25	-	-	125	4	1	-	5
2		Data Structures	4	2	-	60	40	-	-	50	150	4	1	-	5
3		Database Management System	3	2	-	60	40	-	-	50	150	3	1	-	4
4		Software Engineering*	4	2	-	60	40	25	-	-	125	4	1	-	5
5		Computer Communication and Networks	3	2	-	60	40	25	-	-	125	3	1	-	4
6		Information Technology Laboratory - I	-	4	1	-	-	-	25	50	75	-	2	1	3
7		Vocational Course-I	-	-	-	-	-	-	50	-	50	-	2	-	2
8		MOOC - I	-	-	-	-	-	-	-	-	-	-	-	-	2
9		Environmental Studies** (Mandatory Audit Course)	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			18	14	1	300	200	75	75	150	800	18	9	1	30

* Industry Taught Course -I

** 100 Marks Theory Examination

Vocational Course - I

Sr. No.	Course Name	Offered By	Offered By	Offered By
1.	Database Basics	Oracle	Microsoft	IBM
2.	Data Structures	Coursera	CodeChef	edX Certification
3.	Front-End Web Developer	The World Wide Web Consortium (W3C)	Udemy	Microsoft
4.	Object Oriented Programming	Dakota State University	North Hennepin Community College	Udemy
5.	SQL	Oracle	UpGrad	Coursera

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		IT Infrastructure Management*	4	2	-	60	40	25	-	-	125	4	1	-	5
2		Formal Languages and Computation Theory	4	2	-	60	40	25	-	-	125	4	1	-	5
3		Microprocessor and Microcontrollers	3	2	-	60	40	-	-	50	150	3	1	-	4
4		Applied Algorithms	4	2	-	60	40	25	-	-	125	4	1	-	5
5		Operating System	3	2	-	60	40	-	-	50	150	3	1	-	4
6		Information Technology Laboratory - II	-	4	1	-	-	-	25	50	75	-	2	1	3
7		Vocational Course - II	-	-	-	-	-	-	50	-	50	-	2	-	2
8		Social Activities - I	-	-	-	-	-	-	-	-	-	-	-	-	2
9		Disaster Management** (Mandatory Audit Course)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total	18	14	1	300	200	75	75	150	800	18	9	1	30

* Industry Taught Course – II

** 100 Marks Theory Examination

Vocational Course - II

Sr. No.	Course Name	Offered By	Offered By	Offered By
1.	Full Stack Web Development	The Technical University of Munich, Harvard	Oracle	World Wide Web Consortium (W3C)
2.	Java SE Programmer	Oracle	UpGrad	Udemy
3.	Microprocessor and Microcontrollers	Purdue University Fort Wayne, Vignan Institute of Technology and Science, Telangana, Electronics & ICT Academy at IIT Kanpur	Udemy	Coursera
4.	Operating System	Oracle	Linux foundation	Coursera
5	IT Infrastructure Management	LinkedIn Learning	CompTIA	Udemy

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Human Computer Interaction	3	2	-	60	40	25	-	-	125	3	1	-	4
2		Artificial Intelligence and Machine Learning	4	2	-	60	40	25	-	-	125	4	1	-	5
3		Computer Architecture and Organization	3	-	-	60	40	-	-	-	100	3	-	-	3
4		Advanced Database System*	3	2	-	60	40	-	-	50	150	3	1	-	4
5		Mobile Application Development	3	2	-	60	40	-	-	50	150	3	1	-	4
6		Information Technology Laboratory- III	-	4	-	-	-	-	-	50	50	-	2	-	2
7		Vocational Course - III	-	-	-	-	-	-	50	-	50	-	2	-	2
8		Project - I Stage - I	-	2	-	-	-	-	100	-	100	-	4	-	4
9		MOOC-II	-	-	-	-	-	-	-	-	-	-	-	-	2
Total			16	14	0	300	200	50	150	150	850	16	12	-	30

*** Industry Taught Course - III****Vocational Course - III**

Sr. No.	Course Name	Offered By	Offered By	Offered By
1.	Mobile App Development	Harvard Curtin University	Massachusetts Institute of Technology	IBM
2.	Python	Google	Coursera	edX
3.	Game Development	Professional Certificate in Computer Science for Game Development- Harvard	UpGrad	Intel
4.	Mobile Computing with App Inventor	CS Principles - Trinity College, Dublin	University of Hartford, Connecticut	Google
5.	Certificate Program In Machine Learning & AI with Python	Indian Institute of Technology Bombay	Coursera	edX

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Cloud Computing*	3	2	-	60	40	-	50	-	150	3	1	-	4
2		Software Testing and Quality Assurance	3	2	-	60	40	-	-	50	150	3	1	-	4
3		Data Warehousing and Data Mining	4	-	-	60	40	-	-	-	100	4	-	-	4
4		Agile Methodologies	4	-	-	60	40	-	-	-	100	4	-	-	4
5		Information Technology Laboratory- IV	-	4	-	-	-	-	-	50	50	-	2	-	2
6		Quantitative Techniques, Communication and Values	2	2	-	60	40	-	-	-	100	3	-	-	3
7		Project - I Stage - II	-	2	-	-	-	-	100	-	100	-	4	-	4
8		Internship	-	-	-	-	-	-	50	-	50	-	3	-	3
9		Vocational Course- IV	-	-	-	-	-	-	50	-	50	-	2	-	2
		Total	16	12	-	300	200	-	250	100	850	17	13	-	30

*Industry Taught Course - IV

Vocational Course- IV

Sr.No.	Course Name	Offered By	Offered By	Offered By
1.	Cloud Computing	Udemy, IIT Roorkee and Wiley	IBM	Amazon,Google
2.	Computational Thinking and Data Science	Massachusetts Institute of Technology, Cambridge, MA USA	Coursera	UpGrad
3.	Machine Learning with Python	Massachusetts Institute of Technology, Cambridge, MA USA	IIT Roorkee	NIT Warangal
4.	Data Warehousing	Oracle	Microsoft	Coursera
5.	Software Testing	Edureka	LambdaTest	ISTQB (International Software Testing Qualifications Board)

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Project Planning & Management	4	-	-	60	40	-	-	-	100	4	-	-	4
2		Web Services*	4	2	-	60	40	-	-	50	150	4	1	-	5
3		Business Intelligence	4	2	-	60	40	-		50	150	4	1	-	5
4		Elective - I	4	2	-	60	40	-	50	-	150	4	1	-	5
5		Information Technology Laboratory -V	-	4	1	-	-	-	25	75	100	-	2	1	3
6		Project - II Stage - I	-	4	-	-	-	-	200	-	200	-	4	-	4
7		MOOC-III	-	-	-			-	-	-	-	-	2	-	2
8		Research Paper Publication	-	-	-			-	-	-	-	-	2	-	2
		Total	16	14	1	240	160	-	275	175	850	16	13	1	30

***Industry Taught Course - V**

Elective - I

1. Software Architecture
2. Information Retrieval
3. User Experience
4. Storage Area network

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Information Security	4	2	-	60	40		-	50	150	4	1	-	5
2		Elective - II	4	2	-	60	40	-	50	-	150	4	1	-	5
3		Internet of Things*	4	2	-	60	40	-	-	50	150	4	1	-	5
4		Data Engineering	4	-	-	60	40	-	-	-	100	4	-	-	4
5		Information Technology Laboratory-VI	-	4	1	-	-	-	25	75	100	-	2	1	3
6		Project - II Stage - II	-	4	-	-	-	-	200	-	200	-	6		6
7		Social Activities - II	-	-	-	-	-	-	-	-	-	-	-	-	2
		Total	16	14	1	240	160	-	275	175	850	16	11	1	30

*Industry Taught Course - VI

Elective - II

1. Semantic Web Mining
2. Social Analytics in Digital Marketing
3. Management Information System
4. Cyber security

MOOC I, II, III Courses:

MOOC-I	MOOC-II	MOOC-III
Data Structure and Algorithms Using Java	Computer Architecture & Organization	Data Analytics with Python
Computer Graphics	Software Project Management	Big Data Computing
Discrete Mathematics	Advanced Database Management System	Information security - IV
Introduction to Database Systems	Introduction to Artificial Intelligence	Introduction to Human Computer Interaction
Programming in Java	Google Cloud Computing Foundation Course	Data Mining
Software Engineering	Modern Application Development	Introduction to Internet of Things
An Introduction to Probability in Computing	Machine Learning, ML	Cloud computing
Numerical Methods	The Joy of Computing using Python	Wireless Ad Hoc and Sensor Networks
Problem Solving through programming in C	Probability and Statistics	Introduction to Cyber Security
Communication Skills	Linear Algebra	Social Networks

B.Tech. (Information Technology)
Semester-I

Mathematics for Computing-I

TEACHING SCHEME

EXAMINATION SCHEME

CREDIT SCHEME

Lecture:	3 Hours/Week	End Semester Examination:	60 Marks	Theory	3
Tutorials:	1 Hours/Week	Internal Assessment:	40 Marks	Tutorial	1
Total	4 Hours/Week		100 Marks		4

Course Objective:

To study

1. Linear equations and its basis and dimension.
2. Linear mapping and its matrix representation.
3. Orthogonalization and diagonalization of matrices.

Prerequisite: The students should have knowledge of algebra of matrices and determinants.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply rank of matrix in solving system of equations.
2. Identify basis and dimension of matrix.
3. Solve problems on kernel and image of linear transformation.
4. Apply linear operator to represent matrix.
5. Evaluate orthogonalization of inner product space.
6. Use methods to find eigen values and eigen vectors.

Unit I

06 Hours

System of Linear Equation: Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

Unit II

06 Hours

Vector Spaces: Definition, linear combination, spanning sets subspaces, linear dependence and independence, basis and dimension, rank of matrix.

Unit III

06 Hours

Linear Mapping: Linear mapping, Kernel and image of linear mapping, rank and nullity of a linear mapping, singular and non-singular linear mapping

Unit IV

06 Hours

Linear mapping and matrices: Matrix representation of linear operator, change of base, similarity matrices

Unit V

06 Hours

Inner Product space and orthogonalization: Inner product space, Cauchy-schwarz equality, orthogonality, orthogonal sets and bases, projections, Gramschidt orthogonalization, orthogonal and positive definite matrices, matrix representation of inner product

Unit VI

06 Hours

Diagonalization Eigen values and eigen vectors:

Characteristic polynomial, Cayley-Hamilton theorem, eigen values and eigen vectors, properties.

List of Assignment for Internal Assessment will be framed by respective Course Coordinator.

Textbooks/Reference Books

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
5. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
6. Michael Greenberg, Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

Project Based Learning Assignments*

Note: - *Students in a group of 3 to 4 shall complete any one project from the following list)

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Gauss Elimination method.
2. LU-decomposition method
3. Rank of matrix
4. Linear combination
5. Basis and dimension
6. Spanning sets
7. Kernel and image of linear transformation
8. Rank-nullity theorem
9. Non-singular linear mapping
10. Linear operator
11. Similarity matrices
12. Change of base
13. Cauchy Schwarz equality
14. Orthogonality
15. Gram schmidt Orthogonalization
16. Matrix representation of matrix
17. Cayley-Hamilton theorem
18. Eigen values and Eigen vectors

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Physics for Computing System

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 03 Hours/Week	End Semester Examination: 60Marks	Theory 3
Practical: 02 Hours/Week	Internal Assessment: 40 Marks	
	Term Work: 25 Marks	Practical 1
Total 5 Hours/Week	125 Marks	4

Course Objective: To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Computer Engineering and Science.

Prerequisite: Students are expected to have a basic understanding of physics and calculus.

Course Outcomes: At the completion of the course, the students should be able to:

1. Interpret the properties of charged particles to develop modern instruments such as electron microscopy.
2. Appraise the wave nature of light and apply it to measure stress, pressure and dimension etc.
3. Summarize the structure and properties of lasers to their performance and intended applications.
4. Classify the optical fiber, understanding the structure, types and its applications in the field of communication.
5. Solve quantum physics problems to micro level phenomena and solid-state physics.
6. Explain mechanical properties of solid matter, and connect to applications in the field of engineering.

Unit I 06 Hours

Modern Physics: Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatics focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Separation of isotopes by Bainbridge mass spectrograph, Cathode ray tube (CRT).

Unit II 06 Hours

Wave Optics

Interference: Interference of waves, interference due to thin film (Uniform and nonuniform (only formula-no derivation is expected), Newton's ring, Applications of interference (optical flatness, highly reflecting films, non-reflecting coatings).

Diffraction: Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima

Polarization: Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.

Unit III 06 Hours

Lasers: Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO₂ laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, Computers).

Unit IV**06 Hours**

Fiber Optic: Principle of fiber optics, Construction, Numerical Aperture for step index fiber; critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibers, Fiber optic communication system, advantages, and disadvantages of fiber optics.

Unit V**06 Hours**

Quantum Mechanics: Dual nature of matter, DeBroglie's hypothesis, Heisenberg's uncertainty principle with illustrations, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, step potential and potential barrier (analytical discussion), tunnelling effect.

Unit VI**06 Hours**

Solid state physics: Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

Textbooks

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018).
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017).

Reference Books

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, JohnWiley and Sons (2013).
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017).
3. Principles of Physics, John W. Jewett, Cengage publishing (2013).
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004).
5. Principles of Solid-State Physics, H. V. Keer, New Age International (1993).
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011).
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014).
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997).
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013).
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012).

List of Laboratory Exercise (Any Eight of the Following)

1. Study of lissajous figure by Cathode Ray Oscilloscope (CRO).
2. Determination of e/m by Thomson method.
3. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings.
4. Determination of wavelength of light using diffraction grating.
5. Determination of resolving power of telescope.

6. Determination of thickness of a thin wire by air wedge.
7. Determination of refractive index for O-ray and E-ray.
8. Determination of divergence of a laser beam.
9. Particle size by semiconductor laser.
10. Determination of wavelength of laser by diffraction grating.
11. To study Hall effect and determine the Hall voltage.
12. Calculation of conductivity by four probe methods.
13. Study of solar cell characteristics and calculation of fill factor.
14. Determination of band gap of semiconductor.
15. Determination of Planck's Constant by photoelectric effect.

Project Based Learning Assignments*

Note: - *Students in a group of 3 to 4 shall complete any one project from the following list.

1. Measurement and effect of environmental noise in the college
2. Design and simulation of automatic solar powered time regulated water pumping
3. Solar technology: an alternative source of energy for national development
4. Design and construction of digital distance measuring instrument
5. Design and construction of automatic bell ringer.
6. Design and construction of remote-control fan
7. Design and construction of sound or clap activated alarm
8. Electronic eye (Laser Security) as auto switch/security system
9. Electric power generation by road power
10. Determination of absorption coefficient of sound absorbing materials
11. Determination of velocity of O-ray and E-ray in different double refracting materials
12. Need of medium for propagation of sound wave
13. Tesla Coil
14. Thin film interference in soap film-formation of colors
15. LiFi- wireless data transfer system using light

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Computer Aided Drafting

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
Lecture: 4 Hours/Week	End Semester Examination: 60 Marks	Theory	4
Practical: 2 Hours/Week	Internal Assessment: 40 Marks Term Work :50Marks	Practical	1
Total: 6 Hours/Week	150 marks		5

Course Objectives:

To provide knowledge about

1. Fundamentals of engineering drawing and curves.
2. Isometric views and projection.
3. Projections of points, lines, planes & solids.
4. Use of CAD tools.

Prerequisite: The students should have knowledge of Basics of mathematics at secondary school level

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand dimensioning methods and drawing of engineering curves.
2. Draw orthographic projections using 1st angle method of projection*.
3. Draw Isometric views from given orthographic projections*.
4. Draw projection of Lines, its traces, and projections of planes*.
5. Draw projection of different solids*.
6. Draw development of lateral surfaces of solids*.

*Using CAD tools

Unit I

08 Hours

Lines and Dimensioning in Engineering Drawing and Engineering Curves:

Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

Ellipse by Arcs of Circle method, Concentric circle method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone & cylinder, Introduction to Auto CAD commands.

Unit II

08 Hours

Orthographic Projections: Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views, and types of cutting planes and their representation, hatching of sections. (Also using AutoCAD commands).

Unit III

08 Hours

Isometric Projections: Isometric view, Isometric scale to draw Isometric projection, non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view. (Also using AutoCAD commands).

Unit IV**08 Hours**

Projections of Points, Lines and Planes: Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines,

Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP. (Also using AutoCAD commands).

Unit V**08 Hours**

Projection of Solids: Projection of prism, pyramid, cone and cylinder by rotation method. (Also using AutoCAD commands).

Unit VI**08 Hours**

Development of Lateral Surfaces of Solids: Introduction to development of lateral surfaces and its Industrial application, draw the development of lateral surfaces of cone, pyramid, and prism. (Also using AutoCAD commands).

Textbooks

1. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publishing house, Anand India.
2. "AutoCAD 2020 Beginning and Intermediate", Munir Hamad, Mercury Learning & Information Publication, 2019.
3. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.

Reference Books

1. "Textbook on Engineering Drawing", K. L. Narayana & P. Kannaiah, Scitech Publications, Chennai.
2. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
3. "Engineering Drawing", M. B. Shah and B.C. Rana, 1st Ed, Pearson Education, 2005
4. "Engineering Drawing", P. J. Shah, C. Jamnadas and Co., 1st Edition, 1988
5. "Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10th Edition, S. K. Kataria and Sons, 2005.

List of Laboratory Exercise

All sheets should be completed using AutoCAD.

List of Drawing Sheets

1. Types of lines, Dimensioning practice, free-hand lettering, 1nd and 3rd angle methods symbol.
2. Engineering curves.
3. Orthographic Projections.
4. Isometric views.
5. Projections of Points and Lines and planes.
6. Projections of Solids.
7. Development of lateral surfaces

List of Assignments: Assignment questions are supposed to be solved in A3 size sketchbook

1. At least 4 questions on engineering curves.
2. At least 2 questions on orthographic projections without sections.
3. At least 2 questions on sectional orthographic projections.

4. At least 2 questions on isometric views.
5. At least 4 questions on projections of lines.
6. At least 4 questions on projections of planes.
7. At least 4 questions on projections of solids.
8. At least 4 questions on development of lateral surfaces.

Project Based Learning Assignments*

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list)

1. To obtain industrial drawings to identify the types of lines, dimensioning methods and method of projection.
2. To develop the model/charts based on engineering curves.
2. To prepare model/chart for identification of engineering curves in nature for industrial, societal etc application.
4. To demonstrate different methods of orthographic projection.
5. To demonstrate projection of Points.
6. To demonstrate projection of Lines.
7. To demonstrate projection of Planes.
8. To demonstrate projection of Solids.
9. To demonstrate developments of surfaces for solids.
10. To demonstrate industrial application of development of surfaces such as steam carrying pipes, Ducts of air conditioning systems, etc.
11. To demonstrate Isometric projection method through model of a cube.
12. To obtain industrial drawings to identify the types of lines, dimensioning methods, and method of projection.
13. To develop the model/charts based on engineering curves.
14. To prepare model/chart for identification of engineering curves in nature for industrial, societal, etc application.
15. To demonstrate different methods of orthographic projection.

Syllabus for Unit Tests:

Unit Test-1

Unit-I, Unit-II, Unit-III

Unit Test-2

Unit-IV, Unit-V, Unit-VI

Digital Electronics

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory 4
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Practical 1
	Term Work: 25 Marks	
Total 6 Hours/Week	125 Marks	5

Course Objective:

1. To present the Digital fundamentals, Boolean algebra and its applications in digital systems.
2. To familiarize with the design of various combinational digital circuits using logic gates
3. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits.
4. To understand the various semiconductor memories and related technology.

Prerequisite: Physics, Mathematics, Basics of electrical engineering

Course Outcomes: On completion of the course, students will have the ability to:

1. Comprehend different number systems and Boolean algebraic principles.
2. Apply logic design minimization techniques to simplify Boolean expressions
3. Analyze and design combinational logic circuits.
4. Demonstrate the operations of systems with sequential circuit elements.
5. Comprehend characteristics and structure of Programmable Logic Devices and Memory.
6. Draw ASM charts for sequential circuit design.

Unit I

08 Hours

Digital systems:

Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers, 1's complement and 2's complement.

Binary Arithmetic: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division.

Digital Codes: BCD code, Excess-3 code, Gray code and ASCII code.

Logic Gates: Logical Operators, Logic Gates-Basic Gates, Universal Gates, realization of other gates using universal gates.

Unit II

08 Hours

Logic Design Minimization: Boolean algebra, De Morgan's Theorems, Standard representation of logic functions, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using Karnaugh-Maps up to 4 variables Don't care condition, Quine-McCluskey Method.

Unit III

08 Hours

Combinational Circuits: Binary and BCD arithmetic, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Code converters, Multiplexers, De multiplexer, Decoder (IC 74138) and their use in combinational logic design, Priority Encoder, Digital Comparators, Parity generators and Checker (IC 74180), ALU.

Unit IV**08 Hours**

Sequential Circuits: Flip- flop: SR, JK, D, T flip flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop.

Registers: Buffer register, Shift register.

Counters: Asynchronous counters, Synchronous counters, Modulus counters

Unit V**08 Hours**

FSM and ASM charts: Introduction to FSM, Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization, ASM chart notations, ASM block, State diagram, ASM chart for sequential circuits, Multiplexer Controller.

Unit VI**08 Hours**

Memory and PLD: Semiconductor memories: memory organization, memory expansion, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM. Programmable logic devices: Study of PROM, PAL, PLAs. Architecture of PLA, designing combinational circuits using PLDs.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

1. M. Morris Mano and M. D. Ciletti, Digital Design, Pearson Education.
2. R. P. Jain, Modern Digital Electronics, Tata McGraw Hill Publication.
3. F.J. Hill and G.L. Peterson, Switching Theory and Logic Design, John Wiley
4. J.F. Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2
5. David J. Comer, Digital Logic & State Machine Design, Oxford University Press.
6. Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill.

List of Laboratory Exercises:

1. Verify truth tables of logic gates. (AND, OR, XOR, NOT, NAND, NOR). Simplify the given Boolean expression using K-map and implement using gates
2. State De-Morgan's theorem and write Boolean laws. Implement NAND and NOR as Universal gates.
3. Design (truth table, K-map) and implement half and full adder/subtractor.
4. Design (truth table, K-map) and implement 4-bit BCD to Excess-3 Code converters.
5. Study of magnitude Comparator using IC 7485.
6. Implement of logic functions using multiplexer IC 74151 (Verification, cascading & logic function implementation).
7. Implement logic functions using 3:8 decoder IC 74138.
8. Verify truth tables of different types of flip flops.
9. Design (State diagram, state table & K map) and implement 3 bits Up and Down Asynchronous and Synchronous Counter using JK flip-flop.
10. Design and implement modulo 'n' counter with IC 7490.

Project Based Learning Assignments*

Note: - *Students in a group of 3 to 4 shall complete any one project from the following list)

1. Survey report of basic gates ICs 7432, 4011, 4050, 4070, 4071, 40106
2. Implement combinational logic Circuit of given Boolean Equation.
3. Implement Half Adder and Half Subtractor.

4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX
10. Implement 7 segment decoder driver using IC 7447.
11. Build a Decade counter and Up-Down Counter.
12. Build a Shift Registers: SISO and SIPO
13. Implement the Johnson Counter and Ring Counter.
14. Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit –V, Unit - VI

Structured Programming

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 4 Hours/Week	End Semester Examination: 60 Marks	Theory 4
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	
	Term Work and Practical: 100 Marks	Practical: 1
Total	6 Hours/Week	200 Marks
		5

Course Objective:

1. To build the programming skills using 'C' to solve real world problems.
2. To provide an overview of fundamental principles, concepts, and constructs of computer programming.

Prerequisite:

Basic knowledge of Computer Handling.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply steps towards problem solving.
2. Apply fundamental concepts of programming language.
3. Implement conditional, branching and iteration
4. Decompose a problem into functions.
5. Apply programming to solve simple numerical method problems.
6. Exercise structures to formulate programs.

Unit I

08 Hours

Introduction to Computing: Components of computer system, concept of hardware and software, introduction to system software- operating system, editor, compiler, assembler, linker, loader, introduction to computer programming, types of programming languages, software development life cycle, problem solving techniques- fundamental stages of problem solving, define the problem, -designing- development of an algorithm, algorithm design tools- flowcharts, pseudo codes.

Unit II

08 Hours

Programming language 'C': Features of C, header files, pre-processor directives, compiling and executing a C program, syntax and semantic errors, libraries, structure of a C program, declarations, constants, variables, data types, operators and expressions, precedence and associativity of operators, type conversions, input, and output functions- printf and scanf.

Unit III

08 Hours

Control Structures: if-else statement, nested if-else, use of logical operators, Loop control structure: for, while, do-while loops, use of break and continue, Case control structure: switch case
Pointers: Concept, pointer declaration, assignment, initialization, and access.

Unit IV

08 Hours

Function: Types of functions, function definition and declaration, function prototype, calling and returning function, passing values between functions, standard library functions and user defined functions, passing array as function parameter, call-by-value, call-by-reference, recursive function.

Unit V**08 Hours**

Arrays: Concept, declaration, initialization, processing with array, one and multidimensional array, pointer to an array, use of array for searching techniques: linear and binary search. sorting techniques: bubble sort, insertion sort, selection sort, applications of array in image processing.
Strings: concept, declaration, initialization, and standard string library functions.

Unit VI**08 Hours**

Structures: Concept, declaration, accessing structure elements, array of structures, pointer to structures, self-referential structures, use of structures, union.
Introduction command line concepts, programs using command line argument.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

1. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall, ISBN 0131103628.
2. Donald E. Knuth, "The Art of Computer Programming", Addison-Wesley, ISBN-10: 0201485419, ISBN13: 978-0201485417.
3. T. E. Bailey, "Program design with pseudo code", Brooks/Cole Publisher, ISBN-10 : 0534055745, ISBN-13: 978-0534055745.
4. Kanetkar Yashavant P, "Let us C", BPB publications.
5. Subrata Saha and Subhodip M., "Basic Computation and Programming with C", Cambridge University of Press, India, ISBN:9781316601853.

Reference Books

- 1 Lamey Robert, "Logical problem solving", Prentice Hall, ISBN: 9780130618825.
- 2 Henry Mullish, Herbert L. Cooper, "The Spirit of C", Thomson Learning, ISBN 0314285008.

List of Laboratory Exercise

1. Write a program to accept the length of three sides of a triangle and to test and print the type of triangle as equilateral, isosceles or right angled or none.
2. Write a program to check whether input number is Prime or not with and without use of recursive function.
3. Write a program to separate digits of input 4-digit integer, separate and display its digits.
4. Write a program to implement linear and binary search techniques.
5. Write a program to implement sorting techniques: Bubble, Selection, and Insertion sorting.
6. Write a program to accept a string and to display the following:
 - (a) Total number of characters in the string.
 - (b) Total number of vowels in the string.
 - (c) Total number of occurrences of character in the string.
 - (d) Check whether string is palindrome or not.
7. Write a program to carry out following operations on strings using library functions.
 - (a) To concatenate a string S2 to string S1.
 - (b) To find the length of a given string.
 - (c) To compare two strings S1 and S2.
 - (d) To copy a string S2 to another string S1.
8. A class teacher wants to keep record of 10 students in the class along with the names and marks obtained in 5 subjects. Write a C program with function that displays.
 - (a) Name of the student with highest marks in a particular subject.
 - (b) Overall percentage result of the class.

- (c) Total number of passing students in the class.
 - (d) Total number of students failing in one subject.
9. Write a program with function to swap values of two elements (call by reference).

Project Based Learning Assignments*

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list)

1. Design and develop a project for Diary management System
2. Design and develop a project for Calendar using C
3. Design and develop a project for Contact Management System
4. Design and develop a project for Library Management System
5. Design and develop a project for Snake Game
6. Design and develop a project for Bus Reservation system
7. Design and develop a project for Hospital Management system
8. Design and develop a project for Employee management system
9. Design and develop a project for Diary management System
10. Design and develop a project for Calendar using C
11. Design and develop a project for Contact Management System
12. Design and develop a project for Library Management System

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit – III

Unit Test -2

Unit – IV, Unit –V, Unit - VI

Computer System Workshop Technology

TEACHING SCHEME

EXAMINATION SCHEME

CREDIT SCHEME

Practical:	4 Hours/Week	Term Work and Practical : 50 Marks	Practical:	2
Total	4 Hours/Week	50 Marks		2

Course Objective:

Provide student a knowledge of computer hardware and networking, enabling them to identify computer hardware, software and network related problems, and develop an ability to use the basics of computing, necessary for computing courses.

Prerequisite: Basic knowledge of Computer and Electronics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify the architecture of a computer and its different components, including their technology evolution.
2. Apply their knowledge about computer peripherals to identify problems.
3. Install and uninstall given software step-by-step.
4. Configure local area network to access the Internet.
5. Prepare document using Latex.
6. Use GitHub tool for coding and collaboration.

Unit I

06 Hours

Computer hardware peripherals: Introduction to hardware components, random access memory (RAM), Types Of RAM & their speed, tips for buying ram, how to add memory to a computer, problems when installing memory, Central Processing Unit (CPU), Types Of CPU: considerations when buying a new CPU (Types & Differences), different speeds available for CPU and what do they mean, 32 Bit vs 64 Bit – Which One To Choose & Why? How to choose a CPU type for different needs? Graphic Card & Types, How to install a Graphics Card, Installing a CD or DVD burner, Jumper Switch settings, Hard Disk upgrade, Different ports and why we use them - USB, PS2, DivX, Graphic card & types, Virtual Memory and how to configure it for optimum system performance.

Unit II

06 Hours

Assembly of Computer and Software Installations: Assembling the motherboard, Replacing fan, how to avoid common mistakes during assembly, Installation of system software: Operating system (Windows and Linux), Installations step for operating system, Dual booting, Configure the BIOS, Installation of Antivirus, Installation of the open source software such as Scilab, Latex Installation of MS Office.

Unit III

06 Hours

Basic Diagnostic of Hardware and Software: Diagnosis of Power Up problem, Boot Drive, Errant Keyboard, mouse problems, slow computer performance, Computer freezes and displays BSOD (Blue screen of death), no display on monitor, no sound, computer rebooting or turning itself off, how to troubleshoot a computer that does not boot, Registry Cleaner.

Unit IV**06 Hours**

Computer network environments: Network connecting devices. Configure the TCP/IP setting, connect to Local Area Network and access the Internet, Configuring Wireless network. Server and Its Configuration, Email Clients, Browsers, Office tools, customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers, Browsing netiquettes and cyber laws. Cloud Access Tools.

Unit V**06 Hours**

Configuration of External devices: Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader etc.

Unit VI**06 Hours**

Productivity tools: Open-Source Tools Such as Latex, GitHub.

Latex: Format words, lines, and paragraphs, design pages, create lists, tables, references, and figures in LaTeX. Introduction to LaTeX Packages and classes. Using Git, Version Control Systems, interacting with GitHub, Reverting Changes, Creating Pull Requests.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft).
3. LaTeX Companion – Leslie Lamport, PHI/Pearson.
4. <https://nptel.ac.in/courses/106/105/106105081/>.
5. <http://nptel.ac.in/courses/106105084/>.
6. <https://guides.github.com/>.
7. Introduction to Linux: Installation and Programming, N B Venkateswarlu, BS Publication.

Reference Books

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
2. Computer Fundamentals, MS Office, and Internet & Web Technology by Dinesh Maidasani.

List of Laboratory Exercise

1. Demonstrate the Computer Hardware Components and explain its working.
2. Demonstrate the Networking Components and explain its working.
3. Installation of operating system MS windows, Unix on the personal computer
4. Installation of Application software Latex, MS office on the personal computer
5. Troubleshooting hardware related problem.
6. Customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
7. Execution of Important “layout” and formatting commands in Latex,
8. Installation of Antivirus and customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms

9. Assignment on Pull request, code review and collaboration using GitHub.

Project Based Learning Assignments

Note: - *Students in a group of 3 to 4 shall complete any one project from the following list

1. Collect specifications of similar types of hardware and software and prepare report comparing them
2. Assembling and disassembling the PC back to working condition.
3. Installation of operating systems LINUX on Server and different packages on a PC.
4. Practice hardware troubleshooting exercises related to various components of computer like monitor, drives, memory devices, printers etc. and software troubleshooting related to BIOS etc
5. To start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of?
6. Cyber Hygiene: Installing antivirus for Windows.
7. Prepare the report of need of programming language in 21st century.
8. Collect various types of computer hardware and prepare summary report
9. Prepare Seminar report using LaTeX.
10. Prepare Project report using LaTeX.

B.Tech(Information Technology)
Semester-II

Mathematics for Computing-II

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 3 Hours/Week	End Semester Examination: 60 Marks	Theory 3
Tutorials 1 Hour/Week	Internal Assessment: 40 Marks	Tutorial 1
Total 4 Hours/Week	100 Marks	4

Course Objectives:

1. Fourier series and integral transforms.
2. Multiple integrals and its applications.
3. Vector calculus and its applications.

Prerequisite: The students should have knowledge of vector algebra, derivative and integration.

Course Outcomes: On completion of the course, students will have the ability to:

1. Use periodic functions as Fourier series.
2. Apply methods of finding Fourier and Z-transforms.
3. Apply methods of Laplace transform of piecewise continuous functions.
4. Identify concepts of double and triple integrals.
5. Apply vector derivative for physical quantities.
6. Evaluate line, surface, and volume integrals.

Unit I

06 Hours

Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

Unit II

06 Hours

Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory.

Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit III

06 Hours

Laplace Transform and its application: Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit IV

06 Hours

Multiple Integrals and their Application: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, moment of inertia, centre of gravity.

Unit V

06 Hours

Vector Differential Calculus: Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit VI

06 Hours

Vector Integral Calculus and Applications: Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problem in engineering.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks/Reference books:

- 1.P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi GrihaPrakashan, Pune, 2013.
- 2.B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
- 3.B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
- 4.Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
- 5.Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Fourier series
2. Harmonic analysis
3. Fourier transform
4. Z-Transform
5. Laplace transform technique to solve ODE
6. Multiple Integral to evaluate area and volume
7. Directional derivative
8. Divergence and curl
9. Greens theorem
10. Gauss Divergence Theorem
11. Stokes theorem
12. Unit step function
13. Solenoidal and irrotational fields
14. Simple difference equation

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Organic and Electrochemistry

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory 3
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Practical 1
	Term Work: 25 Marks	
Total 5 Hours/Week	125 Marks	4

Course Objective:

The student should acquire the knowledge of

1. To develop the interest among the students regarding chemistry and their applications in engineering.
2. To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
3. The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the computing field.

Prerequisite: Capacitor, insulator, classification and properties of polymers, electromagnetic radiation, electrochemical series

Course Outcomes: On completion of the course, students will be able to:

1. Differentiate between ionic and covalent bonding and classify the bonding in a compound as ionic or covalent.
2. Develop a working knowledge of the twelve fundamental principles of green chemistry and what it is all about.
3. Apply standard reduction potential data to determine the relative strength of oxidizing/reducing agents.
4. Demonstrate the knowledge of polymer materials for futuristic engineering applications.
5. Describe the properties of materials and Application of semiconductor electronics
6. Describe the manufacturing and refining process of fuels and lubricants.

Unit I

06 Hours

Chemical Bonding in Molecules: MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organ metallic chemistry.

Unit II

06 Hours

Green Chemistry: Introduction, Twelve Principles of Green chemistry, numerical on atom economy, synthesis, adipic acid and indigo. Organic dye-Traditional methods of organic dye. Green solvents (ionic liquid supercritical CO₂), and products from natural materials.

Unit III

06 Hours

Electrochemistry: Electrochemical cells and Galvanic cells, EMF of a cell, Single electrode potential, Nernst equation, Electrochemical series, Types of electrodes, Reference electrodes, pH, pOH, acids and basis, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Li-Ion Batteries, Li-Po Batteries.

Unit IV **06 Hours**
Polymers for the Electronics Industry: Polymers, Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p-phenylene), Polyhetrocyclic systems, Polyaniline Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications.

Unit V **06 Hours**
Semi-Conductors, Insulators and Superconductors: Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators, or Dielectrics.

Unit VI **06 Hours**
Fuels and Lubricants: Classification of fuels, Calorific values, Comparison between solid, liquid and gaseous fuels, Theoretical calculation of calorific value of a fuel, Selection of coal, analysis of coal, Natural Gas, Producer gas, water gas, Lubricants, Mechanism of lubrication, classification of lubricants, lubricating oils, Solid lubricants, Greases or Semi-Solid lubricants, Synthetic lubricants, Lubricating emulsions, Properties of lubricating oils.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008.
2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G.Cowie, Blackie Academic & Professional, 1994.
3. A Textbook of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004.
4. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.
5. Inorganic Chemistry (4th edition), D. F. Shriver and P. W. Atkins, Oxford University, Oxford, 2006.
6. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978.
7. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003.

List of Laboratory Exercise

1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. To determine strength of acid by pH – metric Titration
4. To measure the Conductance of a solution by conductometric titration
5. Measurement of Surface tension of a given liquid by Stalagmometer.
6. Determination of viscosity of a given liquid by Ostwald's Viscometer.
7. Determination of Saponification value of an oil sample.
8. To determine alkalinity water sample.
9. Determination of Hardness of water sample by EDTA method.
10. Determination of Chloride content in water sample by precipitation titration method.
11. To determine strength of acid by pH – metric Titration
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin.
13. To study set up of Daniel cell.

Project Based Learning Assignments

Note: - *Students in a group of 3 to 4 shall complete any one project from the following list

1. Green Chemistry approach to Nano-Structured Electronics
2. Assessment of Environmentally Benign Photopolymers as an Alternative to the Use of Formaldehyde Based Textile Finishing Agents
3. Solvent-Free Synthesis of Phthalocyanines
4. Synthesis of Conjugated Polymers and Molecules Using Sugar Reagents and Solventless Reactions
5. Environmentally Benign Control of Polymer Solubility: Photoresist Materials Using DNA Mimics
6. Enzymatic Synthesis of Non-Formaldehyde Phenolic Polymers: Control of Hydrogen Peroxide Concentration.
7. The materials chemistry and electrochemistry of lithium and sodium-ion batteries
8. Electroplating- the principles, how different metals can be used and the practical applications
9. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing and Powder Coating Projects.
10. To determine calorific value of a fuel by any suitable method
11. To study various properties of lubricants
12. To study various types of lubricants and its properties.
13. To determine quality of coal sample & its analysis.
14. To study mechanism of lubrication.
15. To study coal analysis & its significance.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit –V, Unit - VI

Electrical Technology

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	4 Hours/Week	End Semester Examination:	60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks		
		Term Work:	25 Marks	Practical	1
Total	6 Hours/Week		125 Marks		5

Course Objective:

To study of power system basics, magnetic circuits electrical machines, transformers, wiring, measurements, illumination and batteries.

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the various parameters related to magnetic circuit.
2. Describe basic concepts of AC fundamentals and circuits.
3. Illustrate constructional features and describe different parameters of transformer.
4. Describe basic concepts of power system and three phase circuits.
5. Demonstrate AC and DC electrical machines.
6. Classify types of batteries.

Unit I

08 Hours

Magnetic Circuits: Magnetic effect of electric current, Cross & Dot Convention, Right hand thumb rule, Concept of flux, flux linkages, magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability Kirchhoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling

Unit II

08 Hours

AC Fundamentals and circuits: AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasor, phasor representation of sinusoidal varying voltage and current. Analysis of series, parallel and series parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems).

Unit III

08 Hours

Single Phase Transformer: Faradays law of electromagnetic induction, statically and dynamically induced e.m.f, self-inductance, mutual inductance, coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e .m. f. equation, voltage ratio, current ratio, KVA rating ,determination of efficiency and regulation by direct load test, equivalent circuit, power losses,(simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections.

Unit IV

08 Hours

Introduction to Power System and Three Phase Circuits: General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only) Power generation to distribution through overhead lines and underground cables with single line diagram. Three phase system-its necessity and advantages, meaning of phase

sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three phase power and its measurement (simple numerical problems).

Unit V

08 Hours

Electrical Machines: DC & AC: Principles of electromechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics, and applications of dc motors (simple numerical problems). Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).

Unit VI

08 Hours

Batteries: Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, Charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:

1. B.L.Theraja, A Textbook of Electrical Technology, Vol.1, S.Chand& Company Ltd. New Delhi
2. V.K.Mehta, Basic Electrical Engineering, S Chand & Company Ltd. New Delhi.
3. J.Nagarath and Kothari, Theory and applications of Basic Electrical Engineering, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Electrical Technology - Edward Huges (Pearson).
2. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC).
3. Electrical power system technology - S. W. Fardo, D. R. Patric (Prentice Hall).
4. Electrical, Electronics Measurements and Instruments - (Satya Prakashan).

Project Based Learning Assignments

Note: - *Students in a group of 3 to 4 shall complete any one project from the following list

1. Building a small resistive load lamp bank.
2. Building a small resistive load lamp bank for various types of connections like series, parallel, star, delta
3. Building a small inductive load lamp bank for various types of connections like series, parallel, star, delta
4. Building a small capacitive load lamp bank for various types of connections like series, parallel, star, delta
5. Building a small resistive load lamp bank
6. Building a staircase wiring model on a board
7. Building a Go down wiring model on a board
8. Rewinding of a choke
9. Rewinding of a small transformer
10. Building a small rectifier circuit on bread board
11. Building a mobile charger circuit on a bread board

12. Building an electric buzzer circuit
13. Building a solar charger for mobile phone
14. Building a small wind turbine
15. Small Agricultural pump model with DC motor
16. Small Agricultural pump model with AC motor

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Object Oriented Programming

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 4 Hours/Week	End Semester Examination: 60 Marks	Theory 4
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Practical 1
	Term Work and Practical: 75 Marks	
Total 6 Hours/Week	175 Marks	5

Course Objective:

The course focuses on the understanding and practical mastery of object-oriented concepts such as classes, objects, data abstraction, methods, method overloading, inheritance, and polymorphism.

Prerequisite:

Basics of C Programming.

Course Outcomes: On completion of the course, students will have the ability to:

1. Differentiate between top-down and bottom-up programming approach.
2. Associate the object-oriented programming approach in connection with C++.
3. Apply the concepts of array and operator overloading.
4. Implement basic concepts of inheritance.
5. Illustrate the process of data file manipulations using C++
6. Use the concepts of Templates and Exceptions.

Unit I

08 Hours

Introduction to OOP: Programming characteristics of object-oriented languages. Comparison between C and C++. C++ Programming basics: Output using cout. Directives. Input with cin. Type bool. The setw manipulator. Type conversions.

Unit II

08 Hours

Functions: Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.

Object and Classes: Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types of constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes.

Unit III

08 Hours

Arrays and string: arrays fundamentals. Arrays as class Member Data: Arrays of object, string, The standard C++ String class

Operator overloading: Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable.

Unit IV

08 Hours

Inheritance: Concept of inheritance. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation: Classes within classes, inheritance, and program development.

Pointer: Addresses and pointers. The address of operator and pointer and arrays. Pointer and Fraction pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers.

Unit V

08 Hours

Virtual Function: Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information.

Streams and Files: Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, and printer output.

Unit VI

08 Hours

Templates and Exceptions: Function templates, Class templates Exceptions

The Standard Template Library: Introduction algorithms, sequence containers, iterators, specialized iterators, associative containers, strong user-defined object, function objects.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:

- 1 Object Oriented Programming with C++ Author: E. Balagurusamy.
- 2 C++: The complete Reference Author: Herbert Schildt.

Reference Books:

- 1 Object Oriented Programming C++, Fourth Edition, By Pearson.
- 2 Object Oriented Programming in C++ Author: Robert Lafore.

List of Laboratory Exercise:

1. Describe the OOP Concepts.
2. Demonstrate class concept using suitable programmes.
3. Demonstrate array concepts using suitable programmes.
4. Demonstrate Operator Overloading concepts using suitable programmes.
5. Demonstrate Inheritance and its types using suitable programmes.
6. Demonstrate the use of Pointer using suitable programmes.
7. Demonstrate the types of functions using suitable programmes.
8. Demonstrate File Handling using suitable programmes.
9. Demonstrate Templates using suitable programmes.
10. Implement User define Exception.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Login and Registration System using C++
2. Car Rental System using C++
3. Bookshop inventory system using C++
4. Student Report Management System using C++
5. Sudoku Game using C++
6. Credit Card Validator using C++
7. Using Graphics to Draw and Move Shapes using C++
8. Banking Record System using C++
9. Hotel Management System using C++

10. Student Management System using C++

11. Bus reservation System using C++

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Programming Paradigms

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	4 Hours/Week	End Semester Examination:	60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks		
		Term Work and Oral:	50 Marks	Practical	1
Total	6 Hours/Week		150 Marks		5

Course Objectives:

1. To introduce the basic building blocks that underlie programming languages.
2. To introduce the basics of programming language design and implementation.

Prerequisite:

Introduction to computing and programming environment.

Course Outcomes:

On completion of the course, students will have the ability to:

1. Compare and contrast a range of programming paradigms.
2. Apply functional programming language features.
3. Implement the concepts of object orientation.
4. Interpret the features of logic programming paradigm.
5. Summarize the use and types of system programs.
6. Discuss the appropriateness of the using a given programming paradigm within a given environment.

Unit I

08 Hours

Introduction to Programming: Role of programming languages, need to study programming languages, Characteristics of Programming Languages

The Nature of Programming Languages: Imperative languages and non-imperative languages, Functional Language, Scripting languages, Data-oriented languages, Object-oriented languages, Event-driven Programming, Language Standardisation

Programming Environments: Compilers and Interpreters, Interactive development tools, Run-time support environments, Debugging Tools, Testing Tools, Configuration Management.

Unit II

08 Hours

Functional Programming: Definition of a function and Subprogram control: domain and range, total and partial functions, strict functions, subprogram sequence control, attributes of data control, shared data in subprograms, different parameter passing methods, lifetime of variables, Recursion, Referential transparency, Storage management. Desirable and undesirable characteristics of procedural programming.

Unit III

08 Hours

Object Orientation: Basic concepts: Objects, classes, methods, overloading methods, messages inheritance: overriding methods, single inheritance, multiple.

Inheritance, Interfaces (e.g., in Java), encapsulation, polymorphism, Implementing object-oriented programming, desirable characteristics of object-oriented programming, Comparative study of C++ and JAVA.

Unit IV**08 Hours**

Logic programming Paradigm: Introduction, Logic programming language model, Brief Introduction to Predicate Calculus, Predicate Calculus and Proving Theorems, An Overview of Logic Programming, The Origins of Prolog, The Basic Elements of Prolog, Deficiencies of Prolog, Applications of Logic Programming Limitations of Logic Programming.

Unit V**08 Hours**

System Programming: Types and functions of system Programs: Language processors and language processing activities, Assemblers, Macro processor, Linker, Loader, Interpreter, Compiler (steps in compilation).

Unit VI**08 Hours**

Additional Programming Paradigms: Data flow programming design principles, Database programming design principles, Network programming design principles, Socket programming in JAVA, Internet programming design principles, windows programming.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:

1. Roosta Seyed, “Foundations of Programming Languages Design & Implementation”, 3rd Edition, Cenage learning, ISBN-13:978-81-315-1062-9.
2. Pratt T.W., Zelkowitz “Programming Languages: Design and Implementation” PHI, 2002, 3rd Edition, ISBN-81-203-1038-1
3. Sebesta R. W., “Concepts of programming languages”, Pearson Education 2001, 4th edition, ISBN-81-317-0837-3.
4. D.M. Dhamdhare, “Systems Programming and Operating Systems”, Tata McGraw-Hill, ISBN- 13:978-0-07-463579-7
5. Max Bramer, “Logic Programming with Prolog”, 2nd Edition, Springer, ISBN-13 978-1447154860

Reference Books:

1. Sethi Ravi, “Programming Languages: Concepts and Constructs” Pearson Education, ISBN:9788177584226
2. Herbert Schildt, “C++: The Complete Reference, 4th Edition”, McGraw Hill Education; 4th edition, ISBN-13 : 0070532465-978

List of Laboratory Exercises:

1. Implement parameter passing using functional programming approach.
2. Implement recursion using functional programming approach.
3. Implement and comparing lifetime of variable using functional and object-oriented programming approach.
4. Implement and comparing reference passing using functional and object-oriented programming approach.
5. Implement encapsulation in object-oriented programming approach.
6. Case study of Prolog.
7. Implement and compare functions in functional and object-oriented programming approach.
8. Implement concept of binding in functional and object-oriented programming approach
9. Implement inheritance using object-oriented programming approach.

10. Study of a website/software to identify event driven programming elements used.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Make a project in C to maintain student record using files. The project should be able to read, write, modify, add and search records.
2. Make a project in C++ to maintain employee data using files and dynamic object. The project should be able to read, write, modify, add and search records.
3. Implementation of a simple calculator with memory functions in C++ using polymorphism. The screen should continuously display numbers, signs, and symbols similar to calculator. Use shortcut keys for operations and memory functions.
4. Implementation of a simple predicate logic system for diagnosis and applicable medicines using prolog
5. Develop a simulator for assembler. It should accept a assembly program and separate the components of the program as per the data structures of assembler.
6. Develop a macro-processor like program which should identify the macro definitions, macro calls in an assembly program. It should also replace macro calls with macro definitions.
7. Implement a phone book using C/C++.
8. Develop a simple 3-page website to show event elements. It should have at least one registration page to communicate data to and from a server.
9. Implement result calculation system for student marks using each structured programming and object-oriented programming. Make use of files. Compare the difference in both implementation and identify the pros and cons of both implementations with the features of the programming types used.
10. Implement event driven programming on at least one webpage.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit – III

Unit Test -2

Unit – IV, Unit – V, Unit – VI

Web Programming

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Practical: 4 Hours/Week	Term Work and Practical:75 Marks	Practical: 2
Total: 4 Hours/Week	75 Marks	2

Course Objectives:

To develop the skill & knowledge of Web page design.

Prerequisite:

Basic knowledge in HTML tags & skill of creating web pages should be known

Course Outcomes: On completion of the course, students will have the ability to:

1. Use HTML in website designing according to theme.
2. Design web pages with attributes
3. Design various layout of websites.
4. Implement responsive web design.
5. Implement front end framework with Bootstrap Elements.
6. Build website with Content Management System.

Unit I

06 Hours

HTML Tags: Choose a Website Topic, Overview of HTML Tags, The HTML 5 Template, The Head, Formatting Content, Compound Tags, Character Entities, Commenting and Formatting Code, Other HTML Tags.

HTML Attributes and Images:

Acquiring Images, Graphics File Formats, Editing Images, The img Tag, Absolute Links, Embedding Media, Relative Links, Validating Code

Unit II

06 Hours

CSS – Styling Tags and Page Layout: CSS Basics, Colors and Inline Styles, Internal Style Sheets and Basic Formatting, External Stylesheets, Common Properties. Classes IDs Divs Spans, The Box, Boxes in Boxes, Styling Page Divisions, Additional Resources

Designing with Sections: - Sections and Background Colors, Background Images, Adding a Navigation Bar

Unit III

06 Hours

Publishing Websites: -FTP and Web Servers

JavaScript: - Adding a jQuery Animated Scrolling Effect.

Responsive Design: - Media Queries, Multiple Media Queries, Targeting Devices, Images and Video, Columns and Tweaks, The Viewport

Unit IV

06 Hours

Front End Frameworks: Explore Bootstrap Elements, Downloading Bootstrap, downloading a Bootstrap Example, Reviewing the Example Code, Replacing Page Content, Customizing the Design.

Unit V

06 Hours

Web API: Working of APIs, Relationship between JavaScript, APIs, and other JavaScript tools.

Common browser APIs :- APIs for manipulating documents, APIs that fetch data from the server, APIs for drawing and manipulating graphics, Audio and Video APIs, Device APIs, Client-side storage APIs.

Common third-party APIs :- YouTube API, Facebook suite of APIs, Twitter API.

Unit VI

06 Hours

Content Management Systems: Setting up WordPress, Creating Posts, and Creating Pages, Working with Media, Themes and Widgets.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:

- 1) Getting Started with Web Components: Build modular and reusable components using HTML, CSS and JavaScript by Prateek Jadhvani.
- 2) Jump Start Bootstrap: Get Up to Speed With Bootstrap in a Weekend By Syed Fazle Rahman.
- 3) Fronted Web Development/Web Designing, HTML, CSS & JavaScript Basic Tutorial by Sachin Srivastav
- 4) Web Design and Development: Website Technologies Fundamentals By Steven Bright.

Reference Books

- 1) HTML and C Learn HTML, CSS, and JavaScript and Build a Website, App, and Game by Young Rewired State and Duncan Beedie.
- 2) Mastering HTML, CSS & Javascript Web Publishing by Laura Lemay, Rafe Colburn
HTML & CSS, and JavaScript & JQuery (2 book set) by Jon Duckett.

List of Laboratory Exercise:

- 1) Design home page for any website according to domain.
- 2) Implement various functionality using different tags of HTML while designing web pages.
- 3) Implement web pages formatting and content formatting using CSS.
- 4) Implement responsive approach in website designing
- 5) Explorer front end framework using Bootstrap Elements
- 6) Demonstrate website design using content management system.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Design website for department and college
2. Design website for e-commerce platform.
3. Design website for reservation system (eg. bus, train, air)
4. Design website for online food delivery system.
5. Design website for CRM (database management).
6. Design website for hospital management system.
7. Design website for advertisement of products.
8. Design website for customer support system.
9. Design website for Business Portfolio.
10. Design website for Quiz Game.
11. Design website for E-library system.
12. Design website for survey system.
13. Design website for Banking system.
14. Design website for social media.
15. Design matrimonial website.

B.Tech(Information Technology)

Semester-III

Discrete Structures and Graph Theory

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDITS SCHEME</u>	
Lecture:	4 Hours/Week	End Semester Examination: 60 Marks		Theory	4
Practical	2 Hours/Week	Internal Assessment:	40 Marks	Term Work	1
		Term Work:	25 Marks		
Total	06 Hours/Week		125 Marks		5

Course Objectives:

1. To apply and relate knowledge of mathematics in computer science.
2. To learn proof theory with propositional calculus and induction.
3. To map, represent and solve network problem with trees and graphs.

Prerequisite:

Basic mathematics and programming fundamentals.

Course Outcomes: On completion of the course, students will have the ability to

1. Formulate real world problems into statement forms using sets and relations which can be solved or proved mathematically using set theory and logic.
2. Design mathematical model from theoretical statements.
Apply counting techniques to real world problems.
4. Apply knowledge of graphs to solve network problems.
5. Design searching algorithm efficiently by applying tree and tree traversal logic.
6. Apply algebraic structure and coding theory in computer science.

Unit I

08 Hours

Propositional Logic and Proof Theory: Sets, Set operations, Finite and Infinite sets, Venn diagram, Principle of inclusion and exclusion, Multisets. Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, methods of proofs, Principal of mathematical induction.

Unit II:

08 Hours

Relations and Functions: Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence, Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains. Functions, Composition of functions, Invertible functions, Pigeonhole Principle.

Unit III

08 Hours

Counting and Recurrence Relations Basic counting principles, permutations, combinations, generalized permutations and combinations (with/without repetitions), Probability theory, Permutations with indistinguishable objects, Binomial coefficients, and identities. Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Total solutions.

Unit IV

08 Hours

Graph theory: Basic terminology, multi graphs and weighted graphs, paths and circuits, shortest path in weighted graph, Dijkstra's algorithm, Hamiltonian and Euler paths and circuits, factors of a graph, planer graph and Travelling salesman problem.

Unit V**08 Hours**

Trees: Trees, rooted trees, path length in rooted trees, prefix codes, binary search trees, tree traversal, spanning trees and cut set, minimal spanning trees, Kruskal's and Prim's algorithms for minimal Spanning tree. The Max flow- Min Cut Theorem (Transport network). Case Study- Game Tree, Mini-Max Tree.

Unit VI**08 Hours**

Algebraic Structures: The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Homomorphism and Normal Subgroups, Congruence relations, Rings, Integral Domains and Fields, coding theory, Polynomial Rings and polynomial Codes.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th Edition, McGraw Hill.
2. C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics: A Computer Oriented Approach, 4th Edition, McGraw Hill.

Reference Books

1. Seymour Lipschutz, M. Lipson, Discrete Mathematics, 3rd Edition, McGraw Hill.
2. P. Tremblay, R. Manohar, Discrete Mathematical Structures With Applications to Computer Science, McGraw Hill.

List of Laboratory Exercise

1. Write a program to implement set operations. (Set size and elements to be taken from user at runtime).
2. Write a program to calculate value of polynomial for variable x. (Highest degree and coefficients to be taken from user at runtime).
3. Write a program to find value of composite function: fogoh. (f(x), (g(x) and h(x) to be taken from user.)
4. Write a program to implement Warshall's algorithm.
5. Write a program to check whether Eulerian circuit is present in the given graph.
6. Write a program to find shortest path between the vertices in given graph.
7. Write a program to create binary search tree for the values taken from user.
8. Write a program to implement various tree traversals.
9. Write a program to implement Kruskal's algorithm.
10. Write a program to implement Prim's algorithm.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Study the writings of Lewis Carroll on symbolic logic. Describe in detail some of the models he used to represent logical arguments and the rules of inference he used in these arguments.
2. Describe a variety of different applications of the Fibonacci numbers to the biological and the physical sciences.

3. Explain how graph theory can help uncover networks of criminals or terrorists by studying relevant social and communication networks.
4. Explain what community structure is in a graph representing a network, such as a social network, a computer network, an information network, or a biological network. Define what a community in such a graph is, and explain what communities represent in graphs representing the types of networks listed.
5. Describe how Euler paths can be used to help determine DNA sequences.
6. Describe some of the strategies and algorithms used to solve the traveling salesperson problem.
7. Five men with different nationalities and with different jobs live in consecutive houses on a street. These houses are painted different colors. The men have different pets and have different favorite drinks. Determine who owns a zebra and whose favorite drink is mineral water (which is one of the favorite drinks) given these clues: The Englishman lives in the red house. The Spaniard owns a dog. The Japanese man is a painter. The Italian drinks tea. The Norwegian lives in the first house on the left. The green house is immediately to the right of the white one. The photographer breeds snails. The diplomat lives in the yellow house. Milk is drunk in the middle house. The owner of the green house drinks coffee. The Norwegian's house is next to the blue one. The violinist drinks orange juice. The fox is in a house next to that of the physician. The horse is in a house next to that of the diplomat.
8. Explain how graph multicolorings can be used in a variety of different models.
9. Define a heap and explain how trees can be turned into heaps. Why are heaps useful in sorting?
10. Describe the techniques used by chess-playing programs such as Deep Blue or stockfish.
11. Discuss the algorithms used in IP multicasting to avoid loops between routers.
12. Compare and contrast some of the most important sorting algorithms in terms of their complexity and when they are used.
13. Describe an algorithm for finding the minimum spanning tree of a graph such that the maximum degree of any vertex in the spanning tree does not exceed a fixed constant k .
14. Describe the origins of mathematical induction. Who were the first people to use it and to which problems did they apply it?
15. Explain how the ideas and concepts of program correctness can be extended to prove that operating systems are secure.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit – VI

Data Structures

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	4 Hours/Week	End Semester Examination:	60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks	Practical	1
		Term Work and Practical:	50 Marks		
Total	6 Hours/week		150 Marks		5

Course Objective:

The objective of the course is to familiarize students with fundamentals of data structures and algorithms.

Prerequisite:

Fundamental knowledge programming and problem-solving steps

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the fundamentals of data structure and algorithms
2. Execute linear sequential data structures
3. Implement linear linked organization data structures
4. Execute nonlinear data structure-trees
5. Implement nonlinear data structure-graph
6. Know hashing and file organization concepts

Unit I

08 Hours

Introduction to Algorithm and Data Structures: Introduction to data structures, types of data structure, abstract data types (ADT), introduction to algorithms, characteristics of algorithms, algorithm design tools: pseudo code and flowchart, relationship among data, data structure and algorithms, analysis of algorithms, asymptotic notation.

Unit II

08 Hours

Sequential Organization Data Structures: Stacks: primitive operations, stack as an ADT, realization of stacks using array, stack operations, multi-stack, applications of stack, expression evaluation and conversion, simulating recursion using stack
Queue: primitive operations, queues as ADT, realization of queue using array, circular queue, double ended queue, priority queue, applications of queue.

Unit III

08 Hours

Linked Organization Data Structures: Introduction, comparison of sequential and linked organizations, comparison of static and dynamic memory allocation, realization of linked lists, dynamic memory management, linked list as ADT, types of linked list, polynomial manipulations, linked stack, linked queue, generalized linked list (GLL) concept, applications of linked list.

Unit IV

08 Hours

Non-Linear Data Structure-Tree: Tree terminology, types of trees, binary tree as an ADT, realization of tree, tree traversals, binary search tree, operations on BST, threaded binary tree, AVL tree, heap tree, applications of trees.

Unit V

08 Hours

Non-Linear Data Structure-Graph: Graph terminologies, graph as an ADT, realization of graphs using adjacency matrix and adjacency list, graph traversals: breadth first search traversal, depth first search traversal, spanning tree, prim's and kruskal's algorithms, topological sorting, applications of graph

Hashing and File Organization:

Hashing: introduction, key terms, hash function, Collision Resolution strategies, hash table overflow, skip list, comparison of hashing and skip lists.

File: concept of file, file organization, sequential file organization, direct access file organization, indexed sequential file organization.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:

1. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", Prentice Hall of India, , ISBN-81-203-1177-9.
2. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, ISBN 16782928
3. S. Lipschutz, "Data Structures", McGraw Hill Pub.
4. Patil V., "Data Structures using C++", Oxford university press, ISBN 0-19-806623-6
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms"

Reference Books

1. G. A.V, PAI , "Data Structures and Algorithms ", McGraw Hill, ISBN -13: 978-0-07-066726-6
2. M. Welss, "Data Structures and Algorithm Analysis in C++", Pearson Education, ISBN-81-7808-670-0

List of Laboratory Exercise

1. Write a program to implement functions (insert, delete, display) on stack, queue and circular queue data structure.
2. Write a program to convert and solve expression from
3. (a) Infix to Prefix
(b) Infix to Postfix

Evaluate Postfix expression

3. Write a program to implement Singly Linked List manipulation for storing student information (PRN, Name, Marks).
 - a. Display data of top rank student.

How many students secure first class and above rank?

4. Write a program to implement Doubly Linked List manipulation for storing Employee information (Name, Salary, Age).
 - a. Display data of employees having salary more than 50,000.

Display list of employees having age less than 30 and salary greater than 30,000.

5. Write a program to implement Binary Search Tree storing city names and Traversal in BST (Inorder, Preorder, Postorder).
6. Write a program to implement Threaded Binary Tree and its Traversals.
7. Write a program to implement graph traversals: BFS and DFS.
8. Write a program to implement Prim's and Kruskal's algorithms MST.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Design and develop a project for Election System
2. Design and develop a project for Flight ticket booking
3. Design and develop a project for Tourism Management system
4. Design and develop a project for Simple Result system
5. Create a mini project to construct game: Tic-Tac-Toe
6. Design and develop a project for Phone Directory using doubly link list
7. Create a mini project to construct game: Snakes and Ladder
8. School fee enquiry Management System

9. Telecom Billing Management System

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Database Management System			
<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
Lecture: 3 Hours/Week	End Semester Examination: 60 Marks	Theory	3
Practical: 2 Hours/Week	Internal Assessment: 40 Marks		
	Term Work and Practical: 50 Marks	Practical:	1
Total 5 Hours/week	150 Marks		4

Course Objective

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a Database Management Systems.

Prerequisite:

Students should have knowledge of

- 1) Basic understanding of data and data structure.
- 2) Basic understanding of programming language.

Course Outcomes: On completion of the course, students will have the ability to:

1. Model an application's data requirements using conceptual modeling tools.
2. Implement concepts of relational algebra and SQL queries.
3. Demonstrate concepts of relational database design.
4. Interpret the query processing and optimization activities in database.
5. Interpret the transaction activities in database.
6. Recognize the emerging database applications and security concerns.

Unit I

06 Hours

Introduction: Introduction to Database system architecture, Data Abstraction, Data Independence.

Data models: Extended Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit II

06 Hours

Relational algebra: Fundamental and extended relational algebra operations, Tuple and domain relational calculus

Introduction to SQL: Data definition language, Data Manipulation Language, Joined relations, Views.

Introduction to PL/SQL: Functions, Procedures, Triggers, Cursors.

Unit III

06 Hours

Integrity constraints: What are constraints, types of constraints

Relational database design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms (1NF, 2NF, 3NF, BCNF, 4NF), Dependency preservation, Lossless design.

Unit IV

06 Hours

Storage strategies: Indices, B trees, B+ trees, Hashing

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms

Unit V

06 Hours

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Unit VI

06 Hours

Data Intensive Computing: Introduction to big data, unstructured data processing using Hadoop, NoSQL database using MongoDB

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

- 1 Silberschatz, Korth, “Data base System Concepts”, 7th ed., McGraw hill.
- 2 Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems” (3/e), McGraw Hill.
- 3 Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems (5/e), Pearson Education.
- 4 C. J. Date, Kannan, “An Introduction to Database Systems”, 8e, Addison-Wesley
- 5 Ivan Bayross, “SQL, PL/SQL the Programming Language of Oracle”, BPB Publication

Reference Books

- 1 Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management (7/e), Cengage Learning, 2007
- 2 Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, “Database Systems: The Complete Book” (2nd edition), Pearson Prentice Hall

List of Laboratory Exercise

1. Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc).
2. Convert ER Model to Relational Model (Represent entities and relationships in Tabular form, represent attributes as columns, identifying keys).
3. Remove the redundancies and anomalies in the above relational Tables, Normalize up to Third Normal Form.
4. Study and implementation of SQL: DDL
Creation of above Tables using SQL- Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.
5. Study and implementation of SQL: DML, Querying with set operations and wildcards
6. Study and implementation of aggregate functions, joins, nested subqueries in SQL from querying above tables.
7. Study and implementation of views in SQL.
8. Study and implementation of PL/SQL – Control statements.
9. Study and implementation of PL/SQL Functions and stored procedure.
10. Study and implementation of Triggers.
11. Study and implementation of Cursors.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Make a project to maintain employee data using files and dynamic object/structure. The project should be able to read, write, modify, add, and search records. Also demonstrate the effect of performing change in employer data definition after few records have been added.
2. Make an extended ER diagram for insurance management system. Transform this into relation design and implement these relations with appropriate domain and integrity constraints.
3. Employ various data control restrictions on databases, relations, and attributes of relations.
4. Create a phonebook which enables user to save contacts with additional information and

provides various retrieval mechanisms. Provisions should be made to view data in multiple ways.

5. Design and develop a library management system. The relations in the system should be normalized up to BCNF
6. Design and develop a inventory management system and create multiple views on the relations so that users not authorized to edit the relations should be able to views the data.
7. Implement of audit trails and backup on relations.
8. Create a student result calculation system. However, when updating results after calculation should be only of students who paid complete fees, such that transaction of each row is executed separately. Hint- use explicit cursor
9. Develop a student data management system using hash files.
10. Installation of a NoSQL database and implementing a simple student database to compare with SQL database.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit - VI

Software Engineering

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 4 Hours/Week	End Semester Examination: 60 Marks	Theory: 4
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Term Work: 1
	Term Work : 25 Marks	
Total 6 Hours/Week	125 Marks	5

Course Objective:

This course presents modern software engineering techniques and examines the software life-cycle, including software specification, design, implementation, testing. The course is organized as a project where the students work in a team to address a real-world software engineering assignment. The project is supplemented by exercises and lectures that provide insight into the assignment students are working on and software engineering in general.

Prerequisite: Programming knowledge

Course Outcomes: On completion of the course, students will have the ability to:

1. Compare various software development methods.
2. Identify requirements for project.
3. Apply software analysis principles.
4. State steps involved in software designing.
5. Show working of software engineering tools.
6. Execute a thorough software test.
7. Function effectively as a member of a team engaged in software engineering activities.

Unit I

08 Hours

Introduction to Software Development: Software Development Challenges, Software Scope, Software Engineering Discipline, Software Methodologies and Related Process Models, The Human Side of Software Development, Traditional Life Cycle Models o Waterfall, Incremental Evolutionary, Spiral, CBSE, Alternative Process models: Unified Process, Rapid Application Development, Introduction to Agile Software Engineering Process Models: Extreme Programming o Agile Software Development, DevOps, Site Reliability Engineering. Quality and Process Standards: ISO 9000, SWEBOK, ISO 15504, SEI's Capability Maturity Model (CMM).

Unit II

08 Hours

Requirement engineering: Requirements Development Methodology, Specifying Requirements, Eliciting Accurate Requirements, Documenting Business Requirements, Defining User Requirements, Validating Requirements, Achieving Requirements Traceability, Managing Changing Requirements, Reviews, Walkthroughs, and Inspections, Requirements Modelling, Agile Requirements Engineering.

Business Model Engineering: Business Model Capture Tools, Process Modelling, Capturing the Organization and Location Aspects, Developing a Process Model.

Unit IV

08 Hours

System Design: Problem partitioning, abstraction, top-down and bottom-up design, Structured approach. Design Concepts, The Design model architecture, cohesion and coupling, Data Design, Architectural Styles and Patterns, Architectural Design, Mapping Data flow into Software Architecture. Functional versus object-oriented approach.

Coding: Programming languages and development tools Selecting languages and Tools, Good programming practices Coding Standards.

08 Hours

Unit V

Software configuration management (SCM): Elements of SCM, Base lines, Software configuration items, SCM Repository, SCM process:

Software Engineering Tools: Requirements Management Tools (e.g., IBM Rational Doors), Design Tools (e.g., Sparx Enterprise Architect), Development Tools o IDEs (e.g., Xcode, Eclipse, IntelliJ IDEA, NetBeans, Microsoft Visual Studio, Atom), Source Control Management (e.g., GitHub), Release Orchestration (e.g., Open Make), Collaboration (e.g., Jira, Trello, Slack).

08 Hours

Unit VI

Testing Strategies: Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Test case design, A strategic approach to software Testing: Verification and Validation Testing, organizing for software Testing, Software Testing Strategy for conventional Architecture: Unit Testing Integration Testing, Validation Testing, System Testing, Debugging, White-box, Black-box testing, Basis path Testing, Control structure testing.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

1. Roger Pressman, Software Engineering: A Practitioner's Approach, 6th edition, McGraw Hill, 2005. ISBN 0-07-285318-2
2. Somerville, Ian (2001) Addison-Wesley Software Engineering 7th Edition). Massachusetts: Addison Wesley, ISBN 0-321-21026-3
3. Fundamentals of Software Engineering by Rajib Mall

Reference Books

1. Kniberg, H. (2015) Scrum and XP from the Trenches - 2nd Edition,
2. Pro Git: <http://git-scm.com/>

List of Laboratory Exercise

1. Preparing Software Requirements Specifications
2. Performing domain analysis
3. Perform E-R Modeling
4. Perform Data-Flow-Modeling
5. Draw State Diagram
6. Designing Test Suites
7. Calculate cyclomatic Complexity for code snippet

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Android task monitoring
2. Sentiment analysis for product rating
3. Fingerprint-based ATM system
4. Advanced employee management system
5. Image encryption using AES algorithm

6. Fingerprint voting system
7. Weather forecasting system
8. Android local train ticketing system
9. Railway tracking and arrival time prediction system
10. Android Patient Tracker
11. Opinion mining for social networking platforms
12. Automated payroll system with GPS tracking and image capture
13. Data leakage detection system
14. Credit card fraud detection
15. AI shopping system

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

Computer Communication and Networks

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 3 Hours/Week	End Semester Examination: 60 Marks	Theory 3
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Practical: 1
	Term Work and Practical: 25 Marks	
Total	5 Hours/week	125 Marks
		4

Course Objectives:

1. Build an understanding of the fundamental concepts of computer networking.
2. This course will enable students to understand the layering architecture of OSI reference model and TCP/IP protocol suite, protocols associated with each layer.
3. Learn the different networking architectures and their representations and able to learn the various routing techniques and the transport layer services.

Prerequisite:

Students should have knowledge of

1. How computer networks operate and the fundamentals of data communication.
2. Concepts and fundamental design principles of modern computer networking in a top-down approach, focusing on the Internet's architecture and protocols.

Course Outcomes: On completion of the course, students will have the ability to:

1. Find the components required to build different types of networks.
2. Recognize the different types of network Transmission Media and Technologies.
3. Explain the layered architecture of computer networks and distinguish between the OSI reference model and TCP/IP protocol suite.
4. Match the division of network functionalities with the layers.
5. Distinguish the basic network Layer services and Protocols associated with each network.
6. Identify the protocols and functions associated with the transport layer services.

Unit I

06 Hours

Introduction to data communication and networking: Data Communications: Components, Representations, Data Flow. Digital Transmission: Analog-to-Digital Conversion, Digital-to-Digital Conversion. Analog Transmission: Digital-to-analog Conversion, Analog-to- Analog Conversion.

Networks: Physical Structures, Introduction to Networks – Building Network and Network Types: LAN, WAN, MAN and PAN, Overview of Topology, Concepts of Communication Modes and Transmission Modes. Categories of Networks Internet works.

Unit II

06 Hours

Data Transmission Media and Technologies: Transmission Media: Types of transmission media, principal, Specification of Medium, Performance, and Transmission Impairments. Applications of different transmission media.

Introduction to switching: Switching, Circuit-switched Networks, Packet Switching, Datagram Switching and Datagram networks, Virtual circuit networks, Structure of circuit and packet switch.

Unit III

06 Hours

Network Models: Protocol Layering: Scenarios, Principles, Logical Connections. Reference Models, Functions of the layers of The OSI Model, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite and its functioning, Description of layers, services, sockets and ports Encapsulation and D-encapsulation, Addressing, Multiplexing and De-multiplexing, Types of Multiplexing and Multiplexing applications. The OSI Model: OSI Versus TCP/IP.

Unit IV

06 Hours

Networking Devices: Networking Devices: Hubs, Switch, Router, Repeaters, Bridges, Gateway, Modem and Access Point, Backbone networks.

Data-Link Layer:

Introduction: Nodes and Links, Services, Categories of link, Sub layers, Link Layer addressing: Types of addresses, ARP, RARP. Data Link Control (DLC) services: Framing, Flow and Error Control, Data Link Layer Protocols: Simple Protocol, Stop and Wait protocol, Piggybacking.

Unit V

06 Hours

Network Layer: Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services. IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution, Forwarding of IP Packets: Based on destination Address and Label. Overview of IPv6 Addressing – Transition from IPv4 to IPv6 Comparison of IPv4 and IPv6.

Network layer Protocols:

Internet Protocol (IP): Datagram Format, Fragmentation, Options, Security of IPv4 Datagrams, ICMPv4: Messages, Debugging Tools.

Routing: Introduction to Types of Routing, Routing Algorithms: Distance Vector Routing, Link State Routing, Path vector routing, Unicast Routing Protocol: Internet Structure, Routing Information Protocol, Open Shortest Path First, Border Gateway Protocol Version 4.

Unit VI

06 Hours

Transport Layer: Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols, Transport Layer Protocols: Simple protocol, Stop and wait protocol, Go- Back-N Protocol, Selective repeat protocol, User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Transmission Policy, Segment header, Connection, State Transition diagram, Windows in TCP, Flow control, Error control, TCP congestion control, Timer Management. Application Layer Paradigms – Client Server Programming – World Wide Web and HTTP, DNS, Electronic Mail (SMTP, POP3, IMAP, MIME).

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks:

1. Data Communications and Networking, Forouzan, 5th Edition, McGraw Hill, 2016 ISBN: 1-25-906475-3.
2. James F. Kurose, Keith W. Ross, —Computer Networking - A Top-Down Approach Featuring the Internet, Seventh Edition, Pearson Education, 2016.

Reference Books:

1. Computer Networks, James J Kurose, Keith W Ross, Pearson Education, 2013,
2. Introductions to Data Communication and Networking, Wayarles Tomasi, Pearson Education,
3. Nader. F. Mir, — Computer and Communication Networks, Pearson Prentice Hall Publishers,
4. 2nd Edition, 2014.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, —Computer Networks: An Open Source
6. Approachll, Mc Graw Hill Publisher, 2011.
7. Larry L. Peterson, Bruce S. Davie, —Computer Networks: A Systems Approachll, Fifth Edition, Morgan Kaufmann Publishers, 2011.

List of Laboratory Exercise

1. Study and execution of Network commands.
2. Socket programming Client Server using RPC.
3. Demonstration of different types of cables used in data communication.
4. Perform various line coding formats and compare transmission characteristic of each formats.
5. Perform digital carrier modulation techniques used in wireless communication.
6. Study and demonstration of CISCO packet tracer with data transmission.
7. Study and demonstration of CISCO packet tracer with data loss.
8. Perform serial data communication between two data terminal equipment using optical link.
9. Perform Installation of LAN and troubleshooting of frequently occurred problems.
10. Create and test wireless sensor networks using zigbee.
11. To study various aspects of data communication by field visit at data centre.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Network Desktop Manager. Example Modules: Desktop Sharing, Desktop locking and unlocking, IP Port Scanning.
2. Analysis of IPv4/IPv6 protocols over 3G mobile networks
3. Network Traffic Monitoring & windows Remote Manager. Example Modules: Remote Desktop, Remote Chat, Monitoring
4. Learner's Interaction with Information and Communication Technologies.
5. Use of Information-Centric Networks in Revision Control Systems
6. TCP Performance in an EGPRS system
7. Real-Time Networking based Computer Ideas
8. An Internet Voting System Supporting User Privacy
9. Use of Information-Centric Networks in Revision Control Systems.
10. Networking and Security Projects
11. IP based Patient Monitoring System
12. Network Admission Control (NAC) Securing End Point Devices

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit – VI

Information Technology Laboratory - I

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Practical: 4 Hours/Week	Term Work and Practical: 50 Marks	Practical: 2
Tutorials: 1 Hour/Week	Term Work and Oral: 25 Marks	
Total	5 Hours/week	75 Marks
		2

Course Objective

1. Compute time and space complexity for a given program.
2. Demonstrate concepts OOPS using java
3. Solve specified requirement
4. Infer various approaches to decide the efficiency of the given approach.
5. Formulate a given problem by providing the proof of behavior of the given model.
6. Design an application using a platform-independent approach.

Prerequisite:

Basic understanding of Object-Oriented Programming language and logic to solve given problem.

Course Outcomes: On completion of the course, students will have the ability to:

1. Design a solution to a given problem applying logic and features of the java language.
2. Develop their logical skill through various assignments and practicals.
3. Divide complex problem into subpart and then handle every part to achieve the Goal.
4. Model a solution to any real-world problem.
5. Analyze the significance of platform independence.
6. Design application using object-oriented norms.

Unit I

06 Hours

Introduction to Java: Java Fundamentals, Features of Java OOPs concepts Java virtual machine Reflection byte codes Byte code interpretation Data types, variable, arrays, expressions, operators, and control structures - if, switch, and loops like for, do-while, while. Introduction to Objects and classes.

Unit II

06 Hours

Classes and objects: Java Classes, Abstract classes Static classes Inner classes Packages, Wrapper classes. Interfaces This Super Access control, embedded style information Inheritance, Encapsulation, Polymorphism, Data Binding, data abstraction.

Unit III:

06 Hours

String and Arrays: One dimensional Array, Multidimensional array, Array of an object, Introduction to vector. String, StringBuilder, String Buffer, String methods, manipulations.

Unit IV

06 Hours

Exception Handling: Checked exceptions, unchecked exceptions, and Errors, try-catch block, throws, User-defined exception – Throw, Common exception classes.

Unit V

06 Hours

Threading and multithreading: Lifecycle of Thread, Basic functions of thread, multithreading, synchronization.

Unit VI

06 Hours

Collections and Generics: Introduction to collection framework, List, Set, Maps, utility class, Reflection API, Generics.

Textbooks

- 1 OCA Java SE 8 Programmer I Study Guide (Exam 1Z0-808) (Oracle Press) 3rd Edition. by Edward Finegan, Robert Liguori.
- 2 OCA Java SE 8 Programmer, Exam Guide (Exams 1Z0-808) 1st Edition, Kathy Sierra, Bert Bates.
- 3 Programmer's Guide to Java SE 8 Oracle Certified Associate (OCA), Khalid A. Mughal and Rolf W Rasmussen.

Reference Books

- 1 Headfirst Java, 2nd Edition by Kathy Sierra, Bert Bates.
- 2 Java: The Complete Reference, Eleventh Edition 11th Edition, Herbert Schildt.
- 3 OCAJP Associate Java 8 Programmer Certification Fundamentals: 1Z0-808, Hanmant Deshmukh.

List of Laboratory Exercise

1. Maintain record of students and perform CRUD functionality.
2. Write a program to redirect a request using a dynamic approach.
3. Write a program to pass the data using session.
4. Write a servlet to remove spam.
5. Maintain the record of faculty member using jsp action tags and directives.
6. Design a tag to perform the necessary editing in a given report.
7. Design reusable components of the form using taglib.
8. Implement sending and receiving mail utility using Java Mail API.
9. Implement Java Message Service queue.
10. Understand working of framework – struts- case study.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Implement assignment and project submission system.
2. Implement a program to issue Leaving Certificate, Transcripts and Bonafede certificate to student.
3. Implement a program to assign problem statement for practical examination in secured environment.
4. Design a template for NBA report.
5. Design an application for Feedback Management System.
6. Design application to maintain track of research paper with indexing per year.
7. Design a post customized as per social media platform.
8. Design an interface to collect job opportunities and disseminate to eligible student
9. Design a project to track details of Industrial Training.
10. Design notice board application to communicate with students.

B.Tech(Information Technology)

Semester-IV

IT Infrastructure Management

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 4 Hours/Week	End Semester Examination: 60 Marks	Theory 4
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Practical 1
	Term Work	
Total- 6 Hours/Week	125 Marks	5

Course Objectives:

Students undergoing this course are expected.

1. To introduce basic postulates of IT Infrastructure Management and shows the correlation
2. between system and service management process
3. Able to Know the Storage and database Management in Information Technology.
4. Infer various approach to decide efficiency of given approach.
5. Able to know the Security Management in IT.
6. To provide detailed knowledge of IT recent trends in globally.

Prerequisite:

Object Oriented Programming language and Logic to solve given problem.

Course Outcomes: On completion of the course, students will have the ability to:

1. Outline IT Infrastructure, management challenges and requirement.
2. Select Service Delivery and Service Support Processes required in IT infrastructure management.
3. Breakdown complex problem into subpart and then handle every part to achieve the goal.
4. Categorize various storage levels in IT.
5. Select security techniques in information technology.
6. Explain new communication mechanism based on emerging trends in information technology.

Unit I 08 Hours

Introduction & It Infrastructure: Information Technology, IT Infrastructure Management, Introduction—IT Infrastructure Management, Challenges in IT Infrastructure Management, Design Issues of IT Organizations and IT Infrastructure, Determining Customers' Requirements, IT Systems Management Process, IT Service Management Process, Information System Design Process

Unit II 08 Hours

Service Delivery Process & Service Support Process: Service Level Management, Financial Management, IT Service Continuity Management, Capacity Management, Availability Management, Configuration Management, Incident Management, Problem Management, Change Management.

Unit III 08 Hours

Storage Management: Introduction to Storage, Backup and Storage, Archive, Retrieve, Disaster Recovery, Space Management, Database and application Protection, Bare, Machine Recovery (BMR), Data Retention

Unit IV 08 Hours

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access Control System, Intrusion Detection, Intellectual Property.

Unit V

08 Hours

IT Ethics: Introduction to Cyber Ethics, Intellectual Property, Privacy and Law, Computer Forensics, Ethics and Internet, Cyber Crimes.

Unit VI

08 Hours

Emerging Trends in It: Introduction, Electronic Data Interchange, Infrared Technology, Bluetooth, GSM, WiFi, Standards of Wifi, WiMax, 5G Wireless Technology.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

1. Gupta, "IT Infrastructure & Its Management", First Edition, Tata McGraw-Hill Education
2. IT Infrastructure and Management by Manoj Kumar Choubey - Published by Pearson Education

Reference Books

1. Firewalls for dummies, Brain Komar, Ronald Beekelaar, Joern Wettern, for Firewall Security, 70-662 MCTS exchange 2010 microsoft press.

List of Laboratory Exercise

1. Enlist and Illustrate Design Issues of IT Organisations and IT Infrastructure.
2. Demonstrate IT Service Continuity Management and Change Management.
3. Design and Implement various Storage Management and Recovery techniques.
4. Summarize different Security Management policies with assistance of Intellectual Property.
5. Setup and maintenance of Storage – Archive, Retrieve, Backup policies.
6. Configuration and Customization of Access Control List and Active Directory.
7. Discriminate various privacy and Cyber Laws with suitable example.
8. Demonstrate different internet security policies with suitable example.
9. Discover different Problem Management within Service Delivery Process.
10. Case Study- Disaster Recovery within Storage Management.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Develop Infrastructure Management System project for Server Management and Maintenance.
2. Develop Infrastructure Management System project for Software Management and Document Management
3. Secure File Storage on Local Machine Using Hybrid Physical Security Techniques.
4. Design security management for New Data center setup
5. Infrastructure Management System project for Monitoring of Bandwidth.
6. Tracking System for Defects. (For Example: Bug tracking and error system based on the web)
7. Implement Secure Backup Software System.
8. Design system for Detecting Data Leaks within storage management.
9. Implement enterprise management of electronic data interchange systems. (For example: Process mining, Good Security Practice)
10. Develop system for Bluetooth Controlled Electronic Home Appliances.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit – VI

Formal Languages and Computation Theory

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	4 Hours/Week	End Semester Examination:	60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks	Practical	1
		Term Work:	25 Marks		
Total	6 Hours/Week		125 Marks		5

Course Objective:

Students will learn about a variety of issues in the mathematical development of computer science theory, particularly finite representations for languages and machines. Students will gain more formal understanding of algorithms and procedures.

Prerequisite:

Students should have knowledge of set theory and state transition diagrams.

Course Outcomes: On completion of the course, students will have the ability to

- 1.Design automata machines for strings given.
- 2.Write a regular expression for the given string and find set of strings if regular expression is given.
- 3.Write grammar rules for the strings given.
- 4.Design push down automata for the string and grammar.
- 5.Design Turing machine and apply the same to solve algorithmic problems.
- 6.Apply knowledge computation in complexity theory.

Unit I :

08 Hours

Finite Automata: Introduction to Finite Automata, Structural Representations, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence and Minimization of Automata, Conversion of NFA with epsilon to DFA Equivalence of Moore and Mealy Machine. Applications and Limitation of FA.

Unit II

08 Hours

Regular expressions: Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to DFA, DFA to Regular expression, Non-Regular Languages, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Applications of regular expressions.

Unit III

08 Hours

Grammar: Definition, Production rules, Derivation trees, Ambiguous Grammar, Removal of ambiguity, Regular Grammar, Inter-conversion between RE and Grammar, Reduced form of grammar. Linear grammar: left & right linear grammar, Inter- conversion. Chomsky hierarchy of languages, Context Free Grammar- Definition, Context free language (CFL. Normal Forms- Chomsky Normal Form (CNF), Griebach Normal Form (GNF).

Unit IV

08 Hours

Push Down Automata (PDA): Limitations of FA, PDA: Definition, Uses, Equivalence between FA and PDA, Designing of PDA, Deterministic Push Down Automata and Non-Deterministic Push Down Automata- Definition, Language accepted by PDA, Designing a PDA for CFG, Properties of CFL, Pumping Lemma for CFL. Limitations of PDA, Applications of PDA.

Unit V

08 Hours

Turing Machine (TM): Definition, Model, Comparison of TM, FSM, PDA, Design of TM, Examples of TM- Combinational TM, Iterative TM, Recursive TM, Universal TM, TM as a language acceptor, Some Problems that cannot be solved by Turing Machines, Language accepted by TM, Recursive sets, partially recursive functions. Church's Turing hypothesis, Multitask TM, TM limitations.

Unit VI

08 Hours

Computational Complexity: Decidable problems concerning regular languages, Decidable problems concerning context-free languages, Un-decidability, Halting Problem of TM, Reducibility: Un-decidable Problems from Language Theory, A Simple Un-decidable Problem PCP, Mapping Reducibility Time Complexity: Measuring Complexity, The Class P, Examples of problems in P, The Class NP, NP- completeness.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

1. "Introduction to Automata Theory, Languages and Computation", Hopcroft J, Motwani R, Ullman, Addison-Wesley, ISBN 81-7808-347-7, Third Edition .
2. "Introduction to Theory of Computation", Michael Sipser, Course Technology, ISBN-10: 053494728X, Forth Edition. ISE.

Reference Books

1. "Introduction to Languages and Theory of Computation", John Martin. Fifth Edition, McGrawHill.
2. "Computational Complexity", Christos H. Papadimitriou, Pearson Education.

List of Laboratory Exercise

1. Solve problems on designing finite automata.
2. Design and inter-convert Moore and Mealy Machine for same problems.
3. Form grammar rules for language of set of regular expression or strings given.
4. Design Push Down Automata for grammar or given string.
5. Construct Turing Machine to solve given problem.
6. Study Assignment on Complexity Theory.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Describe the process of designing the computer. How is it related with the simple automata?
2. Write project based on famous computer scientist Alan Turing. Select suitable material for reference and summarize.
3. Describe the set of problems which can be represented using machines. What are the criteria we can enlist for such representations?

4. Relate the computational theory to World War II. What is the role of cryptography in World War II?
5. Invention of computer as a machine is related to formal automata. How today's complex and high-end computer systems can be mapped to these simple automata. Describe in detail.
6. Select a real-world problem and represent it mathematically. Design an automaton to solve this problem. Write detailed explanation of the entire process.
7. Study any text editor. Enlist its features. Map these features with the concepts you learned in the subject.
8. Enlist set of problems which can be solved, and which cannot be solved by memoryless automata. How memory affects the power of automata? Explain in detail and justify your answer with example.
9. Why Ethereum blockchain must be deterministic? Study and explain application of computation theory to blockchain technology.
10. Can human brain be simulated by Turing machine? Write detailed essay and justify your conclusions with theorem you learned.
11. Study research paper published by Alan Turing and write a summary in your words.
12. What are the similarities and differences between human brain and machine? Support your answers with suitable mathematical model.
13. Study any chess game software. Write the process of developing such software. Describe how this is related to Turing machine.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

Microprocessors and Microcontrollers

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 3 Hours/Week	End Semester Examination: 60 Marks	Theory 3
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Practical 1
Total 5 Hours/Week	Term Work and Practical: 50 Marks	
	150 Marks	4

Course Objective

This course facilitates the learners with the basic knowledge of microprocessors and microcontrollers. Also, the course supports the learners with detailed study of ARM processor and AVR Microcontroller.

Prerequisite:

Digital Electronics, C/C++/Java Programming

Course Outcomes: On completion of the course, students will have the ability to:

1. Learn basics of 16/32-bit Microprocessors.
2. Cognize the ARM Cortex Processor with its architecture and programming.
3. Discover Intel Pentium and i7 processor with its architecture and pipelining.
4. Comprehend basics of 8/16-bit Microcontrollers.
5. Uncover the details of AVR Microcontroller with its architecture and programming.
6. Understand the basics of Arduino and Raspberry Pi Controllers.

Unit I:

06 Hours

Introduction to Microprocessors: Basics of 16-bit and 32-bit processor (Intel 8086 and 80386 processors), Multicore Architecture, Hyperthreading Technology, Instruction Set Architectures (ISA), Multiprocessor Organizations, Inter-Processor Communication (IPC).

Unit II:

06 Hours

Intel Pentium Processor: Features and Internal Architecture, Superscalar Operation, Integer & Floating-Point Pipeline Stages, Branch Prediction Logic, Cache Organization and MESI Protocol, Comparative study of 8086, 80386, Pentium I, Pentium II and Pentium III, Hyper Threading technology and its use in Pentium 4, Intel i7 processor: Features, Architecture, Memory System, Pipelining.

Unit III

06 Hours

ARM Cortex: ARM Micro-architecture (ARMv7/v8/v9/v11), ARM architectures: Generic Interrupt Controller (GIC), Server Base System Architectures, Trusted Base System Architecture (TBSA), System Memory Management Unit (SMMU), Pipelining, ARM OS, ARM Programming.

Unit IV:

06 Hours

Introduction to Microcontrollers: Microprocessors vs Microcontrollers, Basics of 8-bit and 16-bit Microcontrollers (Intel 8051 and 8096 microcontrollers), Applications of microcontrollers.

Unit V

06 Hours

AVR Microcontroller: Types of AVR Microcontrollers, ATmega16/32 8-bit AVR microcontroller: Features, Pin Description, Internal Architecture, Data and Program Memory, AVR Programming using C/Java/Assembly language, Study of VR Studio/Amtel, Studio 7, Visual Micro Lab.

Unit VI

06 Hours

Introduction to Arduino and Raspberry Pi : Introduction, Difference, Arduino Uno and Raspberry Pi Pico (RP2040), microcontrollers, Programming concepts of Arduino Uno with C/C++/Python and IDE, Programming concepts of Raspberry Pi Pico with C/MicroPython.

Textbooks

- 1 Arm Microprocessor Systems Cortex-M Architecture Programming and Interfacing, Muhammad Tahir, T&F India.
- 2 The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors, Joseph Yiu.
- 3 ARM A32 Assembly Language, Bruce Smith.
- 3 8051 Microcontrollers, Satish Shah, Oxford University Press.
- 4 Microprocessors and Interfacing, N.Senthil Kumar, M.Saravanan, Oxford University Press
- 5 Programming and Interfacing Atmel AVR Microcontrollers, Grace, Cengage Learning.
- 6 Practical AVR Microcontrollers, Alan Trevennor, Technology In Action.
- 7 Getting Started with Arduino, Massimo Banzi and Michael Shiloh.
- 8 Getting Started with Raspberry Pi, Matt Richardson and Shawn Wallace.

Reference Books

- 1 The Definitive Guide to ARM Cortex-M3 Processors, Stellaris, Texas Instruments.
- 2 ARM System-on-Chip Architecture, Steve Furber.
- 3 ARM processor, Santul Bisht, Lambert Publications
- 4 Modern Assembly Language Programming with the ARM Processor, Larry D Pyeatt.
- 5 Programming and Customizing AVR Microcontroller, Dhananjay Gadre.
- 6 Arduino Cookbook 2nd Edition, Michael Margolis.
- 7 Raspberry Pi The Ultimate Guide, Geoff Adams.
- 8 Internet of Things with Raspberry Pi and Arduino, Anita Gehlot.

List of Laboratory Exercise

- 1) Programming Assignments based on ARM Processor (Minimum 3) using Assembly Language.
- 2) Programming Assignments on 8051 using C (Minimum 2).
- 3) Programming Assignments based on AVR Controller (Minimum 3) on AVR Assembly language or Embedded C.
- 4) Study of and Using VR Studio/Atmel Studio 6/ Visual Micro Lab.
Simple programming assignments on Arduino and Raspberry Pi Controllers (1 each) :
Arduino Uno programs on Arduino Desktop IDE or Web IDE using,
a) Assembly/C/Python/Atmel Studio7
b) Raspberry Pi, Pico programs on C/C++/MicroPython.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Design and Implementation of Drunken People Identification with Auto Ignition Disable Function using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller
2. Design and Implementation of Automatic Turn off for Water Pump with Four Different Time Slots using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller
3. Design and Implementation of Gas Leak Detector with Automatic Air Exhaust Using ARM Cortex
4. Design and Implementation of ARM Based Liquid Level Detection & Flow Control
5. Design and Implementation of Motion Based Door Opener (in malls, big shops) using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller

6. Design and Implementation of Fire Detection and Alarm using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller
7. Design and Implementation of Remote-Control Plant Watering System using ARM (Processor/Controller)/AVR Controller/8051 Microcontroller
8. Design and Implementation of Voice Controlled Air Purifier based on Arduino and Raspberry Pi
9. Design and Implementation of Face Recognition Door Lock System based on Arduino and Raspberry Pi
10. Design and Implementation of Vehicle Number Plate Recognition based on Arduino and Raspberry Pi

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit – VI

Applied Algorithms

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	4 Hours/Week	End Semester Examination:	60 Marks	Theory	4
Practical:	2 Hours/Week	Internal Assessment:	40 Marks		
		Term Work:	25 Marks	Practical	1
Total	6 Hours/Week		125 Marks		5

Course Objective:

Understand and compare important algorithmic design paradigms and analysis of algorithms. To choose and extend efficient algorithms required for designs.

Prerequisite:

Students should be well versed with algorithms and operations on basic data structures stacks, queues, linked lists, trees, graphs. Students should have knowledge of searching sorting algorithms.

Course Outcomes: On completion of the course, students will have the ability to:

1. Interpret the performance of algorithms using analysis techniques.
2. Examine the fundamental algorithmic strategies.
3. Compare the fundamental algorithmic strategies.
4. Implement graphs and trees algorithms.
5. Interpret the tractable or intractable problem.
6. Summarize the advance types of algorithms.

Unit I

08 Hours

Introduction to Algorithm analysis: Characteristics of Algorithm. Analysis of Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior, Performance Measurements of Algorithm, Time and Space Trade-Offs. Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

Unit II

08 Hours

Algorithmic Strategies 1: Brute-Force technique, Heuristics, Greedy algorithms, Divide and Conquer, Illustrations of these techniques for Problem-Solving.

Unit III

08 Hours

Algorithmic Strategies 2: Dynamic Programming, Branch and Bound algorithms, Backtracking, methodologies; Illustrations of these techniques for Problem-Solving.

Unit IV

08 Hours

Graph and Tree Algorithms: Self-Balancing trees, B Trees, B+ Trees, Single source shortest path algorithms, all pair shortest path algorithms, Network Flow Algorithm

Unit V

08 Hours

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Unit VI

08 Hours

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE, Introduction to Quantum Algorithms and parallel algorithms.

List of Internal Assignment will be framed by respective Course Coordinator.

Textbooks

1. "Fundamental of Computer Algorithms", E. Horowitz and S. Sahni, Orient Black.
2. "Introduction to Algorithms", T. H. Cormen, C. E. Leiserson and R. L. Rivest, PHI Learning Pvt. Ltd. (Originally MIT Press).
3. "The Design and Analysis of Computer Algorithms", A. Aho, J. Hopcroft and J. Ullman, Pearson Education India.
4. Computer Algorithms: Introduction to Design and Analysis, S. Baase, Pearson Education India.
5. "The Art of Computer Programming", D. E. Knuth, Addison Wesley.

Reference Books

1. M. Welss, "Data Structures and Algorithm Analysis in C++", Pearson Education, ISBN- 81-7808-670-0.
2. G. A.V, PAI , "Data Structures and Algorithms ", McGraw Hill, ISBN -13: 978-0-07-066726-6.

List of Laboratory Exercise

1. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
2. Write a Code to find the shortest path using Bellman-Ford algorithm.
3. Write and analyze code to sort an array of integers using merge sort.
4. Write and analyze to sort an array of integers using divide and conquer quick sort Method.
5. Write a program to implement Longest Common Subsequence problem using Dynamic Programming.
6. Write a program to Implement 0/1 Knapsack problem using Dynamic Programming.
7. Write a program to Implement N Queen's problem using Back Tracking.
8. Write a program to implement quick sort using randomize algorithm.
9. Write a program to implement network flow algorithm.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Design and develop a project for Search engine using data structures
2. Design and develop a project for Google form like application
3. Design and develop a project for shortest path calculation for travelling salesman problem
4. Design and develop a project for finding keywords from the paragraph
5. Design and develop a project for Customer Billing system
6. Design and develop a project for word dictionary using search tree concept
7. Design and develop a project for salary calculation of employees based on performance
8. Design and develop a project for password recovery system
9. Create a mini project to construct game: Create Sudoku

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Operating System

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 3 Hours/Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Practical: 1
Total 5 Hours/Week	Term Work and Practical: 50 Marks	
	150 Marks	4

Course Objective:

The learning objective of this course is to introduce the internal operation of modern operating systems. The course will cover processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems.

Prerequisite:

Programming skills, elementary data structures, algorithms, and computer architecture.

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the services provided by the system calls.
2. Implement the scheduling algorithms like FCFS, SJF and priority scheduling.
3. Implement the memory allocation techniques like first fit, best fit and worst fit.
4. Explain practical implementation of the inter-process communication of the processes.
5. Implement the file system.
6. Explain the concept of the deadlock occurrence, avoidance and implementation of deadlock free condition.

Unit I

06 Hours

Computer System Overview: Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview- objectives and functions, Evolution of Operating System. - Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

Unit II

06 Hours

Process Management: Process Concept, Process states, Process control, Threads, Uni-processor Scheduling: Types of scheduling: Preemptive, Non preemptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.

Unit III

06 Hours

Memory Management: Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging Virtual Memory: Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.

Unit IV

06 Hours

Inter Process Communication: Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded- Buffer - Shared-Memory Solution, Inter-process Communication (IPC), Basic Concepts of Inter-process Communication and Synchronization.

Unit V

06 Hours

File Systems and I/O Systems : Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

Unit VI

06 Hours

Concurrency control: Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, kill.

Textbooks

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts. Sixth edition. Addison-Wesley (2003).
2. Modern Operating Systems -By Andrew S. Tanenbaum (PHI).
3. Operating Systems 5th Edition, William Stallings, Pearson Education India.
4. Peterson and Silberschatz, Modern Operating Systems.
5. Harvey M. Deitel, An introduction to operating systems. Addison-Wesley.

List of Internal Assignment will be framed by respective Course Coordinator.

Reference Books

1. A.M. Lister, Fundamentals of Operating Systems. Macmillan (1979).
2. Andrew Tanenbaum & Albert Woodhull, Operating Systems: Design and Implementation. Prentice-Hall.

List of Laboratory Exercise

1. Basic Linux Commands and Overview.
2. Write Shell Script for finding the global complete path for any file.
3. Write Shell Script to broadcast a message to a specified user or a group of users logged on any terminal.
4. Write Shell Script to copy the file system from two directories to a new directory in such a way that only the latest file is copied in case there are common files in both the directories.
5. Write Shell Script to compare identically named files in two different directories and if they are same, copy one of them in a third directory.
6. Write Shell Script to delete zero sized files from a given directory (and all its sub-directories).
7. Implementation of FCFS (First Come First Serve) CPU Scheduling.
8. Implementation of SJF (Shortest Job First) CPU Scheduling.
9. Implementation of FIFO Replacement Algorithm.
10. Implementation of Optimal Page Replacement Algorithm.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Design of Intranet mail system project.
2. Design of First-fit, worst-fit and best-fit for given allocation memory requirements

3. Simulation of the behavior of the multiprogramming operating system and use CPU scheduler, and CPU Execution.
4. Design the FCFS, SSTF, and SCAN disk-scheduling algorithms to simulate a simple disk drive, which has a specified number of logical blocks numbered from 0 onwards.
5. A Java simulator program to analyze the dependency of Page Faults on the Page Frames for incoming page requests.
6. CPU Scheduling Algorithm to calculate Throughput, Utilization, Turn Around time, Waiting Time. Gantt chart displayed for all n processes.
7. To simulate Round Robin algorithm.
8. A multi-threaded TCP server application, which allows multiple users to be registered and login.
9. Write a simple manual describing how to use the shell. The manual should contain enough detail for a beginner to UNIX to use it.
10. To simulate the dispatcher for allocating the process to CPU.

Syllabus for Unit Tests:

- Unit Test -1** Unit – I, Unit – II, Unit - III
Unit Test -2 Unit – IV, Unit – V, Unit – VI

Information Technology Laboratory II

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Practical:	4 Hours/Week	Term Work and Practical:	50 Marks	Theory	Credits
Tutorial:	1 Hour/Week	Term Work and Oral:	25 Marks	Practical:	2
				Tutorial	1
Total	5 Hour/Week		75 Marks		3

Course Objectives:

- 1) Understand web environment for building the application.
- 2) Implement web application.
- 3) Implement Servlet.
- 4) Implement Java Messaging Services.
- 5) Implement Java Mail API.

Prerequisite:

- 1) Core Java 2) Scripting languages.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the lifecycle of web application.
2. Implement session management using servlet.
3. Apply standard and custom tags of JSP.
4. Design competitive web application which will work real web environment.
5. Implement Java Messaging Services.
6. Apply Java Mail API.

Unit I

06 Hours

Introduction to Servlet: Web Application Basics, Architecture and challenges of Web, application. Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml).

Unit II

06 Hours

Session Management and Servlet Chaining: Handling Request and Response Initializing a Servlet, Accessing Database, Servlet Chaining, Session Tracking & Management, dealing with cookies, Transferring Request, Accessing Web Context, Passing INIT and CONTEXT Parameter, sharing information using scope object Controlling concurrent access User Authentication, Filtering Request and Response, Programming Filter, Filter Mapping, Servlet Listeners.

Unit III

06 Hours

Java Server Pages: Standard Tags: Basic JSP Architecture, Life Cycle of JSP (Translation, compilation), JSP Tags and Expressions, Role of JSP in MVC-2, JSP with Database, JSP Implicit Objects.

Unit IV

06 Hours

Java Server Pages: Custom Tags: Tag Libraries, JSP Expression Language (EL), Using Custom Tag, JSP Capabilities Exception Handling Session Management Directives JSP with Java. Introduction to struts.

Unit V

06 Hours

Java Messaging Services: JMS Architecture, Point-to-Point Messaging Domain, Publisher/Subscriber, Messaging Domain, JMS API, JMS Queue.

Unit VI

06 Hours

Java Mail API: SMTP, POP, IMAP, MIME, NNTP, sending mail, receiving mail, mail with attachment, forward email, delete email.

Textbooks

1. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, JavaScript, PHP, Java, Jsp, XML and Ajax, Black Book Paperback – 1 January 2009, Kogent Learning Solutions Inc.
2. Java EE 8 Cookbook: Build reliable applications with the most robust and mature technology for enterprise development, Packt Publication, Elder Moraes.
3. Headfirst Servlets and JSP: Passing the Sun Certified Web Component Developer Exam 2nd Edition, Bryan Basham, Kathy Sierra, Bert Bates.

Reference Books

1. Beginning Java EE 7, Apress Publication, Antonio Goncalves.
2. Java EE 7 Essentials: Enterprise Developer Handbook 1st Edition, Headfirst Publication, Arun Gupta.
3. J2EE: The complete Reference Paperback, Jim Keogh.

List of Laboratory Exercise:

1. Maintain record of students and perform CRUD functionality.
2. Write a program to redirect a request using a dynamic approach.
3. Write a program to pass the data using session.
4. Write a servlet to remove spam.
5. Maintain the record of faculty member using jsp action tags and directives.
6. Design a tag to perform the necessary editing in a given report.
7. Design reusable components of the form using taglib.
8. Implement sending and receiving mail utility using Java Mail API.
9. Implement Java Message Service queue.
10. Understand working of framework – struts- case study.

Project Based Learning Assignments

Note:- *Students in a group of 3 to 4 shall complete any one project from the following list

1. Implement assignment and project submission system.
2. Implement a program to issue Leaving Certificate, Transcripts and Bonafede certificate to student
3. Implement a program to assign problem statement for practical examination in secured environment.
4. Design a template for NBA report.
5. Design an application for Feedback Management System.
6. Design application to maintain track of research paper with indexing per year.
7. Create message and mail communication of given message.
8. Design a post customized as per social media platform.
9. Design an interface to collect job opportunities and disseminate to eligible student
10. Design a project to track details of Industrial Training.

Bharati Vidyapeeth
(Deemed to be University), Pune, India
College of Engineering, Pune
Department of Mechanical Engineering

Vision of the Department

To develop high quality Mechanical Engineers through dynamic education to meet social and global challenges

Mission of the Department

- To provide extensive theoretical & practical knowledge to the students with well-equipped laboratories & ICT tools through motivated faculty members
- To inculcate aptitude for research, innovation and entrepreneurial qualities in students
- To acquaint students with ethical, social and professional responsibilities to adapt to the demands of working environment.

Name of Programme: B. Tech. Mechanical Engineering

Programme Educational Objectives (PEOs)

- To fulfill need of industry and society with theoretical & practical knowledge
- To perform research, innovation, lifelong learning and continued professional development
- To fulfill professional ethics and social responsibilities

Programme Outcomes (POs)

The graduates will be able to

- a.* apply knowledge of mathematics, science and engineering fundamentals for solving complex engineering problems
- b.* identify the need, plan and conduct experiments, analyze data for improving the mechanical processes.
- c.* design and develop mechanical systems considering social and environmental constraints.
- d.* design and develop a complex mechanical system using research based knowledge, advanced mathematical, statistical tools and techniques.

- e.* use information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance.
- f.* know social responsibilities while doing professional engineering practices.
- g.* familiarize with eco-friendly, sustainable and safe working environment.
- h.* take into account professional ethics while designing engineering systems.
- i.* work efficiently as a group leader as well as an individual.
- j.* communicate in written and verbal form with subordinates and supervisors.
- k.* apply project and finance management techniques in multidisciplinary environments.
- l.* take interest in higher education and update the knowledge.

Programme Specific Outcomes (PSOs)

- Apply the knowledge of thermal, design, manufacturing engineering and computational sciences to solve Mechanical Engineering problems.
- Apply Mechanical Engineering principles for research, innovation and develop entrepreneurial skills.
- Apply concepts of Mechanical Engineering to assess societal, environmental, health, safety issues with professional ethics.

B. TECH. MECHANICAL: COURSE STRUCTURE: CBCS: 2021-2022

B. Tech. Mechanical Sem.-I

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Linear Algebra, Calculus & Complex Variables	4	-	1	60	40	-	-	-	100	4	-	1	5
2		Waves & Solid State Physics	3	2	-	60	40	25#	-	-	125	3	1	-	4
3		Electrical Engineering Systems	4	2	-	60	40	25#	-	-	125	4	1	-	5
4		Computer Aided Drafting & Visualization*	4	2	-	60	40	-	50	-	150	4	1	-	5
5		Statics and Dynamics	3	-	-	60	40	-	-	-	100	3	-	-	3
6		Metal Joining Processes	-	2	-	-	-	50#	-	-	50	-	1	-	1
7		Soft Computing-I	-	4	-	-	-	-	-	100	100	-	2	-	2
Total			18	12	1	300	200	100	50	100	750	18	6	1	25

*End Sem. Examination of 4 Hrs.; #: Based on TW & internal oral examination

B. Tech. Mechanical Sem.-II

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Differential Equations, Probability & Statistics	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Chemistry of Engineering Materials	3	2	-	60	40	25#	-	-	125	3	1	-	4
3		Mechanical Engineering Systems	4	2	-	60	40	25#	-	-	125	4	1	-	5
4		Electronics Engineering Systems	4	2	-	60	40	25#	-	-	125	4	1	-	5
5		Computer Aided Machine Drawing*	4	2	-	60	40	-	-	50	150	4	1	-	5
6		Sheet Metal Operations	-	2	-	-	-	50#	-	-	50	-	1	-	1
7		Soft Computing-II	-	2	-	-	-	-	-	75	75	-	1	-	1
Total			18	12	1	300	200	125	-	125	750	18	6	1	25

*End Sem. Examination of 4 Hrs.; #: Based on TW & internal oral examination

Designation of Course	Linear Algebra, Calculus and Complex Variables		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Tutorial: - 01 Hours/ Week	Internal Assessment	40 Marks	
	Tutorial	-	01
	Total	100 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Students should have knowledge of basic algebra. 2. Students should have knowledge of vector algebra. 3. Students should have knowledge of complex numbers.
Course Objectives:-	<p>To provide knowledge about</p> <ol style="list-style-type: none"> 1. Rank, consistency of system of equations and partial differentiation. 2. Vector differentiation and vector integration. 3. Function of complex variable.
Course Outcomes:-	<p>On completion of the course, students will be able to–</p> <ol style="list-style-type: none"> 1. Understand rank of matrix and apply it test consistency of linear system. 2. Understand the partial derivative and evaluate indeterminate forms. 3. Understand vector differential operator and vector identities. 4. Understand line, surface and volume integrals and apply it evaluate to work done. 5. Understand the analytic functions. 6. Understand Taylors and Laurentz series.

Course Contents

Unit-I	Linear Algebra: Matrices	(08 Hrs.)
Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering		
Unit-II	Partial Differentiation and Indeterminate forms	(08 Hrs.)
Functions of two or more variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Change of variables. Indeterminate forms: L' Hospital's Rule, Evaluation of Limits		
Unit-III	Vector Differential Calculus	(08 Hrs.)
Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.		
Unit-IV	Vector Integral Calculus and Applications	(08 Hrs.)
Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problems in Fluid Mechanics, Continuity equations, Streamlines, Equations of motion, Bernoulli's equation.		
Unit-V	Complex Variables	(08 Hrs.)
Function $f(z)$ of complex variable, limit, continuity and differentiability of $f(z)$, Analytic function, necessary and sufficient conditions for $f(z)$ to be analytic (without proof), Cauchy-Riemann equations in cartesian coordinates (without proof) Milne-Thomson method to determine analytic function $f(z)$ when real part (u) or Imaginary part (v) or its combination ($u+v$ or $u-v$) is given. Harmonic function, Harmonic conjugate and orthogonal trajectories.		
Unit-VI	Complex Integration	(08 Hrs.)
Line Integral, Cauchy's Integral theorem for simple connected and multiply connected regions (without proof), Cauchy's Integral formula (without proof). Taylor's and Laurent's series (without proof). Definition of Singularity, Zeroes, poles of $f(z)$, Residues, Cauchy's Residue Theorem (without proof).		

Assignments:

Problems and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. Examinations.

1. Linear algebra: matrices
2. Partial differentiation and indeterminate forms
3. Vector differential calculus
4. Vector integral calculus and applications
5. Complex variables
6. Complex integration

Tutorials:

Problems and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. Examinations.

1. Matrix algebra and system of linear equations.
2. Eigen values and eigenvectors.
3. Partial differentiation.
4. Indeterminate forms.
5. Fourier series; gradient, divergence, and curl.
6. Directional derivative, scalar potential and vector identities.
7. Line, surface and volume integrals.
8. Application of Gauss, Stokes and Green's theorems.
9. Analytic functions, Cauchy-Riemann equations.
10. Limit continuity and differentiability.
11. Cauchy's integral theorem and integral formula.
12. Taylor and Laurent series.

Text Books

1. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes I)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.
2. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes II)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

References

1. B. S. Grewal, "Higher Engineering Mathematics", 42nd Ed., Khanna Publication, Delhi
2. B.V. Ramana, "Higher Engineering Mathematics", 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Ed., John Wiley & Sons, Inc., 2015.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Ed., Cengage Learning, 2012.
5. Michael Greenberg, "Advanced Engineering Mathematics", 2nd Ed., Pearson Education, 1998.

Project Based Learning

Students are expected to prepare report on any one topic, write its definition, applications and analyze the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. System of linear equations solution
2. Rank of matrix
3. Total derivative
4. L' Hospital's Rule
5. Dimension and basis

6. Curl and divergence
7. Work done
8. Gauss divergence theorem
9. Stokes theorem
10. Eigen values and Eigen vectors
11. Bernoulli's equation
12. Cauchy-Riemann equations in detail
13. Harmonic conjugate and orthogonal trajectories
14. Cauchy's Integral formula
15. Cauchy's Residue Theorem

Unit Test-

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Waves & Solid State Physics		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	04

Course Prerequisites:-	Students are expected to have a basic understanding of physics and calculus.
Course Objective	1. To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Mechanical Engineering.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Infer the wave nature of light and apply it to measure stress, pressure and dimension etc. 2. Summarize the structure and properties of lasers to their performance and intended applications. 3. Explain mechanical properties of solid matter, and connect to applications in the field of engineering. 4. Use the knowledge of nanoscience to develop new materials with tunable properties. 5. Use analytical instruments for understanding the nanomaterials. 6. Interpret the superconductivity and perfect diamagnetism, and give a qualitative description of the Meissner effect and its applications.

Course Contents

Unit-I	Wave Optics	(06 Hrs)
<p>Interference- Interference of waves, interference due to thin film (Uniform and non-uniform), Applications of interference (optical flatness, interference filter, non-reflecting coatings).</p> <p>Diffraction- Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima.</p> <p>Polarisation -Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.</p>		
Unit-II	Lasers	(06 Hrs.)
<p>Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO₂ laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.</p>		
Unit-III	Solid State Physics	(06 Hrs.)
<p>Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.</p>		
Unit-IV	Nano-science	(06 Hrs.)
<p>Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications, quantum dots – wide band semiconductors, direct/indirect band gap semiconductors.</p>		

Unit-V	Analytical Instruments	(06 Hrs.)
Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatics focusing, Electron sources, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Field emission scanning electron microscope (FESEM), X-ray Spectroscopy, Energy Dispersive X-ray Spectroscopy(EDS), Atomic force microscopy(AFM), X-ray diffraction(XRD), Bragg's law, Powder X-ray diffraction.		
Unit-VI	Smart Materials and Superconductors	(06 Hrs)
Introduction to smart materials, active smart polymers, shape memory alloys, Electro and Magneto Rheological Fluids, Introduction to composites, types of composites. Introduction to superconductivity; Properties of superconductors: zero electrical resistance, critical fields, persistent current, Meissner effect - Type I and Type II superconductors, Low and high temperature superconductors (introduction and qualitative)		

Term Work:

Practical (Any Eight of the Following)

1. Determination of radius of plan convex lens/wavelength of light/Flatness testing by Newton's rings
2. Determination of wavelength of light using diffraction grating
3. Determination of resolving power of telescope
4. Determination of thickness of a thin wire by air wedge
5. Determination of refractive index for O-ray and E-ray
6. Determination of divergence of a laser beam
7. Particle size by semiconductor laser
8. Determination of wavelength of laser by diffraction grating
9. To study Hall effect and determine the Hall voltage
10. Calculation of conductivity by four probe method
11. Study of solar cell characteristics and calculation of fill factor
12. Determination of band gap of semiconductor
13. Synthesis of metal oxide nanoparticles (ZnO/ZnS/Gold)
14. UV-VIS spectra of synthesized semiconductor nanoparticles
15. To determine the velocity of sound
16. Measurement of average SPL across spherical wave front and behavior with the distance
17. Expansion chamber muffler: investigation of muffler response as a filter in the low frequency approximation by determining insertion loss.
18. Interference of sound using PC speakers
19. Determination of velocity of sound in liquid by ultrasonic interferometer
20. Ultrasonic probe - a study
21. Mini-project based on contents of syllabus.

Assignments

Six assignments to be given by the subject teacher (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

Text Books

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons(2013)
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons(2004)
5. Principles of Solid State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt.Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. Case study on measurement and effect of environmental noise in the college
2. To develop a demonstration model of heat sensor in process control
3. To develop a demonstration model of automatic solar powered time regulated water pumping
4. Case study on solar technology: an alternative source of energy for national development
5. To develop a demonstration model of double pendulum.
6. The study on the effect of length on the resistance of a copper wire (verification of ohms law r directly proportional to l)
7. To prepare a chart on comparison of various method used in measuring the gravitational constant g
8. To develop a demonstration model of digital distance measuring instrument
9. Case study on electric power generation by road power
10. Case study on vibration of bars.
11. To determine absorption coefficient of sound absorbing materials
12. To develop a demonstration model to understand quantum confinement effect in wide band semiconductors
13. To develop a demonstration model of Tesla Coil
14. To develop a demonstration model of thin film interference in soap film-formation of colours
15. To develop a demonstration model of LiFi- wireless data transfer system using light

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Electrical Engineering Systems		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites: -	Students should have basic knowledge of Physics, Chemistry and Mathematics
Course Objectives: -	1. The course introduces fundamental concepts of DC and AC Circuits, Electrical Measurement, Transformers, Induction Machines, DC Machines, Basics of power transmission, distribution & safety measures.
Course Outcomes: -	<ol style="list-style-type: none"> Understand and apply knowledge of Basic laws and network theorems to solve electrical networks Understand and apply knowledge of AC Circuits, Switch gear and electrical measuring instruments Understand and apply fundamental concept of magnetic and electromagnetic circuits for operation of Transformers Understand AC motors, it's control techniques for various mechanical engineering applications Understand DC motors, it's control techniques for various mechanical engineering applications Understand working of Transmission, Distribution of power use of safety rules.

Course Contents

Unit-I	DC Circuit Analysis and Network Theorems	(08 Hrs.)
<p>Circuit Concepts: Concepts of network, active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements, source transformation, Kirchhoff's laws, loop and nodal methods of analysis, star-delta transformation.</p> <p>Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem (simple numerical problems).</p>		
Unit-II	AC Circuits and Switch Gear, Electrical Measurement	(08 Hrs.)
<p>AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation of AC quantities, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), series and parallel resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.</p> <p>Measuring Instruments: Power measurement in three phase circuits. Electrical instruments such as wattmeter, energy meter, tong-tester, megger and power analyzer.</p> <p>Switch Gear: Introduction to LT Switchgear, NO and NC Contacts, Contactors, relay, timers, use in control panel, application in interlocking and protection, symbols.</p>		
Unit-III	Magnetic Circuit and Electromagnetic Induction	(08 Hrs.)
<p>Magnetic Circuit: flux, flux density, field strength, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling.</p> <p>Electromagnetic Induction: Faradays law of EMI, induced emf, lenz law, self inductance, coefficient of self inductance (L), mutual inductance, coefficient of mutual inductance (M), self induced emf and mutually induced emf, coefficient of coupling, inductance in series, types of inductor, their application and energy stored in magnetic field</p> <p>Transformers: Single phase and Three phase: Working principle, Construction, Types, applications.</p>		

Unit-IV	Induction Machines	(08 Hrs.)
<p>Three Phase Induction Motor: construction, types, rotating magnetic field, principle of operation, slip, frequency of rotor current, rotor emf, rotor current, expression for torque, conditions for maximum torque, torque slip characteristics, starting torque in squirrel cage and slip ring motors, effect of change in supply voltage on torque, slip and speed, relation between full load torque and maximum torque, power stages in induction motor, vector diagram and equivalent circuit, no load and block rotor test, speed control of 3 phase motor, starting methods for 3 phase induction motor, circle diagram, construction and calculation.</p> <p>Single Phase Motor: construction, double revolving field theory, starting methods & types of single-phase motor, equivalent circuit.</p> <p>Servomotor: construction, types, working, characteristics, application in automation and robotics.</p>		
Unit-V	DC Machines	(08 Hrs.)
<p>DC Generator: construction, emf equation of dc generator, methods of excitation, losses, condition for maximum efficiency, armature reaction, interpoles and compensating winding, commutation, methods of improving commutation, characteristics of separately excited and self excited dc generator.</p> <p>DC Motor: Working principle, voltage equation, condition for maximum power, torque developed, operating characteristics of dc motor, starting: 3 point and 4 point starter, speed control methods, Swinburne's and brake test of dc shunt motor. Soft-starting of dc motors.</p>		
Unit-VI	Basic of Power transmission and distribution, Safety Measures	(08 Hrs.)
<p>Basic of Power transmission and distribution: classification of transmission lines, transmission line parameters, ABCD constants, voltage regulation, ferranti effect, efficiency of transmission line. 3-phase 3-wire and 3-phase 4-wire distribution system, feeders, distributors, main lines, comparison of various distribution systems, load power factor improvement techniques.</p> <p>Safety Measures: Safety measures in electrical system, safety rules, basic principles of earthing-types of earthing.</p>		

List of Assignments:

The students will be given total **twelve** assignments (Two assignments on each Unit respectively).

1. DC Circuit Analysis
2. Network Theorems
3. AC Circuits and Switch Gear
4. Electrical Measurement
5. Single Phase Transformer
6. Three Phase Transformer
7. 3 Phase induction motor
8. Single phase motor
9. DC Generator
10. DC Motor
11. Power transmission and distribution
12. Safety Measures

List of Experiments:

Note: Term work shall consist of Minimum **Eight** Experiments from the following list.

List of Practicals to be performed in the laboratory:

1. Plotting B-H characteristics for a material
2. Verification of Kirchhoff's Laws
3. Verification of Superposition Theorem
4. Verification of Thevenin's Theorem
5. Verification of Maximum Power Transfer Theorem
6. Study of R-L series, R-C series, R-L-C series circuit

7. Time response of R-L series and R-C series circuit
8. Verification of voltage and current relationships in star and delta connected 3-phase networks
9. Single lamp controlled by two different switches (staircase)
10. Two lamps controlled independently from two different switches (parallel)
11. Series connected lamps
12. Study of Electricity bill(Industrial / commercial)
13. Direct loading tests on single phase transformer
14. Mini-project based on contents of syllabus.

Text Books

1. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)

Reference Books

2. Electrical Technology - Edward Huges (Pearson)
3. Electrical power system technology - S. W. Fardo, D. R. Patric (Prentice Hall)
4. Principles of Electronics-Dr. H. M. Rai (SatyaPrakashan)
5. Electronic Devices and Circuit Theory- R. L. Boylestad and L. Nashelsky (PHI)
6. Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. To develop a practical kit for verification of Thevenin's theorem.
2. To develop a practical kit for verification of Superposition theorem.
3. To develop a practical kit for verification of Maximum power transfer theorem
4. To develop a practical kit for verification of Norton's theorem.
5. To develop a practical kit for study of R-L-C Series circuit.
6. To develop a practical kit for study of R-L-C parallel circuit.
7. To develop a practical kit for study of voltage and current relationships in starconnected network.
8. To develop a practical kit to understand voltage and current relationships in delta connected network.
9. To develop a demonstration model of single-phase transformer for practical application.
10. Case study on transformer operation and testing by using professional software.
11. To develop a demonstration model of Smart Energy meter using GSM
12. To develop a demonstration model of Safety measures in electrical system.
13. Case studies on – Learning industrial Safety through films/Videos
14. Case studies on – Learning industrial Safety through posters/charts

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Computer Aided Drafting & Visualization		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/Week	Internal Assessment	40 Marks	
	Term Work and Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites: -	Fundamentals of Mathematics
Course Objectives: -	<ol style="list-style-type: none"> To understand the basic principles of engineering drawing and highlight the importance of Computer Aided Drafting in engineering. To develop the graphical skills for communication of concepts & idea through technical drawings.
Course Outcomes:-	<ol style="list-style-type: none"> Understand the fundamental concepts of CAD Drawing, its applications, different types of lines, curves and dimension technique with practical application. Understand the concept of Orthographic projections and apply it to draw detail views by using 1st angle projection method. Understand the concept of isometric projection and apply it to construct 3D view of a component. Understand the concept of projections of Point, Line and plane; and apply to draw its projection by using 1st angle projection method and to locate its traces. Understand the concept of projections of different types of solids and sectioned solids; and apply to draw its projection by using 1st angle projection method. Understand the concept of Development of Lateral surfaces; and apply to development of simple and sectioned Solids.

Course Contents

Unit-I	Fundamentals of CAD and Engineering Curves	(08 Hrs.)
<p>Introduction to Engineering Drawing, Types of lines and Dimensioning, Layout and size of drawing sheets, Scales. Engineering Curves-Ellipse drawing by Focus-Directrix Circle Method and Concentric Circle Method, Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone and Cylinder. Fundamentals of Computer Aided Drafting (CAD) and its applications, Various softwares for Computer Aided Drafting. AutoCAD initial setting and AutoCAD commands</p>		
Unit-II	Orthographic Projection	(08 Hrs.)
<p>Basic principle planes of Projections, First and Third angle method of Projection, Orthographic Projections of given Pictorial view by first angle projection method only, Sectional orthographic Projection. Orthographic Drawing by using AutoCAD.</p>		
Unit-III	Isometric Projections	(08 Hrs.)
<p>Principles of Isometric Projections-Isometric Scale, Isometric Axes, Isometric Projections and Isometric Drawing. Constructions of Isometric view from given Orthographic Views and given origin. Isometric Drawing by using AutoCAD.</p>		
Unit-IV	Projection of Points, Lines and Plane Surfaces	(08 Hrs.)
<p>Projections of Points, Projections of Oblique lines in First Quadrant, Traces. Projections of Planes- Projection of perpendicular and oblique planes (polygonal and circular surfaces), Obtaining true shape of plane surface. Projection of Points, Lines and Plane Surfaces by using AutoCAD.</p>		

Unit-V	Projection of Solids and Sectioned Solids	(08 Hrs.)
Introduction of solids-Types of solids, Projection of solid inclined both reference planes, Projection of common solids such as prism, pyramid, cylinder and cone. Projection of solids cut by AIP and AVP, obtaining true shape of a section. Projection of Solids and Sectioned Solids by using AutoCAD.		
Unit-VI	Development of Lateral Surfaces	(08 Hrs.)
Development of the lateral surfaces of solids like Prisms, pyramids, cylinders and cones. Development of cut solids. Development of Lateral Surfaces by using AutoCAD.		

Term work

Term work shall consist of **seven** A2 size (594 mm x 420 mm) sheets using **AutoCAD**.

1. Types of lines, Dimensioning practice, 1st and 3rd angle methods symbol.
2. Engineering Curves
3. Orthographic Projections
4. Isometric views
5. Projections of Points and Lines and planes
6. Projection of Solids and Section of solids
7. Development of Lateral surfaces

Assignments: Minimum five problems on each unit in A3 size Drawing Book

Textbooks

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India.
2. "Text Book on Engineering Drawing", K.L. Narayana & P. Kanniah, Scitech Publications, Chennai.

Reference Books

1. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
2. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.
3. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005.
4. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005.
5. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988.

Project Based Learning

Following is the list of topics for project-based learning (Not Limited to) based on the syllabus contents:

1. To obtain industrial drawings to identify the types of lines, dimensioning methods and method of projection.
2. To develop the model/charts based on engineering curves.
3. To prepare model/chart for identification of engineering curves in nature for industrial, societal, etc application.
4. To demonstrate different methods of orthographic projection.
5. To demonstrate projection of Points.
6. To demonstrate projection of Lines.
7. To demonstrate projection of Planes.
8. To demonstrate projection of Solids.
9. To demonstrate developments of surfaces for solids.
10. To demonstrate industrial application of development of surfaces such as steam carrying pipes, Ducts of air conditioning systems, etc.
11. To demonstrate Isometric projection method through model of a cube.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Statics and Dynamics		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
	Internal Assessment	40 Marks	
	Total	100 Marks	03

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Physics 2. Engineering mathematics
Course Objective	<ol style="list-style-type: none"> 1. To study different types of forces in a plane. 2. To study Centroid and moment of inertia 3. To study friction in machines 4. To study Kinetics of linear and circular motion 5. To study basics of civil engineering
Course Outcomes:-	<p>The students should be able to</p> <ol style="list-style-type: none"> 1. Understand the concept of force and apply it along with the concept of equilibrium in 2D and 3D system with the help of free body diagram. 2. Understand the significance of centroid and moment of inertia 3. Understand the concept of friction and estimate required force to overcome friction. 4. Analyze body in motion using force and acceleration, work energy, impulse momentum principles 5. Analyze body in motion using centripetal and centrifugal force principles 6. Understand the basic concept of civil material, building component and foundation techniques.

Course Content

Unit-I	Resultant and Equilibrium	(06 Hrs.)
Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point, Virtual work.		
Unit-II	Centroid, Moment of Inertia and Friction	(06 Hrs.)
Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia. Introduction to frictional force, preliminary concepts, laws of friction. Introduction to machines, Relation between Mechanical advantage, Velocity ratio and efficiency, Reversible and non-reversible Machines. Simple lifting machines and their velocity ratio, gear train.		
Unit-III	Analysis of Trusses, Frames and Cables	(06 Hrs.)
Two force members: Introduction to trusses, types of trusses, perfect and redundant trusses, Analysis of plane trusses by method of joint and method of section, cables subjected to point loads. Multi force member: plane frame.		
Unit-IV	Kinematics of particles and rigid body	(06 Hrs.)
Rectilinear motion, velocity and acceleration in terms of rectangular coordinate system, Motion along plane curve path, tangential and normal component of acceleration, motion curves (a-t, v-t, s-t), Projectile motion Rigid body- Introduction to general plane motion,		
Unit -V	Kinetics of Particle	(06 Hrs.)
Force and acceleration, introduction to basic concepts, D'Alembert's principle, equation of dynamic equilibrium, Newton's second law of motion. Work energy principle and law of conservation of energy, impulse and momentum, law of conservation of momentum, Impact and collision.		

Unit-VI	Structural Materials and Foundations	(06 Hrs.)
Types of structures based on loading, material and configuration; structural materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminium		
Foundations- Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation.		

List of Assignments

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Resultant and equilibrium of forces
2. Centroid & Moment of Inertia
3. Friction
4. Trusses, frames and cables
5. Kinematics of particles
6. Kinematics of rigid body
7. Kinetics of particle
8. Structural materials and foundations

Text Books

1. "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K. G., New Age International (P) Ltd.
2. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.
3. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.

Reference Books

1. "Engineering Mechanics (Statics and Dynamics)", Hibbeler R. C., McMillan Publication.
2. "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.
3. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.
4. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication
5. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.
6. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. To prepare demonstration model for various types of beams.
2. To prepare demonstration model for various types supports.
3. To prepare chart for various types of force system with suitable real-life examples.
4. Case study on various situations where varignon's theorem is used.
5. To prepare demonstration model or to prepare a chart on equilibrium system of forces of various engineering applications.
6. To prepare chart on different types for trusses with showing various members.
7. To prepare demonstration model of any one type of truss.
8. To prepare demonstration model of the basic geometrical figures and locate the centroid of them.

9. To prepare demonstration model of the I and T section and locate the centroid of them.
10. To prepare chart for parallel axis and perpendicular axis theorem with suitable example.
11. To prepare chart on types of friction in various field conditions.
12. To prepare chart on application of friction.
13. To prepare chart on motion curves.
14. To prepare chart related to lifting machine and relevant industrial applications.
15. To development of excel sheet for projectile motion (at least three problems).
16. To development of excel sheet for work energy principle (at least three problems).
17. To prepare chart on work energy and Impulse momentum principle with suitable example.
18. Case study on different structural materials and comparison of its mechanical properties.
19. To prepare demonstration model of different types of foundations.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Metal Joining Processes		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical: -02 hours/Week	Term Work	50 Marks	01
	Total	50 Marks	01

Course Prerequisites:-	Students should have basic knowledge of Materials, Physics, Chemistry and Vocational Course.
Course Objectives:-	The student should 1. To acquire the knowledge of Arc and Gas Welding Processes 2. To acquire the knowledge of Resistance and Solid-state Welding Processes
Course Outcomes:-	The students should be able to– 1. Understand the different Arc and Gas Welding Processes and apply for welding Joints 2. Understand the different Resistance and Solid-state Welding Processes and apply for welding Joints.

Course Contents

Unit-I	Introduction to Welding Processes	(12 Hrs.)
Introduction, Classification of welding processes, Advantages and disadvantages of welding processes Soldering, Brazing. Arc Welding Processes -Carbon arc, Submerged arc, Tungsten inert gas (TIG), Metal inert gas (MIG), Plasma arc, Stud welding and related arc welding processes –Theory, Comparison on merits, limitation and applications, Fluxes used in arc welding. Characteristics of Welding Processes. Gas Welding – Processes and equipment used, Types of flames, Gas cutting– Merits, demerits and applications.		
Unit-II	Resistance Welding and Solid-State Welding	(12 Hrs.)
Resistance Welding – Spot, Seam, Projection, Butt, Percussion welding, Tube welding, Electric resistance welding process, its merits, demerits, and applications. Introduction of Solid-State Welding - Pressure, Diffusion, Ultrasonic, Explosive, Friction, Forge, Principle, Equipment used and Flux used, Merit's, demerits and application of the above process.		

Term Work: List of Experiments

1. Edge Preparation of various welding Joints.
2. Making the Joint with Arc Welding Process. (One Individual Job)
3. Making the Joint with Resistance Welding Process. (One Individual Job with spot welding)
4. Making the Joint with TIG or MIG Welding Process.(One Individual Job)
5. Making the Joint with Gas Welding Process.(One Individual Job)
6. Making the Joint with Soldering Process.(One Individual Job)
7. Making the Joint with Braze Welding Process.(One Individual Job)
8. Study / Demonstration on Ultra Sonic Welding.
9. Study / Demonstration on Friction Welding
10. One Industrial Visit to get the detail Knowledge of Advanced Welding Processes and Latest Technology in Welding.

Text Books

1. O.P.Khanna , A Text Book of Welding Technilogy, DhanpatRai and Sons
2. Md. Ibrahim Khan,Welding Science and Technology, New Age International (P) Ltd.
3. Chapman W.A.J “Workshop Technology “volume I,II,III, ELBS.

Reference Books

1. P.N.Rao , Manufacturing Technology- Vol I, Mcgraw Hill Education 9 India Pvt.
2. HajraChoudhary S.K. , Bose S.K. “Elements of Workshop Technology” Volume I,II
3. Richard Little, “Welding And Welding Technology” Pearsons Education second Edition.

Designation of Course	Soft Computing- I		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical: -04 hours/Week	Term Work and Practical	100 Marks	02
	Total	100 Marks	02

Course Prerequisites	Basic Mathematics
Course Objective	The goal of the course is that students should develop techniques for problem solving using a programming language.
Course Outcomes	<p>Students should</p> <ol style="list-style-type: none"> Understand basics of C++ and apply that knowledge to write simple programs. Understand the uses of operators and apply them in writing programs. Understand the concept of conditional statements apply them in writing programs. Understand the concepts of loops in C++ apply them in writing programs. Understand the concepts of user defined functions, recursion and apply them in writing programs Understand the concept of overloaded functions and apply them in writing programs

Course Contents

Unit-I	Introduction to C++	(08Hrs.)
Introduction to C, C++; Object oriented programming; Programming Fundamentals; Data and Data Types		
Unit-II	Operators in C++	(08Hrs.)
Declarations in C++; Operators in C++; Introduction to classes and objects and strings		
Unit-III	Conditional Statements	(08Hrs.)
Relational and logical operators; If statements; Switch Statements		
Unit-IV	Loops	(08Hrs.)
Loops in C++; For loop; While loop; Do while loop; Jump statement		
Unit-V	Functions I	(08Hrs.)
Functions basic formats; Recursion		
Unit-VI	Functions II	(08Hrs.)
Overloaded functions; Local, Global and Static Variables		

Term Work

Term work shall consist of programs (not limited to) listed below based on syllabus.

1. C++ "Hello, World!" Program
2. C++ Program to Print Number Entered by User
3. C++ Program to Add Two Numbers
4. C++ Program to Find Quotient and Remainder
5. C++ Program to Find Size of int, float, double and char in Your System
6. C++ Program to Swap Two Numbers
7. C++ Program to Find ASCII Value of a Character
8. C++ Program to Multiply two Numbers
9. C++ Program to Check Whether Number is Even or Odd
10. C++ Program to Check Whether a character is Vowel or Consonant.

11. C++ Program to Find Largest Number Among Three Numbers
12. C++ Program to Find All Roots of a Quadratic Equation
13. C++ Program to Calculate Sum of Natural Numbers
14. C++ Program to Check Leap Year
15. C++ Program to Find Factorial
16. C++ Program to Generate Multiplication Table
17. C++ Program to Display Fibonacci Series
18. C++ Program to Find GCD
19. C++ Program to Find LCM
20. C++ Program to Reverse a Number
21. C++ Program to Calculate Power of a Number
22. C++ Program to Check Whether a Number is Palindrome or Not
23. C++ Program to Check Whether a Number is Prime or Not
24. C++ Program to Display Prime Numbers Between Two Intervals
25. C++ Program to Check Armstrong Number
26. C++ Program to Display Armstrong Number Between Two Intervals
27. C++ Program to Display Factors of a Number
28. C++ Programs To Create Pyramid and Pattern
29. C++ Program to Make a Simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
30. C++ Program to Display Prime Numbers Between Two Intervals Using Functions
31. C++ Program to Check Prime Number By Creating a Function
32. C++ Program to Check Whether a Number can be Express as Sum of Two Prime Numbers
33. C++ program to Find Sum of Natural Numbers using Recursion
34. C++ program to Calculate Factorial of a Number Using Recursion
35. C++ Program to Find G.C.D Using Recursion
36. C++ Program to Convert Binary Number to Decimal and vice-versa
37. C++ Program to Convert Octal Number to Decimal and vice-versa
38. C++ Program to Convert Binary Number to Octal and vice-versa
39. C++ program to Reverse a Sentence Using Recursion
40. C++ Program to Calculate Power Using Recursion

TextBooks

1. "Let Us C++", KanetkarYashavant, BPB Publications

Reference Books

1. "C++ programming Today", Barbara Johnston, Prentice Hall of India, New Delhi.
2. "C++ how to program", Paul Deitel and Henry Deitel, Prentice Hall of India, New Delhi.
3. "Accelerated C++: Practical Programming by Example", Andrew Koenig and Barbara E. Moo, Addison-Wesley Publications
4. "C++: The Complete Reference", Herbert Schildt, McGraw Hill Publications.
5. "C++ Primer"; Barbara E. Moo, JoséeLajoie and Stanley B. Lippman; Addison-Wesley Professional
6. "Programming: Principles and Practice Using C++", BjarneStroustrup, Addison-Wesley Professional

Designation of Course	Differential Equations, Probability & Statistics		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	03
Tutorial:- 01 Hours/ Week	Internal Assessment	40 Marks	
	Tutorial	-	01
	Total	100 Marks	04

Course Prerequisites:-	Students should have knowledge of 1. Derivative and Integration 2. Partial derivative 3. Basic of statistics
Course Objectives:-	To provide knowledge about 1. Various methods to solve first order and first degree and n^{th} order differential equation. 2. Integral transform and application of partial differential equation. 3. Methods of interpretation of numerical data and probability distribution.
Course Outcome:-	Students will be able to 1. Understand methods of first order and first-degree differential equation. 2. Understand the methods of n^{th} ordinary differential equation and apply it to mass spring system. 3. Understand Laplace transform and evaluate particular solution of wave, one- and two-dimensional heat equation. 4. Understand the multiple integrals and apply it to evaluate area and volume. 5. Understand various technique to analyze and numerical data. 6. Understand probability distribution and testing of hypothesis.

Course Contents

Unit-I	Differential Equation	(06 Hrs.)
Formation of the ordinary differential equations (ODEs), Solution of an ordinary differential equation, Equations of the first order and first degree, Linear differential equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations		
Unit-II	Linear Differential Equations	(06 Hrs.)
Solution of n^{th} order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Mass spring system.		
Unit-III	Laplace Transforms and Applications of Partial Differential Equations	(06 Hrs.)
Laplace transform: Definition of Laplace transforms, Properties of Laplace Transform (Properties without proof). Inverse Laplace Transform, Linearity property, use of standard formulae to find inverse Laplace Transform, finding Inverse Laplace transform using derivative, Partial fractions method & first shift property to find inverse Laplace transform. Inverse Laplace transform using Convolution theorem (without proof). Applications of partial differential equation: Basic concepts, modeling of Vibrating String, Wave equation, One- and two-dimensional Heat flow equations, method of Separation of variables.		
Unit-IV	Multiple Integrals and its Applications	(06 Hrs.)
Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.		
Unit-V	Statistics	(06 Hrs.)
Measures of central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression estimates.		

Unit-VI	Probability and Probability Distributions	(06 Hrs.)
Probability, Bayes Theorem, Probability density function, Probability distributions: Binomial, Poisson, Normal, Test of hypothesis: Chi-square test, t-test.		

Assignments

Problems and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Differential equation.
2. Linear differential equations.
3. Laplace transforms and applications of partial differential equations.
4. Multiple integrals and its applications.
5. Statistics.
6. Probability and probability distribution.

Tutorials:

Problems and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. First order equation (linear and nonlinear),
2. Higher order linear differential equation with constant coefficients
3. Euler-Cauchy equation
4. Legendre's DE
5. Laplace transformation
6. Applications of partial differential equation
7. Double and Triple integrations
8. Applications to area, volume, mean and root mean square values.
9. Sampling theorems, conditional probability; mean, median, mode and deviation.
10. Correlation and regression, reliability of regression estimates.
11. Probability, bayes theorem, probability density function
12. Binomial, poisson and normal distributions.

Text Books

1. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes I and II)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

Reference Books

1. B. S. Grewal, "Higher Engineering Mathematics", 42nd Ed., Khanna Publication, Delhi
2. B.V. Ramana, "Higher Engineering Mathematics", 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Ed., John Wiley & Sons, Inc., 2015.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Ed., Cengage Learning, 2012.
5. Michael Greenberg, "Advanced Engineering Mathematics", 2nd Ed., Pearson Education, 1998.

Project Based learning topics:

Students are expected to prepare report on any one topic, write its definition, applications and analyze the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. Formation of differential equation
2. Exact differential Equation
3. Linear differential equation
4. Solution of nth order LDE with Constant Coefficients

5. Mass spring system
6. Transform (Properties with proof).
7. Applications of partial differential equation in mechanical engineering
8. Multiple integrals applications
9. Applications of Multiple integrals applications to Area, Volume
10. Random Sampling
11. Stratified random sampling
12. Reliability of Regression estimates.
13. Bayes Theorem
14. Probability density function
15. Testing of hypothesis

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Chemistry of Engineering Materials		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03Hour/ Week	End Semester Examination	60 Marks	03
Practical: -02 Hours/Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	04

Course Prerequisites: -	Higher Secondary chemistry.
Course Objective: -	The student should acquire the knowledge of <ol style="list-style-type: none"> To develop the interest among the students regarding chemistry and their applications in engineering. To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field. The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the field such as Mechanical Engineering.
Course Outcomes: -	After completion of the course students will be able to <ol style="list-style-type: none"> Apply the concept X-ray diffraction technique to study crystal structure. Understand the concept of the metallurgy in the study of metals. Understand and apply the knowledge of Ferrous & Non-Ferrous materials for various engineering applications. Apply the knowledge polymer and plastics to study advanced materials. Understand the knowledge of composite materials for various engineering applications. Understand different types of corrosion and suggest control measures in industries.

Course Contents

Unit-I	Crystal Structures	(06 Hrs.)
Study of crystal structure, Indexing of planes and directions, Slip planes, linear and Planar density calculations, volume density calculations, Imperfections in crystals, effect of crystal structure defects on various properties, Allotropic and polymorphism of metals, formation of solid solutions.		
Unit-II	Extractive Metallurgy	(06 Hrs.)
Introduction, Occurrence of metals, types of ores, concentration of ores by physical methods, Crushing and Sizing, Froth- Flotation, Magnetic Separation, Gravity separation method. Chemical methods- calcination, Roasting, Reduction of ore by Pyrolysis, Chemical reductions, Electrolytic refining of metals.		
Unit-III	Ferrous & Non-Ferrous Materials	(06 Hrs.)
Metallic materials: Introduction, Alloy- definition and classification, purposes of making alloys. Ferrous alloys, Introduction to steel making, blast furnace and electric steel making: Plain carbon steels (mild, medium and high), Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminum alloy (Duralumin and Alnico).		
Green Chemistry: Definition, Twelve principles of Green Chemistry.		
Unit-IV	Introduction to Polymers, Plastics and Rubbers	(06 Hrs.)
Polymers: Introduction, plastics, thermo softening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde and epoxy resins, Conducting polymers and Biopolymers (Introduction, examples, and applications), types of rubbers, Acrylics.		
Unit-V	Introduction to Composites	(06 Hrs.)
Introduction, types of composite, different types of reinforce materials, characteristics of reinforced materials, matrix materials composition, properties and uses of fibre reinforced plastics (FRP), Carbon fibres, Boron Nylon etc, and glass reinforced plastic (GRP). Ceramic matrix composite. Metal Matrix composite.		

Unit-VI	Corrosion & Protective Coatings	(06Hrs.)
Introduction corrosion, types of corrosion, hydrogen embrittlement, stress corrosion, Pit type corrosion, corrosion prevention methods, Metallic coatings, Electroplating, Methods of cleaning articles before electrodeposition, Electroplating methods, Electroless plating, Some other metallic coatings, Modification of environment, Cathodic Protection, chemical conversion coatings, Organic Coatings, Paints, Varnishes, Enamels, Special paints. CVD and PVD coatings.		

Term Work

List of Experiments

1. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin.
2. To determine molecular weight/radius of macromolecule polystyrene/ polyvinyl alcohol by viscosity measurement.
3. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method.
4. Study of corrosion of metals in medium of different pH.
5. Determination of rate of corrosion of aluminium in acidic and basic medium.
6. Determination of percentage of Ca in given cement sample
7. Preparation of phenol-formaldehyde resin/ urea-formaldehyde.
8. Estimation of copper in brass solution.
9. Determination of rate of corrosion of aluminium in acidic and basic medium.
10. To obtain metallic coating on base metal by using both the methods, Electroplating and Electroless plating.

Assignments

1. Linear and Planer density calculations with volume density calculations.
2. Extractive Metallurgy.
3. Purposes of making alloy like Ferrous alloys.
4. Twelve principles of Green Chemistry.
5. Conducting polymers and Biopolymers.
6. Thermo softening and thermosetting plastics.
7. Fiber reinforced plastics (FRP).
8. Heat treatment of tool steels
9. Organic Coatings, Paints, Varnishes, Enamels, Special paints for corrosion prevention.
10. Types of corrosion and its preventive measures.

Test Book

1. A Textbook of Engineering Chemistry by S. S. Dara and S. S. Umare, S. Chand & Company Ltd., New Delhi.
2. A Textbook of Engineering Chemistry by C. P. Murthy, C. V. Agarwal and A. Naidu, B S Publications, Hyderabad.
3. A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004

Reference Books

1. Material Science and Engineering Metallurgy by V D Kodgire, Everest publications
2. Materials Science by O P Khanna, Khanna publications
3. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.
4. Engineering Chemistry by Dr. A. K. Pahari and Dr. B. S. Chauhan, Laxmi Publications (P) Ltd, New Delhi.
5. Polymer Science, V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar, Wiley Eastern Limited
6. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008
7. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G. Cowie, Blackie Academic & Professional, 1994.

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. To prepare a demonstration model on Biopolymers.
2. To prepare a epoxy resins by using suitable method.
3. To write a review paper based on applications of fibre reinforced plastics (FRP) and get it published in reputed journal (eg. Google Scholar).
4. With the help of green chemistry principles, to prepare any organic dye by using Traditional and Green pathway.
5. To prepare a demonstration model a hardware model based on Electroless plating and calculate cell voltage.
6. To write a review paper based on Conducting polymers and get it published in reputed journal (eg. Google Scholar).

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Mechanical Engineering Systems		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hour/ Week	End Semester Examination	60 Marks	04
Practical: -02 Hours/Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites: -	Higher Secondary Physics
Course Objective: -	To teach students about 1. Introduction to systems in Thermal Engineering 2. Introduction to systems in Design Engineering 3. Introduction to systems in Manufacturing Engineering
Course Outcomes: -	Students should 1. Understand the fundamentals of power producing and absorbing devices. 2. Understand the fundamental concepts of renewable and non-renewable energy systems. 3. Understand the fundamentals of mechanism of machines 4. Understand the fundamentals of power transmitting devices. 5. Understand the fundamentals of machine tools and manufacturing processes. 6. Understand the fundamentals of robotics and its applications.

Course Contents

Unit-I	Power Producing and Absorbing Systems	(08 Hrs.)
<p>Power Producing Systems: I. C. Engines- Basic nomenclature, Classification, S.I and C. I. Engines, Two stroke and four strike engines. Boilers- classification, water tube and fire tube boilers. Steam Turbines: Classification, simple Impulse, and reaction turbines. Water Turbines: Classification, Impulse, and reaction Turbines. Gas Turbines: classification, open and closed gas turbine. Construction, working and applications of all these devices.</p> <p>Power Absorbing Systems: Compressors; Classification, Rotary, reciprocating air compressors, Blower, Pumps: Classification, Rotary, reciprocating pumps, Household refrigerator and window air conditioner.</p>		
Unit-II	Renewable and Non-Renewable Energy Systems	(08 Hrs.)
<p>Renewable energy systems: Solar- P-V Cells, collectors- Flat plate, Parabolic, Trough collector, Heliostat. Wind- Classification of wind Turbines, Horizontal and vertical axis. Biomass gasification, Biogas Plant, Geothermal, Tidal, micro-hydel plant.</p> <p>Non-renewable energy systems: Thermal power plant, hydroelectric power plant, Nuclear power plant, Gas Turbine plant, I.C engine power Plant,</p>		
Unit-III	Introduction to Mechanisms of Machines	(08 Hrs.)
<p>Kinematic link, Kinematic pair, Types of constrained motions, Kinematic chain, Types of joints, Mechanism, Machine, Degree of freedom (Mobility), Kutzbach criterion, Grubler's criterion. Four bar chain and its inversions, Grashoff's law, Slider crank chain and its inversions, Double slider crank chain and its inversions. Geneva Mechanisms, Ratchet and Paul Mechanisms</p>		
Unit-IV	Power Transmitting Devices	(08 Hrs.)
<p>Types of Belts and belt drives, Chain drive, rope drive, Types of gears, Types of Couplings, Types of friction clutch, Power transmission shafts, axles, keys, types of Keys, Sliding Contact and Rolling Contact Bearing, Bush and ball bearings, Types of brakes.</p>		
Unit-V	Introduction to Machine Tools	(08 Hrs.)
<p>Demonstration of: Lathe machine, Centre lathe, wood working lathe, Drilling machine, types of drilling machine, milling machine, Power saw. Grinding machine, cylindrical grinder, and surface grinder. NC machine, CNC machine.</p>		

Unit-VI	Introduction to Robotics	(08 Hrs.)
History of robotics, Definition of robotics and robot, laws of robotics and classification of robot, application of robot, robot anatomy, Degree of freedom, Degree of mobility, Kinematics, joints, work envelope, pay load, reach, speed, acceleration, accuracy, precision, repeatability, Mounting, Footprint, cycle time, Components of robots such as sensor, power conversion unit, Actuators, Manipulators, Controllers, Base and user interface, Future of robotics.		

Term work: Term work shall consist following experiments

1. Study and demonstration of low-pressure boilers.
2. Study and demonstration of IC Engines.
3. Study and demonstration of Refrigeration and Air Conditioning.
4. Study and demonstration of Pumps and Compressors.
5. Study and demonstration of turbines.
6. Study and demonstration of Inversions of 4-bar, Single and Double Slider Crank Mechanisms.
7. Study and demonstration of power transmitting elements.
8. Study and demonstration of operations on center lathe.
9. Study and demonstration of operations on drilling machine.
10. Study and demonstration of robot anatomy.
11. Mini Project on Contents of Syllabus.

Assignment

1. Assignment on power producing and absorbing devices
2. Assignment on renewable and non-renewable energy
3. Assignment on mechanism of machines
4. Assignment on Power Transmitting Devices
5. Assignment on Machine Tools
6. Assignment on Robotics

Text Books

1. A Textbook of Production engineering” P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition, 8th Edition (2014).
2. A Textbook of Manufacturing Technology: Manufacturing Processes, R. K. Rajput, Laxmi Publications (P) Ltd, 2nd Edition 2015
3. R S Khurmi and J K Gupta, Textbook of Thermal Engineering, S Chand publications.

Reference Books

1. V. Ganeshan, Internal Combustion Engine, Tata McGraw-Hill Publication, 4th Edition (2012).
2. R. K. Rajput, Thermal Engineering, Laxmi Publications
3. Ambekar A.G Mechanisms and Machine Theory, Prentice-Hall of India, Eastern Economy Edition (2007)
4. S.S. Ratan, Theory of Machines, , Tata McGraw Hill, 4th Edition
5. Introduction to robotics, S.K.Shah. McGraw Hill, 2nd Editi

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. To prepare chart of comparison among specification of various models of two wheeler available.
2. To develop demonstration model of low-cost household refrigerator
3. To develop demonstration model of low-cost air conditioner
4. To develop demonstration model of Biogas plant
5. To develop demonstration model of geothermal power plant

6. To develop demonstration model of wind power plant
7. To develop demonstration model of solar energy plant
8. To develop demonstration model of Whitworth quick return mechanism
9. To develop demonstration model of single slider crank chain mechanism with its inversion
10. To develop demonstration model of Ratchet and Paul mechanism
11. To develop demonstration model of mini conveyor using Geneva mechanism

Unit Test

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Electronics Engineering Systems		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites:-	Students should have the basic knowledge of Electrical Engineering
Course Objectives:-	<ol style="list-style-type: none"> To provide overview of electronics engineering that serve the foundation of advanced studies in the area of mechanical engineering. This course provides comprehensive idea about working principle Operation and characteristics of electronic devices, transducers, digital electronics, and communication systems.
Course Outcomes:-	<p>On completion of the course, students will be able to–</p> <ol style="list-style-type: none"> Understand the basic electronics devices and linear ICs Understand and apply the concepts of digital electronics. Understand the methods of signal conditioning and its applications. Understand concepts of Analog Communication & Digital communication Understand the concept of transducer and data acquisition system with its application. Understand the concept of Microprocessor & Microcontroller and its applications.

Course Contents

Unit-I	Electronic Devices and Linear ICs	(08 Hrs.)
Rectifiers: Half wave, Full wave and Bridge rectifiers - capacitor filter-wave forms-ripple factor regulation characteristics. Special semiconductor devices: FET, SCR, LED, MOSFET, DIAC, TRIAC, relays, VI characteristics – applications		
Unit-II	Digital Electronics	(08 Hrs.)
Number system – Binary, Decimal, Octal, Hexa decimal, Digital Signal, Combinational and sequential logic circuits, clock signal, Boolean Algebra and Logic gates, Arithmetic Operations, Multiplexers, Demultiplexers, Encoders, Decoders, Flip-flop, Registers, Counters. Integrated circuits & logic families: – Logic levels, noise immunity, fan out, propagation delay, TTL logic family, CMOS logic family, comparison with TTL family		
Unit-III	Signal Conditioning	(08 Hrs.)
Operational amplifiers, Inverting, non-inverting, voltage follower, summing, subtractor, Instrumentation, 555 timer-operating modes: monostable, astable multivibrator, Analog to Digital & Digital to Analog Converters		
Unit-IV	Communication Systems	(08 Hrs.)
Analog Communication & Digital communication: Block diagram of a basic communication system, Frequency spectrum, need for modulation, Methods of modulations- Principles of AM, FM, Pulse analog & pulsed digital modulation, AM/FM transmitters & receivers, satellite communication – Radar system, data transmission and MODEM, Mobile communication systems: cellular concept, simple block diagram of GSM system		
Unit-V	Transducers and Data Acquisition Systems	(08 Hrs.)
Basic requirement of transducers, classification of transducers, passive transducers: Resistive, capacitive, inductive, LVDT, potentiometric strain gauge, thermistor, hall effect, proximity sensors. Active transducers: Piezoelectric, photoelectric & thermocouple. Static characteristics of transducer, selection of transducer. Block diagram of data acquisition systems and its applications.		

Unit-VI	Microprocessor & Microcontroller	(08 Hrs.)
Overview of generic microprocessor, architecture & functional block diagram, comparison of Microprocessor & microcontroller. 8051 Architecture, ports, registers, timers/counters. Serial communications interrupts. Interfacing of relay, stepper motor, LCD Display, Keyboard, ADC.		

Term Work:

Term work shall consist of Minimum Eight **Experiments**.

1. To study and plot regulation characteristics of half wave and full wave rectifier.
2. To study of characteristics of SCR.
3. To study of characteristics of TRIAC
4. To study basic logic gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR.
5. Implementation of Boolean functions using logic gates.
6. To study Operational Amplifiers (Op-amps).
7. Study of Amplitude Modulation and Demodulation
8. Study of Frequency Modulation and Demodulation
9. To study characteristics of LVDT for displacement measurement.
10. To study of Microprocessor & Microcontroller

Assignment:

Assignment based on each unit.

Text Books:

1. K.P. Ramchandran, G.K. Vijayaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Wiley Publication, 2008
2. W. Bolton, Mechatronics - A Multidisciplinary approach, 4th Edition, Prentice Hall, 2009.
3. Dr. D.S. Kumar, Mechanical Measurement & Control, Metropolitan Book Co. Pvt. Ltd. New Delhi, 2007
4. M.D. Singh and J.G. Joshi, Mechatronics, 3rd Edition, Prentice Hall, New Delhi, 2009.
5. Mottershed Allen, Electronic Devices & Circuits, PHI
6. R. P. Jain, Modern Digital Electronics, M Graw

Reference Books

1. Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)
2. Millman & Halkis, Electronic Devices & Circuits, PHI
3. Malvino Leach, Digital Principles & Applications, Mc Graw Hill
4. Millman & Halkis, Integrated Electronics, MGH

Project Based Learning:

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

To develop a demonstration model on;

1. Potential Divider and Variable DC bias circuit.
2. DC lighting circuit.
3. Automatic LED Emergency Light.
4. Flashing LED.
5. Dancing Light.
6. Voltage regulator using Zener diode.
7. Cascode amplifier using FET.
8. JFET as an analog switch.
9. FET used as a Multiplexer.
10. JFET acts as a current limiter.
11. LDR & Transistors based Light Detector.

12. LDR Based Smart Electronic Candle.
13. Smart Bulb Holder using LDR.
14. MOC3021 Opto-coupler as a solenoid/valve control.
15. Light controller switch using photo-transistor.

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Computer Aided Machine Drawing		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/Week	Internal Assessment	40 Marks	
	Term Work and Practical	50 Marks	01
	Total	150 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Fundamentals of Mathematics 2. Mechanical Engineering systems 3. Computer Aided Drafting and Visualisation
Course Objectives:-	<ol style="list-style-type: none"> 1. To make the students understand and interpret drawings of machine components 2. To prepare assembly drawings both manually and using standard CAD packages 3. To familiarize the students with Indian Standards on drawing practices and standard components
Course Outcomes:-	<p>The students will be able to</p> <ol style="list-style-type: none"> 1. Understand fundamentals of machine drawing and conventional representation of machine elements. 2. Understand concept of Geometric Dimensioning and Tolerancing; and apply in machine drawing. 3. Understand and drawing of component assemblies of given part drawings. 4. Understand and drawing of part details with the help of assembly drawings.

Course Contents

Unit-I	Fundamental of Machine Drawing and Conventional Representation	(10 Hrs)
Introduction to Machine Drawing and its importance, Code of practice for Engineering Drawing, BIS specifications – Materials, Welding Joint and symbols, riveted joints, pipe joints, keys, and screwed fasteners. Conventional Representation of dimensioning and sectioning, breaks in pipes and shafts, Screw Threads, springs, gears, foundation bolts, Common features and machine components.		
Unit-II	Geometric Dimensioning and Tolerancing (GD&T)	(10 Hrs)
<p>Limits, Fits and Tolerances: Introduction, Fundamental tolerances, Deviations, Methods of placing limit dimensions, types of fits with symbols and applications, Geometrical Tolerances on drawings. Standards followed in industry, Interpretation of given symbols on drawing.</p> <p>Characteristics of Surface Roughness- Machining Symbols, Indications of surface roughness and its characteristics, Symbols for directions of lay.</p>		
Unit-III	Details to Assembly Drawing	(14 Hrs)
<p>Classification of Drawings- Machine drawing, Production Drawing, Part Drawing, Assembly drawing, Drawings for catalogues and instruction manuals, patent drawings, Drawing Standards, Introduction to unit assembly drawing, steps involved in preparing assembly drawing from details and vice-versa, Blueprint Readings.</p> <p>Preparation of Assembly Drawings: Universal and Oldham's Couplings, Foot-Step Bearings, Lathe Tool Post, Machine Vice, Pipe Vice, Screw Jack, Single Tool post, Square tool post, Clapper block, Revolving Centre, C-Clamp.</p>		
Unit-IV	Assembly to Details Drawing and Production Drawing	(14 Hrs)
<p>Types of Production Drawings- Detail or Part Drawings, Working Assembly Drawings, Detailed Drawings and Manufacturing Methods.</p> <p>Preparation of Detail or Part Drawings: Plummer Block or Pedestal Bearings, Lathe Tail Stock, Drilling Jig, Piston and Connecting Rod, Gland and Stuffing Box Assembly, Gate valve, Globe valve, Non-Return Valve and Steam Stop Valve.</p>		

Term Work

1. Three A2 size sheets of **Details to assembly** drawing using AutoCAD.
2. Three A2 size sheets of **Assembly to details** drawings using AutoCAD.

Assignments

Minimum **Five** Questions based on each unit in A2 size Sheets

Textbook

1. R.K. Dhavan, "A Textbook of Machine Drawing", S Chand Publication, New Delhi.
2. Gopalakrishna K.R., "Machine Drawing", 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013

References

1. N. D. Bhatt and V.M. Panchal, "Machine Drawing", 48th Edition, Charotar Publishers, 2013
2. Junnarkar, N.D., "Machine Drawing", 1st Edition, Pearson Education, 2004
3. N. Siddeshwar, P. Kanniah, V.V.S. Sastri, "Machine Drawing", published by Tata McGrawHill, 2006
4. S. Trymbaka Murthy, "A Text Book of Computer Aided Machine Drawing", CBS Publishers, New Delhi, 2007

Project Based Learning:

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. To develop chart to represent different types of nuts and bolts conventionally along with industrial real life application.
2. To develop chart to represent different types of springs conventionally along with industrial real life application.
3. To develop chart to represent different types of welded and riveted joints conventionally along with industrial real life application.
4. To develop chart to represent different types of gears conventionally long with industrial real life
5. To develop chart to represent different types of bearings conventionally along with industrial real life application.
6. To develop chart to represent different types of foundation bolt conventionally along with industrial real life application.
7. To collect different types of nuts and bolts available in market, to identify their specifications and application.
8. To obtain industrial drawings to identify the limit, fits, tolerances.
9. To demonstrate geometrical tolerances for different industrial/real life application.
10. To prepare assembly and detail drawing of a given machine tool component.
11. To prepare assembly and detail drawing of a given IC engine component.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Sheet Metal Operations		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical:- 02 Hours/ Week	Term Work	50 Marks	01
	Total	50 Marks	01

Course Prerequisites:-	The student should have 1. Basic knowledge of workshop tools. 2. Basic knowledge of Materials
Course Objectives:-	1. The student should understand various tools, operations and use them for carrying out sheet metal operations.
Course Outcomes:-	The students should be able to— 1. Understand the knowledge of marking, cutting, holding tools and machines used in sheet metal industry. 2. Understand the types and use of rivets in sheet metal industry. 3. Understand the principle, construction of dies used in press working operations.

Course Contents

Unit-I	First Aid, Sheet Metal Equipment's and Rivets	(12 Hrs.)
General safety precautions and precautions for sheet metal industry. Measuring, marking, cutting and holding tools. Bench Work and Fitting Tools, Gauges, Introduction to machines in sheet metal Industry: shearing machine, bending machine, circular profile cutting machines. Different types of sheet metal folds. Rivets and its different parts, selection of rivet heads, types of rivets and its uses.		
Unit-II	Introduction to Press Working	(12 Hrs.)
Punching, blanking, shearing, bending and piercing. Punch & Die tolerance and clearance. Introduction to Dies: Simple Dies, Compound Dies, Progressive Dies. Types of presses.		

Term Work: List of Experiments

1. Cutting different types of shapes with hand snip.
2. Practical on bending machine
3. Practical on shearing machine
4. Practical on profile cutting machine.
5. Making hole with solid punch and round punch.
6. Practice for riveting.
7. Practical for making components from sheet metal.
8. Demonstrations of press working operations such as Punching, blanking operations.

Text Books:

1. Khanna O.P. and Lal. M., " Production Technology", Dhanpatrai Publications (P) Ltd., New Delhi.
2. Jain R.K., "Production Technology", Khanna Publishers, Delhi.
3. Choudhary Hajra S. k., Choudhary Hajra A. k. "Elements of Workshop Technology Vol 1 Manufacturing Processes, Publisher: Media Publishers & Promoters, India.
4. Choudhary Hajra S. k., Choudhary Hajra A. k. "Elements of Workshop Technology Vol 2 Machine Tools, Publisher: Media Publishers & Promoters, India.
5. Rajput R. K., "Manufacturing Technology", Laxmi Publications (P)Ltd, New Delhi.
6. Chapman W.A.J "Workshop Technology "volume I, II, III, ELBS.

Designation of Course	Soft Computing- II		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical: -02 hours/Week	Term Work and Practical	75 Marks	01
	Total	75 Marks	01

Course Prerequisites: -	Basic Mathematics
Course Objective: -	The goal of the course is that students should develop techniques for problem solving using a programming language.
Course Outcomes	<p>Students should</p> <ol style="list-style-type: none"> 1. Understand the concept of pointers and apply them to locate variables in memory. 2. Apply the concepts of pointers in functions 3. Understand the concept of one-dimensional arrays and apply them in writing programs 4. Understand the concept of multidimensional arrays and apply them in writing programs 5. Understand the concept of classes and apply them in writing programs 6. Understand the concept of objects and apply them in writing programs

Course Contents

Unit-I	Pointers I	(04 Hrs.)
Data Variables and memory; Address operator: &		
Unit-II	Pointers II	(04 Hrs.)
Pointers; Functions, pointers and Indirection Operators		
Unit-III	Arrays	(04 Hrs.)
Arrays Fundamentals; Arrays and Functions; Character Arrays		
Unit-IV	Multidimensional Arrays	(04 Hrs.)
Multidimensional Arrays; Multidimensional Arrays and Functions; Array filling from data files		
Unit-V	Classes I	(04 Hrs.)
Objects and classes; Class members; Class Destructors		
Unit-VI	Classes II	(04 Hrs.)
Array of objects; Overloaded operators and objects		

Term Work

Term work shall consist programs (not limited to) listed below based on syllabus.

1. C++ Program to Calculate Average of Numbers Using Arrays
2. C++ Program to Find Largest Element of an Array
3. C++ Program to Calculate Standard Deviation
4. C++ Program to Add Two Matrix Using Multi-dimensional Arrays
5. C++ Program to Multiply Two Matrix Using Multi-dimensional Arrays
6. C++ Program to Find Transpose of a Matrix
7. C++ Program to Multiply two Matrices by Passing Matrix to Function
8. C++ Program to Access Elements of an Array Using Pointer
9. C++ Program to Swap Numbers in Cyclic Order Using Call by Reference
10. C++ Program to Find the Frequency of Characters in a String
11. C++ Program to Find the Number of Vowels, Consonants, Digits and White Spaces in a String
12. C++ Program to Remove all Characters in a String Except Alphabets.

13. C++ Program to Find the Length of a String
14. C++ Program to Concatenate Two Strings
15. C++ Program to Copy Strings
16. C++ Program to Sort Elements in Lexicographical Order (Dictionary Order)
17. C++ Program to Store Information of a Student in a Structure
18. C++ Program to Add Two Distances (in inch-feet) System Using Structures
19. C++ Program to Add Complex Numbers by Passing Structure to a Function
20. C++ Program to Calculate Difference Between Two Time Period
21. C++ Program to Store and Display Information Using Structure
22. Increment ++ and Decrement -- Operator Overloading in C++ Programming
23. C++ Program to Subtract Complex Number Using Operator Overloading

TextBooks

1. "Let Us C++", KanetkarYashavant, BPB Publications

Reference Books

1. "C++ programming Today", Barbara Johnston, Prentice Hall of India, New Delhi.
2. "C++ how to program", Paul Deitel and Henry Deitel, Prentice Hall of India, New Delhi.
3. "Accelerated C++: Practical Programming by Example", Andrew Koenig and Barbara E. Moo, Addison-Wesley Publications
4. "C++: The Complete Reference", Herbert Schildt, McGraw Hill Publications.
5. "C++ Primer"; Barbara E. Moo, JoséeLajoie and Stanley B. Lippman; Addison-Wesley Professional
6. "Programming: Principles and Practice Using C++", BjarneStroustrup, Addison-Wesley Professional

Bharati Vidyapeeth
(Deemed to be University), Pune, India
College of Engineering, Pune
Department of Mechanical Engineering

Vision of the Department

To develop high quality Mechanical Engineers through dynamic education to meet social and global challenges

Mission of the Department

- To provide extensive theoretical & practical knowledge to the students with well-equipped laboratories & ICT tools through motivated faculty members
- To inculcate aptitude for research, innovation and entrepreneurial qualities in students
- To acquaint students with ethical, social and professional responsibilities to adapt to the demands of working environment.

Name of Programme: B. Tech. Mechanical Engineering

Programme Educational Objectives (PEOs)

- To fulfill need of industry and society with theoretical & practical knowledge
- To perform research, innovation, lifelong learning and continued professional development
- To fulfill professional ethics and social responsibilities

Programme Outcomes (POs)

The graduates will be able to

- a.* apply knowledge of mathematics, science and engineering fundamentals for solving complex engineering problems
- b.* identify the need, plan and conduct experiments, analyze data for improving the mechanical processes.
- c.* design and develop mechanical systems considering social and environmental constraints.
- d.* design and develop a complex mechanical system using research based knowledge, advanced mathematical, statistical tools and techniques.

- e.* use information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance.
- f.* know social responsibilities while doing professional engineering practices.
- g.* familiarize with eco-friendly, sustainable and safe working environment.
- h.* take into account professional ethics while designing engineering systems.
- i.* work efficiently as a group leader as well as an individual.
- j.* communicate in written and verbal form with subordinates and supervisors.
- k.* apply project and finance management techniques in multidisciplinary environments.
- l.* take interest in higher education and update the knowledge.

Programme Specific Outcomes (PSOs)

- Apply the knowledge of thermal, design, manufacturing engineering and computational sciences to solve Mechanical Engineering problems.
- Apply Mechanical Engineering principles for research, innovation and develop entrepreneurial skills.
- Apply concepts of Mechanical Engineering to assess societal, environmental, health, safety issues with professional ethics.

B. Tech. Mechanical Sem.-III

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Thermodynamics-Principles	4	2	-	60	40	-	50	-	150	4	1	-	5
2		Mechanisms of Machines*	4	2	-	60	40	-	50	-	150	4	1	-	5
3		Mechanics of Fluids	4	2	-	60	40	-	-	50	150	4	1	-	5
4		Manufacturing Technology [@]	3	-	-	60	40	-	-	-	100	3	-	-	3
5		Strength of Machine Components	3	2	1	60	40	25#	-	-	125	3	1	1	5
6		Manufacturing Technology Laboratory	-	2	-	-	-	25#	-	-	25	-	1	-	1
7		Python Programming-I	-	4	-	-	-	-	-	50	50	-	2	-	2
8		Vocational Course-I ^{\$} (Automobile Servicing-I)	-	-	-	-	-	-	50	-	50	-	2	-	2
9		MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	2
10		Environmental Studies (Mandatory Course) ⁺	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			18	14	1	300	200	50	150	100	800	18	9	1	30

*End Sem. Examination of 4 Hrs; [@] Industry Taught Course-I; ^{\$} To be conducted in service centre after office hours: 4 hrs/week; ⁺ End sem. Exam. of 100 marks

B. Tech. Mechanical Sem.-IV

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Thermodynamics-Applications	4	2	-	60	40	-	50	-	150	4	1	-	5
2		Machine Design & Analysis-I*	4	2	-	60	40	-	50	-	150	4	1	-	5
3		Science of Engineering Materials	4	-	-	60	40	-	-	-	100	4	-	-	4
4		Entrepreneurship Development Skills [@]	3	-	-	60	40	-	-	-	100	3	-	-	3
5		Theory of Machines	3	2	1	60	40	-	50	-	150	3	1	1	5
6		Solid Modelling	-	4	-	-	-	-	-	50	50	-	2	-	2
7		Python Programming-II	-	4	-	-	-	-	-	50	50	-	2	-	2
8		Vocational Course-II ^{\$} (Automobile Servicing-II)	-	-	-	-	-	-	50	-	50	-	2	-	2
9		Social Activities-I	-	-	-	-	-	-	-	-	-	-	-	-	2
10		Disaster Management (Mandatory Course) ⁺	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			18	14	1	300	200	-	200	100	800	18	9	1	30

*End Sem. Examination of 4 Hrs; [@] Industry Taught Course-I; ^{\$} To be conducted in service centre after office hours: 4 hrs/week; ⁺ End sem. Exam. of 100 marks

Designation of Course	Thermodynamics Principles		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work and Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites:	<ol style="list-style-type: none"> 1. Engineering Mathematics. 2. Engineering Physics.
Course Objectives: -	<p>To provide knowledge about</p> <ol style="list-style-type: none"> 1. Laws of thermodynamics & their applications. 2. Properties of pure substances & vapor processes. 3. Fuels and concepts of combustion.
Course Outcomes: -	<p>On completion of the course, students will be able to–</p> <ol style="list-style-type: none"> 1. Understand concepts of first law of thermodynamic and its application. 2. Understand concepts second law of thermodynamics, entropy and availability. 3. Apply the knowledge of Properties of steam for different vapor Processes. 4. Apply the knowledge of properties of steam for different power cycles. 5. Understand the different air standard cycles and analyze it. 6. Understand the different type of fuels, concepts of combustion and analyze exhaust gas composition.

Course Contents

Unit-I	First Law of Thermodynamics	(08 Hrs.)
<p>Introduction of thermodynamics, Review of basic definitions, (State, Process, Cycle, Path, Quasi- static process, path fiction and point function, Equilibrium), energy and work transfer, zeroth law of thermodynamics, statement of first law of thermodynamics, Joule's experiment, Limitations of first law of thermodynamics.</p> <p>Reversibility and Irreversibility, Applications of first law to flow and non-flow processes and cycles. Steady flow energy equation and its application to different devices (Boiler, Diffuser, Turbine, Compressor, Condenser, throttling process), PMM-I.</p>		
Unit-II	Second Law of Thermodynamics, Entropy and Availability	(08 Hrs.)
<p>Heat engine, refrigerator and heat pump, Kelvin-Planck's statement & Clausius statement, equivalence of Kelvin-Planck's and Clausius statements, perpetual motion machine of second kind (PMM-II), Carnot cycle & Carnot heat engine.</p> <p>Entropy: Clausius Theorem, Entropy as a property, second law analysis for entropy, Clausius inequality, principle of increase of entropy, irreversibility, Temperature – Entropy relation, Third law of thermodynamics.</p> <p>Availability: High- and low-grade energy, available and unavailable energy, loss of available energy due to heat transfer through a finite temperature difference.</p>		
Unit-III	Properties of Pure Substances and Vapor Processes	(08 Hrs.)
<p>Formation of steam, Phase changes, Properties of steam, Use of Steam Tables, Study of P-v, T-s and Mollier diagram for steam, use of P-V, T-S, H-S diagrams for Pure substance, Dryness fraction and its determination, Study of steam calorimeters (Barrel, Separating, Throttling, and combined).</p> <p>Non flow and steady flow vapor processes, constant Pressure Process, constant volume Process, constant temperature Process, Isentropic Process, Polytrophic Process, Hyperbolic Process, work transfer & heat transfer.</p>		

Unit-IV	Vapor Power Cycles	(08 Hrs.)
Carnot cycle, Rankine cycle, Comparison of Carnot cycle and Rankine cycle, Efficiency of Rankine cycle, Relative efficiency, Performance parameters of vapor power cycle, Effect of operating variables on Rankin cycle (Superheating, Boiler pressure, condenser pressure).		
Unit-V	Air Standard Cycles	(08 Hrs.)
Analysis of Air standard cycle, Efficiency and Mean Effective Pressure, Carnot Cycle, Otto Cycle, Diesel cycle, Dual cycle, Comparison of cycles, Atkinson Cycle, Ericsson Cycle, Brayton cycle, Sterling Cycle		
Unit-VI	Fuels and Introduction to Combustion	(08 Hrs.)
Solid- Biomass, Coal types, liquid: petrol, diesel, bio-oil, their Application, Gas: Bio-gas, low calorific value gases, LPG, CNG, and their application. Properties of fuels, Mass fraction, mole fraction, combustion equation, theoretical air, excess and deficient air, stoichiometric and actual air to fuel ratio, Measurement of calorific value of fuels, analysis of products of combustion, gravimetric and volumetric analysis and their conversions, method to determine flue gas analysis - CO, CO ₂ , O ₂ , HC, NO _x , smoke.		

Term Work

Term work shall consist of following **eight** experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. First laws of thermodynamics apply to steady flow energy equation.
2. Study of different types of steam calorimeters.
3. Determination of dryness fraction using any commercially available test rig.
4. Determination of calorific value using bomb calorimeter.
5. Study of Boy's gas calorimeter.
6. Study and demonstration of exhaust gas analysis by using any commercially available test rig.
7. Demonstration of smoke meter
8. Study of Orsat apparatus.
9. Study and Demonstration of Flash Point.
10. Study and Demonstration of Pour Point.

Assignment:

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

3. Steady flow energy equation with applications
4. Concept of second law of thermodynamics, entropy.
5. Vapour processes.
6. Rankine cycle and vapour power cycle.
7. Air standard cycles.
8. Combustion of fuels.

Text Books

1. V. P. Vasandani and D. S. Kumar, Heat Engineering Metropolitan Book Company, New Delhi.
2. R S Khurmi and J K Gupta, Textbook of Thermal Engineering, S Chand publications.

Reference Books

1. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications.
2. Y. A. Cengel & M.A. Boles, Thermodynamics -An engineering approach, Tata McGraw Hill Publications.
3. Rayner Joel, Engineering Thermodynamics, ELBS Longman.
4. R. K. Rajput, Engineering Thermodynamics, Laxmi Publications.

5. Kothandarman & S. Domkundwar, "Thermal Engineering" Dhanpat Rai and Sons.
6. P. L. Ballaney, Thermal Engineering, Khanna Publications.

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. To demonstrate steady flow energy equation for engineering applications such as heat exchangers, turbo machinery, boiler, etc.
2. To demonstrate first law of thermodynamic by using Joule's experiment.
3. To demonstrate first law of thermodynamic through real life application such as heating of water using a cook stove, operation of a boiler, operation of a turbo machinery, etc.
4. To demonstrate second law of thermodynamic through real life application. (Kelvin-Planck's statement)
5. Demonstration second law of thermodynamic through real life application. (Clausius statement)
6. To demonstrate Boyle's law.
7. To demonstrate Charles's law.
8. To prepare a chart on identification of gas/vapour processes in various real-life applications such as boiler, steam turbine, gas turbine, IC engine cylinder, etc.
9. To prepare a chart on comparison among different air standard cycles for given conditions.
10. To determine calorific values of different types of solid and liquid fuels.

Unit Test

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Mechanisms of Machines		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/Week	Internal Assessment	40 Marks	
	Term Work and Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Mathematics 2. Engineering Physics 3. Engineering Mechanics
Course Objectives:-	<ol style="list-style-type: none"> 1. To make the students conversant with kinematic analysis of mechanisms applied to real life and industrial applications. 2. To develop the competency to analyse the velocity and acceleration in mechanisms using analytical and graphical approach. 3. To develop the competency to analyse the friction clutches, Brakes, dynamometer and flywheel.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Understand the fundamental concept of Lower pair mechanisms and apply to real life and industrial applications. 2. Understand the basic concept of kinematic analysis and evaluate forces acting on reciprocating engine by graphical and analytical method. 3. Understand the concept of velocity and acceleration of any planar mechanism and analyze it graphically by using relative velocity - acceleration method and ICR method, Coriolis component of acceleration. 4. Understand the concept of friction and apply it in application of clutches. 5. Apply the concept of friction to analyze different parameter in Brakes and Dynamometer 6. Understand the fundamental concept of Turning moment diagram and flywheel; and evaluate coefficient fluctuation speed and energy.

Course Contents

Unit-I	Mechanisms with Lower Pair	(08 Hrs.)
<p>Introduction, Pantograph, Straight line mechanisms- Exact and Approximate, Hook Joint, Double Hook's Joint, Steering gear mechanisms: Condition for correct steering, Davis steering gear mechanism, Ackermann steering gear mechanism.</p> <p>Theory and analysis of Compound Pendulum, Concept of equivalent length of simple pendulum, Bifilar suspension, Trifilar suspension.</p>		
Unit-II	Inertial Forces in Reciprocating Parts	(08 Hrs.)
<p>Analytical method for displacement, velocity and acceleration analysis of slider cranks Mechanism. Klein's construction. Dynamics of Reciprocating Engines: Two mass statically and dynamically equivalent system, Correction couple, static and dynamic force analysis of reciprocating engine mechanism, Torque Exerted on crankshaft.</p>		
Unit-III	Kinematic Analysis of Mechanisms: Graphical Methods	(08 Hrs.)
<p>Relative Velocity Method: Relative velocity of a point on a link, Angular velocity of a link, Sliding velocity, Velocity polygons for simple mechanisms.</p> <p>Relative Acceleration Method: Relative acceleration of a point on a link, Angular acceleration of a link, Acceleration polygons for simple mechanisms.</p> <p>Coriolis component of acceleration.</p> <p>Instantaneous Centre of Rotation (ICR) Method(limit to only 6 link mechanisms)- Kennedy's Theorem, Body and space centre.</p>		

Unit-IV	Friction Clutches	(08 Hrs.)
<p>Friction: Friction in turning pair, friction circle, friction axis, friction in slider crank mechanism. Pivot and collar friction.</p> <p>Friction clutches- design considerations, Classification of Clutches, torque transmitting capacity of – Single plate and multi-plate clutch, cone clutch and centrifugal clutch</p>		
Unit-V	Brakes and Dynamometers	(08 Hrs)
<p>Brakes-Introduction, Classification of brakes, material for brake lining, types of brakes, braking torque of - shoe brakes, internal shoe brake, disc brake.</p> <p>Dynamometer-Types of dynamometers, brake power of absorption and transmission type dynamometers – prony brake, rope brake, belt transmission.</p>		
Unit-VI	Turning Moment Diagrams and Flywheel	(08 Hrs.)
<p>Introduction, Turning Moment Diagrams for different types of Engines, Fluctuations of Energy and Speed of Crankshaft, Coefficient of fluctuation of Energy and speed.</p> <p>Flywheel-Introduction, Coefficient of fluctuation of speed, Energy stored in flywheel, dimensions of flywheel rim, Flywheel in punching press.</p>		

Term Work

The following experiments shall be performed

1. Compound Pendulum
2. Bifilar Suspension Method
3. Trifilar Suspension Method
4. Velocity and acceleration analysis using Graphical methods by Klein's construction
5. Velocity analysis using Graphical methods by ICR.
6. Velocity and acceleration analysis using Graphical methods by Polygon method.
7. Velocity and acceleration analysis using Graphical methods i.e., polygons involving Coriolis component.
8. To determine Coriolis's Component of Acceleration at various speeds of rotation and water flow rates.
9. To measure torque transmitting capacity of friction clutch experimentally.
10. Velocity and acceleration analysis of slider cranks mechanism using Computer programming.
11. Tutorial on Turning Moment Diagrams and Flywheel with computer programming
12. Mini-project based on contents of Syllabus.

Assignment

Numerical and/or theory questions on each unit from previous year question papers of GATE/ESE Mechanical Engg. examinations.

Reference Books

1. Thomas Bevan, "Theory of Machines", CBS Publishers & Distributors, Delhi.
2. Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw Hill, Inc.
3. Ghosh Amitabh and Malik A.K., "Theory of Machines and Mechanisms", East-west Press.
4. Hall A.S., "Kinematics and Linkages Design", Prentice-Hall.
5. Erdman, A. G. & Sandor, G.N., "Mechanism design, Analysis and synthesis", Vol 1, Prentice – Hall of India.

Text Books

1. Rattan S. S., "Theory of Machines", Tata McGraw Hill.
2. Ballaney P. L., "Theory of Machines", Khanna Publishers, Delhi.
3. R. S. khurmi, "Theory of Machines", S Chand Publication.

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. To develop demonstration model of Pantograph mechanism
2. To develop demonstration model of Ackerman steering gear mechanism.
3. To develop demonstration model of Davis steering gear mechanism.
4. To develop demonstration models of exact straight line motion mechanism.
5. To develop demonstration model to understand Coriolis's Effect.
6. To prepare chart on comparison among different types of clutches with their application.
7. Case study on real life application of clutches used in automobile.
8. To develop demonstration model of Prony brake dynamometer
9. Case study on real life application of Brakes used in automobile.
10. To prepare chart on comparison among different types of dynamometer.
11. To develop demonstration model of flywheel energy storage system.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Mechanics of Fluids		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work and Practical	50 Marks	01
	Total	150 Marks	05

Course Prerequisites: -	<ol style="list-style-type: none"> 1. Engineering Mathematics 2. Engineering Physics 3. Engineering Mechanics
Course Objectives: -	<p>To provide knowledge about</p> <ol style="list-style-type: none"> 1. Properties of fluids, concepts of fluid statics, kinematics & dynamics 2. Concepts of laminar & turbulent fluid flows 3. Flow around immersed bodies and boundary layer flow 4. Dimensional analysis
Course Outcomes: -	<p>On completion of the course, students will be able to–</p> <ol style="list-style-type: none"> 1. Understand properties of fluids and analyze concepts of fluid statics. 2. Understand concepts related to fluid kinematics and analyze practical problems. 3. Understand concepts related to fluid dynamics and analyze practical problems. 4. Understand concepts related to laminar flow, flow around immersed bodies and analyze practical problems. 5. Understand concepts related to flow through pipes, dimensional analysis and analyze practical problems. 6. Understand concepts related to turbulent flows, boundary layer theory and analyze practical problems.

Course Contents

Unit-I	Properties of Fluids & Fluid Statics	(08 Hrs.)
<p>Properties of Fluid: - Definition of fluid, concept of continuum, Density, Specific Weight, Specific Gravity, Dynamic Viscosity, Kinematic Viscosity, Newton's law of viscosity, types of fluid, Rheological diagram, Surface Tension, Capillarity, Compressibility, Vapour pressure, Classification of fluid.</p> <p>Fluid Statics: Hydrostatic law, Pascal's Law, Pressure at a point, Total Pressure, Centre of pressure, Liquid pressure on a plane(Horizontal, Vertical, Inclined) & Curved surfaces, Archimedes Principle, Buoyancy and stability of floating and submerged bodies, Metacentric height.</p>		
Unit-II	Fluid Kinematics	(08 Hrs.)
<p>Description of fluid motion- Eulerian and Lagrangian approach, Types of flow (steady, unsteady, uniform, non-uniform, laminar, turbulent, One, Two and Three dimensional, compressible, incompressible, rotational, Irrotational), Continuity equation in Cartesian co-ordinates, flow net, Control volume, Material derivative and acceleration, Visualization of flow field (Stream, Path and Streak line), velocity in two-dimensional flow, stream function and velocity potential function.</p>		
Unit-III	Fluid Dynamics	(08 Hrs.)
<p>Linear momentum Equation using differential Approach, Introduction to Navier-Stoke's Equation, Euler equation of motion. Derivation of Bernoulli's equation along a streamline, application of Bernoulli's equation to Pitot tube, Venturimeter, Orifice meter, Triangular Notch & Rectangular Notch (Without considering Velocity of Approach), Concept of HGL and THL or TEL.</p>		
Unit-IV	Laminar Flow & Flow around Immersed Bodies	(08 Hrs.)
<p>Definition, relation between pressure and shear stresses, laminar flow through round pipe, fixed parallel plates. Introduction to CFD Methodology (Elementary Treatment). Forces on immersed bodies: -Lift and Drag, Classification of Drag, Flow around circular cylinder and Aerofoil, Development of lift on Aerofoil.</p>		

Unit-V	Flow Through Pipes & Dimensional Analysis	(08 Hrs.)
Energy losses through pipe-Major and Minor losses, Pipes in series and parallel, Darcy-Weisbach equation, Moody diagram, Syphon, Transmission of power, Water hammer in pipes Dimensional Analysis: Dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham pi Theorem, Important dimensionless numbers, Model analysis (Reynolds, Froude and Mach).		
Unit-VI	Turbulent Flow, Boundary Layer Flow	(08 Hrs.)
Boundary layer, Laminar and Turbulent flow, Velocity distribution, Development of boundary layer on a flat plate, Boundary layer thickness-displacement, Momentum and Energy, Laminar sub layer, Separation of boundary layer and Methods of controlling, Introduction to compressible fluid flow.		

Term Work

Term work shall consist of following **eight** experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. Study of Pressure Measuring Devices.
2. Measurement of Viscosity using Redwood Viscometer.
3. Stability of Floating Bodies and Optimum Loading Capacity.
4. Verification of Modified Bernoulli's Equation.
5. Calibration on Venturi meter.
6. Calibration of Orifice meter.
7. Laminar and Turbulent Flow by Reynold's Apparatus.
8. Discharge over Notches.
9. Study of Minor Losses due to Pipe Fitting.

Assignment:

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Fluid statics
2. Fluid kinematics.
3. Venturimeter & orifice meter.
4. Laminar flow and flow around Immersed bodies.
5. Flow through pipes and Dimensional analysis.
6. Boundary conditions for the velocity profiles.

Text Books

1. Dr. R.K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines ", Laxmi Publication Pvt. Ltd., New Delhi.
2. R.K. Rajput, A Textbook of Fluid Mechanics and Hydraulic Machines, S. Chand & Company Ltd. New Delhi.

Reference Books:

1. Streeter V. L. and Wylie E. B. Fluid Mechanics McGraw Hill International Book Co.
2. Yunus Cengel, Jhon Cimbala, Fluid Mechanics, Tata McGraw Hill, New Delhi.
3. Streeter & Wylie, Fluid Mechanics, Tata McGraw Hill.
4. Frank White, Fluid Mechanics, McGraw Hill.
5. Dr. P.N. Modi and Dr. S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House.
6. Garde R. J. and Mirajgaonkar, Engineering Fluid Mechanics, Nem Chand & Bros, Roorkee, SCITECH, Publication (India) Pvt. Ltd.

Project Based Learning:

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. To demonstrate Pascal's law through real life application such as hydraulic jack, hydraulic press, hydraulic lift, etc.
2. To demonstrate Archimedes's Principle through real life application.
3. To prepare an experimental setup for measurement of viscosity of different oils.
4. To demonstrate different types of fluid flow through Reynold's experiment.
5. To prepare a chart on real life application of different types of fluid flows and its characteristics.
6. To measure the flow velocity using Pitot tube.
7. To prepare a chart on real life application on fluid flow measuring devices.
8. To develop demonstration model for turbulent and laminar flow.
9. To develop demonstration model of simple viscous damper for earthquake resistance.
10. To prepare a chart for industrial applications of Pascal's law.

Unit Test –

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	ITC-I: Manufacturing Technology		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
	Internal Assessment	40 Marks	
	Total	100 Marks	03

Course Prerequisites:-	The student should have basic knowledge of 1. Manufacturing Processes. 2. Machining Processes.
Course Objectives:-	The student should 1. To acquire the knowledge of Foundry Technology. 2. To acquire the knowledge of hot working and cold working processes. 3. To acquire the knowledge of lathe, drilling, milling, and abrasive machining.
Course Outcomes:-	The students should be able to– 1. Understand the pattern making and mold making. 2. Understand the various casting processes and apply the best casting process for a specific product. 3. Understand the hot working and cold working processes and apply them in Manufacturing. 4. Understand different operations on lathe machine and apply them to create the job. 5. Understand different operations of drilling machine and milling machine and apply them to create the job. 6. Understand various grinding machines and plastic moulding machine and apply them for create the shape.

Course Contents

Unit-I	Pattern and Mould Making	(06 Hrs.)
Introduction to casting, Foundry Layout, Foundry departments and sections, Pattern and pattern making, Design and allowances for patterns, Colour codes for patterns, Storage of patterns. Moulding sand and core sands, Sand control Test, Core and core making –Introduction, Core making Procedure, Types of cores, Core print, Core boxes. Mould and mould making- Moulding Methods, Moulding processes, Design of Gating System.		
Unit-II	Sand Casting and Die Casting Practice	(06 Hrs.)
Sand Casting Practice: Melting furnaces and their selection, Cupola furnace, Induction melting furnaces, Advantages, Limitations, applications, pouring practice and equipment's, Ladle technology, Strike out, Fettling, Cleaning and Surface preparation of castings, Defects in castings. Die Casting Practice: Pressure and gravity die casting, Shell mould casting, Investment casting, Continuous casting, centrifugal casting, Applications, Merits and limitations.		
Unit-III	Hot and Cold Working Processes	(06 Hrs.)
Hot Working Processes: Principle rolling, forging - drops, press, upset. Rolling, forging- extrusion, drawing, spinning, Angle of Contact of rolling, effect of hot working. Cold Working Processes: Cold rolling, swaging, forges extrusion- forward backward impact. Roll forging, tube drawing, wire drawing, spinning, shot peening, high energy rate forming, Stresses in wire drawing operations		

Unit-IV	Theory of Metal Cutting	(06 Hrs.)
Introduction, function, types, construction, accessories, operations, thread cutting, single and multi-start thread cutting, different tools, tool materials, Tool Geometry- Single Point cutting tool, Tool Wear and Tool Life, Mechanics of Metal cutting- Merchant's Circle Diagram, concept of speed, feed, depth of cut. Introduction to Boring Machines- general arrangement and nature of work done.		
Unit-V	Drilling and Milling Machines	(06 Hrs.)
Drilling Machines: Fundamentals of drilling process, twist drill geometry, tool holders, Types of drilling machines, drilling operations. Types of drills, reaming process. Milling Machines: Fundamentals of milling process, cutters-types and geometry, Operations performed on milling machines. Dividing head, methods of indexing.		
Unit-VI	Abrasive Machining Processes, Plastics & Plastic Moulding	(06 Hrs.)
Abrasive Machining Processes: Abrasive machining, abrasives -types, size and geometry, Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, grinding faults, Honing, lapping, super finishing, buffing, burnishing process. Plastics & Plastic Moulding: Moulding characteristics of plastic, Moulding process- compression, transfer and injection blow moulding. Mould design- Materials and construction, bulk factor, shrinkage, moulding parameters, moulding machines, extruders.		

Assignments:

1. Pattern and Mould Making.
2. Sand Casting and Die Casting Practice.
3. Hot Working processes and Cold Working Processes.
4. Turning, boring related process.
5. Drilling Machines.
6. Milling Machines.
7. Abrasive Machining Processes and superfinishing processes.
8. Plastics & Plastic Moulding.

Text Books:

1. O. P. Khanna, A text book of Foundry Technology, Dhanpat Rai and Sons
2. P. C. Sharma, Production Engineering, S. Chand Publications
3. R. K. Jain, Production Technology, Khanna Publishers

Reference Book

1. P. N. Rao, Manufacturing Technology- Vol 1, McGraw Hill Education (India) Private Limited
2. P. N. Rao, Manufacturing Technology, Vol- II, McGraw Hill Education (India) Private Limited
3. G. R. Nagpal, Tool Engineering and Design, Khanna Publishers
4. B. S. Raghuvanshi, Workshop Technology, Vol-II, Dhanpat Rai & Co.
5. Hajra Chaudhari, Workshop Technology, Vol.-II
6. Roy A. Lindberg, Process & Materials of Manufacture, PHI
7. E. P. DeGrmo, J. T. Black and A. Kosher, Material and processes in manufacturing, PHI
8. HMT Handbook, Production Technology, TMH

Project Based Learning:

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

- 1 To develop a pattern of a any component using different types of material.
- 2 To develop a core part by using different types of materials.

- 3 To develop a demonstration model of gating system for any mechanical component.
- 5 To develop a demonstration model of Cupola furnace
- 6 To develop a demonstration model of pouring equipment's.
- 7 To prepare a flowchart for investment casting process
- 8 To develop a demonstration model of centrifugal casting
- 9 To develop a demonstration model of wire drawing process
- 10 To develop a demonstration model of mechanical press
- 11 To develop a demonstration model of short penning process
- 12 To develop a demonstration model of different types of rolling mills
- 13 Case study on different types of tools for thread cutting operations
- 14 To prepare a chart on concept of single point cutting tools & its geometry
- 15 To develop a demonstration model of mini bench tapping machine
- 16 To develop a demonstration model of milling mechanisms for vertical/horizontal movement
- 17 To develop a demonstration model of indexing mechanism
- 19 To develop a demonstration model of plastic molding machine
- 20 To develop a demonstration model of buffing machine
- 21 To develop a demonstration model of abrasive belt grinder

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Strength of Machine Components		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical: - 02 Hours/Week	Assignments Internal	40 Marks	
Tutorial: - 01 Hours/ Week	Term Work	25 Marks	01
	Tutorial	-	01
	Total	125 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Mathematics 2. Engineering Mechanics 3. Engineering Science
Course Objectives:-	<ol style="list-style-type: none"> 1. Understand simple and principal stress and strain 2. Able to find principal stresses on any oblique plane by analytical and graphical method. 3. Able to draw shear force and bending moment diagram and find slope and deflection of beam 4. Able to draw bending stress and shear stress diagram at different cross section in I, C and T section beam. 5. Able to find stresses in shaft in torsional, combined torsional and bending, combined torsional and axial loading. 6. Able to solve problems on strain energy and Euler's column.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Understand the concept of simple stress and strain and apply to find it for simple component. 2. Understand the concept of principal stress analytical and graphical by Mohr's circle; and apply it to find stresses on any oblique plane inclined to principal plane. 3. Understand the concept of shear force and bending moment and apply it to find shear force diagram and bending moment diagram for any loading condition on simply supported beam and cantilever beam. 4. Understand the concept of slope and deflection and apply it to find for any loading condition on simply supported beam and cantilever beam by maculays double integration method 5. Understand the concept of pure bending and shear and apply it to find bending stress and shear stress diagram of I, C and T section of beam. 6. Understand the concept of column theory and strain energy and apply it for loading condition.

Course Contents

Unit-I	Simple Stress and Strain	(06 Hrs)
<p>Load, Direct or normal stress, Direct strain, Sign convention for direct stress and strain, Elastic materials, Hooke's law, Modulus of elasticity - Young's modulus, Tensile test, Ductile materials, Brittle materials, Poisson's ratio, Application of Poisson's ratio to a two-dimensional stress system, Shear stress, Shear strain, Modulus of rigidity, Relationship Between E, G and K, Double shear, Allowable working stress - factor of safety, Load factor, Thermal stresses,</p>		
Unit-II	Principal Stresses, Theories of Failure	(06 Hrs)
<p>Principal Stresses: Introduction to principal stresses with application, Transformation of Plane Stress, Principal Stresses, and planes (Analytical method and Mohr's Circle), Stresses due to combined Normal and Shear stresses.</p> <p>Theories of Elastic failure: Introduction to theories of failure with application, Maximum principal stress theory, Maximum shear stress theory, Maximum distortion energy theory, Maximum principal strain theory, Maximum strain energy theory.</p>		

Unit-III	Shear Force and Bending Moment Diagram, Slope and Deflection	(06 Hrs)
Types of supports and beams, shear force (S.F.), bending moment (B.M.), S.F. and B. M. sign convention, S.F. and B.M. diagrams for beams carrying different loading conditions. Points of contra flexure, Relationship between S.F, B.M. and intensity of loading. Introduction, Simple bending theory, Neutral axis, Section modulus, second moment of area, Relationship between loading, S.F., B.M., slope and deflection, Double integration method, Macaulay's method for all loading conditions.		
Unit-IV	Stresses in Beams, Thin and Thick cylinders	(06 Hrs)
Bending stresses: Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections (rectangular, I,T,C) with respect to centroidal and parallel axes, bending stress distribution diagrams, moment of resistance and section modulus. Shear stresses: Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange and web. Concept of shear centre, Stresses and deformation in Thin Cylindrical and Spherical shells subjected to internal pressure.		
Unit-V	Torsion	(06 Hrs)
Simple torsion theory, Polar second moment of area, Shear stress and shear strain in shafts, Section modulus, Torsional rigidity. Principal stresses, Strain energy in torsion, Variation of data along shaft length-torsion of tapered shafts, Power transmitted by shafts. Stresses in solid circular shaft- Torsional load only, bending load only, combined torsional and bending, Combined Torsion and axial loading.		
Unit-VI	Euler's Columns and Strain Energy	(06 Hrs)
Concept of buckling of columns, derivation of Euler's formula for buckling load for column with hinged ends, concept of equivalent length for various end conditions, limitations of Euler's formula, Rankine's formula, safe load on columns. Strain energy: Strain energy due to axial load (gradual, sudden and impact), Strain energy due to self-weight.		

Term Work

Term work shall consist of following experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. Tension test for ductile materials
2. Tension test for brittle materials
3. Compression test for ductile materials
4. Compression test for brittle materials
5. Shear test for ductile materials
6. Shear test for brittle materials
7. Torsion test for ductile materials
8. Torsion test for brittle materials
9. Impact Test- IZOD and Charpy
10. Strain Gauge and rosettes theory
11. Testing of hardness by Rockwell
12. Graphical simulation of
 - a. Shear force and bending moment diagrams with different end conditions.
 - b. Slope and deflection.
 - c. Principal stresses through graphical and analytical method.

List of Assignments

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Simple stress and strain.
2. Principal stresses and strain.
3. Shear force and Bending moment diagram and slope and deflection
4. Stresses in beams, thick and thin cylinder

5. Torsion
6. Euler's column and strain energy method

List of Tutorial

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. Examinations.

1. Stresses in simple bar, Elastic modulus and two-dimensional stress systems.
2. Normal, tangential and resultant stresses on any oblique plane inclined to normal plane by analytical and graphical method.
3. Shaft diameter and factor of safety by using theories of failure.
4. Shear and bending moments on cantilever and simply supported beam and draw SFD and BMD.
5. Slope and deflection at any section between beams by using Macaulay's method.
6. Stresses in beam and draw shear stress diagram and bending stress diagram.
7. Shaft diameter and stresses when shaft subjected to torsion, bending combined torsional and bending, combined torsional and axial loads.
8. Euler's column theory and strain energy.

Textbooks

1. A textbook of strength of material by R.K.Bansal

Reference Books

1. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication
2. J. E. Shigley, Mechanical Engineering Design, McGraw Hill
3. R. Subramanian strength of Material
4. S Ramamrutham, Strength of Material
5. R.K Rajput, Strength of materials

Project Based Learning

Following is the list of topics for project-based learning (Not Limited to) based on syllabus contents:

1. To prepare demonstration model of cantilever beam for the study of deflection in it.
2. To prepare demonstration model of simply supported beam for the study of deflection in it.
3. To prepare demonstration model of fixed beam for the study of deflection in it.
4. To prepare demonstration model of Overhang beam for the study of deflection in it.
5. To prepare the chart on relation between E, G, K with derivation.
6. To prepare demonstration model for studying strain energy with consideration of various conditions like impact load, sudden load, gradual load.
7. To prepare the chart on various concepts used in Principal Stresses & planes.
8. To prepare the chart on concept use in Mohr's Circle method using graphically & analytically.
9. To prepare the chart on Rules and guidelines use for drawing SFD & BMD.
10. To prepare the chart on finding bending stress for I cross-sections.
11. To prepare the chart on finding bending stress for T cross-sections.
12. To prepare the chart on finding bending stress for C cross-sections.
13. To prepare the chart on concepts used in solid & hollow shafts.
14. To prepare the chart and demonstration model of Euler's formula for buckling load.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Manufacturing Technology Laboratory		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical: - 02 Hours/ Week	Term Work	25 Marks	01
	Total	25 Marks	01

Course Prerequisites:-	1. Manufacturing Processes 2. Machining Processes and Materials.
Course Objectives:-	1. To acquire the knowledge of Foundry technology 2. To acquire the knowledge of Machine Technology
Course Outcomes:-	The students should be able to– 1. Understand the various casting processes and apply the best casting process for a specific product. 2. Understand different operations on lathe, drilling, milling and grinding machine and apply it to create the job.

Course Contents

Unit-I	Foundry Technology	(12 Hrs.)
Introduction to casting, Pattern and pattern making, Design and allowances for patterns, Moulding sand and core sands, Sand control Test, Core and core making –Introduction, Core making Procedure, Types of cores, Core print, Core boxes. Mould and mould making-Moulding Methods, Moulding processes, Gating System. Melting furnaces and their selection, Cupola furnace, pouring practice and equipment's Ladle technology, Strike out, Fettling, Cleaning and Surface preparation of castings, Defects in castings.		
Unit-II	Machining Technology	(12 Hrs.)
Lathe-Introduction, function, types, specification, construction accessories, attachments, operations. Oflathe machine. Drilling-Introduction, Types of drilling machines,operations. Milling-Introduction,Types of milling machines,operations, Milling cutters, Dividing head, methods of indexing. Abrasive machining-Introduction, grinding wheels, wheel marking, Types of grinding machines, Grinding faults. Plastic Moulding- Moulding characteristics of plastic, plastic moulding process.		

List of Experiments: (AnyEight)

1. Moulding and core sand testing (Clay content test, moisture content test etc).
2. Strength of Green sand mould and greens sand core.
3. Mold Making Practice.
4. Job on drilling, reaming, tapping.
5. Casting of component by using green sand molding / Die casting.
6. Individual job on center Lathe.
7. Study of dividing indexing mechanism on milling machine.
8. Gear cutting job on Milling Machine.
9. Study and demonstration of Grinding Machines.
10. Job on Grinding Machine.
11. Job on Plastic Molding Machine.

Text Books

1. O. P. Khanna, A textbook of Foundry Technology, DhanpatRai and Sons
2. P. C. Sharma, Production Engineering, S. Chand Publications
3. R. K. Jain, Production Technology, Khanna Publishers

Reference Book

1. P. N. Rao, Manufacturing Technology- Vol 1, McGraw Hill Education (India) Private Limited
2. P. N. Rao, Manufacturing Technologyp, Vol- II, McGraw Hill Education (India) Private Limited
3. G. R. Nagpal, Tool Engineering and Design, Khanna Publishers
4. B. S. Raghuwanshi, Workshop Technology, Vol-II, DhanpatRai& Co.
5. HajraChaudhari, Workshop Technology, Vol.-II
6. Roy A. Lindberg, Process & Materials of Manufacture, PHI
7. E. P. DeGrmo, J. T. Black and A. Kosher, Material and processes in manufacturing, PHI
8. HMT Handbook, Production Technology, TMH

Designation of Course	Python Programming-I		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical: - 04 Hours/ Week	Term Work and Practical	50 Marks	02
	Total	50 Marks	02

Course Prerequisites:-	Basics of C and C++Programming
Course Objectives:-	The students should be able to 1. Readily use the Python programming language 2. Apply various data types and controlstructure. 3. Understand and begin to implementcode
Course Outcomes:-	Upon completion of the course, students will be able to 1. Understand how to install and run python 2. Understand flow control 3. Understand complex datatypes 4. Understand and Apply functions 5. Understand various modules 6. Understand and Apply NumPymodule

Course Contents

Unit-I	Python introduction	(08 Hrs.)
Learn to install and run Python on your computer, Keywords and Identifiers, Statement, Indentation and Comments, Variables, Constants and Literals, Data Types, Type Conversion and Type Casting, Input,Output and Import		
Unit-II	Python Flow Control	(08 Hrs.)
Learn to install and run Python on your computer, Keywords and Identifiers, Statement, Indentation and Comments, Variables, Constants and Literals, Data Types, Type Conversion and Type Casting, Input, Output and Import		
Unit-III	Datatypes	(08 Hrs.)
Numbers, Type Conversion and Mathematics, List, Tuple, Strings, Sets, Dictionary		
Unit-IV	Python Functions	(08 Hrs.)
Function Arguments, Recursion, Anonymous/Lambda Function, Global, Local and Nonlocal variables, Global Keyword		
Unit-V	Python Modules	(08 Hrs.)
Modules in Python, import modules in Python, import statement, Import with renaming, from...import statement, Import all names, Python Module Search Path		
Unit-VI	NumPy Module	(08 Hrs.)
Python Matrix, Add Two Matrices, Transpose a Matrix, Multiply two matrices		

Term Work

1. Basic Exercise for Beginners
Practice and quickly learn Python's necessary skills by solving simple questions and problems. Topics: Variables, Operators, Loops, String, Numbers, List
2. Python LoopExercise
This Python loop exercise aims to help developers to practice branching and Looping techniques in Python.
Topics: If-else statements, loop, and while loop.
3. Python FunctionsExercise
Practice how to create a function, nested functions, and use the function arguments effectively in Python by solving differentquestions.
Topics: Function's arguments, built-in functions.

4. Python String Exercise
Solve Python String exercise to learn and practice String operations and manipulations.
5. Python Data Structure Exercise
Practice widely used Python types such as List, Set, Dictionary, and Tuple operations in Python
6. Python ListExercise
This Python list exercise aims to help Python developers to learn and practice list operations.
7. Python DictionaryExercise
This Python dictionary exercise aims to help Python developers to learn and practice dictionary operations.
8. Python Tuple Exercise
This exercise aims to help Python developers to learn and practice tuple operations.

Text Books

1. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher,
2. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter- disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

Reference Books

1. Python Programming using problem solving Approach by Reema Thareja, Oxford University, Higher Education Oxford University Press; First edition (10 June 2017), ISBN-10: 0199480173.
2. Data Structures and Algorithms in Python by Michael T Goodrich and Robertto Thamassia, Micheal S Goldwasser, Wiley Publisher (2016)
3. Fundamentals of Python first Programmes by Kenneth A Lambert, Copyrighted material Course Technology Inc. 1st edition (6th February2009)

Supplementary Resources:

1. <http://www.w3schools.com>
2. <http://docs.python.org>
3. <http://www.tutorialspoint.com>
4. <http://www.learnpython.org>

Designation of Course	Vocational Course I: Automobile Servicing- I		
Teaching Scheme	Examination Scheme		Credits Allotted
	Term Work and Oral	50 Marks	02
	Total	50 Marks	02

Course Prerequisites:	<ol style="list-style-type: none"> 1. Inclination for taking up Two-Wheeler Repairs and Service as a self-employment occupation 2. Knowledge of Mechanical Engineering System
Course Objectives: -	<ol style="list-style-type: none"> 1. To perform skilled mechanical work in diagnosing, repairing and maintaining all major vehicle systems of two-wheeler 2. To provide knowledge on automotive industry and job-related activities as an automotive service technician. 3. To work safely and responsibly within all shop standards and environmental guidelines.
Course Outcomes: -	<ol style="list-style-type: none"> 1. Understand the suspension system of two-wheeler and apply it to diagnosing, repairing and maintaining. 2. Understand the braking and steering system of two-wheeler and apply it to diagnosing, repairing and maintaining. 3. Understand the transmission system of two-wheeler and apply it to diagnosing, repairing and maintaining clutch and gear box. 4. Understand the engine system of two-wheeler and apply it to diagnosing, repairing and maintaining. 5. Understand the ignition system of two-wheeler and apply it to diagnosing, repairing and maintaining. 6. Understand the electrical system other accessories of two-wheeler and apply it to diagnosing, repairing and maintaining.

Course Contents

Unit-I	Suspension System in Two Wheelers	(08 Hrs.)
<p>Safety, Hand Tools and Equipment's, Nomenclature of different parts of vehicle and their locations, Introduction & Function of various parts & System of Two-Wheeler</p> <p>Suspension System: Introduction, Objectives of suspension, Basic requirement, Function of suspension springs, Types of suspension springs, Suspension system trouble shooting.</p>		
Unit-II	Brake and Steering Systems	(08 Hrs.)
<p>Brake System: Principle, Braking requirements, Types of brakes, Drum brakes Disk brakes, Mechanical Brakes, Hydraulic brakes, Brake fluid, Disc brake pads, Braking system trouble shooting.</p> <p>Steering: Steering system & their use, Inspect and adjust rake of front fork, dismantle trailing link, adjust heavy duty thrust races.</p>		
Unit-III	Transmission system in Two Wheelers	(08 Hrs.)
<p>Gear Box: Function of transmission, Necessity of transmission, Types of transmission, Manual transmission, sliding mesh gear box, constant mesh gear box, synchromesh gear box,</p> <p>Clutch: Definition, Requirements of clutch, Principle of friction clutches, Dry friction clutches (Single plate clutch, Multiplate clutch, Centrifugal clutch) Preliminary inspection of clutch, clutch adjustment, Clutch overhaul, clutch trouble shooting.</p> <p>Chain & chain Drive, sprocket (chain, sprocket, shafts)</p>		
Unit-IV	Engine system of Two Wheelers	(08 Hrs.)
<p>Basic engine terminology, Types of engine, Constructional details, working of 2-stroke and 4-stroke engine, Classification of 2-stroke & 4-Stroke Engine & their difference, Engine servicing, Repairing method of Engine, engine removal, engine installation,</p> <p>General theory of Carburetion & Silencer.</p>		

Unit-V	Ignition Systems of Two Wheelers	(08 Hrs.)
Ignition System: Function, Requirement of an ignition system, Types of ignition system, Battery ignition, Magneto ignition Electronic ignition, Components of battery and electronic ignition system, Testing and servicing of ignition system components, Ignition system trouble shooting, Kick-starting system of 2 wheelers.		
Unit-VI	Electrical Systems and Accessories in Two-Wheeler	(08 Hrs.)
Electrical and electronic components used in auto electrical, auto electrical parts wiring, battery inspection and maintenance, testing of battery voltage, testing of electrical parts such as head lamp, horn side indicator, brake light etc. Use of ECM bike scanner.		

List of Experiments-

- 1. Introduction:** Importance of safety and general precaution, Elementary First Aid, Identify the parts & general servicing of Two-Wheeler, washing, cleaning, oiling, greasing and lubricating.
- 2. Suspension Work:** Servicing of suspension changing bush, checking shock absorbers. Cleaning, Checking and oil filling of shock absorbers. Cleaning & checking the wheel bearings and greasing.
- 3. Break Work:** Adjusting brake pedal play, servicing the brake system, cleaning, checking, greasing and assembling. Inspecting the shoes and wheel drums, changing of brake lining. Repairing and maintenance of hydraulic disc brake used in Motorcycles.
- 4. Transmission:** Adjusting clutch lever free play, removing clutch assembly from Two-wheeler, cleaning and inspecting parts. Replacing defective parts. Fitting clutch assembly. Repair work of Automatic clutch and automatic transmission used in motor vehicle
- Checking, adjusting and replacing defective parts (chain, sprocket, shafts) in power transmission from engine to driving wheel.
- 6. Engine Work:** Dismantling the unserviceable engine, cleaning and inspecting the parts, checking engine bore piston rings, connecting rod, bearings, crankshaft, assembling all the parts and measures the gaps. Engine Timing setting and Valve Timing setting of 4 -S Engine. Dismantling a four-stroke engine of two-wheeler cleaning, inspecting and assembling parts.
- Dismantling the air cleaner, cleaning, inspecting, cleaning fuel tank, servicing carburetor, rectifying causes for engine not starting, and high fuel consumption.
- Starting engine, tuning for slow speed, checking smoke, and setting for exhaust gas emission measurement as per norms.
- 9. Ignition System:** Dismantling the C.B. point cleaning electronic Ignition system & inspecting and replacing the pitted points. Making wiring harness and check different Electrical circuits used in Two-wheelers.
- 10. Steering work:** Inspect and adjust rake of front fork, dismantle trailing link, adjust heavy duty thrust races.
- 11. Electrical accessories repair:** Tracing the A.C /D.C electrical circuit in a two-wheeler, checking horn, head light, indicator and replacing if necessary.
- Practice on how to read job-card, General Servicing & road testing of Two-Wheeler.

Text Books

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

Reference Books

1. Automobile Engineering by Kirpal Singh Standard Publishers Distributors.
2. Automotive Engines, A.K. Babu, Khanna Publishing House

Designation of Course	Thermodynamics Applications		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work and Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Mechanical Engineering System. 2. Thermodynamic principals
Course Objectives:-	<ol style="list-style-type: none"> 1. Steam generator and their performance analysis. 2. Reciprocating air compressors, Gas turbines & jet propulsion. 3. Various systems and phenomenon of combustion in I.C. Engine; and Performance analysis of I.C. Engine.
Course Outcomes:-	<p>On completion of the course, students will be able to–</p> <ol style="list-style-type: none"> 1. Understand construction working of steam generators and analysis their performance. 2. Understand construction working of Reciprocating air compressors and analysis their performance. 3. Understand fundamentals of gas turbine, analysis their performance and application of gas turbines & jet propulsion. 4. Understand I.C. Engine systems viz. ignition, cooling, lubrication, and governing. 5. Understand phenomenon of combustion in S.I and C.I. Engine. 6. Understand terms related to I.C. Engine testing and analysis their performance.

Course Contents

Unit-I	High pressure Boilers and Performance of Boilers	(08 Hrs.)
<p>Classification of boilers Features of high-pressure boiler, construction and working of high-pressure boilers, Fluidize bed combustion, boiler mountings and Accessories.</p> <p>Boiler performance calculations- Equivalent evaporation, Boiler efficiency, Energy balance, boiler controls, Boiler draught.</p>		
Unit-II	Reciprocating Air Compressors	(08 Hrs.)
<p>Uses of compressed air, classification, constructional details of single stage reciprocating compressor, computation of work done, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, FAD, theoretical and actual indicator diagrams, method of improving volumetric efficiency. Need of multi staging, multistage compressor, work done, volumetric efficiency, condition for maximum efficiency, intercooling, actual indicator diagram</p>		
Unit-III	Gas Turbines & Jet Propulsion	(08 Hrs.)
<p>Theory and fundamentals of gas turbine, Principals, Classification, Assumption for simple gas turbine cycle analysis, Work ratio, Concepts of maximum and optimum pressure ratio, Actual cycle, Effect of operating variable on thermal efficiency, Regeneration, Intercooling. Reheating and their effect on performance, Closed cycle and Semi-Closed cycle gas turbine plant, Application of gas turbines.</p> <p>Jet Propulsion: Introduction, Theory of jet propulsion, Types of jet engines, Energy flow through jet engine, Thrust, Thrust power, Propulsive, Thermal and overall efficiency, Turbojet, Turboprop, Turbofan and Ducted fan engines, Pulse jet and Ram jet engines, Application of jet engines, Methods of thrust augmentation, Introduction to rocket engines.</p>		

Unit -IV	I. C. Engine Systems	(08 Hrs.)
<p>Fuel supply system for S.I and C.I. Engines, M.P.F.I. system for modern automobile engines, CRDI. Ignition and injection System: Battery & coil ignition system, Magneto ignition system, Electronic ignition system, Advantage over mechanical contact breaker point system. Spark-Advance Mechanisms. Engine Cooling System: Necessity of cooling system, effect of overcooling, Air cooling, Water cooling, Thermostatic radiators. Lubrication System: Mist lubrication system, Dry sump lubrication, Wet sump lubrications, Comparison between Wet sump and Dry sump systems, Oil pump Governing System: Function of Governor, Quality governing, Quantity governing, Hit & miss governing Supercharging: Objects of supercharging, Effects on performance, Limitations, Methods of supercharging & turbocharging, Limitation of turbocharging,</p>		
Unit-V	Combustion in I. C. engines	(08 Hrs.)
<p>Combustion in S. I. Engines: Valve timing Diagram for S.I. engine, Ignition Limit, Stages of combustion, Effect of engine variables on ignition lag & flame propagation, Abnormal combustion: Theories, Effects & Controlling measures, Combustion chambers for S. I. engines Combustion in C. I. Engines: Valve timing Diagram for C.I. engine, Air-fuel ratio for C.I engines, Stages of combustion, Ignition delay & factors influencing delay period, Diesel knock & its control, Combustion chambers for C. I. engines</p>		
Unit-VI	Performance Characteristics & Testing of I.C. Engines	(08 Hrs.)
<p>Introduction to Indian standards for testing of I.C. Engines, Performance characteristics, Determination of brake power, indicated power, Friction power, Methods to determine power and efficiency, Determination of break thermal efficiency, Mechanical efficiency, volumetric efficiency, Variables affecting performance of engine, Mean Effective Pressure, SFC, Air consumption, Energy balance. Engine Emission and their controls.</p>		

Term Work:

Term work shall consist of following experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. Study and demonstration of boiler mountings.
2. Study and demonstration of boiler Accessories.
3. Trial on steam power plant.
4. Test on reciprocating air compressor.
5. Performance test on rotary air compressor.
6. Trial on multi cylinder petrol engine – Morse Test.
7. Trial on multi-cylinder diesel engine.
8. Study of superchargers & turbochargers
9. Study of I. C. Engine emission norms.
10. Visit to Boiler House
11. Visit to Automobile service station.
12. Mini-Project on the contents of the syllabus

Assignment:

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Boiler performance.
2. Single and multistage reciprocating air compressors
3. Gas turbine performance
4. I C engine systems
5. I C engine combustions
6. Performance of I C engines.

Text Books

1. V. P. Vasandani and D. S. Kumar, Heat Engineering Metropolitan Book Company, New Delhi.
2. R S Khurmi and J K Gupta, Textbook of Thermal Engineering, S Chand publications.

Reference Books

1. R. K. Rajput, Thermal Engineering, Laxmi Publications
2. Y. Cengel & Boles, “Thermodynamics -An engineering approach”, Tata McGraw Hill Publications
3. S. Domkundwar, “Thermodynamics & Heat Engines” Dhanpat Rai and Sons
4. P. K. Nag, “Engineering Thermodynamics”, Tata McGraw Hill Publications
5. P. L. Ballany, “Thermal Engineering”, Khanna Publications
6. Ganesan V, “Internal Combustion Engines”, Tata McGraw Hill Publishing House
7. R. K. Rajput, “Internal Combustion Engines”, Laxmi Publications.
8. M. L. Mathur & R. P. Sharma, “A Course in I. C. Engines”, Dhanpat Rai & Sons
9. V. M. Domkundwar, “A Course in I. C. Engines”, Dhanpat Rai & Co.
10. Shrinivasan, “Automobile Engines”, Tata McGraw Hill Publishing House – CBS Publication

Project Based Learning

Following is the list of Topics for project based learning (Not Limited to) based on the syllabus contents:

1. To prepare a chart on performance testing of boilers.
2. To prepare a chart on comparison among various types of boilers.
3. To prepare a chart on comparison between open and closed cycle gas turbines.
4. To prepare a chart on comparison among various turbo machinery.
5. To prepare a chart on comparison among different types of jet engines.
6. To prepare demonstration model of ignition system.
7. To prepare demonstration model of engine cooling system.
8. To prepare demonstration model of lubrication system.
9. To prepare demonstration model of governing system.
10. To prepare a chart on different processes of combustion in IC engines.
11. Case study on different IC Engine systems used in cars available in market.
12. To prepare a chart on various performance characteristics of IC engines.

Unit Test –

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Machine Design and Analysis-I		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: -02 Hours/Week	Internal Assessment	40 Marks	
	Term Work and Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites: -	<ol style="list-style-type: none"> 1. Computer Aided Drafting and Visualization 2. Computer Aided Machine Drawing 3. Strength of Machine Components
Course Objectives: -	<ol style="list-style-type: none"> 1. To study basic concepts of machine design. 2. To design and analysis different types of machine elements 3. To design of machine component for finite and infinite life and subjected to fluctuating load.
Course Outcomes: -	<ol style="list-style-type: none"> 1. Understand the basic concept of machine design and evaluate dimensions of simple components. 2. Understand the fundamental concepts for design of shaft, keys and coupling and evaluate forces and dimensions. 3. Understand the concept of designing of Power Screws and Mechanical spring; and analyze it for various applications. 4. Understand the basic concept of fluctuating loads and Analyze design of components under fluctuating loads. 5. Understand the concept of fasteners and threaded joints; and analyze when it is subjected to different loading conditions. 6. Understand the Design concept of welded & riveted joint; and analyze when it is subjected to different loading conditions.

Course Contents

Unit-I	Introduction to Design and Design against Static Load	(08 Hrs)
<p>Introduction to Design: Need for component design, design process, Introductions to concurrent engineering, Design consideration for casting, forging & machined parts, hot & cold worked parts and welded assembly, Introduction to design for manufacture & assembly,</p> <p>Design against Static Load: Modes of failure, Factor of safety, Service factor, stress strain relationship, shear stress & strain, stress due to bending moment, Eccentric axial loading.</p> <p>Design of simple machine parts - Cotter joint, Knuckle joint and Levers, curved beam.</p>		
Unit -II	Shafts, Keys and Coupling	(08 Hrs)
<p>Introduction, Transmission Shafts, Shaft Design on Strength Basis, Shaft Design on Torsional Rigidity Basis, ASME Code for Shaft Design, Design of Hollow Shaft on Strength Basis, Design of Hollow Shaft on Torsional Rigidity Basis, Flexible Shafts</p> <p>Keys— saddle, sunk, feather, woodruff, square, flat, Kennedy key, key design, Types of keys, splines. Couplings- types of couplings, Design of rigid and flexible couplings.</p>		
Unit-III	Power Screws and Mechanical Spring	(08Hrs)
<p>Power Screws, Forms of Threads , Multiple Threaded Screws, Terminology of Power Screw, Torque Requirement—Lifting Load, Torque Requirement—Lowering Load, Self-locking Screw, Efficiency of Square Threaded Screw, Efficiency of Self-locking Screw, Trapezoidal and Acme Threads, Collar Friction Torque, Overall Efficiency, Coefficient of Friction, Design of Screw and Nut, Design of Screw Jack, Differential and Compound Screws, Re-circulating Ball Screw.</p> <p>Mechanical Spring: Types of Springs, Terminology of Helical Springs, Styles of End, Stress and Deflection Equations, Series and Parallel Connections, Design of Helical Springs, Concentric Springs, Helical Torsion Springs, Surge in Spring, Multi-Leaf Spring, Nipping of Leaf Springs, Shot Peening</p>		

Unit-IV	Design for Fluctuating Loads	(08 Hrs)
Stress concentration factor and its Reduction, Stress concentration factor for various machine parts, Cyclic stresses, Fatigue and endurance limit, Notch sensitivity, Cumulative Damage in Fatigue, Design for finite and infinite life, Soderberg, Goodman, Modified Goodman & Gerber criteria.		
Unit-V	Threaded Joints	(08 Hrs)
Basic Types of Screw Fastening, Cap Screws & Setscrews, Bolt of Uniform Strength, Locking Devices, Terminology of Screw Threads, ISO Metric Screw Threads, Bolt under tension, Eccentrically Loaded Bolted Joints in Shear, Eccentric Load Perpendicular to Axis of Bolt, Eccentric Load on Base plate, Torque Requirement for Bolt Tightening, Dimensions of Fasteners, Design of Turnbuckle.		
Unit-VI	Welded and Riveted Joints	(08 Hrs)
Welded Joints- Welding Processes, Strength of Butt and Fillet Joints, Strength of Parallel Fillet Welds, Strength of Transverse Fillet Welds, Axially Loaded Unsymmetrical Welded Joints, Eccentric Load in the Plane of Welds, Welded Joint Subjected to Bending Moment and Torsional Moment, Welding Symbols		
Riveted Joints- Types of Rivet Heads and riveted Joints, Rivet Materials, Types of Failure, Strength Equations, Efficiency of Joint, Caulking and Fullering, Eccentrically Loaded Riveted Joint		

Term work

Term work shall consist of following experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. Symbolic representation of common machine components using Auto-CAD.
2. Design of machine components such as knuckle joint, cotter joint and lever (anyone) using CAD software.
3. Design of coupling system using CAD software.
4. Design of screw jack using CAD software.

Assignment

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. Examinations.

1. Static loading
2. Design of shafts
3. Power screw
4. Mechanical springs
5. Design of fluctuating load
6. Design of threaded joints
7. Design of welded
8. Riveted joints.

Note: Design data book should be used extensively.

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents:

1. To develop Industrial/Real life application demonstration model of different types of Joints. (Cotter joint and Knuckle joint)
2. To observe the system where transmission of power takes place through shaft, Keys, coupling, like Transmission of power from motor to pump/generator/lathe machine/drilling machine. By selecting suitable materials, design the shaft, key and coupling. To prepare design report and assembly drawing indicating overall dimensions, tolerances, and surface finish. Also to prepare bill of materials.

9. To develop a demonstration models of different types of couplings.
10. To develop a demonstration models of different types of keys.
11. To observe the system where transmission of power takes place through power Screws. (e.g. Lead screw of lathe, feed screws of machine tools, Clamping screws, Toggle Jack screw, etc.) Get the required information regarding effort, clamping force, etc., and selecting suitable materials design screw, nut and different simple components in assembly. To prepare design report and assembly drawing indicating overall dimensions, tolerances, and surface finish. Also to prepare bill of materials.
12. To develop demonstration models of different types of springs.
13. To develop demonstration models of different types of threaded joints.
14. To develop demonstration models of different types of fasteners.
15. To develop demonstration models of different types of welded joints.
16. To develop demonstration models of different types of riveted joints.

Textbooks

1. V. B. Bhandari, “Design of Machine Elements”, Tata McGraw Hill Publication Co. Ltd.
2. R. S. Khurmi And J.K. Gupta “Machine Design”, S Chand Publication.
3. Shigley J. E. and Mischke C. R., “Mechanical Engineering Design”, McGraw Hill Publication Co. Ltd.
4. Spotts M. F. and Shoup T.E., “Design of Machine Elements”, Prentice Hall International.

Reference Books

1. Black P.H. and O. Eugene Adams, “Machine Design”, McGraw Hill Book Co. Inc.
2. Willium C. Orthwein, “Machine Components Design”, West Publishing Co. and Jaico Publications House.
3. Hall A. S., Holowenko A. R. and Laughlin H. G, “Theory and Problems of Machine Design”, Schaum’s Outline Series.
4. Sharma C. S. and PurohitKamlesh, “Design of Machine Elements”, PHI LearningPvt. Ltd.
5. D. K. Aggarwal & Sharma P. C., “Machine Design”, S.K Kataria and Sons
6. Gope P. C., “Machine Design: Fundamentals and Applications”, PHI LearningPvt. Ltd.
7. “Design Data- P. S. G.” College of Technology, Coimbatore.
8. V. B. Bhandari, “Design Data Book”, Tata McGraw Hill Publication Co. Ltd.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Science of Engineering Materials		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: -04 Hours/Week	End Semester Examination	60 Marks	04
	Internal Assessment	40 Marks	
	Total	100 Marks	04

Course Prerequisites:-	The student should have 1. Basic knowledge of physics and chemistry 2. Basic information of engineering materials 3. Basic knowledge of manufacturing processes
Course Objectives:-	The student should acquire the knowledge of 1. The scope, objective and application of materials, engineering properties. 2. Material testing to determine the mechanical properties and its applications in mechanical systems. 3. Different methods to change the mechanical properties.
Course Outcomes:-	The students should be able to 1. Understand basics of plastic deformation, annealing, re- crystallization and apply in mechanical engineering applications. 2. Understand and evaluate different types of mechanical properties. 3. Understand and apply fundamental concept of equilibrium diagrams in selections of alloys for different applications. 4. Understand and apply the different types of heat treatment processes on steels. 5. Understand the different types of alloy steels, tool steels and stainless steels and its applications in mechanical engineering. 6. Understand the concept of powder metallurgy and apply in manufacturing of components.

Course Contents

Unit-I	Plastic Deformation, Recrystallization and Strengthening Mechanism	(08 Hrs.)
Mechanism of plastic deformation, Critical resolve shear stress, Deformation of single crystal and polycrystalline metals, Mechanism of plastic deformation at high temperature, effect of grain size, Work Hardening, Cold and hot working, Annealing and re- crystallization, strengthening Mechanism,		
Unit-II	Mechanical Testing of Metals	(08 Hrs.)
Study of destructive testing Tensile test, Engineering stress and true stress strain, evolution of properties, Numerical based Tensile test, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non-Destructive testing such as Liquid dye penetrate test, Magnaflux test, Eddy current test, Ultrasonic testing and Radiography testing.		
Unit-III	Equilibrium Diagrams	(08 Hrs.)
Related terms and their definitions, Hume Ruther's rule of solid solubility, solidification, Dendritic growth, cooling curves, Plotting of Equilibrium diagrams, Lever rule, Coring, Isomorph's system, Eutectic system, Partial eutectic and eutectoid system, non-Equilibrium cooling and its effects, Fe- Fe ₃ C equilibrium diagram.		
Unit-IV	Heat Treatment of steels	(08 Hrs.)
Transformation products of austenite, Martensite transformation & characteristics of martensite, Time – Temperature Transformation curve, Critical Cooling rate, Heat treatment of steels - Annealing, Normalizing, Hardening, Hardenability, Martempering, Austempering, Retained austenite, tempering, Ausforming, Secondary hardening, Quench cracks.		

Unit-V	Cast Irons, Alloy Steels & Tool Steels	(08 Hrs.)
Classification of alloying elements, Types of cast irons, Properties of different cast irons, Effect of alloying elements on properties, Specifications of steels, Various alloy steels, Stainless steels – Classification, Applications & properties, Tool Steels – Classification, Applications & properties, heat treatment of tool steels.		
Unit-VI	Powder Metallurgy	(08 Hrs.)
Introduction, Advantages and limitations of powder metallurgy, Production of metals powder, Characteristics of powder, Powder conditioning, Powder Compacting, Hot compacting methods, Sintering and sintering furnaces, Production of powder metallurgical parts such as self-lubricating bearings, ferrites, electric contact materials, Carbide cutting tools etc		

Term Work

Term work shall consist of following experiments

1. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin.
2. To determine molecular weight/radius of macromolecule polystyrene/ polyvinyl alcohol by viscosity measurement.
3. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method.
4. Study of corrosion of metals in medium of different pH.
5. Determination of rate of corrosion of aluminium in acidic and basic medium.
6. Determination of percentage of Ca in given cement sample
7. Preparation of phenol-formaldehyde resin/ urea-formaldehyde.
8. Estimation of copper in brass solution.
9. Determination of rate of corrosion of aluminium in acidic and basic medium.
10. To obtain metallic coating on base metal by using Electroplating and Electroless plating method.

Assignment

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Mechanism of Plastic deformations
2. Mechanism of recrystallizations
3. Tensile test, Hardness testing
4. calculations a phase and its percentages
5. Heat treatment of steels
6. Cast irons applications
7. Stainless steels
8. Heat treatment of tool steels
9. Production of powder productions
10. Production of powder metallurgical parts

Text Books

1. Material Science and Physical Metallurgy”, Dr.V.D. Kodgere, Everest Publication, Pune.
2. “Material science and Metallurgy”, O P Khanna, Khanna Publication, Delhi
3. “Material Science and Engineering”, R K Rajput, S K Kataria and Sons Publication, Delhi

Reference Books

1. “Physical Metallurgy”, S H Avner, Tata Micro hill Publication, Delhi
2. “Physical Metallurgy” RaghwanV, PHI Learning Pvt. Ltd, Delhi
3. Polymer Science, V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar, Wiley Eastern Limited

4. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008
5. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G. Cowie, Blackie Academic & Professional, 1994.
6. Engineering Chemistry by Dr. A. K. Pahari and Dr. B. S. Chauhan, Laxmi Publications (P) Ltd, New Delhi.
7. Engineering Chemistry (16th Edition) Jain, Jain, DhanpatRai Publishing Company, 2013.

Project Based Learning

Following is the list of Topics for Project Based Learning (Not Limited to) based on the syllabus contents:

1. To develop demonstration model of crystal structure.
2. To prepare a chart on different material and its recrystallization temperatures.
3. To develop a tensile test specimen as per the standards and find its U T S and Y S
4. To find the hardness of any one component by Brinel or Rockwell hardness testing machine
5. To identify flaws and defects in different materials by any NDT methods
6. Case study on case hardening of any mechanical component
7. To perform annealing on any mechanical component
8. To perform hardening operation by either oil quenching or water quenching on any mechanical component.
9. To prepare a chart on properties of different cast irons by using microscope, hardness testing or spark testing.
10. To prepare a flowchart on processing of tool steels
11. To develop demonstrations model of manufacturing of metal powder by atomization technique
12. To develop demonstrations model of different type of powder compacting methods
13. To prepare a flow chart of production process of carbide tools, ferrites, clutch plates and elastic contact materials.
14. To prepare a flow chart of any mechanical component manufactured by powder metallurgy technique

Unit Test

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	ITC-II: Entrepreneurship Development Skills		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
	Internal Assessment	40 Marks	
	Total	100 Marks	03

Course Prerequisites: -	The student should have 1. Introduction to all engineering subjects 2. Passion to become entrepreneur. 3. Ambition to create employment.
Course Objectives: -	The student should 1. Acquire knowledge of behavioral sciences and to develop positive attitude. 2. Enjoy process of learning and develop habits of language skills. 3. Learn success and failure stories. 4. Acquire basic knowledge of Functional Managements and leadership lessons.
Course Outcomes: -	The students should be able to– 1. Understand and develop personality traits. 2. Understand and use communication and interpersonal skills for grooming. 3. Developing habits of life skills books its review and learnings. 4. Understand and analyze case studies of various organizations. 5. Understand basics of entrepreneurship and its allied elements. 6. Understand role of functional management and processes of running business.

Course Contents

Unit-I	Grooming Personality	(06 Hrs.)
Personality types, attitude, developing positive attitude, Effects of Personality management aptitude (PMA), Behavior of human being, under challenging conditions, qualities needed at top level, traits for top executives, enthusiasm, Nevergiveup attitude.		
Unit-II	Developing Skills	(06 Hrs.)
Communication skills, Interpersonal skills, positive reinforcement, recognition, qualities of a leader, who is leader, behavior of leader, assume infinite responsibility, requirement for professional success.		
Unit-III	Reviews and learning's from life skill books.	(06 Hrs.)
Books Review and learnings, Seven habits of highly effective people, Rich dad poor dad, Seven divine laws, Power of Positive thinking, You Can win, Leader without title, Think and grow rich.		
Unit-IV	Case Studies	(06 Hrs.)
Case studies its introduction, types of case studies its relevance and importance, format, and steps of case studies. Mrs Lata Khare, Mericom, Dangal Girl, M S Dhoni, Helen Keller. Ravindra Jain, Arunima Sinha, Study of a successful athlete, Mohammad Ali, Major Dhyanchand, leadership lessons.		
Unit-V	Entrepreneurship and its allied elements	(06 Hrs.)
Introduction to Entrepreneurship, working capital, introduction to sales, finance, risks and rewards, understand customers, how to develop market, use of social media. Types of marketing, innovation, understand statutory requirements, scaling up, managing vendors, managing employees and contractors, managing banking relations. Ways of raising fund. Understand functional management.		
Unit-VI	Functional management and business processes	(06 Hrs.)
Process of sales, Ethics in selling, Sale with integrity, Sale with honesty, law of familiarity, sale with passion and integrity, upselling and cross selling. Cash flow, definition of business, managing payables, managing commitments in tough times.		

List of Assignments

1. What are different types of personalities? What make them stand themselves different from each other? Choose one type of personality and make an analysis of your personality traits.
2. What different behavioral aspects are important to be a good leader? Analyze and prepare the design thinking model for inculcating behavioral aspects of a leader.
3. Communication is lubricant to run an organization smoothly. State your suitable reasoning in concern to the statement and prepare the model to implement it in your organization.
4. What are different interpersonal skills? why do they play significant role in developing business at peak. Elucidate with suitable examples.
5. Choose a like skills book of your choice and prepare review of it and implement the learning lessons for your business model.
6. Why do books on life skills important for a businessman? State your reasoning with appropriate examples.
7. What is meant by case studies? What is its relevance in the business world? Choose a topic from the enlisted and prepare a case study on it.
8. What is meant by Entrepreneurship? State the importance of functional management in it with suitable examples.
9. What are different business ethics and how do they help you in developing the appropriate policy for your organization?
10. Illustrate the different business process and their roles in developing a successful business.

Text Book

1. Dynamics of Entrepreneurial Development & Management -Vasant Desai Himalaya Publishing House.

Reference Books

1. Principles of Management -P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th Edition, 2010.
2. Entrepreneurship Development -Small Business Enterprises -Poornima M Chrestomathy Pearson Education – 2006.
3. Communication Skills by Pushpa Lata and Sanjay Kumar published Oxford University Press.
4. Developing Communication Skills By Meera Banerjee published by Oxford University Press
5. The Third Wave: An Entrepreneur's Vision of the Future (Hardcover)by Steve Case
6. Losing the Signal: The Untold Story Behind the Extraordinary Rise and Spectacular Fall of BlackBerry by Jacquie McNish
7. The 16 Personality Types: Profiles, Theory, & Type Developmentby A.J. Drenth

Project Based Learning

Following is the list of topics for project based learning (Not Limited to) based on the syllabus contents. Group of students should meet entrepreneur and complete the case studies.

1. Company history, establishment.
2. Type of Industry
3. Entrepreneur personality & his approach.
4. Behavioral aspects (leadership quality)
5. Communication skills & Interpersonal skills
6. Correlation of reference books Review and learnings, seven habits of highly effective people, Rich dad poor dad, Seven divine laws, Power of Positive thinking, You Can win, Leader without title, Think and grow rich. with respect to entrepreneur

7. How the working capital work developed
8. Functioning of Production department,
9. Marketing department
10. Financial department

Unit Test –

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Theory of Machines		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical: - 02 Hours/Week	Internal Assessment	40 Marks	
Tutorial: - 01 Hour/Week	Term Work and Oral	50 Marks	01
	Tutorial	Internal Evaluation	01
	Total	150 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Physics and Mathematics 2. Engineering Mechanics 3. Mechanisms of Machines
Course Objectives:-	<ol style="list-style-type: none"> 1. To develop competency in understanding of theory of spur and helical gear. 2. To develop competency in different types of gear train. 3. To develop understanding of static and dynamic balancing, cam and follower, gyroscopic forces; and moments.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Understand the gear theory which will be the prerequisite for gear design. 2. Understand torque transmitting capacity in gear trains which will be the prerequisite for gear box design. 3. Apply the principles of balancing of masses to various links, mechanisms and engines 4. Understand the concept of different types of governor and its applications. 5. Analyze various types of cam and followers with different kinds of follower motion. 6. Apply the principles of gyroscopic effects and stabilization on various transport vehicles.

Course Contents

Unit-I	Spur Gears	(06 Hrs)
Classification, Spur gear: definition, terminology, fundamental law of toothed gearing, involute and cycloidal profile, path of contact, arc of contact, conjugate action, contact ratio, minimum number of teeth, interference and under cutting, Friction in gears. Helical gears: nomenclature, Center Distance		
Unit-II	Gear Trains	(06 Hrs)
Types of Gear Trains, analysis of epicyclic gear trains, Holding torque – Simple, compound and epicyclic gear trains, torque on sun and planetary gear train, compound epicyclic gear train, Bevel epicyclic Gear train. Types of gearboxes.		
Unit-III	Balancing	(06 Hrs)
Static and dynamic balancing, balancing of rotating masses in single and several planes, primary and secondary balancing of reciprocating masses, balancing in single cylinder engines, balancing in multi-cylinder in-line engines, direct and reverse cranks method -radial and V-engines.		
Unit-IV	Governors	(06 Hrs)
Introduction, Classification, Centrifugal Governor, Terminology, Watt Governor, Porter Governor, Proell Governor, Hartnell Governor, Wilson-Hartnell Governor. Sensitiveness, Stability, Isochronous, Hunting. Effort and Power of Governor, Controlling Forces, Friction and insensitiveness.		
Unit-V	Cam and Follower	(06 Hrs)
Types of cams and followers, analysis of standard motions to the follower, Determination of cam profiles for different follower motions, analysis of circular arc cam with flat face follower. Methods of control pressure angle, radius of curvature and undercutting. Jump phenomenon of Eccentric cam, Introduction to advanced cam curves (3-4-5 Polynomial cam only)		

Unit-VI	Gyroscope and Step–Less-Regulation	(06 Hrs)
<p>Gyroscopes- Gyroscopic forces and Couples, Gyroscopic stabilisation for ship and Aeroplane, Stability of four-wheel drive vehicle moving on curved path, Stability of a two-wheel vehicle.</p> <p>Continuous Variable Transmissions - Geometry, Velocity and torque analysis of Faceplate variators, Conical variators, Spheroidal and cone variators, Variators with axially displaceable cones, PIV drives. (Theoretical Treatment Only)</p>		

Term Work

Term work shall consist of following experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. To draw conjugate profile for any general type of gear tooth
2. To generate involute gear tooth profile and to study the effect of undercutting and rack shift using model.
3. To study various types of gearboxes- constant mesh, sliding mesh, synchromesh gear box, Industrial gearbox, differential gearbox.
4. To measure holding torque of the epicyclic gear train.
5. To find the percentage of slip of belt material
6. To balance a system of masses revolving in a plane on a rotating shaft on V Lab
7. To determine the effect of varying mass on the centre of sleeve in Porter and Proell Governor
8. To draw the cam profiles and study the effect of Different follower motions, and Different follower (roller) dimensions
9. To verify the gyroscopic principles.
10. Study of Continuous Variable Transmission and Infinite Variable Transmission.
11. Mini Project based on the contents of the syllabus.

Assignments

Numerical and/or theory questions on each unit from previous year question papers of GATE/ESE Mechanical Engg. examinations.

Tutorial

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Spur Gears
2. Gear Trains
3. Balancing
4. Gyroscope
5. Cam and Follower
6. Governors

Reference Books

1. Thomas Bevan, “Theory of Machines”, CBS Publishers & Distributors, Delhi.
2. Shigley J.E. and Uicker J.J., “Theory of Machines and Mechanisms”, McGraw Hill, Inc.
3. Ghosh Amitabh and Malik A.K., “Theory of Machines and Mechanisms”, East-west Press.
4. Hall A.S., “Kinematics and Linkages Design”, Prentice-Hall.
5. Hartenberg and Denavit, “Kinematic Analysis and Synthesis of Mechanisms”.
6. Erdman, A. G. & Sandor, G.N., “Mechanism design, Analysis and synthesis”, Vol 1, Prentice – Hall of India.

Text Books

1. Rattan S. S., “Theory of Machines”, Tata McGraw Hill.
2. Ballaney P. L., “Theory of Machines”, Khanna Publishers, Delhi.
3. R. S. khurmi, “Theory of Machines’, S Chand Publication.

Project Based Learning

Following is the list of topics for project-based learning (Not Limited to) based on the syllabus contents:

1. To prepare a chart on comparison among different types of gears
2. To prepare a chart to understand various terminology of spur gear.
3. To prepare a chart to understand different methods to avoid interference in spur gear.
4. To develop a mechanical system using simple gear train.
5. To develop a mechanical system using compound gear train.
6. To develop a mechanical system using reverted gear train.
7. To develop a mechanical system using epicyclic gear train.
8. To prepare a chart comparison among different types of gear trains.
9. To develop demonstration model of static and dynamic balancing systems.
10. To develop demonstration model of balancing of rotating masses.
11. To develop demonstration model of balancing of reciprocating masses.
12. Case study on real life applications of various types of governors.
13. To develop demonstration model of a Watt Governor/Portal Governor/Proell Governor.
14. To prepare a chart on comparison among different types of governors.
15. To prepare a chart to understand various terminology of Cam profile.
16. To prepare a chart on comparison among different types of followers.
17. To prepare a chart on comparison among different types of follower motions.
18. To develop demonstration model on real life applications of gyroscopic effect such as Ship, aeroplane, automobile, etc.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Solid Modelling		
Teaching Scheme:	Examination Scheme		Credits Allotted
Practical:- 04 Hours/Week	Term Work and Practical	50 Marks	02
	Total	50 Marks	02

Course Prerequisites: -	1. Computer Aided Drafting and Visualisation 2. Computer Aided Machine Drawing
Course Objectives: -	1. To introduce students to the basic concepts of CAD modelling. 2. To develop the skills in Reading and Interpretation of Engineering Drawings. 3. To familiarize students with SolidWorks Software to Create 2D and 3D model, Assembly, Drafting and Sheet metal modelling.
Course Outcomes: -	The students will be able to 1. Understand the concepts of CAD modelling. 2. Creating 3D machine components using SolidWorks Software. 3. Creating Assembly of machine components using SolidWorks Software. 4. Creating surface model of Automobile Components using SolidWorks Software. 5. Creating detail drawing and generating Bill of Material using SolidWorks Software. 6. Understand the basic concepts of Sheet metal Modelling and Create a machine component using SolidWorks Software.

Course Contents

Unit-I	Introduction to CAD	(08Hrs.)
Introduction to CAD and CAE Features of SolidWorks, Various products available in SolidWorks for Product Design, Simulation, Communication SolidWorks Graphical User Interface - Feature manager design tree, Callouts, Handles, Confirmation corner, mouse buttons, keyboard shortcuts, Command Manager. Sketch Entities, Sketch Tools, Block, Relation and Dimensioning		
Unit-II	Basic Part Modelling	(08 Hrs.)
Part Modelling Tools, Creating Extrude features, Creating Revolve features, Creating Swept features, Creating Loft features, Creating Reference, Creating curves, Fillet features, Inserting Hole types, Creating Chamfer, Shell, rib, pattern and advanced modelling tools.		
Unit-III	Assembly Modelling	(08 Hrs.)
Introduction to Assembly Modelling & Approaches, Applying Advanced Mates and Mechanical Mates, Manipulating Components, Creating Pattern, Creating Explode Views.		
Unit-IV	Surface Modelling	(08 Hrs.)
Surface Modelling tools Creating Extrude, Revolve, Swept, loft, Boundary surface. Inserting Planar Surface, Offset Surface, Radiate Surface. Extending a surface, Surface fill, Ruled Surface, Trimming Surface, Mid surface, Replace Face, Delete face, Un-trim surface, Knit surface, Thickening a Surface, Move Face.		
Unit-V	Drafting of Mechanical Systems	(08 Hrs.)
Generating Views, Creating Dimensions, Inserting Annotations and Bill of Materials.		
Unit-VI	Sheet Metal Modelling	(08 Hrs.)
Constructing the base flange and miter Flange, addition of an Edge Flange, closing corner, Adding Jog, Unfolding the bends, Adding hem and vent.		

Term Work

Term work shall consist of A-3/A4 size printouts of the problems solved in practical's using Solid Works Software.

1. Sketcher drawings
2. Part modelling
3. Parametric Modelling
4. Assembly Modelling
5. Exploded view of Assembly
6. Surface Modelling
7. Drafting of Mechanical Systems
8. Sheet metal modelling

Text Books

1. Kuang-Hua Chang, “Motion Simulation and Mechanism Design with SOLIDWORKS Motion 2018”, SDC Publishers, 2018

Reference Books

1. Ibrahim Zeid and R. Siva-Subramaniam – “CAD/CAM- Theory and Practice”, Tata McGraw Hill, Publishing Co. 2009.
2. Rao P. N., “CAD/CAM”, Tata McGraw Hill.
3. Foley, Van Dam, Feiner and Hughes, “Computer Graphics Principles and Practice”, Second edition, Addison–Wesley, 2000.
4. Martenson, E. Micheal, “Geometric Modelling”, John Wiley & Sons, 1995.
5. Ronald E. Barr, DavorJuricic, Thomas J. Krueger, “Engineering & Computer Graphics Workbook Using SolidWorks 2014”, SDC Publication, 2014.
6. John Willis, Sandeep Dogra, “SOLIDWORKS 2019: A Power Guide for Beginners and Intermediate User”, published by CADArtifex, 2019.

End Semester Practical/Oral examination:

1. Practical examination duration is Two hours, based on the Term work.
2. Questions provided for practical examination should contain minimum five and not more than ten parts.
3. Evaluation of practical examination to be done based on the performance of students work in laboratory.

***Oral examination should also be conducted to check the knowledge of conventional and SolidWorks drawing.**

Designation of Course	Python Programming-II		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical:- 04 Hours/ Week	Term Work and Practical	50 Marks	02
	Total	50 Marks	02

Course Prerequisites:-	1. Soft Computing I 2. Soft Computing II 3. Python Programming-I
Course Objectives:-	The students should be able to 1. Readily use the Python filehandling 2. Apply array to solve engineering problems. 3. Understand data visualization techniques
Course Outcomes:-	Students will be able to 1. Understand file handling. 2. Understand concept of arrays. 3. Understand array manipulation. 4. Understand and Apply random numbers. 5. Understand matplotlib modules. 6. Understand and Apply visualization techniques

Course Contents

Unit -I	Python Files	(08 Hrs.)
Python File I/O, Directory and Files Management, Errors and Built-in Exceptions, Exception Handling Using try, except and finally statement, Custom Exceptions		
Unit -II	NumPy Array	(08 Hrs.)
Create a NumPy ndarray Object, Dimensions in Arrays, 0-D Arrays, 1-D Arrays, 2-D Arrays, 3-D arrays, Access Array Elements, Access 2-D Arrays, Access 3-D Arrays, Negative Indexing		
Unit -III	NumPy Slicing Arrays	(08 Hrs.)
Array Slicing, slicing 2-D Arrays, Shape of an Array, Array Reshaping, Iterating Arrays, Iterating 2-D Arrays, Joining NumPy Arrays, Splitting NumPy Arrays, Sorting Arrays		
Unit -IV	NumPy Random	(08 Hrs.)
Pseudo Random and True Random, Generate Random Number, Generate Random Float, Generate Random Array, Generate Random Number from Array, Normal Distribution, Visualization of Normal Distribution, Binomial Distribution, Poisson Distribution, Uniform Distribution, Exponential Distribution		
Unit -V	Matplotlib	(08 Hrs.)
Install matplotlib, Pyplot API, Figure Class, Axes Class, Multiplot, Subplots () Function, Formatting Axes, Setting Limits, Setting Ticks and Tick Labels		
Unit -VI	Two Dimensional and Three-Dimensional Visualization	(08 Hrs.)
Bar Plot, Histogram, Pie Chart, Scatter Plot, Pie Chart, Contour Plot, 3D Contour Plot, 3D Wireframe plot, 3D Surface plot		

Term Work

1. Read and write given text file (1 exercises)
2. Python NumPy Exercise (2 exercises)
3. Practice NumPy questions such as Array manipulations, numeric ranges, Slicing, indexing, Searching, Sorting, and splitting, and more.
4. Random Data Generation Exercise (2 exercises)
5. Practice and Learn the various techniques to generate random data in Python.

6. Python Matplotlib Exercise (3exercises)
7. Practice Data visualization using Python Matplotlib. Line plot, Style properties, multi-line plot, scatter plot, bar chart, histogram, Pie chart, Subplot, stack plot.

Text Books:

1. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher,
2. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

Books of References

1. Python Programming using problem solving Approach by Reema Thareja, Oxford University, Higher Education Oxford University Press; First edition (10 June 2017), ISBN-10: 0199480173.
2. Data Structures and Algorithms in Python by Michael T Goodrich and Roberto Tamassia, Micheal S Goldwasser, Wiley Publisher (2016)
3. Fundamentals of Python first Programmes by Kenneth A Lambert, Copyrighted material Course Technology Inc. 1st edition (6th February 2009)

Supplementary Resources:

1. <http://www.w3schools.com>
2. <http://docs.python.org>
3. <http://www.tutorialspoint.com>
4. <http://www.learnpython.org>

Designation of Course	Vocational Course I: Automobile Servicing- I		
Teaching Scheme	Examination Scheme		Credits Allotted
	Term Work and Oral	50 Marks	02
	Total	50 Marks	02

Course Prerequisites:	1. Basic knowledge of automobile engineering and servicing
Course Objectives: -	<ol style="list-style-type: none"> To perform skilled mechanical work in diagnosing, repairing and maintaining all major vehicle systems of four-wheeler To provide knowledge on automotive industry and job-related activities as an automotive service technician. To work safely and responsibly within all shop standards and environmental guidelines.
Course Outcomes: -	<ol style="list-style-type: none"> Understand and apply different types of tools and workshop equipment in the workshop for servicing. Understand and apply dismantle and reassemble of engines, cooling and transmission of different vehicles Understand and apply dismantle and reassemble of fuel supply system, Steering Mechanism, Wheel Balancing and Wheel Alignment. Understand and apply dismantle and reassemble of Battery, Ignition and Starting System Understand and apply dismantle and reassemble of Tyre Repairer/Inspection, Auto Body Repair, Denting & Painting Understand and apply overhaul of electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc.

Course Contents

Unit-I	Introduction to Four-wheeler Servicing:	(08 Hrs.)
<p>Familiarization of workshop manual. Practice on how to read job-card. Identification of different types of vehicle. Identification of Vehicle Identification Number, Chassis no. & Engine no identification of different types of engine components, Lubrication and Maintenance Schedule</p> <p>Necessity for routine maintenance, Importance of service manuals, Specification of engines- petrol and diesel vehicles(a) Engine (b) Clutch (c) Gear Box (d) Propeller shaft (e) Universal joints (f) Differential (g) Axles and hubs (h) Suspension system (i) Steering system (j) Tyre (k) Chassis (l) Brake-drum and disc Battery (m) Self-starter (n)Dynamo, Checking of compression and vacuum, Car wash – before & after servicing using different types of nozzles Check / replenish / top up – lubricating oil, engine coolant, power steering hydraulic oil, wind screen wiper water. Replace – air cleaner, oil filter & fuel filter Apply Grease to parts / through greasing points (if necessary).</p>		
Unit-II	Engine Servicing, Cooling and Power Transmission	(08 Hrs.)
<p>Engine Service: Introduction, Engine removal, cylinder head, Valve and Valve mechanism, piston connecting rod assembly, cylinder block, crankshaft and main bearing, engine reassembly.</p> <p>Engine tuning: Meaning and scope of engine tuning. Necessity of engine tuning, Engine analysis and tuning with the help of diagnostic computer, Diesel engine injection timing checking.</p> <p>Engine cooling systems: Necessity, Methods of cooling, Radiator, Cooling system trouble shooting.</p> <p>Power Transmission: Remove & refit vehicle body parts (bonnet, front bumper & door) Check / replenish/top up brake fluid, transmission oil. Adjust Hand brake and replace hand brake cable Adjust clutch and brake pedal plays Replace propeller shaft, wheel hub bearings & brake pads.</p>		

Unit-III	Engine Fuel Supply System, Steering, wheel Balancing and Alignment	(08 Hrs.)
<p>Petrol and Diesel Engine Fuel Supply System: Fuel Supply Systems, Fuel pump, Fuel injection, Fuel pump testing, troubleshooting and service, Fuel supply system troubleshooting, Fuel filters and air cleaners. Maintenance Schedule of diesel engine fuel injector, hot plugs, rotary and reciprocating type of fuel injection pump, fuel injection pump of single cylinder engines, hoses & pipelines, priming unit, tanks. Front Axle and Steering: Introduction, Front axle, steering geometry, Steering mechanism, power steering, steering adjustment, Steering trouble shooting. Wheel Balancing: Remove tyre from vehicle. Check tyre & rim and check for run out. Fit the tyre assembly to the vehicle. Wheel Alignment: Check tyres, ride height, wheel bearings, ball joints, control arms bushings and sway bars, shock absorbers, struts & power steering. Identify components, brief working principle & operation of computerized wheel aligner Procedure to make the aligner ready to check wheel alignment. Procedure for taking readings, interpreting alignment readings and rectify steering geometry with wheel aligner – take a printout. Procedures for test drive to confirm the repairs.</p>		
Unit-IV	Battery, Ignition and Starting System	(08 Hrs.)
<p>Battery and Ignition System: Remove and refit head lamp assembly. Check power plug and inspect H.T. cables Clean, Check and Adjust spark plug Cleaning and topping up of a lead acid battery, testing battery with hydrometer, battery tester, connecting battery to a charger for battery charging. Starting System: Starting motor, Starting drives, Electronic starter control, idea of engine starting-system circuit. Testing the starting system and troubleshooting. Ignition System: Idea of Battery-and-coil ignition circuit and its working. Compression ignition of diesel engines.</p>		
Unit-V	Tyre Repairer/Inspection, Auto Body Repair, Denting & Painting	(08 Hrs.)
<p>Tyre Repairer/Inspection: Removal & re-fitting of wheel from light & heavy vehicle. Measurement of tread wear. Dismantling tyre & tube, checking puncture, assembling, inflate it to correct pressure. Vulcanizing of tubes & tyres. Repair tubeless tyre puncture. Air inflation with nitrogen gas inflator according to the manufacturer's recommendation. Practice on Tyre rotation as per vehicle manufacturers recommendation. Auto body repair: Identification of different types of body, chassis and drive lines, Identification of location of parts and panels, Practice on operating the air compressor, Practice on periodical maintenance of air compressor Inspect and decide whether it can be repaired or replaced Remove and refit body panels, doors, floors, wheel boxes and fenders Practice on removing and refitting wind shield glasses. Auto body painting: Consumable's clothing safety, Practice on removing paint from the damaged area Practice on mixing and applying body filler Practice on sanding (block) Practice on mixing and applying putty Practice on applying primer Practice on feather edge sanding and masking Base coat application Surface cleaning and degreasing Second and third coat application Preheating the vehicle and cooling Cutting, scuffing, rubbing and polishing.</p>		
Unit-VI	Modern Electric and Hybrid Vehicles	(08 Hrs.)
<p>Introduction to electric and hybrid electric vehicles, History of hybrid and electric vehicles, Social and environmental importance of electric and hybrid electric vehicles, Electrical basics, Motor and generator basics, Electric and Hybrid Electric Drive Trains Basic concept of electric and hybrid traction, Introduction to various electric and hybrid electric drive train topologies, Advantages, and disadvantages. Power Flow: Power flow control in electric and hybrid electric drive train topologies. Electric Drive Components: Electric drive components used in electric and hybrid vehicles, Electric motor requirements, Direct Current (DC) motors (Brushed and Brushless), Power converters, Drive controllers.</p>		

List of Experiments-

1. To Follow standard operating procedures for using workshop tools and equipment for fault diagnosis or troubleshoot problem in a vehicle.
2. To Understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle (including major aggregates like engine. gear box, transmission systems propeller shaft etc.)

3. To Service, repair and overhaul of steering system.
4. To Service, repair and overhaul of suspension system.
5. To Service, repair and overhaul of tyres.
6. To Service, repair and overhaul of wheels.
7. To Service, repair and overhaul diesel Engines and its fuel system.
8. To Service, repair and overhaul petrol Engines and its fuel system.
9. To Service, repair and overhaul of cooling system and radiator
10. To Service, repair and overhaul of emission and exhaust system.
11. To Service, repair and overhaul of gearbox, drive-train assembly, and transmission systems (manual, automatic etc.)
12. To Service, repair and overhaul of brake system.
13. To Service, repair, and overhaul of clutch assembly.
14. Repair and overhaul of electronic control unit
15. To Repair and overhaul of electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc.

Text Books

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

Reference Books

1. Automobile Engineering by Kirpal Singh Standard Publishers Distributors.
2. Automotive Engines, A.K. Babu, Khanna Publishing House

Bharati Vidyapeeth
(Deemed to be University), Pune, India
College of Engineering, Pune
Department of Mechanical Engineering

Vision of the Department

To develop high quality Robotics and Automation Engineers through dynamic education to meet social and global challenges

Mission of the Department

- To provide extensive theoretical & practical knowledge to the students with well-equipped laboratories & ICT tools through motivated faculty members
- To inculcate aptitude for research, innovation and entrepreneurial qualities in students
- To acquaint students with ethical, social and professional responsibilities to adapt to the demands of working environment.

Name of Programme: B. Tech. Robotics and Automation Engineering

Programme Educational Objectives (PEOs)

- To fulfill need of industry and society with theoretical & practical knowledge
- To perform research, innovation, lifelong learning and continued professional development
- To fulfill professional ethics and social responsibilities

Programme Outcomes (POs)

The graduates will be able to

- a.* apply knowledge of mathematics, science and engineering fundamentals for solving complex engineering problems
- b.* identify the need, plan and conduct experiments, analyze data for improving the mechanical processes.
- c.* design and develop mechanical systems considering social and environmental constraints.
- d.* design and develop a complex mechanical system using research based knowledge, advanced mathematical, statistical tools and techniques.

- e.* use information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance.
- f.* know social responsibilities while doing professional engineering practices.
- g.* familiarize with eco-friendly, sustainable and safe working environment.
- h.* take into account professional ethics while designing engineering systems.
- i.* work efficiently as a group leader as well as an individual.
- j.* communicate in written and verbal form with subordinates and supervisors.
- k.* apply project and finance management techniques in multidisciplinary environments.
- l.* take interest in higher education and update the knowledge.

B. TECH. & ROBOTICS& AUTOMATION: COURSE STRUCTURE CBCS-2020-21

B.Tech. Robotics &Automation Sem.-I

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Linear Algebra, Calculus & Complex Variables	4	-	1	60	40	-	-	-	100	4	-	1	5
2		Waves & Solid State Physics	3	2	-	60	40	25	-	-	125	3	1	-	4
3		Electrical Engineering Systems	4	2	-	60	40	25	-	-	125	4	1	-	5
4		Computer Aided Drafting & Visualization *	4	2	-	60	40	-	-	50	150	4	1	-	5
5		Mechanical Engineering Systems	3	2	-	60	40	50	-	-	150	3	1	-	4
6		Computer Programming: Fundamentals (Using C/C++)	-	4	-	-	-	-	-	100	100	-	2	-	2
		Total	18	12	1	300	200	100	-	150	750	18	6	1	25

*End Sem. Examination of 4 Hrs.; #: Based on TW & internal oral examination

B. Tech. Robotics & Automation Sem.-II

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P TW/OR/PR	T	Total
1		Differential Equations, Probability & Statistics	4	-	1	60	40	-	-	-	100	4	-	1	5
2		Chemistry of Engineering Materials	3	2	-	60	40	25#	-	-	125	3	1	-	4
3		Electronics Engineering Systems	4	2	-	60	40	25#	-	-	125	4	1	-	5
4		Fundamentals of Robotics	4	2	-	60	40	-	-	50	150	4	1	-	5
5		Engineering Mechanics	3	-	-	60	40	-	-	-	100	3	-	-	3
6		Basics of PLC	-	2	-	-	-	50#	-	-	50	-	1	-	1
7		Object Oriented Programming (Using Python)	-	4	-	-	-	-	-	100	100	-	2	-	2
		Total	18	12	1	300	200	100	-	150	750	18	6	1	25

*End Sem. Examination of 4 Hrs.; #: Based on TW & internal oral examination

Designation of Course	Linear Algebra, Calculus and Complex Variables		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Tutorial: - 01 Hours/ Week	Internal Assessment	40 Marks	
	Tutorial		01
	Total	100 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Students should have knowledge of basic algebra. 2. Students should have knowledge of vector algebra. 3. Students should have knowledge of complex numbers.
Course Objectives:-	<p>To provide knowledge about</p> <ol style="list-style-type: none"> 1. Rank, consistency of system of equations and partial differentiation. 2. Vector differentiation and vector integration. 3. Function of complex variable.
Course Outcomes:-	<p>On completion of the course, students will be able to–</p> <ol style="list-style-type: none"> 1. Understand rank of matrix and apply it test consistency of linear system. 2. Understand the partial derivative and evaluate indeterminate forms. 3. Understand vector differential operator and vector identities. 4. Understand line, surface and volume integrals and apply it evaluate to work done. 5. Understand the analytic functions. 6. Understand Taylors and Laurentz series.

Course Contents

Unit-I	Linear Algebra: Matrices	(08 Hrs.)
Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering		
Unit-II	Partial Differentiation and Indeterminate forms	(08 Hrs.)
Functions of two or more variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Change of variables. Indeterminate forms: L' Hospital's Rule, Evaluation of Limits		
Unit-III	Vector Differential Calculus	(08 Hrs.)
Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.		
Unit-IV	Vector Integral Calculus and Applications	(08 Hrs.)
Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problems in Fluid Mechanics, Continuity equations, Streamlines, Equations of motion, Bernoulli's equation.		
Unit-V	Complex Variables	(08 Hrs.)
Function $f(z)$ of complex variable, limit, continuity and differentiability of $f(z)$, Analytic function, necessary and sufficient conditions for $f(z)$ to be analytic (without proof), Cauchy-Riemann equations in cartesian coordinates (without proof) Milne-Thomson method to determine analytic function $f(z)$ when realpart (u) or Imaginary part (v) or its combination ($u+v$ or $u-v$) is given. Harmonic function, Harmonic conjugate and orthogonal trajectories.		
Unit-VI	Complex Integration	(08 Hrs.)
Line Integral, Cauchy's Integral theorem for simple connected and multiply connected regions (without proof), Cauchy's Integral formula (without proof). Taylor's and Laurent's series (without proof). Definition of Singularity, Zeroes, poles of $f(z)$, Residues, Cauchy's Residue Theorem (without proof).		

Assignments:

Problems and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Linear algebra: matrices
2. Partial differentiation and indeterminate forms
3. Vector differential calculus
4. Vector integral calculus and applications
5. Complex variables
6. Complex integration

Tutorials:

Problems and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Matrix algebra and system of linear equations.
2. Eigen values and eigenvectors.
3. Partial differentiation.
4. Indeterminate forms.
5. Fourier series; gradient, divergence, and curl.
6. Directional derivative, scalar potential and vector identities.
7. Line, surface and volume integrals.
8. Application of Gauss, Stokes and Green's theorems.
9. Analytic functions, Cauchy-Riemann equations.
10. Limit continuity and differentiability.
11. Cauchy's integral theorem and integral formula.
12. Taylor and Laurent series.

Text Books

1. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes I)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.
2. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes II)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

References

1. B. S. Grewal, "Higher Engineering Mathematics", 42nd Ed., Khanna Publication, Delhi
2. B.V. Ramana, "Higher Engineering Mathematics", 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Ed., John Wiley & Sons, Inc., 2015.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Ed., Cengage Learning, 2012.
5. Michael Greenberg, "Advanced Engineering Mathematics", 2nd Ed., Pearson Education, 1998.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

Students are expected prepare report on any one topic, write its definition, applications and analyze the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. System of linear equations solution
2. Rank of matrix
3. Total derivative
4. L' Hospital's Rule
5. Dimension and basis
6. Curl and divergence
7. Work done
8. Gauss divergence theorem

9. Stokes theorem
10. Eigen values and Eigen vectors
11. Bernoulli's equation
12. Cauchy-Riemann equations in detail
13. Harmonic conjugate and orthogonal trajectories
14. Cauchy's Integral formula
15. Cauchy's Residue Theorem

Unit Test-

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Waves and Solid State Physics		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	04

Course Prerequisites:-	Students are expected to have a basic understanding of physics and calculus.
Course Objective	1. To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Mechanical Engineering.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Infer the wave nature of light and apply it to measure stress, pressure and dimension etc. 2. Summarize the structure and properties of lasers to their performance and intended applications. 3. Explain mechanical properties of solid matter, and connect to applications in the field of engineering. 4. Use the knowledge of nanoscience to develop new materials with tunable properties. 5. Use analytical instruments for understanding the nanomaterials. 6. Interpret the superconductivity and perfect diamagnetism, and give a qualitative description of the Meissner effect and its applications.

Course Contents

Unit-I	Wave Optics	(06 Hrs)
<p>Interference- Interference of waves, interference due to thin film (Uniform and non-uniform), Applications of interference (optical flatness, interference filter, non-reflecting coatings).</p> <p>Diffraction- Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima.</p> <p>Polarisation - Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.</p>		
Unit-II	Lasers	(06 Hrs.)
Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO ₂ laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.		
Unit-III	Solid State Physics	(06 Hrs.)
Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.		
Unit-IV	Nano-science	(06 Hrs.)
Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications, quantum dots – wide band semiconductors, direct/indirect band gap semiconductors.		

Unit-V	Analytical Instruments	(06 Hrs.)
Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatics focusing, Electron sources, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Field emission scanning electron microscope (FESEM), X-ray Spectroscopy, Energy Dispersive X-ray Spectroscopy(EDS), Atomic force microscopy(AFM), X-ray diffraction(XRD), Bragg's law, Powder X-ray diffraction.		
Unit-VI	Smart Materials and Superconductors	(06 Hrs)
Introduction to smart materials, active smart polymers, shape memory alloys, Electro and Magneto Rheological Fluids, Introduction to composites, types of composites. Introduction to superconductivity; Properties of superconductors: zero electrical resistance, critical fields, persistent current, Meissner effect - Type I and Type II superconductors, Low and high temperature superconductors (introduction and qualitative)		

Term Work:

Practical (Any Eight of the Following)

1. Determination of radius of plan convex lens/wavelength of light/Flatness testing by Newton's rings
2. Determination of wavelength of light using diffraction grating
3. Determination of resolving power of telescope
4. Determination of thickness of a thin wire by air wedge
5. Determination of refractive index for O-ray and E-ray
6. Determination of divergence of a laser beam
7. Particle size by semiconductor laser
8. Determination of wavelength of laser by diffraction grating
9. To study Hall effect and determine the Hall voltage
10. Calculation of conductivity by four probe method
11. Study of solar cell characteristics and calculation of fill factor
12. Determination of band gap of semiconductor
13. Synthesis of metal oxide nanoparticles (ZnO/ZnS/Gold)
14. UV-VIS spectra of synthesized semiconductor nanoparticles
15. To determine the velocity of sound
16. Measurement of average SPL across spherical wave front and behavior with the distance
17. Expansion chamber muffler: investigation of muffler response as a filter in the low frequency approximation by determining insertion loss.
18. Interference of sound using PC speakers
19. Determination of velocity of sound in liquid by ultrasonic interferometer
20. Ultrasonic probe - a study
21. Mini-project based on contents of syllabus.

Assignments

Six assignments to be given by the subject teacher (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

Text Books

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Measurement and effect of environmental noise in the college
2. Construction and application of heat sensor in process control
3. Design and simulation of automatic solar powered time regulated water pumping
4. Solar technology: an alternative source of energy for national development
5. Double pendulum and its application
6. The study on the effect of length on the resistance of a copper wire (verification of ohms law r directly proportional to l)
7. Comparison of various method used in measuring the gravitational constant g
8. Design and construction of digital distance measuring instrument
9. Electric power generation by road power
10. Study of vibration of bars
11. Determination of absorption coefficient of sound absorbing materials
12. Quantum confinement effect in wide band semiconductors
13. Tesla Coil
14. Thin film interference in soap film-formation of colours
15. LiFi- wireless data transfer system using light

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Electrical Engineering Systems		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites: -	Students should have basic knowledge of Physics, Chemistry and Mathematics
Course Objectives: -	1. The course introduces fundamental concepts of DC and AC Circuits, Electrical Measurement, Transformers, Induction Machines, DC Machines, Basics of power transmission, distribution & safety measures.
Course Outcomes: -	<ol style="list-style-type: none"> Understand and apply knowledge of Basic laws and network theorems to solve electrical networks Understand and apply knowledge of AC Circuits, Switch gear and electrical measuring instruments Understand and apply fundamental concept of magnetic and electromagnetic circuits for operation of Transformers Understand AC motors, it's control techniques for various mechanical engineering applications Understand DC motors, it's control techniques for various mechanical engineering applications Understand working of Transmission, Distribution of power use of safety rules.

Course Contents

Unit-I	DC Circuit Analysis	(08 Hrs.)
Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements, source transformation. Kirchhoff's laws; loop and nodal methods of analysis; star-delta transformation.		
Unit-II	AC Circuits and Switch Gear	(08 Hrs.)
Representation of sinusoidal waveforms, peak and RMS values, Phasor representation of AC quantities, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Series and parallel resonance. Three phase balanced circuits, voltage and current relations in star and delta connections, Power measurement in three phase circuits.		
Unit-III	Network Theorems and Electrical Measurement	(08 Hrs.)
Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem (simple numerical problems). Electrical instruments such as wattmeter, energy meter, tong-tester, megger and power analyzer. Introduction to LT Switchgear, NO and NC Contacts, Contactors, relay, timers, use in control panel, application in interlocking and protection, symbols.		
Unit-IV	Induction Machines	(08 Hrs.)
Phase induction motor: Construction, types, rotating magnetic field, principle of operation, slip, frequency of rotor current, rotor EMF, rotor current, expression for torque, conditions for maximum torque, torque slip characteristics, starting torque in squirrel cage and slip ring motors, effect of change in supply voltage on torque, slip and speed, relation between full load torque and maximum torque, Power stages in induction motor, vector diagram and equivalent circuit, circle diagram, construction and calculation, speed control of 3 phase motor, starting methods for 3 phase induction motor.		

Single phase motor: Double revolving field theory, starting methods, no load and block rotor test, equivalent circuit, types of single-phase motor. Servomotor: Servomotor, construction, types, working, characteristics, application in automation and robotics.		
Unit-V	DC Machines	(08 Hrs.)
<p>DC Generator: Construction features, emf equation of dc generator, methods of excitation, losses condition for maximum efficiency, armature reaction, interpoles and compensating winding, commutation, methods of improving commutation, characteristics of separately excited and self excited dc generator.</p> <p>DC Motor: Working principle, voltage equation, condition for maximum power, characteristics, operating characteristics of dc motor, torque developed, starting, 3 point and 4 point starter, speed control methods, Swinburn's and break test of dc shunt motor.</p>		
Unit-VI	Basic of Power transmission and distribution, Safety Measures	(08 Hrs.)
<p>Classification of transmission lines, transmission line parameters, ABCD constants, Voltage regulation, Ferranti effect, efficiency of transmission line. 3-phase 3-wire and 3-phase 4-wire distribution system, feeders, distributors, main lines, comparison of various distribution systems, load power factor improvement techniques. Safety measures in electrical system, basic principles of earthing-types of earthing.</p>		

List of Assignments:

The students will be given total **twelve** assignments (Two assignments on each Unit respectively).

1. DC Circuit Analysis
2. Network Theorems
3. AC Circuits and Switch Gear
4. Electrical Measurement
5. Single Phase Transformer
6. Three Phase Transformer
7. 3 Phase induction motor
8. Single phase motor
9. DC Generator
10. DC Motor
11. Power transmission and distribution
12. Safety Measures

List of Experiments:

Note: Term work shall consist of Minimum **Eight** Experiments from the following list.

1. Plotting B-H characteristics for a material
2. Verification of Kirchhoff's Laws
3. Verification of Superposition Theorem
4. Verification of Thevenin's Theorem
5. Verification of Maximum Power Transfer Theorem
6. Study of R-L series, R-C series, R-L-C series circuit
7. Time response of R-L series and R-C series circuit
8. Verification of voltage and current relationships in star and delta connected 3-phase networks
9. Single lamp controlled by two different switches (staircase)
10. Two lamps controlled independently from two different switches (parallel)
11. Series connected lamps
12. Study of Electricity bill(Industrial / commercial)
13. Direct loading tests on single phase transformer
14. Mini-project based on contents of syllabus.

Text Books

1. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)

Reference Books

2. Electrical Technology - Edward Huges (Pearson)
3. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
4. Principles of Electronics-Dr. H. M. Rai (SatyaPrakashan)
5. Electronic Devices and Circuit Theory- R. L. Boylestad and L. Nashelsky (PHI)
6. Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Development of practical kit for verification of Thevenin's theorem.
2. Development of practical kit for verification of Superposition theorem.
3. Development of practical kit for verification of Maximum power transfer theorem
4. Development of practical kit for verification of Norton's theorem.
5. Development of practical kit for study of R-L-C Series circuit.
6. Development of practical kit for study of R-L-C parallel circuit.
7. Development of practical kit for study of voltage and current relationships in star connected network.
8. Development of practical kit for study of voltage and current relationships in delta connected network.
9. Demonstration of single-phase transformer application for practical application.
10. Demonstration of transformer operation and testing by using professional software.
11. Development of Smart Energy meter using GSM
12. Demonstration of Safety measures in electrical system.
13. Case studies on – Learning industrial Safety through films/Videos
14. Case studies on – Learning industrial Safety through posters/charts
15. Demonstration of types of earthing.

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Computer Aided Drafting & Visualization		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/Week	Internal Assessment	40 Marks	
	Term Work & Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites: -	Fundamentals of Mathematics
Course Objectives: -	<ol style="list-style-type: none"> To understand the basic principles of engineering drawing and highlight the importance of Computer Aided Drafting in engineering. To develop the graphical skills for communication of concepts & idea through technical drawings.
Course Outcomes:-	<ol style="list-style-type: none"> Understand the fundamental concepts of CAD Drawing, its applications, different types of lines, curves and dimension technique with practical application. Understand the concept of Orthographic projections and apply it to draw detail views by using 1st angle projection method. Understand the concept of isometric projection and apply it to construct 3D view of a component. Understand the concept of projections of Point, Line and plane; and apply to draw its projection by using 1st angle projection method and to locate its traces. Understand the concept of projections of different types of solids and sectioned solids; and apply to draw its projection by using 1st angle projection method. Understand the concept of Development of Lateral surfaces; and apply to development of simple and sectioned Solids.

Course Contents

Unit-I	Fundamentals of CAD and Engineering Curves	(08 Hrs.)
<p>Introduction to Engineering Drawing, Types of lines and Dimensioning, Layout and size of drawing sheets, Scales.</p> <p>Engineering Curves-Ellipse drawing by Focus-Directrix Circle Method and Concentric Circle Method, Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone and Cylinder.</p> <p>Fundamentals of Computer Aided Drafting (CAD) and its applications, Various Softwares for Computer Aided Drafting. AutoCAD initial setting and AutoCAD commands</p>		
Unit-II	Orthographic Projection	(08 Hrs.)
<p>Basic principle planes of Projections, First and Third angle method of Projection, Orthographic Projections of given Pictorial view by first angle projection method only, Sectional orthographic Projection. Orthographic Drawing by using AutoCAD.</p>		
Unit-III	Isometric Projections	(08 Hrs.)
<p>Principles of Isometric Projections-Isometric Scale, Isometric Axes, Isometric Projections and Isometric Drawing. Constructions of Isometric view from given Orthographic Views and given origin. Isometric Drawing by using AutoCAD.</p>		
Unit-IV	Projection of Points, Lines and Plane Surfaces	(08 Hrs.)
<p>Projections of Points, Projections of Oblique lines in First Quadrant, Traces.</p>		

Projections of Planes- projection of perpendicular and oblique planes (polygonal and circular surfaces), Obtaining true shape of plane surface. Projection of Points, Lines and Plane Surfaces by using AutoCAD.		
Unit-V	Projection of Solids and Sectioned Solids	(08 Hrs.)
Introduction of solids- Types of solids, Projection of solid inclined both references plane, Projection of common solids such as prism, pyramid, cylinder and cone. Projection of solids cut by AIP and AVP, obtaining true shape of a section. Projection of Solids and Sectioned Solids by using AutoCAD.		
Unit-VI	Development of Lateral Surfaces	(08 Hrs.)
Development of the lateral surfaces of solids like Prisms, pyramids, cylinders and cones. Development of cut solids. Development of Lateral Surfaces by using AutoCAD.		

Term work

Term work shall consist of **seven** A2 size (594 mm x 420 mm) sheets using **AutoCAD**.

Sheets

1. Types of lines, Dimensioning practice, 1st and 3rd angle methods symbol.
2. Engineering Curves
3. Orthographic Projections
4. Isometric views
5. Projections of Points and Lines and planes
6. Projection of Solids and Section of solids
7. Development of Lateral surfaces

Assignments

Minimum five problems on each unit in A3 size Drawing Book

Textbooks

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India.
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.

Reference Books

1. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
2. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.
3. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005.
4. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005.
5. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. To obtain industrial drawings to identify the types of lines, dimensioning methods and method of projection.
2. To develop the model/charts based on engineering curves.
3. To prepare model/chart for identification of engineering curves in nature for industrial, societal, etc application.
4. To demonstrate different methods of orthographic projection.
5. To demonstrate projection of Points.
6. To demonstrate projection of Lines.
7. To demonstrate projection of Planes.

8. To demonstrate projection of Solids.
9. To demonstrate developments of surfaces for solids.
10. To demonstrate industrial application of development of surfaces such as steam carrying pipes, Ducts of air conditioning systems, etc.
11. To demonstrate Isometric projection method through model of a cube.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Mechanical Engineering Systems		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hour/ Week	End Semester Examination	60 Marks	03
Practical: -02 hours/Week	Internal Assessment	40 Marks	
	Term Work	50 Marks	01
	Total	150 Marks	04

Course Prerequisites: -	Higher Secondary Physics
Course Objective: -	To teach students about 1. Introduction to systems in Thermal Engineering 2. Introduction to systems in Manufacturing Engineering. 3. Introduction to systems in Welding and Joining processes
Course Outcomes: -	Students should 1. Understand the fundamentals of power producing and absorbing devices. 2. Understand the fundamental concepts of power transmitting devices 3. Understand the fundamentals of mechanism of machines 4. Understand the fundamentals of Fusion welding processes and create job as per given specification. 5. Understand the fundamentals of resistance and solid-state welding processes and create job as per given specification. 6. Understand the fundamentals of machine tools and manufacturing processes.

Course Contents

Unit 1	Power Producing and Absorbing Systems	(06 Hrs.)
<p>Power Producing Systems: I. C. Engines- Basic nomenclature, Classification, S.I and C. I. Engines, Two stroke and four stroke engines. Boilers- classification, water tube and fire tube boilers. Steam Turbines: Classification, simple Impulse, and reaction turbines. Water Turbines: Classification, Impulse, and reaction Turbines. Gas Turbines: classification, open and closed gas turbine. Construction, working and applications of all these devices.</p> <p>Power Absorbing Systems: Compressors; Classification, Rotary, reciprocating air compressors, Blower, Pumps: Classification, Rotary, reciprocating pumps, Household refrigerator and window air conditioner.</p>		
Unit 2	Power Transmitting Devices	(06 Hrs.)
Types of Belts and belt drives, Chain drive, rope drive, Types of gears, Types of Couplings, Types of friction clutch, Power transmission shafts, axles, keys, types of Keys, Sliding Contact and Rolling Contact Bearing, Bush and ball bearings, Types of brakes.		
Unit 3	Introduction to Mechanisms of Machines	(06 Hrs.)
Kinematic link, Kinematic pair, Types of constrained motions, Kinematic chain, Types of joints, Mechanism, Machine, Degree of freedom (Mobility), Kutzbach criterion, Grubler's criterion. Four bar chain and its inversions, Grashoff's law, Slider crank chain and its inversions, Double slider crank chain and its inversions. Geneva Mechanisms, Ratchet and Paul Mechanisms.		
Unit 4	Introduction to Welding Processes	(06 Hrs.)
<p>Introduction, Classification of welding processes, Advantages and disadvantages of welding processes Soldering, Brazing.</p> <p>Arc welding processes-Carbon arc, Submerged arc, Tungsten inert gas (TIG), Metal inert gas (MIG), Plasma arc, Stud welding and related arc welding processes –Theory, Comparison on merits, limitation and applications, Fluxes used in arc welding. Characteristics of Welding Processes.</p> <p>Gas welding – Processes and equipment used, Types of flames, Gas cutting– Merits, demerits and applications.</p>		

Unit 5	Resistance Welding and Solid-State Welding	(06 Hrs.)
Resistance welding – Spot, Seam, Projection, Butt, Percussion welding, Tube welding, Electric resistance welding process, its merits, demerits and applications. Introduction of Solid-State Welding- Pressure, Diffusion, Ultrasonic, Explosive, Friction, Forge, Principle, Equipment used and Flux used, Merit's, demerits and application of the above process. ISO welding symbols.		
Unit 6	Introduction to Machine Tools	(06 Hrs.)
Demonstration of Lathe machine, Centre lathe, wood working lathe, Drilling machine, types of drilling machine, milling machine, Power saw. Grinding machine, cylindrical grinder, and surface grinder. NC machine, CNC machine.		

Term work: Term work shall consist following experiments

1. Study and demonstration of low pressure boilers.
2. Study and demonstration of IC Engines.
3. Study and demonstration of Refrigeration and Air Conditioning.
4. Study and demonstration of Pumps and Compressors.
5. Study and demonstration of turbines.
6. Study and demonstration of Inversions of 4-bar, Single and Double Slider Crank Mechanisms.
7. Study and demonstration of operations on resistance welding processes.
8. Study and demonstration of gas welding operations.
9. Study and demonstration of Soldering and brazing
10. Study and demonstration of operations on center lathe.

Assignment

1. Assignment on power producing and absorbing devices
2. Assignment on mechanism of machines
3. Assignment on Power Transmitting Devices
4. Assignment on gas welding
5. Assignment on resistance welding
6. Assignment on centre lathe, drilling and Grinding.
7. Assignment on Milling machine
8. Assignment on NC, CNC machine

Text Books

1. A Textbook of Production engineering” P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition, 8th Edition (2014).
2. A Textbook of Manufacturing Technology: Manufacturing Processes, R. K. Rajput, Laxmi Publications (P) Ltd, 2nd Edition 2015
3. R S Khurmi and J K Gupta, Textbook of Thermal Engineering, S Chand publications.
4. O.P.Khanna , A Text Book of Welding Technology, Dhanpat Rai and Sons

Reference Books

1. V. Ganeshan, Internal Combustion Engine, Tata McGraw-Hill Publication, 4th Edition (2012).
2. R. K. Rajput, Thermal Engineering, Laxmi Publications
3. Ambekar A.G Mechanisms and Machine Theory, Prentice-Hall of India, Eastern Economy Edition (2007)
4. S.S. Ratan, Theory of Machines, , Tata McGraw Hill, 4th Edition
5. Introduction to robotics, S.K.Shah. McGraw Hill, 2nd Edition
6. Richard Little, “Welding And Welding Technology” Pearsons Education second Edition

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. To prepare chart of comparison among specification of various models of two wheeler available.
2. To develop demonstration model of low-cost household refrigerator
3. To develop demonstration model of low-cost air conditioner
4. To develop demonstration model of Biogas plant
5. To develop demonstration model of geothermal power plant
6. To develop demonstration model of wind power plant

7. To develop demonstration model of solar energy plant
8. To develop demonstration model of Whitworth quick return mechanism
9. To develop demonstration model of single slider crank chain mechanism with its inversion
10. To develop demonstration model of Ratchet and Paul mechanism
11. To develop demonstration model of mini conveyor using Geneva mechanism

Unit Test

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Computer Programming: Fundamentals (Using C/C++)		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical: -04 hours/Week	Term Work & Practical	100 Marks	02
	Total	100 Marks	02

Course Prerequisites:-	Basic Mathematics
Course Objective: -	The goal of the course is that students should develop techniques for problem solving using a programming language.
Course Outcomes	<p>Students should</p> <ol style="list-style-type: none"> 1. Understand basics of C/ C++ and apply that knowledge to write simple programs. 2. Understand the uses of operators and apply them in writing programs. 3. Understand the concept of conditional statements apply them in writing programs. 4. Understand the concepts of loops in C/C++ apply them in writing programs. 5. Understand the concepts of user defined functions, recursion and apply them in writing programs 6. Understand the concept of overloaded functions and apply them in writing programs

Course Contents

Unit-I	Introduction to C/ C++	(08 Hrs.)
Introduction to C, C++; Object oriented programming; Programming Fundamentals; Data and Data Types		
Unit-II	Operators in C/C++	(08 Hrs.)
Declarations in C/C++; Operators in C/C++; Introduction to classes and objects and strings		
Unit-III	Conditional Statements	(08 Hrs.)
Relational and logical operators; If statements; Switch Statements		
Unit-IV	Loops	(08 Hrs.)
Loops in C/C++; For loop; While loop; Do while loop; Jump statement		
Unit-V	Functions I	(08 Hrs.)
Functions basic formats; Recursion		
Unit-VI	Functions II	(08 Hrs.)
Overloaded functions; Local, Global and Static Variables		

Term Work

Term work shall consist of programs (not limited to) listed below based on syllabus.

1. C/C++ "Hello, World!" Program
2. C/C++ Program to Print Number Entered by User
3. C/C++ Program to Add Two Numbers
4. C/C++ Program to Find Quotient and Remainder
5. C/C++ Program to Find Size of int, float, double and char in Your System
6. C/C++ Program to Swap Two Numbers
7. C/C++ Program to Find ASCII Value of a Character

8. C/C++ Program to Multiply two Numbers
9. C/C++ Program to Check Whether Number is Even or Odd
10. C/C++ Program to Check Whether a character is Vowel or Consonant.
11. C/C++ Program to Find Largest Number Among Three Numbers
12. C/C++ Program to Find All Roots of a Quadratic Equation
13. C/C++ Program to Calculate Sum of Natural Numbers
14. C/C++ Program to Check Leap Year
15. C/C++ Program to Find Factorial
16. C/C++ Program to Generate Multiplication Table
17. C/C++ Program to Display Fibonacci Series
18. C/C++ Program to Find GCD
19. C/C++ Program to Find LCM
20. C/C++ Program to Reverse a Number
21. C/C++ Program to Calculate Power of a Number
22. C/C++ Program to Check Whether a Number is Palindrome or Not
23. C/C++ Program to Check Whether a Number is Prime or Not
24. C/C++ Program to Display Prime Numbers Between Two Intervals
25. C/C++ Program to Check Armstrong Number
26. C/C++ Program to Display Armstrong Number Between Two Intervals
27. C/C++ Program to Display Factors of a Number
28. C/C++ Programs To Create Pyramid and Pattern
29. C/C++ Program to Make a Simple Calculator to Add, Subtract, Multiply or Divide
Usingswitch...case
30. C/C++ Program to Display Prime Numbers Between Two Intervals Using Functions
31. C/C++ Program to Check Prime Number By Creating a Function
32. C/C++ Program to Check Whether a Number can be Express as Sum of Two Prime Numbers
33. C/C++ program to Find Sum of Natural Numbers using Recursion
34. C/C++ program to Calculate Factorial of a Number Using Recursion
35. C/C++ Program to Find G.C.D Using Recursion
36. C/C++ Program to Convert Binary Number to Decimal and vice-versa
37. C/C++ Program to Convert Octal Number to Decimal and vice-versa
38. C/C++ Program to Convert Binary Number to Octal and vice-versa
39. C/C++ program to Reverse a Sentence Using Recursion
40. C/C++ Program to Calculate Power Using Recursion

Text Books

1. "Let Us C++", Kanetkar Yashavant, BPB Publications

Reference Books

1. "C++ programming Today", Barbara Johnston, Prentice Hall of India, New Delhi.
2. "C++ how to program", Paul Deitel and Henry Deitel, Prentice Hall of India, New Delhi.
3. "Accelerated C++: Practical Programming by Example", Andrew Koenig and Barbara E. Moo, Addison-Wesley Publications
4. "C++: The Complete Reference", Herbert Schildt, McGraw Hill Publications.
5. "C++ Primer"; Barbara E. Moo, Josée Lajoie and Stanley B. Lippman; Addison-Wesley Professional
6. "Programming: Principles and Practice Using C++", Bjarne Stroustrup, Addison-Wesley Professional

Designation of Course	Differential Equations, Probability and Statistics		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	04
Tutorial:- 01 Hours/ Week	Internal Assessment	40 Marks	
	Tutorial		01
	Total	100 Marks	05

Course Prerequisites:-	Students should have knowledge of <ol style="list-style-type: none"> 1. Derivative and Integration 2. Partial derivative 3. Basic of statistics
Course Objectives:-	To provide knowledge about <ol style="list-style-type: none"> 1. Various methods to solve first order and first degree and n^{th} order differential equation. 2. Integral transform and application of partial differential equation. 3. Methods of interpretation of numerical data and probability distribution.
Course Outcome:-	Students will be able to <ol style="list-style-type: none"> 1. Understand methods of first order and first-degree differential equation. 2. Understand the methods of n^{th} ordinary differential equation and apply it to mass spring system. 3. Understand Laplace transform and evaluate particular solution of wave, one- and two-dimensional heat equation. 4. Understand the multiple integrals and apply it to evaluate area and volume. 5. Understand various technique to analyze and numerical data. 6. Understand probability distribution and testing of hypothesis.

Course Contents

Unit-I	Differential Equation	(08 Hrs.)
Formation of the ordinary differential equations (ODEs), Solution of an ordinary differential equation, Equations of the first order and first degree, Linear differential equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations		
Unit-II	Linear Differential Equations	(08 Hrs.)
Solution of n^{th} order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Mass spring system.		
Unit-III	Laplace Transforms and Applications of Partial Differential Equations	(08 Hrs.)
Laplace transform: Definition of Laplace transforms, Properties of Laplace Transform (Properties without proof). Inverse Laplace Transform, Linearity property, use of standard formulae to find inverse Laplace Transform, finding Inverse Laplace transform using derivative, Partial fractions method & first shift property to find inverse Laplace transform. Inverse Laplace transform using Convolution theorem (without proof). Applications of partial differential equation: Basic concepts, modeling of Vibrating String, Wave equation, One- and two-dimensional Heat flow equations, method of Separation of variables.		
Unit-IV	Multiple Integrals and its Applications	(08 Hrs.)
Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.		

Unit-V	Statistics	(08 Hrs.)
Measures of central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression estimates.		
Unit-VI	Probability and Probability Distributions	(08 Hrs.)
Probability, Bayes Theorem, Probability density function, Probability distributions: Binomial, Poisson, Normal, Test of hypothesis: Chi-square test, t-test.		

Assignments

Problems and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Differential equation.
2. Linear differential equations.
3. Laplace transforms and applications of partial differential equations.
4. Multiple integrals and its applications.
5. Statistics.
6. Probability and probability distribution.

Tutorials:

Problems and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. First order equation (linear and nonlinear),
2. Higher order linear differential equation with constant coefficients
3. Euler-Cauchy equation
4. Legendre's DE
5. Laplace transformation
6. Applications of partial differential equation
7. Double and Triple integrations
8. Applications to area, volume, mean and root mean square values.
9. Sampling theorems, conditional probability; mean, median, mode and deviation.
10. Correlation and regression, reliability of regression estimates.
11. Probability, bayes theorem, probability density function
12. Binomial, poisson and normal distributions.

Text Books

1. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Volumes I and II)", 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.

Reference Books

1. B. S. Grewal, "Higher Engineering Mathematics", 42nd Ed., Khanna Publication, Delhi
2. B.V. Ramana, "Higher Engineering Mathematics", 6th Ed., Tata McGraw-Hill, New Delhi, 2008.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Ed., John Wiley & Sons, Inc., 2015.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Ed., Cengage Learning, 2012.
5. Michael Greenberg, "Advanced Engineering Mathematics", 2nd Ed., Pearson Education, 1998.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

Students are expected prepare report on any one topic, write its definition, applications and analyze the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. Formation of differential equation
2. Exact differential Equation
3. Linear differential equation
4. Solution of nth order LDE with Constant Coefficients
5. Mass spring system
6. Transform (Properties with proof).

7. Applications of partial differential equation in mechanical engineering
8. Multiple integrals applications
9. Applications of Multiple integrals applications to Area, Volume
10. Random Sampling
11. Stratified random sampling
12. Reliability of Regression estimates.
13. Bayes Theorem
14. Probability density function
15. Testing of hypothesis

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Chemistry of Engineering Materials		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hour/ Week	End Semester Examination	60 Marks	03
Practical: -02 Hours/Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	04

Course Prerequisites: -	Higher Secondary chemistry.
Course Objective: -	The student should acquire the knowledge of <ol style="list-style-type: none"> To develop the interest among the students regarding chemistry and their applications in engineering. To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field. The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the field such as Mechanical Engineering.
Course Outcomes: -	After completion of the course students will be able to <ol style="list-style-type: none"> Apply the concept X-ray diffraction technique to study crystal structure. Understand the concept of the metallurgy in the study of metals. Understand and apply the knowledge of Ferrous & Non-Ferrous materials for various engineering applications. Apply the knowledge polymer and plastics to study advanced materials. Understand the knowledge of composite materials for various engineering applications. Understand different types of corrosion and suggest control measures in industries.

Course Contents

Unit-I	Crystal Structures	(06 Hrs.)
Study of crystal structure, Indexing of planes and directions, Slip planes, linear and Planar density calculations, volume density calculations, Imperfections in crystals, effect of crystal structure defects on various properties, Allotropic and polymorphism of metals, formation of solid solutions.		
Unit-II	Extractive Metallurgy	(06 Hrs.)
Introduction, Occurrence of metals, types of ores, concentration of ores by physical methods, Crushing and Sizing, Froth- Flotation, Magnetic Separation, Gravity separation method. Chemical methods- calcination, Roasting, Reduction of ore by Pyrolysis, Chemical reductions, Electrolytic refining of metals.		
Unit-III	Ferrous & Non-Ferrous Materials	(06 Hrs.)
Metallic materials: Introduction, Alloy- definition and classification, purposes of making alloys. Ferrous alloys, Introduction to steel making, blast furnace and electric steel making: Plain carbon steels (mild, medium and high), Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminum alloy (Duralumin and Alnico).		
Green Chemistry: Definition, Twelve principles of Green Chemistry.		
Unit-IV	Introduction to Polymers, Plastics and rubbers	(06 Hrs.)
Polymers: Introduction, plastics, thermo softening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde and epoxy resins, Conducting polymers and Biopolymers (Introduction, examples, and applications), types of rubbers, Acrylics.		

Unit-V	Introduction to Composites	(06 Hrs.)
Introduction, types of composite, different types of reinforce materials, characteristics of reinforced materials, matrix materials composition, properties and uses of fibre reinforced plastics (FRP), Carbon fibres, Boron Nylon etc, and glass reinforced plastic (GRP). Ceramic matrix composite. Metal Matrix composite.		
Unit-VI	Corrosion & Protective Coatings	(06 Hrs.)
Introduction corrosion, types of corrosion, hydrogen embrittlement, stress corrosion, Pit type corrosion, corrosion prevention methods, Metallic coatings, Electroplating, Methods of cleaning articles before Electrode position, Electroplating methods, Electroless plating, Some other metallic coatings, Modification of environment, Cathodic Protection, chemical conversion coatings, Organic Coatings, Paints, Varnishes, Enamels, Special paints. CVD and PVD coatings.		

Term Work

List of Experiments

1. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin.
2. To determine molecular weight/radius of macromolecule polystyrene/ polyvinyl alcohol by viscosity measurement.
3. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method.
4. Study of corrosion of metals in medium of different pH.
5. Determination of rate of corrosion of aluminum in acidic and basic medium.
6. Determination of percentage of Ca in given cement sample
7. Preparation of phenol-formaldehyde resin/ urea-formaldehyde.
8. Estimation of copper in brass solution.
9. Determination of rate of corrosion of aluminum in acidic and basic medium.
10. To obtain metallic coating on base metal by using both the methods, Electroplating and Electroless plating.

Assignments

1. Linear and Planar density calculations with volume density calculations.
2. Extractive Metallurgy.
3. Purposes of making alloy like Ferrous alloys.
4. Twelve principles of Green Chemistry.
5. Conducting polymers and Biopolymers.
6. Thermo softening and thermosetting plastics.
7. Fiber reinforced plastics (FRP).
8. Heat treatment of tool steels
9. Organic Coatings, Paints, Varnishes, Enamels, Special paints for corrosion prevention.
10. Types of corrosion and its preventive measures.

Test Book

1. A Textbook of Engineering Chemistry by S. S. Dara and S. S. Umare, S. Chand & Company Ltd., New Delhi.
2. A Textbook of Engineering Chemistry by C. P. Murthy, C. V. Agarwal and A. Naidu, B S Publications, Hyderabad.
3. A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004

Reference Books

1. Material Science and Engineering Metallurgy by V D Kodgire, Everest publications
2. Materials Science by O P Khanna, Khanna publications
3. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.
4. Engineering Chemistry by Dr. A. K. Pahari and Dr. B. S. Chauhan, Laxmi Publications (P) Ltd, New Delhi.
5. Polymer Science, V. R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, Wiley Eastern Limited
6. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008
7. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G. Cowie, Blackie Academic & Professional, 1994.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Prepare a hardware model based on Biopolymers.
2. Prepare epoxy resins by using suitable method.
3. Write a review paper based on applications of fibre reinforced plastics (FRP) and get it
4. published in reputed journal (eg. Google Scholar).
5. With the help of green chemistry principles, prepare any organic dye by using
6. Traditional and Green pathway.
7. Prepare a hardware model based on Electroless plating and calculate cell voltage.
8. Write a review paper based on Conducting polymers and get it published in reputed journal (eg. Google Scholar).

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Electronics Engineering Systems		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites:-	Students should have the basic knowledge of Electrical Engineering
Course Objective	<ol style="list-style-type: none"> To teach the construction, working, ratings and application of passive devices like resistors, capacitors, inductors, transformers and relays To introduce types of Voltage and current sources To teach the construction, working and ratings of devices like pn junction diode, Schottky diode, zener diode To teach the construction, working and ratings of field effect transistor To introduce the concept of Transducers and their applications To teach handling of electrical machine
Course Outcomes:-	<p>The students should be able to-</p> <ol style="list-style-type: none"> Classify resistors, capacitors, inductors and transformer based on their construction, types and ratings and analyze simple circuits consisting of passive devices Analyze circuits using voltage and current sources Classify active devices based on their types and ratings and plot their characteristic curves Understand the basic electronics devices and linear ICs Use of various Instruments, transducers and working of electronic circuits used in electronic test and measuring instruments To Understand and apply the concepts of Electric wiring for safety.

Course Contents

Unit 1	Passive Electronic Components	(08 Hrs)
Introduction to the concept of active and passive electronic devices, Types of resistors, construction, ratings and typical applications, Types of capacitors, construction, ratings and typical applications, Types of inductors, construction, ratings and typical applications, Types of transformers, construction, ratings and typical applications, Construction of relays, types and ratings, Analysis of series and parallel resistors and capacitor circuits (R-L, R-C, RLC series circuit, R-L-C parallel circuit).		
Unit 2	Sources	(08 Hrs)
Types of voltage and current sources (AC and DC), Concept of ideal and non-ideal voltage source, Concept of ideal and non-ideal current source, Series and parallel combinations of sources, Loading effect, Dependent voltage and current sources, Electrochemical cells and batteries, Types and characteristics, Regulation concept (Line regulation, load regulation, temperature stability factor), power, energy, Kirchoff's laws and applications to network solutions using mesh analysis		
Unit 3	Diodes	(08 Hrs)
Classification of material based on band gap theory, Types of semiconductors (p-type and n-type),LED and LDR, VI characteristics and applications, pn junction diode and its characteristics, Schottky diode, zener diode, Diode models, Rectifiers: Half wave, Full wave and Bridge rectifiers - capacitor filter-wave forms-ripple factor regulation characteristics		
Unit 4	Transistors	(08 Hrs)
Introduction to BJT (nnp and pnp) and its construction and working mechanism, BJT configurations and their input and output characteristics, FET-construction, V-I characteristics and working, MOSFET-construction, V-I characteristics and working.		
Unit 5	Opto-Electronics	(08 Hrs)
Construction and working of LDR and its characteristics, simple application , Construction and working of LED and its characteristics and ratings, Photo-transistor and its characteristics , Introduction to the concept of electrical isolation and its importance , Construction of opto-isolator(opto-coupler) and its ratings , Construction and working of photovoltaic cell and its characteristics and ratings		

Unit 6	Electrical Wiring and Illumination system	(08 Hrs)
Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED)		

List of Experiments-

Term work shall consist of **Minimum Eight** Experiments.

1. Study of resistors, capacitors and inductors
2. To study and plot regulation characteristics of half wave and full wave rectifier.
3. Plot V-I Characteristics of PN Junction Diode
4. Plot V-I Characteristics of Zener Diode
5. Plot Input and Output Characteristics of BJT in CE Configuration
6. Plot Transfer and output characteristics of FET
7. Plot Transfer and output characteristics of EMOSFET
8. Plot characteristics of LDR
9. To Study characteristics of LVDT for displacement measurement.
10. Study of Relays

Text Books/ Reference Books

1. Passive Components for Circuit Design, Ian Sinclair, 1st Edition 2000, ISBN: 9780750649339, Newnes
2. Grob's Basic Electronics, Mitchel Schultz, 11th Edition, 2010, ISBN-13: 978-0-07-351085-9, McGraw Hill
3. Fundamentals of Electronic Devices and Circuits, David A. Bell, 5th Edition, 2008, ISBN: 0195425235, 9780195425239, Oxford University Press,
4. Microelectronics Circuits, Adel S. Sedra & Kenneth C. Smith, 7th Edition, 2015, ISBN 978-0-19-933913-6, Oxford University Press
5. Dr. D.S. Kumar, Mechanical Measurement & Control, Metropolitan Book Co. Pvt. Ltd. New Delhi, 2007
6. R. P. Jain, Modern Digital Electronics, McGraw Hill

REFERENCE BOOKS

1. Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)
2. Millman & Halkis, Electronic Devices & Circuits, PHI
3. Malvino Leach, Digital Principles & Applications, McGraw Hill

Assignments:

At least ONE assignment on each unit

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

To prepare a demonstration model on:

1. Potential Divider and Variable DC bias circuit.
2. DC lighting circuit.
3. Automatic LED Emergency Light.
4. Flashing LED.
5. Dancing Light.
6. Voltage regulator using Zener diode.
7. Cascode amplifier using FET.
8. JFET as an analog switch.
9. FET used as a Multiplexer.
10. JFET acts as a current limiter.
11. LDR & Transistors based Light Detector.
12. LDR Based Smart Electronic Candle.
13. Smart Bulb Holder using LDR.
14. MOC3021 Opto-coupler as a solenoid/valve control.
15. Light controller switch using photo-transistor.

Unit Tests

Unit Test-I	Unit-I,II,III
Unit Test-II	Unit-IV, V,VI

Designation of Course	Fundamentals of Robotics		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hour/ Week	End Semester Examination	60 Marks	04
Practical: -02 hours/Week	Internal Assessment	40 Marks	
	Term Work & Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites: -	The student should have <ul style="list-style-type: none"> 1. Basic knowledge of higher secondary Physics 2. Basic knowledge of Mathematics
Course Objective: -	The student should acquire the knowledge of <ul style="list-style-type: none"> 1. The concepts of Robotic system, its components and Configurations. 2. Robot Grippers, Drive systems and Robotics sensors. 3. Application of robots in various fields.
Course Outcomes: -	The student should be able to <ul style="list-style-type: none"> 1. Understand the basic components and configurations of robots. 2. Understand different types of grippers and apply them based on applications. 3. Understand the robot drive systems. 4. Understand the fundamentals of sensors and apply them based on application. 5. Understand the robot control systems. 6. Understand the applications of robots in various fields.

Course Contents

Unit-I	Introduction to Robotics	(08 Hrs.)
History of robots, Classification of robots, Present status and future trends. Basic components of roboticsystem. Robot Joints, Robot Anatomy, Basic terminology- Accuracy, Repeatability, Resolution, Degree of freedom. Basic Configuration of Robots.		
Unit-II	Robot Grippers	(08 Hrs.)
Introduction to End effectors. Consideration in selection of gripper, Types of grippers, Mechanical Grippers, Hooks and Scoops, Magnetic Grippers, Vacuum Grippers, Expandable Bladder Type Grippers, Adhesive Grippers. Specifications of robot. Industrial Robots in Manufacturing trial robots specifications. Selection based on the Application.		
Unit-III	Robotics Drives Systems	(08 Hrs.)
Introduction, Functions of drive systems, Hydraulic actuators- Linear Hydraulic actuators and Rotary Hydraulic actuators. Pneumatic Actuators- Linear Pneumatic actuators and Rotary Pneumatic actuators. Electric Actuators-D.C. Motor, Reversible A.C. Motors, Brushless D.C. Motors, D.C. Servomotors, A.C. Servomotors, Stepper Motors.		
Unit-IV	Robotics Sensors	(08 Hrs.)
Sensors in robot –Introduction, Classification, Internal and external sensors, Touch sensors, Tactile sensor, Proximity and range sensors, Robotic vision sensor, Light sensors, Pressure sensors. Position sensors & Velocity sensors, acceleration sensors, sound sensors, Proximity sensors & Force or Torque sensors.		
Unit-V	Robot Control system.	(08 Hrs.)
Robot controls-Point to point control, Continuous path control, Intelligent robot, Control system for robotjoint, Control actions, Feedback devices, Encoder, Resolver, LVDT, Motion Interpolations, Control architecture- position, path velocity, and force control systems.		
Unit-VI	Applications of Robots	(08 Hrs.)
Robot applications: Robots in continuous arc welding, Spot welding, Spray painting, assembly operation, cleaning, and robot for under water applications. material handling, Robotics and Automation for Industry 4.0, Applications in unmanned systems, defense, medical, biomedical, industries, Co-bot etc.		

Term work:

Term work shall consist of any six experiments from the following list:

1. To study an introduction to basic components of Robot.
2. To study an introduction to Robot configuration
3. To introduce different types of robotics and demonstrate them to identify different parts and components.
4. To study and demonstrations of various robotics sensors.
5. To study and demonstrations of Hydraulic actuators.
6. To study and demonstrations of Pneumatic actuators.
7. To study and demonstrations of Electric actuators.
8. Two Case Studies of Applications in Industry
 - a. Introduction and general considerations in robot applications.
 - b. Case study I: Robot application for Welding.
 - c. Case study II: Robot application for Spray painting.
9. Mini project is based on above syllabus.

Assignment

Assignments questions based on following topic

1. Classification, configuration and characteristics of robot.
2. Robot grippers and their types.
3. Drive systems used in Robots.
4. Sensors used in Robots.
5. Robot control systems.
6. Applications of Robots.

Text Books

1. Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta,
2. "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
3. Craig. J. J. "Introduction to Robotics- mechanics and control", Addison- Wesley, 1999.

Reference Books

1. S.R. Deb, "Robotics Technology and flexible automation", Tata McGraw-Hill Education., 2009.
2. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, "Robotics Engineering an Integrated Approach", PHI Learning. 2009.
3. Francis N. Nagy, Andras Siegler, "Engineering foundation of Robotics", Prentice Hall Inc., 1987.
4. P.A. Janaki Raman, "Robotics and Image Processing an Introduction", Tata McGraw Hill Publishing Company Ltd., 1995.
5. Carl D. Crane and Joseph Duffy, "Kinematic Analysis of Robot manipulators", Cambridge University press, 2008.
6. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGrawHill Book co, 1987
7. Ray Asfahl. C., "Robots and Manufacturing Automation", John Wiley & Sons Inc., 1985

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. 2D models of basic components of robotic system
2. 2D models of different configuration of robots and its application
3. Working model and application of mechanical gripper
4. Working model and application of magnetic gripper
5. Working model and application of adhesive gripper
6. Working model and application of expandable ladder gripper
7. Working model of robotic drive system using pipe and syringe
 - a. Linear actuator
 - b. Rotary actuator
8. Selection of electric actuators with respect to its specification and application.

9. Detail description and working model of touch sensor.
10. Detail description and working model of tactile sensor.
11. Detail description and working model of proximity sensor.
12. Detail description and working model of pressure sensor.
13. Detail description and working model of sound sensor.
14. Detail description and working model of temperature sensor.
15. Detail description and working model of torque sensor.
16. Detail description and working model of accelerometer.

Unit Test

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Engineering Mechanics		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
	Internal Assessment	40 Marks	
	Total	100 Marks	03

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Physics 2. Engineering mathematics
Course Objective	<ol style="list-style-type: none"> 1. To study different types of forces in a plane. 2. To study Centroid and moment of inertia 3. To study friction in machines 4. To study Kinetics of linear and circular motion 5. To study basics of civil engineering
Course Outcomes:-	<p>The students should be able to</p> <ol style="list-style-type: none"> 1. Understand the concept of force and apply it along with the concept of equilibrium in 2D and 3D system with the help of free body diagram. 2. Understand the significance of centroid and moment of inertia 3. Understand the concept of friction and estimate required force to overcome friction. 4. Analyze body in motion using force and acceleration, work energy, impulse momentum principles 5. Analyze body in motion using centripetal and centrifugal force principles 6. Understand the basic concept of civil material, building component and foundation techniques.

Course Content

Unit-I	Resultant and Equilibrium	(06 Hrs.)
Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point, Virtual work.		
Unit-II	Centroid, Moment of Inertia and Friction	(06 Hrs.)
Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia. Introduction to frictional force, preliminary concepts, laws of friction. Introduction to machines, Relation between Mechanical advantage, Velocity ratio and efficiency, Reversible and non-reversible Machines. Simple lifting machines and their velocity ratio, gear train.		
Unit-III	Analysis of Trusses, Frames and Cables	(06 Hrs.)
Two force members: Introduction to trusses, types of trusses, perfect and redundant trusses, Analysis of plane trusses by method of joint and method of section, cables subjected to point loads. Multi force member: plane frame.		
Unit-IV	Kinematics of particles and rigid body	(06 Hrs.)
Rectilinear motion, velocity and acceleration in terms of rectangular coordinate system, Motion along plane curve path, tangential and normal component of acceleration, motion curves (a-t, v-t, s-t), Projectile motion Rigid body- Introduction to general plane motion,		
Unit -V	Kinetics of Particle	(06 Hrs.)
Force and acceleration, introduction to basic concepts, D'Alembert's principle, equation of dynamic equilibrium, Newton's second law of motion. Work energy principle and law of conservation of energy, impulse and momentum, law of conservation of momentum, Impact and collision.		

Unit-VI	Structural Materials and Foundations	(06 Hrs.)
Types of structures based on loading, material and configuration; structural materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminium Foundations- Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation.		

List of Assignments

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Resultant and equilibrium of forces
2. Centroid & Moment of Inertia
3. Friction
4. Trusses, frames and cables
5. Kinematics of particles
6. Kinematics of rigid body
7. Kinetics of particle
8. Structural materials and foundations

Text Books

1. "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K. G., New Age International (P) Ltd.
2. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.
3. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.

Reference Books

1. "Engineering Mechanics (Statics and Dynamics)", Hibbeler R. C., McMillan Publication.
2. "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.
3. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.
4. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication
5. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.
6. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Prepare model for various types of beams.
2. Prepare model for various types supports.
3. Prepare chart for various types of force system with suitable real-life examples.
4. Collect the various situations where varignon's theorem is used.
5. Prepare model or chart for equilibrium system of forces of various engineering applications.
6. Prepare chart for different types for trusses with showing various members.
7. Prepare prototype model of any one type of truss.
8. Calculate the forces in members of truss by using analytical method and check it graphically (At least three problems for different types of trusses)
9. Prepare prototype models of the basic geometrical figures and locate the centroid of them.
10. Prepare prototype models of the I and T section and locate the centroid of them.
11. Prepare chart for parallel axis and perpendicular axis theorem with suitable example.
12. Prepare chart regarding the types of friction in various field conditions.
13. Prepare chart for application of friction.
14. Prepare chart for motion curves.

15. Prepare chart related to lifting machine and relevant industrial applications.
16. Development of excel sheet for projectile motion (at least three problems).
17. Development of excel sheet for work energy principle (at least three problems).
18. Prepare chart for work energy and Impulse momentum principle with suitable example.
19. Collect the different structural materials and compare its mechanical properties.
20. Prepare models of different types of foundations.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Basics of PLC		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical:- 02 Hours/ Week	Term Work	50 Marks	01
	Total	50 Marks	01

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Basic knowledge of c program 2. Basic Boolean algebra 3. Basic knowledge of computer
Course Objective:-	<ol style="list-style-type: none"> 1. Compare conventional sequential control with programmable logic control system 2. Interface analog and digital input/ output devices with PLC 3. Develop programs using different PLC programming languages for sequential and continuous process
Course Outcomes:-	<ol style="list-style-type: none"> 1. Explain the basic knowledge of PLC and compare with computer 2. Identify the hardware components and I/O devices interfacing with PLC 3. Identify the basic logic to implement Ladder diagram 4. Introduce the basic PLC programming with industrial examples 5. Identify various PLC instructions 6. Identify data handling functions

Course Contents

Unit-I	Introduction to Programmable Logic Controllers (PLCs)	(04 Hrs.)
Introduction; definition & history of the PLC; Principles of Operation; Various parts of a PLC: CPU & programmer/ monitors; PLC input & output modules; Solid state memory; the processor; I/O modules; power supplies. PLC advantage & disadvantage; PLC versus Computers, PLC Application. Programming equipment; proper construction of PLC ladder diagrams; process scanning consideration; PLC operational faults.		
Unit-II	Hardware Components and its interfacing with PLC	(04 Hrs.)
PLC Hardware Components: The I/O section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O specifications, The CPU, Memory design, Memory Types, Programming Devices, Selection of wire types and size. Various INPUT /OUTPUT Devices and its interfacing with PLC. Different types of Input devices : Switches: Push button Switches, Toggle Switches, Proximity switches, Photo switches, Temperature Switch, Pressure Switch, and Level Switch, Flow Switches, manually operated switches, Motor starters, Transducers and sensors, Transmitters etc. Their working, specification and interfacing with PLC. Different types of Output devices: Electromagnetic Control Relays, Latching relays, Contactors, Motors, Pumps, Solenoid Valves etc. Their working, specification and interfacing with PLC..		
Unit-III	Fundamentals of Logic	(04 Hrs.)
The Binary Concept, AND, OR and NOT functions, Boolean Algebra, Developing circuits from Boolean Expression expressions, Producing the Boolean equation from given circuit, Hardwired logic versus programmed logic, Programming word level logic instructions. Converting Relay schematics and Boolean equation into PLC Ladder Programs, Writing a ladder logic program directly from a narrative description.		
Unit-IV	Basics of PLC Programming	(04 Hrs.)
Processor Memory Organization, Program Scan, PLC Programming languages, Relay type instructions, Instruction addressing, Branch Instructions, Internal Relay Instructions, Programming Examine if Closed and examine If Open instructions, Entering the ladder diagram, Modes of operation. Creating Ladder Diagrams from Process Control Descriptions. Ladder diagram & sequence listing; large process ladder diagram construction, flow charting as programming method, Industrial Examples		
Unit-V	Data Handling Functions	(04 Hrs.)
Bit Logic Instructions: NO, NC, Set, Reset, rising edge Pulse, Falling Edge Pulse, RS, SR, NOP, OUTPUT etc. Clock: READ_RTC, SET_RTC. Different Logical operation Instructions: INVERT BIT, BYTE, WORD DOUBLE WORD. OR: BIT, BYTE, WORD DOUBLE WORD. AND: BIT, BYTE, WORD DOUBLE WORD. X-OR: BIT, BYTE, WORD DOUBLE WORD.		

Program Control Instructions: The PLC SKIP and MASTER CONTROL RELAY Functions. Introduction; the SKIP function & application; the MASTER CONTROL RELAY function & application. Introduction: Jump with non-return; jump with return		
Unit-VI	Allen bradley PLC	(04 Hrs.)
PLC Data Move Systems. Introduction; PLC MOVE function & application; moving large blocks of PLC data; PLC table & registers moves; other PLC MOVE functions. Other PLC Data Handling Functions. Different Move Instructions: BIT, BYTE, WORD DOUBLE WORD, REAL, SWAP Byte, Move Byte Immediate Read, Move Byte Immediate Write. Different Shift/Rotate Instructions		

List of Experiments:-

1. Introduction to ladder programming & to implement basic logic gates.
2. Develop, Simulate and Test Ladder diagram for a. A Door Bell Operation b. A Combination Lock.
3. Develop, Simulate and Test Ladder diagram for Bottle Filling system.
4. Develop, Simulate and Test Ladder diagram for Traffic Light Control System.
5. Develop, Simulate and Test Ladder diagram for Car Parking system.
6. Develop Simulate and Test Ladder diagram for an alarm annunciator system.
7. Develop, Simulate and Test Ladder diagram for Batch Mixer.
8. Develop, Simulate and Test Ladder diagram for Drink Dispenser system.
9. Develop and test PLC program for three phase motor in both direction.
10. Develop, Simulate and Test Ladder diagram for stepper motor control in forward and reverse direction.
11. Develop and test PLC program for two axis Robotic arm for pick and place application
12. Develop, Simulate and Test Ladder diagram for Packing line system.
13. Develop, Simulate and Test Ladder diagram for an Elevator system.
14. Develop and test PLC program for PID Controller for Temperature control Application.
15. Develop and test PLC program in FBD, SFC, IL, ST, and Ladder Logic Language for Motor starter application.
16. Detail study of PLC Hardware and its interfacing

Text Books:

Lab Manual, Web resources for components data sheets.

1. Complete PLC Design Using Or CAD Capture and PCB Editor 1st Edition, Kindle Edition .
2. <https://www.plccart.com/article/content/PLC-manufacturing-process.html>
3. <https://www.autodesk.in/products/eagle/free-download>

Designation of Course	Object Oriented Programming (Using Python)		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical: - 04 Hours/ Week	Term Work & Practical	100 Marks	02
	Total	100 Marks	02

Course Prerequisites:-	1. Basics of C and C++ Programming
Course Objective	1. Readily use the Python programming language 2. Apply various data types and control structure. 3. Understand and begin to implement code 4. Understand Object Oriented Programming
Course Outcomes:-	Upon completion of the course, students will be able to 1. Understand how to install and run python 2. Understand flow control 3. Understand complex datatypes 4. Understand and Apply functions 5. Understand various modules 6. Understand Object Oriented Programming

Course Contents

Unit-I	Python introduction	(08 Hrs.)
Learn to install and run Python on your computer, Keywords and Identifiers, Statement, Indentation and Comments, Variables, Constants and Literals, Data Types, Type Conversion and Type Casting, Input, Output and Import		
Unit-II	Python Flow Control	(08 Hrs.)
Learn to install and run Python on your computer, Keywords and Identifiers, Statement, Indentation and Comments, Variables, Constants and Literals, Data Types, Type Conversion and Type Casting, Input, Output and Import		
Unit-III	Datatypes	(08 Hrs.)
Function Arguments, Recursion, Anonymous/Lambda Function, Global, Local and Nonlocal variables, Global Keyword		
Unit-IV	Python Functions	(08 Hrs.)
Modules in Python, import modules in Python, import statement, Import with renaming, from...import statement, Import all names, Python Module Search Path		
Unit-V	Matplotlib	(08 Hrs.)
Install matplotlib, Pyplot API, Figure Class, Axes Class, Multiplot, Subplots () Function, Formatting Axes, Setting Limits, Setting Ticks and Tick Labels		
Unit-VI	Object Oriented Programming	(08 Hrs.)
Object, Class, The self , The __init__ method , Class and Instance Variables (Or attributes) , Class and Instance Variables (Or attributes) , Printing Objects, Inheritance, examples of object, is sub class and super.		

Term Work

1. Basic Exercise for Beginners
Practice and quickly learn Python's necessary skills by solving simple questions and problems. Topics: Variables, Operators, Loops, String, Numbers, List
2. Python Loop Exercise
This Python loop exercise aims to help developers to practice branching and Looping techniques in Python.
Topics: If-else statements, loop, and while loop.

3. Python Functions Exercise
Practice how to create a function, nested functions, and use the function arguments effectively in Python by solving different questions.
Topics: Function's arguments, built-in functions.
4. Python String Exercise
Solve Python String exercise to learn and practice String operations and manipulations.
5. Python Data Structure Exercise
Practice widely used Python types such as List, Set, Dictionary, and Tuple operations in Python
6. Python List Exercise
This Python list exercise aims to help Python developers to learn and practice list operations.
7. Python Dictionary Exercise
This Python dictionary exercise aims to help Python developers to learn and practice dictionary operations.
8. Python Tuple Exercise
This exercise aims to help Python developers to learn and practice tuple operations.
9. Object Oriented
Simple Python program that creates a class with a single method.
10. Object Oriented
A Sample class with in it method

Text Books

1. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher,
2. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

Reference Books

1. Python Programming using problem solving Approach by Reema Thareja, Oxford University, Higher Education Oxford University Press; First edition (10 June 2017), ISBN-10: 0199480173.
2. Data Structures and Algorithms in Python by Michael T Goodrich and Roberto Tamassia, Micheal S Goldwasser, Wiley Publisher (2016)
3. Fundamentals of Python first Programmes by Kenneth A Lambert, Copyrighted material Course Technology Inc. 1st edition (6th February 2009)

Supplementary Resources:

1. <http://www.w3schools.com>
2. <http://docs.python.org>
3. <http://www.tutorialspoint.com>
4. <http://www.learnpython.org>

Bharati Vidyapeeth
(Deemed to be University), Pune, India
College of Engineering, Pune
Department of Mechanical Engineering

Vision of the Department

To develop high quality Robotics and Automation Engineers through dynamic education to meet social and global challenges

Mission of the Department

- To provide extensive theoretical & practical knowledge to the students with well-equipped laboratories & ICT tools through motivated faculty members
- To inculcate aptitude for research, innovation and entrepreneurial qualities in students
- To acquaint students with ethical, social and professional responsibilities to adapt to the demands of working environment.

Name of Programme: B. Tech. Robotics and Automation Engineering

Programme Educational Objectives (PEOs)

- To fulfill need of industry and society with theoretical & practical knowledge
- To perform research, innovation, lifelong learning and continued professional development
- To fulfill professional ethics and social responsibilities

Programme Outcomes (POs)

The graduates will be able to

- a.* apply knowledge of mathematics, science and engineering fundamentals for solving complex engineering problems
- b.* identify the need, plan and conduct experiments, analyze data for improving the mechanical processes.
- c.* design and develop mechanical systems considering social and environmental constraints.
- d.* design and develop a complex mechanical system using research based knowledge, advanced mathematical, statistical tools and techniques.

- e.* use information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance.
- f.* know social responsibilities while doing professional engineering practices.
- g.* familiarize with eco-friendly, sustainable and safe working environment.
- h.* take into account professional ethics while designing engineering systems.
- i.* work efficiently as a group leader as well as an individual.
- j.* communicate in written and verbal form with subordinates and supervisors.
- k.* apply project and finance management techniques in multidisciplinary environments.
- l.* take interest in higher education and update the knowledge.

B. Tech. Robotics & Automation Sem.-III

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Hydraulics & Pneumatics: Principals	4	2	-	60	40	-	50	-	150	4	1	-	5
2		Theory of Machines	4	2	-	60	40	-	50	-	150	4	1	-	5
3		Strength of Machine Components	3	2	1	60	40	25#	-	-	125	3	1	1	5
4		Electronic Circuits	3	2	-	60	40	25#	-	-	125	3	1	-	4
5		Embedded Systems®	4	2	-	60	40	25#	-	-	125	4	1	-	5
6		Data Structures and Algorithms	-	2	-	-	-	25#			25		1	-	1
7		MATLAB Programming	-	2	-	-	-	-	-	50	50	-	1	-	1
8		Vocational Course-I: Sensors, PLC & HMI: Basic Training	-	-	-	-	-	-	50	-	50	-	2	-	2
9		MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	2
10		Environmental Studies (Mandatory Course)+	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			18	14	1	300	200	100	150	50	800	18	9	1	30

#: Based on TW & internal oral examination; ®Industry Taught Course-I; \$ To be conducted in service centre after office hours: 4 hrs/week; + End sem. Exam. of 100 marks

B. Tech. Robotics & Automation Sem.-IV

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	UE	IA	TW	TW & OR	TW & PR	Total	L	P	T	Total
													TW/OR/PR		
1		Design & Analysis of Machine Components	4	2	-	60	40	-	50	-	150	4	1	-	5
2		Digital Electronics®	4	2	-	60	40	25#	-	-	125	4	1	-	5
3		Power Electronics & Drives	3	2	1	60	40	-	50	-	150	3	1	1	5
4		Manufacturing Technology-I	3	2	-	60	40	50#	-	-	150	3	1	-	4
5		Automatic Control Systems	4	2	-	60	40	25#	-	-	125	4	1	-	5
6		Solid Modelling	-	4	-	-	-	-	-	50	50		2	-	2
7		Vocational Course-II: PLC, HMI & Automation: Advanced Training	-	-	-	-	-	-	50	-	50	-	2	-	2
8		Social Activities-I	-	-	-	-	-	-	-	-	-	-	-	-	2
9		Disaster Management (Mandatory Course)+	-	-	-	--	-	-	-	-	-	-	-	-	-
Total			18	14	1	300	200	100	150	50	800	18	9	1	30

#: Based on TW & internal oral examination; ®Industry Taught Course-II; \$ To be conducted in service centre after office hours: 4 hrs/week; + End sem. Exam. of 100 marks

Designation of Course	Hydraulics & Pneumatics: Principals		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work & Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Mathematics. 2. Engineering Physics. 3. Engineering Mechanics.
Course Objectives:-	<p>To provide knowledge about</p> <ol style="list-style-type: none"> 1. Properties of fluids, concepts of fluid statics, kinematics & dynamics. 2. Concepts of fluid power and pumps and its control. 3. Hydraulics and Pneumatics – Actuators and Circuits.
Course Outcomes:-	<p>On completion of the course, students will be able to</p> <ol style="list-style-type: none"> 1. Understand properties of fluids and analyze concepts of fluid statics. 2. Understand concepts related to fluid kinematics and analyze practical problems. 3. Understand concepts related to fluid dynamics, flow through pipes and analyze practical problems. 4. Understand concepts related to fluid power system, Power units and accessories and analyze pump performances. 5. Understand concepts related to Control of fluid power and Control valves. 6. Understand concepts related to Hydraulics and Pneumatics – Actuators and Circuits and its application.

Course Contents

Unit 1	Properties of Fluids & Fluid Statics	(8 Hrs.)
<p>Properties of Fluid:- Definition of fluid, concept of continuum, Density, Specific Weight, Specific Gravity, Dynamic Viscosity, Kinematic Viscosity, Newton's law of viscosity, types of fluid, Rheological diagram, Surface Tension, Capillarity, Compressibility, Vapour pressure, Classification of fluid.</p> <p>Fluid Statics: Hydrostatic law, Pascal's Law, Pressure at a point, Total Pressure, Archimedes Principle, Buoyancy and stability of floating and submerged bodies, Metacentric height.</p>		
Unit 2	Fluid Kinematics	(8 Hrs.)
<p>Description of fluid motion- Eulerian and Lagrangian approach, Types of flow (steady, unsteady, uniform, non-uniform, laminar, turbulent, One, Two and Three dimensional, compressible, incompressible, rotational, Irrotational), Continuity equation in Cartesian co-ordinates, flow net, Control volume, Material derivative and acceleration.</p>		
Unit 3	Fluid Dynamics and Losses in Pipes	(8 Hrs.)
<p>Linear momentum Equation using differential Approach, Introduction to Navier-Stoke's Equation, Euler equation of motion, Derivation of Bernoulli's equation along a stream line, application of Bernoulli's equation to Pitot tube.</p> <p>Losses in Pipes: Energy losses through pipe-Major and Minor losses, Pipes in series and parallel, Darcy-Weisbach equation</p>		
Unit 4	Basics of Fluid Power and Pumps	(8 Hrs.)
<p>Components of fluid power system, advantages and limitations. Difference between electrical, pneumatic and fluid power systems. Seals, sealing materials. Types of pipes, hoses, material. Fluid conditioning through filters, strainers, sources of contamination and contamination control.</p> <p>Power units and accessories: Types of power units, reservoir assembly, sizing of reservoirs, constructional details, pressure switches, temperature switches. Accumulators: Types, selection procedure, applications of accumulators. ISO symbols for hydraulic and pneumatic Components</p>		

Pumps: Types, classification, principle of working and constructional details of vane pumps, gear pumps, radial and axial plunger pumps, screw pumps, power and efficiency calculations, and characteristics curves		
Unit 5	Fluid Power Control	(8 Hrs.)
Necessity of fluid control through pressure control, directional control and flow control valves. Control valves: i) Principle of pressure control valves, direct operated and pilot operated pressure relief valves, pressure reducing valve, sequence valve. ii) Principle of flow control valves, pressure compensated and non-compensated flow control valves. iii) Principle of directional control valves, types of directional control valves, two-way, three-way, four-way valves, check valve and shuttle valve. Open centre, close centre, tandem centre valves. Actuating devices- manually operated, mechanically operated, solenoid operated, pilot operated, lever operated.		
Unit 6	Hydraulic & Pneumatic Circuits	(8 Hrs.)
Linear and rotary actuators: Types, construction and characteristics. Cylinder mountings, cushioning of cylinders. Hydraulic & Pneumatic circuits: Simple reciprocating, regenerative, speed control (meter in, meter out and bleed off), sequencing, synchronization, traverse and feed, automatic reciprocating, fail safe circuit, counter balance circuit, actuator locking, unloading circuit, motor breaking circuit etc. Compressors: Types, principle of working and constructional details. Comparison of pneumatic with hydraulic power transmissions. Types of filters, pressure regulators, lubricators, mufflers, dryers, direction control valves, pneumatic actuators, shuttle valve, two pressure valve, quick exhaust valve and time delay valves. Speed regulating methods, pneumatic circuits, reciprocating, cascading time delay etc. Application of pneumatics in low-cost automation and in industrial automation		

Term Work: (Any 8 experiments needs perform during practical's)

1. Study of Pressure Measuring Devices.
2. Measurement of Viscosity using Redwood Viscometer
3. Stability of Floating Bodies and Optimum Loading Capacity.
4. Verification of Modified Bernoullis Equation.
5. Calibration of Venturimeter.
6. Calibration of Orificemeter.
7. Laminar and Turbulent Flow by Reynold's Apparatus.
8. Discharge over Notches.
9. Study of Minor Losses due to Pipe Fitting.
10. Study of flow control valves (Meter in, Meter out Circuits).
11. Study of ISO/JIC Symbols for hydraulic and pneumatic systems.
12. Following experiments to be done on hydraulic trainer
 - a) Regenerative circuit
 - b) Speed control circuit
 - c) Sequencing circuit
 - d) Traverse and feed circuit etc.
13. Following experiments to be done on pneumatic trainer
 - a) Automatic reciprocating circuit
 - b) Speed control circuit
 - c) Pneumatic circuit involving Shuttle valve/ Quick exhaust valve / Two pressure valve
14. Design of simple hydraulic/pneumatic systems used in practice such as hydraulic clamp, jacks, dumper, forklift etc by using fluid simulation software's such as LVSIM®-HYD & PNEU, AUTOMATION STUDIO.
15. Study of accumulators/actuators/intensifiers/hydraulic and pneumatic power brakes.
16. Industrial visit to study Hydraulic / Pneumatic based Automation systems

Assignment:

Assignment Based on each unit.

Text Books:

1. Dr. P.N. Modi and Dr. S.M. Seth, “Hydraulics and Fluid Mechanics including Hydraulic Machines”, Standard Book House.
2. Dr. R.K. Bansal, “Fluid Mechanics and Hydraulic Machines – I”, Laxmi Publication Pvt. Ltd., New Delhi.
3. Streeter V. L. and Wylie E. B. Fluid Mechanics McGraw Hill International Book Co.
4. Garde R. J. and Mirajgaonkar, Engineering Fluid Mechanics, Nem Chand & Bros, Roorkee, SCITECH, Publication (India) Pvt. Ltd.
5. Cengel & Cimbala Fluid Mechanics, TATA McGraw-Hill. 8. Irving Shames, “Mechanics of Fluid”, McGraw Hill Publication
6. Esposito A, Fluid Power with application, Prentice Hall
7. Majumdar S.R, Oil Hydraulic system- Principle and maintenance ,Tata McGraw Hill
8. Majumdar S.R, Pneumatics Systems Principles and Maintenance ,Tata McGraw Hill
9. Stewart H. L, Hydraulics and Pneumatics , Taraporewala Publication

Reference Book:

1. Pipenger J.J, Industrial Hydraulics, McGraw Hill
2. Pinches, Industrial Fluid Power, Prentice Hall
3. Yeaple, Fluid Power Design Handbook
4. Andrew A. Parr, Hydraulics and Pneumatics, Elsevier Science and Technology Books
5. ISO - 1219, Fluid Systems and components, Graphic Symbols
6. Standard Manufacturer’s Catalogues

Project Based Learning

Topics for the project based learning will be given by respective faculty member.

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Theory of Machines		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/Week	Internal Assessment	40 Marks	
	Term Work & Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Physics and Mathematics 2. Engineering Mechanics
Course Objectives:-	<ol style="list-style-type: none"> 1. To develop competency in understanding of theory of different types of gear. 2. To make the students conversant with kinematic analysis of mechanisms applied to real life and industrial applications. 3. To develop the competency to analyse the velocity and acceleration in mechanisms using analytical and graphical approach. 4. To develop understanding of static and dynamic balancing and gyroscopic effect.
Course Outcomes:-	<p>On completion of the course, students will be able to</p> <ol style="list-style-type: none"> 1. Understand the fundamental concept of Lower pair mechanisms and apply to real life and industrial applications. 2. Understand the basic concept of kinematic analysis and evaluate forces acting on reciprocating engine by graphical and analytical method. 3. Understand the concept of velocity and acceleration of any planar mechanism and analyze it graphically by using relative velocity - acceleration method and ICR method, Coriolis component of acceleration. 4. Understand the gear theory which will be the prerequisite for gear design. 5. Apply the principles of balancing of masses to various links, mechanisms and engines 6. Apply the principles of gyroscopic effects and stabilization on various transport vehicles.

Course Contents

Unit-I	Mechanisms with Lower Pair	(08 Hrs.)
<p>Introduction, Pantograph, Straight line mechanisms- Exact and Approximate, Hook Joint, Double Hook's Joint, Steering gear mechanisms: Condition for correct steering, Davis steering gear mechanism, Ackermann steering gear mechanism.</p> <p>Theory and analysis of Compound Pendulum, Concept of equivalent length of simple pendulum, Bifilar suspension, Trifiler suspension.</p>		
Unit-II	Inertial Forces in Reciprocating Parts	(08 Hrs.)
<p>Analytical method for displacement, velocity and acceleration analysis of slider cranks Mechanism. Klein's construction.</p> <p>Dynamics of Reciprocating Engines: Two mass statically and dynamically equivalent system, Correction couple, static and dynamic force analysis of reciprocating engine mechanism, Torque Exerted on crankshaft.</p>		
Unit-III	Kinematic Analysis of Mechanisms: Graphical Methods	(08 Hrs.)
<p>Relative Velocity Method: Relative velocity of a point on a link, Angular velocity of a link, Sliding velocity, Velocity polygons for simple mechanisms.</p> <p>Relative Acceleration Method: Relative acceleration of a point on a link, Angular acceleration of a link, Acceleration polygons for simple mechanisms.</p> <p>Coriolis component of acceleration.</p> <p>Instantaneous Centre of Rotation(ICR) Method (limit to only 6 link mechanisms)- Kennedy's Theorem, Body and space centrede.</p>		

Unit-IV	Gears	(08 Hrs.)
Classification, Spur gear: definition, terminology, fundamental law of toothed gearing, involute and cycloidal profile, path of contact, arc of contact, conjugate action, contact ratio, minimum number of teeth, interference and under cutting, Friction in gears. Helical gears: nomenclature, Center Distance. Worm & Worm wheel, Bevel gears, Spiral gears, Introduction to Gear Box, Electronic Gearing.		
Unit-V	Balancing	(08 Hrs)
Static and dynamic balancing, balancing of rotating masses in single and several planes, primary and secondary balancing of reciprocating masses, balancing in single cylinder engines, balancing in multi-cylinder in-line engines, direct and reverse cranks method -radial and V-engines.		
Unit-VI	Gyroscope	(08 Hrs.)
Gyroscopes- Gyroscopic forces and Couples, Gyroscopic stabilisation for ship and Aeroplane, Stability of four-wheel drive vehicle moving on curved path, Stability of a two-wheel vehicle.		

Term Work

Term work shall consist of following experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. Compound Pendulum
2. Bifilar Suspension Method
3. Trifilar Suspension Method
4. Velocity and acceleration analysis using Graphical methods by Klein's construction
5. Velocity analysis using Graphical methods by ICR.
6. Velocity and acceleration analysis using Graphical methods by Polygon method.
7. Velocity and acceleration analysis using Graphical methods i.e., polygons involving Coriolis component.
8. To determine Coriolis's Component of Acceleration at various speeds of rotation and water flow rates.
9. To draw conjugate profile for any general type of gear tooth
10. To generate involute gear tooth profile and to study the effect of undercutting and rack shift using model.
11. To balance a system of masses revolving in a plane on a rotating shaft on V Lab
12. To verify the gyroscopic principles.

Assignments

Numerical and/or theory questions on each unit from previous year question papers of GATE/ESE Mechanical Engg. examinations.

Tutorial

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Lower Pair Mechanism
2. Static and dynamic force analysis
3. Velocity and Acceleration analysis using graphical method.
4. Spur Gears
5. Balancing
6. Gyroscope

Reference Books

1. Thomas Bevan, "Theory of Machines", CBS Publishers & Distributors, Delhi.

2. Shigley J.E. and Uicker J.J., “Theory of Machines and Mechanisms”, McGraw Hill, Inc.
3. Ghosh Amitabh and Malik A.K., “Theory of Machines and Mechanisms”, East-west Press.
4. Hall A.S., “Kinematics and Linkages Design”, Prentice-Hall.
5. Hartenberg and Denavit, “Kinematic Analysis and Synthesis of Mechanisms”.
6. Erdman, A. G. & Sandor, G.N., “Mechanism design, Analysis and synthesis”, Vol 1, Prentice –Hall of India.

Text Books

1. Rattan S. S., “Theory of Machines”, Tata McGraw Hill.
2. Ballaney P. L., “Theory of Machines”, Khanna Publishers, Delhi.
3. R. S. khurmi, “Theory of Machines’, S Chand Publication.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Demonstration model of Pantograph mechanism
2. Demonstration model of Automobiles steering gear mechanism in real life
3. Demonstration model of Ackerman and Davis steering gear mechanism and its comparison.
4. Demonstration models of exact straight line motion mechanism.
5. Demonstration o relative velocity and acceleration method and Klien’s construction in slider crank mechanism
6. Demonstration model Kennedy’s Theorom (Three centre in line)
7. Demonstration model to understand Coriolli’s Effect
8. Demonstration model of different types of gears
9. Chart to understand various terminology of spur gear
10. Demonstration model for failure modes of gear tooth.
11. Chart to understand different methods to avoid interference in spur gear.
12. Demonstration model of static and dynamic balancing.
13. Demonstration model of balancing of rotating masses.
14. Demonstration model of balancing of reciprocating masses.
15. Demonstration model of balancing V-Engine.
16. Demonstration model to understand gyroscopic effect in Ship, aeroplane and automobile.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Strength of Machine Components		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical: - 02 Hours/Week	Assignments Internal	40 Marks	
Tutorial: - 01 Hours/ Week	Tutorial		01
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Mathematics 2. Engineering Mechanics 3. Engineering Science
Course Objectives:-	<ol style="list-style-type: none"> 1. Understand simple and principal stress and strain 2. Able to find principal stresses on any oblique plane by analytical and graphical method. 3. Able to draw shear force and bending moment diagram and find slope and deflection of beam 4. Able to draw bending stress and shear stress diagram at different cross section in I, C and T section beam. 5. Able to find stresses in shaft in torsional, combined torsional and bending, combined torsional and axial loading. 6. Able to solve problems on strain energy and Euler's column.
Course Outcomes:-	<p>On completion of the course, students will be able to</p> <ol style="list-style-type: none"> 1. Understand the concept of simple stress and strain and apply to find it for simple component. 2. Understand the concept of principal stress analytical and graphical by Mohr's circle; and apply it to find stresses on any oblique plane inclined to principal plane. 3. Understand the concept of shear force and bending moment and apply it to find shear force diagram and bending moment diagram for any loading condition on simply supported beam and cantilever beam. 4. Understand the concept of slope and deflection and apply it to find for any loading condition on simply supported beam and cantilever beam by maculays double integration method 5. Understand the concept of pure bending and shear and apply it to find bending stress and shear stress diagram of I, C and T section of beam. 6. Understand the concept of column theory and strain energy and apply it for loading condition.

Course Contents

Unit-I	Simple Stress and Strain	(06 Hrs)
<p>Load, Direct or normal stress ,Direct strain, Sign convention for direct stress and strain ,Elastic materials, Hooke's law, Modulus of elasticity - Young's modulus, Tensile test, Ductile materials, Brittle materials, Poisson's ratio, Application of Poisson's ratio to a two-dimensional stress system, Shear stress, Shear strain, Modulus of rigidity, Relationship Between E, G and K, Double shear, Allowable working stress -factor of safety, Load factor, Thermal stresses.</p>		
Unit-II	Principal Stresses, Theories of Failure	(06 Hrs)
<p>Principal Stresses: Introduction to principal stresses with application, Transformation of Plane Stress, Principal Stresses, and planes (Analytical method and Mohr's Circle), Stresses due to combined Normal and Shear stresses.</p> <p>Theories of Elastic failure: Introduction to theories of failure with application, Maximum principal stress theory, Maximum shear stress theory, Maximum distortion energy theory, Maximum principal strain theory, Maximum strain energy theory.</p>		

Unit-III	Shear Force and Bending Moment Diagram, Slope and Deflection	(06 Hrs)
Types of supports and beams, shear force (S.F.), bending moment (B.M.), S.F. and B. M. sign convention, S.F. and B.M. diagrams for beams carrying different loading conditions. Points of contra flexure, Relationship between S.F, B.M. and intensity of loading. Introduction, Simple bending theory, Neutral axis, Section modulus, second moment of area, Relationship between loading, S.F., B.M., slope and deflection, Double integration method, Macaulay's method for all loading conditions.		
Unit-IV	Bending and Shear Stress in Beam	(06 Hrs)
Bending stresses: Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections (rectangular, I, T, C) with respect to centroidal and parallel axes, bending stress distribution diagrams, moment of resistance and section modulus. Shear stresses: Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange and web.		
Unit-V	Torsion	(06 Hrs)
Simple torsion theory, Polar second moment of area, Shear stress and shear strain in shafts, Section modulus, Torsional rigidity. Principal stresses, Strain energy in torsion, Variation of data along shaft length-torsion of tapered shafts, Power transmitted by shafts. Stresses in solid circular shaft- Torsional load only, bending load only, combined torsional and bending, Combined Torsion and axial loading.		
Unit-VI	Euler's Columns and Strain Energy	(06 Hrs)
Concept of buckling of columns, derivation of Euler's formula for buckling load for column with hinged ends, concept of equivalent length for various end conditions, limitations of Euler's formula, Rankine's formula, safe load on columns. Strain energy: Strain energy due to axial load (gradual, sudden and impact), Strain energy due to self-weight.		

Term Work

Term work shall consist of following experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. Tension test for ductile materials
2. Tension test for brittle materials
3. Compression test for ductile materials
4. Compression test for brittle materials
5. Shear test for ductile materials
6. Shear test for brittle materials
7. Torsion test for ductile materials
8. Torsion test for brittle materials
9. Impact Test- IZOD and Charpy
10. Strain Gauge and rosettes theory
11. Testing of hardness by Rockwell
12. Graphical simulation of
 - a. Shear force and bending moment diagrams with different end conditions.
 - b. Slope and deflection.
 - c. Principal stresses through graphical and analytical method.

List of Assignments

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Simple stress and strain.
2. Principal stresses and strain.
3. Shear force and Bending moment diagram and slope and deflection
4. Stresses in beams, thick and thin cylinder
5. Torsion
6. Euler's column and strain energy method

List of Tutorial

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Stresses in simple bar, Elastic modulus and two-dimensional stress systems.
2. Normal, tangential and resultant stresses on any oblique plane inclined to normal plane by analytical and graphical method.
3. Shaft diameter and factor of safety by using theories of failure.
4. Shear and bending moments on cantilever and simply supported beam and draw SFD and BMD.
5. Slope and deflection at any section between beams by using Macaulay's method.
6. Stresses in beam and draw shear stress diagram and bending stress diagram.
7. Shaft diameter and stresses when shaft subjected to torsion, bending combined torsional and bending, combined torsional and axial loads.
8. Euler's column theory and strain energy.

Textbooks

1. A textbook of strength of material by R.K.Bansal

Reference Books

1. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication
2. J. E. Shigley, Mechanical Engineering Design, McGraw Hill
3. R. Subramanian strength of Material
4. S Ramamrutham, Strength of Material
5. R.K Rajput, Strength of materials

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. To prepare demonstration model of cantilever beam for the study of deflection in it.
2. To prepare demonstration model of simply supported beam for the study of deflection in it.
3. To prepare demonstration model of fixed beam for the study of deflection in it.
4. To prepare demonstration model of Overhang beam for the study of deflection in it.
5. To prepare the chart on relation between E, G, K with derivation.
6. To prepare demonstration model for studying strain energy with consideration of various conditions like impact load, sudden load, gradual load.
7. To prepare the chart on various concepts used in Principal Stresses & planes.
8. To prepare the chart on concept use in Mohr's Circle method using graphically & analytically.
9. To prepare the chart on Rules and guidelines use for drawing SFD & BMD.
10. To prepare the chart on finding bending stress for I cross-sections.
11. To prepare the chart on finding bending stress for T cross-sections.
12. To prepare the chart on finding bending stress for C cross-sections.
13. To prepare the chart on concepts used in solid & hollow shafts.
14. To prepare the chart and demonstration model of Euler's formula for buckling load.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Electronic Circuits		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical: - 02 Hours/Week	Assignments Internal	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	04

Course Prerequisites:-	1. Electronics Engineering Systems
Course Objectives:-	<p>The objective of this course is to cover performance evaluation of various amplifiers by</p> <ol style="list-style-type: none"> 1. Introducing a concept of the multistage amplifiers, parameter evaluation and related design aspects of multistage amplifiers with the help of derivations. 2. Teaching a concept of the feedback in the amplifiers, feedback topologies with the help of derivations and their advantages and disadvantages. 3. Gauging the efficiencies of various types of power amplifiers with the help of derivations. 4. Teaching a concept and design of the RC and LC oscillators with the help of derivations. 5. Analyze the biasing of BJT circuit and Amplifier 6. Classify different types of FET
Course Outcomes:-	<p>On completion of the course, students will be able to</p> <ol style="list-style-type: none"> 1. Identify applications of BJT 2. Analyze FET operations. 3. Analyze numerical to get values of the input impedance, output impedance, gain and bandwidth in a multistage amplifier. 4. Analyze numerical to get values of the input impedance, output impedance, gain and bandwidth of all the topologies in a negative feedback amplifier. 5. Analyze the efficiencies in power amplifiers. 6. Analyze numerical to get values of the oscillation frequencies of the RC and LC oscillators, and to design the oscillator for the given oscillations frequency.

Course Contents

Unit-I	BJT Biasing	(06 Hrs)
Need of biasing circuits, Analysis and design of BJT biasing circuits like fixed bias, collector to base bias, voltage divider bias, split-supply bias, Concept of DC load line, Concept of stability factor, Derivation of stability factor, Single stage amplifiers		
Unit-II	Field Effect Transistor (FET) Biasing	(06 Hrs)
Types of MOSFET, construction, VI characteristics, FET Biasing-Self Bias, Fixed Bias, Current Source Bias, JFET amplifiers-CS,CD and CG amplifiers, Application of MOSFET.		
Unit-III	Multistage Amplifiers	(06 Hrs)
Projectile Need of the Multistage amplifiers, Types of Multistage amplifiers-Cascade and Cascode, Cascade-Coupling methods, Frequency response, Parameter evaluation - R_i , R_o , A_v , A_i & Bandwidth for general multi stage amplifier, Choice of the transistor configuration in cascade amplifier, Analysis & design of direct coupled, RC coupled (Low frequency, high frequency and medium frequency analysis), transformer coupled (Low frequency, high frequency and medium frequency analysis) amplifier. Darlington Amplifier, Design of Cascode amplifier.		
Unit-IV	Feedback Amplifiers	(06 Hrs)
Types of basic Amplifiers, Concept and types of feedback, Transfer gain with feedback, Negative feedback topologies with their block Schematics, Effect of negative feedback on Input impedance; Output impedance; Gain and Bandwidth with derivation, Analysis of one circuit for each feedback topology for input impedance, output impedance, gain and bandwidth.		

Unit-V	Power Amplifiers	(06 Hrs)
Need of Power amplifiers, classification; applications; advantages of power amplifiers - Class A, Class B, Class C, class D and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull; Class AB Complementary symmetry and Quasi – complementary. Efficiency analysis for Class A transformer coupled amplifier, Class B push – pull amplifier. Comparison of efficiencies of other configurations. Distortion in amplifiers; concept of Total Harmonic Distortion (THD).		
Unit-VI	Oscillators	(06 Hrs)
Concept of Positive feedback, Condition and principle of oscillations (Barkhausen criterion), Classification of oscillators, Design analysis of RC and LC oscillators, RC oscillators: Phase shift, Wien bridge Oscillators; LC Oscillators: Hartley, Colpitt's and Clap; Piezo-electric effect in crystals and Crystal Oscillator.		

List of Experiments:

1. To find the gain and bandwidth of a 2-stage CE RC coupled amplifier.
2. To find the gain and bandwidth of a 2-stage transformer coupled amplifier.
3. To find the gain of a direct coupled amplifier.
4. To find the gain and bandwidth of a voltage series negative feedback amplifier.
5. To find the gain and bandwidth of a voltage shunt negative feedback amplifier.
6. To find the gain and bandwidth of a current series negative feedback amplifier.
7. To find the gain and bandwidth of a current shunt negative feedback amplifier.
8. To study the response of a Class A direct coupled/ transformer coupled amplifier.
9. To study the response of a Class B power amplifier.
10. To find the oscillations frequency of the RC amplifiers-RC phase shift/ Wien bridge oscillator.
11. To find the oscillations frequency of LC amplifiers-Colpitt's Oscillator/Hartley Oscillator
12. To plot frequency response of tuned amplifiers.

List of Assignments: One assignment on each unit

Text Books:

1. S. Salivahanan and N Suresh Kumar, 'Electronic devices and circuits', Mc Graw Hill Education India Private Limited, Third Edition.

Reference Books:

1. Ramakant A.Gayakwad "Op-amps and Linear Integrated Circuit Technology"Fourth edition
2. Adel S. Sedra, Kenneth C. Smith " Microelectronic Circuits" Oxford series in Electrical and computer engineering

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

To prepare a demonstration model on:

1. Water Level Indicator.
2. LED Emergency Light.
3. Home Security System.
4. AC to DC converter.
5. Automatic Street Light controller
6. Rain Alarm
7. Flashing LED
8. Dancing Light
9. Voltage doubler.
10. Voltage regulator using Zener diode.
11. Reverse Current Protection using diode.

12. BJTs as a digital switch.
13. Cascode amplifier
14. Sine wave generator.
15. FET used as a Multiplexer.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	EMBEDDED SYSTEMS		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: - 02 Hours/Week	Assignments Internal	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites:-	Electronics Engineering Systems
Course Objectives:-	1. To familiarize students with architecture and features of typical Microcontrollers. 2. To learn interfacing of real world input and output devices and use Embedded C to interface the microcontrollers to various applications.
Course Outcomes:-	1. Use Hardware and software tools for microcontrollers. 2. Write programs using features of 8051 microcontroller. 3. Write programs using features of PIC microcontroller. 4. Develop interfacing of microcontrollers with real world devices.

Course Contents

Unit-I	Introduction to Microcontrollers	(08 Hrs)
Comparison of Microprocessor & Microcontroller. Difference between RISC & CISC architectures, Harvard & Von Neumann architectures. 8051 Microcontroller: architecture, family devices & its derivatives. Ports, registers, memory organization, Programming in Embedded C.		
Unit-II	8051 Microcontroller features	(08 Hrs)
Timers and its modes, Delay generation using timers, Serial Communication with RS232, Interrupt structure, Timers programming with interrupts, Programming in Embedded C.		
Unit-III	Peripheral Interfacing With 8051	(08 Hrs)
8051 based system design – Address decoding, data memory space Interfacing & Applications –LED, LCD, Stepper motor, DAC/ADC, Sensors, Keyboard. Programming in Embedded C.		
Unit-IV	PIC Microcontroller	(08 Hrs)
Comparison of Features of different PIC series, PIC 18F architecture, registers, memory Organization, oscillator options, BOD, power down modes and configuration bit settings, Port structure, interrupts & timers of PIC18F, All programs in embedded C.		
Unit-V	Peripheral Interfacing With PIC-I	(08 Hrs)
Interfacing of PIC18F with LED, Seven segment display, LCD and Keypad. Use of timers with interrupts, PWM generation. All programs in embedded C.		
Unit-VI	Peripheral Interfacing With PIC-II	(08 Hrs)
MSSP structure, CCP and ECCP, Study of UART, SPI, I2C, ADC. Interfacing serial port, ADC, RTC, EEPROM. Motor Control using PIC. All programs in embedded C.		

List of Experiments:

1. BCD to HEX, HEX to BCD conversion in 8051
2. Generate BCD up/ down counter in 8051.
3. Square wave generation using timers in 8051.
4. Serial Communication using 8051.
5. LCD interfacing with 8051.
6. Stepper motor interfacing with 8051.
7. Keyboard interfacing with 8051.

8. ADC/DAC interfacing with 8051.
9. Serial Communication using PIC.
10. LCD interfacing with PIC.
11. Stepper motor interfacing with PIC.
12. Keyboard interfacing with PIC.
13. Seven segment display interfacing with PIC.

List of Assignments: One assignment on each unit

Content Delivery Methods: Chalk & talk, Power point presentation

Text Books:

1. Mazidi, “8051 microcontroller & embedded system” 3rd Edition ,Pearson
2. Mazidi, “PIC microcontroller & embedded system” 3rd Edition ,Pearson

Reference Books:

1. Ajay V. Deshmukh, “Micro-controllers - Theory and Applications”, Tata McGraw Hill.
2. Kenneth J. Ayala, “The 8051 Micro-controller – Architecture, Programming & Applications”, Penram International & Thomson Asia, Second Edition.
3. John B. Peatman, “Design with PIC Micro-controllers”, Pearson Education Asia, Low Price Edition.
4. 18F xxx reference manual

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

To prepare a demonstration model on:

1. Finger Print based attendance management system
2. LPG gas leakage detection system
3. Automatic motor control for filling water tank
4. Fire detection and alert system
5. Room temperature maintenance by automatically adjusting fan speed / AC
6. Home automation
7. Automatic maintenance of green house
8. Alcohol detection and alert family members in case of drunk and drive
9. Patient monitoring through GSM
10. Digital Notice board for college students
11. Line follower robot
12. Path follower robot
13. Public garden automation
14. Voting machine with digital display
15. Design Real Time Clock
16. Automatic City Street Lights control system

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	Data Structures and Algorithms		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Practical:- 04 Hours/ Week	Term Work	25 Marks	01
	Total	25 Marks	01

Course Contents

Unit 1	Introduction to Data structures and Algorithms	(8 Hrs.)
Introduction to data structure, Data representation, Abstract Data types, Primitive data types, Data structure and data types, Differences between data types. Program design. Algorithms and different approaches to designing an algorithm, Complexity, Big O notation, algorithm analysis, recursion. Sorting Bubble sort, Selection sort, Quick sort, Merge sort, Insertion sort.		
Unit 2	Analysis of Algorithms	(8 Hrs.)
Asymptotic notations and their significance, Running time of an algorithm, Time-complexity of an algorithm, Performance analysis of an algorithm, Analysis of iterative and recursive algorithms, Master theorem (without proof).		
Unit 3	Data Structures	(8 Hrs.)
Importance of data structures, Arrays, Stacks, Queues, Linked list, Trees, Hashing table, Binary Search Tree, Heaps.		
Unit 4	Search Trees and Multiway Trees	(8 Hrs.)
Binary tree, Linked and array representation of Binary tree, Binary search tree, Operation: Searching of a Node in a Binary tree, Insertion of a node in binary tree, deletion from a binary tree. Threaded binary tree, Forest. AVL trees Multiway Trees: Issues in large dictionaries, m-way search trees, Btrees, search insert and delete operations, height of B-tree, 2-3 trees, sets and multisets in STL		
Unit 5	Graphs Algorithms	(8 Hrs.)
Definition, terminology, directed and undirected graphs, properties, connectivity in graphs, applications, implementation – adjacency matrix and linked adjacency chains, graph traversal – breadth first and depth first, minimum spanning tree (MST), single source shortest paths.		
Unit 6	Algorithm Design Paradigms	(8 Hrs.)
Divide and Conquer, Brute force, Greedy, Recursive Backtracking and Dynamic programming.		

Text Books:

1. “Data structure using C” ISRD group, TMH.
2. “Data Structure through C” ,Yashwant kanetkar, BPB Publication.
3. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009.

Reference Books:

1. “Data structure using C” AM Tanenbaum, Y Langsam and MJ Augustein, Prentice Hall India.
2. “Data structure and Algorithm Analysis in C” Weiss, Mark Allen Addison Wesley.
3. “Data structure – A Pseudocode Approach with C”, Richard F Gilberg Behrouz A. Forouzan, Thomson
4. “Let us C”, Yashwant Kanetkar,BPB Publication.
5. SanjoyDasgupta, C.Papadimitriou and U.Vazirani , Algorithms, Tata McGraw-Hill, 2008.
6. A. V. Aho, J.E. Hopcroft and J. D. Ullman, Data Structures and Algorithms, Pearson India, 1st Edition, 2006
7. Sara Baase, Allen Van Gelder, Computer Algorithms, Introduction to Design and Analysis, 3rd edition, Wesley Longman Publishing, 1999.

List of Experiments:

1. Extract the features based on various color models and apply on image and video retrieval
2. Arrays, loops and Lists
3. Stacks and Queues
4. Searching and Sorting

5. Linked List and operations
6. Brute force technique
7. Greedy Technique
8. Backtracking
9. Dynamic Programming
10. Trees and Tree Operations
11. BFS and DFS
12. Minimum Spanning Tree

Designation of Course	MATLAB Programming		
Teaching Scheme	Examination Scheme		Credits Allotted
Practical: -02 hours/Week	Term Work & Practical	50 Marks	01
	Total	50 Marks	01

Course Prerequisites:-	Basic Mathematics
Course Objective: -	The goal of the course is that students should develop techniques for problem solving using a programming language.
Course Outcomes	<p>Students should</p> <ol style="list-style-type: none"> 1. Understand basics of MATLAB and apply that knowledge to write simple programs. 2. Understand the concept of arrays and functions and be able apply them in writing programs/solving problems. 3. Understand the concept of 2D graphics and be able apply them in developing 2D plots 4. Understand the concept of 3D graphics and be able apply them in developing 3D plots 5. Apply MATLAB knowledge to solve algebraic problems 6. Understand the concepts of GUI and apply them in creation of forms and objects

Course Contents

Unit-I	Introduction to MATLAB	(04 Hrs.)
MATLAB Introduction; Platform & Features; Advantages & Disadvantages; MATLAB Commands; MATLAB Environment; Working with Variables & Arrays Workspace, Variables, & Functions; MATLAB Data Types; Control Statements; if...end statement; if-else... end statement; MATLAB switch; Loops: for loop; while loop; break and continue		
Unit-II	Arrays and Functions	(04 Hrs.)
Matrices & Arrays; Multi-Dimensional Arrays; MATLAB Compatible Array; MATLAB Sparse Matrices; MATLAB M-Files; MATLAB Functions; Anonymous Function		
Unit-III	Graphics I: 2D plots	(04 Hrs.)
fplot(); Semilogx(); Semilogy(); loglog(); Polar Plots(); fill(); Bar(); errorbar(); barh(); plotyy(); area(); Pie(); hist(); stem(); Stairs(); compass(); comet(); contour(); quiver(); pcolor();		
Unit-IV	Graphics I: 3D plots	(04 Hrs.)
plot3(); fill3(); contour3(); surf(); surfc(); mesh(); meshz(); waterfall(); stem3(); ribbon(); sphere(); ellipsoid(); cylinder(); slice()		
Unit-V	Algebra in MATLAB	(04 Hrs)
Gauss & Gauss-Jordan Elimination; Eigenvalues & Eigenvectors; Symbolic Mathematics, Polynomials and Interpolation		
Unit-VI	GUI in MATLAB	(04 Hrs.)
Components, Containers, Callback		

Term Work

Term work shall consist of programs and assignments based on syllabus.

1. Introduction to MATLAB commands and Programming
2. Use of Arrays and functions in command prompt and programming
3. Generation of 2D graphs
4. Generation of 3D graphs
5. Solving algebraic problems using MATLAB
6. Creation of GUI forms and objects

Text Books

1. "Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers", Rudra Pratap, Oxford University Press

Reference Books

1. "MATLAB and its Applications in Engineering", Barbara Johnston, Prentice Hall of India, New Delhi.
2. " MATLAB: An Introduction with Applications ", Amos Gilet, Wiley Publication
3. " MATLAB Programming for Engineers ", Stephen Chapman, Cengage Learning India Pvt. Ltd.
4. " Fundamental Concepts of MATLAB Programming: From Learning the Basics to Solving a Problem with MATLAB (English Edition) ", Dr.Brijesh Bakariya, Dr.Kulwinder Singh Parmar, BPB Publications

Designation of Course	Vocational Course-I: Sensors, PLC & HMI: Basic Training		
Teaching Scheme	Examination Scheme		Credits Allotted
	Term Work & Oral	50 Marks	02
	Total	50 Marks	02

Course Prerequisites:-	Digital Electronics, Embedded systems, Power Electronics
Course Objectives:-	<ol style="list-style-type: none"> 1. To introduce the student to the programmable logic controllers sensors. 2. To impart the knowledge of protocols & networking of PLCs 3. To introduce SCADA &DCS 4. To introduce HMI
Course Outcomes:-	<ol style="list-style-type: none"> 1. Understand the general principles of sensors and transducers 2. Understand the requirements for networking of sensors 3. Understand the principle and working of advanced sensors 4. Identify the sensors for typical applications. 5. Identify the components of SCADA & DCS 6. Identify the components of HMI

Course Contents

Unit-I	Fundamentals of Sensors	(8 Hrs)
Performance terminology, static and dynamic characteristics of transducers, classification of sensors and transducers, signal processing and signal conditioning.		
Unit-II	Sensors and Networking	(8 Hrs)
Inductive, capacitive, magnetic, various types of photo sensors, detection methods, through-beam detection, reflex detection & proximity detection, ultrasonic and microwave sensors. Applications and understanding of the above sensors. Networking: Networking of sensors, control of manufacturing process, tracking- the meantime between operations interventions, tracking the yield and mean process time, detection of machining faults, diagnostic systems, resonance vibration analyzer, sensing motor current for signature analysis, temperature sensing.		
Unit-III	Advanced Sensor Technologies	(8 Hrs)
Laser production, characteristics of lasers, types of laser sensors, bar code sensors, benefits of bar coding, transponder, RFID (Radio Frequency Identification), electromagnetic identifier, optical encoders, color sensors, sensing principles, color theory, unit color measurement, colour comparator, color sensing algorithm, fuzzy logic color sensor. fuzzy logic for optoelectronic colour sensor in manufacturing. Sensors in Flexible Manufacturing Systems: Vision sensors, image transformations, robot visual sensing tasks, detecting partially visible objects, sensors in flexible manufacturing.		
Unit-IV	Sensors for Special Applications	(8 Hrs)
A multi objective approach for selection of sensors in manufacturing, cryogenic manufacturing applications, semiconductor absorption sensors, semiconductor temperature detector using photoluminescence temperature detectors using point-contact, sensors in process manufacturing plants, measurement of high temperature, robot control through sensors, other sensors, collection and generation of process signals in decentralized manufacturing system.		
Unit-V	SCADA & DCS	(8 Hrs)
Role of SCADA in Industrial Automation, SCADA System Configuration, RTU, Communication, Introduction to DCS, Architecture of DCS, Input and output modules, communication module, Specifications of DCS.		
Unit-VI	Human Machine Interface	(8 Hrs)
Different Types of Operator Interfaces: Textual, Graphical, Data Handling With HMI, Configuration and Interfacing to PLC and PC, Communication Standards- DF1, Ethernet, DH45, RS232, RS485, Profibus.		

Text Books:

1. "Sensors & control systems in manufacturing.", Sabnesoloman, Mc-Graw Hill book Company Network, 1994
2. "Mechatronics" ,W, Bolton
3. "Programmable Logic Controllers, Principles and Applications"; John W. Webb, Ronold A Reis, 5th Edition, Prentice Hall of India Pvt. Ltd

References Books:

1. "Sensor Technology Handbook", Jon S. Wilson
2. "Mechanical measurement", N.L. Buck & T.G.Buck,
3. "Sensors and Transducers", Ian Sinclair

Designation of Course	Design and Analysis of Machine Component		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: -02 Hours/Week	Internal Assessment	40 Marks	
	Term Work & Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisites: -	<ol style="list-style-type: none"> 1. Computer Aided Drafting and Visualization 2. Computer Aided Machine Drawing 3. Strength of Machine Components
Course Objectives: -	<ol style="list-style-type: none"> 1. To study basic concepts of machine design. 2. To design and analysis different types of machine elements 3. To design of machine component for finite and infinite life and subjected to fluctuating load.
Course Outcomes: -	<ol style="list-style-type: none"> 1. Understand the basic concept of machine design and evaluate dimensions of simple components. 2. Understand the fundamental concepts for design of shaft, keys and coupling and evaluate forces and dimensions. 3. Understand the concept of designing of Power Screws and Mechanical spring and analyze it for various applications. 4. Understand the basic concept of fluctuating loads and Analyze design of components under fluctuating loads. 5. Understand the concept of fasteners and threaded joints; and analyze when it is subjected to different loading conditions. 6. Understand the Design concept of welded & riveted joint;and analyze when it is subjected to different loading conditions.

Course Contents

Unit-I	Introduction to Design and Design against Static Load	(08 Hrs)
<p>Introduction to Design: Need for component design, design process, Introductions to concurrent engineering, Design consideration for casting, forging & machined parts, hot & cold worked parts and welded assembly, Introduction to design for manufacture & assembly,</p> <p>Design against Static Load: Modes of failure, Factor of safety, Service factor, stress strain relationship, shear stress & strain, stress due to bending moment, Eccentric axial loading.</p> <p>Design of simple machine parts - Cotter joint, Knuckle joint and Levers, curved beam.</p>		
Unit -II	Shafts, Keys and Coupling	(08 Hrs)
<p>Introduction, Transmission Shafts, Shaft Design on Strength Basis, Shaft Design on Torsional Rigidity Basis, ASME Code for Shaft Design, Design of Hollow Shaft on Strength Basis, Design of Hollow Shaft on Torsional Rigidity Basis, Flexible Shafts</p> <p>Keys– saddle, sunk, feather, woodruff, square, flat, Kennedy key, key design, Types of keys, splines.</p> <p>Couplings- types of couplings, Design of rigid and flexible couplings.</p>		
Unit-III	Power Screws and Mechanical Spring	(08Hrs)
<p>Power Screws, Forms of Threads , Multiple Threaded Screws, Terminology of Power Screw, Torque Requirement—Lifting Load, Torque Requirement—Lowering Load, Self-locking Screw, Efficiency of Square Threaded Screw, Efficiency of Self-locking Screw, Trapezoidal and Acme Threads, Collar Friction Torque, Overall Efficiency, Coefficient of Friction, Design of Screw and Nut, Design of Screw Jack, Differential and Compound Screws, Re-circulating Ball Screw.</p>		

Mechanical Spring: Types of Springs, Terminology of Helical Springs, Styles of End, Stress and Deflection Equations, Series and Parallel Connections, Design of Helical Springs, Concentric Springs, Helical Torsion Springs, Surge in Spring, Multi-Leaf Spring, Nipping of Leaf Springs, Shot Peening		
Unit-IV	Design for Fluctuating Loads	(08 Hrs)
Stress concentration factor and its Reduction, Stress concentration factor for various machine parts, Cyclic stresses, Fatigue and endurance limit, Notch sensitivity, Cumulative Damage in Fatigue, Design for finite and infinite life, Soderberg, Goodman, Modified Goodman & Gerber criteria.		
Unit-V	Threaded Joints	(08 Hrs)
Basic Types of Screw Fastening, Cap Screws & Setscrews, Bolt of Uniform Strength, Locking Devices, Terminology of Screw Threads, ISO Metric Screw Threads, Bolt under tension, Eccentrically Loaded Bolted Joints in Shear, Eccentric Load Perpendicular to Axis of Bolt, Eccentric Load on Base plate, Torque Requirement for Bolt Tightening, Dimensions of Fasteners, Design of Turnbuckle.		
Unit-VI	Welded and Riveted Joints	(08 Hrs)
Welded Joints- Welding Processes, Strength of Butt and Fillet Joints, Strength of Parallel Fillet Welds, Strength of Transverse Fillet Welds, Axially Loaded Unsymmetrical Welded Joints, Eccentric Load in the Plane of Welds, Welded Joint Subjected to Bending Moment and Torsional Moment, Welding Symbols		
Riveted Joints- Types of Rivet Heads and riveted Joints, Rivet Materials, Types of Failure, Strength Equations, Efficiency of Joint, Caulking and Fullering, Eccentrically Loaded Riveted Joint		

Term work

Term work shall consist of following experiments. Hand calculations must be confirmed through a computer programme using any programming language.

1. Symbolic representation of common machine components using Auto-CAD.
2. Design of machine components such as knuckle joint, cotter joint and lever (anyone) using CAD software.
3. Design of coupling system using CAD software.
4. Design of screw jack using CAD software.

Assignment

Numerical and/or theory questions on following topics from previous year question papers of GATE/ESE Mechanical Engg. examinations.

1. Static loading
2. Design of shafts
3. Power screw
4. Mechanical springs
5. Design of fluctuating load
6. Design of threaded joints
7. Design of welded
8. Riveted joints.

Note: Design data book should be used extensively.

Textbooks

1. V. B. Bhandari, "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.
2. R. S. Khurmi And J.K. Gupta "Machine Design", S Chand Publication.
3. Shigley J. E. and Mischke C. R., "Mechanical Engineering Design", McGraw Hill Publication Co. Ltd.
4. Spotts M. F. and Shoup T.E., "Design of Machine Elements", Prentice Hall International.

Reference Books

1. Black P.H. and O. Eugene Adams, "Machine Design", McGraw Hill Book Co. Inc.
2. Willium C. Orthwein, "Machine Components Design", West Publishing Co. and Jaico Publications House.
3. Hall A. S., Holowenko A. R. and Laughlin H. G, "Theory and Problems of Machine Design", Schaum's Outline Series.
4. Sharma C. S. and Purohit Kamlesh, "Design of Machine Elements", PHI Learning Pvt. Ltd.
5. D. K. Aggarwal & Sharma P. C., "Machine Design", S.K Kataria and Sons
6. Gope P. C., "Machine Design: Fundamentals and Applications", PHI Learning Pvt. Ltd.
7. "Design Data- P. S. G." College of Technology, Coimbatore.
8. V. B. Bhandari, "Design Data Book", Tata McGraw Hill Publication Co. Ltd.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. To develop Industrial/Real life application demonstration model of different types of Joints. (Cotter joint and Knuckle joint)
2. To observe the system where transmission of power takes place through shaft, Keys, coupling, like Transmission of power from motor to pump/generator/lathe machine/drilling machine. By selecting suitable materials, design the shaft, key and coupling. To prepare design report and assembly drawing indicating overall dimensions, tolerances, and surface finish. Also to prepare bill of materials.
3. To develop a demonstration models of different types of couplings.
4. To develop a demonstration models of different types of keys.
5. To observe the system where transmission of power takes place through power Screws. (e.g. Lead screw of lathe, feed screws of machine tools, Clamping screws, Toggle Jack screw, etc.) Get the required information regarding effort, clamping force, etc., and selecting suitable materials design screw, nut and different simple components in assembly. To prepare design report and assembly drawing indicating overall dimensions, tolerances, and surface finish. Also to prepare bill of materials.
6. To develop demonstration models of different types of springs.
7. To develop demonstration models of different types of threaded joints.
8. To develop demonstration models of different types of fasteners.
9. To develop demonstration models of different types of welded joints.
10. To develop demonstration models of different types of riveted joints.

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Designation of Course	DIGITAL ELECTRONICS		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites:-	Electronics Engineering Systems
Course Objective	<ol style="list-style-type: none"> To present the Digital fundamentals, Boolean algebra and its applications in digital systems To familiarize with the design of various combinational digital circuits using logic gates To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits To explain the various semiconductor memories and related technology To introduce the electronic circuits involved in the making of logic gates To introduce memory operation is PLA
Course Outcomes:-	<p>The students should be able to-</p> <ol style="list-style-type: none"> Use digital electronics in the present contemporary world. Design various combinational digital circuits using logic gates. Do the analysis and design procedures for synchronous and asynchronous sequential circuits. Use the semiconductor memories and related technology. Use electronic circuits involved in the design of logic gates. To understand characteristics of PLDs, Semiconductor memories and their applications

Course Contents

Unit 1	Digital Fundamentals	(08Hrs)
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization		
Unit 2	Combinational Circuit Design	(08Hrs)
Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.		
Unit 3	Synchronous Sequential Circuits	(08Hrs)
Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.		
Unit 4	Asynchronous Sequential Circuits	(08Hrs)
Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits.		
Unit 5	Digital Integrated Circuits	(08 Hrs)
Digital integrated circuits: Logic levels, propagation delay, power dissipation, fan-out and fan-in,		

noise margin, logic families and their characteristics-RTL, TTL, ECL, CMOS		
Unit 6	PLDs & Semiconductor Memories: Programmable logic devices	(08Hrs)
Study of PROM, PAL, FPGA, PLAs. Designing combinational circuits using PLDs.		
Semiconductor memories		
Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.		

List of Experiments-

Term work shall consist of **Minimum Eight** Experiments.

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load, noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. Function implementation using Multiplexer and Demultiplexer
6. Sequence generator using MSJK flip flop IC's
7. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
8. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
9. Study of Full Adder using half adder
10. Study of 2 bit comparator
11. BCD Adder/Subtractor with Decoder driver and 7 segment display

Text Books/ Reference Books

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2014.

REFERENCE BOOKS

1. Charles H. Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
2. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
3. S. Salivahanan and S. Arivazhagan "Digital Electronics", 1st Edition, Vikas Publishing House Pvt Ltd, 2012.
4. Anil K. Maini "Digital Electronics", Wiley, 2014.
5. A. Anand Kumar "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Private Limited, 2016.
6. Soumitra Kumar Mandal " Digital Electronics", McGraw Hill Education Private Limited, 2016.

Assignments:

At least ONE assignment on each unit

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Survey report of basic gates ICs 7432, 4011, 4050, 4070, 4071, 40106
2. Implement combinational logic Circuit of given Boolean Equation.
3. Implement Half Adder and Half Subtractor.
4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX

10. Implement 7 segment decoder driver using IC 7447.
 11. Build a Decade counter and Up-Down Counter.
 12. Build a Shift Registers: SISO and SIPO
 13. Implement the Johnson Counter and Ring Counter.
 14. Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.
 15. Implement given Boolean Function using PLA.
- (Function and Equation will be given by Subject Teacher)

Unit Tests

Unit Test-I	Unit-I,II,III
Unit Test-II	Unit-IV, V,VI

Designation of Course	POWER ELECTRONICS AND DRIVES		
Theory: 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical: 02 Hours / Week	Internal Assessment	40 Marks	
Tutorial: 01 Hour/Week	Tutorial		01
	Term work & Oral	50 Marks	01
	Total	150 Marks	05

Course	Construction, Working Principle & Application of AC and DC motors
Prerequisites:-	Introductions to Electronic Components SCR , Diodes etc
Course Outcomes:-	<ol style="list-style-type: none"> 1. Explore the basic knowledge of the components and dynamics related to electrical drives and also basics of Voltage source converters. 2. Explore the basic knowledge of the components and also basics of Current source converters. 3. Perform and understand the operation of solid state control using Inverters. 4. Analyze and understand the DC Drives. 5. Understand the various Induction motor drives in various applications. 6. Explore the synchronous motor drives as per the industrial point of view.
Course Outcomes:-	<p>The students should be able to-</p> <ol style="list-style-type: none"> 1. Understand the different types of converters. 2. Understand the basic concepts of matrix converter and CSC. 3. Understand the basic concepts multilevel Inverters. 4. Understand the basic concepts DC drives and apply it for different applications. 5. Understand the basic concepts of Induction motor drives and its different types. 6. Understand the basic concepts of Synchronous Motor Drives and apply it for different applications.

Course Contents

Unit 1	Converters	(06 Hrs.)
Voltage Source Converters: Review of 3-ph-full wave bridge converter, operation and harmonics, 3 level voltage source converters. PWM converter. Generalized technique of harmonic elimination and voltage control. Advanced modulation techniques (space vector modulation, 3 rd harmonic PWM) Comparison of PWM techniques. Converter rating.		
Unit 2	Current source converters	(06 Hrs.)
(i) Matrix Converter: 3×3 matrix converter, principle of working, mathematical treatment, comparison of matrix converter with multipulse converter. (ii) Self and Line commutated current source converter: Basic concepts of CSC, converters with self commutating devices.		
Unit 3	Multilevel Inverters	(06 Hrs.)
Multilevel concept, Types of multilevel Inverters, diode clamped multilevel inverter, flying-capacitors multilevel inverters, cascaded multilevel inverter, switching device currents, D.C. link capacitor voltage balancing, features of multilevel inverters, comparison of multilevel inverters. Applications of multilevel Inverter: Reactive power compensation Back to back inertie system.		
Unit 4	DC Drives	(06 Hrs.)
Single phase and 3 phase converter drives. Four quadrant Chopper drives, closed loop control of DC motor, Permanent magnet DC motor drives, DC Servo drives, applications.		

Unit 5	Induction Motor Drives	(06 Hrs.)
3 phase induction motor control, stator voltage control/rotor voltage control, voltage and frequency control, current control, closed loop control of 3-phase induction motor. Soft starters, comparison of variable frequency drives, Speed control by static slip power recovery, induction motor servo drives, applications.		
Unit 6	Synchronous Motor Drives	(06 Hrs.)
Voltage and frequency control, closed loop control of synchronous motors. Synchronous motor servo drive with sinusoidal waveform, synchronous motor servodrive with trapezoidal waveform. Load commutated inverter drives, speed control of synchronous motors by cyclo-converters, applications.		

LIST OF EXPERIMENTS: (Students should perform at least 08 experiments from the following list)

1. Gate Pulse Generation using R, RC and UJT.
2. Characteristics of SCR and Triac
3. Characteristics of MOSFET and IGBT
4. AC to DC half controlled converter
5. AC to DC fully controlled Converter
6. Step down and step up MOSFET based choppers
7. IGBT based single phase PWM inverter
8. IGBT based three phase PWM inverter
9. AC Voltage controller
10. Switched mode power converter.
11. Simulation of PE circuits

(1 Φ &3 Φ semiconverter, 1 Φ &3 Φ fullconverter, dc-dc Converters, ac voltage controllers).

Text Books:

1. Bimal K Bose, Modern power electronics and AC drives, Pearson education asia
2. G. K. Dubey, Fundamentals of Electrical Drives CRC press 2002
3. Vedam Subrahmanyam Electric Drives: Concepts & Appl Tata McGraw-Hill
4. Power electronics convertors, applications and design, Ned Mohan, Tore M Undeland, William P Robbins, Wiley India Pvt. Ltd., 2009
5. E. Acha, Miller & Others, Power Electronic Control in Electrical Systems (Newnes, Oxford publication) – first Edition
6. M. H. Rashid Power Electronics, Prentice Hall of India Pvt. Ltd. New Delhi, (3rd Edition)
7. R Krishnan, Electric motor drives, modeling, analysis and control, PHI learning Pvt. ltd. 2001
8. S.K. Pillai, A first course in electrical drives, Newage international publishers. 2010

Reference Books and Papers:

1. E. H. Watanabe, R.M. Stephen and Maurico Ardes “New Concepts of instantaneous active and reactive powers in Electrical systems with Generic loads” (IEEE transaction on Power Delivery Vol.8, no.2 April 1993, PP-697-703.
2. L. Benchaita, S. Sadaate and A. Salemnia – “A comparison of voltage source and current source shunt Active filter by simulation and Experimentation” (IEEE Transaction on Power Systems, Vol 14, No.2, May 99, PP 642-647.
3. H. Akagi, E.H. Watanabe and M. Aredes “Instantaneous Power Theory and Applications to Power Conditioning, IEEE Press, New York.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Review paper on applications of Power electronic switches with and without Snubber (i) IGBT (ii) MOSFET
2. Modeling and system simulation of basic electrical circuits using MATLAB-SIMULINK/SCILAB
3. Modeling and System simulation of basic power electronic circuits using MATLAB-SIMULINK/SCILAB
4. Development of AC Source with Single Diode fed Resistive and Resistive-Inductive Load
5. Development of AC source with Single SCR fed Resistive and Resistive-Inductive Load
6. Modeling and System Simulation of SCR based full converter with different types of load using MATLAB-Simulink/SCILAB
7. Development of prototype of Full converter fed resistive load
8. Development of prototype of Full converter fed Resistive-Back Emf (RE) load at different firing angles
9. Development of prototype of Full Converter fed Resistive-Inductive Load at different firing angles
10. Development of prototype of Full converter fed DC motor load at different firing angles
11. Circuit Simulation of Voltage Source Inverter and study of spectrum analysis with and without filter using MATLAB/SCILAB
12. Development of prototype of Single phase square wave inverter
13. Development of prototype of Three phase sine PWM inverter
14. Generation of PWM gate pulses with duty cycle control using PWM peripheral of microcontroller (TI-C2000 family/ PIC18)
15. Design of Driver Circuit using IR2110
16. Design and testing of signal conditioning circuit to interface voltage/current sensor with microcontroller (TI-C2000 family/ PIC18)
17. Design of PI controller using OP-AMP
18. PCB design and fabrication of DC power supply using any PCB design software (open source- KiCAD/students version)

Unit Tests

Unit Test-I	Unit-I,II,III
Unit Test-II	Unit-IV, V,VI

Designation of Course	Manufacturing Technology-I		
Teaching Scheme	Examination Scheme		Credits Allotted
Theory: - 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical: 02 Hours/Week	Internal Assessment	40 Marks	
	Term work	50 Marks	01
	Total	150 Marks	04

Course Prerequisites:-	The student should have basic knowledge of 1. Mechanical engineering system 2. Engineering materials 3. Advanced metallurgical technology
Course Objectives:-	The student should 1. To acquire the knowledge of Foundry Technology. 2. To acquire the knowledge of hot and cold working processes. 3. To acquire the knowledge of lathe, drilling, milling, and sheet metal operations.
Course Outcomes:-	The students should be able to– 1. Understand the pattern and mold making. 2. Understand the various casting processes and apply the best casting process for a specific product. 3. Understand the hot working and cold working processes and apply them in Manufacturing. 4. Understand different operations on lathe machine and apply them to create the job. 5. Understand different operations of drilling machine and milling machine and apply them to create the job. 6. Understand various sheet metal operations and apply them to create the job.

Course Contents

Unit 1	Pattern and Mould Making	(06 Hrs.)
Introduction to casting, Foundry Layout, Foundry departments and sections, Pattern and pattern making, Design and allowances for patterns, Colour codes for patterns, Storage of patterns. Moulding sand and core sands, Sand control test, Core and core making –Introduction, Core making Procedure, Types of cores, Core print, Core boxes. Mould and mould making-Moulding Methods, Moulding processes, Design of Gating System.		
Unit 2	Sand Casting and Die Casting Practice	(06 Hrs.)
Sand Casting Practice: Melting furnaces and their selection, Cupola furnace, Induction melting furnaces, Advantages, Limitations, applications, pouring practice and equipment's, Ladle technology, Strike out, Fettling, Cleaning and Surface preparation of castings, Defects in castings. Die Casting Practice: Pressure and gravity die casting, Shell mould casting, Investment casting, Continuous casting, centrifugal casting, Applications, Merits and limitations.		
Unit 3	Hot and Cold Working Processes	(06 Hrs.)
Hot Working Processes: Principle rolling, forging - drops, press, upset. Rolling, forging- extrusion, drawing, spinning, Angle of Contact of rolling, effect of hot working. Cold Working Processes: Cold rolling, swaging, forges extrusion- forward backward impact. Roll forging, tube drawing, wire drawing, spinning, shot peening, high energy rate forming, Stresses in wire drawing operations.		
Unit 4	Introduction to sheet metal Working	(06 Hrs.)
Introduction to machines in sheet metal Industry: shearing machine, bending machine, circular profile cutting machines. Rivets and its different parts, Punching, blanking, shearing, bending, and piercing. Punch & Die tolerance and clearance. Introduction to Dies: Simple Dies, Compound Dies, Progressive Dies. Types of presses.		

Unit 5	Theory of Metal Cutting	(06 Hrs.)
Introduction of Lathe, function, types, construction, accessories, operations, thread cutting, single and multi-start thread cutting different tools, tool materials, Tool Geometry- Single Point cutting tool, Tool Wear and Tool Life, Mechanics of Metal cutting- Merchant's Circle Diagram, concept of speed, feed, depth of cut. Introduction to Boring Machines- general arrangement and nature of work done.		
Unit 6	Drilling Milling and Grinding Machines	(06 Hrs.)
Drilling Machines: Fundamentals of drilling process, twist drill geometry, tool holders, Types of drilling machines, drilling operations. Types of drills, reaming process. Milling Machines: Fundamentals of milling process, cutters-types and geometry, Operations performed on milling machines. Dividing head, methods of indexing, Introduction to grinding Machines.		

Assignments:

1. Pattern and Mould Making.
2. Sand Casting and Die Casting Practice.
3. Hot Working processes and Cold Working Processes.
4. Turning, boring related process.
5. Drilling Machines.
6. Milling Machines.
7. Rivets and its different parts.
8. Punch & Die tolerance and clearance.

List of Experiments: (Any Eight)

1. Moulding and core sand testing (Clay content test, moisture content test etc.).
2. Strength of Green sand mould and greens sand core.
3. Mold Making Practice.
4. Job on drilling, reaming, tapping.
5. Casting of component by using green sand molding / Die casting.
6. Individual job on center Lathe.
7. Study of dividing indexing mechanism on milling machine.
8. Gear cutting job on Milling Machine.
9. Study and demonstration of Grinding Machines.
10. Job on sheet metal working.

Text Books:

1. O. P. Khanna, A text book of Foundry Technology, Dhanpat Rai and Sons
2. P. C. Sharma, Production Engineering, S. Chand Publications
3. R. K. Jain, Production Technology, Khanna Publishers

Reference Book

1. P. N. Rao, Manufacturing Technology- Vol 1, McGraw Hill Education (India) Private Limited
2. P. N. Rao, Manufacturing Technology, Vol- II, McGraw Hill Education (India) Private Limited
3. G. R. Nagpal, Tool Engineering and Design, Khanna Publishers
4. B. S. Raghuvanshi, Workshop Technology, Vol-II, Dhanpat Rai & Co.
5. Hajra Chaudhari, Workshop Technology, Vol.-II
6. Roy A. Lindberg, Process & Materials of Manufacture, PHI
7. E. P. DeGrmo, J. T. Black and A. Kosher, Material and processes in manufacturing, PHI
8. HMT Handbook, Production Technology, TMH

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Working model of all types of patterns
2. Different types of gates in casting process
3. Different types of runners layout
4. Design and working model of gating system for any simple mechanical component
5. 2D model for detailed sand casting process
6. 2D model for detailed die casting process
7. Selection criteria, detail specifications, brands available in market and cost comparison of pressure and gravity die casting machine
8. Selection criteria, detail specifications, brands available in market and cost comparison of shell moulding
9. Selection criteria, detail specifications, brands available in market and cost comparison of centrifugal casting
10. Selection criteria, detail specifications, brands available in market and cost comparison of rolling machines
11. Selection criteria, detail specifications, brands available in market and cost comparison of wire drawing
12. Selection criteria, detail specifications, brands available in market and cost comparison of forging machine
13. Design and working model of simple die
14. Design and working model of compound die
15. Design and working model of combination die
16. Design and working model of progressive die
17. Selection criteria, detail specifications, brands available in market and cost comparison of lathe machine
18. Selection criteria, detail specifications, brands available in market and cost comparison of drilling machine
19. Selection criteria, detail specifications, brands available in market and cost comparison of milling machine
20. Selection criteria, detail specifications, brands available in market and cost comparison of CNC machine

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	AUTOMATIC CONTROL SYSTEMS		
Teaching Scheme:	Examination Scheme		Credits Allotted
Theory: - 04 Hours/ Week	End Semester Examination	60 Marks	04
Practical: 02 Hours/Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	01
	Total	125 Marks	05

Course Prerequisites: -	<ol style="list-style-type: none"> 1. Mathematics & Science 2. Basic Electrical Engineering. 3. Sensors and Measurement System.
Course Objectives: -	<ol style="list-style-type: none"> 1. Familiarization with Control System Principles and Applications of Control System. 2. Calculate and Estimate the Stability Measures, Time Response Measures from the Analysis of Mathematical Models of Some Simple Engineering Systems. 3. Develop Data Acquisition System using Controllers and apply it for Industrial Automation Application.
Course Outcomes: -	<p>The students should be able to</p> <ol style="list-style-type: none"> 1. Understand the basic concepts of automatic control systems 2. Obtain an overall transfer function of control system by using block diagram algebra methods 3. Determine the time and frequency response of control systems 4. Determine the (absolute) stability of a closed-loop control system using Routh-Hurwitz's stability criterion. 5. Apply fundamentals of PID controllers and use it in industrial automation 6. Select and use control system components for industrial automation.

Course Contents

Unit-I	Introduction to Automatic Control systems	(08 Hrs.)
Open Loop system, Closed Loop system, Conversion of an Open Loop system to a Closed Loop system, Servo Mechanism, Feed Forward Systems, Adaptive Control Systems, Classification of Control Systems, the design process. Transfer Function, Concept of Poles & Zeros of a Transfer Function, Properties of Transfer Function, Transfer Function of Basic Devices; Mathematical Modelling of Mechanical and Electrical Systems. Mechatronics System & Its Examples, Mechatronics System Components.		
Unit-II	Block Diagram Representation	(08 Hrs.)
Block Diagram Definitions, Generating a Block Diagram from a Physical System, Canonical Form, Rules for Block Diagram Reduction, Reduction of Block Diagram, Reducing to Unity Feedback Systems, Examples on Block Diagram Reduction.		
Unit-III	Time Response and Frequency Response Analysis	(08 Hrs.)
Time response of control system, standard test signal, Time Response, Analysis of First and Second order system, Time Domain specifications. Step response of second order system. Steady-state errors, static error constants, steady state, analysis of different type of Systems using step. Ramp and parabolic inputs, Frequency Response Specification, Co-relation between Time and Frequency Domain		
Unit-IV	Stability Analysis	(08 Hrs.)
Stable system, Unstable System, Marginally Stable System, Time Response of Poles, Hurwitz Stability Criterion, Routh Stability Criterion, Routh Criterion Special Cases, Relative Stability, Application of Routh's Criterion.		
Unit-V	Controllers	(08 Hrs.)
Introduction to Controllers, Control System Parameters, Controller Modes, Control Actions, Types of		

Controllers-ON-OFF Controller, Proportional Controller (P-Controller), Proportional + Integral Controller(P-I Controller), Proportional + Derivative Controller (P-D Controller), Proportional +Integral+ Derivative Controller (P-I-D Controller), Effect of Proportional, Integral, and derivative control on the Time Response of the System

Unit-VI	Control System Components	(08 Hrs.)
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Data Acquisition: Elements of a Data Acquisition and Control System, Overview of the Input/Output Process, Analog to Digital (A/D) Conversion, Digital to Analog (D/A) Conversion, Data Acquisition Case Studies. Variable Frequency Drive, Servomotor.

Switches: Construction, symbolic representation, working, application of Toggle switch, Slide switch, DIP

switch, Rotary switch, Thumbwheel switch, Selector switch, Push button, Drum switch, Limit switch, Temperature switch, Pressure switch, Level switch, Flow switch.

Relays: Construction, working, specifications/selection criteria and applications of electromechanical relay, Reed relay, hermetically sealed relay, Solid state relays.

Contactors: Construction, working, specifications and applications of contactors. Comparison between relay& contactor.

Term Work:

Term work shall consist record of minimum 8 experiments from the following;

1. Analysis of following control system parameters using software like MATLAB/SIMULINK
 - a. Plot the pole-zero configuration in s-plane for the given transfer function
 - b. Stability analysis of given control system using Routh-Hurwitz's criterion
 - c. Determine the transfer function for given closed loop system in block diagram representation.
 - d. Plot unit step response of given transfer function and find peak overshoot, peak time, rise time and delay time.
2. To study the basic Open and Closed Loop Control system
3. To study the Water Level Control Using Industrial PLC
4. Determination of step & impulse response for a first order unity feedback system
5. Study of P, P+I, P+D, P+I+D control actions using any Trainer Kit / Simulation Software.
6. Study of A/D and D/A Converters.
7. Study the functions and applications of variable frequency drive (VFD).
8. Study the functions and applications of AC servomotor.
9. Study of various switches, Relays and Contactors.
10. Study of Data Acquisition System and Interfacing of sensors with computer using DAQ Cards
11. Identification of different control system components in PLC based mini assembly cell

Text Books/Reference Books:

1. K. Ogata, Modern Control Engineering, Prentice Hall of India, 3rd edition, 1998
2. I.J. Nagarath and M. Gopal, Control Systems Engineering , New Age International (P) Ltd.
3. M. Gopal, Digital Control and State Variable Methods, Tata Mc Graw-Hill Companies, 1997.
4. Stainslaw H. Zak, Systems and Control , Oxford Press, 2003.

5. M. Gopal Modern Control System Theory, New Age International Publishers, 2nd edition, 1996.
6. W. Bolton, "Mechatronics", Pearson Education.
7. Ramchandran K. P., Vijayaraghavan G. K., Balasundaram M. S., "Mechatronics: Integrated Mechanical Electronic Systems", John Wiley & Sons, 2008.
8. Kumar D. S., "Mechanical Measurement & Control", Metropolitan Book Co. Pvt. Ltd. New Delhi, 2007
9. Singh M. D. and Joshi J. G., "Mechatronics", 3rd Edition, Prentice Hall, New Delhi, 2009.

Project Based Learning

Following is the list of topic for project based learning (Not Limited to) based on the syllabus contents:

1. Prepare a simple circuit for Open Loop Control systems for any Engineering application
2. Prepare a simple circuit for Closed Loop Control systems for any Engineering application
3. Prepare a simple working model which depicts an application of Mechatronics System
4. Generate a Block Diagram Algebra for any Mechanical System using Block Diagram Algebra rules.
5. Prepare Mathematical Model of any simple Mechanical Systems using MATLAB
6. Prepare a MATLAB Code to find the Time Response of Control system.
7. Solve the any Control system Characteristics equation for Stability Analysis using MATLAB
8. Prepare a simple control industrial application using Proportional Controller using any simulation software
9. Prepare a simple model which depicts the application of PID Controller using any simulation software
10. Prepare a circuit which depicts the operation of Analog to Digital Converter
11. Prepare a circuit which depicts the operation of Digital to Analog Converter
12. Identify Mechatronics Systems from Day-to-Day Applications and mention all the system components used
13. Prepare a simple circuit which depicts application of different Switches
14. Prepare a simple circuit which depicts application of different Relays
15. Prepare a simple circuit which depicts application of different Contactors
16. Prepare a simple Data Acquisition System and Interfacing of sensors with computer for temperature sensors
17. Prepare a simple Data Acquisition System and Interfacing of sensors with computer for Load Cell
18. Prepare a Model to control water level in Tank

Unit Test -

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

Designation of Course	Solid Modelling		
Teaching Scheme:	Examination Scheme		Credits Allotted
Practical:- 04 Hours/Week	Term Work & Practical	50 Marks	02
	Total	50 Marks	02

Course Prerequisites: -	<ol style="list-style-type: none"> 1. Computer Aided Drafting and Visualisation 2. Computer Aided Machine Drawing
Course Objectives: -	<ol style="list-style-type: none"> 1. To introduce students to the basic concepts of CAD modelling. 2. To develop the skills in Reading and Interpretation of Engineering Drawings. 3. To familiarize students with modeling Software to Create 2D and 3D model, Assembly, Drafting and Sheet metal modelling.
Course Outcomes: -	<p>The students will be able to</p> <ol style="list-style-type: none"> 1. Understand the concepts of CAD modelling. 2. Creating 3D machine components using Modeling Software. 3. Creating Assembly of machine components using Modeling Software. 4. Creating surface model of Automobile Components using Modeling Software. 5. Creating detail drawing and generating Bill of Material using Modeling Software. 6. Understand the basic concepts of Sheet metal Modelling and Create a machine component using modeling Software.

Course Contents

Unit-I	Introduction to CAD	(08 Hrs.)
Introduction to CAD and CAE Features, Various products available for Product Design, Simulation, Communication modeling Graphical User Interface - Feature manager design tree, Callouts, Handles, Confirmation corner, mouse buttons, keyboard shortcuts, Command Manager. Sketch Entities, Sketch Tools, Block, Relation and Dimensioning.		
Unit-II	Basic Part Modelling	(08 Hrs.)
Part Modelling Tools, Creating Extrude features, Creating Revolve features, Creating Swept features, Creating Loft features, Creating Reference, Creating curves, Fillet features, Inserting Hole types, Creating Chamfer, Shell, rib, pattern and advanced modelling tools.		
Unit-III	Assembly modelling	(08 Hrs.)
Introduction to Assembly Modelling & Approaches, Applying Advanced Mates and Mechanical Mates, Manipulating Components, Creating Pattern, Creating Explode Views.		
Unit-IV	Surface Modelling	(08 Hrs.)
Surface Modelling tools Creating Extrude, Revolve, Swept, loft, Boundary surface. Inserting Planar Surface, Offset Surface, Radiate Surface. Extending a surface, Surface fill, Ruled Surface, Trimming Surface, Mid surface, Replace Face, Delete face, Un-trim surface, Knit surface, Thickening a Surface, Move Face.		
Unit-V	Drafting of Mechanical Systems	(08 Hrs.)
Generating Views, Creating Dimensions, Inserting Annotations and Bill of Materials.		
Unit-VI	Sheet Metal Modelling	(08 Hrs.)
Constructing the base flange and miter Flange, addition of an Edge Flange, closing corner, Adding Jog, Unfolding the bends, Adding hem and vent.		

Term Work

Term work shall consist of A-3/A4 size printouts of the problems solved in practical's using Solid Works Software.

1. Sketcher drawings
2. Part modelling
3. Parametric Modelling
4. Assembly Modelling
5. Exploded view of Assembly
6. Surface Modelling
7. Drafting of Mechanical Systems
8. Sheet metal modelling

Text Books

1. Kuang-Hua Chang, "Motion Simulation and Mechanism Design with MODELING Motion 2018", SDC Publishers, 2018

Reference Books

1. Ibrahim Zeid and R. Siva-Subramaniam – "CAD/CAM- Theory and Practice", Tata McGraw Hill, Publishing Co. 2009.
2. Rao P. N., "CAD/CAM", Tata McGraw Hill.
3. Foley, Van Dam, Feiner and Hughes, "Computer Graphics Principles and Practice", Second edition, Addison–Wesley, 2000.
4. Martenson, E. Micheal, "Geometric Modelling", John Wiley & Sons, 1995.
5. Ronald E. Barr, DavorJuricic, Thomas J. Krueger, "Engineering & Computer Graphics Workbook Using Modeling 2014", SDC Publication, 2014.
6. John Willis, Sandeep Dogra, "MODELING 2019: A Power Guide for Beginners and Intermediate User", published by CADArtifex, 2019.

End Semester Practical/Oral examination:

1. Practical examination duration is Two hours, based on the Term work.
2. Questions provided for practical examination should contain minimum five and not more than ten parts.
3. Evaluation of practical examination to be done based on the performance of students work in laboratory.

***Oral examination should also be conducted to check the knowledge of conventional and Solid Works drawing.**

Designation of Course	Vocational Course-II: PLC, HMI & Automation: Advanced Training		
Teaching Scheme:	Examination Scheme		Credits Allotted
	Term Work & Oral	50 Marks	02
	Total	50 Marks	02

Course Prerequisites: -	C Programming
Course Objectives: -	<ol style="list-style-type: none"> 1. To introduce the functions of given industrial automation system. 2. To introduce input-output devices in PLC. 3. To introduce HMI and PLC interfacing
Course Outcomes: -	<ol style="list-style-type: none"> 1. Understand the functions and characteristics of given industrial automation system 2. Interface the given I/O device with appropriate PLC module 3. Understand working of HMI 4. Identify HMI hardware and software. 5. Interface PLC & HMI. 6. Understand the control panels of various industry HMIs

Course Contents

Unit-I	Introduction to Industrial Automation	(08 Hrs.)
Need and benefits of Industrial Automation, Automation Hierarchy, Basic components of automation system, description of each component, Types of automation system:-Fixed, programmable, flexible, Different systems for Industrial automation: PLC, HMI, SCADA, DCS, Drives		
Unit-II	PLC Programming and Applications	(08 Hrs.)
PLC I/O addressing, PLC programming Instructions : Relay type instructions, timer instructions: On delay, off delay, retentive. Counter instructions, Up. Down. High speed, Logical instructions, Comparison Instructions, Data handling Instructions. Arithmetic instructions, PLC programming language-Functional Block Diagram (FBD). Instruction List, Structured text, Sequential Function Chart (SFC), Ladder Programming, Simple Programming examples using ladder logic: Language based on relay, timer counter, logical, comparison, arithmetic and data handling instructions PLC based applications: Motor sequence control, Traffic light control, elevator control, Tank level control, conveyor system, Stepper motor control, reactor control		
Unit-III	Human Machine Interface (HMI)	(08 Hrs.)
History of User Interface Designing, I/O channels, Hardware, Software and Operating environments, The Psychopathology of everyday Things, Psychology of everyday actions, Reasoning and problem solving . The computer: Devices, Memory, processing and networks. Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity, Paradigms, Security Features of HMI		
Unit-IV	HMI Selection and programming	(08 Hrs.)
HMI Interfacing Considerations, HMI Hardware Selection, HMI Software Selection, HMI Ergonomics, Configuring System Communications, Security Delta HMI programming: Communication to PLC Tags, Alarms, Trends, DataLog Screens, Animation. Download / upload Making Applications Download & Upload the Programs Creating Alarm Messages Communication with PLC Fault Finding and Trouble Shooting		
Unit-V	PLC & HMI	(08 Hrs.)
Communications - PLC to HMI, operator station design, Operator Interfaces Types, Textual, Graphical, animation, Interlocking tagging, HMI assembling and Wiring, HMI Data Handling		
Unit-VI	HMI in Industries	(08 Hrs.)
Role of HMI in Industries, Hardware & Architecture Source & Sink Concepts Wiring different field devices to PLC, Siemens KTP 600 Basic color PN (Key Touch Panel), Siemens TP177A DP (Touch Panel), Delta DOP-B07S411 (Touch Panel), Mitsubishi GS Series, HMI/SCADA development for the Pressure Control Station.		

Text Books:

1. Frank D. Petro Zella, "Programmable logic controller" McGraw – Hill Publications, 1998
2. PanelView32 and RSView32 Programming Guides, Rockwell Automation

References Books:

1. John B. Peatman, PIC programming, McGraw Hill International, USA, 2005
2. Programmable Logic Controllers, Principles and Applications: John W. Webb, Ronald A Reis, 5th Edition, Prentice Hall of India Pvt. Ltd
3. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication

Bharati Vidyapeeth Deemed University
College of Engineering, Pune- 411043
The Structure of the Curriculum: 2007 Course

B. TECH. MECHANICAL: SEMESTER- I & II



Bharati Vidyapeeth University
College of Engineering, Pune
Department of Mechanical Engineering



Vision: To provide mechanical engineers capable of dealing with global challenges

Mission: Social transformation through dynamic education

Programme Educational Objectives (PEOs):

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

Programme Outcomes (POs):

- a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems
- b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes
- c. To design and develop mechanical systems considering social and environmental constraints.
- d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques
- e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance
- f. To know social responsibilities while doing professional engineering practice.
- g. To become familiar with eco-friendly, sustainable and safe work environment.
- h. To take into account professional ethics while designing engineering systems.
- i. Able to work efficiently as a group leader as well as an individual.
- j. To communicate in written and verbal form with subordinates and supervisors
- k. To apply project and finance management techniques in multidisciplinary environments.
- l. To create interest for higher education and updating the knowledge.

B. TECH. MECHANICAL: SEMESTER- I

Total Duration: 31 Hrs./ week									
Total Marks: 700									
Course Code	Course	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total Marks
		L	P/D	T	TH	UT	TW & Pr	TW & Or	
K 70101	Engineering Mathematics- I	04	--	01	80	20	--	--	100
K 70102	Engineering Science- I	04	02	--	80	20	25	--	125
K 60103	Elements of Mechanical Engineering	04	02	--	80	20	25	--	125
K 20104	Elements of Civil Engineering	03	02	--	80	20	25	--	125
K 20105	Environmental Studies	03	--	--	80	20	25	--	125
K 60106	Engineering Graphics- I	02	02	--	--	--	50	--	50
K 60107	Workshop Practice-I	--	02	--	--	--	50	--	50
Total		20	10	01	400	100	200	--	700

B. TECH. MECHANICAL: SEMESTER- II

Total Duration: 32 Hrs./ week									
Total Marks: 700									
Course Code	Course	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total Marks
		L	P/D	T	TH	UT	TW & Pr	TW & Or	
K 70108	Engineering Mathematics - II	04	--	01	80	20	--	--	100
K 70109	Engineering Science - II	04	02	--	80	20	25	--	125
K 20110	Engineering Mechanics	04	02	--	80	20	25	--	125
K 60111	Engineering Graphics – II*	03	02	--	80	20	50	--	150
K 40112	Elements of Electrical & Electronics Engineering	04	02	--	80	20	25	--	125
K 30113	Computer Fundamentals & Information Technology	--	02	--	--	--	25	--	25
K 60114	Workshop Practice.-II	--	02	--	--	--	50	--	50
Total		19	12	01	400	100	200	--	700

*Subject with Four hours Theory Paper

Rules for Conducting Tests

Mode of the test

- In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.
- To calculate these marks following procedure is followed:
 - i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
 - ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
 - iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
 - iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
 - v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; these marks will be final marks obtained by the student. No scaling up is permitted.
 - vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.
- Paper pattern for tests
 - i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

ii) There will not be any sub-questions.

- For granting the term it is mandatory to appear for all three tests conducted in each semester.
- Roll nos. allotted to students shall be the examination nos. for the tests.

Department of Mechanical Engineering
ENGINEERING MATHEMATICS-I
(Course No.K70101)

Designation of Course		Engineering Mathematics-I	
Teaching Scheme:		Examination Scheme:	
Theory:-	04 Hours/ Week	Theory	80 Marks
Practical:-	-- Hours / Week	Duration	03 Hours
Tutorials:-	01 Hours / Week	Unit Test	20 Marks
		T. W. & Or.	-- Marks

Course Prerequisites:-	Basic Knowledge of Algebra
Course Outcomes:-	<ol style="list-style-type: none"> 1. To develop an ability to solve the consistency of any type of systems. 2. To develop an ability to find the roots of equations using DeMoiver's theorem and to locate imaginary points using argand diagram. 3. To develop an ability to find the derivative using Leibnitz's rule. 4. To develop an ability to test convergence and divergence of infinite series 5. To develop an ability to find total derivative 6. To develop an ability to find maxima and minima of any 7. function of two variables

Course Contents

Unit 1	Matrices:	(08 Hrs.)
Rank of a Matrix, Reduction to Normal Form, Consistency of Systems of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Eigen values and Eigen vectors, Cayley- Hamilton Theorem, Reduction of Quadratic Forms, Sylvester's Theorem (without proof) to find functions of a matrix, Application to problems in Engineering(Translation and Rotation of Matrix)		
Unit 2	Complex Numbers and Applications:	(08 Hrs.)
Definition, Cartesian, Polar and Exponential Forms, Argand's Diagram, Diagram's DeMoiver's Theorem and its applications, Hyperbolic Functions and Logarithms of Complex Numbers, Separation of Real and Imaginary Parts, Application to problems in Engineering.		
Unit 3	Differential Calculus:	(08 Hrs.)
Successive Differentiation, n (th) Derivatives of Standard Functions, Leibnitz's Theorem. Mean Values Theorems: Rolle's Theorem, Lagrange's and Cauchy's Mean Value Theorems.		
Unit 4	Infinite Series:	(08 Hrs.)
Infinite Sequences, Infinite Series, Alternating Series, Test for Convergence, Absolute and Conditional Convergence, Power Series, Range of Convergence. Expansion of Functions: Taylor's Maclaurin's Series.		
Unit 5	Differential Calculus:	(08 Hrs.)
Indeterminate Forms, L Hospital's Rule and Evaluation of limits. Partial Differentiation and Applications: Partial Derivatives, Euler's Theorem on Homogeneous Functions, Composite Function, Total Derivatives, Differentiation of Implicit Functions, Change of		

Independent Variables.		
Unit 6	Jacobian:	(08 Hrs.)
Jacobians and their applications, Chain Rule, Functional Dependence, Errors and Approximations.		
Maxima and Minima:		
Maxima and Minima of Functions of two variables, Lagrange's Method of Undetermined Multipliers.		

Text Books/ Reference Books

1. Advanced Engineering Mathematics, 5th Edition, Peter V O' Neil Thomson Learning.
2. Advanced Engineering Mathematics, Erwin Kreyszig (Wiley Eastern Ltd.)
3. Advanced Engineering Mathematics, Wylie C. R. and Barrett L. C. (McGraw-Hill)
4. Advanced Engineering Mathematics, 2nd Edition, M. D. Greenberg (Pearson Education)
5. Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi.
6. Applied Mathematics (Volume I & II) P. N. Wartikar and J. N. Wartikar
7. A text Book of Engineering Mathematics- I, P. N. Wartikar and J. N. Wartikar

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ENGINEERING SCIENCE-I
(Course No.K70102)

Designation of Course	Engineering Science-I		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W. & Or.	25 Marks	

Course Prerequisites:-	Basics knowledge of Science and fundamentals Laws
Course Outcomes:-	<p>Students will be able to associate the wave nature of light and apply it to measure stress, pressure and dimension etc</p> <p>To discuss the concept of transverse waves</p> <p>To judge the problems associated with architectural acoustics and give their remedies and use ultrasonic as a tool in industry for Non-Destructive Testing.</p> <p>Students will be able to understand the methods involved in improving quality of water for domestic and industrial purposes</p> <p>Students will be able to associate the basic concepts of electrochemical techniques and its applications in society</p> <p>To recognize the properties and applications of fossil fuels and derived fuels.</p>

Course Contents

PHYSICS		
Unit 1	Optics-I	(08 Hrs.)
<p>Interference: Interference of waves. Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Michelson's interferometer, Engineering applications of interference (optical flatness, interference filter, non-reflection coatings, multi-layer ARC, gravitational sensors using interference (for detection of mineral deposits.)</p> <p>Diffraction: Classes of diffraction, diffraction at a single slit (geometrical Method), condition for maximum and minimum, Diffraction at a circular aperture (Result only) Plane diffraction grating Conditions for principal maximum and minimum, Rayleigh's criterion for resolution, Resolving power of grating and telescope, Fresnel's zone plate, Gabor's zone plate.</p>		
Unit 2	Optics-II	(08 Hrs.)
<p><u>Polarisation</u>: Introduction, Polarisation by reflection, Law of Malus, Brewster's Double refraction and Huygen's theory, Positive and negative crystals Nicol prism, Dichroism, Polaroids, Elliptical and circular polarization, Quarter and half wave plates, Production of polarized light, Analysis of polarized light, Photoelasticity.</p> <p><u>Lasers</u>: Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser. Semiconductor laser, Properties of Lasers, Applications of lasers (engineering / industry, medicine, communication, computers.)</p> <p>Holography, Compton effect, Compton shift.</p>		
Unit 3	Acoustics and Ultrasonic's:	(08 Hrs.)
<p>Elementary acoustics: Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Threshold of hearing, Audibility curve, Limits of audibility, Ultrasonic waves, Production</p>		

of ultrasonic waves by piezo-electric oscillator and magnetostrictive oscillator, Application of ultrasonic waves.

Superconductivity and Spectroscopy: Introduction, Properties of a super conductor, Meissner's effect, Critical, Field, Type of superconductors, BCS theory, High temperature superconductors. .Application of superconductors. Effect of magnetic field on spectral lines-Zeeman effect (normal and anomalous), Raman effect

Text Books/ Reference Books

1. Fundamentals of Optics -Jenkins and White, McGraw Hill International Book Company Ltd.
2. Optics -Subramanyam and Brij Lal, S. Chand & Company Ltd. Modern
3. Physics -J. B. Rajam, S. Chand & Company Ltd.
4. Modern Physics - B. L. Thereja, S. Chand & Company Ltd. Introduction to
5. Solid State Physics - C. Kittel, Wiley Eastern Ltd. Engineering Physics -
6. Sen, Gaur and Gupta, Dhanpat Rai & Sons

CHEMISTRY

Unit 4	Water:	(08 Hrs.)
Structure of water, Effects of hard water on boilers and heat exchangers (a) corrosion (b) caustic embrittlement (c) scales and sludges (d) priming and foaming. Water softening methods for industrial purpose: (a) Permuted or zeolite process (b) Phosphate conditioning. Water softening for drinking purpose: Drinking water or Municipal water and purification of water for domestic use (a) Removal of suspended impurities: screening, sedimentation, filtration (b) Removal of microorganism-by boiling, by adding bleaching powder, by chlorination, by using chloramines tablets, by using Ozone gas Toxic elements in water and their adverse effects: Toxic effects of the elements like Arsenic, cadmium, lead and Mercury etc. Numerical based on the Zeolites.		
Unit 5	Electrochemistry:	(08 Hrs.)
Introduction, Arrhenius Ionic theory, Kohlrausch's law of conductivity of electrolytes, Law of independent migration of ions, Laws of electrolysis, Ostwald's dilution law, Acids and Base, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions. Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Polarization, Decomposition Potential, Overvoltage, and Conduct metric Titrations. Batteries, Fuel cells, Aluminum-Air Battery, Lead Acid Storage Cell, numerical based on the above articles.		
Unit 6	Fuels:	(08 Hrs.)
Classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter, Theoretical calculation of calorific value of a fuel, Analysis of coal: a) proximate b) ultimate analysis of coal, Pulverized coal metallurgical coke, Petroleum cracking synthetic Petrol, Refining of gasoline, Reforming knocking Non Petroleum fuels like natural gas and oil gas, Analysis of fuel gas, Petrochemicals, Numerical based NCV, GCV		

Text Books/ Reference Books

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi.
2. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition(1979).
3. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988).
4. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955) Engineering.
5. Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990) Engineering.

6. Chemistry by Dara S. S. Chand Publications.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ELEMENTS OF MECHANICAL ENGINEERING
(Course No: K60103)

Designation of Course	Elements Of Mechanical Engineering	
Teaching Scheme:	Examination Scheme:	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical:- 02 Hours/ Week	Duration	03 Hours
Tutorials:- -- Hours/ Week	Unit Test	20 Marks
	T. W.	25 Marks

Course Prerequisites:-	Basics of Science and Mathematics
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand fundamental concepts and definition. 2. Able to understand power conversion mechanical devices. 3. Able to differentiate between conventional and non-conventional energy sources. 4. Able to understand basic modes of Heat transfer. 5. Able to understand the different laws of ideal gasses. 6. Able to understand different manufacturing processes.

Course Contents

Unit 1	Thermodynamic Concepts and Laws:	(08 Hrs.)
<p>Fundamental Concepts and Definitions: Thermodynamic system, Surroundings and boundary, Thermodynamic properties, Thermodynamic processes and cycles, Energy, Power, Work and heat. Zeroth law of Thermodynamics, Temperature and Temperature scale, Pressure and its measurement, Macro and microscopic approach</p> <p>Laws of Thermodynamics: Principles of conservation of mass and energy, continuity equation, First law of Thermodynamics, Joule's experiment. Application of first law to non-flow processes and cycles. Concept of internal energy, flow energy and enthalpy. Application of steady flow energy equation to nozzles, turbines, heat exchangers and pumps.</p>		
Unit 2	Power Conversion Devices:	(08 Hrs.)
<p>Power Producing Devices: Boilers and Steam turbines, reciprocating I. C. Engines, Gas turbines, Hydraulic turbines, Compressed air motor. (Theoretical study using schematic diagrams). Power Absorbing Devices: Reciprocating pumps and compressors, Centrifugal pumps and rotary compressors. Study of Household, refrigerators and window air conditioners using schematic diagrams. (Elementary treatment only. No Numerical)</p>		
Unit 3	Energy Sources and Heat Transfer:	(08 Hrs.)
<p>Sources of Energy: Thermal, Hydraulic, Nuclear, Wind, Solar, Tidal, Biogas, ocean thermal energy (Schematic of plant layout) Heat Transfer: Basic modes of heat transfer, conduction, convection and radiation. Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan-Boltzmann's law of radiation. Conducting and insulating materials and their properties. Description and types of heat exchangers.</p>		
Unit 4	Processes of Ideal Gases and Steam:	(08 Hrs.)
<p>Ideal gas and Processes: Ideal gas definition, Gas Laws, The characteristic equation of ideal gas, Universal gas constant, Relationship between C_p and C_v. Non flow processes using ideal gases. Properties and Processes of Steam: Formation of steam, phase changes, properties of steam. Use of steam tables, Work done and heat transfer</p>		

during constant pressure, constant volume, isothermal, hyperbolic, adiabatic, polytropic and throttling processes on steam		
Unit 5	Manufacturing Process:	(08 Hrs.)
Metal Cutting Machine Tools: Lathe Machine - Centre lathe (Basic elements, working principle and types of operations). Drilling Machine - Pillar drilling machine (operation only) Introduction to NC, CNC machines, classification, principles and explanation with block diagram, Sheet metal working, piercing and blanking operations on punching press. Non-traditional machining processes like electro-discharge machining and electro-chemical machining. Metal Joining Processes: Welding, soldering, brazing methods and applications.		
Unit 6	Mechanical Devices and Machine Elements:	(08 Hrs.)
Individual and group drives, belt drive, rope drive, chain drive, gear drive and friction clutches (types and applications only). Power transmission shafts, axles, Keys, couplings, bush and ball bearings (Types and applications only). Description and application of ON-OFF valves, Non return valves, pressure regulating valves, throttle valves and butterfly valves.		

Term- work

The term work shall consist of the study and demonstration on any five from the first six and any three from remaining list

1. Water tube boiler or smoke tube boiler
2. Reciprocating air compressor
3. Internal combustion engine
4. Household refrigerator / window air conditioner
5. Heat exchangers
6. Water turbines
7. Power transmission devices
8. Lathe and drilling machine
9. Valves
10. NC/CNC Machine

Text Books/ Reference Books

1. Thermodynamics and Heat Engines by Domkundwar and Kothandarman, Publisher Dhanpat rai & Co. Ltd,
2. Educational and Technical Publisher
3. Elements of Workshop Technology Vol- I and II by Choudhary, Hajara S. K., Media Promoters & Publishers
4. Basic Engineering Thermodynamics by Reyner, Joel, Publisher - Addison Wesley Longman Limited
5. Thermodynamics and Engineering Approach by Y. A. Cengal and M. A. Boles, Tata McGraw Hill Publishing Ltd., New Delhi
6. Design of Machine Elements, V. B. Bhandari, Tata McGraw Hill Publishing Company Ltd.
7. Theory of Machines- S. S. Rattan, Tata Mc Graw Hill Publishing Company Ltd.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ELEMENTS OF CIVIL ENGINEERING
(Course No.K20104)

Designation of Course	Elements Of Civil Engineering		
Teaching Scheme:	Examination Scheme:		
Theory:- 03 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W. & Or.	25 Marks	

Course Prerequisites:-	Basics of Science, measurements and Mathematics
Course Outcomes:-	<p>Students should be able to describe various branches of Civil engineering and principles of Surveying.</p> <p>Students should know use of Prismatic compass for measurement of bearings and computations of included angles.</p> <p>Students should know use of level and computation of RLs and principles of modern surveying equipments</p> <p>Students should know principles of building planning and bye laws.</p> <p>Students should know function and types of foundations</p> <p>Students should be able to describe components of infrastructure elements such as roads, railways and bridges.</p>

Course Contents

Unit 1	Introduction and Linear Measurements:	(07 Hrs.)
Branches of Civil Engineering, applications of Civil Engineering to other disciplines in Engineering, role of Civil Engineer in various construction activities. Principles of surveying, classification of surveys, scale and Representative fraction, linear measurement - instruments used, direct ranging.		
Unit 2	Angular Measurement:	(06 Hrs.)
Study of prismatic compass, types of bearings and reference meridians, measurement of bearing and angles, local attraction and its adjustment, adjustment of closing error, dip and declination, open and closed traverse.		
Unit 3	Vertical Measurements and Modern Equipment:	(07 Hrs.)
Study and use of auto and dumpy level and leveling staff, temporary adjustment of dumpy level, types of bench marks, reduction of levels by collimation plane and rise and fall method. Contours - uses and characteristics. Modern equipments - Electronics Distance Meter - principle and basic functions, Total Station and its field applications, study of Global Positioning System, measurement of area by mechanical and digital planimeter.		
Unit 4	Building Planning, Construction and Materials:	(07 Hrs.)
Building Planning: Site selection, building plans, elevation, and principles of planning. Building byelaws-necessity, Floor Space Index, heights, open space requirement, set back distances, ventilation and lighting, concept of carpet and built up area. Constructions: types of structures-load bearing, framed and composite structures, building components. Construction materials: concrete and its ingredients, cement, reinforcement steel, bricks.		
Unit 5	Foundations:	(08 Hrs.)
Building foundation- necessity and functions, concept of bearing capacity of soil and rock, foundation		

settlement, differential settlement, types of foundation - shallow and deep, and causes of foundation failure. Earthquake, causes of earthquake, Definition of terms- focus, epicenter, isoseismal lines, seismograph, seismogram, intensity, magnitude of earthquake, earthquake zones as per IS codes, effect of earthquake on civil structures.

Unit 6	Infrastructure:	(08 Hrs.)
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Roads- types of roads and their suitability, cross section of roads; meaning of terms: width of road, super elevation, camber, gradients, sight distance; materials used in construction of roads. Railways- advantages types of gauges, section of railway track, components of railway track. Bridges-necessity, components of bridges - sub structures and super structure.

Text Books/ Reference Books

1. Introduction to Surveying - M. Anderson, McGraw Hill Publication Surveying for Engineers - W. Uren, J. Price, Macmillan Publication.
2. Surveying and Leveling - T. P. Kanetkar and S. V. Kulkarni, PVG Publication, Pune Building Construction - S. P Bindra and S. P. Arrora, Dhanpatrai Publication, New Delhi.
3. Building Design and Drawing - Shah, Kale, Patki. Tata McGraw Hill Publication Foundation Engineering- Dr. B. J Kasmalkar, PVG Publication, Pune.
4. Principals of Geotechnical Engineering - B. M. Das, Thomson Brooks.
5. Text Book of Engineering Geology - Dr. R. B. Gupte, PVG Publication, Pune Transportation Engineering - R. Paquette, John Wiley and Sons.
6. Highway Engineering - Khanna Justo, Khanna Publishers, New Delhi.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ENVIRONMENTAL STUDIES
(Course No. K20105)

Designation of Course	Environmental Studies	
Teaching Scheme:	Examination Scheme:	
Theory:- 03 Hours/ Week	Theory	80 Marks
Practical:- -- Hours/ Week	Duration	03 Hours
Tutorials:- --Hours/ Week	Unit Test	20 Marks
	T. W. & Or.	25 Marks

Course Prerequisites:-	Basic knowledge of environment, natural resources, soils types.
Course Outcomes:-	<ol style="list-style-type: none"> 1. The student should be able to explain multidisciplinary nature of Environmental Studies. 2. The student should be able to explain natural resources available in the environment and its associated problems 3. The student should be able to discuss concept of ecosystem and its components 4. The student should be able to describe concept of Biodiversity 5. The student should be able to explain sources of and control measures of environmental pollution 6. The student should be able to describe social and environmental issues.

Course Contents

Unit 1	The Multi-disciplinary nature of Environmental Studies:	(02 Hrs.)
	<ul style="list-style-type: none"> • Definition, Scope and Importance • Need for public awareness 	
Unit 2	Natural Resources:	(08 Hrs.)
	<ul style="list-style-type: none"> • Renewable and non-renewable resources • Natural resources and associated problems <ol style="list-style-type: none"> a. Forest resources: Use and over-exploitation, deforestation case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflict's over water, dams-benefits and problems. c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer- pesticide problems, water logging, salinity, case studies. e. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies. f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles. 	
Unit 3	Ecosystems:	(06 Hrs.)
	<ul style="list-style-type: none"> • Concept of an ecosystem. • Structure and function of an ecosystem. 	

- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristics, features, structure and function of the following ecosystems : -
 1. Forest ecosystem.
 2. Grassland ecosystem.
 3. Desert ecosystem.
 4. Aquatic ecosystems (ponds, streams, rivers, oceans, estuaries)

Unit 4	Biodiversity and its Conservation:	(08 Hrs.)
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- Introduction : Definition: genetics, species and ecosystem diversity
- Biographical classification of India
- Value of bio-diversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, national and local level.
- India as a mega - diversity nation.
- Hot spots of biodiversity.
- Threats to bio-diversity: habitat loss, poaching of wildlife conflict, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Unit 5	Definition, causes, effects and control measures of :	(07 Hrs.)
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- Definition, causes, effects and control measures of :
 - a) Air Pollution
 - b) Water Pollution
 - c) Soil Pollution
 - d) Marine Pollution
 - e) Noise Pollution
 - f) Thermal Pollution
 - g) Nuclear Hazards
- Solid waste management: Causes, effects and Control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: Floods, cyclone and landslides.

Unit 6	Social Issues and the Environment	(07 Hrs.)
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- From unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation: rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Waste land reclamation.
- Consumerism and waste products.
- Environment Protection Act
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.

<ul style="list-style-type: none"> • Forest Conservation Act. • Issues involved in enforcement of environmental legislation. • Public awareness. 		
Unit 7	Human population and the Environment:	(07 Hrs.)
<ul style="list-style-type: none"> • Population growth, variation among nations. • Population explosion-Family Welfare Programme. • Environment and Human Health. • Human Rights. • Value Education. • HIV/AIDS Women and Child Welfare. • Role of Information Technology in Environment and Human Health. • Case studies. 		
Unit 8	Field Work / Term Work:	(07 Hrs.)
<ul style="list-style-type: none"> • Visit to a local area to document environmental assets river / forest / grassland / hill/ mountain. • Visit to a local polluted site - Urban /Rural/ Industrial /Agricultural. • Study of simple ecosystems- pond, river, hill slope, etc. The core module syllabus for Environmental studies includes class room teaching and field work. The syllabus is divided into 8 units, covering 48 lectures. The first 7 units, which cover 44 lectures, are class room teaching based and intended to enhance knowledge skills and attitude to environment. Unit 8 is based on field activities, to be covered over 4 lecture hours, and would provide students with firsthand knowledge on various local environmental aspects 		

Text Books / References

1. Agrawal. K. C., 2001 Environmental Biology, Nidi Publ. Ltd., Bikaner.
2. Dr. Bharucha Erach, the Biodiversity of India, Mapin Publishing Pvt. Ltd. Ahmadabad- 380013, India. E.mail:mapin@icnet.net(R).
3. Brunner R. C. - 1989 Hazardous Waste Incineration. McGraw Hill Inc-480p Clark R. S., Marine Pollution, Clanderson Press Oxford (TB).
4. Cunningham W. P. Cooper, T. H. Gorhani, E & Hepworth M.T.2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai 1196 p.
5. De A. K., Environmental Chemistry, Wiley Eastern Ltd. Down to Earth, Center for Science and Environment (R)
6. Gleick, H. P., 1993 Water in Crisis, Pacific Institute for Studies in Dev, Environmental & Security, Stockholm Env. Institute Oxford University Press 473p.
7. Hawkins R. E., Encyclopedia of India Natural History, Bombay Natural History Society, Bombay(R).
8. Heywood, V .H & Watson. R.T. 1995, Global Biodiversity Assessment Cambridge, University. Press 1140 p.
9. Judah H. & Bhopal V. M., 1995, Environmental Protection and Laws, Himalayas.

Unit Test

Unit Test 1	Unit I, II & III
Unit Test 2	Unit IV & V
Unit Test 3	Unit VI & VII

ENGINEERING GRAPHICS - I
(Course No: - K60106)

Designation of Course	Engineering Graphics - I	
Teaching Scheme:	Examination Scheme:	
Theory:- 02 Hours/ Week	Theory	-- Marks
Practical:- 02 Hours / Week	Duration	-- Hours
Tutorials:- -- Hours / Week	Unit Test	-- Marks
	T. W.	50 Marks

Course Prerequisites:-	Basic Knowledge of Mathematics
Course Outcomes:-	<ol style="list-style-type: none"> 1. Differentiate Ist angle and IIIrd angle projection Method. 2. Interpret views of the object and to draw by using Isometric projection method and to draw different Engineering Curves

Course Contents

Unit 1	Orthographic Projections and Missing Views:	(08 Hrs.)
Quadrants 1 st and 3 rd angle method of orthographic projections. Concept of horizontal, vertical and end vertical planes. Sectional views. Interpretation of an object from the given orthographic projections. Drawing of the third view from the two views. Dimensioning of the views.		
Unit 2	Isometric Projection, Geometrical Curves, Link Mechanisms, CAD	(06 Hrs.)
To draw isometric projection or isometric view from given orthographic projections of an object. Isometric scale. To draw Ellipse, Cycloid, Spiral, Involute and Helix. To find the locus of points in simple mechanisms. To write commands in order to get / draw the figures of simple objects using Auto-CAD.		

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets and one assignment on Auto-CAD.

Sheets

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle method symbol.
2. Orthographic Projections Missing views
3. Isometric views
4. Curves and loci of points

Assignment

Drawing of simple figures using AutoCAD and writing the required commands in order.

Text Books/ Reference Books

1. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005.
2. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005.
3. N. D. Bhatt and V M. Panchal, "Engineering Drawing (Plane and Solid Geometry)", 42th Edition, Charotar Publishing House, 2000.
4. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988.
5. P. Nageswara Rao, "AutoCAD 14 for Engineering Drawing Made Easy", Tata McGraw Hill Co.

Ltd., 1A Edition, 2000.

6. C. R. Shrock, "Exercise Workbook for Beginning AutoCAD", New Age International Publishers.

WORKSHOP PRACTICE-I
(Course No.60107)

Designation of Course	Workshop Practice-I		
Teaching Scheme:	Examination Scheme:		
Theory:- -- Hours/ Week	Theory	-- Marks	
Practical:- 02 Hours / Week	Duration	-- Hours	
Tutorials:- -- Hours / Week	Unit Test	-- Marks	
	T. W.	50 Marks	

Course Prerequisites:-	Basic knowledge of mathematics, basic components of machine.
Course Outcomes:-	<ol style="list-style-type: none"> 1. The student should know the different sections of metal and wood working process. 2. The student should able to handle the marking, measuring and cutting tools used for wood working 3. The student should able to get the practical knowledge of gas welding and arc welding processes. 4. The student should able to know the different types of welding joints. 5. The student should able to get the practical knowledge of soldering process. 6. The student should able to get the introduction about centre lathe and CNC lathe machines.

Course Contents

Term work of Workshop Practice I and Workshop Practice II shall consist of two sets viz.SET A and SET B. Students are required to complete any one set in first semester for term work of Workshop Practice I and the remaining set shall be completed as term work of Workshop Practice II in second semester.

Set A shall consist of

Jobs:

- 1) Wood Working- one job involving joint, wood turning, use of filler materials and adhesives
- 2) Welding- one job with edge preparation and simple joint using gas or arc welding.
- 3) Soldering- Fabrication of at least 5 electronic components on a PCB.
- 4) Demonstration on a centre lathe and CNC lathe.

OR

A suitable combination of above operations to make a composite job either individually or in a group.

Journal:

Journal shall consist of write-up about materials, equipments used in above processes, specific procedures followed, and safety precautions.

Set B shall consist of

Jobs:

- 1) Fitting- One job with one joint along with drilling, tapping, hacksaw cutting
- 2) Tin smithy- One job including riveting/soldering
- 3) Black Smithy- One job with at least two different operations
- 4) Plastic molding- One plastic component on injection molding machine.

OR

A suitable combination of above operations to make a composite job either individually or in a group.

Journal:

Journal shall consist of write-up about materials, equipments used in above processes, specific procedures followed, and safety precautions.

At the end of each semester students are required to submit the completed jobs and Journal for assessment of work done in workshop.

Department of Mechanical Engineering
ENGINEERING MATHEMATICS – II
(Course No. K70108)

Designation of Course	ENGINEERING MATHEMATICS – II		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- -- Hours/ Week	Duration	03 Hours	
Tutorials:- 01 Hours/ Week	Unit Test	20 Marks	
	T. W.	-- Marks	

Course Prerequisites:-	Student should have knowledge of Mathematics-I
Course Outcomes:-	<ol style="list-style-type: none"> 1. To develop an ability to solve differential equations of first order and first degree. 2. To develop an ability to form mathematical model of rectilinear motion, electric circuit, Fourier heat conduction, Newton's law of cooling. 3. To develop an ability to transform the Cartesian co-ordinates into spherical polar and cylindrical coordinate systems. 4. To develop an ability to represent periodic function as Fourier series. 5. To develop an ability to evaluate definite integral by DUIS rules and to trace Cartesian and polar curves. 6. To develop an ability to apply methods to find area and volume by double and triple integration.

Course Contents

Unit 1	Differential Equations:	(09 Hrs.)
Differential Equations of First Order and First Degree, Exact Differential Equations and Reducible to Exact form, Linear Differential Equations, Reducible to Linear types, Method of Substitution and Miscellaneous Types, Differential Equations of First and Higher degree		
Unit 2	Applications of Differential Equations (of First Order and First Degree):	(08 Hrs.)
Orthogonal Trajectories, Atmospheric Pressure, Newton's Law of Cooling, Motion Under Gravity and Rectilinear Motion, L-R, R-C and L-C Circuits, Applications to Mass-Spring System, One Dimensional Conduction of Heat Applications to Chemical Engineering.		
Unit 3	Solid Geometry:	(09 Hrs.)
Cartesian, Spherical Polar and Cylindrical Coordinate systems, Relation between coordinate systems. Sphere, Tangent Plane of the Sphere, Sphere through a Circle, Orthogonal Spheres, Cone and Cylinder, Quadratic surfaces.		
Unit 4	Fourier Series:	(09 Hrs.)
Definition and Dirichlet's Conditions, Full range Fourier series on $c \leq x \leq c + 2\pi$ and $c \leq x \leq c + 2L$, Expansions of even and odd Periodic functions and on $-\pi \leq x \leq \pi$ and $-L \leq x \leq L$, Half Range Fourier Expansions Harmonic Analysis and Application to problems in Engineering. Reduction formulae for Trigonometric functions, Beta and Gamma functions.		
Unit 5	Foundations:	(08 Hrs.)
Integral Calculus (Single Integral):		

Differentiation Under the Sign of Integration, Error functions.

Curve Tracing:

Tracing of Cartesian, Polar and Parametric curves, Rectification of curves.

Unit 6 Multiple Integrals and their Application:

(09 Hrs.)

Double and Triple Integrations, Application of Multiple Integral to Areas and Volumes, Mean and RMS Values, Mass, Centre of Gravity and Moment of Inertia.

Text Books / References

1. Advanced Engineering Mathematics, 5th Edition, by Peter V. O'Neil (Thomson Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
3. Advanced Engineering Mathematics by Wylie C.R. and Barrett L. C. (McGraw-Hill).
4. Advanced Engineering Mathematics, 2nd Edition, by M. D. Greenberg (Pearson Education).
5. Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
6. Applied Mathematics (Volume I & II) by P. N. Wartikar and J. N. Wartikar (Pune Vidyarthi Griha Prakashan).
7. A Text Book of Engineering Mathematics - II by P. N. Wartikar and J. N. Wartikar.

Unit Tests-

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
Unit Test 3	Unit III & VI

ENGINEERING SCIENCE – II
(Course No. K70109)

Designation of Course	Engineering Science – II		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W.	25 Marks	

Course Prerequisites:-	Students should have knowledge of Engineering Science-I
Course Outcomes:-	<ol style="list-style-type: none"> 1. To use the properties of charged particles to develop modern instruments and explain the mechanism of fusion and fission. 2. To understand the behavior of quantum particles in different types of potentials. 3. To understand the basics of semiconductors and its uses to develop devices such as diode, transistor, solar cell etc. 4. Students will be able to understand the fundamental principles of corrosion and methods used for minimizing corrosion. 5. To recognize the preparation, properties and applications of polymeric materials.

Course Contents

PHYSICS		
Unit 1	Modern Physics:	(09 Hrs.)
Motion of a charged particle in electric and magnetic fields, Electrostatic and Magneto static focusing, Wavelength and resolution. Specimen limitation, Depth of field and focus. Electron microscope. Positive rays, Separation of isotopes by Bainbridge mass spectrograph. Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium. Fission energy, Critical mass and size. Reproduction factor, Chain reaction and four factor formula. Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions. Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron, Microtron.		
Unit 2	Quantum Mechanics:	(08 Hrs.)
Wave nature of matter, De-Broglie waves. Wavelength of matter waves. Electron diffraction, Davisson and Germer's experiment, Heisenberg's uncertainty principle with illustrations, Schrodinger's time dependant and time independent wave equation, Physical significance of wave function. Application of Schrodinger's time independent wave equation to the problems of (1) Electron gas, (2) Step potential (3) Potential barrier, (4) Particle in a rigid box (5) Particle in a non-rigid box (Boundary condition and result).		
Unit 3	Electrical Properties:	(07 Hrs.)
Band theory of solids. Band structures of Lithium, Sodium, Beryllium, Silicon and Diamond, Classification of solids on the basis of band theory. Fermi-Dirac probability function and position of		

Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semiconductors. Band structure of p-n junction diode under forward and reverse biasing, Conductivity in semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.		
<i>CHEMISTRY</i>		
Unit 4	Corrosion And Its Control:	(08 Hrs.)
Definition, dry or Chemical corrosion, wet or Electrochemical corrosion, mechanism of wet or electrochemical corrosion, Galvanic Corrosion, concentration cell corrosion passivity, underground or soil corrosion, pitting corrosion, inter granular corrosion, stress corrosion, microbiological corrosion. Electrochemical and galvanic series, Factors influencing corrosion and corrosion control.		
Unit 5	Polymers:	(08 Hrs.)
Definition and Classification based on origin and thermal behavior, Polymerization reactions, Functionality, Degree of Polymerization, tacticity. Types of Polymerization - Addition and condensation, Thermo-softening and Thermosetting Plastics, Polymerisation reactions, properties and uses of some polymers such as Polyethylene, Polypropylene, Polyvinyl Acetate, Polystyrene, Teflon, Melamine Formaldehyde, PMMA, SBR. Polymers in Medicine and surgery, Polymer blends and Alloys, Engineering Plastics.		
Unit 6	Instrumental Methods of Chemical Analysis:	(08 Hrs.)
Infrared Spectroscopy, Visible Spectroscopy, Ultraviolet Spectroscopy. Introduction, Principle, Instrumentation (Schematic Diagram) and Engineering Applications of the above Techniques.		

PHYSICS: Term Work Experiments:

Any five experiments from the following:

1. Determination of band gap of semi-conductor
2. Solar cell characteristics.
3. E/m by Thomson's method.
4. Uses of CRO for measurement of phase difference by Lissajous figures
5. Hall effect and Hall coefficient
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode. Photo diode. LED, Ge/Si diode)
8. Plank's constant by photodiode.

Assignments:

Any **two** of following:

1. Harmonic oscillator
2. Nuclear radiation detectors.
3. Scanning electron microscope and scanning tunneling microscope
4. Advanced opto-electronic devices

Text Books /References

1. Physics for Engineers - Srinivasan M. R., New Age International (P) Ltd.
2. Atomic Physics - Weher and Richards, Narosa Publishing House
3. Modern Physics - B. L. Thereja, S. Chand & Company Ltd.

4. Atomic Physics - J. B. Rajam, S. Chand & Company Ltd.
5. Principle of Electronics - V. K. Mehta, S. Chand & Company Ltd.
6. Electronics Principles - A. P. Molvino, McGraw Hill International Book Company Ltd.

CHEMISTRY: Experiments:

Any **five** of the following:

1. To Determine the Molecular Weight of a polymer
2. Estimation of Copper from brass sample solution Iodometrically
3. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
4. To find the Radius of Macro Molecule by Viscometer
5. To Determine Surface Tension of a liquid by Stalagmometer
6. Determination of the strength of unknown liquid by using the colorimeter

Text Books / References

1. Fundamentals of Engineering Chemistry - Theory and Practice by S. K. Singh, New International Publishers.
2. A Textbook of Engineering Chemistry by S. S. Dara, S. Chand and Company Ltd., New Delhi.
3. Instrumental Methods of Chemical Analysis by Chatwal and Anand, Himalaya Publishing House.
4. Engineering Chemistry by Jain and Jain.
5. Nace Corrosion Engineers R. B. by R. Baboian, C. G. Munger.
6. Corrosion Engineering by Mars G. Montana & Norbert D. Green.
7. Polymer Handbook Edited by Brandrup, J. Immergut, Edmund H., etc.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ENGINEERING MECHANICS
(Course No.K20110)

Designation of Course	Engineering Mechanics		
Teaching Scheme:	Examination Scheme:		
Theory:- 4 Hours/ Week	Theory	80 Marks	
Practical:- 2 Hours/ Week	Duration	03 Hours	
Tutorials:- - Hours/ Week	Unit Test	20 Marks	
	T. W.	25 Marks	

Course Prerequisites:-	Basic knowledge of physics and mathematics.
Course Outcomes:-	<ol style="list-style-type: none"> 1. The student should able to calculate Resultant of the Force system and also apply conditions of equilibrium for different problems. 2. The student should able to calculate Centroid and moment of Inertia of areas. 3. The student should be able to calculate effect friction force. 4. The student should be able to calculate velocity, acceleration, displacement, time for bodies in motion. 5. The student should be able to use D'Alemberts principle, Work-energy principle and Impulse momentum principle. 6. The student should be able to use concept of ICR for rigid body motion.

Course Contents

Unit 1	Force system in a plane	(8 Hrs.)
Types of forces classification of a force system Resolution of forces Resultant of a force system in a Plane- Analytical and Graphical approach Moment of a force, Couple, Force and Couple system About a point. Equilibrant, Free Body Diagram, Types of Supports, Conditions of Equilibrium Equilibrium of a force system in a plane.		
Unit 2	Force system in a Space and Moment of Inertia	(8 Hrs.)
Resultant and Equilibrium of a force system in a space, moment of a force about a point and About in line. Centroid of a line element, plane areas and volume, center of gravity, Moment Of inertia.		
Unit 3	Application of Static Equilibrium	(8 Hrs.)
Analysis of perfect Trusses – Method of Joint, Method of Section and graphical Method, Analysis of Pin Jointed Frames ,Analysis of cables subjected to Concentrated Load Coefficient of Static Friction Impending motion of Blocks , Ladder and wedges, Belt friction & Band-brake system.		
Unit 4	Kinematics of a Particle	(8 Hrs.)
Kinematics of Rectilinear motion of Particles – Equations of motion , Motion Curves ,Relative motion Dependent motion. Kinematics of Curvilinear motion of practical -Equation of motion in Cartesian, Polar and Path variable co-ordinate system, motion of projectile.		
Unit 5	Kinetics of a Particle	(8 Hrs.)
Kinetics of Rectilinear Motion of Particles , Newton's Second Law of motion , D Alembert's principal , Work- Energy Principal ,Impulse-Momentum Principal, Direct Central Impact, Coefficient of Restitution,		

Spring Force. Kinetics of Curvilinear motion of Particles: D'Alembert's principle, Work-Energy Principle, Impulse-Momentum Principle, Oblique Central Impact		
Unit 6	Rigid Body Motion	(8 Hrs.)
Kinematics of Rigid bodies: Translation and Rotation about a fixed axis, General Plane Motion, Concept of Instantaneous center of Rotation. Kinetics of Rigid bodies: General Plane motion, D'Alembert's Principle, Work-Energy Principle.		

Term Work Experiments:

A) The term-work shall consist of total SIX experiments. (Minimum THREE from each section)

Section - I

1. Determination of reactions of Simple and Compound beam. Study of equilibrium of concurrent force system in a space.
2. Determination of coefficient of friction for Flat Belt and Rope. Verification of Law of Polygon of forces.
3. Study of Simple Lifting Machine.

Section - II

1. Study of Curvilinear motion. Determination of Coefficient of Restitution.
2. Determination of gravitational acceleration using Compound Pendulum. Determination of Moment of Inertia of Fly wheel.
3. Determination of Moment of Inertia of Irregular shape body using Torsional Pendulum.

B) The term-work shall also consist of minimum SIX graphical solutions of the problems on different topics. (Minimum THREE from each section)

Text Books/ Reference Books

1. Beer F.P. and Johnston E.R., "Vector Mechanics for Engineers - Vol. -I and Vol. -II
2. Timoshenko S.P. and Young D.H. "Engineering Mechanics" McGraw Hill Publication.
3. Singer E. L. "Engineering Mechanics" Haper and raw Publications.
4. Meriam J.I. and Craig "Engineering Mechanics" John Wiley and Sons Publications.
5. Shames I. H. "Engineering Mechanics" Prentice Hall of India Ltd.
6. Bhavikatti S. S. and Rajashekarappa K. G. "Engineering Mechanics" New Age International Ltd
7. Mokashi V. S. "Engineering Mechanics I and II" Tata McGraw Hill Publications
8. Tayal A. K. "Engineering Mechanics" Umesh 8. Tayal A. Publications

Unit Tests-

Unit Test-I	Unit-I & IV
Unit Test-II	Unit-II & V
Unit Test-III	Unit-III & VI

ENGINEERING GRAPHICS-II
(Course No. K60111)

Designation of Course	Engineering Graphics-II		
Teaching Scheme:	Examination Scheme:		
Theory:- 03 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	04 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W.	50 Marks	

Course Prerequisites:-	Knowledge of basic drawing, mathematics and geometry.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand projection of Lines and Planes 2. Able to understand projection of solids and its sections. 3. Able to understand development of different solids. 4. Able to understand intersection of surfaces of solids

Course Contents

Unit 1	Projections of Lines and Projections of Planes.	(12 Hrs.)
Projections of points. Projections of lines situated in 1st quadrant only Horizontal trace (HT) Vertical trace (VT) Applications of lines. Auxiliary inclined plane (AIP), Auxiliary vertical plane (AVP), distance between skew lines, distance of a point from a line. Projections of planes, True shape of plane, Angle between two planes, distance of a point from a plane.		
Unit 2	Projections of Solids and Sections of Solids:	(12 Hrs.)
Projections of solids such as prisms, pyramids, cylinder, cone and sphere. Projections of solids in combination. Sections of above solids by AIP and AVP True shape of section.		
Unit 3	Development of Surfaces of Solids	(09 Hrs.)
To draw the development of the lateral surfaces of cut prism, pyramid, cylinder and cone. To draw orthographic projections from the given developed surface of solid.		
Unit 4	Intersection of Surfaces of Solids:	(09 Hrs.)
To draw the lines or the curves of intersection of the surfaces of solids excluding following combination. Pyramid-pyramid, Pyramid-cone, Cone-cone, Sphere-cone, Sphere pyramid.		

Term Work

Term work shall consists of six half-imperial size or A2 size (594mm x 420mm) Sheets

1. Projections of lines
2. Projections of planes
3. Projections of solids
4. Sections of solids
5. Development of surfaces
6. Intersections of surfaces

Text Books/ Reference Books

1. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Edition, Persian Education, 2005.
2. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10th Edition, S. K. Kataria and Sons, 2005.
3. N. D. Bhatt and V. M. Panchal, "Engineering Drawing (Plane and Solid Geometry)" 42nd Edition, Charotar Publishing House, 2000.

4. Warren J. Luzadder and Jon M. Duff, "Fundamentals of Engineering Drawing", Prentice Hall of India Pvt. Ltd., 11 Edition, 1995.
5. P. J. Shah, "Engineering Drawing", C. Jammadas and Co., 1- Edition, 1988.\
6. P. Nageswara Rao, "Auto CAD 14 for Engineering Drawing Made Easy", Tata McGraw Hill Co. Ltd

Note:

Paper shall be based on the topics covered in the syllabus of Engineering Graphics-I and Engineering Graphics-II

Unit Test:

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ELEMENTS OF ELECTRICAL & ELECTRONIC ENGINEERING
(Course No. K40112)

Designation of Course	Elements Of Electrical & Electronic Engineering		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W.	25 Marks	

Course Prerequisites:-	Basic knowledge of physics, electronics, electrical.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand and apply knowledge of basic laws and theorems to solve simple electrical dc circuits. 2. Able to define basic terms of single phase and three phase ac circuits and supply systems. Draw vector diagram and solve simple numerical on ac circuits. 3. Able to describe fundamental concepts of magnetic and electromagnetic circuits. Explain principle of transformer and calculate efficiency and regulation of transformer 4. Able to draw power supply system layout, block diagram of SMPS, UPS. Know and use electrical safety rules. 5. Able to specify and select electronic components as per required application. 6. Able to specify and select suitable measuring instruments for required application.

Course Contents

Unit 1	Basic Concepts in Electrical Circuits:	(08 Hrs.)
Fundamental electrical quantities: Potential difference(voltage),current, power, energy, circuit elements-resistance, inductance, capacitance, laws for dc circuits analysis-Kirchhoff's voltage and current law, superposition theorem, the venin's theorem, maximum power transfer theorem.		
Unit 2	AC Circuits:	(08 Hrs.)
Graphical, mathematical and phase representation of ac voltage and currents, instantaneous, average and RMS value, peak factor form factor, periodic time, frequency, phase difference, power factor and complex power, analysis of series and parallel single phase ac circuits consisting of R,L,C combinations and Resonance phenomenon. Concept of 3-phase ac supply, supply specifications, phase sequence, star and delta connection and their line and phase values, current, voltage and power relationship for balanced 3-phase star and delta connected loads(with phase representation)		
Unit 3	Magnetic circuits and Transformer	(08 Hrs.)
Magnetic effects of an electric current ,magnetic circuit concepts terms MMF, flux density, field intensity, permeability, reluctance, composite series and parallel magnetic circuits, magnetization and hysteresis curve hysteresis and eddy current loss. Introduction to 1-phase transformer, function, principle of operation, types ,specifications, EMF equations ideal and practical transformer ,operation on no load and load conditions, losses, efficiency, regulation, determination of efficiency and regulation by direct loading introduction to auto transformation and instrument transformers.		
Unit 4	Electrical power Systems:	(08 Hrs.)

Generation, transmission and distribution systems layout ,types of supply system 3 phase-3wire,3phase-4 wire ac system rectifiers half wave, full wave, bridge wave with relevant wave forms, UPS, SMPS, stabilizers. Electrical safety, Necessity of earthing-safety and first aid measures against electrical shock.		
Unit 5	Electrical and Electronic component, device and Integrated Circuits:	(08 Hrs.)
Basic principle and applications of D.C. machines, connection diagram, load characteristics and applications, three phase induction and working principle. Types of resistance (fixed, variable, precision-carbon film, metal film, wire wound) their standard values specifications and applications .classification of capacitors based on dielectrics ,their standard values, specification and applications, study of different core materials depending on range of frequencies for inductors and transformers. Flat package, SMD's, pin configuration and cooling of LC's mounting of LC's basic block diagram and its explanation along with specifications of Mobile phones fax machines, Microwaves , personal computers.		
Unit 6	Electrical and Electronic Instruments:	(08 Hrs.)
Salient constructional features, operating principle, specification of PMMC and MI voltmeter and ammeter, Dynamometer- wattmeter, Induction type single phase energy meter. Basic block diagram, its explanation, specification and application of Digital millimeter, Function generator, CRO.		

List of Practical's to be performed in the laboratory

1. Verification of Kirchhoff's current and voltage laws for D. C. network Verification of superposition theorem for a given D. C. network.
2. Experimental verification of current flowing through a branch of D. C. circuit using the venin's theorem.
3. Verification of maximum power transfer theorem for D. C. circuit Performance of 1-phase a. c. R-L-C circuit and developing phase or diagram Verification of relationship between star and delta connection (balanced).
4. Efficiency and regulation of a given 1-phase transformer by direct loading Testing and operation of domestic appliances.
5. Use of CRO for obtaining wave forms of electrical quantities Load characteristics of different rectifiers.

Text Books/ Reference Books

1. Electrical Technology- Edward Huges
2. Basic Electrical Engineering D. P. Kothari, Nagrath
3. Electrical power system technology-S.W. Fordo, D. R. Patrick
4. Principles of Electronics-Dr. H. M. Rai
5. Electronic Devices and circuit Theory- R. L. Boylestad and L. Nashelsky
6. Electrical, Electronics Measurements and Instrument
7. Principles of Communication Engineering- Anokh Singh, A. K. Chhabra

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

COMPUTER FUNDAMENTALS AND INFORMATION TECHNOLOGY
(Course No. K70113)

Designation of Course	Computer Fundamentals And Information Technology		
Teaching Scheme:	Examination Scheme:		
Theory:- ---Hours/ Week		Theory	-- Marks
Practical:- 02 Hours/ Week		Duration	--Hours
Tutorials:- -- Hours/ Week		Unit Test	-- Marks
		T.W.	25 Marks

Course Prerequisites:-	Basic Computer software knowledge and computer accessories.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to study different types of Number Systems and Conversion Techniques. 2. Able to understand the working of different types of Input/ Output Devices 3. Able to learn Software installations on Various Platforms 4. Able to develop familiarity with MS Office Suite. 5. Able to understand the Characteristics of Object Oriented Programming. 6. Able to write simple programs in C++.

Course Contents

Unit 1	Computer Fundamentals	
Computer basics, data representation, number system. Computer architecture, Microcomputer PC hardware: CPU, Memory, Disks, Cards, Slots, Floppy And Modem.		
Unit 2	Input / Output / Storage Devices	
<p>Input devices: function, typical examples of input devices with their installation such As keyword, mouse, scanners, bar code readers, MICR readers, Audio and Video input Devices.</p> <p>Output devices: Typical examples of output devices with their installation such as VDU, printers, TFT, Audio and Video output devices. Storage devices: Primary storage such as RAM, ROM, secondary storage such as floppy disk, hard disk, CD ROM, ZIP drives tape drives, DAT etc.</p>		
Unit 3	Software	
Software characteristics, Types of software's files, Introduction to OS with DOS Commands. Operating environment such as windows. Programming language with High level and low-level programming. Utility packages such as MS office with MS- Word, Power Point, Excel, CAD and their typical applications in engineering.		
Unit 4	MS-Windows	
Introduction, Installation, Utilization, Features, and Accessories-notepad, paint, and word pad. Communication, Entertainment, System tools: disk cleaning, scan disk, Formatting disk, disk defragmentation etc. System setting. Control panel, desktop. Internet: Modem Types, Connectivity, TCP/IP, ISP, ISDN, Getting connected, and WWW. Browsers such as IE-5, Email, Newsgroups, Chatting, and Internet security. Search engines such as yahoo, Google, info seek, Alta Vista, hot boat etc. Computer Network, Basic concept. Layers, Topologies, Introduction to Networking. Types of LAN, WAN, MAN, Internet working. Wireless networks, Satellite links		

Unit 5	Database Management Systems (DBMS)	
File concepts. Database, logical and physical databases. Data modeling: hierarchical, Network, relational, and object oriented. Concept of normalization: database creation And modification using SQL. Sample queries. Multi Media System: Introduction to Multimedia System, Multimedia components, Text, audio, video, etc.		
Unit 6	Latest trends in Information Technology	
Study of MIS, BIS, GIS, OOP Concepts: Comparison of structured and object oriented Programming language, object structures. Object classes. Inheritance, Object identity. Encapsulation, Polymorphism.		

Term Work:

Term work will consist of ten assignments based on above syllabus out of which four assignments will be based on C programming language.

Assignment List:

1. Study of various Input and Output devices like Keyboard, Mouse, Scanner, Monitor, Printer etc.
2. Software Installation: Install any Office suite for study purpose
3. Study of any Office suite: Features make new documents, save documents, edit documents.
4. Study of various data representation & conversion techniques (Decimal to Octal, Decimal to binary, Decimal to hexadecimal)
5. Study of an operating system and list its features like I/O processing, memory management, process management.
6. Study basic of basic UNIX OS Commands (directory, file maintenance commands)
7. Compare the basic features of Windows OS with Linux or UNIX OS? Design a Spreadsheet for a given application
8. Study of Search Engines (like Google, Yahoo, AltaVista, Info Seek) and its features & WWW technologies.
9. Design a 3-D structure using any design tool
10. List and study database driven software.
11. Create a Database in any suitable application and perform add, delete and modify operations on it
12. Write a C++ program to compare 3 integer and display the greatest number
13. Write a C++ program to perform arithmetic operations on two complex numbers using operator overloading
14. Write a C++ program to study the concept of Inheritance

Required Software for above assignments:

1. UNIX / Linux
2. MS Windows
3. Open Office / MS Office / Star Office
4. 3D Studio MAX /Maya
5. Turbo C++

Text Book/References

1. Dr. V Rajaraman: Computer Fundamentals
2. Peter Norton: Inside IBM PC, (TMH)
3. Tannanbaum: Computer Networks, (TMH)

4. Korth: Database Management Systems, (TMH)
5. Yashwant Kanitkar: C-Programming
6. C Programming Language : Reference and Users Manuals, Microsoft Press
7. Steven Alter: Information Systems, Addison Wesley
8. Stroutstrup: Programming in C, (TMH)

WORKSHOP PRACTICE-II
(Course No: K60114)

Designation of Course	Workshop Practice-II		
Teaching Scheme:	Examination Scheme:		
Theory:- -- Hours/ Week	Theory	-- Marks	
Practical:- 02 Hours/ Week	Duration	-- Hours	
Tutorials:- -- Hours/ Week	Unit Test	-- Marks	
	T. W.	50 Marks	

Course Prerequisites:-	Basic knowledge of fabrication techniques, machine components.
Course Outcomes:-	<ol style="list-style-type: none"> 1. The student should know the different sections of metal and wood working processes. 2. The student should be able to handle the marking, measuring and cutting tools used in fitting section. 3. The student should be able to get the practical Knowledge of sheet metal work. 4. The student should be able to handle the different tools used in black smithy. 5. The student should be able to get the Practical Knowledge of plastic molding process. 6. The student should be able to get the Practical Knowledge of Plumbing process.

Course Contents

Students are required to complete the remaining set as the Term Work of Workshop Practice - II

Set A shall consist of

Jobs:

- 1) Woodworking-one job involving joint, woodturning, use of filler materials and adhesives
- 2) Welding- one job with edge preparation and simple joint using gas or arc welding.
- 3) Soldering- Fabrication of at least 5 electronic components on a PCB.
- 4) Demonstration on a centre lathe and CNC lathe.

OR

A suitable combination of above operations to make a composite job either individually or in a group.

Journal:

Journal shall consist of write-up about materials, equipments used in above processes, specific procedures followed, and safety precautions.

Set B shall consist of

Jobs:

- 1) Fitting- one job with one joint along with drilling, tapping, hacksaw cutting
- 2) Tin smithy- One job including riveting/ soldering
- 3) Black Smithy- One job with at least two different operations
- 4) Plastic moulding- one plastic component on injection moulding machine.

OR

A suitable combination of above operations to make a composite job either individually or in a group.

Journal:

Journal shall consist of write-up about materials, equipments used in above processes, specific procedures followed, and safety precautions

At the end of each semester students are required to submit the completed jobs and journal for assessment of work done in workshop

Rules regarding ATKT, Continuous Assessment and award of Class

A. T. K. T.

- A candidate who is granted term for B. Tech. Semester-I will be allowed to keep term for his/her B. Tech. Semester-II examination even if he/she appears and fails or does not appear at B. Tech. Semester-I examination.
- A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B. Tech. Semester-IV examination even if he/she appears and fails or does not appear at B. Tech. Semester-III examination.
- A candidate who is granted term for B. Tech. Semester-V will be allowed to keep term for his/her B. Tech. Semester-VI examination if he/she appear and fails or does not appear at B. Tech. Semester-V examination.
- A candidate who is granted term for B. Tech. Semester-VII will be allowed to keep term for his/her B. Tech. Semester-VIII examination if he/she appears and fails or does not appear at B. Tech. Semester-VII examination.
- A candidate shall be allowed to keep term for the B. Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B. Tech. Semester-I & II taken together.
- A candidate shall be allowed to keep term for the B. Tech. Semester-V of respective course if he/she has no backlog of B. Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.
- A candidate shall be allowed to keep term for the B. Tech. Semester-VII course if he/she has no backlog of B. Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

- In respect of Term work at B. Tech. Semester-I & II, B. Tech. Semester-III & IV and B. Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment

or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

- Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.
- For B. Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

- Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or more marks but less	First Class
C	Aggregate 55% or more marks but less	Higher Second Class
D	Aggregate 50% or more marks but less	Second Class
E	Aggregate 40% or more marks but less	Pass Class

Bharati Vidyapeeth Deemed University
College of Engineering, Pune- 411043
The Structure of the Curriculum: 2007 Course

B. TECH. MECHANICAL: SEMESTER- III & IV



Bharati Vidyapeeth University
College of Engineering, Pune
Department of Mechanical Engineering



Vision: To provide mechanical engineers capable of dealing with global challenges

Mission: Social transformation through dynamic education

Programme Educational Objectives (PEOs):

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

Programme Outcomes (POs):

- a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems
- b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes
- c. To design and develop mechanical systems considering social and environmental constraints.
- d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques
- e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance
- f. To know social responsibilities while doing professional engineering practice.
- g. To become familiar with eco-friendly, sustainable and safe work environment.
- h. To take into account professional ethics while designing engineering systems.
- i. Able to work efficiently as a group leader as well as an individual.
- j. To communicate in written and verbal form with subordinates and supervisors
- k. To apply project and finance management techniques in multidisciplinary environments.
- l. To create interest for higher education and updating the knowledge.

B. TECH. MECHANICAL: SEMESTER- III

Total Duration: 30 Hrs./ week									
Total Marks: 750									
Course Code	Course	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total Marks
		L	P/D	T	TH	UT	TW & Pr	TW & Or	
K 60201	Strength of Machine Elements	04	02	--	80	20	--	50	150
K 60202	Applied Thermodynamics	04	02	--	80	20	--	50	150
K 50261	Industrial Electronics & Electrical Technol.	04	02	--	80	20	--	50	150
K 60241	Manufacturing Process	04	--	--	80	20	--	--	100
K 60203	Fluid Mechanics	04	02	--	80	20	--	50	150
K 60242	Workshop Prac.-III	--	02	--	--	--	50	--	50
Total		20	10	--	400	100	50	200	750

B. TECH. MECHANICAL: SEMESTER- IV

Total Duration: 33 Hrs./ week									
Total Marks: 750									
Course Code	Course	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total Marks
		L	P/D	T	TH	UT	TW & Pr	TW & Or	
K 70208	Engineering Mathematics - III	04	--	01	80	20	--	--	100
K 60204	Internal Combustion Engines	04	02	--	80	20	50	--	150
K 60205	Theory of Machines- I*	04	02	--	80	20	--	50	150
K 60243	Material Science & Engineering Metallurgy	04	02	--	80	20	--	50	150
K 60206	Computer Aided Drafting & Machine Drawing*	04	04	--	80	20	50	--	150
K 60244	Workshop Prac.-IV	--	02	--	--	--	50	--	50
Total		20	12	01	400	100	150	100	750

*Subject with Four hours Theory Paper

Rules for Conducting Tests

Mode of the test

- In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.
- To calculate these marks following procedure is followed:
 - i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
 - ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
 - iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
 - iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
 - v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; these marks will be final marks obtained by the student. No scaling up is permitted.
 - vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.
- Paper pattern for tests
 - i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

ii) There will not be any sub-questions.

- For granting the term it is mandatory to appear for all three tests conducted in each semester.
- Roll nos. allotted to students shall be the examination nos. for the tests.

Department of Mechanical Engineering
STRENGTH OF MACHINE ELEMENTS
(Course No: K60201)

Designation of Course	Strength of Machine Elements		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Marks	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W. & Or.	50 Marks	

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Mathematics 2. Engineering Mechanics
Course Outcomes:-	<ol style="list-style-type: none"> 1. Calculate stress and strain in machine components 2. Find out maximum load carrying capacity under tensile, compressive, torsion tests 3. Assess different types of failures 4. Use shear force and bending moment diagrams for different loading conditions in beams and shaft 5. Use analysis in simple machine elements 6. Calculate diameter of joints

Course Contents

Unit 1	Simple Stresses & Strain in Machine Parts	(08 Hrs.)
Concept of stress & strain, types of stresses, strains – linear, lateral, shear, thermal, volumetric, hooks law, Poison's ratio, modulus of elasticity, modulus of rigidity, bulk modulus, stress-strain diagram for ductile & brittle material, yield strength, ultimate strength, buckling, impact loading, suddenly applied loading, Thermal stresses in machine elements.		
Unit 2	Engineering Materials	(08 Hrs.)
Mechanical properties of engineering materials, creep, stress concentration, selection of materials, cast iron, BIS system of designation of steel, plain carbon steel, overseas standards, cast steel, aluminum alloys, die casting alloys, weighted point method.		
Unit 3	Principle Stresses	(08 Hrs.)
Normal & shear stresses & strain on any oblique plane, concept of principle planes, derivation of expression of principle stresses & maximum shear stresses, position of principle planes & planes of maximum shear, graphical solution using Mohr's circle, combined effect of axial force, bending & torsion. Theories of Failure: Maximum normal stress theory, Maximum shear stress theory, Maximum distortion energy theory, Maximum strain theory, Maximum strain energy theory, their application & limitation to engineering material, composite member design.		
Unit 4	Shear force Diagram & Bending Moment Diagram of Shafts and Beams	(08 Hrs.)
SFD & BMD of shaft with different end conditions, simply supported, cantilever, and overhang, with all types' loads, concentrated load conditions, torsional deflection of shaft, and lateral deflection of shaft by Maculley's method, moment area method, Castigliano's theorem.		

Unit 5	Stress Analysis of Knuckle and Cotter Join	(08 Hrs.)
Bending of curved bars, stresses in ring, chain link, crane hook, eccentric loading, design of knuckle & cotter joint & chain link.		
Unit 6	Threaded and Riveted Joints	(08 Hrs.)
Basic types of screw fastenings, uniform strength bolts, ISO metric screw threads, Eccentrically loaded bolt joint load perpendicular to bolt axis, eccentric load on circular base, cylindrical bolts, turn buckle design		

Term work

The Journal containing the record of following:

1. Experiment on Tension test on M.S. bar.
2. Experiment on Compression test on M.S. bar.
3. Experiment on Shear test on M.S. bar.
4. Experiment on Torsion test on M. S. bar.
5. Experiment on Impact test.

Drawing file containing two half imperial sheets:

1. Drawing sheet of SFD - BMD of shafts using computer.
2. Drawing sheet of Mohr's circle.

Any two assignments based on above syllabus.

Text Books/ Reference Books

1. Timoshenko & Young, Engineering Mechanics, Tata McGraw Hill Book Publishing Co. Ltd. 1985
2. James Gere, Mechanics of Materials, Thomson Learning
3. S Ramamrutham, Strength of Materials
4. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication
5. J. E. Shigley, Mechanical Engineering Design, McGraw Hill

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

APPLIED THERMODYNAMICS
(Course No: K60202)

Designation of Course	Applied Thermodynamics	
Teaching Scheme:	Examination Scheme:	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical:- 02 Hours/ Week	Duration	03 Hours
Tutorials:- -- Hours/ Week	Unit Test	20 Marks
	T.W. & Or.	50 Marks
Course Prerequisites:-	<ol style="list-style-type: none"> 1. Knowledge of basic concept of thermodynamics 2. Knowledge of basic gas laws 3. Knowledge of pumps and compressors 	
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand 2nd law of thermodynamics and its applications 2. Able to calculate Air Standard efficiency of petrol and Diesel cycle. 3. Able to draw heat balance sheet of boiler. 4. Able to understand working of Single and Multistage air compressor. 5. Able to understand working of rotary compressor. 6. Able to analyse flue gas analysis 	

Course Contents

Unit 1	Second Law of Thermodynamics and Entropy	(08 Hrs.)
<p>Limitations of first law of thermodynamics, heat engine, refrigerator and heat pump, Kelvin-Planck's statement & clausius statement, equivalence of Kelvin-Planck's and clausius statements, perpetual motion machine of second kind, carnot cycle & carnot heat engine. Entropy as a property, second law analysis for entropy, clausius inequality, principle of increase of entropy, irreversibility.</p>		
Unit 2	Air Standard Cycles and Vapour Processes	(08 Hrs.)
<p>Concept of air standard cycles, assumptions, Otto, diesel & dual cycle, thermal efficiency, mean effective pressure, comparison of Otto, diesel & dual cycle, actual cycle, deviation from theoretical cycle, relative efficiency.</p> <p>Non flow and steady flow vapor processes, change of properties, work transfer & heat transfer, use of P-V, T-S, H-S diagrams for steam, determination of dryness fraction, study of calorimeters.</p>		
Unit 3	Steam Generators and Vapour Power Cycle	(08 Hrs.)
<p>Classification, constructional details of process and power boiler, boiler mountings and accessories, equivalent evaporation, boiler efficiency, energy balance, boiler controls, boiler draught. Carnot cycle using steam, ideal Rankin cycle, calculation of thermal efficiency, specific steam consumption, work ratio, comparison of Carnot and Rankin cycle, effect of superheat.</p>		
Unit 4	Single Stage Reciprocating Air Compressor and Multi Stage Reciprocating Air Compressor	(08 Hrs.)
<p>Uses of compressed air, classification, constructional details of single stage compressor, computation of work done, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, FAD, theoretical and actual indicator diagrams, method of improving volumetric efficiency. Need of multi staging, multi stage compressor, work done, volumetric efficiency, condition for maximum efficiency, intercooling, actual indicator diagram.</p>		
Unit 5	Rotary Compressor	(08 Hrs.)

Introduction, classification and working principles of different types of compressors, comparison between reciprocating and rotary compressors, positive displacement and rotodynamic compressors, static and total head, work done efficiencies, surging, and choking, stalling, characteristics curves for rotodynamic compressors. Selection of compressors for various applications.

Unit 6	Fuels and Combustion and Availability	(08 Hrs.)
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Mass fraction, mole fraction, combustion equation, theoretical air, excess and deficient air, stoichiometric and actual air to fuel ratio, analysis of products of combustion, gravimetric and volumetric analysis and their conversions, method to determine flue gas analysis - CO, CO₂, O₂, HC, NO_x, smoke. High and low grade energy, available and unavailable energy, loss of available energy due to heat transfer through a finite temperature difference.

Oral: Based on above term work.

Term Work

1. Term work shall consist of record of minimum eight experiments of the following:
2. Determination of calorific value using bomb calorimeter.
3. Demonstration to determine exhaust gas analysis by using any commercially available test rig.
4. Test on reciprocating air compressor to determine volumetric efficiency, isothermal efficiency and FAD.
5. Determination of dryness fraction using any commercial available test rig. Study of boiler mounting and accessories.
6. Study of package boiler / modern boiler.
7. Report on visit to any process industry, which uses boiler.
8. Trial on boiler to determine boiler efficiency, equivalent evaporation and energy balance sheet.
9. Performance test on rotary air compressor/ blower. Study of rotary type positive displacement compressor.

Text Books/ Reference Books

1. Y. Cengel & Boles, Thermodynamics -engineering approach, Tata McGraw Hill Publications.
2. C. P. Arora, Engineering Thermodynamics, Tata McGraw Hill Publications.
3. P. L. Ballany, Thermal Engineering, Khanna Publications.
4. Kothandarman & Domkundwar Thermodynamics & Heat Engines.
5. Rayner Joel, Engineering Thermodynamics, ELBS Longman.
6. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

INDUSTRIAL ELECTRONICS AND ELECTRICAL ENGINEERING
(Course No. K50261)

Designation of Course	Industrial Electronics And Electrical Engineering		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical: 02 Hours/ Week	Duration	03 Hours	
Tutorials: -- Hours/ Week	Unit Test	20 Marks	
	T.W. & Or.	50 Marks	

Course Prerequisites:-	Basic knowledge of electronics, electrical and Motors.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand and apply knowledge of basic laws and theorems to solve simple electrical dc circuits. 2. Able to define basic terms of single phase and three phase ac circuits and supply systems. Draw vector diagram and solve simple numerical on ac circuits. 3. Able to describe fundamental concepts of magnetic and electromagnetic circuits. Explain principle of transformer and calculate efficiency and regulation of transformer 4. Able to draw power supply system layout, block diagram of SMPS, UPS. Know and use electrical safety rules. 5. Able to specify and select electronic components as per required application. 6. Able to specify and select suitable measuring instruments for required application

Course Contents

Unit 1	D C Machines	(08 Hrs.)
Construction, generator action, e.m.f. equations, types, shunt, series, compound generators (elementary treatment). Motoring action, types - Shunt and series, significance of back e.m.f., torque - speed equations, torque - armature, current speed - armature current, torque - speed characteristics, different methods of speed control for shunt and series motor, starters of DC motors. Applications Of D C motor		
Unit 2	Three Phase Induction Motors:	(08 Hrs.)
Concept of rotating magnetic field Principle of operation, slip, slip torque equation, , torque slip characteristics, Methods of starting of I M , relation between slip, of mechanical power developed and copper loss, efficiency of motor, applications of 3-phase I M Principle of working, construction and applications (descriptive treatment only) of. I) Single phase induction motors: Resistance split phase, capacitor split phase and shaded pole motors. ii) Special purpose motors: Stepper motors, servomotors, A.C. series motors, Universal motors.		
Unit 3	Synchronous Machines :	(08 Hrs.)
Alternators: Constructional features, salient pole and cylindrical type rotors, synchronous speed. Frequency of induced e.m.f. Equations, winding factors, regulation of an alternator. (Synchronous impedance method only). Synchronous motors: Principle of working phasor diagram, effect of variation of load and excitation, methods of starting, general application, applications as asynchronous condenser		

Unit 4	Study of Power Control Devices:	(08 Hrs.)
Construction and working of SCR, Triac, Power MOSFET, IGBT, Characteristics and, Triggering circuits using Diac / UJT, simple applications like Controlled rectifiers light dimmers, fan regulators. Study of UPS (Only block diagram)		
Unit 5	Linear and Digital ICs	(08 Hrs.)
Introduction to IC Op-Amp (like 741), ideal parameters, open loop and closed loop gain , Op-Amp with negative feedback as a small signal amplifier (e.g. Inverting and non-inverting configurations) Op-Amp as Instrumentation Amplifier, Audio Power Op-Amp. IC's like TBA 810, LM380, Op-Amp as comparator, Op-Amp as wave form generator (Square and ramp), case study of Waveform generator IC such as 8038 or XR 2206. Timing Circuits Using IC 555 as mono stable and a stable multi vibrator and its applications in Mechanical Engg., sequential timers. Binary and BCD adder, Subtractor, Study of flip-flops, shift registers, counters, applications of digital circuits such as staircase, traffic light, lift controller, sequential controllers, display devices like LED, LCD, opto- isolators and opto-couplers.		
Unit 6	Industrial Applications:	(08 Hrs.)
Advantage of electrical heating, various methods of heating a) Resistance heating: Requirements of heating element materials, various heating element materials, design of Heating elements. b) Induction heating: Core type furnace, Ajax - Wyatt furnace, coreless induction type furnace, high frequency Eddy current heating. Dialectical heating: General principles Resistance welding and arc welding transformers, storage welding, RF heating, ultrasonic method of testing of materials, principles at LASER and applications, Use of CRO as display devices for industrial application.		

List of Practical

The Term-work shall consist of record of following experiments (Any Eight) (4 from Electronics and 4 from Electrical)

1. Study of UPS Systems: Instruments: UPS Kit, CRO, DMM Or
2. Controlled rectifiers using SCR with UJT triggering for a lamp load. Instruments: Power-Scope, DMM
3. Applications of Op-Amp. Using 741 (Any Two)
4. Square wave generators/ramp. Generator
Instrumentation Amplifier
Op-Amp as comparator and Schmitt trigger
5. Instruments: Dual trace CRO, Dual power supply, Function generator
6. Sequential timer using IC 555 and square wave generator. Instruments: Power supply, Dual trace CRO, stop-watch. Application of logic gates (one bit comparator) and combinational circuits e.g. traffic lights
7. Combinational lock lift, control, code conversion
8. Shift register IC 7495 and its application a sequence generator OR
9. Experiment on CNC programming (to be conducted in workshop)
10. Speed control of D. C. shunt motor by armature voltage and flux control methods and study Of D.C. shunt motor starters
11. Load test on D. C. shunt motor Load test on D. C. series motors
12. Regulation of alternator by synchronous impedance method Load test on three phase induction motor
13. Regulation of alternator by direct loading method
14. Study of various single-phase Induction motor

Text Books/ Reference Books

1. Boylested and Nastellsky, Electronic Devices and Circuits-PHI

2. Malvino and other Digital Principles and Applications–McGraw Hill
3. Allen Mottershed, Electronic Devices and Circuits, PHI
4. Harish C, Raj: Industrial and Power Electronics, Umesh Publications Delhi
5. E Huges, Basic Electrical Engineering, PHI
6. C.S.Rangan, Sharma, Mahi Instrumentation Devices and system.WIE.
7. Curtis Johnson, Process Instrumentation, PHI
8. Grover and Zeimmers, CAD/CAM,PHI
9. PillaiS.K.,FirstcourseinElectricalDrives:WileyEasternHCottonElectricalTechnology
10. Open show Taylor: Utilization of Electrical Energy

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

MANUFACTURING PROCESSES
(Course No.K60241)

Designation of Course	Manufacturing Processes		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- -- Hours/ Week	Duration	03 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T.W. & Or.	-- Marks	

Course Prerequisites:-	Basic knowledge of workshop practice and fabrication techniques.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand different casting processes 2. Able to know different hot working and cold working processes 3. Able to understand different welding process 4. Able to understand different operations performed on lathe machine 5. Able to understand different drilling and milling operations 6. Able to get knowledge of abrasive machining and plastic moulding

Course Contents

Unit 1	Expendable Mould and Permanent Mould Casting Processes:	(08 Hrs.)
Sand casting, Types of pattern materials, pattern making allowances, core prints, Moulding sand- properties and testing, Hand and machine moulding, core, core boxes, core making melting and pouring, Melting furnaces- Cupola, fuel fired, electric arc, Induction furnaces, Cleaning, Finishing and heat treatment of castings, Defects in casting lost foam process, Shell moulding, Investment casting. Die casting low pressure permanent mould castings hot and cold chamber processes, Centrifugal casting, Semi-centrifugal casting. Centrifuging, Continuous casting		
Unit 2	Hot & Cold Working Processes	(08 Hrs.)
<p>A) Hot working processes: Principle, rolling, forging - drops, press, upset. Rolling, forging- extrusion, drawing, spinning, effect of hot working.</p> <p>B) Cold working processes Cold rolling, swaging, forging extrusion- forward backward impact. Roll forging, tube drawing, wire drawing, spinning, shot peening, high energy rate forming, sheet metal, working- types of press, drives, different operations, and types of dies.</p>		
Unit 3	Joining Process:	(08 Hrs.)
<p>a) welding process-</p> <ol style="list-style-type: none"> i) Arc weld - theory SMAW, GTAW, GMAW, FCAW, Submerged arc welding stud welding. ii) Resistance welding- Theory, spot, seam, projection welding processes. iii) Gas welding iv) Friction welding, ultrasonic welding, thermit welding, electron beam and laser welding. <p>b) Use of adhesives for joining. Classification of adhesives, types of adhesives and their applications, surface preparation and various joints</p>		
Unit 4	Turning, Boring related Process:	(08 Hrs.)
Introduction, function, types, construction accessories operations, thread cutting, single and multi start thread cutting, different tools, tool materials, Tool Geometry, concepts of speed, feed, depth of cut, Introduction to boring		

gmachinesgeneralarrangementandnatureofworkdone		
Unit 5	Drilling and Milling Machines:	(08 Hrs.)
<p>A) Drilling :</p> <p>Fundamentals of drilling process, twist drill geometry, tool holders, Types of drilling machines, drilling operations. Types of drills, reaming process.</p> <p>B) milling machines:</p> <p>Fundamentals of milling process, cutters-types and geometry, Operations performed on milling machines. Dividing head, methods of indexing. Gear train calculations for helical and cam milling</p>		
Unit 6	Abrasive Machining Process & Plastics & Plastic Moulding:	(08 Hrs.)
<p>Abrasive machining processes: Abrasive machining, abrasives -types, size and geometry, Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, Grinding faults, Honing, lapping, super finishing, buffing, burnishing process. Plastics & Plastic Moulding: Moulding characteristics of plastic, Moulding process- compression, transfer, and injection blow moulding. Mould design- Materials and construction, bulk factor, shrinkage, moulding parameters, moulding machines, extruders</p>		

Textbooks/ Reference Books

1. Chapman W.A.J.: "workshop technology" volume I, II, III. ELBS.
2. Hajara choudhary S. K., Bose S. K.: "Elements of Workshop technology" – Volume I, II.
3. Begman: Manufacturing processes.
4. HMT: production technology. TMH Publishing Co. New Delhi.
5. Roy A. Lindberg: processes and metables of manufacturing fourth edition prentice Hall of India New Delhi.
6. Manufacturing process, P C Pandey

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

FLUID MECHANICS
(Course No. K60203)

Designation of Course	Fluid Mechanics		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- - Hours/ Week	Unit Test	20 Marks	
	T. W. & Or.	50 Marks	

Course Prerequisites:-	<p>Student should have knowledge of</p> <ol style="list-style-type: none"> 1. Fundamentals of Mechanical engineering. 2. Analysis of forces and moments. 3. Laws of motion, kinetics and kinematics.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand behaviour of fluids 2. Able to use appropriate pressure measuring devices 3. Able to apply Bernoulli's energy equation 4. Able to distinguish between laminar and Turbulent flow 5. Able to calculate losses in the piping system 6. Able to verify dimensional analysis results

Course Contents

Unit 1	Fluid Properties & Fluid Kinematics:	(10 Hrs.)
<p>Definition of fluid, Types of fluids, Viscosity, Compressibility, Vapour pressure, Surface tension, Capillarity, Velocity of sound, Mach number. Types of Flow – Steady, Unsteady, Uniform, Non-uniform, Laminar, Turbulent, One, Two & Three dimensional, Compressible, Incompressible, Rotational, Irrotational, Stream lines, Path lines, Streak lines, Velocity components, Convective & Local acceleration, Velocity potential, Stream function, Flow net.</p>		
Unit 2	Fluid Statics:	(06 Hrs.)
<p>Pressure at a point, Pascal's law, Devices for pressure measurement, Liquid pressure on plane & curved surfaces, Centre of pressure, Buoyancy & stability of floating & submerged bodies, Meta centric height.</p>		
Unit 3	Fluid Dynamics:	(08 Hrs.)
<p>Equations of motion, Continuity equation, Euler's equation of motion along a stream line, Bernoulli's equation, Application of Bernoulli's equation to pitot tube, Venturimeter, Orifices, Orifice Meter, Triangular & Rectangular notch.</p>		
Unit 4	Laminar Flow & Flow around Immersed Bodies:	(08 Hrs.)

Definition, Relation between pressure & shear stresses, Laminar flow through a circular pipe, Hagen Poiseuille equation, Fixed parallel plates, One fixed & one moving plate. Flow around Immersed Bodies: Lift & drag, Classification of drag, Flow around circular cylinder & Aerofoil, Development of lift on Aerofoil.		
Unit 5	Flow through Pipes:	(08 Hrs.)
Energy losses through pipe, Darcy Weisbach equation, Minor losses in pipes, Pipes in series & parallel, Equivalent pipe, Flow through siphon, Hydraulic power transmission through pipe.		
Unit 6	Turbulent Flow & Boundary Layer:	(08 Hrs.)
Definition of turbulent flow, Velocity distribution, Development of boundary layer on flat plate, Separation of boundary layer & methods of controlling. Dimensions of physical quantities, Dimensional homogeneity, Buckingham π theorem, Similarity, Important dimensionless numbers.		

Term Work

1. A journal containing record of any eight experiments of the following:
2. To find viscosity of liquids & its variation with temperature.
3. Study of pressure measuring devices.
4. Stability of floating body & optimum loading capacity.
5. Verification of modified Bernoulli's equation.
6. Calibration of Venturimeter.
7. Calibration of 'V' notch.
8. Study of minor losses due to pipe fittings.
9. Study of laminar & turbulent flows by Reynolds apparatus.
10. Study flow around immersed bodies by Hales haw apparatus.
11. Verification of friction factor for laminar & turbulent flow through pipes.

Oral

Based on above term work

Text Books/ Reference Books

1. Streeter V. L. & Wylie E. B., Fluid Mechanics, McGraw Hill International Book Co.
2. Kumar K. L., Engineering Fluid Mechanics, Eurasia Publishing House.
3. Dr. P. N. Modi and Dr. S. M. Seth, "Hydraulics and Fluid Mechanics Including Hydraulic Machines", Standard Book House.
4. R. K. Rajput, Fluid Mechanics, S. Chand.
5. Garde R. J. and Mirajgaonkar, Engineering Fluid Mechanics, New Chand & Bros; Roorkee

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

WORKSHOP PRACTICE III
(Course No: K60242)

Designation of Course	Workshop Practice III		
Teaching Scheme:	Examination Scheme:		
Theory:- -- Hours/ Week	Theory	-- Marks	
Practical:- 02 Hours/ Week	Duration	-- Hours	
Tutorials:- -- Hours/ Week	Unit Test	-- Marks	
	T. W. & Pr.	50 Marks	

Course Prerequisites:-	Student should have basic knowledge of welding, soldering, Lathe Machine.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to perform different forging operations 2. Able to perform different operations on lathe machine 3. Able to handle different wood working tools and equipments to prepare the pattern 4. Able to perform joints with arc welding.

Course Contents

Each candidate shall be required to complete and submit the following term work.

Jobs

1. Forging and grinding of lathe tool with one knife and other end V one job.
2. Plain and taper turning one job.
3. Making a pattern involving wood turning one job.
4. Welding (gas or arc) one job.

Journal and Demonstration

A journal shall consist of assignments based on M/C tools. These should include sketches and description as given below-(Any Five)

1. Mechanical test on weldment (To check tension, bend properties)
2. Plasma arc welding
3. At least one assignment on joining process
4. Demonstrations of lathe machine
5. Assignment on turning boring process
6. Demonstration of drilling machine
7. Assignment on drilling machine

Practical Assignment Scheme

A practical examination of three hours duration based on above term work shall be conducted at the end of semester.

Department of Mechanical Engineering
ENGINEERING MATHEMATICS – II
(Course No. K70108)

Designation of Course	ENGINEERING MATHEMATICS – II		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- -- Hours/ Week	Duration	03 Hours	
Tutorials:- 01 Hours/ Week	Unit Test	20 Marks	
	T. W.	-- Marks	

Course Prerequisites:-	Student should have knowledge of Mathematics-I
Course Outcomes:-	<ol style="list-style-type: none"> To develop an ability to solve differential equations of first order and first degree. To develop an ability to form mathematical model of rectilinear motion, electric circuit, Fourier heat conduction, Newton's law of cooling. To develop an ability to transform the Cartesian co-ordinates into spherical polar and cylindrical coordinate systems. To develop an ability to represent periodic function as Fourier series. To develop an ability to evaluate definite integral by DUIS rules and to trace Cartesian and polar curves. To develop an ability to apply methods to find area and volume by double and triple integration.

Course Contents

Unit 1	Differential Equations:	(09 Hrs.)
Differential Equations of First Order and First Degree, Exact Differential Equations and Reducible to Exact form, Linear Differential Equations, Reducible to Linear types, Method of Substitution and Miscellaneous Types, Differential Equations of First and Higher degree		
Unit 2	Applications of Differential Equations (of First Order and First Degree):	(08 Hrs.)
Orthogonal Trajectories, Atmospheric Pressure, Newton's Law of Cooling, Motion Under Gravity and Rectilinear Motion, L-R, R-C and L-C Circuits, Applications to Mass-Spring System, One Dimensional Conduction of Heat Applications to Chemical Engineering.		
Unit 3	Solid Geometry:	(09 Hrs.)
Cartesian, Spherical Polar and Cylindrical Coordinate systems, Relation between coordinate systems. Sphere, Tangent Plane of the Sphere, Sphere through a Circle, Orthogonal Spheres, Cone and Cylinder, Quadratic surfaces.		
Unit 4	Fourier Series:	(09 Hrs.)
Definition and Dirichlet's Conditions, Full range Fourier series on $c \leq x \leq c + 2\pi$ and $c \leq x \leq c + 2L$, Expansions of even and odd Periodic functions and on $-\pi \leq x \leq \pi$ and $-L \leq x \leq L$, Half Range Fourier Expansions Harmonic Analysis and Application to problems in Engineering. Reduction formulae for Trigonometric functions, Beta and Gamma functions.		
Unit 5	Foundations:	(08 Hrs.)
Integral Calculus (Single Integral):		

Differentiation Under the Sign of Integration, Error functions.

Curve Tracing:

Tracing of Cartesian, Polar and Parametric curves, Rectification of curves.

Unit 6 Multiple Integrals and their Application:

(09 Hrs.)

Double and Triple Integrations, Application of Multiple Integral to Areas and Volumes, Mean and RMS Values, Mass, Centre of Gravity and Moment of Inertia.

Text Books / References

1. Advanced Engineering Mathematics, 5th Edition, by Peter V. O'Neil (Thomson Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
3. Advanced Engineering Mathematics by Wylie C.R. and Barrett L. C. (McGraw-Hill).
4. Advanced Engineering Mathematics, 2nd Edition, by M. D. Greenberg (Pearson Education).
5. Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
6. Applied Mathematics (Volume I & II) by P. N. Wartikar and J. N. Wartikar (Pune Vidyarthi Griha Prakashan).
7. A Text Book of Engineering Mathematics - II by P. N. Wartikar and J. N. Wartikar.

Unit Tests-

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
Unit Test 3	Unit III & VI

ENGINEERING SCIENCE – II
(Course No. K70109)

Designation of Course	Engineering Science – II		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W.	25 Marks	

Course Prerequisites:-	Students should have knowledge of Engineering Science-I
Course Outcomes:-	<ol style="list-style-type: none"> 1. To use the properties of charged particles to develop modern instruments and explain the mechanism of fusion and fission. 2. To understand the behavior of quantum particles in different types of potentials. 3. To understand the basics of semiconductors and its uses to develop devices such as diode, transistor, solar cell etc. 4. Students will be able to understand the fundamental principles of corrosion and methods used for minimizing corrosion. 5. To recognize the preparation, properties and applications of polymeric materials.

Course Contents

PHYSICS		
Unit 1	Modern Physics:	(09 Hrs.)
Motion of a charged particle in electric and magnetic fields, Electrostatic and Magneto static focusing, Wavelength and resolution. Specimen limitation, Depth of field and focus. Electron microscope. Positive rays, Separation of isotopes by Bainbridge mass spectrograph. Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium. Fission energy, Critical mass and size. Reproduction factor, Chain reaction and four factor formula. Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions. Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron, Microtron.		
Unit 2	Quantum Mechanics:	(08 Hrs.)
Wave nature of matter, De-Broglie waves. Wavelength of matter waves. Electron diffraction, Davisson and Germer's experiment, Heisenberg's uncertainty principle with illustrations, Schrodinger's time dependant and time independent wave equation, Physical significance of wave function. Application of Schrodinger's time independent wave equation to the problems of (1) Electron gas, (2) Step potential (3) Potential barrier, (4) Particle in a rigid box (5) Particle in a non-rigid box (Boundary condition and result).		
Unit 3	Electrical Properties:	(07 Hrs.)
Band theory of solids. Band structures of Lithium, Sodium, Beryllium, Silicon and Diamond, Classification of solids on the basis of band theory. Fermi-Dirac probability function and position of		

Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semiconductors. Band structure of p-n junction diode under forward and reverse biasing, Conductivity in semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.		
<i>CHEMISTRY</i>		
Unit 4	Corrosion And Its Control:	(08 Hrs.)
Definition, dry or Chemical corrosion, wet or Electrochemical corrosion, mechanism of wet or electrochemical corrosion, Galvanic Corrosion, concentration cell corrosion passivity, underground or soil corrosion, pitting corrosion, inter granular corrosion, stress corrosion, microbiological corrosion. Electrochemical and galvanic series, Factors influencing corrosion and corrosion control.		
Unit 5	Polymers:	(08 Hrs.)
Definition and Classification based on origin and thermal behavior, Polymerization reactions, Functionality, Degree of Polymerization, tacticity. Types of Polymerization - Addition and condensation, Thermo-softening and Thermosetting Plastics, Polymerisation reactions, properties and uses of some polymers such as Polyethylene, Polypropylene, Polyvinyl Acetate, Polystyrene, Teflon, Melamine Formaldehyde, PMMA, SBR. Polymers in Medicine and surgery, Polymer blends and Alloys, Engineering Plastics.		
Unit 6	Instrumental Methods of Chemical Analysis:	(08 Hrs.)
Infrared Spectroscopy, Visible Spectroscopy, Ultraviolet Spectroscopy. Introduction, Principle, Instrumentation (Schematic Diagram) and Engineering Applications of the above Techniques.		

PHYSICS: Term Work Experiments:

Any five experiments from the following:

1. Determination of band gap of semi-conductor
2. Solar cell characteristics.
3. E/m by Thomson's method.
4. Uses of CRO for measurement of phase difference by Lissajous figures
5. Hall effect and Hall coefficient
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode. Photo diode. LED, Ge/Si diode)
8. Plank's constant by photodiode.

Assignments:

Any **two** of following:

1. Harmonic oscillator
2. Nuclear radiation detectors.
3. Scanning electron microscope and scanning tunneling microscope
4. Advanced opto-electronic devices

Text Books /References

1. Physics for Engineers - Srinivasan M. R., New Age International (P) Ltd.
2. Atomic Physics - Weher and Richards, Narosa Publishing House
3. Modern Physics - B. L. Thereja, S. Chand & Company Ltd.

4. Atomic Physics - J. B. Rajam, S. Chand & Company Ltd.
5. Principle of Electronics - V. K. Mehta, S. Chand & Company Ltd.
6. Electronics Principles - A. P. Molvino, McGraw Hill International Book Company Ltd.

CHEMISTRY: Experiments:

Any **five** of the following:

1. To Determine the Molecular Weight of a polymer
2. Estimation of Copper from brass sample solution Iodometrically
3. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
4. To find the Radius of Macro Molecule by Viscometer
5. To Determine Surface Tension of a liquid by Stalagmometer
6. Determination of the strength of unknown liquid by using the colorimeter

Text Books / References

1. Fundamentals of Engineering Chemistry - Theory and Practice by S. K. Singh, New International Publishers.
2. A Textbook of Engineering Chemistry by S. S. Dara, S. Chand and Company Ltd., New Delhi.
3. Instrumental Methods of Chemical Analysis by Chatwal and Anand, Himalaya Publishing House.
4. Engineering Chemistry by Jain and Jain.
5. Nace Corrosion Engineers R. B. by R. Baboian, C. G. Munger.
6. Corrosion Engineering by Mars G. Montana & Norbert D. Green.
7. Polymer Handbook Edited by Brandrup, J. Immergut, Edmund H., etc.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ENGINEERING MECHANICS
(Course No.K20110)

Designation of Course	Engineering Mechanics		
Teaching Scheme:	Examination Scheme:		
Theory:- 4 Hours/ Week	Theory	80 Marks	
Practical:- 2 Hours/ Week	Duration	03 Hours	
Tutorials:- - Hours/ Week	Unit Test	20 Marks	
	T. W.	25 Marks	

Course Prerequisites:-	Basic knowledge of physics and mathematics.
Course Outcomes:-	<ol style="list-style-type: none"> 1. The student should able to calculate Resultant of the Force system and also apply conditions of equilibrium for different problems. 2. The student should able to calculate Centroid and moment of Inertia of areas. 3. The student should be able to calculate effect friction force. 4. The student should be able to calculate velocity, acceleration, displacement, time for bodies in motion. 5. The student should be able to use D'Alemberts principle, Work-energy principle and Impulse momentum principle. 6. The student should be able to use concept of ICR for rigid body motion.

Course Contents

Unit 1	Force system in a plane	(8 Hrs.)
Types of forces classification of a force system Resolution of forces Resultant of a force system in a Plane- Analytical and Graphical approach Moment of a force, Couple, Force and Couple system About a point. Equilibrant, Free Body Diagram, Types of Supports, Conditions of Equilibrium Equilibrium of a force system in a plane.		
Unit 2	Force system in a Space and Moment of Inertia	(8 Hrs.)
Resultant and Equilibrium of a force system in a space, moment of a force about a point and About in line. Centroid of a line element, plane areas and volume, center of gravity, Moment Of inertia.		
Unit 3	Application of Static Equilibrium	(8 Hrs.)
Analysis of perfect Trusses – Method of Joint, Method of Section and graphical Method, Analysis of Pin Jointed Frames ,Analysis of cables subjected to Concentrated Load Coefficient of Static Friction Impending motion of Blocks , Ladder and wedges, Belt friction & Band-brake system.		
Unit 4	Kinematics of a Particle	(8 Hrs.)
Kinematics of Rectilinear motion of Particles – Equations of motion , Motion Curves ,Relative motion Dependent motion. Kinematics of Curvilinear motion of practical -Equation of motion in Cartesian, Polar and Path variable co-ordinate system, motion of projectile.		
Unit 5	Kinetics of a Particle	(8 Hrs.)
Kinetics of Rectilinear Motion of Particles , Newton's Second Law of motion , D'Alembert's principal , Work- Energy Principal ,Impulse-Momentum Principal, Direct Central Impact, Coefficient of Restitution,		

Spring Force. Kinetics of Curvilinear motion of Particles: D'Alembert's principle, Work-Energy Principle, Impulse-Momentum Principle, Oblique Central Impact		
Unit 6	Rigid Body Motion	(8 Hrs.)
Kinematics of Rigid bodies: Translation and Rotation about a fixed axis, General Plane Motion, Concept of Instantaneous center of Rotation. Kinetics of Rigid bodies: General Plane motion, D'Alembert's Principle, Work-Energy Principle.		

Term Work Experiments:

A) The term-work shall consist of total SIX experiments. (Minimum THREE from each section)

Section - I

1. Determination of reactions of Simple and Compound beam. Study of equilibrium of concurrent force system in a space.
2. Determination of coefficient of friction for Flat Belt and Rope. Verification of Law of Polygon of forces.
3. Study of Simple Lifting Machine.

Section - II

1. Study of Curvilinear motion. Determination of Coefficient of Restitution.
2. Determination of gravitational acceleration using Compound Pendulum. Determination of Moment of Inertia of Fly wheel.
3. Determination of Moment of Inertia of Irregular shape body using Torsional Pendulum.

B) The term-work shall also consist of minimum SIX graphical solutions of the problems on different topics. (Minimum THREE from each section)

Text Books/ Reference Books

1. Beer F.P. and Johnston E.R., "Vector Mechanics for Engineers - Vol. -I and Vol. -II
2. Timoshenko S.P. and Young D.H. "Engineering Mechanics" McGraw Hill Publication.
3. Singer E. L. "Engineering Mechanics" Harper and Row Publications.
4. Meriam J.I. and Craig "Engineering Mechanics" John Wiley and Sons Publications.
5. Shames I. H. "Engineering Mechanics" Prentice Hall of India Ltd.
6. Bhavikatti S. S. and Rajashekarappa K. G. "Engineering Mechanics" New Age International Ltd
7. Mokashi V. S. "Engineering Mechanics I and II" Tata McGraw Hill Publications
8. Tayal A. K. "Engineering Mechanics" Umesh 8. Tayal A. Publications

Unit Tests-

Unit Test-I	Unit-I & IV
Unit Test-II	Unit-II & V
Unit Test-III	Unit-III & VI

ENGINEERING GRAPHICS-II
(Course No. K60111)

Designation of Course	Engineering Graphics-II		
Teaching Scheme:	Examination Scheme:		
Theory:- 03 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	04 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W.	50 Marks	

Course Prerequisites:-	Knowledge of basic drawing, mathematics and geometry.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand projection of Lines and Planes 2. Able to understand projection of solids and its sections. 3. Able to understand development of different solids. 4. Able to understand intersection of surfaces of solids

Course Contents

Unit 1	Projections of Lines and Projections of Planes.	(12 Hrs.)
Projections of points. Projections of lines situated in 1st quadrant only Horizontal trace (HT) Vertical trace (VT) Applications of lines. Auxiliary inclined plane (AIP), Auxiliary vertical plane (AVP), distance between skew lines, distance of a point from a line. Projections of planes, True shape of plane, Angle between two planes, distance of a point from a plane.		
Unit 2	Projections of Solids and Sections of Solids:	(12 Hrs.)
Projections of solids such as prisms, pyramids, cylinder, cone and sphere. Projections of solids in combination. Sections of above solids by AIP and AVP True shape of section.		
Unit 3	Development of Surfaces of Solids	(09 Hrs.)
To draw the development of the lateral surfaces of cut prism, pyramid, cylinder and cone. To draw orthographic projections from the given developed surface of solid.		
Unit 4	Intersection of Surfaces of Solids:	(09 Hrs.)
To draw the lines or the curves of intersection of the surfaces of solids excluding following combination. Pyramid-pyramid, Pyramid-cone, Cone-cone, Sphere-cone, Sphere pyramid.		

Term Work

Term work shall consists of six half-imperial size or A2 size (594mm x 420mm) Sheets

1. Projections of lines
2. Projections of planes
3. Projections of solids
4. Sections of solids
5. Development of surfaces
6. Intersections of surfaces

Text Books/ Reference Books

1. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Edition, Persian Education, 2005.
2. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10th Edition, S. K. Kataria and Sons, 2005.
3. N. D. Bhatt and V. M. Panchal, "Engineering Drawing (Plane and Solid Geometry)" 42nd Edition, Charotar Publishing House, 2000.

4. Warren J. Luzadder and Jon M. Duff, "Fundamentals of Engineering Drawing", Prentice Hall of India Pvt. Ltd., 11 Edition, 1995.
5. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1- Edition, 1988.\
6. P. Nageswara Rao, "Auto CAD 14 for Engineering Drawing Made Easy", Tata McGraw Hill Co. Ltd

Note:

Paper shall be based on the topics covered in the syllabus of Engineering Graphics-I and Engineering Graphics-II

Unit Test:

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

ELEMENTS OF ELECTRICAL & ELECTRONIC ENGINEERING
(Course No. K40112)

Designation of Course	Elements Of Electrical & Electronic Engineering		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W.	25 Marks	

Course Prerequisites:-	Basic knowledge of physics, electronics, electrical.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to understand and apply knowledge of basic laws and theorems to solve simple electrical dc circuits. 2. Able to define basic terms of single phase and three phase ac circuits and supply systems. Draw vector diagram and solve simple numerical on ac circuits. 3. Able to describe fundamental concepts of magnetic and electromagnetic circuits. Explain principle of transformer and calculate efficiency and regulation of transformer 4. Able to draw power supply system layout, block diagram of SMPS, UPS. Know and use electrical safety rules. 5. Able to specify and select electronic components as per required application. 6. Able to specify and select suitable measuring instruments for required application.

Course Contents

Unit 1	Basic Concepts in Electrical Circuits:	(08 Hrs.)
Fundamental electrical quantities: Potential difference(voltage),current, power, energy, circuit elements-resistance, inductance, capacitance, laws for dc circuits analysis-Kirchhoff's voltage and current law, superposition theorem, the venin's theorem, maximum power transfer theorem.		
Unit 2	AC Circuits:	(08 Hrs.)
Graphical, mathematical and phase representation of ac voltage and currents, instantaneous, average and RMS value, peak factor form factor, periodic time, frequency, phase difference, power factor and complex power, analysis of series and parallel single phase ac circuits consisting of R,L,C combinations and Resonance phenomenon. Concept of 3-phase ac supply, supply specifications, phase sequence, star and delta connection and their line and phase values, current, voltage and power relationship for balanced 3-phase star and delta connected loads(with phase representation)		
Unit 3	Magnetic circuits and Transformer	(08 Hrs.)
Magnetic effects of an electric current ,magnetic circuit concepts terms MMF, flux density, field intensity, permeability, reluctance, composite series and parallel magnetic circuits, magnetization and hysteresis curve hysteresis and eddy current loss. Introduction to 1-phase transformer, function, principle of operation, types ,specifications, EMF equations ideal and practical transformer ,operation on no load and load conditions, losses, efficiency, regulation, determination of efficiency and regulation by direct loading introduction to auto transformation and instrument transformers.		
Unit 4	Electrical power Systems:	(08 Hrs.)

Generation, transmission and distribution systems layout ,types of supply system 3 phase-3wire,3phase-4 wire ac system rectifiers half wave, full wave, bridge wave with relevant wave forms, UPS, SMPS, stabilizers. Electrical safety, Necessity of earthing-safety and first aid measures against electrical shock.		
Unit 5	Electrical and Electronic component, device and Integrated Circuits:	(08 Hrs.)
Basic principle and applications of D.C. machines, connection diagram, load characteristics and applications, three phase induction and working principle. Types of resistance (fixed, variable, precision-carbon film, metal film, wire wound) their standard values specifications and applications .classification of capacitors based on dielectrics ,their standard values, specification and applications, study of different core materials depending on range of frequencies for inductors and transformers. Flat package, SMD's, pin configuration and cooling of LC's mounting of LC's basic block diagram and its explanation along with specifications of Mobile phones fax machines, Microwaves , personal computers.		
Unit 6	Electrical and Electronic Instruments:	(08 Hrs.)
Salient constructional features, operating principle, specification of PMMC and MI voltmeter and ammeter, Dynamometer- wattmeter, Induction type single phase energy meter. Basic block diagram, its explanation, specification and application of Digital millimeter, Function generator, CRO.		

List of Practical's to be performed in the laboratory

1. Verification of Kirchhoff's current and voltage laws for D. C. network Verification of superposition theorem for a given D. C. network.
2. Experimental verification of current flowing through a branch of D. C. circuit using the venin's theorem.
3. Verification of maximum power transfer theorem for D. C. circuit Performance of 1-phase a. c. R-L-C circuit and developing phase or diagram Verification of relationship between star and delta connection (balanced).
4. Efficiency and regulation of a given 1-phase transformer by direct loading Testing and operation of domestic appliances.
5. Use of CRO for obtaining wave forms of electrical quantities Load characteristics of different rectifiers.

Text Books/ Reference Books

1. Electrical Technology- Edward Huges
2. Basic Electrical Engineering D. P. Kothari, Nagrath
3. Electrical power system technology-S.W. Fordo, D. R. Patrick
4. Principles of Electronics-Dr. H. M. Rai
5. Electronic Devices and circuit Theory- R. L. Boylestad and L. Nashelsky
6. Electrical, Electronics Measurements and Instrument
7. Principles of Communication Engineering- Anokh Singh, A. K. Chhabra

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

COMPUTER FUNDAMENTALS AND INFORMATION TECHNOLOGY
(Course No. K70113)

Designation of Course	Computer Fundamentals And Information Technology		
Teaching Scheme:	Examination Scheme:		
Theory:- ---Hours/ Week		Theory	-- Marks
Practical:- 02 Hours/ Week		Duration	--Hours
Tutorials:- -- Hours/ Week		Unit Test	-- Marks
		T.W.	25 Marks

Course Prerequisites:-	Basic Computer software knowledge and computer accessories.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to study different types of Number Systems and Conversion Techniques. 2. Able to understand the working of different types of Input/ Output Devices 3. Able to learn Software installations on Various Platforms 4. Able to develop familiarity with MS Office Suite. 5. Able to understand the Characteristics of Object Oriented Programming. 6. Able to write simple programs in C++.

Course Contents

Unit 1	Computer Fundamentals	
Computer basics, data representation, number system. Computer architecture, Microcomputer PC hardware: CPU, Memory, Disks, Cards, Slots, Floppy And Modem.		
Unit 2	Input / Output / Storage Devices	
<p>Input devices: function, typical examples of input devices with their installation such As keyword, mouse, scanners, bar code readers, MICR readers, Audio and Video input Devices.</p> <p>Output devices: Typical examples of output devices with their installation such as VDU, printers, TFT, Audio and Video output devices. Storage devices: Primary storage such as RAM, ROM, secondary storage such as floppy disk, hard disk, CD ROM, ZIP drives tape drives, DAT etc.</p>		
Unit 3	Software	
Software characteristics, Types of software's files, Introduction to OS with DOS Commands. Operating environment such as windows. Programming language with High level and low-level programming. Utility packages such as MS office with MS- Word, Power Point, Excel, CAD and their typical applications in engineering.		
Unit 4	MS-Windows	
Introduction, Installation, Utilization, Features, and Accessories-notepad, paint, and word pad. Communication, Entertainment, System tools: disk cleaning, scan disk, Formatting disk, disk defragmentation etc. System setting. Control panel, desktop. Internet: Modem Types, Connectivity, TCP/IP, ISP, ISDN, Getting connected, and WWW. Browsers such as IE-5, Email, Newsgroups, Chatting, and Internet security. Search engines such as yahoo, Google, info seek, Alta Vista, hot boat etc. Computer Network, Basic concept. Layers, Topologies, Introduction to Networking. Types of LAN, WAN, MAN, Internet working. Wireless networks, Satellite links		

Unit 5	Database Management Systems (DBMS)	
File concepts. Database, logical and physical databases. Data modeling: hierarchical, Network, relational, and object oriented. Concept of normalization: database creation And modification using SQL. Sample queries. Multi Media System: Introduction to Multimedia System, Multimedia components, Text, audio, video, etc.		
Unit 6	Latest trends in Information Technology	
Study of MIS, BIS, GIS, OOP Concepts: Comparison of structured and object oriented Programming language, object structures. Object classes. Inheritance, Object identity. Encapsulation, Polymorphism.		

Term Work:

Term work will consist of ten assignments based on above syllabus out of which four assignments will be based on C programming language.

Assignment List:

1. Study of various Input and Output devices like Keyboard, Mouse, Scanner, Monitor, Printer etc.
2. Software Installation: Install any Office suite for study purpose
3. Study of any Office suite: Features make new documents, save documents, edit documents.
4. Study of various data representation & conversion techniques (Decimal to Octal, Decimal to binary, Decimal to hexadecimal)
5. Study of an operating system and list its features like I/O processing, memory management, process management.
6. Study basic of basic UNIX OS Commands (directory, file maintenance commands)
7. Compare the basic features of Windows OS with Linux or UNIX OS? Design a Spreadsheet for a given application
8. Study of Search Engines (like Google, Yahoo, AltaVista, Info Seek) and its features & WWW technologies.
9. Design a 3-D structure using any design tool
10. List and study database driven software.
11. Create a Database in any suitable application and perform add, delete and modify operations on it
12. Write a C++ program to compare 3 integer and display the greatest number
13. Write a C++ program to perform arithmetic operations on two complex numbers using operator overloading
14. Write a C++ program to study the concept of Inheritance

Required Software for above assignments:

1. UNIX / Linux
2. MS Windows
3. Open Office / MS Office / Star Office
4. 3D Studio MAX /Maya
5. Turbo C++

Text Book/References

1. Dr. V Rajaraman: Computer Fundamentals
2. Peter Norton: Inside IBM PC, (TMH)
3. Tannanbaum: Computer Networks, (TMH)

4. Korth: Database Management Systems, (TMH)
5. Yashwant Kanitkar: C-Programming
6. C Programming Language : Reference and Users Manuals, Microsoft Press
7. Steven Alter: Information Systems, Addison Wesley
8. Stroutstrup: Programming in C, (TMH)

WORKSHOP PRACTICE-II
(Course No: K60114)

Designation of Course	Workshop Practice-II		
Teaching Scheme:	Examination Scheme:		
Theory:- -- Hours/ Week	Theory	-- Marks	
Practical:- 02 Hours/ Week	Duration	-- Hours	
Tutorials:- -- Hours/ Week	Unit Test	-- Marks	
	T. W.	50 Marks	

Course Prerequisites:-	Basic knowledge of fabrication techniques, machine components.
Course Outcomes:-	<ol style="list-style-type: none"> 1. The student should know the different sections of metal and wood working processes. 2. The student should be able to handle the marking, measuring and cutting tools used in fitting section. 3. The student should be able to get the practical Knowledge of sheet metal work. 4. The student should be able to handle the different tools used in black smithy. 5. The student should be able to get the Practical Knowledge of plastic molding process. 6. The student should be able to get the Practical Knowledge of Plumbing process.

Course Contents

Students are required to complete the remaining set as the Term Work of Workshop Practice - II

Set A shall consist of

Jobs:

- 1) Woodworking-one job involving joint, woodturning, use of filler materials and adhesives
- 2) Welding- one job with edge preparation and simple joint using gas or arc welding.
- 3) Soldering- Fabrication of at least 5 electronic components on a PCB.
- 4) Demonstration on a centre lathe and CNC lathe.

OR

A suitable combination of above operations to make a composite job either individually or in a group.

Journal:

Journal shall consist of write-up about materials, equipments used in above processes, specific procedures followed, and safety precautions.

Set B shall consist of

Jobs:

- 1) Fitting- one job with one joint along with drilling, tapping, hacksaw cutting
- 2) Tin smithy- One job including riveting/ soldering
- 3) Black Smithy- One job with at least two different operations
- 4) Plastic moulding- one plastic component on injection moulding machine.

OR

A suitable combination of above operations to make a composite job either individually or in a group.

Journal:

Journal shall consist of write-up about materials, equipments used in above processes, specific procedures followed, and safety precautions

At the end of each semester students are required to submit the completed jobs and journal for assessment of work done in workshop

Department of Mechanical Engineering

ENGINEERING MATHEMATICS-III (Course No. K70208)

Designation of Course	Engineering Mathematics-III		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- -- Hours/ Week	Duration	03 Hours	
Tutorials:- 01 Hours/ Week	Unit Test	20 Marks	
	T. W. & Or.	----	

Course Prerequisites:-	Student should have knowledge of differential equations, Fourier Series.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to develop an ability of mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient. 2. Able to develop an ability to solve the Laplace, heat and wave equations for a variety of boundary conditions in domains of simple geometry and with simple boundary conditions; the techniques available will include, separation of variables. 3. Able to develop an ability to use theorems to compute the Laplace transform, inverse Laplace transforms. 4. Able to develop an ability to understand basics of statistics and probability. 5. Able to develop an ability to calculate the gradients and directional derivatives of functions of several variables 6. Able to develop an ability to use Green's theorem to evaluate line integrals along simple closed contours on the plane.

Course Contents

Unit 1	Differential equations:	(09 Hrs.)
Solution of Linear differential equation of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's (Homogeneous type) and Legendre's linear equations. Simultaneous linear differential equations, Total differential equation, Symmetrical Simultaneous differential equations.		
Unit 2	Applications of differential equations:	(08 Hrs.)
Application to mass spring systems with coupled masses, equivalent electrical circuits. Solution of multi degree of freedom systems (Vertical and Horizontal). By matrix method, Natural frequencies and normal modes of vibration. Applications of Partial differential equations: Solution of wave equation, one and two-dimensional heat flow equation by method of separating variables. Application to mechanical and allied engineering problems.		
Unit 3	Transforms:	(09 Hrs.)
Fourier <u>t</u> ransforms: Fourier integral theorem, Fourier sine and cosine integrals, Fourier Transform,		

Fourier sine and cosine transforms, Inverse Fourier transforms, Solution of boundary value problems using Fourier transform (Diffusion equation only). La place Transform: Definition, Properties and Theorems, Inverse Laplace transform, Methods of finding inverse Laplace transform, Application to solution of linear differential equations.		
Unit 4	Statistics and Probability:	(09 Hrs.)
Measures of central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates. Probability density function and probability mass function, Binomial, Poisson's, Normal and Hyper geometric distributions, Test of Hypothesis: Chi-Square test of goodness of fit and Independence of attributes, Introduction to Decision and Quality control.		
Unit 5	Vector Differentiation:	(09 Hrs.)
Radial, Transverse, Tangential, Normal components of linear velocity and acceleration, Gradient, Divergence and Curl, Directional derivative, vector identities Irrotational and Solenoidal Vector fields.		
Unit 6	Vector Integration:	(08 Hrs.)
Line integral, Surface integral and Volume integral, Work done, Gauss- Divergence theorem, Stoke's theorem and Greens lemma. Applications to fluid flow, Streamline's, Continuity equation, Motion equation and Bernoulli's equation.		

Text Books/ Reference Books

1. Wylie C. R. and Barrett L. C. Advanced Engineering Mathematics, McGraw-Hill.
2. M. D. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson Education.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, Delhi.
4. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volume I & II), Vidyarthi Griha Prakashan.
5. Irwin Miller and John E. Freund, Probability and Statistics for Engineers, Prentice-Hall of India.
6. Peter V. O'Neil, Advanced Engineering Mathematics, 5th Edition, Thomson learning Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd.

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

INTERNAL COMBUSTION ENGINES
(Course No.K60204)

Designation of Course	Internal Combustion Engines		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- -- Hours/ Week	Unit Test	20 Marks	
	T. W. & Pr.	50 Marks	

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Basic information of thermodynamics. 2. Basic knowledge of fluid mechanics.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Identifying different components of IC engines 2. Able to calculate efficiency of different air standard cycles 3. Able to understand working principles of carburetors, fuel injection systems, fuel pumps 4. Determination of power, fuel consumption, efficiency of the engine 5. Understand detonation and knocking processes 6. PUC norms Bharat I-IV and Euro I-IV

Course Contents

Unit 1	Constructional Features of Reciprocating I. C. Engine: And Cycle Analysis of I. C. Engines:	(08 Hrs.)
Engine components and Engine classification. Fuel air cycle analysis .Comparison of P-V diagram of air standard cycles Fuel air cycle & actual cycle.		
Unit 2	Fuel Supply Systems:	(08 Hrs.)
S.I. Engines: Carburetion, Mixture requirements, Essential parts of modern carburetor, Carburetors used on automobiles, Calculation of A/F ratio, M.P.F.I. system for modern automobile engines. C.I. Engines: Functional requirements of an injection system, Typical arrangement of solid injection system, Types of fuel injection system, Fuel pump & fuel injectors, Quantity of fuel & size of nozzle orifice.		
Unit 3	Ignition System:	(08 Hrs.)
Battery & coil ignition system Magneto ignition system Electronic ignition system Advantage over mechanical contact breaker point system Engine Cooling System: Air cooling, Water cooling, Thermostatic radiators Lubrication System: Dry sump lubrication Wet sump lubrication – Fully pressurized, Oil filters Governing System: Quality governing Quantity governing, Hit & miss governing		
Unit 4	Testing & Performance of I. C. Engine And Supercharging:	(08 Hrs.)
Determination of brake power, Indicated power, Friction power, Determination of brake thermal efficiency, Mechanical efficiency, Volumetric efficiency, Energy balance, Performance characteristics. Objects of supercharging, Effects on performance, Limits, Methods of supercharging & turbo charging, Limitation of turbo charging.		

Unit 5	Combustion in S. I. Engines And Combustion in C. I. Engines:	(08 Hrs.)
Stages of combustion, Effect of engine variables on ignition lag & flame propagation, Abnormal combustion: Theories, Effects & Controlling measures, Combustion chambers for S. I. engines. Stages of combustion, Ignition delay & factors influencing delay period, Diesel knock & its control, Combustion chambers for C. I. engines.		
Unit 6	Emissions & Pollution Control And Fuels:	(08 Hrs.)
Emissions from S. I. and C. I. engines & their harmful effects, Catalytic convertors, Contemporary & proposed emission norms, BHARAT I to IV emission norms. Types of fuels for I. C. engines, Rating of S. I. & C. I. engine fuels, Alternative fuels for I. C. engines & future trends, Hybrid vehicles.		

Term Work

1. A journal containing record of any eight experiments of the following: Study of carburetor / MPFI system
2. Study of fuel pump & injector.
3. Trial on multi cylinder petrol engine – Morse Test.
4. Trial on diesel engine to determine energy balance & variable load performance. Variable speed trial on petrol / diesel engine.
5. Trial on computerized I. C. engine to plot P – θ diagram.
6. Trial / demonstration of smoke meter & exhaust gas analyzer. Study of battery, magneto & electronic ignition system.
7. Study of superchargers & turbochargers.
8. Study of combustion chambers in S. I. & C. I. engines.

Text Books/ Reference Books

1. Ganeshan V., Internal Combustion Engines, Tata McGraw Hill Publishing House
2. L. Mathur & R. P. Sharma, A Course in I. C. Engines, Dhanpat Rai & Sons
3. V. M. Domkundwar, A Course in I. C. Engines, Dhanpat Rai & Co.
4. I. C. Engines, R. K. Rajput, Laxmi Publications (P) Ltd. – New Delhi
5. Shrinivasan, Automobile Engines, Tata McGraw Hill Publishing House – CBS Publication

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

THEORY OF MACHINES- I
(Course No: K60205)

Designation of Course	Theory of Machines- I	
Teaching Scheme:	Examination Scheme:	
Theory:- 04 Hours/ Week	Theory	80 Marks
Practical:- 02 Hours/ Week	Duration	04 Hours
Tutorials:- -- Hours/ Week	Unit Test	20 Marks
	T. W. & Or.	50 Marks

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Mathematics 2. Engineering Mechanics
Course Outcomes:-	<ol style="list-style-type: none"> 1. Understand various concepts related to mechanisms of machines 2. Use mechanism for appropriate application 3. Draw velocity, acceleration, inertia force polygons 4. Calculate velocity, acceleration of mechanism elements 5. Calculate forces on different parts of engine 6. Understand synthesis of mechanisms

Course Contents

Unit 1	Basic Concept and Definition	(06 Hrs.)
Link - Binary, ternary, quaternary, Structure, Machine, Mechanism, Kinematic pair - Classification, Kinematic Chain and Mechanism - Grubler's criteria for movability of chains and mechanism as locked constrained, Unconstrained based on grubler's criteria, Inversion of single slider and double slider crank chain, Inversion of four bar chain.		
Unit 2	Mechanism with lower Pair	(06 Hrs.)
Study of Pentograph, Study of exact straight line motion mechanism, Study of approximate straight line motion mechanism, Steering Gear Mechanisms, Hook's or Universal joint, Ratchets and Escapement Mechanism, Swinging / Rocking Mechanism, Indexing Mechanism.		
Unit 3	Velocity and Acceleration Analysis	(12 Hrs.)
Instantaneous centre method to determine velocities, Methods of locating Instantaneous center, Kennedy's theorem of three centers, Body and space Centroides. Relative velocity and Relative acceleration Method, Coriolis component of acceleration. Klien's construction.		
Unit 4	Analytical Method	(06 Hrs.)
Velocity and Acceleration by Vector Algebra, Complex Algebra and Analytical method.		
Unit 5	Static and Dynamic Force Analysis	(10 Hrs.)
D'Alemberts Principle, Radius of gyration of rigid bodies, Theory of compound pendulum, Bifillar & Trifillar Suspension, Dynamically equivalent system, correction couple Inertia in I.C. Engine Mechanism by analytical and graphical Method, Inertia of Geared system.		
Unit 6	Introduction to Analysis and Synthesis of Mechanism	(08 Hrs.)
Type, Number and Dimensional Synthesis, Function Generation, Path Generation and Body Guidance, Two position synthesis of slider crank mechanism, Two position synthesis of crank and rocker mechanism, Crank rocker mechanism with optimum transmission angle, Three positionsynthesis, Frudenstein method.		

Term Work

1. Determination of Moment of inertia by Bifilar / Trifillar Suspension Method.
2. Compound Pendulum.
3. Experimental verification of displacement relation of different shaft angle for single Hooke's joint
4. Assignment
5. Developing a computer program for velocity and acceleration analysis of slider crank mechanism / Four bar mechanism.
6. Study of steering gear mechanism.
7. Drawing sheets
8. Velocity by Instantaneous Centre Method
9. Relative Velocity and Relative Acceleration Method
10. Coriolis component of acceleration.
11. Straight line Motion Mechanism.
12. Inertia force analysis using graphical method

Text Books/ Reference Books

1. Thomas Bevan, Theory of Machine, CBS Publication
2. J. E. Shingley, Theory of Machine, McGraw Hill
3. John Hannah and R. C. Stephens, Mechanics and Machines, Advanced theory and examples, Edward Arnold
4. R. S. Khurmi and J. K. Gupta, Theory of Machines, Eurasia Publishing House
5. S.S. Rattan, Theory of Machines, McGraw Hill
6. Abdulla Shariff, Theory of Machine, Dhanpat Rai Publication
7. P. L. Ballney, Theory of Machines, Khanna Publications

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

MATERIAL SCIENCE AND ENGINEERING METALLURGY

(Course No: K60243)

Designation of Course	Material Science and Engineering Metallurgy		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical:- 02 Hours/ Week	Duration	03 Hours	
Tutorials:- - Hours/ Week	Unit Test	20 Marks	
	T.W. & Or.	50 Marks	

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Physics 2. Engineering Chemistry
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to do selections of metals and non-metals as per mechanical properties, density, ductile and brittle. 2. Able to do Mechanical testing, Nondestructive as per standard methods. 3. Able to do Plotting of Equilibrium diagram and use it in manufacturing for producing different types of alloys. 4. Able to do working in Steel Manufacturing industry as well as processing industry. 5. Able to do work in ceramics and composite manufacturing industry. 6. Able to do apply knowledge of Nonferrous metals in actual industrial and society problems related to corrosion

Course Contents

Unit 1	Crystal Structure of Metals and Plastic Deformation	(08 Hrs.)
Study of crystal structure, Indexing of planes and directions, Imperfections in crystals, Mechanism of plastic deformation, Deformation of single crystal, Polycrystalline metals, Critical resolve shear stress, Work Hardening, Cold and hot working, Annealing and re - crystallization.		
Unit 2	Mechanical Testing of Metals:	(08 Hrs.)
Study of destructive testing, Tensile test, Engineering stress and true stress strain, Numerical based on Evolution of properties, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non Destructive testing such as Liquid dye penetrate test, Magna flux test, Eddy current test, Ultrasonic testing and Radiography testing.		
Unit 3	Study of Equilibrium Diagrams:	(08 Hrs.)
Related terms and their definitions, Hume Ruther's rule of solids solubility, Allotropy and polymorphism, Solidification, Dendritic growth, Cooling curves, Plotting of Equilibrium diagrams, Lever rule, Coring, Eutectic system, Partial eutectic and eutectoid system, Non Equilibrium cooling and its effects.		
Unit 4	Study of Steel and Cast Irons:	(08 Hrs.)
Production of steel and cast Irons, Allotropy of Iron, Iron and Iron Carbide Equilibrium Diagram, Classification of Steels, Specifications of steels, Plain Carbon steel, Applications and microstructure of steels, Study of cast iron, Classification and applications of cast irons, Properties and manufacturing methods, Effect of alloying elements Alloy cast irons etc.		

Unit 5	Study of Non-Ferrous Materials:	(08 Hrs.)
Introduction, Copper and its alloy, Alpha and alpha beta brasses, Zinc Equivalent, Copper Nickel alloy, Bronzes, Aluminum and its alloy, Precipitation and age hardening, Dispersion strengthening, Nickel and its alloy, Metals at High and Low Temperature, Bearing Materials etc.		
Unit 6	Study of Composite Materials and Ceramics:	(08 Hrs.)
Introduction, Classification of composites, Types of composite, Properties, Metal matrix composite, Ceramic matrix composite, Fiber Reinforced plastic, Manufacturing methods, Applications in Different field. Ceramic, Properties and applications of ceramics. Manufacturing of ceramics.		

Term Work

List of Experiments :(AnyEight)

1. Tensile test to determine strength and other mechanical properties
2. Hardness test Brinell and Vickers
3. Rockwell and Poldi hardness test
4. Study of Microstructure of plain carbon steel
5. Study of Microstructure of cast irons
6. Magnetic Particle test
7. Liquid Penetrate test
8. Ultrasonic Test
9. Visual inspection of casting and welded components

Text Books/ Reference Books

1. Dr. V. D Kodgere, Material Science and Physical Metallurgy, Everest Publication,
2. Pune S H Avner, Physical Metallurgy, McGraw Hill Publication
3. O. P. Khanna, Material science and metallurgy, Khanna Publication, Delhi
4. R K. Rajput, Material Science and Engineering, S K Kataria and Sons Publication, Delhi

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

COMPUTER AIDED DRAFTING AND MACHINE DRAWING
(Course No: K60206)

Designation of Course	Computer Aided Drafting And Machine Drawing		
Teaching Scheme:	Examination Scheme:		
Theory:- 04 Hours/ Week	Theory	80 Marks	
Practical: 02 Hours/ Week	Duration	04 Hours	
Drawing:- 02 Hours/ Week	Unit Test	20 Marks	
	T.W. & Pr.	50 Marks	

Course Prerequisites:-	Student should have knowledge of engineering graphics and fundamentals of computer.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to design simple components with tolerances 2. Able to understand different types of joints used in engineering practices 3. Able to interpret the assembly drawing and draw components drawing. 4. Able to use CAD Software. 5. Able to understand 3D drawings and surface modelling 6. Able to understand basic concepts in AUTOLISP

Course Contents

Unit 1	Dimensioning Practices:	(04 Hrs.)
<p>Terms and Notations, Leader, Extension Lines, Terminations and Origin indication, Functional dimension, Non-functional dimension, Datum dimension, Redundant and auxiliary dimension, Chain dimensioning, Running dimensioning, Co-ordinate dimensioning, Symmetrical or equidistant dimensioning, Methods of dimensioning Common features: Diameters, Radii, Hole sizes, chamfers, Screw threads, Chords, Arcs, Angles, Spheres, Cylinders, Squares. Conventional Representation of Machine Components As per SP-46 (1988), ISO Systems of Tolerancing, Tolerance and Allowances, Unilateral and Bilateral limits. Maximum Material Condition (MMC), Methods of tolerance, Indications of deviations and limits of sizes, Tolerances for linear and Angular dimensions, Types of fits with symbols and applications, Types of nut locking arrangements, Threaded hole and stud assembly. Set screws: Grub screws, Geometric Tolerancing, General definitions, Symbols, Interpretations, Conventional representation on part drawing Surface Roughness: Surface feature, Machining symbols, Roughness value (Ra) Roughness grade numbers, Conventional representation on part Drawing, Manufacturing process and Surface finish.</p>		
Unit 2	Types of joints:	(04 Hrs.)
<p>Thread forms and their properties, Standard Tables of ISO Metric Threads, Thread designation, Single and multi start threads, Right and left hand threads, Types screws, bolt and nuts, Types of nut locking Arrangements, Threaded hole and stud assembly, Set screws, Grubs screws, Screwed Joints Welded Joints, Types of pipes and pipe joints, Flange joint Spigot and socket joints , Cotter joint, Hydraulic pipe joints Screwed and flanged union , Expansion joints, Stuffing box and Gland, Piping Layouts, Conventional representation of pipe fitting</p>		
Unit 3	Assembly and Part Drawing:	(08 Hrs.)
<p>Production Drawing, Bill of Materials Assembly and Part Drawings, Such as: Boiler mounting, Steam engines, Machine tools, Automobile Parts</p>		
Unit 4	Introduction to Computer Aided Drafting:	(06 Hrs.)

Working Interface of AutoCAD, Drawing Limits, Creating 2-D Drawing in AutoCAD, AutoCAD commands, Editing commands in AutoCAD, Dimensioning in AutoCAD, Creating text in Auto CAD, Changing object properties Scale, Object Snap Mode, Display control in AutoCAD, Layer		
Unit 5	3-D Drawing, Surface Modeling:	(10 Hrs.)
WCS, View Point, and UCS, Working with UCS, Orthographic Views Surface Modeling: Box, Wedge, Pyramid, Cone, Sphere, Dome, Dish Introduction to Solid Modeling: Box, Wedge, Cylinder, Cone, Sphere, Extrude, Revolved, Slice section, Union, Subtract.		
Unit 6	Introduction to AUTOLISP:	(08 Hrs.)
Concepts of Parametric Programming Data Types AUTO LISP, Integers, Real Numbers, Strings, Symbols Lists, Selection Sets, Data Types Conversion: Integer to Real, String List, Real to Integer, AUTO LISP Math Functions: Addition, Subtraction, Multiplication, Division Maximum and Minimum of Numbers, Remainder and Exponential Operating Functions. Get Functions for user input, Working with Lists and Entities, and Filtering from Lists, Editing Lists and Entities Introduction to Decision. Making and Looping in AUTO LISP.		

Term Work

1. Firstsheetbasedondimensioningpractice,conventionandsymbolsinmachine drawing
2. TwoDrawingAssignmentsbasedonAssemblyandDetailsofMachineParts,Automobile parts, Engine, Boiler parts etc. (One Drawing assignment preferably on Auto CAD)
3. Four Auto CAD drawing assignments
4. Four Auto Lisp Programming assignments

T.W. & Oral

Term work and oral will be based on above syllabus

Practical Assignment Schemes

1. Signals And Systems
2. Concerned staff member is directed to frame two assignments on each Unit

Text Books/ Reference Books

1. SP46:1988,EngineeringDrawingPracticeforSchoolandColleges
2. George Omura, The ABC's of AutoLisp, BPB Publications,1990, New Delhi
3. Warren J. Luzadder and Jon M. Duff, Fundamentals of Engineering Drawing, PHI Pvt. Ltd., 11th edition, 1995, New Delhi
4. K. L. Narayana, P. Kannaiah and K. Venkata Reddy, Machine Drawing, New Age Int. (P) Ltd., 2nd edition, 1999, New Delhi
5. N. D. Bhattand V. M. Panchal, Machine Drawing, Charotar Publishing House, 33rd edition, 2000, Anand
6. R. B. Gupta, Machine Drawing, SatyaPrakashan,7th edition,2000, New Delhi
7. P. S. Gill, Machine Drawing,S. K. Kataria & Sons,17th edition,2004, Delhi
8. N. Sidheswar, P. Kannaiah and V. V. S. Sastry, Machine Drawing, Tata McGraw Hill, 28th reprint, 2004, Delhi
9. M. D. Junnarkar, Machine Drawing, Pearson Education (Singapore) Pvt. Ltd., 1st edition, 2005, Delhi

Unit Tests-

Unit Test-I	Unit-I, II
Unit Test-II	Unit-III, IV
Unit Test-III	Unit-V, VI

WORKSHOP PRACTICE IV
(Course No.K60244)

Designation of Course	Workshop Practice IV		
Teaching Scheme:	Examination Scheme:		
Theory:- -- Hours/ Week	Theory	-- Marks	
Practical:- 02 Hours/ Week	Duration	-- Hours	
Tutorials:- -- Hours/ Week	Unit Test	-- Marks	
	T. W. & Or.	50 Marks	

Course Prerequisites:-	Students should have knowledge of welding, machining, drilling and manufacturing techniques.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to perform different operations on lathe and drilling machines 2. Able to perform different operations on milling machine 3. Able to perform different operations on grinding machine 4. Able to get knowledge of NC/CNC machines.

Course Contents

Content:

Each candidate shall be required to complete and submit the following term work.

Part - A:

One composite job consisting of machining of components covering operations on: Lathe, Shaping Drilling, Milling, Grinding Machines. Composite job should consist of 3 to 4 components and covering 5 to 6 different machining operations including one precision turning operation.

Part - B:

Demonstration on NC/CNC machine or trainer for manufacturing of simple components.

Journal:

A journal will have assignments of M/C tools. This should include sketches and description as given below - (Any Five)

1. Moulding and core testing (clay content test, moisture content test)
2. Fluidity test using fluidity spiral.
3. Green strength of mould and green strength of core.
4. At least one assignment on casting process.
5. Demonstrations of Grinding machine
6. Assignment on Grinding Machine
7. Demonstration and assignment on non-conventional machining process.

Practical Examination:

A practical examination of Six hours based on term work shall be conducted at the end of semester.

Rules regarding ATKT, Continuous Assessment and award of Class

A. T. K. T.

- A candidate who is granted term for B. Tech. Semester-I will be allowed to keep term for his/her B. Tech. Semester-II examination even if he/she appears and fails or does not appear at B. Tech. Semester-I examination.
- A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B. Tech. Semester-IV examination even if he/she appears and fails or does not appear at B. Tech. Semester-III examination.
- A candidate who is granted term for B. Tech. Semester-V will be allowed to keep term for his/her B. Tech. Semester-VI examination if he/she appear and fails or does not appear at B. Tech. Semester-V examination.
- A candidate who is granted term for B. Tech. Semester-VII will be allowed to keep term for his/her B. Tech. Semester-VIII examination if he/she appears and fails or does not appear at B. Tech. Semester-VII examination.
- A candidate shall be allowed to keep term for the B. Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B. Tech. Semester-I & II taken together.
- A candidate shall be allowed to keep term for the B. Tech. Semester-V of respective course if he/she has no backlog of B. Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.
- A candidate shall be allowed to keep term for the B. Tech. Semester-VII course if he/she has no backlog of B. Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

- In respect of Term work at B. Tech. Semester-I & II, B. Tech. Semester-III & IV and B. Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment

or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

- Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.
- For B. Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

- Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or more marks but less	First Class
C	Aggregate 55% or more marks but less	Higher Second Class
D	Aggregate 50% or more marks but less	Second Class
E	Aggregate 40% or more marks but less	Pass Class



BHARATI VIDYAPEETH UNIVERSITY, Pune.

(Established under Section 3 of UGC ACT 1956)



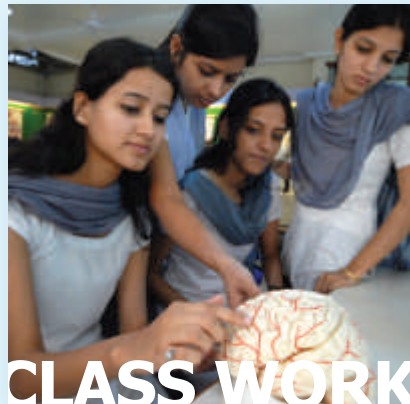
PRACTICAL

C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (BIOMEDICAL)
(Sem. III & IV)**



FIELD WORK



CLASS WORK



COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (BIOMEDICAL) (Sem. III & IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

Biomedical Engineering is the application of Engineering Principles & Techniques to the medical field. It combines the design & problem solving skills of engineering with medical & biological sciences to help improve patient health care & the quality of life of individual.

Biomedical Engineering is an interdisciplinary field, influenced by various fields & sources. It integrates physical, chemical, mathematical & computational sciences & Engineering principles to study biology, medicine, human behavior & health. It advances fundamental concepts; creates knowledge from the molecular to the organ system behavior & develops innovative biologies, materials, processes, implants, devices & informatics approaches of disease for patient rehabilitation & for improving health.

Biomedical Engineering is a study that uses engineering expertise to analyze & solve problems in biology & medicine. It is usually based on one of the traditional engineering disciplines, such as Electrical or Mechanical Engineering. There has been a great expansion of Biomedical Engineering in areas such as Medical Electronics, Clinical Engineering, Bio-materials, & Rehabilitation Engineering.

The scope of the field is enormous; from cardiac monitors to clinical computing, artificial hearts to contact lenses, wheel chairs to artificial tendons, modelling dialysis therapy to modelling the cardiovascular systems. In most aspects of health care, disease prevention & treatment or rehabilitation, there are problems that require an engineering approach. These may include developing systems to maintain & enhance life, designing replacement parts for people, or creating systems to allow the handicapped to use computers for work & communication.

Major Groups / Areas

Biomedical Instrumentation, Biomedical Digital Signal Processing, Nuclear Medicine, Advanced Medical Imaging, Biomechanics and Biomaterials

Major Equipments

X-ray Machine (Demo type), ECG Stress Test Software with Tread Mill, Blood Cell Counter, Spectrophotometer (Demo Type), Gas Chromatography System (Demo Type), Pacemaker (External/Internal)(Demo type), Defibrillator (Demo Type), Solid State Electrosurgery (Demo Type).

Software

MATLAB, Labview, EEG Software, EMG Software, ECG Stress Test Software, PET Software, ECG Central Monitoring Software, ECG Monitoring Software.

Laboratories

Biomedical Lab - I, Biomedical Lab - II



STRUCTURE & EXAMINATION PATTERN

B. Tech. - Biomedical Engineering

Semester III								Total Duration : 28Hrs/Week
								Total Marks : 750
Subject Code	Subject	Teaching Scheme(Hrs)		Examination Scheme				Total
		L	P	Theory	Unit Test	TW & Pr.	TW & Or.	
K50211	Signals & Systems	04	-	80	20	-	-	100
K50242	Electronic Devices & Circuits - I	04	04	80	20	50	50	200
K50243	Human Biology	04	02	80	20	-	50	150
K70201	Engg. Mathematics-III	04	-	80	20	-	-	100
K50245	Network Theory	04	02	80	20	50	50	200
Total		20	08	400	100	100	150	750

Teaching Scheme		Examination Scheme				Total
Lectures	Practical	Theory	Unit Test	T. W. & Pr	T. W. & Or.	
20	08	400	100	100	150	750

Semester IV								Total Duration : 30Hrs/Week
								Total Marks : 750
Subject Code	Subject	Teaching Scheme(Hrs)		Examination Scheme				Total
		Lect.	Prac.	Theory	Unit Test	TW & Pr.	TW & Or.	
K50246	Biomechanics-I	04	02	80	20	-	50	150
K50247	Electronic Instruments	04	-	80	20	-	-	100
K50248	Biochemistry	04	02	80	20	-	50	150
K50249	Principles of Instrumentation & Measurements	04	02	80	20	-	50	150
K50250	Electronic Devices and Circuits-II	04	04	80	20	50	50	200
Total		20	10	400	100	50	200	750

Teaching Scheme		Examination Scheme				Total
Lectures	Practical	Theory	Unit Test	T. W. & Pr.	T. W. & Or.	
20	10	400	100	50	200	750



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III



TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(07 Hours)

Introduction To Signals:

Signals: Definition of signal, Classification of signals. Continuous and Discrete time, Analog & Digital, Periodic & Non-periodic, Deterministic and non-deterministic, Energy & Power. Basic Signals & Operations on signals, Sine, Cosine, Exponential, and Unit step, Unit impulse, even, odd. Time shifting, time scaling, Differentiation and integration of signals.

Unit-II

(09 Hours)

Classification of Discrete Time System:

Definition, Classification, Linear & Nonlinear, Time variant and time invariant, Causal & Non-Causal, Static & dynamic, Stability.

LTI System Analysis: Introduction to LTI systems. Block Diagram & System Terminology. Impulse response. Convolution & Methods of Convolution. Properties of convolution, System interconnections, stability & impulse response of systems to standard signals.

Unit-III

(08 Hours)

Continuous Time System Analysis:

Response of LTI systems to exponential signals, periodic signals. Fourier series, Fourier transforms, properties, application of Fourier series & Fourier transforms to the system analysis.

Laplace Transforms: Definition and its properties, methods of inversion (Review only), application to LTI system analysis.

Unit-IV

(09 Hours)

Sampling Theorem And Correlation:

Correlation The correlation function: Conceptual basis, Energy signals, power-signals, Autocorrelation: Relation to signal energy and signal

power, Properties of auto-correlation, Crosscorrelation: Properties of cross-correlation, Sampling Theorem and its proof, effects of under sampling, sampling of band pass signals.

Unit-V

(08 Hours)

Probability:

Sample space, Event, Probability, Conditional Probability and statistical independence. Random Variables, Discrete Random Variable, Cumulative Distributive Function, Continuous Random Variable, Probability Density Function, Properties of CDF and PDF.

Unit-VI

(07 Hours)

Random Variables And Random Processes:

Transformation of random variables, Statistical averages, Mean, Moments and expectations, Standard Deviation and Variance, Chebyshev inequality, Multivariate expectations. Probability models, Binomial, Poisson's, Gaussian, Rayleigh.

Random Process: Ensemble averages and correlation functions, Ergodic and stationary process. Gaussian process.

Text Books /References

Roberts M J, "Signals & Systems" TMH

Oppenheim, Wilsely & Nawab, "Signals & Systems" (NIGH) V C

Alan V. Oppenheim, Alan S. Willsley, "Signals & Systems", PHI

John G. Proakis, "Digital Signal Processing", PHI

Rodger E. Ziemer, William H. Tranter, "Signals & Systems, Continuous & Discrete",
MGH

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI

**TEACHING SCHEME**

Lectures : 04 Hrs/week

Practical : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Study of Electronic Materials & Components and Semiconductor Diode Characteristics:

Classification of materials based on band gaps, types of resistors like fixed, variable, precision, Carbon film, metal film, wire wound, their standard values, specifications & applications, classifications of capacitors based on dielectrics, standard values, specifications & application of capacitors, types of capacitors like electrolytic, ceramic, paper, mica, tantalum, plastic film etc., study of different core materials depending on range of frequencies for inductors & transformers, semiconductor materials Si, Ge, AIII & BV group components with their properties. Diffusion phenomenon, voltage equivalent of temperature, total current (drift diffusion), current components in forward biased/reverse biased p-n junction diode, cut in voltage, reverse saturation current.

Unit-II

(08 Hours)

Application of Semiconductor Diodes:

Diode as rectifier, half wave, full wave & bridge rectifier with and without capacitor filter, different types of filters L-section & choke input, parameters like ripple factor efficiency, transformer utilization factor (TUF), peak inverse voltage (PIV), I_{max} , I_{surge} , Derivation of ripple factor for L, C & L section filter, bleeder resistor, diode as a wave-shaping element in clipping and clamping circuits, voltage multipliers.

Unit-III

(08 Hours)

Bipolar Junction Transistor (BJT):

BJT as a two port device, configuration of BJT [Common Emitter (CE) / Common Base (CB)/Common Collector (CC)], input-output and transfer characteristics in all three configurations with relevant V-I expressions and

definitions of DC current gains, concept of load line and quiescent point (Q point) with active, cut off, saturation region of operation of BJT, early effect and punch through effect, various biasing circuits for CE configuration, definition of stability factors for CE transistor and their derivations for above circuits, condition to avoid thermal runaway, absolute maximum ratings of BJT as referred to data sheets.

Unit-IV

(08 Hours)

BJT as Small Signal Amplifier:

Small signal low frequency (LF) - h parameter model in CE, CB, CC configuration concept of AC equivalent circuit of single stage amplifier, need of coupling and bypass capacitor; analysis CE, CB, CC amplifier for current gain (A_i), voltage gain (A_v), input impedance (R_i), output impedance (R_o) in terms of h-parameter, simplified h-parameter model, effect of biasing and source resistance on performance of single stage amplifier, concept of frequency response.

Unit-V

(08 Hours)

Field Effect Transistor (FET):

Construction of p-channel and n-channel junction field effect transistor (JFET), depletion metal oxide semiconductor FET (D-MOSFET), enhancement metal oxide semiconductor FET (E-MOSFET) output and transfer characteristics of each with definitions of parameters like transconductance (g_m), drain resistance (r_d), and biasing techniques for all types, small signal LF model of FET, analysis of [Common Source (CS), Common drain (CD), Common gate (CG)] amplifier for voltage gain and input- output impedance, comparison of BJT / JFET and metal oxide semiconductor FET (MOSFET), frequency response for FET amplifier, absolute maximum ratings / specifications of FET as referred to data sheet.

Unit-VI

(08 Hours)

Considerations of Printed circuit boards (PCB):

Design fabrication and assembly: mechanical dimensions of devices and components used in electronics circuit and their dependence on package of device, rules of preparing layout and drawing artwork, fabrication process of single sided PCB board, double sided printed through holes (DPTH), various copper clad laminates, composition of solder metal.

List of Practical

Study of electronic components
Study of CRO
Study of Clippers and Clampers
Biasing Circuits
Frequency response of single stage CE amplifier
Comparison of CE, CC, CB amplifier
FET as an amplifier
Half wave and Full wave rectifier
Opto-isolator
FET characteristics
H-parameter measurement
PCB design of small circuits

Text Books / References

Millman & Halkias, "Integrated Electronics", Mc Graw Hill
Millman & Halkias, "Electronic Devices & Circuits", Mc Graw Hill
Boylestad & Nashelsky, "Electronic Devices & Circuits", PHI
Allen Mottorshed, "Electronic Devices & Circuits", PHI
David A. Bell, "Electronic Devices & Circuits", PHI
Sedra Smith, "Microelectronics Circuits", Oxford International Edition

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

General Anatomy:

Cell, Tissues, Six parts of the Body, Types of Bones with Examples, Bones of Upper & Lower Extremities, Special groups of Muscles, Skin

Unit-II

(08 Hours)

Systemic Anatomy:

Organ & Structures of following Systems: Cardiovascular System, Respiratory System, Gastrointestinal System, Excretory System, Reproductive System.

Unit-III

(08 Hours)

Central Nervous System & Special Senses:

In Short Anatomy of Cerebrum, Cerebellum, Brain Stem & Spinal Cord, Eye, Ear, Nose & Tongue

Unit-IV

(08 Hours)

Physiology of Cardio-Respiratory System:

Blood: Plasma & Blood Components, Coagulation, Hemoglobin, Blood Groups, Blood Transfusion; Vessels: Pulse, Blood Pressure; Heart: Parts, Conducting System, Cardiac Cycle, ECG, Physiology of Respiration: External Respiration, Gaseous Exchange, Artificial Respiration, Spirometer, Peak flow meter

Unit-V

(08 Hours)

Physiology of Gastrointestinal, Reproductive & Endocrine System:

Secretions of all digestive organs & Their Functions, Physiology of Nephron, Urine Formation Excretion of Urine & Function of Kidney, Functions of Male & Female Reproductive Organs, All Endocrine Glands, their Secretions & Functions & Control of Secretions.

Unit-VI

(08 Hours)

Physiology of Nervous System & Sense Organs:

Functions of Cerebrum, Cerebellum, Brain Stem & Spinal Cord, Functions of Eye, Ear, Nose, Tongue & Skin.

List of Practical

Study of anatomy of Tissue, Cell

Study of anatomy of Endocrine system and Skeleton system

Study of physiology of Blood and Cardiovascular system

Study of physiology of Nervous System

Study of Spirometer and peak Flow Meter

Study of physiology of Female Reproductive System and Male Reproductive System

Text Books/References

Tortora and Grabowski, "Principals of Anatomy and physiology", Harper Collin Publication

B. D. Chaurasia, "General Anatomy", Third Edition, CBS Publications

Sujit K. Chaudhari, "Medical physiology", Second Edition, New central book agency (P) Ltd., India

Arthur C. Guyton, "Medical Physiology", Prism Book

William Ganong, "Review of Medical Physiology", Prentice Hall International

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(09 Hours)

Differential Equations:

Solution of Linear differential equation of nth order with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's linear equations, Simultaneous linear differential equations, Total differential equations, Symmetrical simultaneous differential equations. Applications to Electrical circuits

Unit-II

(08 Hours)

Complex Variables:

Function of complex variables, Analytic function, Cauchy-Riemann equations, Conformal mapping, Bilinear transformation, Residue theorem, Cauchy's Integral theorem and Cauchy's Integral formula.

Unit-III

(09 Hours)

Transforms:

Fourier transforms: Fourier integral theorem, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms, Inverse Fourier transforms, Discrete Fourier transform and its applications. Z- Transform: Definition, Properties, Inverse Z-Transform, Applications to difference equation, Relationship between Z-Transform and Fourier Transform.

Unit-IV

(09 Hours)

Laplace Transform:

Definition, Properties and Theorems, Inverse Laplace transform, Methods of finding Inverse Laplace transforms, Laplace transform of Unit-step function, Dirac-delta functions, Periodic functions, Ramp functions, Error function, First order Bessel's function, $Si(t)$, $Ci(t)$, $Ei(t)$. Applications to solution of linear differential equations.

Unit-V

(09 Hours)

Vector Differentiation:

Vector Differentiation, Gradient, Divergence and Curl, Directional derivative, Vector identities, Irrotational and Solenoidal vector fields.

Unit-VI

(08 Hours)

Vector Integration:

Line integral, Surface integral and Volume integral, Work done, Gauss-Divergence theorem, Stoke's theorem and Green's lemma, Applications to Electromagnetic fields.

Text Books/References

Peter V. O'Neil, "Advanced Engineering Mathematics", 5e, Thomson Learning
Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
Wylie C. R. and Barrett L. C., "Advanced Engineering Mathematics", MGH
M. D. Greenberg, "Advanced Engineering Mathematics", 2e, Pearson Education
B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi
P. N. Wartikar and J. N. Wartikar, "Applied Mathematics" (Volume I & II), Pune Vidyarthi Griha Prakashan
Murray R. Spiegel, "Laplace Transforms", Schaum's Outline Series - International Edition

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week
Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks
T. W. & Pr. : 50 Marks
T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Network Techniques and Network Theorem:

Network definition, mesh and node analysis, principle of duality, source transformation, simplification of network, T & Π conversion, twin T & Wien bridge network, Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Maximum power transfer theorem.

Unit-II

(08 Hours)

Transient analysis and Resonance:

Undriven and driven RC, RL, RLC circuits, initial conditions. Figure of merit (Q- factor), conditions for resonance, various properties of series and parallel resonance.

Unit-III

(08 Hours)

Two Port network:

Various types of four terminal networks, definition of characteristic impedance, propagation constant, image impedance, iterative impedance, calculation of above parameters

Unit-IV

(08 Hours)

Passive Filters:

Filter fundamentals, low pass filter (LPF), high pass filter (HPF), band pass filter (BPF), band stop filter (BSF) , prototype(constant K) and m derived filters, composite filters

Unit-V

(08 Hours)

Network Functions:

Terminals and terminal pairs, network functions, poles and zeroes and

their significance, Z, Y, H, ABCD parameters, interrelationship between parameters, interconnection of two port networks, study of ideal transformer.

Unit-VI

(08 Hours)

Network Synthesis:

Positive real function, properties of LC, RL, RC, driving point functions, realization of Positive real function (PRF) in four canonical forms for one Port network.

List of Practicals

- To study the various characteristics of two port network
- To study the Twin-T network
- Study of Z and Y parameters
- To study the characteristics of series and parallel resonance
- To verify superposition theorem, Norton's Theorem
- To study frequency response of Band Pass Filter
- To study frequency response of High Pass Filter
- To study frequency response of Low Pass Filter

Text Books / References

- A. Chakraborty, "Circuit Theory", Dhanpat Rai & Co.
- Franklin Kuo, "Network Analysis and Synthesis", Wiley Eastern
- D. Roy Chaudhary, "Network Analysis and Synthesis", Wiley Eastern
- John D. Ryder, "Network Lines and Fields", PHI

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



SEMESTER - IV



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

BioMechanics:

General principles of Biomechanics, Analysis of biological subsystems from Biomechanical view and rise modeling instrumentation

Tissue Biomechanics:

Direct, shear, bending and torque actions and the Corresponding stresses, strains in biological tissues, Stress relaxation and creep Stability & instability, biomechanical characterization of bone and the soft Connective (Skin, tendon, ligaments) covering structure, function and physiological Factors.

Unit-II

(08 Hours)

Movement Biomechanics:

Gait analysis, body and limb mass & motion characteristic actions, forces transmitted by joints, Joint forces result in the normal and disabled human body, normal and fast gait on the level, Strain and ramp ascent & descent, Joint replacement.

Unit-III

(08 Hours)

Prosthetics and Orthotics:

Principles in designing Orthosis and Prostheses: Principles of three point pressure, total contact, partial weight relieving. Positions of anatomical axis and corresponding movements of the body parts, International conventions with respect to above. Purpose for providing prostheses and Orthosis: Various aspects regarding diagnosis, Prognosis, stature and socio-economic conditions.

Unit-IV

(08 Hours)

Classification in Prosthetics and Orthotics :

Lower Extremity Orthosis and prostheses, Upper Extremity Orthosis and

Prostheses, Spinal Orthosis. Recent developments in Prostheses & Orthosis.

Unit-V

(08 Hours)

Material Technology in Prostheses and Orthosis:

Indigenous metals and their alloys. Different types of leather and leather tanning. Types of Rubber. Thermoplastic and Thermosetting resins. Wood and binding materials

Unit-VI

(08 Hours)

Artificial Machines and Implants:

Introduction, basic transport Paper, Artificial lungs / Respirator, Artificial Kidney, Intra- Aortic Balloon pumps.

List of Practicals

- Study of Hip Knee Ankle Foot Orthosis
- Study of Hip Knee Ankle Foot Prosthesis
- Study of Below Elbow Orthosis
- Lamination of Prosthesis
- Study of Milwaukee Brase
- Study of Hand Prosthesis and Orthosis

Text Books / References

- R. M. Kennedy, "A Textbook of Biomedical Engineering", Blackie Publication
- Prof. Ghista, "BioMechanics ", Private Publication, UAE
- White and Puyator, "BioMechanics ", Private Publication, UAE
- S. Sunder, "Textbook of Rehabilitation", Jaypee Publication
- Wise Donald, Trantolo Debra, "Encyclopedic Handbook of Biomaterials & Bioengg.", Dekker

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(08 Hours)

Error Analysis and Standards:

Types of errors, Statistical analysis of errors, probability of errors, Limiting errors, standards of measurements - classification - Primary, Secondary and working standards, standards for - mass, length, time, frequency, voltage, current, resistance, inductance, capacitance.

Unit-II

(08 Hours)

Input/Output Devices:

Digital I/O devices - punched card, paper tape, bar codes, line printer, ink jet printer, digital tape recording, Method of Digital recording, floppy disk, Displays - LED, LCD, LED seven segment display driver, Alpha numeric display, Bar graph display. Brief comparison with analog displays & recorders.

Unit-III

(08 Hours)

Digital Instruments:

Automation in voltmeter (ranging, zeroing, polarity indication), DMM (digital multimeter) circuit (block diagram), Accuracy & guarding of DVM, significance of $\frac{1}{2}$ & $\frac{3}{4}$ digits, Sine wave Generator, Square wave generator, Pulse generator, Function generator, Wave analyzer, Harmonic distortion analyzer, Heterodyne wave analyzer, spectrum analyzer, Frequency response analyzer, Lock-in amplifier.

Unit-IV

(08 Hours)

Digital Counters and Timers:

Circuitry of logic elements (DTL, TTL FAMILIES), Interfaces and LOGIC converters, Basic internal counter circuitry, modes of operation ac, rms, digital time and frequency. Ratiometric sampling plug in units and special functions, Accuracy.

Unit-V

(08 Hours)

Cathode Ray Oscilloscope:

Block Diagram, Delay line, Horizontal Deflection system, Vertical Deflection system, Types of CRO'S –single beam, double beam, digital storage and sampling, brief comparison between CROs, block diagram, its features like roll, refresh, sampling rate and specification. Application in Instrumentation and measurement, virtual oscilloscope.

Unit-VI

(08 Hours)

Sources of Noise and Preventive Maintenance:

Brief Descriptions towards Sources of noise and their reduction techniques, preventive maintenance and troubleshooting of electronic equipments.

Text Books/References

- A. J. Bouwens, "Digital Instrumentation", MGH- 1986
- T. S. Rathore, "Digital measurement Techniques", Narosa 1996
- Oliver and Cage, "Electronic Measurement and Instrumentation", MGH- 1975
- A. D. Helfrick and W. D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI- 1995
- C. S. Rangan, G. R. Sarma, V.S. Mani, "Instrumentation Devices and Systems", 2nd Edition, TMH- 1983
- H. S. Kalsi, "Electronic Instrumentation", TMH- 1991

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI

**TEACHING SCHEME**

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

PH & Buffers:

Water: Properties of water, its biological significance, Dissociation of water & ionic products. PH: Definition, Dissociation of strong electrolytes, Ionization of weak acids & bases, Henderson - Hasselbalch equation. Buffers: Definition & concept, Buffers in biological system, Paper of acid-base balance.

Molecular interactions:

Vander waal's forces, Non-covalent & covalent bonds, Hydrogen bond, Hydrophobic bond, Electrostatic bond, Peptide bond, Disulphide bond and Glycosidic bond.

Unit-II

(08 Hours)

Carbohydrates:

Classification, Stereo chemical properties of carbohydrates, Biological & chemical Significance, Physical & chemical properties of Carbohydrates

Unit-III

(08 Hours)

Lipids:

Introduction & classification, Fatty acids, prostaglandins, Acyl glycerol waves Phospholipids, Sphingolipids, Glycolipids & their biological significance, Lipoproteins, Biological significance of Lipids, Distribution of lipids in pro & eukaryotic cells.

Unit-IV

(08 Hours)

Proteins:

Amino acids: Structure, Essential & Non - essential amino acids, Non - protein amino acids. Properties of amino acids physical properties, Reactions of amino acid, carboxyl group amino acids, R group simple peptides, Classification of proteins: Primary, secondary, tertiary,

quaternary, Fibrous proteins: Keratin silk collagen, Globular proteins: Cytochrome, Antibodies, Blood proteins, Hormones (oxytocin, vasopressin, and glucagons, ACTH, Insulin) Enzymes.

Unit-V

(08 Hours)

Enzymes:

Classification (outline), Properties: Enzyme - substrate complex, specificity, effect of concentration & dilution of enzyme, effect of pH & temperature, Inhibition & activation.

Nucleic acids:

Purines & Pyrimidines, Nucleosides & Nucleotides, RNA - structure, types & functions. DNA- Structure, properties, Watson - Crick model, physiochemical properties of DNA & Biological significance.

Unit-VI

(08 Hours)

Vitamins:

Water-soluble vitamins, Fat-soluble vitamins

Minerals:

Elementary knowledge of the Role of following minerals: Na, K, Ca, Mg, Zn, Mn, Fe, Cu.

Biochemical energetics:

Energy rich compounds ADP, ATP, GTP & Co. Exergonic and Endergonic Reactions, Coupled Reactions, Laws of thermodynamics, Role of high-energy phosphate molecule.

List of Practicals

- Identification of carbohydrate
- Protein estimation by uret method
- Sorensens formal titration
- Determination of acid value of given oil sample
- Estimation of vitamin-C by using 26 Dichlorophynol indophynol
- Estimation of Dextrose Dihypoidate method

Text Books/References

S. Nagini, "Textbook of Biochemistry", Scitech Publications (India Pvt. Ltd.)

Montgomery, "Biochemistry", 6th Edition, Mosby

R. W. Lambert, "Medicinal Chemistry", Royal Society of Chemistry Burlington House,
London W1V0BN

Peter Atkins, "Atkins' physical chemistry", Oxford University Press

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



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K50249: PRINCIPLES OF INSTRUMENTATION & MEASUREMENTS

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Basic concepts of measurement:

Characteristics of measuring devices-accuracy, precision, linearity, repeatability, hysteresis, threshold, calibration, errors.

Unit-II

(08 Hours)

Transducers & Sensors:

Introduction, requirements, definition, classification, specifications, types of sensors and transducers for measurement of temperature, pressure, flow, strain, displacement, vibration.

Unit-III

(08 Hours)

Optical transducers:

Fundamentals of electromagnetic (EM) radiation, light sources (Lasers & LEDs) Characteristics of light, photometry photodetectors, optical fiber sensors and the Applications.

Unit-IV

(08 Hours)

Bipotential Electrodes:

Electrode electrolyte interface, half-cell potential polarization, polarizable and non-polarizable electrodes, calomel electrode, electrode circuit model, electrode skin interface and motion artifact, body surface electrodes, internal electrodes, needle and wire electrodes (different types), Micro electrodes metal, supported metal, micropipette, microelectronic, Properties of micro electrodes, method of use of electrodes for measurement of ECG, EEG, EMG

Unit-V

(08 Hours)

Flow measurement:

Plethysmography, electromagnetic indicator, indicator dilution, thermal

convection and Ultrasonic.

Chemical Transducers:

Blood gas and acid base physiology, reference electrode, pH, pO₂, pCO₂, electrodes, transcutaneous arterial oxygen tension, CO₂ tension monitoring, enzyme electrode.

Unit-VI

(08 Hours)

Passive circuits:

Divider circuits, bridge circuits, RC filters. Grounding and shielding techniques, low and high resistance measurement techniques.

List of Practicals

- To study the characteristics of Resistance Temperature Detector
- To study the characteristics of Proportional Integral Difference Controller
- To study the characteristics of Thermocouple
- To study the characteristics of ON-OFF controller
- To study the characteristics of Linear Variable Differential Transformer
- Study of Strain Gauge

Text Books/References

- John-G.Webster, "Medical Instrumentation Application and Design", Wiley & Sons
- Leslie Cromwell, Fred.J.Weibel "Biomedical Instrumentation and Measurements", PHI
- Joseph J.Carr, John M. Brown, "Introduction to Biomedical Equipment Technology" Pearson Education
- Richard Aston, "Principles of Biomedical Instrumentation and Measurement", Marwell Macmillar
- J. B. Gupta, "Electronic and Electrical measurements and Instrumentation", Kataria and Sons
- Bishnu P. Pal, Editor, "Fundamentals of Fiber Optics in Telecommunication & Sensor Systems", Wiley Eastern
- Harry. N. Norton, "Biomedical sensors - fundamentals and applications", Prenum Press

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K50250: ELECTRONIC DEVICES AND CIRCUITS - II

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Multistage Low Frequency Amplifiers (BJT/FET):

Necessity of cascading low frequency (LF) small signal amplifier in various configurations techniques for improving input impedance for CC stage (darlington connection, boot strapping), CE - CE cascade, CE - CB cascade arrangement, effect of cascading on frequency response of single stage and cascaded amplifier, square wave testing or step response audio frequency (AF) amplifier.

Unit-II

(08 Hours)

LF amplifiers with Negative Feedback:

Block schematic of amplifier with negative feedback, gain with feedback, consequences of Introducing negative feedback in small signal and multistage amplifier, classification of amplifier in view of feedback concept, types of sampling and mixing, ways of introducing negative feedback in amplifiers i.e. [voltage amplifier, current amplifier, resistance amplifier, transconductance amplifier], voltage series, voltage shunt, current series, current shunt and effects of negative feedback on input and output impedance in all four types, methodology of feedback amplifier analysis.

Unit-III

(08 Hours)

Operational Amplifiers (Op-Amp's):

Internal block schematic of monolithic op-amp IC, analysis of transistorized difference amplifier stage, method of improving common mode rejection ratio (CMRR), definition and measurements of Op-amp parameters like input offset voltage and current, bias current CMRR, power supply rejection ratio (PSRR), open loop gain etc, concept of dc amplification inability of op-amp to work as linear small signal

amplifier in open loop, Op-amp with closed loop negative feedback, close loop gain, frequency response of op-amp, linear applications like inverting and non-inverting amplifier, summing and difference amplifier.

Unit-IV

(08 Hours)

Large signal (power) AF amplifiers and Oscillators:

Classification of amplifiers in class A, B, C etc., concept of large signal amplification, total harmonic distortion, push-pull configuration, efficiency of power conversion, CE transformer coupled amplifier, complementary symmetry CC power amplifier in single dual supply version efficiency and distortion, graphical techniques to calculate harmonic distortion, cross over distortion, safe operating area (SOA) and its limits, secondary breakdown, heat sink, its standard shapes and sizes, thermal calculations and resistances, Employing positive feedback in amplifier, problems of instability, Barkhausen criteria for Sinusoidal oscillators, derivations and analysis of transistorized RC phase-shift / Wein-bridge Oscillators, frequency expressions and gain requirements, LC oscillators: Hartley, Colpitts, Crystal (Miller and Pierce), unijunction transistor (UJT) relaxation oscillators.

Unit-V

(08 Hours)

Voltage Regulators:

Zener diode as shunt regulator, emitter follower regulator, transistorized series feedback type regulator, comparison of above discrete regulators on the basis of voltage stability factor (S_v), Temperature stability factor (S_t), output resistance (R_o), constant voltage (CV) / constant current (CC) modes, over voltage / over current protection circuit, internal block diagram, pin diagram and specifications of IC regulator 723, applications of IC 723, SOA of IC regulators.

Unit-VI

(08 Hours)

Hybrid π (II) small signal model of BJT and Introduction power Devices such as Thyristors and MOSFETS:

Relations with h-parameters, definitions of f_{α} , f_{β} , f_t , calculations of A_I , A_V with finite load and source resistances for CE stage, gain bandwidth product, tuned load, loaded and Unloaded Q, insertion loss, single tuned

amplifiers, staggered tuning, cascade configuration for high Frequency (HF) amplification.

Note: No rigorous mathematical treatment is expected.

List of Practicals

Analysis of Multistage LF Amplifier using BJT, verify with theoretical values of A_{is} , A_{vs} , R_i , R_o (overall) with Square wave testing and comment on the results

Input impedance improvement techniques for emitter follower

Analysis of LF with negative Feedback for voltage and current series topology

Analysis of LF with negative Feedback for voltage and current shunt topology

Power Amplifier:

a) Class A, B, C

b) Class AB Push Pull Complementary Symmetry

Transistorized differential amplifier: Measurement of CMRR

Measurement of frequency of oscillation for Crystal oscillator, RC Phase Shift oscillator, LC oscillator

Op-Amp-I: Measurement of DC parameters such as input offset voltage and current, input bias current

Op-Amp-II: Measurement of AC parameters such as CMRR, Slew rate, Z_i , Z_o , frequency response for FH and FT

Linear applications of Op-Amp such as summing, difference, voltage Follower, signal phase shifter

Study of Instrumentation amplifiers using Op-Amp

Regulation characteristics of Voltage Series and Shunt Regulator and calculation of S_v and R_o

IC -723 Regulator as negative regulator

IC - 723 as basic high/ low voltage regulator with simple/ fold back current limiting.

Design build and test for given specification

Text Books/References

Millman and Halkias, "Integrated Electronics", McGraw Hill

Millman and Halkias, "Electronic Devices and Circuits", PHI

Boylstad and Nashelsky, "Electronic Devices and Circuits", PHI

Sedra Smith, "Micro Electronic Circuit", Oxford International Press

David A. Bell, "Electronic Devices and Circuits", PHI

Allen Mottershed, "Electronic Devices and Circuits", PHI

Thomas L. Floyd, "Electronic Devices", 6th Edition, Pearson Publication

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester-III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.

For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class



BHARATI VIDYAPEETH UNIVERSITY, Pune.

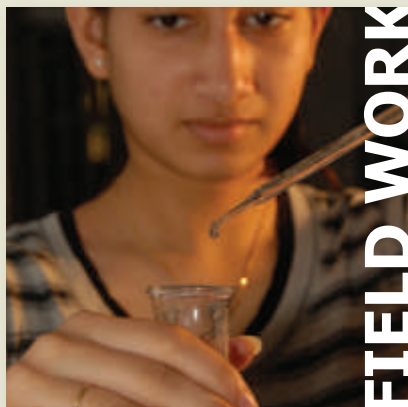
(Established under Section 3 of UGC ACT 1956)



PRACTICAL

C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (CHEMICAL)
(Sem. III & IV)**



FIELD WORK



CLASS WORK



COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (CHEMICAL) (Sem. III & IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

DEPARTMENT OF CHEMICAL ENGINEERING

Department of Chemical Engineering is one of the oldest department in Pune region and known for its very valuable contribution in providing high caliber, outstanding professionals to the industry and R & D establishments.

Being our own university, the department has got freedom to design and adopt the change in the structure and content of the syllabus in consultation with the industrial experts and researchers to suit their requirement. The department of chemical engineering desires its students to excel in the changing trends in the global economy. The salient features of the present course designed are:

- Computer Education with advanced simulation softwares
- Industrial training after VIIth semester for the period of six weeks
- Wide range of advanced elective subjects
- Expert interaction on each subject by the experts from the various fields

The department also conducts a post graduate course in Chemical Engineering. The P. G. students perform their dissertation work in collaboration with National Chemical Laboratories (NCL), Pune.

The Department of Chemical Engineering has following well equipped laboratories:

- Mechanical Operations
- Heat Transfer
- Mass Transfer
- Chemical Reaction Engineering
- Process Dynamics Instrumentation and Control
- Instrumental Analysis
- Software Laboratory - CHEMCAD, MATLAB, FEMLAB, gPROMS, T. K. Solver

The faculty has constantly endeavored to improve the academic standards and pursue the R & D work, publishing the academic research papers in the National and International journals. Some of the faculty members have presented their research papers at various conferences/seminars and workshops. As a result of continuous efforts by the faculty, the department has received the following funds/grants from the AICTE, New Delhi.

Young Career Award Research Project (10 Lakh)

Research Promotion Scheme (RPS) Grant (5.75 Lakh)

MODROB's for various chemical engineering laboratories (12 Lakh)

The department has the state of Art facilities of:

Gas Chromatography (G. C.)

High Pressure Liquid Chromatography (HPLC)

U.V.- Visible Spectrophotometer

Fluoride ion selective electrode meter

Department plans to provide low priced testing facility for Industry and research laboratories. Students' community actively involved in R & D experimentation can avail the same for affordable rates.



STRUCTURE & EXAMINATION PATTERN

B. Tech. - Chemical Engineering

Semester III									Total Duration : 32 Hrs/Week
									Total Marks : 750
Subject Code	Subject	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total (Marks)
		L	P	D	Theory	Unit Test	TW & Pr	TW & Or	
K70201	Applied Chemistry - I	04	02	-	80	20	50	-	150
K10202	Principles of Design & Material Technology	04	-	02	80	20	-	50	150
K20215	Solid Mechanics	04	02	-	80	20	-	50	150
K10204	Mechanical Operations	04	02	-	80	20	50	-	150
K10205	Stoichiometry	04	-	-	80	20	-	-	100
K10206	Computer Programming for Chemical Engineering - I	02	02	-	-	-	-	50	50
Total		22	08	02	400	100	100	150	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Drawing	Theory	Test	T. W. & Pr	T. W. & Or.	
22	08	02	400	100	100	150	750

Semester IV									Total Duration : 32 Hrs/Week
									Total Marks : 750
Subject Code	Subject	Teaching Scheme (Hrs)			Examination Scheme (Marks)				Total (Marks)
		L	T	P	Theory	Unit Test	TW & Pr	TW & Or	
K70208	Applied Chemistry -II	04	-	02	80	20	50	-	150
K70209	Engineering Mathematics - III	04	-	-	80	20	-	-	100
K10210	Fluid Mechanics	04	-	02	80	20	50	-	150
K10211	Heat Transfer-I	04	-	02	80	20	50	-	150
K10212	Chemical Engineering Thermodynamics - I	04	02	-	80	20	-	50	150
K40213	Electrical & Electronics Technology	02	-	02	-	-	-	50	50
Total		22	02	08	400	100	150	100	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Drawing	Theory	Test	T. W. & Pr.	T. W. & Or.	
22	08	02	400	100	150	100	750



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III

**TEACHING SCHEME**

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Structural Effect and Reactivity :

Benzene and aromaticity, concept of aromaticity ($4n+2$), condition's necessary for demoralization, breaking and formation of bonds (Reaction intermediate). Factors affecting electron availability - Inductive effect, Resonance effect (resonance structures of naphthalene, anthracene, aniline, phenoxide ion, benzaldehyde, nitrobenzene, etc.), hyperconjugation, steric effect, tautomerism. Effects of resonance, inductive effect, steric effect on pKa and pKb, value of simple acids and bases. Types of reactions, types of reagents.

Unit-II

(10 Hours)

Reaction Mechanism :**Mechanism of reaction involving carbonium ion intermediates:**

Nucleophilic substitution - Hydrolysis of alkyl halide (SN^1 Mechanism). Also discuss SN^2 mechanism and factors affecting SN reactions.

Electrophilic substitution in benzene and mono-substituted benzene, nitration, sulphonation, halogenation, Friedal Craft alkylation and acylation.

Electrophilic addition to C=C, polar addition of hydrogen halides and water, alkylation, dimerisation.

Elimination's - E^1 reaction in acid catalyzed dehydration of alcohols, base catalyzed dehydro-halogenation of alkyl halides, comparison of elimination with substitution. Also cover E^2 mechanism.

Rearrangement- Beckman rearrangement.

Mechanism of reactions involving carbanion intermediates:

Addition of carbon nucleophile to C=O, Grignard reaction for preparation of primary, secondary, and tertiary alcohol's and carboxylic acids.

Nucleophilic substitution by carbon nucleophile-Wurtz reaction.

Carbanion involved in condensation-Aldol condensation and Claisen ester condensation.

Rearrangement involving carbanion-Favorskii rearrangement

Unit-III

(06 Hours)

Spectroscopy:

Revision of UV. & I.R. spectroscopy. Application of UV & I.R. spectroscopy for identification of simple organic compounds (simple problems).

Unit-IV

(08 Hours)

Gaseous State:

Gaseous state I - Behavior of ideal gases, kinetic molecular theory of gases. The kinetic gas equation. Derivation of gas laws from gas equation, kinetic energy and temperature. Types of molecular velocities and their calculations, mean free path and collision frequency, collision diameter and degrees of freedom. Law of equipartition of energies, specific heat and molar heats of gases.

Gaseous state II - Behavior of real gases-ideal and real gases, deviation from ideal behavior, Vander Wall's equation of state and its limitations intermolecular forces. The critical phenomenon, experimental determination of critical constants of a gas, critical phenomenon and Andrews experiments, Vander Wall's equation and critical state, calculation of critical constants. Numericals based on above article.

Unit-V

(08 Hours)

Solution:

Solution-Definition, why substances dissolve, temperature and solubility, solution of gas in gas, gases in liquid, Henry's law, the ideal solution, Raoult's law of ideal solution, solutions of liquids in liquids, theory of dilute solution. Colligative properties, osmosis, osmotic pressure, measurement of osmotic pressure. Colligative properties of dilute solution - lowering of vapor pressure, elevation of boiling point and thermodynamic derivation, depression in freezing point and thermodynamic derivation. Abnormal behavior of solutions of electrolytes. Numericals on all above. Numericals based on this article.

Unit-VI

(08 Hours)

Instrumental Methods of Chemical Analysis:

Principles and working of flame photometer UV-Visible spectrophotometer, Gas Chromatograph, Conductivity meter, pH meter, Atomic Absorption Spectrophotometer, Polarimeter, Potentiometer, Karl Fischer Titrator.

List of Practicals - I Volumetric Analysis (Any Two)

Volumetric estimation of amide from the given solution of amide.

Volumetric estimation of acetone from the given solution.

Estimation of aniline / phenol from the given solution.

List of Practicals - II Preparations (Any Two)

Preparation of benzoic acid from benzamide.

Preparation of osazone derivative of glucose.

Preparation of aspirin from salicylic acid.

List of Practicals - III (Any Eight)

To determine the molecular weight of a given solute by freezing point of naphthalene.

To determine heat of solution of KNO_3 / NH_4Cl by studying their solubility in water.

To determine the equivalent weight of the given metal (Zn or Mg) Eudiometrically.

To determine distribution coefficient of iodine between water and CCl_4 .

To standardize $\text{Na}_2\text{S}_2\text{O}_3$ solution by preparing $\text{K}_2\text{Cr}_2\text{O}_7$ & to estimate % of copper from given solution.

Heat of neutralization.

Thermodynamic parameters.

Purification of organic compound by recrystallization and sublimation and to find their physical constant (any four compounds)

Experiments on UV-Vis spectrophotometer.

Estimation of percentage of sugar by polarimeter.

Text Books/ References

Barrow G. M., Physical Chemistry, 5th ed, McGraw Hill, 1988.

Maron S. H. and Prutoon C. F., Principles of Physical Chemistry 4th ed, Oxford and

IBH, 1972.

Ewing G.M. Instrumental Methods of Chemical Analysis, 5th ed, McGraw Hill, 1985

Glasstone S.A. Text book of Physical Chemistry, 2nd ed. McMillan 1986

Moore W.J. Physical Chemistry, 5th ed., Orient Longman, 1972

Industrial Chemistry by B. K. Sharma

Principles of Physical Chemistry by Puri, Sharma, Pathana

Morrison and Boyd Organic Chemistry; Prentic Hall of India Ltd.

Jerry March, Advanced Organic Chemistry, McGraw Hill International Book Company

Peter Sykes, A Guide to Mechanism in Organic Chemistry, Orient Longman.

Syllabus for Unit Test

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
Unit Test 3	Unit III & VI



K10202: PRINCIPLES OF DESIGN AND MATERIAL TECHNOLOGY

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(07 Hours)

Introduction to Process Equipment Design:

General design procedure, Equipment classification, Design codes, Study of design parameters such as maximum working pressure, design pressure, design temperature, design stress & factor of safety, design of wall thickness & minimum actual thickness, Corrosion allowance, Design loading, Poissons ratio. Design of various heads & closures such as flat head, torrispherical head, elliptical head, hemispherical head, conical head.

Unit-II

(08 Hours)

Design of Machine Elements:

Design of machine elements such as agitators, shafts, keys and couplings
Valves: General construction working selection of globe valve, stop valve, three-way valve, steam trap, non rising stem, diaphragm.
Pumps: General construction working application of different pumps, fan blowers.

Unit-III

(09 Hours)

Introduction to Vessels and Vessel Elements:

Introduction to various vessels such as Pressure vessel, Storage vessel etc. Vessel Supports- Design of various such as skirt support, leg support, bracket support, saddle support, leg support, design of tall vertical column. Flanges & Nozzles- Detail design of Flanges, Gasket, Bolts & Nozzles.

Unit-IV

(08 Hours)

Ferrous and non-ferrous materials and its alloys (Al ,Cu , Ni , Ti , and its alloys, babbites). Engineering properties, Metal- metal and metal -nonmetal composites, Heat treatment of steels. Surface treatments: Electroplating, anodizing, lining.

Unit-V

(08 Hours)

Corrosion and its classification, Environmental study and method of elimination and prevention, Polymers: engineering plastics and rubbers, their typical properties and applications, Testing of polymers, Types of organic protective coatings, Factors determining choice of materials of constructions in chemical industry.

Unit-VI

(08 Hours)

Various types of composite materials used in chemical industry and their applications, Crystalline and non-crystalline ceramic systems, Glass and porcelain enamels, Refractories.

List of Drawing Practical

Drawing Sheets (4 Nos. A-1) based on the following equipment :

Detail drawing of Various Heads.

Machine drawing conventions. Production drawing showing tolerances, various bolts, types of thread.

Types of valve - assembly and detailed drawing of globe, gate, needle, check, relief and safety valves, gear and vane pumps, reciprocating and centrifugal pumps.

Mechanical drive components : Shaft, Keys and Couplings.

Various types of vessels and accessories.

AUTOCAD assignment on A-4 sheets.

AUTOCAD Exercises (2 Nos.)

Sectional drawing of assemblies of components with the use of important commands of AUTOCAD. Components : knuckle joint, flanges coupling, stuffing box, cottor joint, valve, etc.

Text Books/References

Bhattacharya B. C., "Introduction to Chemical Equipment Design", CBS Publishers and Distributors

Dawande S. D., "Process Design of Equipments", Central Techno Publications

Joshi M. V., "Process Equipment Design", McMillan India

Hajra Choudhry S. K., A. K. Hajra Choudhary, "Material Science & Processes", Indian Book Distributing Company

Khurmi R. S. and Gupta J. K., "A Text Book of Machine Design"

Bhandari V. B., "Design of Machine Elements"

Badger W. L. and Banchemo J. T., "Introduction to Chemical Engineering", McGraw Hill

J. M. Coulson, J. F. Richardson and R. K. Sinnott, "Chemical Engineering Vol. 6", Pergamon Press

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TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Concept of Stress and Strain:

Concept of stress, strain; Normal, lateral, shear and volumetric stresses and strains; Stress-strain curve; Elastic constants and their relationship; Generalized Hooke's law.

Axial and Thermal Stresses

Axial force diagram; Stresses, strains and deformation of determinate and indeterminate, prismatic and tapered cross section, homogenous and composite bars; due to concentrated loading, self weight and temperature effect; Axial rigidity.

Unit-II

(08 Hours)

Axially Loaded Long Columns:

Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula; Johnson's formula.

Direct and Bending Stress:

Concept; Resultant stress due to the axial load and uniaxial or biaxial bending; Core of section; Effect of lateral force and self weight; Application to columns, retaining walls, dams, chimneys etc.

Unit-III

(08 Hours)

Principal Stresses and Principal Planes:

Normal and shear stresses on any oblique plane; Concept of principal stresses and principal planes; Maximum shear stress; Analytical and graphical method. (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion; Theories of failure.

Strain Energy:

Concept of strain energy; Modulus of Resilience and Toughness; Strain

energy for axially loaded members due to gradual, sudden and impact load; Strain energy due to self weight

Unit-IV

(08 Hours)

Shear Force and Bending Moment in Beams:

Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram due to point load, uniformly distributed load, uniformly varying load and moments for the simple and compound beams; Elastic curve.

Flexure Stresses:

Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section.

Unit-V

(08 Hours)

Shear Stresses:

Concept of direct and transverse shear; Shear stress formula; Concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section.

Torsion of Circular Shafts:

Theory, assumptions and derivation of torsional formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity.

Unit-VI

(08 Hours)

Slope and Deflection of Beams:

Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Double Integration method; Macaulay's method; Moment area Method; Conjugate beam method.

Pressure Vessels:

Stresses, strains and deformation in thin walled cylindrical and spherical vessels due to internal fluid pressure; Thick cylinders; Lamé's equation of stresses.

Term-work:

The term-work shall consist of minimum TEN experiments from the following list:

Tension test – Mild Steel, Tor Steel, Aluminum

Compressive Strength test-Concrete

Compressive Strength test-Cement

Bending test – Timber

Bend Re-bend test- Mild Steel, Tor Steel

Direct Shear test- Mild Steel, Aluminum

Torsion test- Mild Steel, Aluminum

Izod & Charpy Impact test- Mild Steel, Aluminum, Brass, Copper

Rockwell Hardness test- Mild Steel, Aluminum, Brass, Copper

Fatigue test- Mild Steel, Aluminum

Block board test

Drawing up of SFD and BMD using computer software

Text Books/References

Beer F. P. and Johnston E. R., “Mechanics of Materials”, McGraw Hill Publication

Gere J. M. & Timoshenko S. P., “Mechanics of Materials”, CBS Publishers & Distributors

Singer F. L. & Pytel A., “Strength of Materials”, Harper and Row Publication

Popov E. P., “Engineering Mechanics of Solids”, Prentice Hall of India (P) Ltd.

Benham P. P., Crawford R. J. & Armstrong C. G., “Mechanics of Engineering Materials”, ELBS Longman Publication

Rajput R. K., “Strength of Materials”, S. Chand Publication

Junnarkar & Adavi, “Mechanics of Materials”, Charotar Publishing House

Ramamrutham S. & Narayan R., “Strength of Materials”, Dhanpat Rai Publishing Company

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Unit Test 1	Unit I & IV
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TEACHING SCHEME

Lectures : 04 Hrs/week
Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks
T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Properties and Handling of Particulate Solids:

Properties of solids: Particle size and shape. Screen analysis: Cumulative and differential. Specific surface of mixture. Standard screen series. Properties of particulate masses: Pressure in mass of particles. Angle of internal friction and angle of repose. Storage of solids.

Conveyors:

Basic types of conveyors. Basic principles of design and criteria for selection of conveyors.

Unit-II

(08 Hours)

Size Reduction:

Principles of comminution: Criteria for comminution, Energy and power requirement in comminution, Laws of comminution. Size reduction equipment: Crushers , grinders and ultrafine grinders, cutting machines, Open and closed circuit grinding.

Unit-III

(08 Hours)

Screening:

Types of screening equipment, Material balance and effectiveness of a screen, Comparison of ideal and actual screen.

Centrifugal settling process:

Working and theory of cyclone separator, Hydrocyclone and centrifugal sedimentation.

Gas filters. Fiber and fabric filters. Froth filtration. Magnetic separation. Electrostatic separations. Tabling and jigging.

Unit-IV

(08 Hours)

Filtration :

Introduction. Equipment for filtration. Theory of filtration : filter media and filter aids, pressure drop through filter cake, compressible and incompressible filter cakes, cake and filter medium resistance, washing of cakes. Principles of cake filtration for constant rate and constant pressure filtration. Principles of continuous filtration. Principles of centrifugal filtration.

Unit-V

(08 Hours)

Separation based on motion of particles through the liquids:

Gravity Settling Process: Gravity classifiers, Sorting classifiers, Terminal settling velocity, Free and hindered settling, Stokes law and Newton's law, Sink and float method, Differential method.

Sedimentation and Thickening: Batch sedimentation test. Types of thickeners. Design calculations: Kynch theory of sedimentation, Calculation of area of thickener.

Unit-VI

(08 Hours)

Mixing of Solids and Pastes:

Mixers for pastes and plastic masses. Mixers for dry powders. Criteria for mixer effectiveness. Mixing index in blending granular solids. Rate of mixing.

Mixing and agitation of liquids:

Types of equipment, Mixing characteristics, Power consumption, Mixing index calculations.

Term work

Term will consist of the experiments. listed below of which at least eight should be performed in laboratory by the students .In addition, two more topics given in the list may be given as assignments.

List of Practicals

- Determining the effectiveness of a screen
- Determining the properties of particle beds
- Determining the area of a thickener by conducting batch sedimentation test

Study of free settling of particles through fluids of different density and viscosity
Determining efficiency of a cyclone separator
Determining the resistance of a filter cloth and cake by using vacuum leaf filter or plate and frame press
Determining the energy consumption and crushing law constants for jaw crusher and ball mill or drop weight crusher
To study the behavior of a bed during the fluidization and determine the minimum fluidization velocity
Ore separation by froth floatation cell
Study of belt conveyor, bucket elevator and pneumatic conveyor

Text Books/References

W. L. McCabe, J. C. Smith and P. Hariott, "Unit operations in Chemical Engg.", McGraw Hill Publications

J. M. Coulson and F. Richardson, "Chemical Engineering Vol. II", Pergamon Press

W. L. Badger and J. T. Banchero, "Introduction to Chemical Engineering" McGraw Hill Publications

A. S. Foust, "Principles of Unit Operation", Wiley Publications

Syllabus for Unit Test

Unit Test 1	Unit I & II
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K10205: STOICHIOMETRY

TEACHING SCHEME

Lectures : 04Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(06 Hours)

Overview of the needs of Process Engineer:

Importance of material and energy balance calculations in raw material and energy requirement .Calculations and performance analysis of a process plant. Material and energy balance equations as foundations of process design and process modeling and simulation.

Units and Dimensions:

Basic and derived units. Different unit systems. Relation between mole and mass, average molecular weight of a mixture. Different units of concentration: molarity, normality, molality, density, PPM, mol % and weight %.

Unit-II

(09 Hours)

Material balances without Chemical Reactions:

Concept of material balance in respect of mass and moles. Material balance problems without chemical reactions. Material balance involved in unit operations: viz. absorption, stripping, distillation, extraction, crystallization, evaporation and drying. Chemical equation and stoichiometry.

Unit-III

(09 Hours)

Material balances involving Chemical Reactions:

Concept, material balance calculations, Recycle, bypass and purge operations.

Unit-IV

(06 Hours)

Gases, Vapours, Liquids and Solids:

Ideal gas law calculations. Compressibility factor . Vapor pressure of liquids. Steam table and vapor pressure of water .Saturation , partial saturation and humidity of gas-vapor mixture .Material balances

involving condensation and vaporization. Equilibrium composition determination for vapor-liquid, liquid-liquid and solid-liquid systems. (Binary Systems only) Solubility diagrams.

Unit-V

(10 Hours)

Energy Balance:

General energy balance equation and its appropriate reduction for the purpose of process calculations. Calculation of enthalpy changes with and without Phase change and using heat capacity equations of the type $C_p = a + bT + cT^2 + \dots$. Standard heat of formation : Sources and prediction tools. Standard heat of combustion . Standard heat of reaction. Standard heat of Solution. Heat of reaction from heats of formation and heats of combustion. Use of Hess's law in enthalpy change calculations. Energy balance problems involving exothermic and endothermic reactions. Adiabatic reaction temperature. Problems based on heats of dissolution. Use of steam table for enthalpy of water and steam. Utility calculations involving steam and cooling water.

Unit-VI

(08 Hours)

Fuels and Combustion:

Proximate and ultimate analysis. Gross and Net calorific values. Stoichiometric and excess air calculations. Adiabatic or theoretical flame temperature calculations.

Text Books/ References

- B. I. Bhatt and Vora: "Stoichiometry", Tata McGraw Hill Publishers
Himmelblau D. M.: "Basic Principles and Calculations in Chemical Engg.", Prentice Hall Publications
O. A. Hougen, K. M. Watson and R.A. Ragatz: "Chemical Processes Principles, Part-I, Material and Energy Balances", Asia Publishing House, Bombay
M. F. Felder and R. W. Pouseau: "Elementary Principles of Chemical Processes", John Wiley Publications
D. F. Rudd, G. J. Powers and J. F. Sirola: "Process Synthesis", Prentice Hall Publications
S. D. Shukla and G. N. Pandey: "Chemical Engineering Calculations", Lion Press, Kanpur
W. E. Ranz: "Describing Chemical Engineering Systems", McGraw Hill Publications

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
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K10206: COMPUTER PROGRAMMING FOR CHEMICAL ENGINEERING - I

TEACHING SCHEME

Lectures : 02 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

T. W. & Or : 50 Marks

Unit-I

(04 Hours)

Introduction to C-Programming, Character sets, constant, variables and Data Types: int, float, double, char, string. Operators: arithmetic, relational, logical, increment and decrement, assignment, conditional. Standard input-output functions: printf (), scanf (), getch () or getchar ().

Unit-II

(05 Hours)

Control statements: programs using if statement, if-else statement, goto statement and switch-case statement.

Loop statements: programs using while loop, do-while loop and for loop.

Unit-III

(04 Hours)

Arrays: single dimension, double dimension. String: programs using string. String functions: strlen ()/strcpy()/ strev()/ strcat ()/strlwr ()/strupr ()/ strcmp ()).

Unit-IV

(04 Hours)

Pointers: programs using pointers. Use of * and & operators. pointer arithmetic's. Use of pointers. Pointer and function: parameter passing to function by reference and by value. File handling, Linked list

Unit-V

(04 Hours)

Application of C-programming for Chemical Engineering: various calculations and solutions in Chemical Engineering.

Unit-VI

(03 Hours)

Number systems and conversion, Computers and communication: single user, multi-user, work station, client server systems. Programming languages: classification, machine code, assembly language, fourth generation languages.

List of Practicals

Minimum number of practicals: 7

Unsolved problems/assignments from the reference books should be given in the practical hours to do the programming. The problem(s) should be such that it will keep the students engaged for 2 hours

A report on the above should be submitted as term work

Text Books/ References

Yashwant Kanetkar, "Let Us C," 4th revised ed., BPB Publications

Cooper M. "The Spirit of 'C' - An introduction to modern programming", Jaico Publisher

Rajaraman V., "Fundamentals of Computers", Prentice Hall of India

E. Balagurusamy, "Programming in ANSY C", 2nd Ed. McGraw Hill Publication Co. 1989

Sanders D. H., "Computers Today," McGraw Hill Publications

Trainer T., et. al. "Computers," McGraw Hill Publications



SEMESTER - IV

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**TEACHING SCHEME**

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Biomolecules:

Carbohydrates: Definition, classification, Reactions of carbohydrate oxidation, reduction, osazone formation, ester formation, isomerization, D and L configuration, cyclic structure of glucose, fructose, Fischer-Haworth projection chair form. Brief account and cyclic structure of disaccharides-maltose, sucrose, cellobiose polysaccharide starch.

Aminoacids, proteins and enzymes: α -amino acids, Fischer projection and relative configuration. Classification of α -amino acids, properties and reactions. Proteins-Formation of peptide linkage, features of peptide linkage, α helical configuration, β -pleated structure, primary, secondary, tertiary and quaternary structure of proteins.

Unit-II

(08 Hours)

Transition Elements and their Complexes:

Transition elements, study of d^1 transition series with respect to oxidation states, magnetic behaviour, colour, ability to form complexes and catalytic behaviour.

Co-ordination compounds-different terms-C.N., ligands, EAN, etc. Nature of metal ligand bonding-VBT and CFT-Formation and above properties in tetrahedral, square planar and octahedral complexes of d^1 transition series on the basis of VBT and CFT.

Unit-III

(08 Hours)

Volumetric Analysis:

Standard solutions and various methods of expressing various methods of solutions, equivalent weights in different types of reactions. Primary and secondary standard solutions, their preparations. Classification of volumetric analysis- Acid-base, complexometric, oxidation-reduction,

precipitation-with specific examples, theories of indicators used in all above types of titrations, titration curve (acid-base, redox). Numericals on all above.

Unit-IV

(06 Hours)

Colligative Properties and their Experimental Determination:

Boiling Point Elevation, Freezing Point depression, Osmotic Pressure. Numericals based on the topic.

Unit-V

(08 Hours)

Surface Chemistry:

Interparticle forces, adsorption isotherms, determination of the surface area of fine powders using BET theory, surface films.

Catalyst Science:

Modern theories of catalysis physicochemical investigations of catalysts, kinetics of catalytic reactions, the Langmuir Hinshelwood approach.

Unit-VI

(10 Hours)

Industrial chemistry: Oil, Soap & Detergent

Fats & Oils:

Analysis & composition, extraction of oils-pressing, rendering & solvent extraction, bleaching & refining.

Soaps:

Raw materials & manufacture, types of soaps

Detergents:

Classification & application, raw materials & manufacture, Enzyme & Zeolite based detergents, biodegradable detergents.

List of Practicals - I

Organic Qualitative Analysis (8 compounds):

Preliminary tests, type, elements, functional group & physical constants.

List of Practicals - II(Any Two)

To determine loss in weight & percentage composition of NaHCO_3 by gravimetric method.

To determine water of crystallization of $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$ by gravimetric method.

To determine water of crystallization of $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$ by gravimetric method.

List of Practicals - III(Any Two)

Determine λ -max for KMnO_4 & find concentration of unknown solution by using colorimetric measurements.

Determine surface tension of a given liquid by stalagmometer.

Identification of organic compounds by using IR & UV spectroscopy.

List of Practicals - IV(Any Two)

Preparation of tetra mine Cu (II) sulphate

Preparation of potassium tri-oxalato ferrate.

Preparation of crystal of potash alum.

Text Books/References

Barrow G. M., Physical Chemistry, 5th ed, McGraw Hill, 1988

Maron S. H. and Prutoon C. F., Principles of Physical Chemistry 4th ed, Oxford and IBH, 1972

Ewing G. M., Instrumental Methods of Chemical Analysis, 5th ed, McGraw Hill, 1985

Glasstone S. A., Text book of Physical Chemistry, 2nd ed. McMillan 1986

Moore W. J., Physical Chemistry, 5th ed., Orient Longman, 1972

B. K. Sharma, Industrial Chemistry

Puri, Sharma, Pathana, Principles of Physical Chemistry

Conn E. E. and Stumps. P. Y., Outline of Biochemistry

Das-Gupta S. K., Biochemistry, Vol. I

Rao K. P., Text book of Biochemistry

Syllabus for Unit Test

Unit Test 1	Unit I & IV
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TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(09Hours)

Differential Equations:

Solution of Linear differential equation of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's linear equations. Simultaneous linear differential equations, Total differential equations, Symmetrical simultaneous differential equations.

Unit-II

(09Hours)

Applications of Differential Equations:

Applications to bending of beams, whirling of shafts and chemical engineering problems.

Applications of Partial Differential Equations:

Solution of wave equation, one and two dimensional heat flow equations by method of separating variables. Applications to problems in chemical and allied engineering.

Unit-III

(08Hours)

Fourier Transform:

Fourier integral theorem, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms, Inverse Fourier transforms, Solution of boundary value problems using Fourier transform (Diffusion equation only).

Unit-IV

(09Hours)

Laplace Transform:

Definition, Properties and Theorems, Inverse Laplace transform, Laplace transform of Unit-step function, Dirac-delta functions, Periodic functions, Ramp functions, Error function, First order Bessel's function, $Si(t)$, $Ci(t)$, $Ei(t)$.

Applications to solution of linear differential equations, Liquid level

system consisting of single tank and two tanks in series (interacting and non interacting systems), Second order systems (damped vibrator).

Unit-V

(09 Hours)

Vector Differentiation:

Radial, Transverse, Tangential, Normal components of linear velocity and acceleration. Gradient, Divergence and Curl, Directional derivative, Vector identities, Irrotational and Solenoidal Vector fields.

Unit-VI

(08 Hours)

Vector Integration:

Line integral, Surface integral and Volume integral, Work done, Gauss Divergence theorem, Stoke's theorem and Green's lemma. Applications to fluid flow, Stream lines, Continuity equation, Motion equation and Bernoulli's equation.

Text Books/References

Peter V. O'Neil, Advanced Engineering Mathematics, 5e, Thomson Learning
Erwin Kreys zing, Advanced Engineering, Wiley Eastern Ltd.
Wylie C. R. and Barrett L.C. , Advanced Engineering Mathematics, McGraw-Hill
M. D. Greenberg, Advanced Engineering Mathematics, 2e, Pearson Education
B.S. Grewal, Higher Engineering Mathematics, Khanna Publication, Delhi
P. N. Wartikar and J.N. Wartikar, Applied Mathematics (Volume I & II), Pune Vidyarthi Griha Prakashan
Murray R. Spiegel, Laplace Transforms, Schaum's Outline Series-International Edition

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TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(09 Hours)

Introduction:

Scope and applications

Fluid Statics:

Review and properties of fluids and related concepts. Concepts of pressure and hydrostatic equilibrium. Barometric equation. Manometer of different types.

Fluid Flow Phenomena:

Review of velocity fields, velocity gradients and the shear stress field in laminar flow. Dynamic and kinematic viscosity. Newtonian and Non-Newtonian fluid behavior, Reynolds No. Transition from laminar to turbulent flow for Newtonian and Non-Newtonian fluids. Nature of turbulence. Eddy viscosity.

Flow in Boundary Layer:

Basic concept . Boundary layer growth along a flat plate .Thickness of boundary layer. Boundary layer separation and wake formation. Qualitative discussion on importance of boundary layer in heat and mass transfer.

Unit -II

(08 Hours)

Dimensional Analysis:

Fundamental dimensions. Units of various quantities used in fluid mechanics Dimensional analysis. Importance of dimensional analysis in experimental design. Applications of dimensional analysis.

Basic Equations of Fluid Flow:

Review of equations of continuity. Bernoulli's equation with and without friction, correction terms in Bernoulli's equations, applications to various cases.

Unit-III

(07 Hours)

Flow of Incompressible Fluids:

Review of skin friction and wall shear in cylindrical tubes. Hagen Poisuille equation for Newtonian fluids . Laminar flow of Newtonian fluids. Turbulent flow in pipes and in closed conduits . Universal velocity distribution law and its limitations. Von Karman equation.

Smooth pipe flow in Newtonian fluids :

Friction factor .Friction factor as a function of a Reynolds No. Effect of roughness parameters . Use of friction factor versus Reynolds No. chart with allowance of pipe roughness and non-circular cross section for the solution of process flow problems (Moody's diagram)

Unit-IV

(07 Hours)

Newtonian Flow past immersed bodies :

Flow past a sphere: Study of motion of spherical particle in an incompressible fluid. Particle Reynolds No. Settling velocity of a spherical particle in Stokes and in Newton's regimes .

Flow through a packed bed:Friction in flow through a packed bed. Packed bed Reynolds No. and Ergun equation.

Flow through a fluidized bed: Fluidization phenomena. Curve of pressure drop as a function of superficial velocity. Types of fluidization. Minimum fluidization velocity using Ergun equation .

Unit-V

(09 Hours)

Transportation and Metering of Fluids:

Fluid moving machinery: Operation , selection and specification of pumps, fans, blowers. Calculation of power consumption and volumetric flow. Priming, Cavitation and NPSH calculations.

Flow Measurement Devices: Orificemeter, Venturimeter, Pitot tube and Rotameter.

Unit-VI

(08 Hours)

Piping of Fluids:

Calculations of minor losses . Losses due to sudden contraction and expansion .Losses due to bends and fittings. Losses at the entrance and

exit. Concept of equivalent length. Pipes in series, pipes in parallel.
Pipelines containing pumps. Optimum pipe diameter.

Gas/liquid and liquid/liquid Two phase flow :

Flow types and regimes in horizontal and vertical flow. Regime maps.
Behavior of non-Newtonian fluids in two phase flow.

Flow through orifices, notches and weirs

Term work

Term work will consist of the experiments listed below , of which at least eight should be performed in laboratory by the students. In addition, two more subjects from the list may be given as assignments.

Determination of viscosity.

Flow through pipes. Analysis for laminar and turbulent regions

Flow through packed bed.

Flow through Venturimeter.

Flow through Orificemeter.

Flow through pipe fittings.

Verification of Darcy's law.

Characteristics of centrifugal pump.

Pump and blower specification writing in a format routinely used by process industry.

Trial and error solution to a given flow problem on a computer.

Flow through fluidized bed/packed bed.

Study of motion of particles in fluids of different viscosity.

Text Books/References

W. L. McCabe, J. C. Smith and P. Hariott: "Unit operations in chemical Engg.",
McGraw Hill Publications.

J. M. Coulson and F. Richardson: "Chemical Engineering Vol.1", Pergamon press.

S. K. Gupta: "Momentum transfer operations", Tata McGraw Hill Publishers.

M. M. Denn: "Process fluid mechanics", Prentice Hall Publications.

Syllabus for Unit Test

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K10211: HEAT TRANSFER - I

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(05 Hours)

Modes of Heat Transfer:

Conduction, convection and radiation. Fundamental laws employed:
Conservation of mass, heat and momentum.

Dimensional Analysis:

Fundamental dimensions, units of various quantities used in heat transfer, importance of dimensional analysis in experimental design and data reduction, dimensional analysis applicable to three modes of heat transfer, dimensionless numbers with significance used in heat transfer.

Unit-II

(10 Hours)

Conduction:

Fourier's law of heat conduction. Thermal conductivity of solids, liquids and gases. Differential equations from shell balances for steady (rectangular and cylindrical) and unsteady state conduction and their solutions for particular cases. Steady state conduction in infinite slab, infinitely long hollow cylinder, hollow sphere. Concepts of thermal resistance, contact coefficient, thermal conductance. Thermal resistance of infinite composite slab and cylinder. Heat loss through pipe insulation and optimum thickness of insulation. Critical radius of insulation. Unsteady state conduction. Heat transfer from extended surfaces. Efficiency of longitudinal fins. Heat transfer coefficient, pressure drop, wall temperature in heat exchangers with fins.

Unit-III

(10 Hours)

Convection:

Newton's law of cooling. Shell balances for heat convection. Classification of convection.

Natural convection: empirical correlations laminar and turbulent flow, vertical plates, walls, cylinders, horizontal plates and cylinders.

Forced convection: empirical correlations laminar and turbulent flow, forced convection inside tubes and ducts.

Individual and overall heat transfer coefficient, Fouling factor.

The colburn analogy: colburn j factor.

Thermal boundary layer: Heat transfer in laminar and turbulent boundary layer. Boundary layer thickness in laminar and turbulent flow.

Reynolds analogy. Analogy between heat and momentum transfer in turbulent flow.

Unit-IV

(09 Hours)

Radiation:

Stefan- Boltzman's law. Common terms in radiation: black body, gray body, opaque body, white body, emissive power, emissivity, Absorptivity, transmissivity and reflectivity.

Radiation laws: Kirchoff's law , Wein's displacement law, Planck's law. Solid angle. Intensity of radiation. Radiant exchange between two finite and infinite black surfaces. Radiant exchange between two infinite parallel gray planes. Radiation shield. Radiation shape factor, laws of shape factor. Radiant heat exchange in an enclosure having black surfaces.

Unit-V

(07 Hours)

Furnaces:

Types and classification of different furnaces. Characteristics of an efficient furnace. Heat transfer in furnace. Furnace efficiency calculations. Lobo and Evans method. Wohlenberg simplified method. Orrock-Hudson method.

Unit-VI

(07 Hours)

Heat transfer in agitated vessels, packed bed, fluidized bed, gases at high Velocity. Heat transfer coefficient for liquid metals, forced cross flow heat exchanger, cross flow of air/ gas across a tube.

Term work

Term work will consist of the experiments listed below , of which at least eight should be performed in laboratory by the students. In addition, four more assignments should be given to the students.

List of Practical

- To determine thermal conductivity of a metal bar .
- To determine Stefan-Boltzman constant .
- To determine thermal conductivity of an insulating material.
- To determine heat transfer coefficient in natural convection.
- To determine heat transfer coefficient in forced convection.
- To determine emmissivity of aluminium plate .
- To determine heat transfer coefficient for pin fin .
- Heat transfer in furnace.
- Study of heat transfer in agitated vessels.

Text Books/References

- W. L. McCabe, J Smith, Harriot: "Unit Operations of Chemical Engineering", McGraw Hill Book Company.
- D. Q. Kern: "Process Heat Transfer" , Tata McGraw Hill Publishers.
- S. P. Sukhatme: "A text book on Heat Transfer" , Universities Press.
- S. D. Dawande : "Principles of Heat and Mass Transfer", Central Technova Publications.

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K10212: CHEMICAL ENGINEERING THERMODYNAMICS-I

TEACHING SCHEME

Lectures : 04 Hrs/week

Tutorial : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or : 50 Marks

Unit-I

(07 Hours)

Introduction to Chemical Engineering Thermodynamics:

Introduction; Basic concepts of energy, work, heat, scope of thermodynamics, fundamental and derived quantities, state and path functions, thermodynamic systems, reversible & irreversible processes.

Unit-II

(08 Hours)

First Law of Thermodynamics:

Statements, First law for cyclic process, Internal energy, Enthalpy, Heat capacity, Intensive & Extensive process, Equilibrium, Phase rule, Constant volume & constant pressure process.

Unit-III

(09 Hours)

Volumetric Properties of Pure Fluids:

The P.V.T. behavior of pure substance, the virial equations & their application Types of process ideal & real gas, Compressibility factor, the constant volume, constant pressure, adiabatic, polytropic processes, real gas, Vander Wall equation, Redlich Kwong equation, Peng-Robinson equation, Benedict-Webb Rubin equation, Cubic equation, Heat effect

Unit-IV

(08 Hours)

Second Law of Thermodynamics:

Relevance of second law, Kelvin-Planck statement, Thermodynamic temp. scale Carnot cycle, entropy, Third law of thermodynamics, mathematical statement of 2nd law, statement of 3rd law.

Unit-V

(09 Hours)

Thermodynamic properties of Fluids:

Maxwell relationships, residual properties, residual properties by equations of state, two-phase systems, Clausius - Clapeyron equation, type of thermodynamic diagram, availability.

Unit-VI

(07 Hours)

System of Variable Composition-Ideal Behavior:

Fundamental property relation, Solution, properties of solution, Chemical potential Ideal gas mixture, ideal solution & Raoult's law, Henry's law

Text Books/References

J. M. Smith & H. C. Vanness, "Introduction to Chemical Engineering Thermodynamics"

Narayanan, "Chemical Engineering Thermodynamics"

Kenneth Denbigh, "Principles of Chemical Equilibrium"

Y. V. C. Rao, "Chemical Engineering thermodynamics"

B. F. Dodge, "Chemical Engineering Thermodynamics"

T. E. Daubert, "Chemical Engineering Thermodynamics"

Glasstone S., "Thermodynamics for Chemists"

Weber and Meissner, "Thermodynamics for Chemical Engineers"

B. G. Kyle, "Chemical and Process Thermodynamics"

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K40213: ELECTRICAL AND ELECTRONICS TECHNOLOGY

TEACHING SCHEME

Lectures : 02 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

T. W. & Or. : 50 Marks

Unit-I

(04 Hours)

Three phase Circuits: Revision, Basic three phase voltage and current relations in Y & delta Measurements of power in three phase circuits using two-wattmeter method for balanced star and delta loads. Measurement of reactive power using single-wattmeter.

D. C. motors: Principal of working. Construction. Types. Characteristics. Starters. Method of speed control. Applications.

Unit-II

(04 Hours)

Induction Motors:

- a) Three phase : Rotating, Magnetic Field, Slip and Torque-slip. Characteristics, Starters, Applications, Simple calculations,
- b) Single phase: Types, Starting methods, Applications. (No mathematical treatment)

Unit-III

(04 Hours)

Introduction to Alternator:

Construction, Working principle, Regulation methods: (only by OC & SC Test using synchronized Impedance method only)
Electrical heating: Introduction, Resistance and dielectric heating (Descriptive treatment only)

Unit-IV

(05 Hours)

Transistors:

Transistors as an amplifier, Biasing circuits, different configurations of amplifiers, Audio Frequency Amplifiers, Frequency response, FET.

Unit-V

(04 Hours)

Introduction to Operational Amplifiers:

Salient features. Inverting and Non-Inverting type amplifiers, Operational Amplifiers as adder, subtractor, multiplier integrator etc. Introduction to Logic Gates: AND, NAND, OR, NOR with truth tables.

Unit-VI

(04 Hours)

Special devices:

UJT, DIAC, TRIAC, SCR.

Study of power supplying function. Function generators. Digital multimeter. (Descriptive treatment only.)

Practical

The term work will consist of eight practicals out of the list given below. (4 experiments from electrical technology and 4 experiment from Electronics technology)

List of Practical

Electrical Technology:

Measurement of power and reactive power in three phase circuit using two-wattmeter and single-wattmeter.

Break test on D. C. shunt motor.

Speed variation of D. C. shunt motor using armature voltage and field current Method.

Load test of three phase Induction motor.

To find regulation of Alternator by OC and SC test.

Study of DC motor starter.

Study of starters for 3 phase Induction motors.

Electronics Technology:

Frequency response of single stage Audio Frequency Amplifier.

Study of Transistor characteristics. (C. C. only)

Study of Operational Amplifier circuits.
Study of SCR characteristics.
Study of Digital Multimeter and Function Generator.
Study of triac characteristics.

Text Books/References

Malvino, " Electronic Principles" Tata McGraw Hill Publishers
Cotton H, " Electrical Technology" CBS publications.
Hughes Edward, " Electrical Technology", Longamann Publications.



RULES REGARDING ATKT, CONTINUOUS ASSESSMENT and AWARD of CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester-III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.

For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class



BHARATI VIDYAPEETH UNIVERSITY, Pune.

(Established under Section 3 of UGC ACT 1956)



PRACTICAL

C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (CIVIL)
(Sem. III & IV)**



FIELD WORK



CLASS WORK



COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (CIVIL) (Sem. III & IV)

Rs. 150/-



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering is the largest engineering college in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from undergraduate to doctorate Level, BVUCOE is probably the only engineering college in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have Enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in 2007-2008.

Currently we have 12 outgoing research projects. The infrastructure BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MOUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

The Construction activity is the second largest economic activity in India next only to agriculture. The amount of money invested and the jobs provided by the Civil Engineering industry are much larger than any other industry. Overall globalization of the economy has resulted in more and more demand for better infrastructure facilities like roads, bridges, airports and project related to water resources. The Civil Engineer therefore has to play a major role in the development of the country. The Department of Civil Engineering desires its students to excel in the changing trends in global economy.

The department of Civil Engineering has developed two fold:

It has well-established laboratories in subjects of Structural Engineering, Environmental, Hydraulics, Geotechnical, Transportation, Geology, Surveying and Computer Engineering. The department also maintains a well-equipped audio - visual room with facilities like VCR, TV, and overhead and slide project for projecting videocassettes, CDs, slides and transparencies containing technical demonstrations. There are more than 200 videocassettes and CDs, 35 wall charts demonstrating various Civil Engineering theories and techniques.

The department has developed linkages with C. W. P. R. S. Pune and INSWAREB Vishakhapattanan for research works in Hydraulics and concrete materials. The department also has access to laboratories of CW & PRS and libraries of IAT, Pune and I. I. T. Powai, Mumbai. The department maintains a separate departmental library consisting of some rare books.

The teaching staff of the department is actively involved in research works. The research works on protection of scour around bridge piers by riprap, use of mineral admixtures in concrete are some of the research work successfully done. The faculties of the department routinely publish their works in reputed journals and conferences at national and international level. The testing and consultancy cell of the department caters to the various technical services in Hydraulics, Soil Mechanics, Bridge and Dam foundations, Environmental Engineering, Concrete Materials and Surveying.

The department also runs a postgraduate course in Hydraulic Engineering. This course is blessed by the guidance of some of the internationally recognized scientists in the field of Hydraulics. The P.G. Students perform their dissertation works in collaboration with CW & PRS laboratories, especially the model studies. The undergraduate and postgraduate students have unlimited access to the Internet facility provided by the department. The Civil Engineering Students Association (CESA) serves as a platform for the overall development of the students. The CESA organizes personality development programs, guest lectures of experts; site visits to Civil Engineering projects and is also actively involved in social programs. The department has also organized national level workshop on artificial neural network, Hydraulic structures and advances in concrete technology in the last few years.

MAJOR GROUPS/AREAS

Hydraulic Engineering, Structural Engineering, Computer Aided Analysis and Design, Concrete Technology, Environmental Engineering, Foundation Engineering, Surveying, Project feasibility, Engineering Geology.

EXPERTISE IN RESEARCH AND CONSULTANCY

Pump Testing, Precision Survey works, Analysis and Design of Structures, Testing of Concrete, Building materials and Metals, Concrete Composites, Air & noise pollution, Water quality, Geological Investigation for Civil Engineering Structures.

MAJOR EQUIPMENTS

Universal Testing Machine (1000KN & 200KN) with computer attachment, Compression Testing Machine (2000KN), Concrete Mixer, Torsion Testing Machine, Polariscope, Wind Tunnel, Tilting Flume, Airflow Bench, Standard Penetration Tests set up, Electronic Distance Meter, High Volume Sampler with PMIO, Spectrophotometer, Nephelo Turbidity meter, Flame Photometer, Noise Level Meter.

SOFTWARE

Auto CAD 2000, STAAD-PRO, Geo-Concept GIS, MATLAB, Hit-Office

LABORATORIES

Testing of Materials, Engineering Mechanics, Geotechnical & Transportation Engineering Environmental Engineering , Fluid Mechanics & Hydraulic Machinery, Survey Laboratory, Geology Laboratory



STRUCTURE & EXAMINATION PATTERN

B. Tech. - Civil Engineering

Semester III									Total Duration : 34Hrs/Week
									Total Marks : 750
Subject Code	Subject	Teaching Scheme Hrs/Week			Examination Scheme				Total
		L	P	D	Theory	Unit Test	TW & Pr	TW & Or	
K20201	Building Construction Practices	04	-	04	80	20	-	50	150
K20202	Engineering Geology	04	02	-	80	20	50	-	150
K20203	Mechanics of Materials	04	02	-	80	20	-	50	150
K20204	Concrete Technology	04	02		80	20	-	50	150
K20205	Engineering Economics & Management	04	-	-	80	20	-	-	100
K20206	Computer Applications in Civil Engineering- I	-	04	-	-	-	50	-	50
Total		20	10	04	400	100	100	150	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Drawing	Theory	Test	T. W. & Pr.	T. W. & Or.	
20	10	04	400	100	100	150	750

Semester IV									Total Duration : 34Hrs/Week	
									Total Marks : 750	
Subject Code	Subject	Teaching Scheme Hrs/Week				Examination Scheme				Total
		L	P	D	T	Theory	Unit Test	TW & Pr	TW & Or	
K70207	Engineering Mathematics-III	04	-	-	-	80	20	-	-	100
K20208	Building Planning and Design	04	-	04	-	80	20	-	50	150
K20209	Surveying and Leveling	04	04	-	-	80	20	50	-	150
K20210	Structural Mechanics-I	04	-	-	01	80	20	-	50	150
K20211	Fluid Mechanics-I	04	02	-	-	80	20	-	50	150
K20212	Computer Applications in Civil Engineering- II	01	02	-	-	-	-	50	-	50
Total		21	08	04	01	400	100	100	150	750

Teaching Scheme				Examination Scheme				Total
Lectures	Practical	Drawing	Tutorial	Theory	Test	T. W. & Pr.	T. W. & Or.	
21	08	04	01	400	100	100	150	750



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The Schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III



K20201: BUILDING CONSTRUCTION PRACTICES

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Building and Building Foundations:

Building and its components, Types of Structures and their suitability, Different types of foundations, Design criterion for R.C.C. Column, footing and plinth beams, Earthquake resistant foundations.

Unit-II

(08 Hours)

Stone Masonry and Brick Masonry:

Different types of Stones, Characteristics of good building stones, Principles of masonry construction, Types of stone masonry, various proportions of mortar used in constructions. Bricks: Qualities, tests and special types of bricks. I.S. Sizes of bricks, Types of bonds, Reinforced brickwork, composite masonry, Hollow and solid block masonry, cavity walls.

Unit-III

(08 Hours)

Arches, Lintels and Floors:

Arches: Terms used, methods of construction, Types of arches, stability of arches

Lintels: Types, details of RCC lintel & Chhajja

Flooring: Types & I.S. Specifications, Ground Floor & Upper floor design & construction requirements, varieties of floor finishes, types of floorings. Precast flooring, factors for selection of flooring.

Unit-IV

(08 Hours)

Roof Construction:

Types of roof & their suitability, roof structure, selection of roof covering material, R.C.C., G.I Sheets, A.C. Sheets, water proofing, rainwater drainage system. Truss types, advantages of steel trusses, false ceiling materials & method of fixing. Different types of shell structures.

Unit-V

(08 Hours)

Doors, Windows and Stairs:

Types of doors, windows, different types of materials used for frames and shutters. Fixtures and fastenings used, Types of stairs, Design and construction of stairs ramps, lifts and escalators.

Unit-VI

(08 Hours)

Building Finishes and Miscellaneous Materials:

Building Finishes & Miscellaneous Materials, Plastering, pointing, Types and material used, Mortars, White washing lime & its types, colour washing, Distempering, Types of paints. Wall cladding materials and their fixing methods, use of glazing work for windows.

Glass: types & properties, Fiber glass. Use of plastics

Water proofing: Methods and Systems.

Term Work

A) Plates (1/4 imperial size)

B) Drawings on full imperial size sheets

A) Plates :- Plates are prepared by drawing as per list specified below;

Symbols and conventional signs of materials

Different Types of Foundations (Any Five)

Types of stone masonry

Arches in stone & brick masonry to be drawn using AutoCAD

Bonds in Brick work to be drawn using AutoCAD

Types of floors (any Three)

Different types of roofs to be drawn using AutoCAD

C.C.T.W. Panelled door – Plan, Elevation Section.

Flush door

Types of Windows

Types of stairs

Reports of site visit to construction sites. (min. 2 visits)

Collection of advertisement related to construction materials & Machinery. (Minimum ten)

B) Drawing on imperial size sheets.

Sheet No.1: Single Storied Residential building with load bearing structure.

Details to be drawn – Plan, elevation and section to the scale of 1:50. And Site plan to the scale of 1:200.

Sheet No.2: Axonometric View of Sheet No.1.

Sheet No.3: G+1, R.C.C. Residential building from given data. Details to be drawn:

1. Plan, front elevation, section to the scale of 1:50
2. Site plan to the scale of 1:200

Text Books/References

“A to Z Building Construction”, Mantri Publication

Rangwala, “Building Construction”, Charotar Book House

Bindra Arora, “Building Construction”, Laxmi Publication

“Hand book on Water Proofing”, ACC

Syllabus for Unit Test

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
Unit Test 3	Unit III & VI

**TEACHING SCHEME**

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit -I

(08 Hours)

Introduction: Objects, Scope and Subdivisions.

General Geology: Surface relief of the earth. External and internal agents modifying the earth, Weathering, Erosion, Denudation and

Decomposition. Earth Movement, Metamorphism, Volcanism.

Petrology: Rock and mineral. Silicate and non silicate minerals, Rock forming minerals, Primary and secondary minerals, Essential and accessory minerals.

Igneous rocks: Mineral composition, Felsic and mafic minerals. Textures, Reasons for textural variation. Dependence of degree of crystallization and shape and size of crystals on conditions of cooling. Conditions of cooling of Plutonic, Hypabyssal and Volcanic rocks. Gas cavities and secondary infillings in volcanic rocks. Classification : Study common rock types described in practical work.

Secondary rocks: Rock weathering, Decomposition and disintegration, favorable conditions, Processes and products of decomposition and disintegration transport and deposition. Classification: Residual, Sedimentary, Chemical and Organic Deposits.

Sedimentary Deposits: Agents of transport. Textural characteristics Clastic texture, Stratification and Lamination. Consolidation by welding and cementation. Grain size classification.

Metamorphic Rocks: Agents and types of metamorphism. Metamorphic textures, Contact, Cataclastic, Dynamothermal and Plutonic metamorphism.

Unit-II

(08 Hours)

Physical Geology:

Geological action of running water, River valley development, Normal and Regional cycle of river erosion. Water falls, Ox-bow lakes, flood plain deposits, Deltas. Rejuvenation and resulting features such as canyons,

River terraces and incised meanders. Earth movements, Earthquakes, Interior of the earth, Earthquake zones. Geological considerations for choosing sites of buildings in seismic areas Earthquake Resistant structures Volcanism, Types of mountains.

Unit-III

(08 Hours)

Structural Geology and Indian Geology:

Structural Geology: Outcrop, Dip and Strike, Conformable series. Unconformity and overlap. Different types of faults and folds in rocks. Inlier and outlier. Modes of occurrence of igneous rocks, Joints and fractures

Indian Geology: General principles of stratigraphy. Age of the earth and divisions of geological time. Physiographic divisions of India and their characteristics. Geological history of Peninsula. Study of formations in Peninsula and the significance of their structural characters in major Civil Engineering activities, Economic minerals and building stones.

Unit-IV

(08 Hours)

Ground Water: Meteoric. Connate and Juvenile water, Depth zones of groundwater. Perched watertable. Influence of textures and structures of rocks on ground water storage and movement. Pervious and impervious rocks. Geological work of groundwater, Effects of solution and deposition. Natural springs and seepages, Depression and contact springs. Hot springs and geysers, wells. Effects of dams and canals, Effect of pumping, Cone of depression, Circle of influence. Conservation of groundwater. Artesian wells, Waterbearing capacity of common rocks. Locating groundwater supplies. Case histories.

Building stones: Requirements of a good building stone. Dependence of strength, durability, ease of dressing, availability of blocks of suitable size and appearance on mineral composition, textures and field structures. Suitability of common rocks as building stone.

Landslides: Causes. Role of water. Stability of slopes in consolidated materials. Influence of dip and slope. Safe and unsafe slopes. Prevention of landslides, Keeping slopes free from water. Retaining walls. Vegetation. Slope treatment, Precautions to be taken while aligning roads etc. across hills and making cuts in hill side. Case histories.

Unit-V

(08 Hours)

Geological Investigations:

Preliminary Geological Investigations: Use of Geological maps and sections, Verification of surface data by subsurface exploration. Drill holes. Test pits, trenches, Exploratory tunnels, Shafts, Adits, Drifts etc. Compilation and interpretation of information obtained from these. Correlation of surface data with results of subsurface exploration. Limitations of drilling. Engineering significance of Geological structures such as Stratification. Dips. Folds, Faults, Joints. Fractures. Crush zones, Fault zones. Dykes etc. Case histories.

Tunneling: Influence of geological conditions on design and construction methods. Preliminary geological investigations for tunnels. Important geological considerations while choosing alignment. Difficulties during tunneling as related with lithology, nature and structures of materials to be excavated. Role of groundwater. Geological conditions likely to be troublesome. Suitability of common rock types for tunneling. Unlined tunnels. Case histories.

Unit-VI

(08 Hours)

Geology of Sites:

Geology of Dam Sites: Dependence of strength, Stability and watertightness of foundation rocks on their physical characters and geological structures. Influence of geological conditions on the choice of types and design of dam. Preliminary geological work on dam sites. Favourable and unsuitable geological conditions for locating a dam. Precautions to be taken to counteract conditions. Treatment of leaky rocks, Faults Folds Dykes, Crush zones, Joints. Fractures, Unfavourable dips. etc. Earthquakes in regions of dams. Case histories. Geology of reservoir sites: Dependence of water tightness on physical properties and structures of rocks, Geological conditions suitable and unsuitable for reservoir sites. Conditions likely to cause leakage through reservoir rim. Importance of ground water studies and effects of raising of water table. Case histories. Geology of Bridge Sites: Importance of bridge foundations, Preliminary geological exploration for bridge piers and bridge abutments. Scouring and erosion around bridge piers. Influence of nature and structures of rocks on bridge foundations. Case histories.

List of Practical

Identification of the following minerals in hand specimens: (Two Experiments)
Quartz and its varieties, Gypsum, Fluorite, Barytes, Tourmaline, Beryl, Graphite, Asbestos, Talc, Kyanite, Garnet, Galena. Magnetite. Haematite. Limonite, Iron pyrites, Chromite, Bauxite.

Identification of the following rock types in hand specimens: (Seven Experiments)
Granites, Syenites, diorites, gabbros, rhyolites, trachytes, andesites, basalts, varieties of Deccan Trap rocks, volcanic breccias. Tachylytes pegmatites, dolerites, graphic granites - Laterites, bauxites, conglomerates, breccias, sandstones, quartzites, grits, arkoses, shales, mudstones, chemical and organic limestones.

Maps: (Twelve Experiments)

Construction of geological sections from countoured geological maps, interpreting geological features without drawing sections, solution fo engineering geological problems such as alignment of dams, tunnels, roads canals, bridges etc., based on geological maps.

Data interpretation: (Two Experiments)

Logging of drill core and interpretation of drilling data. Graphical representation of core log.

Text Books/References

Gupte R. B., "A Text Book of Engineering Geology", P. V. G. Publications, Pune

Legget R., "Geology and Engineering", McGraw Hill Book Co., London

Trefethen J. M., "Geology for Engineers", D Van Nostrand Co. Inc.

Schultz J. R. and A. B. Cleaves, "Geology in Engineering", John Wiley Inc.

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

General Anatomy:

Concept of Stress and Strain: Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve. Elastic constants and their inter relationship. Generalized Hooke's law.

Axial and Thermal Stresses: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate, prismatic and tapered cross section, homogenous and composite bars; due to concentrated loading, self weight and temperature effect; Axial rigidity.

Unit-II

(08 Hours)

Axially Loaded Long Columns:

Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula; Johnson's formula; Direct and Bending Stress : Concept; Resultant stress due to the axial load and uniaxial or biaxial bending; Core of section; Effect of lateral force and self weight; Application to columns, retaining walls, dams, chimneys etc.

Unit-III

(08 Hours)

Principal Stresses and Principal Planes:

Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method. (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion; Theories of failure;

Strain Energy: Concept of strain energy; Modulus of Resilience and Toughness; Strain energy for axially loaded members due to gradual, sudden and impact load; Strain energy due to self weight;

Unit-IV

(08 Hours)

Shear Force and Bending Moment in Beams:

Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram due to point load, uniformly distributed load, uniformly varying load and moments for the simple and compound beams; Elastic curve.

Flexural Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section.

Unit-V

(08 Hours)

Shear Stresses:

Concept of direct and transverse shear; Shear stress formula; Concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section.

Torsion of Circular Shafts: Theory, assumptions and derivation of torsional formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity.

Unit-VI

(08 Hours)

Slope and Deflection of Beams:

Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Double Integration method; Macaulay's method.

Pressure Vessels: Stresses, strains and deformation in thin walled cylindrical and spherical vessels due to internal fluid pressure; Thick cylinders; Lame's equation of stresses.

Term-work and Oral

A) Term work

The term-work shall consist of minimum TWELVE experiments.

1. Tension test – Mild Steel, Tor Steel, Aluminum.
2. Compressive Strength test- Bricks.

3. Bending test – Timber.
4. Transverse test- Roof tiles.
5. Flexure test- Flooring tiles.
6. Bend Re-bend test- Mild Steel, Tor Steel.
7. Direct Shear test- Mild Steel, Aluminum.
8. Torsion test- Mild Steel, Aluminum.
9. Izod & Charpy Impact test- Mild Steel, Aluminum, Brass, Copper
10. Rockwell Hardness test- Mild Steel, Aluminum, Brass, Copper
11. Abrasion test- Flooring tiles
12. Fatigue test- Mild Steel, Aluminum
13. Water Absorption test- Bricks
14. Block board test
15. Brittle coat

B) Oral:

Oral shall be based on above term work.

Text Books/References

- Beer F.P. and Johnston E.R., “Mechanics of Materials”, McGraw Hill Publication
 Gere J.M. & Timoshenko S.P., “Mechanics of Materials”, CBS Publishers & Distributors
 Singer F. L. & Pytel A., “Strength of Materials”, Harper and Row Publication
 Popov E. P., “Engineering Mechanics of Solids”, Prentice Hall of India (P) Ltd.
 Benham P. P., Crawford R. J. & Armstrong C. G., “Mechanics of Engineering Materials”, ELBS Longman Publication
 Rajput R. K., “Strength of Materials”, S. Chand Publication
 Junnarkar S. B. & Adavi, “Mechanics of Materials”, Charotar Publishing House
 Ramamrutham S. & Narayan R., “Strength of Materials”, Dhanpat Rai Publishing Co.

Syllabus for Unit Test

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
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TEACHING SCHEME

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Ingredients of Concrete:

Cement: Manufacture of Portland cement, Chemical Composition, Bogues compounds, Hydration of cement, Structure of Hydrated cement, ASTM classification and types of cement, Tests of cement and I.S. requirements for ordinary Portland cement.

Aggregates: Classification, Properties of aggregates, Deleterious materials, Soundness, Alkali-Aggregate Reaction, Grading of aggregates, Standard Grading curves, Testing of aggregates, Artificial & recycled aggregates.

Water: Quality of water IS requirements, Use of sea water.

Unit-II

(08 Hours)

Fresh Concrete:

Workability: Factors affecting workability, Measurements of workability, Suitability of concrete based on degree of workability, Segregation, bleeding.

Concreting Process: batching, mixing, transporting, placing and compaction.

Curing of Concrete: Methods of curing (study of machinery not expected), Effect of temperature on curing, Steam curing, curing compounds, period for curing, stripping time, Analysis of fresh concrete.

Unit-III

(08 Hours)

Hardened Concrete:

Properties of Hardened concrete

Strength of Concrete: General, Compressive strength, Factors affecting strength, Maturity Concept, Tensile strength, Relation between compressive and tensile strength, Flexural strength, Testing under central and third point loading, Shear strength, Bond strength,

Elasticity, Creep and Shrinkage: Stress-Strain relation, Modulus of Elasticity, Creep-time curve, classification of shrinkage.

Non Destructive Testing: Schmidt's Rebound hammer, Pull out test, Ultrasonic Pulse velocity method.

Unit-IV

(08 Hours)

Concrete Mix Design:

Concept of mix design, Variables in mix design, Statistical Quality Control, Various methods of mix design, Design of mix by Indian Standard recommended method (IS: 10262-1982 & IS: 456-2000), and DO method, Acceptance criteria.

Unit-V

(08 Hours)

Admixtures in Concrete and Special Concreting Techniques:

Purpose and functions, Classification

Chemical Admixtures: Plasticizers, Super-Plasticizer, Retarders, Air entraining agents, Compatibility of admixtures and cement, Marsh Cone Test.

Mineral Pozzolanic/Admixtures:- Fly ash, Silica fume, GGBS, Rice Husk Ash

Special Concreting: Under water concreting, Cold weather concreting

Unit-VI

(08 Hours)

Special Concrete and Durability of Concrete:

Special Concrete: Light weight concrete, Polymer Concrete, Fiber reinforced concrete, Roller Compacted Concrete, Self Compacting Concrete, Ferro-cement, Pumped Concrete, Ready mix concrete; High Performance Concrete.

Durability of Concrete: Definition, Significance, Strength and durability relationship; Permeability, Chemical attack; Sulphate attack; Chloride attack, attack by sea water, Carbonation and measurement of depth of carbonation, Requirement for durability as per IS 456-2000.

Term-work:

The term-work shall consist of (ANY FIFTEEN) experiments from PART A where as PART B is compulsory.

PART A: List of Experiment

- 1) Fineness test on Cement
- 2) Standard consistency and Setting time test on cement
- 3) Soundness test on Cement
- 4) Compressive strength test on Cement.
- 5) Moisture content & Water absorption of aggregates.
- 6) Specific gravity of Aggregates.
- 7) Elongation and Flakiness Index of Aggregates.
- 8) Fineness Modulus of Aggregate.
- 9) Aggregate Impact Value.
- 10) Aggregates Crushing Value.
- 11) Measurement of Workability of Concrete (Slump, Compaction factor, Flow table and Vee-bee test)
- 12) Study of effect of admixtures (Superplastsizer & Retarding agent) on concrete.
- 13) Concrete mix design using IS code method.
- 14) Compressive strength of Concrete.
- 15) Split Tensile strength of Concrete.
- 16) Flexural Test of Concrete.
- 17) Non Destructive Test on concrete –Schmidth's Rebound hammer test

PART-B: Site Visit with site visit report:

- 1) NDT Project on any site under construction
- 2) Study of any of the advances in Concrete Technology (RMC Plant, Pumped Concrete, Roller Compacted Concrete, Self Compacted Concrete, Tremix flooring etc)

Text Books/References

- Neville A. M. & Brooks J. J., "Concrete Technology", Pearson Education Publication
Neville A. M., "Properties of Concrete", ELBS & Longman Publication

Shetty M. S., "Concrete Technology", S. Chand & Company Ltd.

Gambhir M. L., "Concrete Technology", Tata McGraw Hill Publication

Syllabus for Unit Test

Unit Test 1	Unit I & IV
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K20205 -ENGINEERING ECONOMICS AND MANAGEMENT

TEACHING SCHEME

Lectures : 04Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(08 Hours)

Elementary Economics and Production:

Definition of Economics, nature, scope and importance of engineering economics, basic economics concept - Human wants. Utility, value, cost, price, profit, capital, wealth, equilibrium etc. law of demand, elasticity of demand. The law of supply. Factors influencing production: land, labour, capital and organization. Characteristics and rewards, factors of production. Division of labors, specialization, scales of production, economics of scale.

Unit-II

(08 Hours)

Finance and Construction:

Types of capitals - Fixed and Working Capital Use of Capital. Shares, Debentures. Public deposits. Forms of foreign capital. Money and capital market in India. Constituents of Indian capital market. Various sources of building finance and nature of their operations. New economic policy, liberalisation, Extending privatization and globalisation. Role of Financial institutions in economic development. Forms of business organization: Sole, Proprietorship, Partnership, Joint Stock Company. Private line. Co-operative Society, Unlimited.

Unit-III

(08 Hours)

Introduction to Management:

Management Theories and Principles. Contributions by Taylor, Mayo, Fayol, McGregor, Frank and Gilberth. Management by objectives and decision-making. Manager: Qualities, Functions and Experience. Role of "Project Manager. Introduction to Project Life cycle. Major types of constructions. Selection of professional services --contractors.

Unit-IV

(08 Hours)

Construction Organization:

Importance of organization. Principles of forming organization Span of control, Types of organization - Line, Function, Line and Staff, Committee and matrix. Motivation for the Project team-Interpersonal behaviour in project organization-perceptions of Owners and Contractors. Manpower Planning, Organising, Staffing, directing and Controlling-Personnel Principles.

Unit-V

(08 Hours)

Project Planning:

Planning - Purpose and objective, Strategies, Policies and Rules, Steps in planning. Execution, Operation and maintenance in relation with various Civil Engineering projects. Resources required for construction projects.

Unit-VI

(08 Hours)

Personnel Management:

Nature and Scope of Personnel management, Manpower planning, Job - Analysis, Description, Recruitment, selection, job evaluation techniques, Human relations in construction: client-contractor, Contractor- project staff, Labour, Public etc.

Text Books/References

Dewett K. K., "Elementary Economic Theory"

Stonier and Hague, "A Text Book of Economic Theory"

Panneerselvam R., "Engineering Economics"

Koontz Harold, Heinz Weihrich, "Management", McGraw Hill Company International Editions

Sherlekar S. A. and V. S. Sherlekar, "Modern Business Organization Management", Himalaya Publishing House

Davis Gordon Band Margrethe R Olson, "Management Information Systems", McGraw Hill International Editions

Khanna O. P., "Industrial Engineering and Management", Dhanpat Rai and Sons

Syllabus for Unit Test

Unit Test 1	Unit I & IV
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K20206 - COMPUTER APPLICATION IN CIVIL ENGINEERING - I

TEACHING SCHEME

Practical : 04Hrs/week

EXAMINATION SCHEME

T. W. & Pr. : 50 Marks

To a Civil engineer drawing is of immense importance, Civil engineer in his scope may not draw but needs to read the drawings. Application of AutoCAD is widely used by the industry and there is basic need of knowing AutoCAD by an engineer. In this subject AutoCAD software, a Civil Engineering application will be taught. This subject covers all the commands used to create and modify the drawing. Students as guided by the faculty have to draw different drawings related to civil engineering, details of which are mentioned below:

Learning Auto Cad:

1. Introduction
2. Getting Started
3. Learning commands: Draw and Modify menu
4. Learning commands through drawings
5. Centerline drawing
6. Layers / Filters
7. Blocks
8. Area command
9. Drawing Presentation: Sheet size and Text Format.

List of Practicals

Drawing plan, Elevation and Section of G +1 Building
Theory assignment giving details of all commands used
Drawing plates. (minimum 10 numbers)

Text Book/References

AutoCAD: Users Guide. 2000



SEMESTER - IV





TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(09 Hours)

Differential Equations:

Solution of Linear differential equation of nth order with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's linear equations. Simultaneous Linear differential equations, Total differential equations, Symmetrical Simultaneous differential equations.

Unit-II

(09 Hours)

Applications of Differential Equations:

Applications to cantilever, bending of beams, whirling of shafts, Mass spring systems.

Applications of Partial Differential Equations:

Solution of wave equation, one and two dimensional heat flow equations by method of separating variables. Applications to civil and allied engineering problems.

Unit-III

(08 Hours)

Numerical Methods:

Numerical solutions of System of Linear equations by Gauss elimination, LU Decomposition, Cholesky, Jacobi and Gauss-Seidel methods. Numerical solutions of Ordinary differential equations by Euler's, Modified Euler's, Runge- Kutta 4th order, and Predictor-Corrector methods.

Unit-IV

(09 Hours)

Statistics and Probability:

Measure of Central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates.

Probability density function and Probability mass function, Binomial, Poisson, Normal and Hypergeometric distributions, Test of Hypothesis: Chi-square test of goodness of fit and Independence of attributes, Introduction to Decision and Quality Control.

Unit-V

(09 Hours)

Vector Differentiation:

Radial, Transverse, Tangential, Normal components of linear velocity and acceleration, Gradient, Divergence and Curl, Directional derivative, Vector identities, Irrotational and Solenoidal Vector fields.

Unit-VI

(08 Hours)

Vector Integration:

Line integral, Surface integral and Volume integral, Work done, Gauss's-Divergence theorem, Stoke's theorem and Green's lemma. Applications to fluid flow, Streamlines, Continuity equation, Motion equation and Bernoulli's equation.

Text Books/References

- Peter. V'Neil, "Advanced Engineering Mathematics", 5e, Thomson Learning
Erwin Kreyszing, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
Wylie C. R. and Barrett L. C., "Advanced Engineering Mathematics", Mc Graw Hill
M. D. Greenberg, "Advanced Engineering Mathematics", 2e, Pearson Education
B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi
P. N. Wartikar and J. N. Wartikar, "Applied Mathematics" (Volume I & II), Pune Vidyarthi Griha Prakashan
Irwin Miller and John E. Freund, Probability and Statistics for Engineers, Prentice-Hall of India
P.N. Wartikar and J.N. Wartikar, "A Text Book of Engineering Mathematics - III"

Syllabus for Unit Test

Unit Test 1	Unit I & IV
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Unit Test 3	Unit III & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

Drawing : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 04 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Building Planning Natural and Built Environment, Ecology, Environment and Man relationship, Principles of planning for building, Integrated approach necessity, concept of building as Environmental Filter. Building Rules Regulations and Byelaws necessity, plot size, open space around the building. FSI, Building line, control line. Height, room size, Built up area, floor area, carpet area. Rules of lighting ventilation, Drainage and Sanitation.

Unit-II

(08 Hours)

Design of Building: Climate, elements of climate, global climate, thermal design Principles, comfort sectors, Heat exchange of building. Heat transfer loads - definition, calculation of U value of temperature gradient. Thermal insulation of roof and wall. Ventilation comfort factors, function of ventilation, stack effect wind effect. Mechanical ventilation, ventilation rate, Air conditioning-design data, cooling load, Air conditioning systems.

Unit-III

(08 Hours)

Lighting Principles of Day Lighting Design of Windows, Sky components, Noise and acoustics -Effect of noise, comfort standards, Noise control sound insulation, Acoustics reverberation Sabines formula acoustical defects conditions of good acoustics. Fire Protection - Fire safety, fire load, grading of occupancies by fire load, fire escape elements.

Unit-IV

(08 Hours)

Building Services:

Constructional requirements for different building services, Electrical, Telecommunication services, Circulation-Lift escalators, Entertainment services plumbing services, Layout of water supply & drainage system, Rate of water supply, storage and distribution arrangement, Plumbing systems, septic tank, garbage disposal arrangement.

Unit-V

(08 Hours)

Design concept of ECO building, Green buildings, Intelligent building, Low Cost Housing, Planning considerations in High rise buildings.

Unit-VI

(06 Hours)

Perspective drawing, one point and two point perspective.

Term Work

- 1) Sheet No1-Perspective Drawing of different objects.
- 2) Project Work-Detailed planning, designing and drawing of any one of the buildings listed below:

1. Residential Building
2. Commercial Building
3. Educational Building
4. Industrial Building
5. Recreational Building
6. Health Club

Sheets to be drawn in project work

- Layout plan of project with a suitable scale
- Plan/Typical floor plan to a suitable scale.
- Elevation and section to a suitable scale.
- Parking plan/Terrace plan to a suitable scale.
- Foundation Plan to a suitable scale.
- Lay out plan showing water supply and Drainage
- Line plan of any five buildings mentioned in project work.

Report File

File shall consist of

1. Data collection, line plan, planning considerations and approximate cost of building
2. Visit report to project buildings
3. Advertisement / Brochures regarding scheme of promoters and Builders

Oral examination shall include sketching and viva.

Text Books/References

Calendar, "Time Saver Standards for Architectural Design", Tata McGraw Hill Publishers

Merit, "Building Design and Construction", Tata McGraw Hill Publishers

Bindra Arora, "Building Construction", Laxmi Publication

M. L. Shah, C. M. Kale, B. Y. Patki, "Building Drawing with integrated approach to Built Environment", Tata McGraw Hill Publishers

Syllabus for Unit Test

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TEACHING SCHEME

Lectures : 04Hrs/week
Practical : 04Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks
T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Leveling:

Study of -Dumpy level, Auto level, Laser Level. Profile leveling - Longitudinal section and cross-section .Plotting of L section and cross section, Ground profile and cross section, working profile. Reciprocal leveling; Curvature and refraction correction, Distance to visible horizon. Principle Axes of dumpy level; Permanent Adjustment of level Adjustment of bull's eye bubble or Round Bubble. Line of collimation and Sensitiveness of bubble tube.

Unit-II

(08 Hours)

Theodolite Survey:

Introduction to 20" Vernier theodolite, Types of theodolites, Principal axes of Theodolite. Use of Theodolite -Measurement of horizontal angle, vertical angle, Magnetic bearing, Prolonging a line, Lining-in, Measuring deflection angles, setting out angles. Finding out elevation of objects, (Base accessible and inaccessible) by trigometrical observations. Theodolite traversing: Items of work checking of traverse open and close, Computation of consecutive and independent co-ordinates, Adjustment of closed traverse, balancing the traverse using Gales traverse table.

Unit-III

(08 Hours)

E.D.M.:

Omitted measurements, Area calculations by Co-ordinates. Testing and permanent adjustment of transit theodolite. Principal of stadia, fixed hair method with vertical staff to determine horizontal distance and elevation of points. Introduction to tachometric surveying. Introduction to Digital Theodolite, Digital angle Measurement. Introduction and Theory of EDM.

Unit-IV

(08 Hours)

Horizontal and vertical curves:

Horizontal and vertical curves Purpose. Simple circular curves-Elements and setting out of circular curves by linear i.e. Offsets from chords produced, offsets from long chord and angular methods i.e. Rankin's method, Two theodolite method. Compound curves - Elements and setting out compound curves. Introduction to reverse curves-Elements, Location and Uses.

Unit-V

(08 Hours)

Transition Curves and Plane Table Survey:

Transition Curves -Types and uses, Length of transition curves, Elements of cubic parabola, process to set out a transition curve by deflection angle method. Accessories required for plane table survey and uses of accessories: Advantages and disadvantages and Limitation of Plane table Survey. Methods of plane table survey, Radiation, Intersection, Traversing, Resection, Errors in plane table surveying.

Unit-VI

(08 Hours)

Minor Instruments used in surveying:

Two point and three point problems and their solutions by different methods. Reconnaissance survey Preliminary survey locating obligatory points fixing gradients paper and field locations, Construction Survey. Study and use of Abney level, Box sextant.

Term work

The term Work shall consists of

Field book containing record of all exercises and project listed below.

- | | |
|--|----------|
| a) Theodolite traverse survey project. | 1 Sheet |
| b) Plane table traverse survey project. | 1 Sheet |
| c) Road project showing L- Section plan
of road with contours and typical cross section | 2 Sheets |

List of Practicals

Details of practical to be performed, Exercise projects and assignments

Study and use of auto level and double check leveling

Study of laser level, Compound levelling and fly levelling, calculation By Rise and Fall Method

Study of theodolite and Practice of reading

Measurement of Horizontal angle of triangle by repetition method and applying Check

Measurement of vertical angle by Transit Theodolites

Project I- Theodolite traverse survey of closed traverse for minimum 0.5 Hectares including building, roads, etc.

Computation of Horizontal distance and elevation of points by tachometry for horizontal and inclined sights

Introduction and study of outfit of plane table and method of Radiation

Intersection Methods of plane table survey

Project II- Plane table survey project of closed traverse of Minimum of four sides for at least 0.5 Hectares Area including building, roads, etc.

Solution of Three point problem in plane tabling

Setting out of a simple circular curve by Rankin's Method of Deflection angles, by offsets from Chords produced

Study and use of Abney level, Box sextant

Setting out a simple Building on Ground from a given a foundation plan

Project III- Road project of Minimum length of 250 m including fixing of Alignment, Profile leveling and cross sectioning and calculations to be done at the site

Two peg test for dumpy level.

Setting out angle using Theodolite.

Measurement of distance by using EDM

Text Books/References

Prof. Kanetkar T. P., Prof. S. V. Kulkarni, "Surveying and Leveling", (Vol-I and II), P. V. G. Publishers

Dr. B. C. Punmia, "Surveying", Vol-I and II, Laxmi Publishers

Late David Clark, "Plane and Geodetic Surveying for Engineers", Vol I - II, C.B.S

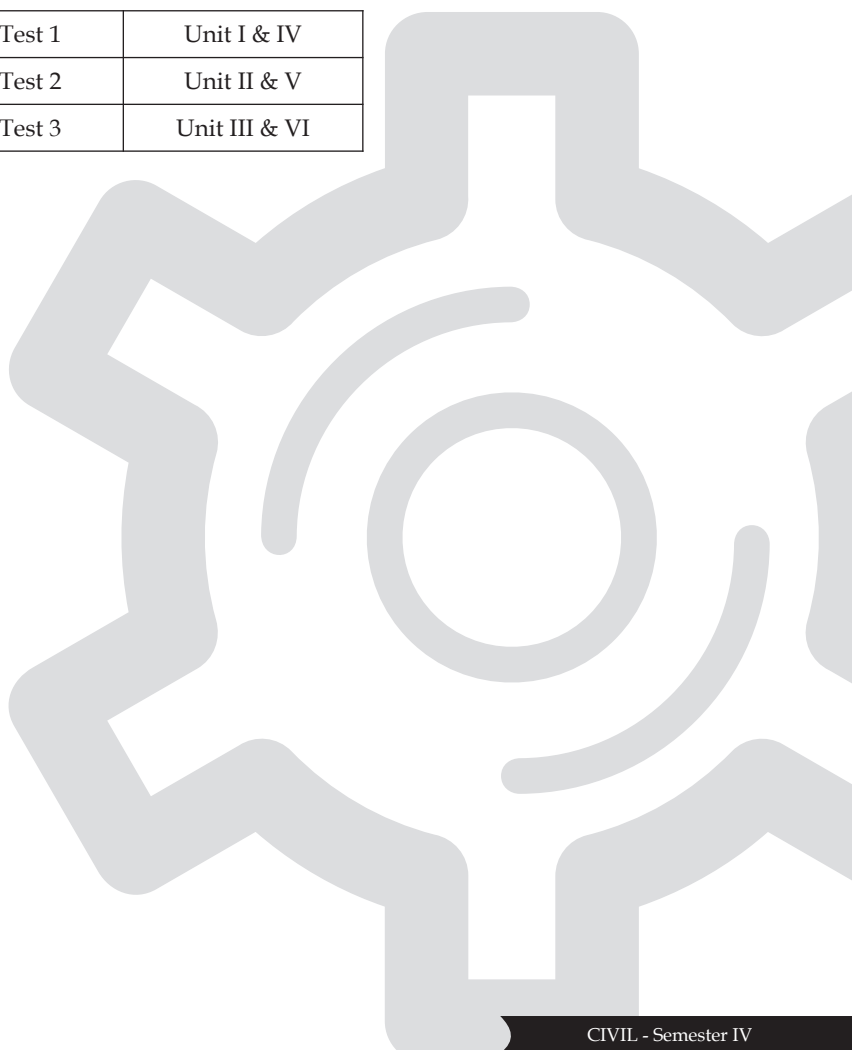
Publishers

Alake De, "Plane Surveying", S. Chand and Company

Dr. A. M. Chandra, "Plane Surveying", New Age International Publishers

Syllabus for Unit Test

Unit Test 1	Unit I & IV
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Unit Test 3	Unit III & VI





TEACHING SCHEME

Lectures : 04Hrs/week

Tutorials : 01Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Basic Concepts of Structural Analysis:

Types and classification of skeletal structures, members, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Concepts of strain energy; Strain energy due to axial force, shear force, bending moment and torsion; Deflection of determinate beams by Moment area method and Conjugate beam method.

Unit-II

(08 Hours)

Analysis of Plane Trusses using Strain Energy Method:

Castigliano's first theorem; Deflections of determinate trusses; Castigliano's second theorem; Analysis of redundant Trusses; Lack of fit and temperature changes in members; Sinking of supports; Graphical method-Williot diagram.

Unit-III

(08 Hours)

Analysis of Beams and Plane Frames using Strain Energy Method:

Deflection of determinate beams and rectangular portals by application of Castigliano's first theorem; Analysis of indeterminate beams and rectangular portals by application of Castigliano's second theorem with indeterminacy up to two degrees; Maxwell's theorem of reciprocal displacements and Betti's law.

Unit-IV

(08 Hours)

Fixed Beams and Three Moment Theorem:

Analysis of propped cantilevers and fixed Beams; Sinking of support; Analysis of continuous beams by Clapeyron's theorem of three moments.

Unit-V

(08 Hours)

Slope Deflection Method:

Analysis of continuous beams using slope deflection method-sinking and rotation at support; Deflected shape of beam; Analysis of sway and non-sway rectangular portal frames. (Involving not more than three unknowns); Deflected shape of frame.

Unit-VI

(08 Hours)

Moment Distribution Method:

Analysis of continuous beams using moment distribution method-sinking and rotation at support; Analysis of sway and non-sway rectangular portal frames. (Involving not more than three unknowns)

Term-work

The term-work shall consist of total TWELVE assignments (two from each unit).

Text Books/References

Hibbeler R. C., "Structural Analysis", Prentice Hall Publication

Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication

Norris, Wilbur & Utku, "Elementary Structural Analysis", TMH Publication

Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company

Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill Publication

Junnarkar S. B. & Adavi, "Mechanic of Structures", Charotar Publishing House

Pandit G. S. & Gupta S. P., "Theory of Structures Vol-I", Tata McGraw Hill Publication

Prakash Rao D. S., "Structural Analysis", Universities Press Publication

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TEACHING SCHEME

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks
T. W. & Or. : 50 Marks

Unit-I

(10Hours)

Introduction & Properties of Fluids:

Scope and application of fluid mechanics, Newton's law of viscosity, SI system of units, Physical properties of fluids- Density, Specific Weight, Specific Volume, Relative density, Dynamic & Kinematic Viscosity, classification of fluids, Newtonian & Non Newtonian fluids, Ideal and Real fluids Compressibility, Cohesion, Adhesion, Surface Tension, Capillarity, Vapor pressure.

Statics:

Pressure at a point, Pascal's law, Pressure density height relationship, Measurement, Hydrostatic pressure on a plane & curved surface, Centre of pressure, Pressure diagrams, Practical application related to Hydrostatic pressure and Centre of Pressure. Buoyancy, Stability of floating bodies, Metacentre and metacentric height, Submerged bodies, Relative Equilibrium, Fluid masses subjected to uniform linear acceleration and rotation about vertical axis, Free and forced vortices.

Unit-II

(08Hours)

Kinematics and Dynamics:

Kinematics: Methods of describing the motion of fluid, Velocity and acceleration of fluid particle, Types of flow- steady and unsteady, Uniform and non-uniform, Laminar and turbulent, one, two, and three dimensional flows, streamlines, path lines and streak lines, stream tubes, Equation of continuity for one dimensional flow along a stream line and for three dimensional flow in Cartesian coordinate system, Circulation and Vorticity, Rotational and Irrotational motion, Velocity potential, Stream functions and flow net, Methods of drawing flow net, Uses of flow net.

Dynamics: Forces acting on fluid masses in motion, Euler's equation of motion along a stream line and for three dimensional flow in Cartesian coordinate, Introduction of Euler's equation of motion, Bernoulli's Equation motion, Limitations, Kinetic energy correction factor, Total

energy and hydraulics grade line, Cavitation, Linear momentum equation, Momentum correction factor, Application of continuity equation-Bernoulli and momentum equation, flow measuring devices and Pitot tube, Venturimeter, Orifice Meter, Nozzle meter, Rota meter, orifices, Mouthpieces, Notches and weirs.

Unit-III

(08 Hours)

Dimensional Analysis and Model Studies:

Dimensions of physical quantities, Dimensional homogeneity, Dimensional analysis using Rayleigh's and Buckingham's π theorem, important dimensionless parameters and their significance, Model studies: Geometric, Kinematics and Dynamic similitude, Model laws, Types of models, Application of dimensional analysis and model studies to fluid flow problems.

Unit-IV

(08 Hours)

Laminar Flow:

Laminar flow in circular pipe, Laminar flow between parallel plates, Stokes law, Methods of measurement of viscosity, Flow through porous media, Darcy's law Reynolds experiment, Transition from laminar to turbulent flow,

Flow through pipes: Pipe flow problems, Energy losses in pipe flow, parallel and series pipes, pumps and turbines in pipeline, pipe network various arrangements of pipes, siphons, Hydraulic transmission through pipes, three reservoir problem.

Unit-V

(08 Hours)

Boundary layer theory:

Concept of boundary layer, Development of Boundary layer over a flat plate, Laminar and transitional boundary layer, laminar sub layer, General characteristic of boundary layer, Boundary layer thickness, Velocity distributions within boundary layer, Momentum equation for obtaining boundary layer thickness, local and mean drag Coefficient, Hydro dynamically smooth and rough boundaries, Boundary layer separation and its control.

Unit-VI

(08 Hours)

Turbulent flow:

Phenomenon of turbulence, characteristics of turbulent flow- velocity and pressure fluctuations, instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, mixing length hypothesis, Velocity distributions in turbulent flow for smooth and rough pipes and their integration- Darcy- Weisbach equation, Variation of friction factor for laminar flow and for smooth and rough turbulent flow, Nikuradse's experiment on artificially roughened pipes, Stanton diagram, friction factor for commercial pipe, Moody's diagram, White Colebrook's equations.

Term Work

Term work will consist of journal giving the detailed report of experiments and assignments performed.

Oral Examination

Oral examination shall be based on the above term work.

List of Practicals

Following experiments (Any Eight) and assignments (Any Two) on the above theory are to be performed

Measurement of viscosity

Study of Pressure measuring devices

Stability of floating bodies

Flow net by Electrical Analogy for flow below weir (with and without sheet pile)

Verification of Bernoulli's theorem with reference to losses of energy

Calibration of Venturimeter / Orifice meter

Calibration of Orifice / Notch

Study of Laminar flow using Reynold's apparatus / Heleshaw's apparatus

Study of Laminar and Turbulent flow through pipes

Study of Boundary layer on smooth and rough plate

a) Flow net by Graphical Method

b) Trial and error solution of three reservoir problem

c) Solution of pipe network problem by 'Hardy-Cross Method'

In addition to above experiments and assignments, it is desirable to solve problem on the following experiments

a) Study of minor losses in pipe flow

b) Study of development of boundary layer over a flat plate

Text Books / References

Garde R. J. and Mirajgaonkar, "Engineering Fluid Mechanics", Publication-Scitech

Garde R. J., "Fluid Mechanics through Problems", New Age International, New Delhi

Modi P. N. and Seth S. M., "Fluid Mechanics", Publication-Standard Book House

Streeter -Wylie, "Fluid Mechanics", Tata McGraw Hill Publication

Subramanya K., "Theory and Application of Fluid Mechanics", Tata McGraw Hill Publication

Syllabus for Unit Test

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
Unit Test 3	Unit III & VI



K20212 - COMPUTER APPLICATIONS IN CIVIL ENGINEERING - II

TEACHING SCHEME

Lectures : 01 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

T.W. & Pr. : 50 Marks

Use of computers in Civil Engineering is increasing day by day, applications and development of new software's has created openings for the civil engineers in the software industry. This subject covers introduction to the basic languages C and C++.

Exercises covered under this subject should help logical development of the students through problem solving and all the syntaxes required to write the programs in this languages should be taught. Object oriented programming approach should be used for writing the program. Details of practicals are given below:

CONCEPT:

1. Numerical Problems for logical development

- a. Algorithms
- b. Flow Charts
- c. Home Assignments for logical development (Minimum. Ten Nos.)

2. Syntaxes of C ++

- a. Variables, Operators, Data Types
- b. Input, Output
- c. If, if-else, switch ... case
- d. While, do ... while, for
- e. Arrays, strings, structures
- f. Functions
- g. Classes, objects, data access specifiers.
- h. Object Oriented Programming approach of writing program.

3. Civil Engineering applications using above syntaxes

List of Practicals

Programs on Civil Engineering problems. (Minimum. Ten Nos.)

Emphasis should be given on logical development

Text Books/References

Rohert Lafore, "Object Oriented Programming in Turbo C++"

E. Balagulusamy, "Object Oriented Programming with C++"

Yashwant Kanetkar, "Let us C" (For Problems)

J.S. Chitode, "Numerical Computational Techniques" (For Problems)





RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester- III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.

For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class



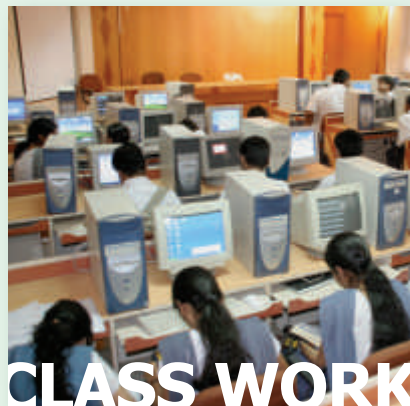
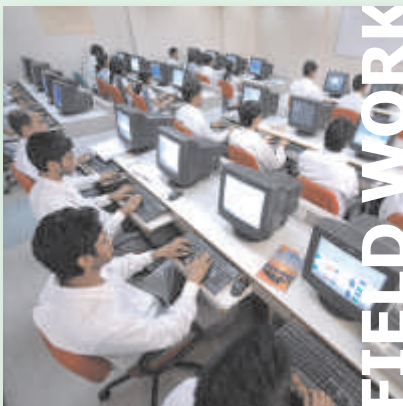
BHARATI VIDYAPEETH UNIVERSITY, Pune.

(Established under Section 3 of UGC ACT 1956)



C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (COMPUTER)
(Sem. III & IV)**





COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (COMPUTER) (Sem. III & IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

The field of engineering reflects the technological dynamism present in today's world. The department has an under-graduate programme viz. B.Tech. (Comp) and a post-graduate programme viz. M.Tech. (Comp). The department has incorporated all the latest facilities for the benefit of the students. The department has 8 well-equipped laboratories, with three servers. The latest software and hardware equipments are provided to the students. The department has specialized laboratories in Digital Signal Processing, Multimedia Techniques, Linux and Software Engineering.

The Association of Computer & Information Technology Engineering Students (ACIES) organizes different events, guest lectures for the students. The syllabi of the department are revised regularly so as to match the needs of the industry. Apart from giving thorough technical knowledge using the state-of-art technology, the students are taught communication skills and are given experience in working in groups on live projects.

MAJOR GROUPS/AREAS

Operating Systems, Multimedia, Image Processing, Computer Networks, Software Engineering, System Programming

EXPERTISE IN RESEARCH AND CONSULTANCY

The department of Computer Engineering has received fund from AICTE for Modernization of Research Laboratory "Object Oriented Modeling and Design".

ON GOING RESEARCH PROJECTS

Extended Log Structural File System For Linux Operating System, Platform Independent File Transfer, Block based Image Processing, Process Based Generic Modeling at Real Time Complex System with specific reference to Visual Modeling, DOUT - Distributed Opportunistic Unit Testing

COMPLETED PROJECTS

Visual Modeling of Real Time System, NeTailor- A Network Patch Management Solution, Voice Message Transform, Artillery Command Post Execution Software, MAFCOG 1.0 Mathematical Formula Analysis and Generator, Object Oriented Learning Environment Using ASP, Real Time Complex System, Implementation of Sniffers.

MAJOR EQUIPMENTS

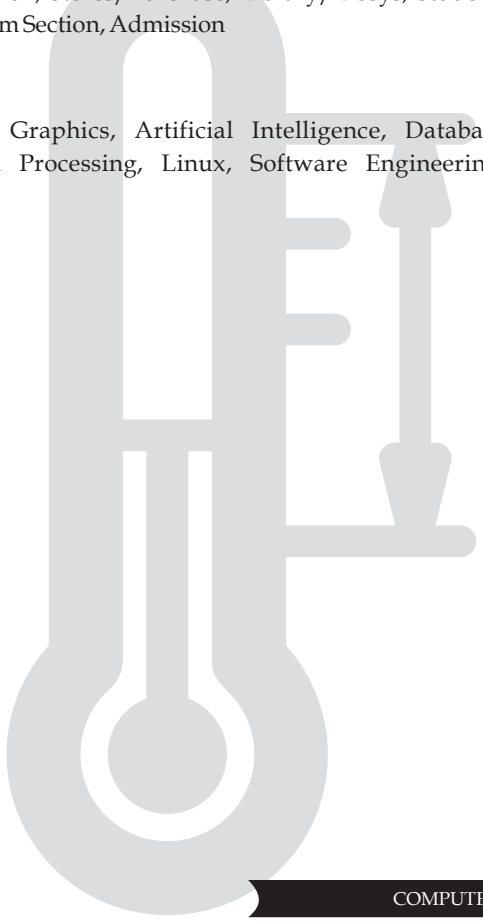
Pentium -I 120/150 MHz - 25, Pentium - III 550 MHz - 10, Pentium -III 933 MHz - 68, Pentium -IV 2.46GHz - 94, Pentium - IV 1.7GHz - 10, Pentium - IV (IBM) 2.8GHz - 100.

SOFTWARES

- Operating Systems** : MS-DOS, Windows 95, Windows 98, SCO Xenix 2.1, Linux 7.0, Microsoft OS/2 Sdk Ver 1.02, Sun Solaris 7.1
- RDBMS** : Oracle 8, Oracle 8i, Oracle 9i, SQL Ver 7.0 & 8.0
- Developing Softwares** : Visual Studio 6.0, Microsoft Office-2000, Turbo C ++ For DOS 4.5, Microsoft C 6.0, Microsoft Fortran, Turbo Pascal, Microsoft COBOL, Turbo C, Visual Studio MS.Net, Developer 2000, MS Project 2003
- Web Designing Softwares** : Adobe Photoshop, PageMaker, Corel Draw
- Customized Softwares** : Payroll, Stores/Purchase, Library/Libsys, Student, Exam Section, Admission

LABORATORIES

Information Technology, Computer Graphics, Artificial Intelligence, Database Management System, Digital Signal Processing, Linux, Software Engineering, Microprocessor





STRUCTURE & EXAMINATION PATTERN

B. Tech. - Computer Engineering

Semester III									Total Duration : 32Hrs/Week	
									Total Marks : 750	
Subject Code	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)				Total (Marks)	
		L	P	T	Theory	Unit Test	TW & Pr	TW & Or		
K70201	Engineering Mathematics - III	04	-	-	80	20	-	-	100	
K30202	Algorithms and Data Structures	04	02	-	80	20	50	-	150	
K50203	Digital Logic Techniques	04	02	-	80	20	-	50	150	
K30204	Discrete Mathematics	04	02	-	80	20	50	-	150	
K30205	Internet Programing	04	-	-	80	20	-	-	100	
K30206	Programing Laboratory - I	02	02	02	-	-	50	50	100	
Total		22	08	02	400	100	150	100	750	
Teaching Scheme			Examination Scheme				Total			
Lectures	Practical	Tutorial	Theory	Unit Test	T. W. & Pr.	T. W. & Or.				
22	08	02	400	100	150	100	750			

Semester IV									Total Duration : 32Hrs/Week	
									Total Marks : 750	
Subject Code	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)				Total (Marks)	
		L	P	T	Theory	Unit Test	TW & Pr	TW & Or		
K70207	Industrial Management	04	-	-	80	20	-	-	100	
K30208	Data Communication Systems	04	-	-	80	20	-	-	100	
K30209	Advanced Data Structures	04	02	-	80	20	50	-	150	
K30210	Digital Signal Processing Tech.	04	02	-	80	20	-	50	150	
K30211	Techniques of Microprocessor Programing	04	02	-	80	20	50	-	150	
K30212	Programing Laboratory - II	02	02	02	-	-	50	50	100	
Total		22	08	02	400	100	150	100	750	
Teaching Scheme			Examination Scheme				Total			
Lectures	Practical	Tutorial	Theory	Unit Test	T. W. & Pr.	T. W. & Or.				
22	08	02	400	100	150	100	750			



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III



TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks

Unit-I

(08 Hours)

Differential Equations:

Solution Of Linear Differential Equation Of Nth Order With Constant Coefficients, Method Of Variation Of Parameters, Cauchy's and Legendre's Linear Equation, Simultaneous Linear Differential Equations, Total Differential Equations, Symmetrical Simultaneous Differential Equations. Applications to Electrical Circuits.

Unit-II

(09 Hours)

Complex Variables:

Function Of Complex Variables, Analytic Function, Cauchy-Riemann Equations. Conformal Mapping, Bilinear Transformation, Residue theorem, Cauchy's Integral Theorem and Cauchy's Integral Formula.

Unit-III

(09 Hours)

Transforms:

Fourier transforms: Fourier Integral Theorem, Fourier Sine And Cosine Integrals. Fourier Transform, Fourier Sine And Cosine Transforms, Inverse Fourier Transforms, Discrete Fourier Transform And Its Applications.

Z - Transform: Definition, Properties, Inverse Z- Transform. Applications to difference equation, Relationship between Z- Transform and Fourier Transform.

Unit-IV

(09 Hours)

Laplace Transform:

Definition, Properties and Theorems, Inverse Laplace Transform, Methods of Finding Inverse Laplace Transforms, Laplace Transform of Unit-step Function. Dirac-Delta Functions, Periodic Functions, Ramp Functions, Error Function, First order Bessel's function, $Si(t)$, $Ci(t)$, $Ei(t)$.

Applications to Solution of Linear Differential Equations.

Unit-V

(09 Hours)

Vector Differentiation:

Vector Differentiation, Gradient, Divergence and Curl, Directional Derivative, Vector Identities, Irrotational and Solenoidal Vector Fields.

Unit-VI

(09 Hours)

Vector Integration:

Line Integral, Surface Integral and Volume integral, Workdone, Gauss-Divergence Theorem, Stoke's theorem and Green's Lemma, Applications to Electromagnetic fields.

Text Books / References

- Peter V. O'Neil, Advanced Engineering Mathematics, 5e, Thomson Learning
Erwin Kreyszing, Advanced Engineering Mathematics, Wiley Eastern Ltd.
Wylie C. R. and Barrett L. C., Advanced Engineering Mathematics, McGraw-Hill.
M.D. Greenberg, Advanced Engineering Mathematics, 2e, Person Education
B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, Delhi
P.N. Wartikar and J.N. Wartikar, Applied Mathematics (Volume I & II), Pune Vidyarthi Griha Prakashan
Laplace Transforms by Murray R. Spiegel, Schaum's Outline Series – International Edition

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K30202: ALGORITHMS AND DATA STRUCTURES

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit -I

(06 Hours)

Introduction To Data Structures:

Concept Of Data, Data types, Data Object, Data Structure, Abstract Data Type and Realization of ADT in C. (Class Concept Only).

Unit-II

(10 Hours)

Stacks:

Fundamental Concept of Stacks and Queues, ADT of Stack and Queues. Data Structure, Basic Operations on Stacks and Queues, Disadvantages and Applications, Implementation of Stacks, Linear Queue, Circular Queue using Sequential Organization.

Application of Stack: Polish Notation (Infix, Postfix, Prefix), Evaluation of Prefix and Postfix Expression, Inter Conversion of Infix, Prefix and Postfix Expression. Use of Stack by Function Call and Recursive Function Call, Parenthesis Matching, Towers of Hanoi, Application Of Queues.

(08 Hours)

Unit-III

Linear Data Structures Using Sequential Organization:

Concept of Sequential Organization, Concept of Linear and Non Linear Data Structures, Arrays as ADT, Storage Representations, Concept of Ordered List and Polynomial Representation Using Arrays.

Representation of Sparse Matrix Using Arrays And Using Linked list, Algorithm for Sparse Matrix Addition, Transpose, Time And Space Complexity Analysis for Simple and Fast Transpose for Sparse Matrix.

(08 Hours)

Unit-IV

Linear Data Structures Using Linked Organization:

Concept of Linked Organization, Single Linked List, Double Linked List, Circular Linked List, Insertion, Deletion and Traversal on Above Data

Structures. Representation and Manipulations of Polynomials using Linked Lists. Representation of Polynomial Using Generalized Linked List.

(10 Hours)

Unit-V

Algorithm Analysis: Definition and Characteristics of an Algorithm, Running Time of a Program (Frequency Count), Time and Space Complexity, Big O Notation, Graphical Representation of Time Complexities.

Searching: Algorithmic Notation, Importance of Searching, Sequential Search, Efficiency Of Sequential Searching, Searching an Ordered Table, Indexed Sequential Search Binary Search, Analysis for the Algorithm.

(06 Hours)

Unit-VI

Sorting:

Bubble Sort, Selection Sort, Quick Sort, Heap Sort, Shell Sort, Insertion Sort, Merge Sort, Radix Sort, Analysis for Best, Worst Cases And Average Case.

PRACTICAL ASSIGNMENTS SCHEME

ALGORITHMS AND DATA STRUCTURES

Concerned staff member is directed to frame 2 To 3 assignments on each Unit

Text Books / References

Ellis Howoritz, Sartaj Sahani, Data Structures, Galgotia Publications

Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tanenbaum – Data Structures Using C And C++, Prentice- Hall

Loudon, Mastering Alogirithms with C, Oreilly

Alfred V. Aho, John E. Hopcroft, and Jeffery D. Ullman – Data Structures And Algorithms, Addison-Wesley

Richard F. Gilberg and Behrouz A. Forouzan – Data Structures, Brooks, Cole Pub.

Seymour Libschutz, Data structures, Schaum's outline series, Tata Mc Graw Hill

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





K50203: DIGITAL LOGIC TECHNIQUES

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit -I

(09 Hours)

Number Systems, Algebra Of Logical Variables:

Number Systems: Number Systems, Binary, Octal, Hexadecimal, Conversion Methods, Binary Addition and Subtraction, 1's & 2's Complement Method.

Algebra Of Logical Variables: Review of Boolean Algebraic Theorems, Realization of Boolean Functions and Sufficiency of NAND/NOR for Implementation Standard SOP and POS Forms of Logical Functions, Minimization Techniques K-MAP and Quine McCluskey Method.

Unit -II

(09 Hours)

Logic Families and Design Of Combinational Logic Circuits:

Logic Families: Logic Families TTL NAND Gate, Specifications, Tristate TTL, Bus Organized Computer Principal, ECL, MOS, CMOS Families And their Interfacing In Details.

Combinational Logic Circuits: Half adders/subtractors. Full adder/subtractor, Unsigned and Signed Number Representation, N Bit Parallel Adder, subtractor With Look Ahead Carry, BCD Adder, Subtractor Using 7483, 74181 ALU, Code Converter, Binary, BCD, EXCESS 3, Gray, Parity Generator, Checker, MUX DEMUX Encoders, Implementation of Boolean Functions Using MUX, DEMUX BCD to 7 Segment Decoder Driver.

Unit-III

(06 Hours)

Flip Flops, Registers, Counters:

One Bit Latch Using NOR/NAND, S-R Flip-Flop, Clocked S-R FF, J-K FF Race Around Condition M/S J-K FF, D FF, Shift Registers SISO, SIPO, PIPO, PISO, Applications of Shift Registers, Ripple Counters, Synchronous Counter ICS like 7490, 7492, 74161, 74191, Functional Block Diagram of Frequency Counter.

Unit-IV

(08 Hours)

Memories:

Random Access Memory, TTL RAM Cell, Parameters, Read/Write Cycles, ROM Types, EPROM Structure and Programming, MOS Static RAM Cell, Dynamic Cell, Refreshing, Memory Cycles.

Unit-V

(08 Hours)

Sequential Circuits:

Block Diagram, State Variables and Excitation Variables, State Diagram Representation, Moore and Mealy Circuits, Design of Sequence Generator And Sequence Detector, Elimination of Redundant States, Avoiding Lockouts, Fundamental Mode Sequential Circuits Elimination of Critical Races, Hazards, Pulse Mode Sequential Circuits.

Unit-VI

(09 Hours)

Algorithmic State Machines: ASM Charts Notations, Design of Simple Controller, Multiplexed Controller Method, RTL Notations, and Implementation.

Programmable Logic Devices: Programmable Logic Elements And Array Logic, Implementation of Combinational and Sequential Logic Design using PLA, PAL, Introduction to FPGA.

List of Practicals

Implementation of Boolean functions using logic gates.

Study of characteristics of typical 74 TTL / 74 CMOS Family like: fan in, fan out standard load, noise margin & interfacing with other families.

Half, Full Adder and subtractor using gates and IC's.

Code conversion using digital IC's.

2 bit digital computer and ALU verification.

Function implementation using Multiplexer and Demultiplexer.

Sequence generator using MSJK flip flop IC's.

Study of counters: Ripple, Synchronous, Ring, Johnson, Up-down counter and its application.

Study of shift registers: Shift left, Shift right, parallel loading and Pulse Train generator.

BCD Adder / Subtractor with Decoder driver and 7 segment display.

Study of typical RAM IC.

Text Books / References

Douglas Hall, Digital Circuits and Systems, MGH

Morris Mano, Digital Logic Design, PHI

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit -I

(08 Hours)

Fundamental Structures And Basic Logic:

Sets, Venn Diagram, Completeness, Cartesian Product, Power Sets, Pigeonhole Principle, Cardinality and Count-ability. Propositional Logic, Logical Connectives, Truth Tables, Normal Forms, Validity, Predicate Logic, Limitations of Predicate Logic, Universal and Existential Quantification, MODUS Ponens and Modus Tollens.

Unit -II

(08 Hours)

Functions and Relations:

Subjective, Injective, Bijective and Inverse Functions, Composition of Function. Reflexivity, Symmetry, Transitivity, and Equivalence Relations, Poset & Recurrence Relation.

Unit-III

(08 Hours)

Proof Techniques:

Notions of implication, Converse, Inverse, Contra-positive, Negation and Contradiction, Structure of Formal Proofs, Directs Proofs, Proof by Counter Example, Proof By Contradiction, Mathematical Induction, Strong Induction, Recursive Mathematical definitions, Well orderings.

Unit-IV

(09 Hours)

Graph Theory:

Basic Terminology, Multi Graphs and Weighted Graphs, Paths and Circuits, Shortest Path Problems, Euler and Hamiltonian Paths, Representation of Graph, Factors of Graph, Isomorphic Graphs, Planar Graphs, Directed graphs.

Unit-V

(06 Hours)

Trees :

Trees, Rooted Trees, Path Length in Rooted Tree, Binary Search Trees, Spanning Trees and Cut set, Minimal Spanning Trees, Kruskal's and Prim's Algorithms for Minimal Spanning Tree.

Unit-VI

(06 Hours)

Algebraic Systems:

Algebraic Systems, Groups, Semi Group, Monoid, Subgroup , Isomorphism and Homomorphism, Rings and Fields, Lattices, Boolean lattices and Boolean Algebra, Group Codes.

List of Practicals

Concerned staff member is directed to frame 2 To 3 assignments on each Unit

Text Books / References

C. L. Liu, Elements of Discrete Mathematics, 2nd Edition, McGraw Hill Pub
Kenneth H. Rosen, Discrete mathematics, 5th Edition, McGraw Hill Pub
Tremblay Manohar, Discrete Mathematical Structures in Com. Sci Applications
Lipschutz Lipson, Discrete Mathematics, 2nd Edition TMH
V. K. Balakrishn, Graph Theory, TMH (Recommended for Graph)

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K30205: INTERNET PROGRAMMING

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit -I

(09 Hours)

Introduction:

Computer Networks, ARPANET, History of Internet, WWW, Cyberspace, Working of Internet. Internet Technologies: HTML, DHTML, Java Script, PHP, Perl, My SQL, Linux and Internet: Role of Linux on Internet, Role as a server on Internet.

Unit -II

(08 Hours)

HTML:

basics,

Introduction, Anatomy of HTML document, Web typography, Text Rules, Images and Multimedia: Horizontal rule, Using image in document, Background audio, animAted text, Links, Frames, Tables.

Unit-III

(09 Hours)

DHTML:

Dynamic document, Netscape layout extensions. Basic DHTML page building.

Unit-IV

(08 Hours)

Java Script:

History, Introduction, role on Internet, String handling, Numbers and dates, Arrays and objects, Variables and functions, Browser feature detection, Dynamic forms.

Unit-V

(09 Hours)

Web Databases:

Introduction, Technologies, different databases available and their use. MySQL: Introduction, Installation and configuration, database system concept, SQL overview, Introduction to Apache web server.

Unit-VI

(09 Hours)

PHP:

History, Introduction, Role on Internet, basic rules of PHP program, Working with Text and Numbers, Making Decisions, Working with arrays, Functions, Web forms.

NOTE:

Staff member should conduct extra practical sessions on above units.

Text Books / References

Bill Kennedy, Chuck Musciano, HTML & XHTML: The Definitive Guide, 5th Edition, O'Reilly Pub

Danny Goodman, JavaScript & DHTML Cookbook, O'Reilly Pub

David Sklar, Learning PHP5, O'Reilly Pub

Davis, Learning PHP and MySQL, O'Reilly Pub

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 02 Hrs/week
Practical : 02 Hrs/week
Tutorials : 02 Hrs/week

EXAMINATION SCHEME

Duration : 03 Hours
T. W. & Or. : 50 Marks
T. W. & Pr. : 50 Marks

Unit -I

(06 Hours)

Functions:

Need Function Definition, Prototype, Function, Parameter, Recursion, Scope of in the Function, Library Functions, Passing Array to Function, Pointer to Function
Pointers - Fundaments, Declaration, Advantage, Pointers to Different Data Types, Array And Pointers, Array to Pointers, Operations on Pointers.

Unit -II

(08 Hours)

Structure:

Definition, Declaration, Array to Structures, Structures Within Structures, Structures, and Function, Structures and Pointers, self Referential Structures User Defined data types - typedef Union - Need definition, Operation, Bit Fields, Difference Between Structure and Union. File Handling - Structure of file, File types, File Operations Macros - Substitution, File Inclusion, Compiler, Controlled Directives.

Unit-III

(10 Hours)

Introduction to Object Oriented Programming :

Need of Object Oriented Programming: A look at Procedure Oriented Programming, Object Oriented Programming Paradigm Basic Concept of OOP - Objects, classes, Data Abstraction, Encapsulation, Inheritance, Polymorphism, Data hiding, and Message Passing. Benefits of OOP, Application of OOP. Beginning with C++: Introduction to C++, Structure of C++ Program, A simple C++ program, comments, output using Cout, input using Cin, declaration of variables, Reference variables, Token, Keywords, Identifier, Constant, Basic data types, Derived data types. Control structures - Control Structures: If statement, switch statement, Do while statement, while statement and for statement.

Unit-IV

(10 Hours)

Java Script:

Classes and objects: Specifying a Class, Defining Member function, A C++ program with class, Nesting of member function, Private member function, Array within a class, memory allocation for objects, Static Data member, Static member function, Array of Objects, Objects as function argument, Friend function, Returning objects.

Constructor and destructor : Constructor Parameterized Constructor, Multiple Constructor in a class, and Constructor with default argument, Dynamic Initialization of Objects, Copy Constructor, Destructor

Unit-V

(06 Hours)

Functions and Operator overloading :

Function in C++: The main function, Function prototype, Call by value, Call by reference, Return by reference, Inline Function, Default Argument, Function Overloading, Operator - Operator in C++, Scope Resolution Operator, Operator Precedence Operator Overloading - Defining Operator overloading, Overloading Unary and Binary operator, Overloading binary operator using friend, Rules for operator overloading, Type conversion Inheritance - Virtual function and Polymorphism, Inheritance: Introduction, Defining Derived classes, Types of inheritance, Virtual base classes, Abstract classes, Constructor in derived class.

Pointer, Virtual Function and Polymorphism: Introduction, Pointer to Object, this pointer, Pointer to Derived classes, Virtual function.

Unit-VI

(10 Hours)

Managing Console I/O operation and File Operation :

Managing Console I/O operation: C++ Stream, C++ Stream Classes, Unformatted I/O Operation, Formatted Console I/O operation, Managing Output with manipulators

Working with files: Classes for File Stream Operations, Opening and Closing a File, Detecting End Of File ,More about Open() : File Modes, File Pointer and their manipulator, Sequential Input and Output Operations, Updating a

File: Random Access. Error handling during file operation,

Template: Function template, Class Template

List of Practicals

PROGRAMMING LAB - I

1. Term work should include minimum 12 experiments from the above Units.
2. The programs can be developed with Integrated Development Environment (IDE) like Borland C++ or any suitable Compiler with emphasis on step by step development and debugging.

Text Books / References

Kanetkar Y P, Let us C, BPB Publications

E. Balaguruswami, Programming in ANSI C, Tata McGraw Hill

H. Schildt, C The complete Reference, Tata McGraw Hill

V. Raja Raman, Computer Oriented Numerical Methods, 3rd Edition Prentice Hall

Oualline, Practical C++ Programming 2ed, Oreilly

E. Balgurusamy, Object Oriented Programming with C++, Tata McGraw Hill

Schildt, C++ the Complete Reference, Tata McGraw Hill Publication

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



SEMESTER - IV



TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit -I

(09 Hours)

Management and Organization:

Conceptual difference between terms ; Management, Administration and Organization, Evolution of Management Science up to Modern times, Contributions of Taylor, Fayol, Gilbreth, Management as an Art, Science, Profession. Functions and Principles of Management, Levels of Management. Factors deciding selection of type of business organization, sole proprietorship, partnership, Joint stock company, Cooperative enterprise, Public sector undertakings (PSU's). Organization structures - Line, Functional, Line and staff, Committee, Matrix and Project.

Unit -II

(08 Hours)

Plant Location and Economics:

Factors governing plant location, Process of plant locations, Plant layouts - Types, Principles of good plant layout, Cellular. Basic economic concepts- Human wants, economic goods, utility, Value, price, cost, profit revenue. Laws of demand and supply, exceptions to these laws, Concept of elasticity of demand, Scales of production, National and International Trade.

Unit-III

(09 Hours)

Materials Management and Quality Concepts:

Inventory, Types of inventory, Inventory Control objectives and function, Selective Inventory Control techniques - Costs related to Inventory, EOQ concept, Purchase Procedure (Cycle), Quality related concepts; Inspection, Quality Control, Quality Assurance (ISO 9000), Total Quality management (TQM), Quality Circles.

Unit-IV

(09 Hours)

Financial Management:

Definition, Scope and Objective of financial management. Capital, Types of capital, Sources of industrial finance, Elements of cost, Types of overheads. Financial Accounting – definitions, Scope, Objectives. Breakeven analysis, Capital Budgeting Methods (Pay Back, Accounting rate of return (NPV). Types of budget, Financial statements, purpose, Interpretation. Credit Rating of software projects.

Unit-V

(09 Hours)

Marketing Management:

Evolution, Marketing and selling concepts, Definitions, Concept of Marketing Mix, Market Segmentation – Objectives, Bases, Benefits, Distribution channels, Advertising, Sales promotion, Sales forecasting. Marketing research, Service sector – growth, types of services, service tax, Service mix. Recent Trends in Retailing, Emerging changes in global marketing.

Unit-VI

(08 Hours)

Management Information System (MIS) and Research Methodology:

Meaning, definition, objectives, benefits, flow of Information in the organization with respect to MIS applications in different functional areas of management (Manufacturing, finance, marketing), Research Methodology – Definitions and types of Research – Research Process (Problem formulation, Literature survey, Research design, Sample design and techniques, Types of scales, Data collection, Data analysis and Interpretation-Findings/Suggestions, Preparation of report), E-Governance, E-Business, Patents, Copyright, Trade Marks. .

Text Books / References

- O. P. Khanna, Industrial Engineering and Management
- Banga and Sharma, Industrial Origination and Engineering Economics
- Philip Kotler, Marketing Management
- I. M. Pandey, Financial Management
- Jayant Oak, Management Information System
- S. M. Jawadekar, Management Information System

C. R. Kothari., Research Methodology

K. K. Dewett, Elementary Economic Theory

Horold and Heinz Weinrich, Essentials of Management

Venu Gopal Rao, Serivces Marketing

P. Narayanan, Intellectual Property Laws

M. C. Shukla, Business Organisation and Management

Dr. P. C. Shejawalkar, Dr. Anjali Ghanekar, Principles and Practice of Management

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI

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TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit -I

(08 Hours)

Introduction:

Data, Signal, Information, Sampling Theorem, Natural and Flat-top Sampling. Pulse Amplitude Modulation. Time Division Multiplexing, Pulse Transmission Over Band Limited Channel, Cross talk, and Guard Time Inter Symbol Interference. Source Coding Techniques in Digital Communication: Pulse Code Modulation Encoder/Decoder, Multiple Channels frame Alignment for PCM-TDM, Simplex, duplex.

Unit -II

(08 Hours)

Amplitude and Angle Modulation:

Amplitude Modulation & Its Variations like DSB-FC, SSB-SC, Frequency Modulation, Phase Modulation, Principle of Super Heterodyne Radio Receiver (Block diagrams only). Application in brief for Above Modulation Techniques e.g. radio, T.V., Mobile Phone. Pulse Modulation: Delta modulation. Slope Overload and Adaptive Delta Modulation, Applications Of Above Source Coding Techniques as Data Compression Tools e.g. Linear Predictive Coders, Voice Coders, DMA.

Unit-III

(08 Hours)

Communication:

Measure of Information, Entropy, Information Rate, Shannon's Theorems on Channel Capacity, Codes For Error Detection And Correction such as Parity, Vertical Redundancy Check, Longitudinal Redundancy Check, Checksum, Block Check Character, Block codes - Hamming Code, Cyclic Redundancy Check Codes. Line Codes Such As Bipolar, Uni-polar, RZ, NRZ, Manchester, AMI and Handshaking Techniques like FEC, ARQ, Channel Throughput and Efficiency Calculations.

Unit-IV

(10 Hours)

Modems:

Digital Continuous Wave Modulation Techniques For Modem Such As ASK, PSK, FSK, Block Diagram of Modem And Interface Control For Typical Modem, Modem Standards. Network Protocols: International Standards Organization - Open System Interconnection (ISO-OSI) Architecture, Seven layer models, Physical layer protocol, RS232, RS-422, RS-449, 4 to 20 mA Current interfaces. Data link level Protocol HDLC, SDLC, X-25, LAN, WAN, ISDN. Telephone Network: Wire telephony, Subscriber loop, Trunk circuits. Four wire terminating set. Public switch telephone networks, Frame Relay.

Unit-V

(06 Hours)

Satellite Communication:

Orbital aspects. Geostationary satellite, Station keeping, Frequency plans and polarization, Transponders, Multiple access methods. Fiber optic communication: Principle of light transmission in Fiber, types and modes of fiber, losses in Fiber. Dispersion, light sources and detectors, fiber optic communication link, Physical Layer of Wireless Media.

Unit-VI

(08 Hours)

Cellular Mobile Communication System:

Cell structure, Frequency reuse, Roaming, transmitter, Receiver, Special services provided by cellular phone, IEEE 802.11, WI-FI, Bluetooth, GSM, GPRS.

Text Books / References

George Kennedy, Principles of Communication System, McGraw Hill
William Stallings, Data and Computer Communication, PHI
Roddy Coolen, Electronics Communication, PHI, 4th Edition
William Schweber, Data Communication, McGraw Hill
Biglieri, MIMO, Wireless Communications

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit -I

(08 Hours)

Non Linear Data Structures:

Trees and Binary trees – Concept and Terminology. Properties, Height of Binary Trees, Balance, Complete Binary Trees, Data structures for Binary Trees. Binary Tree Traversal - Depth-First Traversals, Preorder Traversal, Inorder Traversal, Postorder Traversal, Breadth First Traversal. Algorithm for Tree Traversals (Recursive and Non Recursive). General Trees- Conversion of General Tree to Binary Tree. Insertion into General Trees FIFO Insertion, LIFO Insertion. General Tree Deletion, Expression Tree.

Unit -II

(08 Hours)

Threaded Binary Trees:

Concept and Terminology, Insertion and deletion of nodes in Inorder threaded binary tree. Preorder, Inorder and Post order traversals of Inorder Threaded Binary tree, Optional Binary Search Tree and AVL tree, Red Black Tree.

AVL Trees: AVL Balance Factor, Balancing Trees, AVL Node Structure, AVL Insert Algorithm, AVL Delete Algorithm, Delete Right Balance, Adjusting the Balance Factors.

AVL Abstract Data Types: Create AVL Tree, Insert, Delete, Tree Data Processing, AVL Utility Functions- Empty Tree, Full Tree and Count.

Unit-III

(06 Hours)

Graphs:

Concept and Terminology, Operations, Graph Storage structures- adjacency matrix, Adjacency list, Graph Algorithms - Depth First Traversal and Breadth First Traversal algorithms. Minimum Spanning Tree, Dijkstra's Algorithm for Shortest path, Prim's Algorithm, Kruskal's Algorithm.

Unit-IV

(06 Hours)

Symbol Tables :

Notion of symbol table, Binary search trees, static and dynamic trees, height balanced weight balanced binary trees, hashing techniques
Indexed Structures, M-way search trees, B-Trees searching, Overview of B*- trees and B+ Trees.

Unit-V

(08 Hours)

File Structures:

Concept of record, File Operations- Create, Update and delete, File system organization- Sequential, Relative, Indexed and Random access mode, Sequential Organization and Access, Relative File Organization, Addressing Techniques. Direct Mapping Techniques, Concept of Index.

Unit-VI

(08 Hours)

Introduction to Dynamic programming:

The General Method, Multistage Graphs, All Pair Shortest Path, Single Source Shortest Path- General Weights, Optimal Binary Search Trees, 0/1- Knapsack, The Traveling Salesperson Problem, Divide & Conquer problem, Backtracking, Graph coloring problem

List of Practicals

ADVANCED DATA STRUCTURES

Concerned staff member is directed to frame 2 To 3 assignments on each Unit

Text Books / References

Ellis Howoritz, Sartaj Sahani, Data Structures; Galgotia Publications

Lischner, C++ in Nutshell, Oreilly

Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tanenbaum, Data Structures Using C and C++, Prentice- Hall India

Alfred V. Aho, John E. Hopcroft, and Jeffery D. Ullman, Data Structures and Algorithms, Addison-Wesley

Richard F. Gilberg and Behrouz A. Forouzan, Data Structures, Brooks, Cole Pub.

Seymour Lipschutz, Data structures, Schaum's outline series, Tata Mc Graw Hill

Ellis Howoritz, Sartaj Sahani, Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Galgotia Publications

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





K30210: DIGITAL SIGNAL PROCESSING TECHNOLOGY

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit -I

(12 Hours)

Signals and Systems:

Basic concepts of signals as array of values, standard signals, linearity, shift invariance, stability and causality, Linear Shift Invariant (LSI) systems, I/O mapping and difference equations. Linear convolution, properties of linear convolution, computation of linear convolution, A/D conversion process as sampling, quantization, encoding, sampling theorem and anti-aliasing filter, Circular convolution, Properties of Circular convolution, Computation of Circular convolution

Unit -II

(12 Hours)

Analysis of Signals:

Fourier transform, Fourier transform of standard signals, properties of Fourier transform, inverse Fourier transform, computation of Fourier transform. Discrete Fourier Transform (DFT), DFT of standard signals, properties of DFT, computation of DFT, Fast Fourier Transform (FFT) using Goertzel, Decimation In Time (DIT) and Decimation In Frequency (DIF) computation of Goertzel, DIT/DIF FFTs, Inverse DFT and computation of IDFT using the FFT algorithms. Magnitude phase transfer functions using Fourier transform, computation for transfer function.

Unit-III

(08 Hours)

Analysis of LSI Systems:

Region Of Convergence (ROC) using pole-zero plot and stability analysis, Z transform, Z transforms of standard signals, properties of Z transform, inverse Z transform, computation of Z transform. System functions from Z transform and pole-zero plots, computation of poles and zeros. Geometric constructs for transfer function.

Unit-IV

(08 Hours)

Digital Filters:

Implementation of general difference equation, cascade and parallel forms of computation. Finite Impulse Response (FIR) and Infinite Impulse Response (IIR: filters from difference equations, FIR filter design using inverse Fourier transform and Windowing Gibb's phenomenon, computation of windows, IIR filter design using impulse invariance and bilinear transform computation of system function for given design parameters

Unit-V

(08 Hours)

DSP Processors:

DSP processors and their desirable features ADSP-21 XX and ADSP-210XX series of DSI processors and their architectural features implementing filters and FFTs on DSP processors

Unit-VI

(04 Hours)

Applications of DSP:

A brief overview of applications of DSP in speech and image processing.

List of Practical

Check the performance of a general difference equation LSI system using suitable software package. Write a C function to implement a general difference equation based array mapping and compare the results.

Write C programs to generate samples of Cosine, Sine, and Square, Saw Tooth, exponential and random noise signals at specified sampling frequencies and compare the results with that of a standard software package

Check the performance of a Linear Convolution operation using suitable software package. Write a C function to implement the linear convolution operation and compare the results

Write a C function to compute the Fourier transform of a sequence at a given frequency and using the function, compute the transfer function of a few LSI systems

Write a C function to compute the Z transform of a sequence at a given value of Z and using the function, compute the system function of a few LSI systems at

points on the unit circle and X- Y axes.

Write a C program to accept the coefficients of a difference equation and plot the corresponding poles and zeros against unit circle and compare the results with that of a standard software package.

Write a C program to accept the coefficients of a difference equation generate the magnitude and the phase transfer function plots for the same and compare the results with that of a standard software package.

Write a C program to accept the pole-zero locations for LSI system and convert the same to the coefficients of a difference equation and compare the results with that of a standard software package.

Write a C program to implement a notch band-pass filter at a given frequency using a zero-pole-zero combination.

Write an assembly language routine on a DSP - Processor simulator and test it on a kit with ADC and DAC to perform AD-DA looping, AD-DA looping with inversion & AD-DA looping with half wave rectification.

Write an assembly language routine on an DSP-Processor simulator and test it on a kit with ADC and DAC to perform difference equation implementation with given coefficients. Compare your results with the standard software with the kit.

Write a C program to design low-pass, high-pass FIR filters with given cut-off frequency, given no. Of coefficients and given smoothing window. After generating the filter coefficients use the earlier difference equation function to check the response of the filter at different frequencies.

Write a C program to design Butterworth filters of given order and cut-off frequency using the bilinear transform method. Compare your results with the standard software package.

Write an assembly language routine to implement Goertzel algorithm for DFT at a given k on a DSP-Processor simulator and test it on a kit with ADC and DAC to perform difference equation implementation with given coefficients. Compare your results with the standard software with the kit.

Write a C function to implement DIT FFT of a given length. Compare test it on a kit with ADC and DAC so that the kit may be used as a spectrum analyser.

To implement a harmonic distortion analyser on the DSP Processor kit and test

the result for sinusoidal, square and saw tooth inputs.

Text Books / References

Prokias, Digital Signal Processing, Tata McGraw Hill

Alan V. Oppenheim, Ronald W. Schafer, Digital Signal Processing, Prentice Hall

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K30211: TECHNIQUES OF MICROPROCESSOR PROGRAMING

TEACHING SCHEME

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit -I

Introduction To Microprocessor:

Introduction to 16 bit processor- 8086/8088 architecture, minimum and maximum mode configurations, supporting chips 8284, 8286, 8288, Addressing Modes of 8086, Segmentation in 8086.

Unit -II

Programmers Model:

Instruction encoding format, Instruction set, Addressing modes, Assembler directives, 8086 assembly language programming, String operations, file I/o processing, Far & near procedures, Macros, timing & delay routines.

Unit-III

8086 Interrupt Structure:

Interrupt Service Routine, Interrupt Vector Table (IVT) - location of IVT in the memory, contents of IVT, Hardware interrupts and Software interrupts - INTR, NMI and INT n. Interrupt response, Execution of an ISR, priority of 8086 interrupts. 8259A priority interrupt controller.

Unit-IV

I/O Interface:

Serial communication interface Asynchronous & Synchronous communication, Physical communication standards, RS 232, 8251A PCI, Parallel communication, 8255A PPI, interfacing and programming, 4x4 Key matrix interfacing, Seven Segment display interfacing .8257 /8237 DMA Controller. 8253/8254 Programmable Timer.

Unit-V

Multiprocessor Configurations:

Queue status & LOCK facilities, 8086/8088 based multiprocessing systems, Co-processor configurations, closely & loosely coupled configuration, Microcomputer networks, 8087 NDP coprocessor, Processor Architecture, 8089 I/O processor, IOP architecture, Communication between IOP & CPU.

Unit-VI

DOS:

Internals of DOS, DOS loading ,DOS Memory map , Internal & external commands ,command interpreter POST Sequence ,PSP Structure,.Exe & com file structures and conversion ,use of BIOS and DOS calls. INT 10H calls, DOS Calls, INT 21H calls. Difference between DOS & BIOS, TSRS: Types, structures, Details of TSR Types, Structures, writing TSRS in Assembly language.

List of Practicals

Write 8086 Assembly language program (ALP) to add array of N numbers stored in the memory.

Write 8086 ALP to perform non-overlapped and overlapped block transfer.

Write 8086 ALP to find and count negative numbers from the array of signed numbers stored in memory.

Program to check whether the entered password is correct or not.

Write 8086 ALP for the following operations on the string entered by the user.

Calculate Length of the string

Reverse the string

Check whether the string is palindrome or not.

Write 8086 ALP to perform string manipulation. The strings to be accepted from the user is to be stored in code segment Module_1 and write FAR PROCEDURES in code segment Module_2 for following operations on the string:

Concatenation of two strings

Compare two strings

Number of occurrences of a sub-string in the given string

Find number of words, characters, number of lines and number of capital letters from the given text in the data segment

Note: Use PUBLIC and EXTERN directive. Create .OBJ files of both the modules and link them to create an EXE file.

Program for 32 bit hex multiplication.

Write a program to arrange given set of numbers in Ascending/Descending order.

Write assembly language program for BCD to Hex conversion.

Write assembly language program for computing factorial of a number between 0 to 9.

Text Books / References

Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085 Penram International

Douglas Hall, Microprocessor & interfacing Programming & Hardware

Liu Gibson, Microcomputer Systems 8086/8088 family PHI

Peter Abel, Assembly Language Programming

Ray Denkon, DOS Programers Manual

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 02 Hrs/week
Practical : 02 Hrs/week
Tutorial : 02 Hrs/week

EXAMINATION SCHEME

Duration : 03 Hours
T. W. & Or. : 50 Marks
T. W. & Pr. : 50 Marks

Unit -I

An Introduction to Java:

History, Features of Java language, Object oriented features of Java, Benefits of using OOP, Applications of OOP, Virtual Machine and Java Programming Environment, Fundamental Programming Structures in Java. Java and Internet, Hardware and Software requirement, JDK, JRE, JVM Architecture, Byte Code, Byte Code Execution.

Unit -II

Constant, Variables, Data types: Declaration of variable, Scope of variable, Symbolic constant, Type Casting Operators and Expressions: Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Conditional, Bitwise, Special operator, Dot.

Operator Expressions: Arithmetic, Evaluation of expressions, Type conversion in expressions.

Unit-III

Decision making, branching, looping:

Branching: Introduction, If statement, If...Else statement, Nesting of If...Else statement, The Else If ladder, The Switch statement, The ? : operator. Looping: The while statement, The do statement, The for statement, Jumps in Loop, Labeled Loop.

Unit-IV

Classes, Objects and Methods:

Introduction, Defining a Class, Methods, Objects, Accessing class members, Constructors, Methods overloading, Static members, Nesting of methods, Inheritance: Extending a class, Defining a subclass, Multilevel and hierarchical Inheritance. Overriding methods, Final variables, methods, Final Classes, Abstract methods and classes.

Visibility and control.

Unit-V

Arrays, Strings and Vectors:

One dimensional arrays, Two-dimensional arrays, Strings: Strings arrays, String methods. Vectors, Wrapper classes.

Unit-VI

Interfaces:

Introduction, Defining interfaces, Extending Interfaces, Implementing Interfaces, Accessing interface available.

List of Practicals

PROGRAMMING LABORATORY - II

Concern Staff Should Frame 2-3 Assignments on Each Unit.

Text Books / References

Java in a Nutshell, 5th Ed, Oreilly

E. Balagurusamy, Programming with Java

Head First Java, Oreilly

Chavan, Java for Beginners, Shroff Pub.

Herbert Schildt , Java 2 Complete Reference – 5th Edition, Tata MGRA Hill

Java How to Program – Dietel & Dietel

Practical Java Projects, Shroff Pub.

Syllabus for Unit Test

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RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester- III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.

For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class



BHARATI VIDYAPEETH UNIVERSITY, Pune.

(Established under Section 3 of UGC ACT 1956)



PRACTICAL

C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (ELECTRICAL)
(Sem. III & IV)**



FIELD WORK



CLASS WORK



COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (ELECTRICAL) (Sem. III & IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

Electrical Branch and the Electrical Engineering Department was established in the year 1987 with the permission of AICTE New Delhi with an intake capacity of 60 students. The college and the course were affiliated to the University of Pune. The University Grants Commission and the Ministry of Human Resource Development, Govt. of India awarded the Deemed University status to the Institution and the Department in the year 2000.

The specious infrastructure, well equipped laboratories, meritorious students and academically qualified and enthusiastic faculty being the salient features of the Department. Electrical Department runs U.G., P.G. & Ph.D. courses and imparts education of very high standard and has created its own impression in the society. The students are admitted to B.E. & M.E. course through Common Entrance Examination conducted on All India Basis.

More than 900 students have acquired B.E. (Electrical) degree and most of them have attained high positions in the organizations of repute. Some students continued their studies abroad and some have their own business. This shows the versatility of the knowledge they acquired in the department.

The department, apart from routine academic Curriculum takes keen interest in several other academic activities like conducting seminars, workshops, conferences, expert lectures etc. and updates the practical aspects through industry -institute interaction. The department maintains good culture and discipline by having close association with each student through 'Teacher Guardian Scheme'. One of the main achievements of the department is that in last 3 years BE Electrical students were placed 100 % in top ranking companies in India and abroad.

Infra structure of the Department

The total space available is 785 sq. mts. and has Four class rooms, and following **Laboratories:**

Electrical Machines Labs [A &B], Electrical Measurements and Instrumentation Lab, Switch gear protection and HV Lab, Network Analysis and Microprocessor Lab, Industrial Drives and Control and Basic Electrical Lab, Computer and Software Center / Lab, Power System Lab, Control System Lab

DEPARTMENTAL LIBRARY

The Departmental Library, organized by ASEE, is having good number of titles of Text Books, Reference books. Technical Journals U G and P G Seminar and Dissertation Reports, Audio Video CDs on Technical Topics.

MAJOR GROUPS/AREAS IN THE DEPARTMENT

Electrical Power System, SCADA and Automation, Computer Applications in Power Systems, Electrical Control Systems, Electrical Machines, Electrical Drives and Control, Electrical Measurements, High Voltage Engineering, Microprocessors and controllers

EXPERTISE IN RESEARCH AND CONSULTANCY

The department is actively engaged in number of research projects, which are sponsored, by A.I.C.T.E., U.G.C. & other funding agencies.

MAJOR EQUIPMENTS

Synchronous Induction Motor, Linear Induction Motor, Microprocessor Kits, Relay Testing Kit, HV transformer with Sphere gap arrangement, Alternator Protection scheme, Switchgear Testing Kits

SOFTWARES

PSCAD, ETAP, Electro-2D/3D, Magneto-2D/3D, ORSTEAD, MATLAB, All other Licensed Windows, Antivirus [Quick Heal]

Students Placements:

Recruitment of the Electrical students through Campus Interview

The students are selected in various Companies Like TCS, CTS, Infosys, Wipro, Kanbay, Accenture, Tech Mahindra , HSBC, ICICI Bank ABB, AREVA T&D, Siemens, Rockwell Automation, JSW, L&T, CG, NDPL, Tata Power, Bhatiya Group of Companies- Power Machines Ltd. Dubai, US Technology & many more.

In 2004-05 Placement of the Electrical students was 100 % [57 Out of all 57 Eligible students]

In 2005-06 Placement of the Electrical students is 100 % [58 Out of 58 Eligible Students].

In 2006-07 Placement of the Electrical students is 100 % [60 Out of 60 Eligible Students].



STRUCTURE & EXAMINATION PATTERN

B. Tech. - Electrical Engineering

Semester III									Total Duration : 31 Hrs/Week
									Total Marks : 750
Subject Code	Subject	Teaching Scheme			Examination Scheme (Marks)				Total (Marks)
		L	P	D	Theory	Unit Test	TW & Pr	TW & Or	
K70201	Engineering Mathematics - III	04	-	-	80	20	-	-	100
K40202	DC Machines Theory & Design	04	02	02	80	20	50	50	200
K40203	Electronics Devices & Circuits	04	02	-	80	20	-	50	150
K40204	Numerical Methods & Computer Programming	05	02	-	80	20	-	50	150
K40205	Electrical Measurements & Measuring Instruments	04	02	-	80	20	50	-	150
Total		21	08	02	400	100	100	150	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Drawing	Theory	Test	T. W. & Pr	T. W. & Or.	
21	08	02	400	100	100	150	750

Semester IV									Total Duration : 31Hrs/Week
									Total Marks : 750
Subject Code	Subject	Teaching Scheme (Hrs)			Examination Scheme (Marks)				Total (Marks)
		L	P	D	Theory	Unit Test	TW & Pr	TW & Or	
K40206	Linear & Digital Integrated Circuits	04	02	-	80	20	-	50	150
K40207	Transformer Theory & Design	05	02	02	80	20	50	50	200
K40208	Network Analysis	04	02	-	80	20	50	-	150
K40209	Instrumentation	04	02	-	80	20	-	50	150
K402010	Power Generation Techniques	04	-	-	80	20	-	-	100
Total		21	08	02	400	100	100	150	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Drawing	Theory	Test	T. W. & Pr.	T. W. & Or.	
21	08	02	400	100	100	150	750



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The Schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III



TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(09 Hours)

Differential Equations:

Solution of Linear differential equation of nth order with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's linear equations, Simultaneous linear differential equations, Total differential equations, Symmetrical simultaneous differential equations. Applications to Electrical circuits.

Unit-II

(08 Hours)

Complex Variables:

Function of complex variables, Analytic function, Cauchy-Riemann equations, conformal mapping, bilinear transformation, Residue theorem, Cauchy's Integral theorem and Cauchy's Integral formula.

Unit III

(09 Hours)

Transforms:

Fourier transforms: Fourier integral theorem, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms, Inverse Fourier transforms, Discrete Fourier transform and its applications.
Z -Transform: Definition, Properties, Inverse Z-Transform, Applications to difference equation, Relationship between Z-Transform and Fourier Transform.

Unit-IV

(09 Hours)

Laplace Transform:

Definition, Properties and Theorems, Inverse Laplace transform, Methods of finding Inverse Laplace transforms, Laplace transform of Unit-step function, Dirac-delta functions, Periodic functions, Ramp functions, Error function, First order Bessel's function, $Si(t)$, $Ci(t)$, $Ei(t)$ Applications to solution of linear differential equations.

Unit-V

(09 Hours)

Vector Differentiation:

Vector Differentiation, Gradient, Divergence and Curl, Directional derivative, Vector identities, Irrotational and Solenoidal vector fields.

Unit-VI

(08 Hours)

Vector Integration:

Line integral, Surface integral and Volume integral, Work done, Gauss-Divergence theorem, Stoke's theorem and Green's lemma, Applications to Electromagnetic fields.

Text Books / References

Peter V. O'Neil, Advanced Engineering Mathematics, 5th ed., Thomson Learning

Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd.

Wylie C. R. and Barrett L. C., Advanced Engineering Mathematics, McGraw-Hill

M. D. Greenberg, Advanced Engineering Mathematics, 2nd ed. Pearson Education

B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, Delhi

P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volume I & II), Pune

Vidyarthi Griha Prakashan

Murray R. Spiegel, Laplace Transforms, Schaum's Outline Series - International Edition

Syllabus for Unit Test

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
Unit Test 3	Unit III & VI



K40202: DC MACHINE THEORY & DESIGN

TEACHING SCHEME

Lectures : 04 Hrs/week
Practical : 02 Hrs/week
Drawing : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks
T.W. & Or. : 50 Marks
T.W. & Pr. : 50 Marks

Unit-I

(08 Hours)

DC Generator:

Basic principle of working, E.M.F. equation, Types, characteristics and applications of different types of D.C. generators.

Armature reaction in d.c. generators & its effects. Remedies to overcome armature reaction. Process of commutation & types, causes of bad commutation and remedies, interpoles, compensating windings.

Unit-II

(08 Hours)

DC Motors:

Basic principle of working, Significance of Back e.m.f., Torque equation, Types, characteristics and applications of different types of d.c. motors, Starting, reversing and armature voltage and field control method of speed control, Starters. Armature reaction in dc motors. Study and working principle, control and performance and applications of brushless DC motor & permanent magnet motors.

Unit-III

(08 Hours)

Testing of DC Machines:

Losses, efficiency, condition for maximum efficiency and maximum power output, effect of saturation and armature reaction on losses.

Insulation resistance, Brake Test, Swinburne's test, Regenerative test on shunt motors, Separation of various losses, retardation test, type and routine tests according to ISI specifications.

Unit-IV

(08 Hours)

Design of DC Machines

Choice of specific electric and specific magnetic loading. Determination of

main dimensions using output equation. Design of field system and interpoles. Design of armature. Design of commutator and brushes.

Unit-V

(08 Hours)

Estimation from Design:

Estimation of machine performance in respect of losses, temperature rise and efficiency.

Design of heating coil, motor resistance starter, regulators, lifting magnets.

Unit-VI

(08 Hours)

Heating, Cooling and Ventilation

Study of different modes of heat generation, temperature rise, heat dissipation, heating and cooling curves, heating time constants, cooling time constants, their estimation, dependence and application.

List of Practical

Determination of magnetization, external and internal characteristics of D. C. generator

Speed control of D. C. Shunt motor by Armature and Field control

Study of three point and four point starters

Load test on D. C. Shunt motor

Retardation test on D. C. machine

Hopkinson's test on D. C. machine

Swinburne's test on D. C. machine

Note

The term work shall consist of the record of minimum five experiments based on the course outline above.

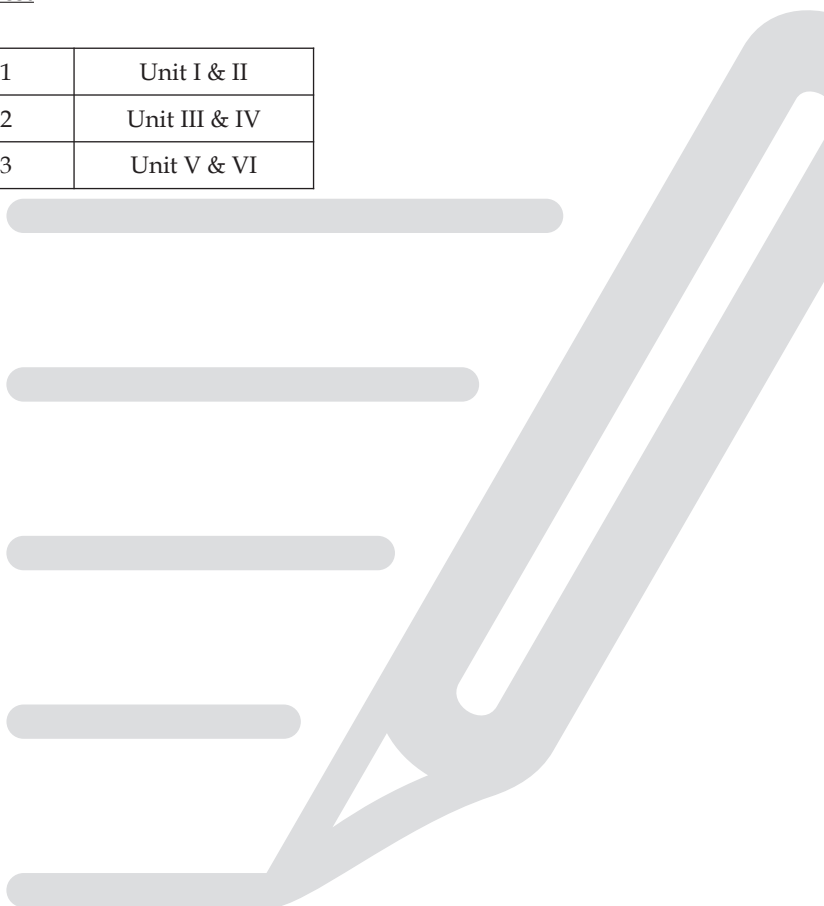
In design a report of design of dc machine is prepared for a typical dc machine which will contain the entire design procedure and calculations and sketches with dimensions calculated on 1/8 size drawing paper.

Text Books/References

- B. L. Theraja, Electrical Technology Vol. II
- A. E. Clayton, Performance and Design of DC Machines
- A. K. Shawney, Electrical Machine Design
- R. K. Agarwal, Principle of Electrical Machine Design
- S. K. Bhattacharya, Electrical Engineering Drawing
- K. L. Narang, Electrical Engineering Drawing

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Transistor Theory:

Transistor circuits- C E ,C B, C C, Cathod follower –comparison Biasing, Temp stabilization, Low frequency analysis usingh-parameters [for C E only], Methods and effects of cascading, frequency response

Unit-II

(08 Hours)

A F power Amplifiers:

Types and class of operation, efficiency of operation considerations. Feedback amplifiers, Types, negative feedback identification of different topologies.

Unit-III

(08 Hours)

Special Devices:

Principles, Characteristics, applications of - FET, UJT, PUT, DIAC, Opto electrical Devices, opto couplers, opt isolators, Optical Decoders, Display Devices such as LED, LCD

Unit-IV

(08 Hours)

Digital Circuit:

Multivibrators, Free running, Mono, Bi-stable, Schmitt trigger, Logic Gates, Types, combinations, applications, truth tables, Single bit comparators, adder, subtractor circuits, Various types of flip-flops- SR, D, JK.

Unit-V

(08 Hours)

Shift Registers and counters:

Types applications and operations of counters – synchronous and asyn, Decade BCD, N-Modulo, Ring, Johnson, Study of Ics-7495, 7490, 7492-93 shift registers, Pulse train generators.

Study and operation of RAM, NVRAM, SRAM, DRAM, ROM, EPROM, PLA, FPLA.

Unit-VI

(08 Hours)

Regulated power supplies:

Discrete, series, shunt regulators, Protection circuits, study of IC regulators- 723, 317, 7805, with applications

List of Practicals

Transistor : Biasing and Stabilization

Multistage Amplifiers : Effect of cascading on gain and frequency response

Characteristics and performance of Single Stage FET Amplifier

Audio Frequency Power Amplifier Performance

Feedback Amplifiers : Current series / shunt feedback, effect of negative feedback on Input impedance, output impedance, gain and bandwidth

OR

Voltage series / shunt feedback, effect of negative feedback on input impedance, output Impedance, gain and bandwidth

Regulated Power Supplies : Discrete Regulators – shunt and series regulators circuits

OR

IC 723 (low voltage / high voltage) line, load regulation and performance calculations

Characteristics and applications of optoelectronic devices (viz. photodiode, Phototransistor, LDR, Photovoltaic cell)

Applications of Op-Amp : Inverting, Non-Inverting, Voltage follower, summer, Subtractor

OR

Integrator, Differentiator, Multiplication and Division (Using log, antilog), comparator

Applications of Logic Gates : Study of single bit comparator, BCD Adder or Subtractor (using IC 7483)

OR

Verification of truth tables of SR, D and JK flip-flops and use of flip-flops as counters

Note

The term work shall consist of the record of minimum 8 experiments based on the course outlined above.

Text Books/References

Boylestad and Nashelsky, Electronic Devices and Circuits Theory, PHI

Ramakant Gaikwad, Operational Amplifiers, PHI

Malvino Leach, Digital Principles, TMH

Deboo Burroughs, Optoelectronics, TMH

C.W. Lander, Power Electronics, TMH

Millman and Halkais, Integrated Electronics, MGH

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K40204: NUMERICAL METHODS & COMPUTER PROGRAMMING

TEACHING SCHEME

Lectures : 05 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Introduction to Numerical Computations:

Basic Principle of numerical methods and necessity of computers for high speed calculations. Mathematical Preliminaries: Rolle's Theorem, Generalized Rolle's Theorem, Intermediate Value Theorem, Mean-Value Theorem for Derivatives. Errors and their Computation: Absolute, Relative and Percentage Errors.

Unit-II

(08 Hours)

Transcendental and Polynomial Equations:

Roots of an equation and methods to find the same. Methods to solve equations like Bisection, Secant, Regula-Falsi, Newton-Raphson methods, Single Variable, Multivariable Newton-Raphson Technique. Linear Algebraic Simultaneous Equation: Methods like Gauss elimination method and Gauss Jordan method. Iterative method like Gauss-Siedel method, accelerated Gauss-Siedel method and Jacobi's method.

Unit-III

(08 Hours)

Interpolation:

Introduction to Interpolation and calculus of finite differences. Polynomial interpolation methods- Lagranges, Newton's forward, backward and central difference methods, Sterling and Bessel's interpolation.

Unit-IV

(08 Hours)

Differentiation and Integration:

Numerical differentiation using simple interpolation techniques like Lagrangian and Newton Gregory method. Numerical integration using Trapezoidal, Simpsons rule as a special case of Newton cote quadrature techniques. Solution of ordinary differential equation using Euler's, Modified Euler's, Taylor series methods, Runge-kutta second and fourth order techniques using Hune's and polygon method.

Unit-V

(08 Hours)

C++ Programming:

Object Oriented Programming (OOPS) concepts, Class and objects, Abstraction, Encapsulation, Inheritance, and Polymorphism, Attributes of class, Functions in C++- Parameter passing Mechanism, Function overloading, Default values, Inline Functions, Virtual functions, Friend Functions, Static Members and Functions, Inheritance- Types of Inheritance Defining derived class, Access Control, Public - Protected and Private derivation, Derived class constructors, Destructors, Overloading Member functions, Object as a class member, Polymorphism- What is polymorphism, static polymorphism, overloaded Functions, overloaded operators, Operator overloading, L'nary operators Overloading, Dynamic polymorphism.

Unit-VI

(08 Hours)

Object-oriented software development with C++:

Evolution of the software development processes, stream and files-stream classes, stream errors, use case modeling and the programming problem, from use case to classes.

Term work of NMCP

LIST OF PROGRAMS using C++

Newton-Raphson method

Gauss elimination method

Lagranges Interpolation method
Newton's divided difference interpolation method
Trapezoidal method
Euler's method
Runge Kutta 4th order method
C++ program on Inheritance
C++ program on Polymorphism
C++ program on derived class constructor and destructor

Note

The term work shall consist of the record minimum 8 Experiments of the above.

Text Books/References

S. S. Sastry, Introductory Methods of Numerical Analysis
M. K. Jain, R. K. Jain, Numerical methods for Scientific and Engineering Computation
Santosh K. Gupta, Numerical methods for Engineers, Wiley Eastern Ltd.
Stagg and E. I. Abid, Computer Methods in power system analysis, TMH (Japan Edn.)
J. B. Scarborough, Numerical Mathematical Analysis
Robert Lafore, Object oriented programming in C++, Techmedia Publications
James P. Cahoon, Jack W. Davidson, C++ Program design, TMH Series
Al Stevens, Clayton Walnum, C++ Programming-Bible
Balguruswamy, Object Oriented Programming in C++

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K40205: ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Introduction:

Significance of measurement, classification of instruments, mechanical, electrical, electronic instruments, deflection and null type, applications of measurement system.

Units:

Absolute units, Fundamental and derived units, international system of units. Dimensions of mechanical, electrical quantities. Absolute measurement of current and resistance. Standards and their classification. Electrical standards of emf, current, resistance

Measuring instruments:

Static characteristics of an instrument, Accuracy, linearity, sensitivity, reproducibility, resolution, Types of errors, necessity of different torques in indicating instruments, recording instrument integrating instrument.

Measurement of current and voltage:

Construction, Principle of operation, torque equation and sources of errors in PMMC, Moving Iron instrument, dynamometer type instrument, Extension of ranges using shunts and multipliers.

Galvanometer:

Construction, principle of operation of D'Arsonval, vibration and ballistic galvanometer

Unit II

(08 Hours)

Instrument Transformers:

Advantages of instrument transformers over shunts and multipliers, use of instrument transformers, expression for ratio and phase angle errors in case of C.T. and P.T. (No derivation), precaution in using instrument transformers. Clip on ammeter.

Unit -III

(08 Hours)

Measurement of resistance :

Classification of resistances, measurement of Medium resistance, ammeter voltmeter method, Wheatstone bridge, sensitivity of Wheatstone bridge, limitations of the method, measurement of low resistance. D.C. Potentiometer- Calibration of ammeter and voltmeter application, Kelvin bridge, Ohmmeter , measurement of high resistance, difficulties in measurement, use of guard circuit, direct deflection method, loss of charge method, earth tester and measurement of earth resistance, megger.

A.C. Bridges :

Generalized equation of balance, Difference between Dc Bridge and Ac Bridge, Measurement of inductance using Maxwell's Bridge, Anderson bridge, Measurement of capacitance using Schering bridge, (No derivation, only numericals based on balance Equations)

Unit-IV

(08 Hours)

Measurement of power:

Construction, principle of operation of Electro-dynamometer type wattmeter, low power factor wattmeter, Errors and their compensation. Measurement of power in three phase circuit for balanced and unbalanced load by one wattmeter and two wattmeter method. Effect of power factor variation on wattmeter reading in two wattmeter method, Measurement of reactive power in three phase balanced load by one wattmeter method. Measurement of power using CT and PT, Three phase wattmeter.

Unit-V

(08 Hours)

Measurement of energy:

Construction, principle of operation and torque equation of induction type energymeter, errors and adjustments. Calibration of energymeter, three phase three wires, and three phase four wire energy meter, electronic energy meter

Other measuring instruments:

Power factor meter (electrodynamometer type only), frequency meter (Vibration, Weston type only), synchroscope, Phase sequence indicator, tri-vector meter, maximum demand indicator.

Unit-VI

(08 Hours)

Digital equipment:

comparison between analog and digital instruments, difference amplifier type electronic voltmeter, rectifier type, peak reading instruments .block diagram and principle of operation of digital multimeter, Function generator block diagram and working, digital storage oscilloscope, Harmonic distortion analyzer block diagram and working.

List of Practical

To observe construction and identify parts of PMMC, MI voltmeter, ammeter Electro-dynamometer wattmeter, energymeter and write down symbols and Specifications

To measure power in three phase balanced load by one wattmeter method

To measure power in three phase balanced/ unbalanced load by two wattmeter method

To measure reactive power in three phase circuit by one wattmeter method.

To extend range of wattmeter by use of CT and PT

To calibrate single phase energymeter at

- i) Unity power factor
- ii) 0.5 lagging power factor
- iii) 0.5 leading power factor

Calibration of ammeter and voltmeter with the help of potentiometer

To measure low resistance with Kelvin double bridge

To measure earth resistance by earth tester

To measure unknown inductance by Anderson bridge

Note

The term work shall consist of the record of minimum 8 experiments out of the above.

Text Books/References

A. K. Sawhney, A course in electrical and electronic measurements and instrumentation, Dhanpat Rai and Company

Golding, Electrical measurements

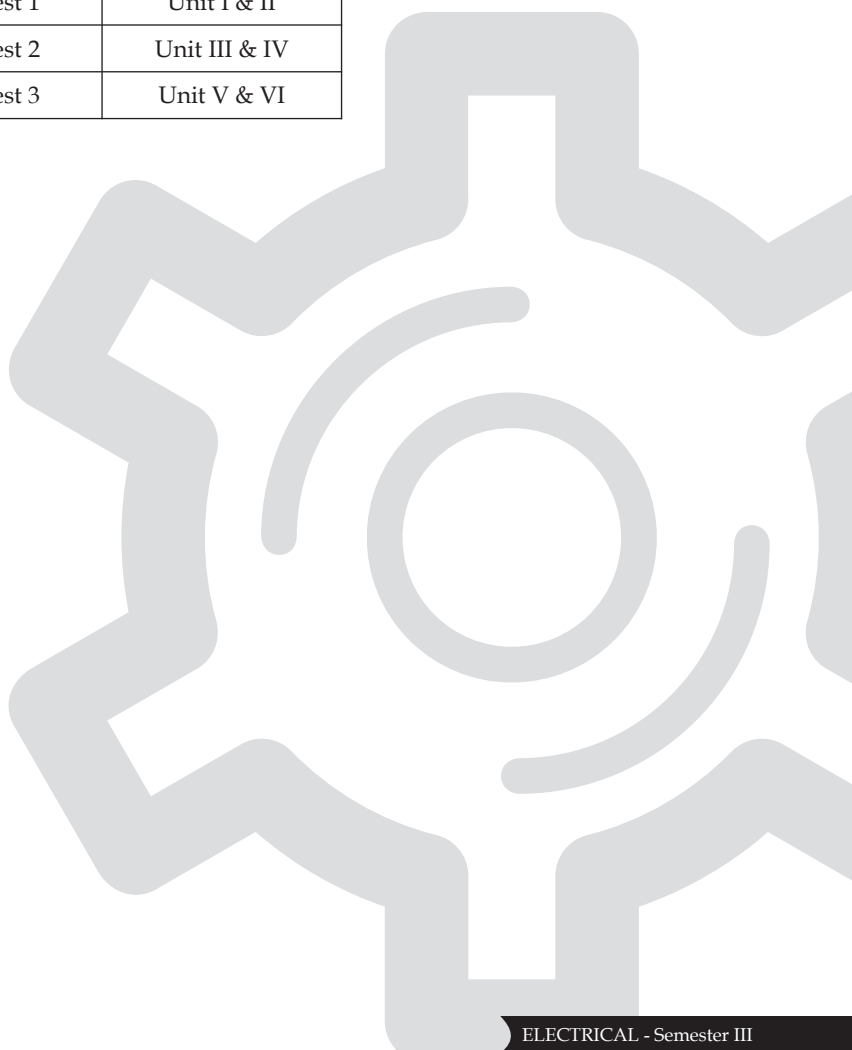
C. T. Baldwin, Electrical measurements

W. D. Cooper, Electronic instrumentation and measurement techniques, Prentice Hall of India

H. S. Kalsi, Electronic instrumentation, Tata McGraw Hill

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





SEMESTER - IV



K40206: LINEAR & DIGITAL INTEGRATED CIRCUITS

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Basic circuits for Analog ICs :

Current sources -Widlar, Wilson, and MOSFET voltage sources active level shifters, single supply operation and biasing, external offset, and its compensation. The characteristics of the Operational Amplifiers, open loop and closed loop operations, thermal drift, Important Parameters- Power supply rejection Ratio, Slew rate, gain etc

Unit-II

(08 Hours)

Applications of Operational Amplifier :

AC amplifiers, Norton Amplifier, Instrumentation amplifier, Isolation amplifier with strain gauge and thermister with signal conditioning circuits. Precision full wave and half wave rectifiers, comparators and Schmitt trigger, peak detector clipper and clamper circuits.

Unit-III

(08 Hours)

Other applications :

Basic applications -multipliers, deviders, square root, Adder, sub tractor etc. Waveform generators-Multi vibrators, sine, square, triangular generators, Study of ICs- 8038, 555, 556, LM 324, 741, LM380

Unit-IV

(08 Hours)

Digital Electronics :

Number systems- Binary, Octal, Hexadecimal, conversion methods, Binary addition and subtraction method, 1's and 2's compliment method.

Concept of coding, BCD codes, 8421, Excess-3, Gray code, codes more than 4-bits, ASCII code

Unit-V

(08 Hours)

Logic Circuits:

Logic families: TTL Nand gate, specifications, tri state TTL, ECL, MOS, CMOS families, and their interfacing.

Unit-VI

(08 Hours)

Combinational Logic:

Code conversion, arithmetic circuits, Half and full adder, Subtractor, Binary serial and parallel Adder, IC 7483, BCD Adder, Excess-3 Adder, Digital comparator.

Multiplexer, Demultiplexer, Encoder, Decoder and their applications, Design of ALU.

List of Practical

Study of characteristics of typical 74 TTL / 74 CMOS family like : fan in, fan out Standard load, noise margin & interfacing with other families

Half, Full Adder and Subtractor using gates and Ics

code conversion using digital IC'S

Function implementation using Multiplexer and Demultiplexer

Sequence generator using MSJK flip flop IC'S

Study of shift registers : Shift left, Shift right, parallel loading, and pulse train generator

Testing precision full and half wave rectifier

Waveform generator Ics and their circuits

Testing of circuit s using IC 555, Astable and Monostable mode.

Study of characteristics of ICs- 8030, 556

Some of the Following experiments should be implemented using PSPICE or MATLAB

- i) Schmitt trigger
- ii) Integrator and differtiator
- iii) Precision rectifier
- iv) PLL/Log antilog/555 circuits

Note

The term work shall consist atleast 8 experiment out of the experiments given above.

Text Books/References

Ramakant Gaikwad, Op AMP & Ics, PHI

D. Roy Chaudhary, Linear Integrated Circuits, PHI

G B Clayton, Op Amps, ELBS

K R Botkar, Integrated Circuits, Khanna Publisher

R P Jain, Modern Digital Electronics, TMH

Tocci, Digital Systems and Applications, PHI

Douglas Halls, Digital Circuits and Systems, McGHolla

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Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K40207: TRANSFORMER THEORY & DESIGN

TEACHING SCHEME

Lectures : 05Hrs/week
Practical : 02Hrs/week
Drawing : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks
T. W. & Or. : 50Marks
T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Single Phase Transformers:

Working Principle, construction, Types of Transformer, E.M.F. equation and transformer ratio, Transformer on No load, Transformer on load, Equivalent resistance, Magnetic leakage, Transformer with resistance & magnetic leakage, Equivalent circuit of Transformer. Open circuit and Short circuit tests on single phase Transformer, Efficiency of a Transformer, Condition for maximum efficiency, Kapp regulation diagram, Back to back test, All day efficiency of Transformer, Parallel operation of single phase Transformer.

Unit-II

(08 Hours)

Pholyphase Transformers:

Connecting a bank of three single identical single phase transformers. Construction of three phase shell and core type transformer. Comparison between single three phase unit and three single phase units, standard connections for three phase transformer, their voltage phasor diagrams, phasor groups, Floating neutral, parallel operation of three phase transformers, Three winding transformers, Tertiary winding and use of it in three phase transformers. Tap changer: types- construction & working.

Unit-III

(08 Hours)

Testing & Maintenance of Transformers:

Concept of polarity of transformer windings, standard practice of marking transformer winding terminals, polarity test using ac supply and voltmeter, open circuit and short circuit tests, methods of carrying out tests and information obtained from these. Sumpner's test (Back to back). I.S. Specifications of transformers. Concept of routine and type tests.

Testing of transformers as per I.S. specifications.

Transformer oil maintenance, transformer oil testing as per I.S.

Unit-IV

(08 Hours)

Design of Transformers:

Design of distribution and power transformers, specifications, design of main dimensions, core, yoke, winding, tank and cooling tube radiators

Unit-V

(08 Hours)

Performance Evaluation:

Estimation of leakage reactance for equal heights for HV and LV windings. Resistance of windings, Calculations of no load current and losses. Voltage regulation and efficiency. Calculation of mechanical forces during short circuits, remedies to overcome them.

Unit-VI

(08 Hours)

AC windings:

Single and double layer single phase AC winding with integral and fractional slots. Single and double layer integral and fractional slots in case of 3 phase AC winding.

List of Practicals

Open circuit and short circuit tests on a single phase transformer.

Polarity test on single phase and three phase transformers

i) Using ac supply and voltmeter

ii) Using battery, tap-key and dc galvanometer.

Study of standard connections for three phase transformers, line to line voltage ratios and phasor groups.

Sumpner's test on two identical single phase transformers.

T-connection of two single phase transformers on no load and at balanced load

V-connection of two single phase transformers on no load and at balanced load

Note

The term work shall consist of the record of all five experiments based on the course outline above.

In design, a report of design of transformer is prepared which will contain the entire design procedure, calculations and sketches with dimensions calculated on 1/8 size drawing paper.

Text Books/References

- M. G. Say, The performance & design of A.C. Machines
- B. L. Theraja, Electrical Technology (Vol. II)
- U. A. Bakshi, Electrical Circuit & Machine
- B. H. Deshmukh, Electrical Technology
- A. K. Shawney, Electrical Machine Design
- R. K. Agarwal, Principle of Electrical Machine Design
- S. K. Bhattacharya, Electrical Engineering Drawing
- K. L. Narang, Electrical Engineering Drawing

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Network Theorems:

Introduction, Thevenin's theorem, Norton theorem, Superposition theorem, Maximum power transfer theorem, Millman's, Reciprocity, Substitution, Compensation, Tellegen's Theorem.

Unit-II

(08 Hours)

Transient Response of Passive Circuits:

Introduction, transient response of series R-L and R-C circuit having DC excitation, Transient response in RL and RC circuit with sinusoidal excitation. Transient response in RLC circuit with DC and sinusoidal excitation

Unit-III

(08 Hours)

Laplace Transformation and its application:

Laplace transform of a derivative and integration. Laplace transform of common forcing functions, Initial and final value theorem, Time displacement theorem, Convolution theorem, Impulse response of R-L and R-C Circuit, Application of Laplace transformation technique in electric circuit analysis.

Unit-IV

(08 Hours)

Two Port Networks:

Short circuit admittance, open circuit impedance, transmission and inverse transmission, hybrid and inverse hybrid parameters. Relation between parameter sets, T, Ladder, lattice, twin T networks. Input and out put impedance in terms of two port parameters. Interconnection of networks, Symmetry and reciprocity.

Unit-V

Network Functions:

Network function for one port and two port networks, ladder networks, general network, poles and zeros of network functions, Restriction on poles and zeros for driving point functions and transfer functions.

Unit-VI

Fourier Analysis:

Exponential form of Fourier series, trigonometric form of Fourier series, symmetry in Fourier series, Frequency spectrum, properties of Fourier analysis, shifting of function, applications in circuit analysis.

List of Practical

Determination of time-response of R-C circuit to a step DC voltage input (charging and discharging of a capacitor through a resistor)

Determination of time-response of R-L circuit to a step DC voltage input (Rise and decay of current in an inductive circuit)

Determination of frequency-response of an R-C series circuit.

Verification of Superposition and Thevenin's Theorem.

Verification of Reciprocity Theorem.

Determination of step-response of a second order (R-L-C Series circuit) with variable damping.

Determination of parameters of a two-port network.

Harmonic Analysis of No-Load current of a power transformer.

Determination of parameters of Coupled circuits.

Determination of Resonance, Bandwidth and Q-Factor of an R-L-C Series circuit.

Note

The term work shall consist of atleast 8 experiments out of the experiments given above.

Text Books/References

M. E. Van Valkenburg, Network Analysis, Prentice, Hall India Pvt. Ltd.

D. Roy Choudhury, Networks & System, New Age International

A. Chakrabarti, Circuit Theory (Analysis and Synthesis), Dhanpat Rai Publication

G. K. Mithal, Network Analysis, Khanna Publication

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



**TEACHING SCHEME**

Lectures : 04 Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(07 Hours)

Introduction:

Definitions of Instrumentation, Measurements, with general block diagram, Transducers-types, applications, special features, comparison and selection factors, Error analysis-types, sources, limiting and minimizing techniques

Unit-II

(07 Hours)

Measurement of displacement:

Potentiometer, Linear-Strain gauge, types, gauge factor, circuits, temperature compensation, calibration, load cell, application for other measurements. LVDT characteristics, uses, circuits, applications for other variables. Angular velocity measurement, electrical tachometers, photo electric tachometers, stroboscope relative Comparison in different methods

Unit-III

(07 Hours)

Measurement of Pressure and vibration:

Definitions, ranges & units, Types, Mechanical instruments - Bourden tube, diaphragm, bellows, use of electrical transducer, Measurement of Vacuum Thermocouple gauges, Pirani gauges, and Ionization type vacuum gauges. Measurement of vibration, seismic accelerometers, types

Unit-IV

(07 Hours)

Measurement of temperature:

Definition, Effects and its use for measurements, Mechanical transducers- all types of thermometers, electrical transducers, resistance thermometers types circuits, thermistors, thermocouples with circuitry, thermopiles Pyrometer- principles, types, applications, comparison. Use of strain gauge.

Unit-V

(07 Hours)

Measurement of flow and level:

Use of nozzles, orifice, Ventury. Turbine meters, electromagnetic flow meters, Use of thermister, Ultrasonic flow meters, variable area meters, Pitot tube Measurement of liquid level-electric transducers using Resistance, Inductance, Capacitance, Mechanical methods-use of float, pressure gauges. Level measurement in closed tank.

Unit-VI

(07 Hours)

Recorders and Special topics:

Display and recording devices, Analog and digital meters, Recorders-types, working, applications
Methods of data transmission, Telemetry system-types, RF telemetry, FM telemetry.

List of Practical

Measurement of capacitance and loss angle by Schering bridge
Strain measurement using strain gauge
Study of LVDT
Temperature measurement by RTD, thermistor and thermocouple
Study of pressure transducers
Study of Recorders
Speed measurement by magnetic pick-up, photoelectric method
Study of C.R.O.s of different types and their applications
Step response of a meters
Measurement of systematic errors of wattmeters
Study of op-amp parameters
Study of op-amp applications

Note

The term work shall consists of atleast 8 experiments out of experiments given above.

Text Books

A. K. Sawhney, A course in Electrical and Electronic Measurement and Instrumentation, Eleventh Edition-Dhanpat Rai and Sons
B. C.Nekra , K. K. Choudhary, Instrumentation and Measurement Analysis, Sixth Reprint-T.M.H.L, New Delhi

E. B. Doebelin, Measurement System - Application and Design, Fourth Edition-
McGraw Hills International

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(08 Hours)

Hydro Power Station & Thermal Power Stations:

Introduction: Importance of electrical energy sources of energy – growth of power system in India.

Hydro Power Station: Selection of site – classification of Hydro Power Station – general arrangements and operations of Hydro Power Station – functions of each component – water hammering effect – turbines – hydro electric generators – list of Hydro Power Station in India with capacity.

Thermal Power Station: General lay out – operation - site selection – Fuels used – Types – analysis of coal – classification – liquid fuels – gaseous fuels – Boilers – turbines – condensers – cooling towers – major Thermal Power Station in India.

Unit -II

(08 Hours)

Nuclear – Diesel and Gas Power station:

Nuclear Power Station: Advantages – selection of site – elements of Nuclear Power Station – chain reaction – nuclear materials – moderators – coolants – control rods – main part of reactor- functions – different type of reactors.

Diesel Power Station: Field of use, outline – types of engine – different systems – advantages & disadvantages of diesel power station over Thermal Power Station – present trends in research.

Gas Power Station: Basics – classification - components – governing system – comparison of gas, diesel, & thermal power plant.

Major Electrical equipments in power stations

Unit-III

(08 Hours)

Solar and Wind Power Plant:

Solar: Photo Voltiac cell – solar to electric conversion – VI characteristics

- wattage efficiency – spectral response – solar module – solar array – solar PV technologies & systems for rural areas – solar diesel hybrid plant – solar power plant for space craft – economics of solar PV system.

Wind Power Station: introduction – schematic arrangement - vertical axis, horizontal axis – choice of electrical generator – energy storage – grid connection – hybrid solutions : Wind Tidal –diesel, Wind Tidal - solar etc. –wind farms in India / world.

Unit-IV

(08 Hours)

Biogas & Geo-Thermal Plants:

Biogas: biogas anaerobic fermentation process – raw materials – small, medium & large plants – Types: single stage & two stage, dome type – ocean biomass to biogas.

Geothermal: classification – types : vapour dominated, liquid dominated flashed system, double flashed system , binary cycle liquid dominated, Hyber binary cycle, liquid dominated total flow.

Unit-V

(08 Hours)

Tidal Energy conversion & Fuel Cells:

Tidal: tidal range – types : single basin, modulated single basin, double basin – main equipments – energy storage – projects in the world – prospectus – economic factors – disadvantages.

Fuel Cells: concepts- types – schematic of H₂ – O₂ cells – working – fuels – solid oxide fuel cells – fuel cells with permeable ion – exchange membrane.

Unit-VI

(08 Hours)

Load Curves and Economic Aspects :

Load Curves: load curve – base load station and peak load station - demand factor – maximum demand – average demand – diversity of load- load factor – diversity factor – significance of high Load Factor & diversity factor- plant factor – capacity factor – connected load - load duration curve – integrated load duration curve – selection of units.

Economic Aspects: cost of generating stations – tariff – types of tariff – factors influencing the rate of tariff designing.

Text Books/References

S. L. Uppal, Electrical Power, Khanna Publication

S. Rao, Dr. B. B. Panelkar, Energy Technology, Khanna Publication

Arrora, Domkundwar, A Course in Power Plant Engineering, Dhanpatrai & Co. Publications

Soni, Gupta, Bhatanagar, A Course in Electrical Power, Dhanpatrai & Co. Publications

J. B. Gupta, A Course in Power System, S. K. Kataria & Sons

Syllabus for Unit Test

Unit Test 1	Unit I & II
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RULES REGARDING ATKT, CONTINUOUS ASSESSMENT and AWARD of CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester-III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

- Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.
- For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

- The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class



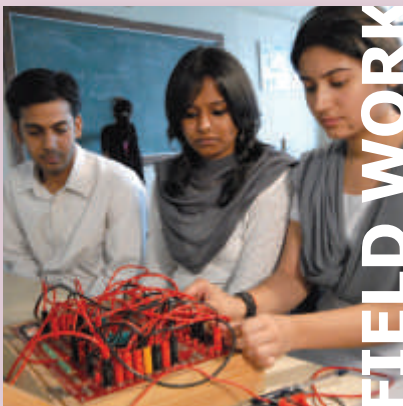
BHARATI VIDYAPEETH UNIVERSITY, Pune.

(Established under Section 3 of UGC ACT 1956)



C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (ELECTRONICS)
(Sem. III & IV)**





COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (ELECTRONICS) (Sem. III & IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

India is the fourth largest telecom market in Asia. The Indian telecom market is eighth largest in the world and second largest among emerging economies. The industry has witnessed an explosive growth in the field of electronics in the recent years. India has institutions that are deeply rooted in the principles of democracy and Justice. This ensures a transparent, predictable and secure environment for development of electronics field.

The National Telecom policy 1999 (NT 99) targets tele-density at 15 per cent by 2010. The Indian market presents a unique opportunity as compared to developed countries, hence increasing the attractiveness of the Indian market.

In the engineering field, electronics branch is one of the most significant as it reflects today's changing technology. It has become a must-know field as it forms the base for all other engineering branches.

To comply with the present day requirements & keep pace with the recent technology, the course is designed to provide the students with technical know-how. The department therefore aims to ensure that the students excel in hardware as well as software technologies. The department has started post-graduate course leading to M.E. Electronics (VLSI) which focuses on the theory, design, implementation and application of this upcoming technology in technical context.

The department has received a grant of Rs. 45.5 Lakhs from UGC under their innovative program scheme to start the Biomedical Engineering course with the intake capacity of 40 students.

College has established collaboration with ACTEL Corporation, USA. Under this collaboration an advanced VLSI laboratory is established jointly. For this laboratory, ACTEL Corporation has provided software and hardware worth \$3, 56,000 (Approx. 1.5 Crores)

The department has well-qualified and experienced staff with 6 Professors, 2 Assistant-Professors and 11 lecturers. Most of them have completed post-graduation and some are pursuing.

MAJOR GROUPS / AREAS

Image Processing, Digital Signal Processing, Very Large Scale Integration, Biomedical Engineering, Fiber optic sensors

EXPERTISE IN RESEARCH AND CONSULTANCY

Electronics engineering department received a grant of 6.5 lakhs from All India Council for Technical Education (AICTE), New Delhi for development of DSP laboratory under MODROB scheme. Research has been carried out in the field of signal

processing, control and communication with credit of five research papers published at national level. Three staff members are pursuing PhD work in the field of signal processing and communication. The department has received the grant of Rs. 70, 000 from Institute of Engineers, Pune for various research projects undertaken by students.

MAJOR EQUIPMENT

Mixed Signal Oscilloscope, Vector Voltmeter, Digital Storage Oscilloscope, Wobbuloscope, Powerscope, Allen-Bradley PLC with RSLogix500 software, Ratio Control Unit Trainer, ICAP 4, DSP Processor Training Boards & EVMs, X-ray machine (Demo type), Ultrasound scanner (Demo type), Blood cell counter, EEG hardware and software, Spectrophotometer (Demo type), Gas chromatography system (Demo type), ECG stress test software with thread mill

SOFTWARE

ORCAD, XLINX 3.1, Altera, MATLAB, LabView, ALDEC, Code Composer Studio, Libero

LABORATORIES

ACTEL-VLSI Lab, Microelectronics Laboratory, Digital Electronics Laboratory, Network and Lines Laboratory, Electric Circuit Design and Project Laboratory, Communication Laboratory, Microprocessor and Microcontroller Laboratory, Computer Networking Laboratory, DSP and Image Processing Laboratory, Electronic Instrumentation and Measurements, Power Electronics Laboratory, Instrumentation and Control Laboratory, Biomedical Laboratory, Computer Lab



STRUCTURE & EXAMINATION PATTERN

B. Tech. - Electronics Engineering

Semester III				Total Duration : 28 hours/week				Total Marks : 750
Subject Code	Subject	Teaching Scheme (Hrs.)		Examination Scheme (Marks)				Total (Marks)
		L	P	Theory	Unit Test	TW & Pr	TW & Or	
K50201	Electronic Devices & Circuits	04	02	80	20	50	50	200
K50202	Network Analysis	04	02	80	20	50	-	150
K50203	Fundamentals of Instrumentation & Control	04	02	80	20	-	50	150
K50204	Computational Techniques	04	02	80	20	-	50	150
K70201	Engineering Mathematics-III	04	-	80	20	-	-	100
Total		20	08	400	100	100	150	750

Teaching Scheme		Examination Scheme				Total
Lectures	Practical	Theory	Unit Test	T.W. & Pr.	T.W. & Or.	
20	08	400	100	100	150	750

Semester IV				Total Duration : 28 hours/week				Total Marks : 750
Subject Code	Subject	Teaching Scheme (Hrs.)		Examination Scheme (Marks)				Total (Marks)
		L	P	Theory	Unit Test	TW & Pr	TW & Or	
K50207	Electronic Circuits	04	02	80	20	50	50	200
K50208	Analog Communications	04	02	80	20	50	-	150
K50209	Digital Electronics & Logic Design	04	02	80	20	50	-	150
K50210	Linear Integrated Circuits	04	02	80	20	50	-	150
K50211	Signals & Systems	04	-	80	20	-	-	100
Total		20	08	400	100	200	50	750

Teaching Scheme		Examination Scheme				Total
Lectures	Practical	Theory	Unit Test	T. W. & Pr.	T. W. & Or.	
20	08	400	100	200	50	750



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr : 50 Marks

T. W. & Or : 50 Marks

Unit-I

(08 Hours)

Study Of Electronic Materials & Components:

Classification of materials based on band gaps; Semiconductors materials Si, Ge. Types of Resistors : 1. Fixed 2. Variable 3. Precision etc.

Like carbon film, metal film, wire wound, their standard values, specifications and applications. Classification of capacitors based on dielectrics, standard values, specifications & applications of capacitors, types of capacitors – electrolytic ceramic, paper, mica, tantalum, plastic film etc. Study of different core materials depending on range of frequencies - for inductors & transformers.

Unit-II

(09 Hours)

Semiconductor Diode Characteristics:

Diffusion phenomenon, concentration gradient, Einstein relation, volt equivalent of temperature, total current (drift & diffusion), potential variation within continuous and step graded semiconductor p-n junction. Current components in forward biased/reverse biased p-n junction diode, cut in voltage, reverse saturation current. Characteristics (Logarithmic) equation of diode temperature dependence of diode characteristics concepts and significance & expressions of transition and diffusion capacitance, junction diode switching times.

Unit-III

(08 Hours)

Application Of Semiconductor Diode:

Diode as rectifier, half wave, full wave and bridge rectifier with and without capacitor & filter, different types of filters-L-section and Π section input Parameters like ripple factor efficiency, TUF, PIV, I_{max} , I_{surge} , etc. Derivation of ripple factor for L, C and L section filter, Π section. bleeder resistor. Diode as a wave shaping element in clipping and clamping circuits, voltage multipliers.

Unit-IV

(09 Hours)

BJT (Bipolar Junction Transistor):

(07 Hours)

(07 Hours)

Millman & Halkias, Integrated Electronics, Mc Graw Hill

Millman & Halkias, Electronic Devices & Circuits, Mc Graw Hill

Syllabus for Unit Test

Unit -I

Error Analysis & Roots Of Polynomial:

Sources , types, analysis . Bisection method , Regula falsi method , Newton Raphson, Secant , iterative , convergence tests.

Unit -II

Interpolation/Optimization:

Finite difference operators , interpolation techniques based on finite differences, Newton's forward, backward, divided . Lagrange's, spline, least squares.

Unit-III

Linear Equations & Numerical Integration:

Gauss Jordan, Gauss Elimination , Jacobis , Gauss Siedel, LU decomposition, analysis of methods
Trapezoidal, Simson's 1/3 & 3/8 rules .

Unit-IV

Differential Equations & Monte Carlo Techniques:

Taylor's series, Euler's method, Runge Kutta 4th order, predictor corrector & stability analysis . Simulation for integration , pseudo random nos.

Unit-V

Searching & Sorting:

Sorting: Bubble, Quick , Insertion , Selection , Shell , Merge , Radix , analysis. Searching: Sequential , Binary , Hashing.

Unit-VI

Data Structures:

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(09 Hours)

Network Techniques & Theorem:

Network definition, mesh & node analysis, principle of duality, source transformation, Simplification of networks. T & it conversion. Twin T & Wienbridge networks. Super position theorem, Thevenins theorem, Norton's theorem, Reciprocity theorem , Millman's theorem, Maximum power transfer theorem.

Unit-II

(09 Hours)

Transients & Resonance:

Undriven & driven RC, RL, RLC circuit. initial conditions.

Figure of merit, conditions for resonance, various properties of series & parallel resonance.

Unit-III

(08 Hours)

Two Port Network:

Various types of four terminal network, definition of characteristic impedance (Z_0), propagation constant, image impedance , iterative impedance, calculation of above parameter.

Unit-IV

(08 Hours)

Filters (Passive):

Filter fundamentals , LPF , HPF , BPF , BSF , prototype(constant k) & m - derived filters , composite filters.

Unit-V

(07 Hours)

Network Functions:

Terminals & terminal pairs , network function, poles & zeros and its significance.

Z, Y, H, A B C D parameters, Equivalent circuit, inter relationship between parameters, interconnection of two port network, Study of ideal transformer.

Unit-VI

(07 Hours)

Network Synthesis:

Positive real function, properties of LC, RL, R driving point function. Realization of positive real function in four canonical form for one port network.

List of Practicals

Network Theorems -I: Thevenin's & reciprocity theorem.

Network Theorem-II: Superposition & maximum power transfer theorem.

Filter-I: Low pass filter & High pass filter.

Filter-II: Band pass filter & band stop filter.

Resonance: Series and Parallel.

Transient response of RLC circuit.

Z & Y Parameters.

h & ABCD Parameters.

Step and Impulse response of given network using MATLAB.

Any two assignments using PSPICE or any software. Experiment can be set on filters transient response or theorem.

Text Books/References

Van Valkenberg, "Linear Circuit".

D.Roy Choudhary, "Network Analysis & Synthesis", PHI.

John O'Malley, "Basic Circuit Analysis", Schaum's series 2nd Ed.

Franklin Kuo, "Network Analysis & Synthesis".

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





K50203: FUNDAMENTALS OF INSTRUMENTATION & CONTROL

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or : 50 Marks

Instrumentation Control Devices:

(09 Hours)

Control actions: On/Off, P, PI, PD, PID. PLC: Architecture, comparison with relay logic. Ladder Diagrams for simple applications

List of Practicals

Unit step and ramp response of the transfer function system using MATLAB.

To draw Root locus and Bode plot using MATLAB.

Magnitude and phasor plot of lead network.

Magnitude and phasor plot of lag network.

Transient response of second order system.

To Study characteristic of temperature transducer

To Study the characteristics of LVDT for displacement measurement

Flow control using Proportional controller action.

Verification of ladder diagram using PLC

Study of I/P converter

(07 Hours)

Text Books/References

Nagrath and Gopal, Control Systems

A.K.Sawhney, Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai & Co Ltd.

H. S. Kalsi, Electronic Instrumentation, Tata McGraw Hill

K. Ogata, Modern Control Engineering

(09 Hours)

Syllabus for Unit Test

Unit-I

Basics For Electronic Communication:

(08 Hours)

Properties of sound, Types of microphones and loudspeakers, enclosures,

Different methods of sound recording and reproduction (Analog &

digital sound) Monophony , Stereophony P.A. system & Hi-Fi system (07 Hours)
Types of noise, Noise calculation, Noise figure, Noise temperature.

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K50204: COMPUTATIONAL TECHNIQUES

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or : 50 Marks

Queues, Stacks, linked lists & Binary trees. (08 Hours)

List of Practical

Minimum of one assignment on each topic should be conducted in C. It will cover algorithm, error analysis and C program implementation.

(08 Hours)

Text Books/References

Gere J. M. & Timoshenko S. P., Numerical Methods for Scientific Engineering & Computation, New Age Int'l

Chapra & Canale, Numerical Methods for Engineers, Tata McGraw Hill (09 Hours)

William Press, Numerical Recipes in C, Oxford Press

Syllabus for Unit Test

Unit-I

Linear & Non-Linear Control System:

Introduction to linear & nonlinear control system, Elements of control systems, Open loop & closed loop, feedback & feed forward control systems. (Each control systems will be highlighted with real time applications). Transfer function using block diagram reduction techniques & signal flow graph using Mason's gain formula.

Unit-II

(07 Hours)

Transient Response:

Time domain Analysis of linear control systems. First order & second order system. Error constant, steady state error, transient response specifications. Stability of control system, Routh-Hurwitz criterion and Root locus technique.

(07 Hours)

Unit-III

Frequency Domain Analysis:

Frequency domain analysis frequency domain specification, Bode plot- Gain margin and phase margin, Mapping theorem and Nyquist Plot.

Unit-IV

Transducers:

Characteristics, types of transducers for temperature (RTD, Thermocouple, Thermistor), Capacitance type level, electromagnetic type flowmeter, pressure transducer, LVDT, Strain gauge, piezoelectric type accelerometer, photoelectric tachometer (Pick up)

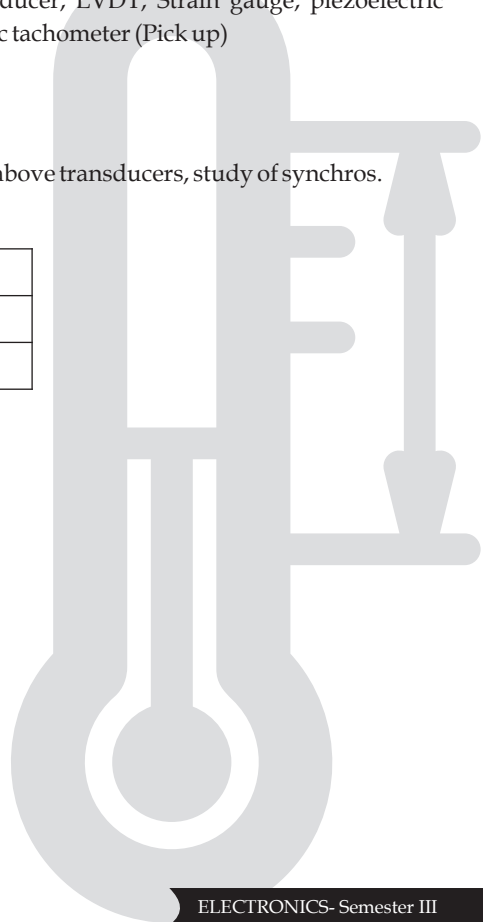
Unit-V

Signal Conditioning:

Signal conditioning circuits, for above transducers, study of synchros.

Unit-VI

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(09 Hours)

Differential Equations:

Solution of Linear differential equation of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's linear equations, Simultaneous linear differential equations, Total differential equations, Symmetrical simultaneous differential equations. Applications to Electrical circuits.

Unit-II

(08 Hours)

Complex Variables:

Function of complex variables, Analytic function, Cauchy-Riemann equations, Conformal mapping, Bilinear transformation, Residue theorem, Cauchy's Integral theorem and Cauchy's Integral formula.

Unit-III

(09 Hours)

Transforms:

Fourier Transform: Fourier integral theorem, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms, Inverse Fourier transforms, Discrete Fourier transform and its applications.
Z -Transform: Definition, Properties, Inverse Z-Transform, Applications to difference equation, Relationship between Z-Transform and Fourier Transform.

Unit-IV

(09 Hours)

Laplace Transform:

Definition, Properties and Theorems, Inverse Laplace transform, Methods of finding Inverse Laplace transforms, Laplace transform of Unit-step function, Dirac-delta functions, Periodic functions, Ramp functions, Error function, First order Bessel's function, $Si(t)$, $Ci(t)$, $Ei(t)$. Applications to solution of linear differential equations.

Unit-V

(09 Hours)

Vector Differentiation:

Vector Differentiation, Gradient, Divergence and Curl, Directional derivative, Vector identities, Irrotational and Solenoidal vector fields.

Unit-VI

(08 Hours)

Vector Integration:

Line integral, Surface integral and Volume integral, Work done, Gauss-Divergence theorem, Stoke's theorem and Green's lemma, Applications to Electromagnetic fields.

Text Books/References

Peter V. O'Neil, Advanced Engineering Mathematics, 5e, Thomson Learning

Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd.

Wylie C. R. and Barrett L. C., Advanced Engineering Mathematics, McGraw-Hill

M. D. Greenberg, Advanced Engineering Mathematics, 2e, Pearson Education

B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, Delhi

P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volume I & II), Pune Vidyarthi Griha Prakashan

Murray R. Spiegel, Laplace Transforms, Schaum's Outline Series- International Ed.

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



SEMESTER - IV



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

T. W. & Or. : 50 Marks

(09 Hours)

Unit-VI

RF/HF Amplifiers:

Hybrid - small signal model of BJT, its relation with h-parameters, definitions of f_t , f_{β} , calculation of A_i , A_v , with finite load and source resistances for CE stage, Gain bandwidth product, Tuned load, loaded & unloaded Q, insertion loss, single tuned amplifiers, staggered tuning, cascade configuration for HF amplification.

List of Practicals

Analysis of multistage LF amplifier using BJT / FET, verification with theoretical values of A_{is} , A_{vs} , R_i , R_o (overall) with square wave testing and comment on the results. Compute the simulation of above circuits.

Input impedance improvement techniques for emitter follower.

Biasing analysis of BJT power amplifier in class A, B, AB, C.

Calculation of efficiency & measurement of total harmonic distortion of class B/AB complementary symmetry power amplifier, verify the results using simulation.

Analysis of LF amplifier with negative feedback in voltage & current series topology

Measurement of frequency of oscillation for op-amp based RC oscillators, BJT/FET based LC oscillators, crystal oscillators.

Linear applications of Op-Amp such as summing, difference, voltage follower, signal phase shifter.

Regulation characteristics of series & shunt regulators and calculation of S_v and R_o (Discrete)

IC 723 as basic high / low voltage regulator with simple / foldback current limiting

Design, build and test for given specification.

Text Books/References

Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)

Millman & Halkis, Electronic Devices & Circuits, PHI

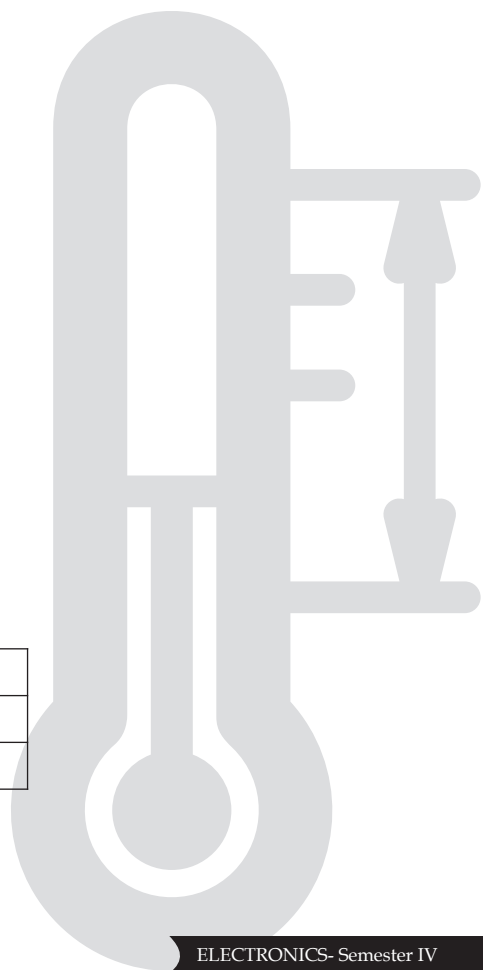
Millman & Halkis, Integrated Electronics, MGH

(08 Hours)

(08 Hours)

(09 Hours)

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr : 50 Marks

Frensel, Fundamentals of Communication, TMH

(09 Hours)

R. G. Gupta, Audio video Engineering Systems, TMH

Syllabus for Unit Test

Unit-I

Number Systems And Coding:

Number systems, Binary, Octal, Hexadecimal, Conversion (08 Hours)
Binary addition and subtraction , 1's & 2's complement method. Concept of coding, BCD codes, 8421, Excess -3, Grey code , codes with more than four bits, ASCII code.

Unit-II

Design Methods:

(08 Hours)

De-Morgan's theorem, Canonical and standard forms, dependency notation, minimization of logic functions, Karnaugh map upto 4 variables, SOP and POS forms, Don't care conditions, Quine Mc-Clusky method, multiple output minimization.

Unit-III

Logic Families And Semiconductor Memories:

(07 Hours)

Logic Families TTL NAND gate, specifications, tristate TTL, bus organized computer principle, ECL, MOS, CMOS families and their interfacing in details. Semiconductor Memories: RAM, ROM, PROM, EPROM, EEPROM, NVRAM, SRAM, DRAM; Concept of PLA, PAD.

(09 Hours)

Unit-IV

Combinational Logic:

Code conversion , arithmetic circuits , Half and Full adder, subtractor, Binary Serial, Parallel Adder, IC 7483, BCD Adder, Excess-3 Adder,

Digital comparator.

Unit-V

Multiplexer And Demultiplexer:

Multiplexer, Demultiplexer, Encoder, Decoder and their applications,
Design of ALU. (07 Hours)

Unit-VI

Sequential Logic Circuits:

S-R, Clocked S-R, JK and Master Slave JK flip flops, Flip-flop conversion, edge triggered flip-flops, design of Algorithmic State Machines (ASM) for simple applications. Design of ripple and synchronous counters, shift registers and pulse train generators, Pseudo Random Binary Sequencing (PRBS) generator, Analysis of clocked sequential circuits.

List of Practicals

- Implementation of Boolean functions using logic gates
- Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load, noise margin & interfacing with other families
- Half, Full Adder and subtractor using gates and IC's
- Code conversion using digital IC's
- 2 bit digital comparator and ALU verification
- Function implementation using Multiplexer and Demultiplexer
- Sequence generator using MSJK flip flop IC's
- Study of counters: Ripple, Synchronous, Ring, Johnson, Up-down counter and its application
- Study of shift registers: Shift left, Shift right, parallel loading and Pulse Train generator
- BCD Adder/Subtractor with Decoder driver and 7 segment display
- Study of typical RAMIC.

Text Books/References

Gothman, Digital Electronics - An Introduction to Theory and Practice, PHI

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K50209: DIGITAL ELECTRONICS & LOGIC DESIGN

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

R.P. Jain, Modern Digital Electronics, TMH

(09 Hours)

Tocci, Digital Systems-Principles & Applications, PHI

Douglas Hall, Digital Circuits and Systems, McGraw Hill

Syllabus for Unit Test

(08 Hours)

Unit-I

Frequency Amplifiers (BJT/FET):

Necessity of cascading LF small signal amplifiers in various configuration, techniques for improving input impedance of CC stage (Darlington connection, Bootstrapping), CE-CE cascade, CE-CB cascade arrangement, effect of cascading on frequency response of single stage and cascaded amplifiers, square wave testing or step response of AF amplifier. (08 Hours)

Small signal LF- h parameter model in CE/CB/CC configuration: concept of A.C equivalent circuit of single stage amplifier, need of coupling and bypass capacitors; analysis CE/CB/CC amplifier for A_i , A_v , R_i , & R_o in terms of h- parameter. Simplified h-parameter model, effect of biasing and source resistance on performance of single stage amplifier, concept of frequency response. (07 Hours)

Unit-II

LF Amplifiers With Negative Feedback:

Block schematic of amplifier with negative feedback, gain with feedback, consequences of introducing negative feedback in small signal and multistage amplifier, classification of amplifiers in view of feedback concept i.e. A_i , A_v , G_m , R_m , types of sampling and mixing, ways of introducing negative feedback in amplifiers i.e. voltage series & shunt, (07 Hours)

current series & shunt and effect on R_i & R_o in all four types, Methodology of feedback amplifier analysis.

Unit-III

(09 Hours)

Operational Amplifiers:

Internal block schematic of monolithic op-amp IC, Analysis of transistorized difference amplifier stage, Methods of improving CMRR, Definitions and measurement of op-amp parameters like input offset voltage and current, bias current CMRR, PSRR, open loop gain, etc., concept of dc amplification, inability of op-amp to work as a linear small signal amplifier in open loop, op-amp with closed loop negative feedback, closed loop gain and frequency response of op-amp, Linear applications like inverting & non - inverting amplifier, summing, difference.

Unit-IV

Large Signal (Power) Amplifiers:

Classification of amplifiers in class A, B, C, etc., concept of large signal amplification total harmonic distortion, push-pull configuration, efficiency of power conversion, CE transformer coupled amplifier, complementary symmetry CC power amplifier in single & dual supply version, efficiency and distortion analysis of those configuration (Graphical techniques to calculate harmonic distortion), cross over distortion, SOA and its limits, secondary breakdown, Heat sinks: standard shapes & sizes, thermal calculations and resistances and its calculations.

Unit-V

Oscillators & Voltage Regulators:

Employing positive feedback in amplifier, problems of instability, Barkhausen criteria for sinusoidal oscillators, derivation & analysis of transistorised RC phase shift / Wein Bridge for frequency expressions and gain requirements, LC oscillators: Hartley, Colpitts, Clapp, Crystal (Miller & Pierce), UJT relaxation oscillator, gain and frequency stability.

Zener diode as shunt regulator, emitter follower regulator, transistorised feedback type regulator, comparison of above discrete regulators on the basis of S_v , S_t , & R_o , CV / CC modes, over voltage & current protection circuits, internal block diagram, pin diagram and specification of

regulator its applications, SOA of IC regulators .

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





K50210: LINEAR INTEGRATED CIRCUITS

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Practical : 50 Marks

(07 Hours)

(08 Hours)

(09 Hours)

(08 Hours)

(09 Hours)

(07 Hours)



Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K50211: SIGNALS AND SYSTEMS

TEACHING SCHEME

Lectures : 04Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

(07 Hours)

(09 Hours)

(08 Hours)

(09 Hours)

(08 Hours)

(07 Hours)

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester-III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.

For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class



BHARATI VIDYAPEETH UNIVERSITY, Pune.

(Established under Section 3 of UGC ACT 1956)



PRACTICAL

C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (E&TC)
(Sem. III & IV)**



FIELD WORK



CLASS WORK



COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (E & TC) (Sem. III & IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

The world of today is ever dependent on a rapidly versatile and rapidly growing communications infrastructure. Convergence is the need of the hour where voice, data and video over single networks are likely to be offered with a very high quality of service. The consumer market for broadband services, VOIP and Internet TV is increasing at a fast pace.

The near future will see IP Multimedia sub systems (IMS) as a bedrock of the Next Generation Networks (NGNs).

To cope with this highly specialised sphere of technology, the course has been designed with all key relevant inputs being provided. Our aim is to develop innovative engineering skills which are essential in meeting the critical demands of the fast and furiously advancing electronics and telecommunications industry.

MAJOR EQUIPMENT

Mixed Signal Oscilloscope, Vector Voltmeter, Digital Storage Oscilloscope, Wobbuloscope, Powerscope, Allen-Bradley PLC with RSLogix500 software, Ratio Control Unit Trainer, ICAP 4, DSP Processor Training Boards

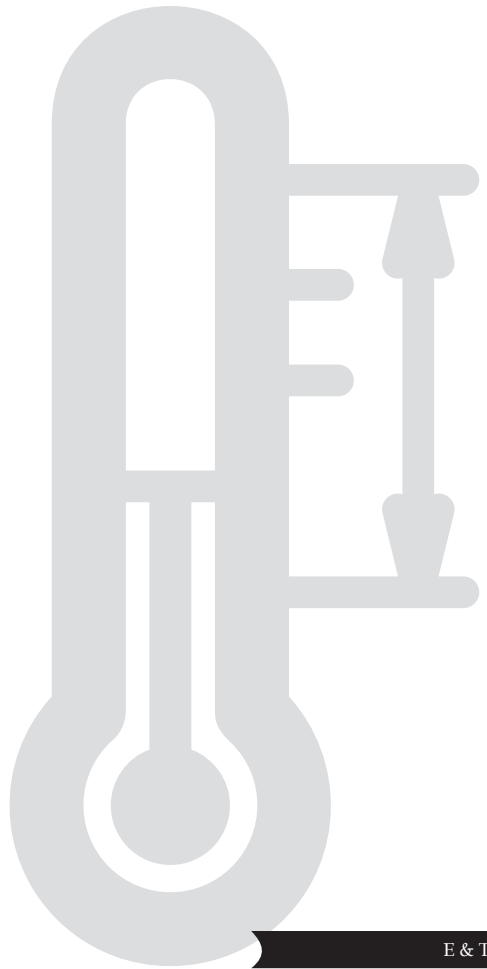
SOFTWARE

ORCAD, XLINX 3.1, Altera, MATLAB, LabView, ALDEC, Code Composer Studio, Libero

LABORATORIES

ACTEL-VLSI Lab, Microelectronics Laboratory, Digital Electronics Laboratory, Network and Lines Laboratory, Electric Circuit Design and Project Laboratory, Communication Laboratory, Microprocessor and Microcontroller Laboratory, Computer Networking Laboratory, DSP and Image Processing Laboratory, Electronic Instrumentation and

Measurements, Power Electronics Laboratory, Instrumentation and Control Laboratory, Biomedical Laboratory, Computer Lab





STRUCTURE & EXAMINATION PATTERN

B. Tech. - E & TC

Semester III				Total Duration : 28Hrs/Week				Total Marks : 750
Subject Code	Subject	Teaching Scheme		Examination Scheme				Total
		L	P	Theory	Unit Test	TW & Pr	TW & Or	
K50221	Electronic Devices	04	02	80	20	50	50	200
K50222	Network Analysis	04	02	80	20	50	-	150
K50223	Fundamentals of Instrumentation & Control	04	02	80	20	-	50	150
K50224	Data Structures & Files	04	02	80	20	-	50	150
K70201	Engineering Mathematics - III	04	-	80	20	-	-	100
Total		20	08	400	100	100	150	750

Teaching Scheme		Examination Scheme				Total
Lectures	Practical	Theory	Unit Test	T. W. & Pr	T. W. & Or.	
20	08	400	100	100	150	750

Semester IV				Total Duration : 28Hrs/Week				Total Marks : 750
Subject Code	Subject	Teaching Scheme		Examination Scheme				Total
		L	P	Theory	Unit Test	TW & Pr	TW & Or	
K50227	Electronic Circuits	04	02	80	20	50	50	200
K50228	Analog Communication	04	02	80	20	50	-	150
K50229	Digital Electronics	04	02	80	20	50	-	150
K50230	Computer Organization & Operating Systems	04	-	80	20	-	-	100
K50231	Signals & Systems	04	02	80	20	-	50	150
Total		20	08	400	100	150	100	750

Teaching Scheme		Examination Scheme				Total
Lectures	Practical	Theory	Unit Test	T. W. & Pr.	T. W. & Or.	
20	08	400	100	150	100	750



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III



TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Semiconductor Materials & Passive Components:

Classification of materials on the basis of electrical conductivity, Intrinsic and extrinsic semiconductors, Conduction mechanism in extrinsic semiconductors, Carrier concentrations, Drift and diffusion mechanism, Drift and diffusion current densities, Semiconductor materials used in Optoelectronic devices, modern semiconductor devices and Integrated circuits- GaAs, SiGe, GaAsP. Study of resistor, inductor, capacitor, relay, switches, LED, photo-electric devices.

Unit-II

(09 Hours)

Semiconductor Diodes and Applications:

A brief overview of following types of diodes, their peculiarities and applications Rectifier, Switching, Power, Tunnel, Shockley, Gunn, PIN.

Semiconductor P-N junction diode –Open circuited step graded junction, Metallurgical junction and ohmic contacts, Depletion region, Barrier potential, Forward and reverse biased diode operation. V-I characteristics equation of diode (no operation). Volt equivalent of temperature. Temperature dependence of V-I characteristics, DC load line, Forward and reverse dynamic resistance, Small signal and large signal diode models. Diode data sheet specifications- PIV, etc. switching diodes – Diode switching times, junction capacitance, (No derivation).

Voltage multiplier circuits: Working and comparison of voltage doubler, tripler and voltage quadrupler configurations. Limitations of voltage multiplier circuits. Clipping and clamping circuits: Series and parallel forms of clipping circuits, Biased clipper, their operation and transfer characteristics. Clamping circuits.

(09 Hours)

Unit-III

BJT Biasing and Basic Amplifier Configurations:

An overview of different types of BJTs – Small signal and large signal low frequency types, switching/RF, Hetero-junction types. Peculiarities of these types and their application areas.

Need for biasing BJT, DC analysis of BJT circuits, typical junction voltages for cutoff, active and saturation regions. Voltage divider bias and its analysis for stability factors, Small signal- low frequency h-parameter model, Variation of h-parameters with operating point, Derivations for CE configuration for A , R_{in} , R_o , in terms of h-parameters, Comparison of performance parameters with CB and CC configurations in tabular form. Need for multistage amplifiers and suitability of CE, CC and CB configurations in multistage amplifiers. Small signal and DC data sheet specifications for BJT.

(08 Hours)

Unit-IV

Field Effect Transistors:

An overview of different types of FETs viz. JFET, MOSFET, MESFET. Peculiarities of these types and their application areas.

JFET: JFET construction, symbol, basic operation, V-I characteristics, transfer characteristics (Shockley's equation), cut-off & pinch-off voltages, Trans-conductance, Input resistance & Capacitance. Drain to source resistance. Universal JFET bias curve. Biasing arrangements for JFET – Biasing against device variation, biasing for zero current drift. J F E T as voltage controlled current source. JFET data sheet specification – I_{DSS} , V_p , g_m , r_d , R_{DS} .

JFET Amplifiers: CS, CD, CG amplifiers. Analysis using small signal J F E T model.

(08 Hours)

Unit-V

MOSFETs:

An overview of following MOSFET types –D- MOSFET, E-MOSFET, Power MOSFET. n-MOS, p-MOS and CMOS devices. Handling precautions for CMOS devices. D and E-MOSFET characteristics & parameters, non ideal voltage current characteristics viz. finite output resistance, body effect, sub threshold conduction, breakdown effects and

temperature effects. MOSFET Biasing, Introduction to MOFET as VLSI device.

Unit-VI

(07 Hours)

Performance of BJT & FET Amplifiers & PCB Design:

Concept of frequency response, Human ear response to audio frequencies, significance of Octaves and Decades. The decibel unit. Square wave testing of amplifiers. Miller's theorem. Effect of coupling, bypass, junction and stray capacitances on frequency response for BJT and FET amplifiers.

Types of PCB, PCB design rules, Layout design, Artwork design, Fabrication process of single sided PCB. Different copper clad laminates, composition of solder metal.

List of Practicals

Study of Components (Resistor, Inductor, Capacitor, Relay, Switches, Transfer)

Study of CRO and Different modes of operation.

Study of simulation software for circuits.

Study of diode characteristics.

Study of BJT and FET characteristics.

Study of biasing BJT CE amplifier.

Study of biasing of FET CS and CD amplifier.

Frequency response of single stage BJT amplifier.

Square wave testing of BJT amplifier.

Design, build and Test small electronic circuit on PCB

Text Books/References

Thomas L. Floyd, "Electronic Devices", Pearson Education (sixth edition)

Millman Halkias, "Electronic Devices and Circuits", Tata McGraw Hill (20th reprint)

Millman Halkias, "Integrated Electronics", Tata McGraw Hill (20th reprint)

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Unit Test 3	Unit V & VI

**TEACHING SCHEME**

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(09 Hours)

Simplification & Analysis Techniques(AC & DC circuits):

Sinusoidal steady state, Phases & phasor diagram. Energy Sources. Mesh and nodal analysis. Source transformation of impedance. N network theorems.

- i) Superposition theorem
- ii) Thevenin Theorem
- iii) Norton Theorem
- iv) Maximum power transfer theorem

Unit-II

(07 Hours)

Resonance & its Applications:

Definition of figure of merits', Series resonance: current Bandwidth, impedance & Selectivity in series resonance. Parallel (anti) resonance: Application of resonance circuits including impedance transformation.

Unit-III

(07 Hours)

Transient Response:

Initial Conditions in elements. A procedure for evaluating initial conditions. Solution of RC, RL, RLC step response using classical method. Solution of RC, RL and RLC step response using Laplace transform.

Unit-IV

(09 Hours)

Four Terminal Networks:

Classification of four terminal networks (Symmetrical, Asymmetrical, Balanced & Unbalanced), Characteristic Impedance & propagation constant for symmetrical networks. Image & Iterative impedance for symmetrical networks.

Filter Fundamentals: Constant K type Low pass filter. Constant K type high pass filter. Constant K type Pass filter. Constant K type band pass filter. Constant K type band stop filter. M-derived T and n sections of low pass filter. Composite Low pass filter.

Attenuators: Introduction. Nippers & decibels. Symmetrical T & n type attenuators.

Unit-V

(08 Hours)

Network Functions:

Terminal pairs and ports. Network functions for one and two port networks. Poles & zeroes of network function. Time domain behaviour from pole zero plot.

Unit-VI

(08 Hours)

Two port network parameters:

Introduction. Open circuit Impedance parameters. Short circuit . Admittance parameters. Hybrid parameters. Transmission parameters. Interrelation between different parameters. Inter connection of two port networks.

List of Practicals

To verify Thevenin's Theorem.

To verify Maximum power transfer Theorem. (ac and dc)

To plot frequency response of frequency selective network (Twin T or Wein Bridge).

To build & test series and parallel Resonance circuits (Fr, BW, Q calculations).

To design constant k BPF and LPF circuits , to plot frequency response & to find cut-off frequency.

To design constant BPF and BSF circuits, to plot frequency response & to find cut-off frequency.

Select any two port network & find Z-Y parameters.

To plot Poles & zeroes for one port driving poles function.

Measurement of Zo and gamma for T and pi network.

Design , build & test symmetrical T & pi attenuators (plot of attenuation versus load

resistance)

Text Books/References

D.Roy Choudhary, "Network & System", Wiley Eastern (2nd Edition)

M.E. Van Valkenburg, "Network Analysis", PHI (3rd Edition)

F.F.Kuo, "Network Analysis & Synthesis", John Wiley & Sons (2nd Edition)

Hayt & Kimmerly, "Engineering Circuit Analysis", McGraw- Hill International (2nd Edition)

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K50223: FUNDAMENTALS OF INSTRUMENTATION & CONTROL

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(09 Hours)

Linear & Non-Linear Control System:

Introduction to linear & nonlinear control system , Elements of control systems, Open loop & closed loop , feedback & feed forward control systems. (Each control systems will be highlighted with real time applications).

Transfer function using block diagram reduction technique & signal flow graph using Mason's gain formula.

Unit-II

(07 Hours)

Transient Response:

Time domain Analysis of linear control systems. First order & second order system. Error constant, steady state error, transient response specification.

Stability of control system , Routh - Hurwitz criterion and Root locus technique.

Unit-III

(08 Hours)

Frequency Domain Analysis:

Frequency domain analysis ,frequency domain specification,Bode Plot-Gain margin and Phase margin, Mapping theorem and Nyquist Plot.

Unit-IV

(09 Hours)

Transducers:

Characteristics , types of transducers for temperature (RTD, Thermocouple, Thermistor), Capacitance type level transducer , electromagnetic type flowmeter, pressure transducer, LVDT, Strain gauge, Piezoelectric type accelerometer, photoelectric tachometer (Pick up)

Unit-V

(08 Hours)

Signal Conditioning:

Signal conditioning circuits, for above transducers, study of synchros.

Unit-VI

(07 Hours)

Instrumentation Control Devices:

Control actions: On/Off, P , PI , PD, PID,PLC: Architecture, comparison with relay logic.

Ladder Diagrams for simple applications.

List of Practicals

Study of Temperature Transducers.

Study of LVDT for displacement measurement.

Flow control using PID action.

Verification of ladder diagram using PLC.

Unit step and ramp response of the transfer function system using MATLAB.

To draw Root locus and Bode Plot using MATLAB.

Phasor plot of synchro system (Transmitter-Receiver).

Magnitude and phasor plot of lead network.

Magnitude and phasor plot of lag network.

Transient response of second order system.

Text Books/References

Nagrath and Gopal, "Control Systems"

A. K. Sawhney, "Electrical & Electronic Measurements & Instrumentation",
Dhanpat Rai Co & Ltd.

C. D. Johnson, "Process Control Instrumentation Technology"

K.Ogata, "Modern Control Engg.", PHI

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TEACHING SCHEME

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Review of 'C':

Array, Pointer, array and pointer,

Function: Parameter passing, Call by value by reference, scope rules, concept of recursion and recursive functions, functions and pointer,

Structure and Union: Passing and returning structure and union as parameter of function structure/union and pointer.

Input/output files: Concept, files operations

Types: sequential & random access files.

Unit-II

(09 Hours)

Introduction to Data Structures:

Overview-algorithm, data structure, how to create a program, how to analyze the program. Abstract Data Type. Concept of sequential organization, concept of linear and non linear data structure, arrays ADT, storage representations (row major and column major) Concept of ordered list & polynomial representation using array. Searching and sorting technique: Searching: Basic search technique, sequential searching, binary search, indexed sequential search. Analysis of these algorithms.

Unit-III

(07 Hours)

Linear Data Structure using Linked Organization:

Concept of link organization. Singly linked list, doubly linked list, Circular linked list. Insertion, deletion & traversal on above data structures, Representation & manipulation of polynomial using linked list.

Generalized lists: Representation of polynomial using generalized list.

Unit-IV

(09 Hours)

Stacks & Queues:

Stack: definition & examples, representing stack in C, implementing stack using linked list.

Example: infix, postfix and prefix(basic definition and examples, evaluating postfix expression, converting infix to postfix expression, program to convert infix to postfix).

Queues: The queue and its sequential representation, linked implementation of queues, circular queue, concept of priority queue.

Unit-V

(08 Hours)

Trees:

Basic terminology, binary trees, binary tree representation, binary tree traversal, primitive operation on binary tree, Binary search trees-primitive operation binary search trees, Threaded binary trees, Traversal of threaded binary tree.

Unit-VI

(07 Hours)

Graphs:

Concepts and terminology, Representation of graphs using adjacency matrix, adjacency matrix, adjacency list. Traversal; Depth first search, breadth first search. Algorithms for minimal spanning tree and shortest path.

List of Practical

- (a) program to create & manipulate database using structure.
- (b) program to add two polynomial using array of structure.

Program to implement primitive operation on Sequential file.

- (a) Program to search for record from a given list of records stored in array using
 - i) Linear search
 - ii) Binary search
- (b) Program to create Hash table & handle collision using linear probing without replacement.

Program to sort an array of names using

- i) Bubble sort

- ii) Insertion sort
- iii) Quick sort

(a) Program to implement following operation on singly linked list:

- i) Create
- ii) Delete
- iii) Insert
- iv) Display
- v) Search

(b) Program to add two polynomials using linked list.

(a) program to implement stack using:

- i) Array
- ii) Linked list

(b) Program to convert an infix expression to postfix expression & evaluate the resultant expression.

Program to Implement Queue using: (i) Array (ii) linked list

Program to create a Binary search tree & Perform following primitive operation on it:

- i) Search
- ii) Delete
- iii) Traversals(inorder, pre-order, post-order -recursive)
- iv) Non-recursive in order traversal

Program to create a graph using adjacency list & traverse it using BFS & DFS methods

Text Books/References

Yedidyah Langsam, Moshe J Augenstein, Aaron M Tenenbaum, "Data structures using C and C++"; PHI (2nd edition)

Ellis Horowitz, Sataraj Sahni, "Fundamentals of Data Structures" Galgetia Books source

Brain W Kernighan and Denis M Ritchie, "The programming language", PHI (2nd edition)

Robert L Kruse, "Data structure & program design", PHI(3rd edition)

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TEACHING SCHEME

Lectures : 04Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks

Unit-I

(09 Hours)

Differential Equations:

Solution of linear differential equation of nth order with constant coefficients, Methods of variation of parameters, Cauchy's and legendry linear equation , Simultaneous linear differential equation, Total differential equations , Symmetrical simultaneous differential equations, Application to electrical circuits.

Unit-II

(08 Hours)

Complex variables:

Functions of complex variables , Analytic function, Cauchy - Riemann equations, Conformal mapping, Bilinear transformation, Residue theorem, Cauchy's integral theorem and formulae.

Unit-III

(09 Hours)

Transforms:

Fourier transform: Fourier integral theorem, Fourier sine and cosine integral, Fourier transform , Fourier sine and cosine transform, Inverse fourier transform, Discret fourier transform and its application.

Z-Transform: Defination, Properties, Inverse Z-Transform, Application to difference equatin, Realtionship between Z-Transform and Fourier transform.

Unit-IV

(09 Hours)

Laplace transform:

Definition, Properties and theorem, Inverse laplace transform, method of finding inverse laplace transform, Laplace transform of unit step function, Dirac-delta functions, Periodic functions, Ramp functions, Error functions, First order bessel's function, $S_i(t)$, $C_i(t)$, $E_i(t)$. Applications to solution of linear differential equations.

Unit-V

(09 Hours)

Vector Differentiation:

Vector Differentiation, Gradient, Divergence and curl, Directional derivative, Vector identities, Irrotational and solenoidal vectors fields.

Unit-VI

(08 Hours)

Vector integration:

Line integral, Surface integral and volume integral, Work done, Gauss- divergence theorem, Stoke's theorem and Green's lemma, Application to electro magnetic field.

Text Books/References

Peter V. O'Neil, "Advanced Engineering Mathematics", 5e, Thomson Learning

Erwin Kreyszig, "Advanced Engineering Mathematics" Wiley Eastern Ltd.

Wylie C. R. and Barret L. C., "Advanced Engineering Mathematics", McGraw-Hill

M.D. Green Berg, "Advanced engineering mathematics", 2e, Pearson Education

B. S. Grewal, "Higher Engineering Mathematics", Khanna publication, Delhi

P. N. and J. N. Wartikar, "Applied Mathematics, Volume I and II", Pune Vidyarthi Griha Prakhasan

Murray R. Spiegel, "Laplace Transform", Schaum's Outline Series International Edition

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SEMESTER - IV



**TEACHING SCHEME**

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks
T. W. & Or. : 50 Marks
T. W. & Pr. : 50 Marks

Unit-I

(09 Hours)

MOSFET Applications:

MOSFET: V-I characteristic equation in terms of W/L ratio, MOSFET scaling and small geometry effect, MOSFET capacitances. Modeling MOS transistor using SPICE. CMOS inverter, Static characteristic -Noise margin, threshold voltage, Layout and latch-up prevention, other logic gates-NAND and NOR gates.

POWER MOSFET: Construction-Lateral double diffused MOSFET, VMOSFET. Drive requirements, Comparison with power BJT. One example of drive for circuit for POWER MOSFET.

POWER BJT: Power BJT construction, Data sheet specifications, Thermal resistance, Second Breakdown, Safe operating area (SOA), Thermal runaway, BJT as a switch in display and relay drive applications, Drive considerations, Anti saturation circuits, Comparison with Power MOSFET.

Unit-II

(07 Hours)

Large Signal AF BJT Amplifiers:

Block schematic of AF amplifiers. Classes of power amplifier - Class A , Class B , Class AB. An overview and applications of Class C and Class D amplifiers. Class A with resistive load. Transformer coupled class A amplifier, Class B Push - pull, Class AB, Complementary symmetry and Quasi - complementary. Efficiency analysis for Class A transformer coupled amplifier, Class B push - pull amplifier. Comparison of efficiencies of other configurations. Distortion in amplifiers, concept of Total Harmonic Distortion (THD).

Unit-III

(08 Hours)

High Frequency, Small Signal BJT Amplifiers:

Behavior of transistor at high frequencies. Modified T equivalent circuit. High frequency hybrid π CE amplifier model. CE short circuit current gain β_{sc} for T and hybrid π models. Definitions and derivations for f_{β} , f_{β} and f_{β} . Amplifier bandwidth taking into account source and load resistances. Techniques to improve bandwidth. Single tuned, Double tuned and stagger tuned amplifiers. Unloaded and loaded Q. Effect of staggering on bandwidth (no derivations).

Unit-IV

(08 Hours)

Feedback Amplifiers And Oscillators:

Concept of feedback. Negative and positive feedback. Classifications of amplifier based on feedback topology. (Voltage, Current, Transconductance and Transresistance amplifiers). Transfer gain with feedback. Advantages and disadvantage of negative feedback. Effect of feedback on input and output impedances and bandwidth of amplifier. Analysis of one circuit for each feedback topology.

Unit-V

(07 Hours)

Oscillators :

Oscillator start mechanism, need of amplitude limiting. Study of following oscillator circuits(using BJT & FET) - (Derivations not expected) RC oscillators, phase shift and Wien bridge oscillator LC oscillator - General form of LC Oscillators. Hartley oscillator, Colpitts oscillator, Clapp oscillator, Crystal oscillator.

Unit-VI

(09 Hours)

Linear Voltage Regulators And Voltage References:

Block schematic of linear regulators, Emitter follower regulator, Transistor series regulator and its analysis for performance parameters. 3 terminal floating, dual and adjustable regulator. Method of boosting output current using external series pass transistor. Performance parameters - Load and Line regulations, Ripple rejection, Output resistance and efficiency. Protection circuits - Reverse polarity protection,

over circuit, fold back current limiting, over voltage protection. Important data sheet specifications of linear regulators. Voltage references, their peculiarities and applications.

List of Practicals

Centre tapped bridge rectifier
Study of multistage amplifier
RC Oscillators (phase shift and Wien bridge)
Class A transformer coupled, Class B push – pull amplifier – Efficiency calculations
Transistor inverter in relay and LED driving application
Tuned amplifiers – single and double tuned amplifiers
Voltage series, current series feedback amplifier
Voltage shunt and current shunt feedback amplifiers
Simulation of LC oscillators
Linear voltage regulators – Floating, Adjustable three terminal regulators, current boosting, CV and CC modes of operation

Text Books/References

Thomas L. Floyd, “Electronics devices”, Pearson Education (Sixth edition)
Donald A. Neamen, “Electronic circuit analysis & Design”, Tata McGraw Hill (Second Edition)
Mark N. Horenstein, “Microelectronics Circuits and Devices”, Prentice Hall (Second Edition)
Millman Halkias, “Electronics Devices and Circuits”, Tata McGraw Hill
Millman Halkias, “Integrated Electronics”, Tata McGraw Hill

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TEACHING SCHEME

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Introduction To Communication:

Block Schematic of communication system, Base Band Signals and their bandwidth requirement, RF Bands, Types of communication channels(Transmission Lines, Parallel wires, co-axial Cables, Waveguides and Optical Fiber).Necessity of Modulation.

Unit-II

(08 Hours)

Amplitude Modulation:

Mathematical treatment and expression for AM, Frequency Spectrum, Modulation Index, Power Relation as applied to Sinusoidal Signal, Representation of AM wave, Mathematical treatment as applied to general signals in communication, Generation of AM using non-linear property.

Type of AM Transmitters: DSB-FC, DSB-SC, SSB, ISB & VSB, their Generation methods and Comparison in terms of bandwidth and Transmission Power requirement & Complexity(Block diagram treatment only)

Unit-III

(09 Hours)

Angle Modulation:

Mathematical analysis of FM and AM using Sinusoidal Signals, Frequency Spectrum, Mathematical treatment as applied to general Non-sinusoidal Signals, Modulation Index, Bandwidth requirement(all three relation), Narrowband and Wideband FM, Comparison of PM & FM, Direct and indirect methods of FM generation, Need for Preemphasis, Comparison of AM and FM, Block diagram of PAM, PWM, PPM. Multiplexing technique-TDM, FDM

Unit-IV

(07 Hours)

Noise:

Sources of Noise, Types of Noise, SNR, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth, Performance of AM(DSB, SSB & VSB) And FM in presence of Noise: Mathematical treatment.

Unit-V

(09 Hours)

AM & FM Receiver:

Block diagram of AM and FM Receiver, Super heterodyne Receiver, Performance characteristic: Sensitivity, selectivity, Fidelity, Image Frequency Rejection, IFRR. Tracking, De-emphasis, Mixers.

AM Detection: Envelope detection, Synchronous detection, Practical diode detection, AGC, SSB and DSB detection methods.

FM Detection: Phase discriminator and Ratio Detector, Mathematical analysis of FM Detection.

Unit-VI

(07 Hours)

Radiation and Propagation:

Concept of Radiation, Basic Antenna System(Dipole), Antenna parameters, Yagi-Antenna, Mechanism of Propagation: Ground Wave, Sky Wave, Space Wave, Duct, Tropospheric Scatter and Extraterrestrial Propagation, Concept of Fading and diversity reception.

List of Practicals

Study of AM Generation(DSB-FC)

Study of AM transmitter using Spectrum Analyzer.

Study of Envelope Detector-Practical diode detector.

Study of FM Generation.

Study of transmitter using Spectrum analyzer.

Study of FM detection- Ratio detector.

Measurement of Receiver characteristics: Sensitivity, Selectivity, Fidelity

Study of DSB-SC & SSB Generator using Spectrum Analyser.

Study of DSB-SC & SSB Detector

Measurement of antenna radiation pattern for different antenna

Text Books/References

B.P.Lathi, "Modern Digital and Analog Communication System", Oxford Press Publication

Kennedy & Devis, "Electronic Communication Systems", PHI

Dennis Roddy & Coolen, "Electronic Communication", PHI

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**TEACHING SCHEME**

Lectures : 04 Hrs/Week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Logic Families:

Parameter definitions -noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL ,CMOS & ECL. Input / output profile for TTL & CMOS. TTL logic families-standard, Totem – pole, open collector, tri-state (concept & application). Significance of TTL sub families (L, H, LS, S) & MOS family-importance of (C,HC), PMOS, NMOS (inverter only) ,CMOS (inverter, AND & NOR). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS. TTL compatible high speed CMOS series.

Unit-II

(08 Hours)

Binary Number Systems & Coding:

Binary number system: Signed number representation (1's, 2's complement & sign magnitude representation). Codes- BCD, GRAY, Seven Segment, ASCII code.

Principles of combinational logic: Canonicals forms don't care conditions, minimization techniques (K-maps up to 4 variables only). Quine-McCluskey method (4 variables). Design examples- code converters (binary to gray and gray to binary, BCD to 7 segment, IC 7447,7448).

Unit-III

(09 Hours)

Combinational Logic Circuits:

Digital comparators (2 - bit, 4- bit using IC 7485), parity generation and checking (1 C 741'80). Design methodology using MSI IC's. Multiplexer, Demultiplexer (Trees), multi variable function implementation using MUX & decoder. Parallel adder (1C 7483). Look ahead carry generator, arithmetic logic unit (IC 74181).

Programmable Logic Devices: Detail architecture, study of PROM, P AL,

PLA, designing combinational circuits using PLDs.(Code conversion)

Unit-IV

(09 Hours)

Sequential Logic Circuit:

Study of flip-flops, flip-flop truth table, 1 bit latch, SR flip-flop, Clocked SR flip-flop, JK flip-flop, Race around condition, Master-Slave JK flip-flop, D flip-flop, T flip-flop. Design of ripple counter using flip-flop (1 C 7490,93) 4 bit up/ down (positive / negative edge triggered).

Shift register (modes of operation), 4 bit bi-directional using D/ J-K universal shift registers, application of shift registers (Ring counter, Sequence generator, Johnson's counter) IC 7495/74195.

Unit-V

(07 Hours)

Synchronous Sequential Machines:

Design of Synchronous counter using IC 74191 ,4 bit up/down mod-n counters. Moore/Mealy M/C's, representation techniques, state diagrams, state tables, state reduction, state assignment, implementation using flip-flops. Applications like sequence generator and detection.

AID and D/A converters: Digital to Analog converters, example of D/ A converter 1 C, Analog to Digital converters, example of AID converter.

Unit-VI

(07 Hours)

Semiconductor Memories:

Memory organization and operation, expanding memory size, classification and characteristics of memory, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM.

List of Practical

Verification of parameters & transfer characteristics of 74LS and 74HC family.

I Verification of TTL - CMOS/CMOS- TTL interfacing.

Code conversion using logic gates: BCD to Binary, BCD to Gray, Gray to BCD 4.

Design and implementation of 2 bit digital comparator using logic gates and

Functional verification of 4 bit digital comparator IC 7485.

Design & implementation of 1 digit BCD adder using IC 7483. 6. A) Verification of functionality of multiplexer and demultiplexer

a) Verification of functionality of multiplexer and demultiplexer Ics

- b) Design and implement combinational function using multiplexer and demultiplexer
- a) Design & implementation of 3 bit bi directional shift register using D flip flop
- b) Design and implementation of Johnson counter using above shift register
- a) Functional verification of universal shift registers IC 7495/194
- b) Design and implementation of pulse train generator using above 1 C
- Design and implementation of 3 bit up down ripple counter using flip-flop
- Functional verification of ripple counter IC 7490 & synchronous counter IC 74191(mod n operation)
- Verification of DAC using R/2R method

Text Books/References

- M. Morris Mano, "Digital Design", PHI (3rd Edition)
- R.P. Jain, "Modern Digital Electronics", TMH
- Tocci, "Digital Systems", (PHI)
- Gothman, "Digital Electronics", (PHI)

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K50230: COMPUTER ORGANISATION AND OPERATING SYSTEMS

TEACHING SCHEME

Lectures : 04Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(07 Hours)

Structure Of A Computer System:

Brief History of computers, Von Neumann Architecture, Functional Units, Bus structures and Interconnection networks, Performance.

Control Unit Design: Machine Instructions and addressing modes, Single Bus CPU, Control Unit Operation: Instruction Sequencing, Micro-operations, (Register Transfer). Hardwired Control: Design methods, Design Examples: Multiplier CD. Micro-programmed Control: Basic concepts, Microinstruction-sequencing and execution, Micro-program control, Applications of microprogramming, Emulator.

Unit-II

(09 Hours)

Central Processing Unit:

CPU Architecture, Intel IA-32 Family Architecture as an example, Register Organization, Addressing modes, Instruction types, instruction formats (Intel, Motorola processors), Instruction cycles, Instruction pipelining, Types of operands, Addressing Modes.

Memory Organization: Internal Memory, Characteristics of memory systems and Hierarchy, Chip Packaging, Main Memory, ROM, EPROM, RAM: SRAM, SDRAM, DRAM, RDRAM.

High-Speed Memories: Cache Memory, organization and Mapping, Replacement Algorithms, Cache Coherence, MESI protocol. Interleaved and Associative Memories, Virtual Memory: Main Memory allocation, Segmentation, paging.

Secondary Storage: Magnetic Disk, Tape, DA T, RAID, Optical memory, CDROM, DVD

Unit-III

(08 Hours)

I/O Organization:

Input/Output Systems, Programmed I/O, Interrupt driven I/O, Traps, Faults, Exceptions, Pentium Interrupt Structure, I/O channels, Direct Memory Access, Standard Buses, Synchronous, Asynchronous, Parallel, Serial, PCI, SCSI, USB Ports.

Peripherals: Keyboard, Mouse, Scanners, Video Displays, Dot-Matrix, Desk-jet, Laser Printers.

Multiprocessor Configurations: Closely coupled and loosely coupled multiprocessor architectures, Problems of bus contentions, Interprocess Communications, Coprocessor and I/O Processor, Bus controller, Bus Arbitration, System Bus-Uni-Bus, Multibus.

Unit-IV

(08 Hours)

Introduction to Operating System:

Architecture, Goals & Structures of O. S, Basic functions, Interaction of O. S. & hardware architecture, System calls & O. S. services. Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real-time O. S. examples of O. S.: Linux and variants, MS-Windows, Handheld O. S.

Unit-V

(09 Hours)

Process Management:

Process description & control: Process Concept, Process states, Process description, Process control, Threads

Concurrency: Principles of Concurrency, Mutual Exclusion: SIW approaches, HA V Support, Semaphores, Message Passing, Monitors.

Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategies.

Scheduling: Uniprocessor Scheduling: Types of scheduling: Preemptive, No preemptive, Scheduling.

Multiprocessor Scheduling: Granularity, Design Issues, Process Scheduling, Thread Scheduling, Real Time Scheduling: Characteristics, Real Time Scheduling

Unit-VI

(07 Hours)

Memory Management Software:

Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Fragmentation, Swapping, Paging.

Virtual Memory: Concepts, Segmentation, Paging, Address Translation, Demand paging, I/O

Devices & Files: I/O management &

Disk scheduling: I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering.

File Management: Concepts, File Organization, File Directories, File Sharing, Record Blocking, Free Space management, Security Issues
Secondary Storage Management .

Text Books/References

C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", 5th Edition, McGraw Hill, 2002 ISBN 0 - 07 - 120411 - 3

Stalling William, "Operating Systems", Pearson Education, 2001, ISBN 81-7808503-8

W. Stallings William, "Computer Organization and Architecture: Principles of Structure and Function", 2nd Ed, Maxwell Macmillan Editions, 1990 ISBN 0 - 02 946297 - 5 (Chapter: 2,3,4,5,7,8,9,10,11,12,13,14)

A. Tanenbaum, "Structured Computer Organization", 4th Ed, Prentice Hall of India, 1991 ISBN 81 - 203 - 1553 - 7 (Chapter: 1,4,5,6,8)

Nutt Gary, "Operating Systems", Pearson Education, 2004, ISBN 81-297-0614-8

Tanenbaum Andrew S., "Modem Operating Systems" PHI, 2001. ISBN 81-203-0974-X

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI

**TEACHING SCHEME**

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(07 Hours)

Introduction To Signals:

Signals: Definition of signal, Classification of signals, Continuous and Discrete time, Analog & Digital, Periodic & Non-periodic, Deterministic and non-deterministic, Energy & power. Basic signals & Operations on signals, Sine, Cosine, Exponential and unit step, Unit Impulse. Even, Odd. Time shifting, time scaling, Differentiation and integration of signals.

Unit -II

(09 Hours)

Classification of Discrete Time System:

Definition, Classification, Linear Nonlinear, Time variant and time invariant, Casual & Non-causal, Static & dynamic, Stability.

LTI system Analysis: Introduction to LTI systems. Block Diagram 7 System Terminologies. Convolution Integral. Impulse response. Convolution & Methods of Convolution. Properties of convolution, System interconnections, stability & impulse response of systems to standard signals.

Unit-III

(08 Hours)

Continuous Time Analysis:

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, application of Fourier series & Fourier transforms to the system analysis.

Laplace Transforms: Definition and its properties, methods of inversion, application to LTI system analysis.

Unit-IV

(09 Hours)

Correlation, Energy Spectral Density and Power Spectral Density:

Introduction, Correlation & Correlogram, The correlation function:

Conceptual basis, Energy signals, power signals, Auto- correlation: Relation to signal energy and signal power, properties of Auto-correlation.

Cross-correlation: Properties of cross-correlation,

Energy Spectral Density: Definition & Derivation of PSD, Effects of system on ESD, The PSD concept, Relation of ESD to auto-correlation,

Power Spectral Density: Definition & derivation of PSD, Sampling Theorem and its roof, effects of under- sampling, sampling of band pass signals.

Unit-V

(08 Hours)

Probability:

Sample space, Event, probability, Conditional Probability and statistical independence. Random Variables, Discrete Random variable, Cumulative Distributive Function, Continuous Random Variable, Probability Density Function, Properties of CDF and PDF.

Unit-VI

(07 Hours)

Random Variables and Random Processes:

Transformation of random variables, Statistical averages, Mean, Moments and expectations. Probability models, Binomial, Poisson's Gaussian, Rayleigh.

Random Process: Ensemble averages ad correlation functions, Ergodic and stationary Process. Gaussian process. Random Signals, power spectral density, auto-correlation, Superposition and Modulation.

List of Practicals

- Generation of Signals
- Signal Convolution
- Correlation- Auto & Cross
- Laplace Transform
- Inverse laplace Transform
- Fourier Transform
- Inverse Fourier Transform

PDF, CDF

Mean, Standard Deviation, Variance & Moments

Note: All the Practical's to be conducted using MATLAB

Text Books/References

Roberts MJ, "Signals & Systems", TMH

Oppenheim, Wilsely & Nawab, "Signals Systems", (MGH)

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester-III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.

For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class



BHARATI VIDYAPEETH UNIVERSITY, Pune.

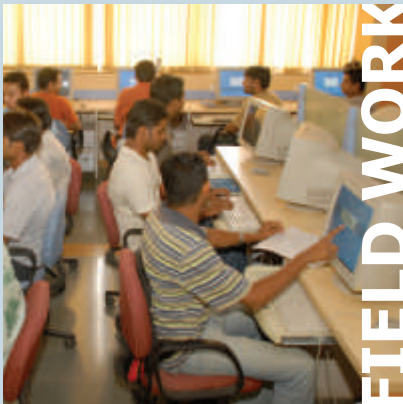
(Established under Section 3 of UGC ACT 1956)



PRACTICAL

C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (IT)
(Sem. III & IV)**



FIELD WORK



CLASS WORK



COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (IT) (Sem. III & IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

Information Technology deals in study, design, development, implementation, support and management of software. The department runs an under-graduate programme viz. B.Tech. (IT) and one post-graduate programme viz. M.Tech. (IT). The department has incorporated all the latest facilities for the benefit of the students. The department has well-equipped laboratories. The latest software and hardware equipments are provided to the students. The department has specialized laboratories in Software Engineering, Linux Operating System, Multimedia.

The Association of Computer & Information Technology Engineering Students (ACIES) organizes various events and expert lectures on different technologies. The syllabi of the department are revised regularly so as to match the needs of the industry. Apart from giving thorough technical knowledge using the state-of-art technology, the students are taught communication skills and are given experience in working in groups on live projects.

MAJOR GROUPS/AREAS

Operating Systems, Multimedia, Image Processing, Computer Networks, Software Engineering, System Programming

EXPERTISE IN RESEARCH AND CONSULTANCY

The department of Information Technology has received fund from UGC for Modernization of Research Laboratory "Object Oriented Modeling and Design".

ON GOING RESEARCH PROJECTS

High Non Stationary EEG Analysis, Brain-Computer Interface, Hidden Relation Finder, Video Steganography

COMPLETED PROJECTS

Visual Modeling of Real Time System, NeTailor- A Network Patch Management Solution, Voice Message Transform, Artillery Command Post Execution Software, MAFCOG 1.0 Mathematical Formula Analysis and Generator, Object Oriented Learning Environment Using ASP, Real Time Complex System, Implementation of Sniffers, EEG Analysis using Time Domain, Steganographic System.

MAJOR EQUIPMENTS

Pentium - IV 2.46 GHz - 100, Microprocessor Kits, Microcontroller Kits

SOFTWARES

- Operating Systems** : MS-DOS, Windows 95, Windows 98, SCO Xenix 2.1, Linux 7.0, Microsoft OS/2 Sdk Ver 1.02, Sun Solaris 7.1
- RDBMS** : Oracle 8, Oracle 8i, Oracle 9i, SQL Ver 7.0 & 8.0
- Developing Softwares** : Visual Studio 6.0, Microsoft Office-2000, Turbo C ++ For Dos 4.5, Microsoft C 6.0, Microsoft Fortran, Turbo Pascal, Microsoft COBOL, Turbo C, Visual Studio MS.Net, Developer 2000, MS Project 2003
- Web Designing Softwares** : Adobe Photoshop, PageMaker, Corel Draw
- Customized Softwares** : Payroll, Stores/Purchase, Library/Libsys, Student, Exam Section, Admission

LABORATORIES

- IT Lab I - Software Engineering Laboratory & Project Laboratory
- IT Lab II - Programming Laboratory
- IT Lab III - Linux Laboratory
- Microprocessor Laboratory





STRUCTURE & EXAMINATION PATTERN

B. Tech. - IT

Semester III									Total Duration : 32 Hrs/Week
									Total Marks : 750
Subject Code	Subject	Teaching Scheme Hrs/Week			Examination Scheme				Total
		L	P	T	Theory	Unit Test	TW & Pr	TW & Or	
K70201	Engineering Mathematics III	04	-	-	80	20	-	-	100
K70202	Industrial Management	04	-	-	80	20	-	-	100
K30203	Discrete Mathematics	04	02	-	80	20	-	50	150
K30204	Data Structures & Files	04	02	-	80	20	50	-	150
K30205	Object Oriented Programming	04	02	-	80	20	50	-	150
K30206	IT Lab 1	02	02	02	-	-	50	50	100
Total		22	08	02	400	100	150	100	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Tutorial	Theory	Test	T. W. & Pr	T. W. & Or	
22	08	02	400	100	150	100	750

Semester IV									Total Duration : 32 Hrs/Week
									Total Marks : 750
Subject Code	Subject	Teaching Scheme			Examination Scheme				Total
		L	P	T	Theory	Unit Test	TW & Pr	TW & Or	
K30207	Theory of Automata & Formal Languages	04	-	-	80	20	-	-	100
K30208	Computer Communications & Networks	04	-	-	80	20	-	-	100
K30209	Database Management Systems	04	02	-	80	20	50	-	150
K30210	Microprocessor Architecture & Programming	04	02	-	80	20	50	-	150
K30211	Signals & Systems	04	02	-	80	20	-	50	150
K30212	IT Lab 2	02	02	02	-	-	50	50	100
Total		22	08	02	400	100	150	100	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Tutorial	Theory	Test	T. W. & Pr	T. W. & Or	
22	08	02	400	100	150	100	750



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III



TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(09 Hours)

Differential Equations:

Solution Of Linear Differential Equation Of Nth Order With Constant Coefficients, Method Of Variation Of Parameters, Cauchy's and Legendre's Linear Equation, Simultaneous Linear Differential Equations, Total Differential Equations, Symmetrical Simultaneous Differential Equations. Applications to Electrical Circuits.

Unit-II

(08 Hours)

Complex Variables:

Function Of Complex Variables, Analytic Function, Cauchy-Riemann Equations. Conformal Mapping, Bilinear Transformation, Residue theorem, Cauchy's Integral Theorem and Cauchy's Integral Formula.

Unit-III

(09 Hours)

Transforms:

Fourier transforms: Fourier Integral Theorem, Fourier Sine And Cosine Integrals. Fourier Transform, Fourier Sine And Cosine Transforms, Inverse Fourier Transforms, Discrete Fourier Transform And Its Applications.

Z - Transform: Definition, Properties, Inverse Z- Transform. Applications to difference equation, Relationship between Z- Transform and Fourier Transform.

Unit-IV

(09 Hours)

Laplace Transform:

Definition, Properties and Theorems, Inverse Laplace Transform, Methods of Finding Inverse Laplace Transforms, Laplace Transform of Unit-step Function. Dirac-Delta Functions, Periodic Functions, Ramp Functions, Error Function, First order Bessel's function, $Si(t)$, $Ci(t)$, $Ei(t)$.

Applications to Solution of Linear Differential Equations.

Unit-V

(09 Hours)

Vector Differentiation:

Vector Differentiation, Gradient, Divergence and Curl, Directional Derivative, Vector Identities, Irrotational and Solenoidal Vector Fields.

Unit-VI

(09 Hours)

Vector Integration:

Line Integral, Surface Integral and Volume integral, Workdone, Gauss-Divergence Theorem, Stoke's theorem and Green's Lemma, Applications to Electromagnetic fields.

Text Books/References

Peter V. O'Neil, Advanced Engineering Mathematics, 5e, Thomson Learning

Erwin Kreyszing, Advanced Engineering Mathematics, Wiley Eastern Ltd.

Wylie C.R. and Barrett L.C., Advanced Engineering Mathematics, McGraw-Hill

M.D. Greenberg, Advanced Engineering Mathematics, 2e, Person Education

B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, Delhi

P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volume I & II), Pune Vidyarthi Griha Prakashan

Murray R. Spiegel, Laplace Transforms, Schaum's Outline Series - International Edition

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(09 Hours)

Management and Organization:

Conceptual difference between terms Management, Administration and Organization, Evolution of Management Science up to Modern times, contributions of Taylor, Fayol, Gilbreth, Management as an Art, Science, Profession, Functions and Principles of Management, Levels of Management. Factors deciding selection of type of business organization, sole proprietorship, partnership, joint stock company, cooperative enterprise, public sector undertakings (PSU's). Organization structures - Line, functional, line and staff, committee, matrix, project.

Unit-II

(09 Hours)

Plant Location and Economics:

Factors governing plant location, process of plant locations, plant layouts - Types, principals of good plant layout, cellular. Basic economic concepts- Human wants, economic goods, utility, Value, price, cost, profit revenue. Laws of demand and supply, exceptions to these laws, concept of elasticity of demand, Scales of production, National and International Trade.

Unit-III

(08 Hours)

Personnel Management:

Evolution, definitions, functions (Scope). Manpower Planning - definition, procedure, advantages, factors affecting MPP. Recruitment - Definition, Sources of recruitment, Factors deciding sources selection. Selection - Definition, procedure, methods of selection. Training - Definition, benefits, methods and types of training. Job Evolution - Administration - Methods of wage payments (Time Rate, Piece Rate, Industrial Bonus. Group Incentive Schemes), Employee Motivators.

Unit-IV

(09 Hours)

Financial Management:

Definition, Scope and Objective of financial management. Capital, Types of capital, Sources of industrial finance, Elements of cost, Types of overheads. Financial Accounting - definitions, Scope, Objectives. Breakeven analysis, Capital Budgeting Methods (Pay Back, Accounting rate of return (NPV). Types of budget, Financial statements, purpose, Interpretation. Credit Rating of software projects.

Unit-V

(09 Hours)

Marketing Management:

Evolution, Marketing and selling concepts, Definitions, Concept of Marketing Mix, Market Segmentation - Objectives, Bases, Benefits, Distribution channels, Advertising, Sales promotion, Sales forecasting. Marketing research, Service sector - growth, types of services, service tax, Service mix. Recent Trends in Retailing, Emerging changes in global marketing.

Unit-VI

(08 Hours)

Entrepreneurship Development and Environment Management:

Entrepreneurship-concept, characteristics of successful entrepreneurship, functions of entrepreneur, Institutions supporting small business enterprise, project report contents. Pollutions and (EMS), EMS Standards, ISO 14000, E-Commerce, E-Governance, E-Business, Patents, Copyright, Trade Marks.

Text Books/References

O.P. Khanna, Industrial Engineering and Management

Banga and Sharma, Industrial Origination and Engineering Economics

Philip Kotler, Marketing Management

I. M. Pandey, Financial Management

Jayant Oak, Management Information System

S. M. Jawadekar, Management Information System

G. N. Pandey, Environmental Management

K. K. Dewett, Elementary Economic Theory
Horold and Heinz Weinrich, Essentials of Management
Venu Gopal Rao, Services Marketing
P. Narayanan, Intellectual Property Laws
M. C. Shukla, Business Organisation and Management
Dr. P. C. Shejawalkar, Dr. Anjali Ghanekar, Principles and Practice of Management
Poornims Charantimath, Entrepreneurship Development - Small business Enterprises
David Hotts, Entrepreneurship
C. B. Mamoria, Personnel Management

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or : 50 Marks

Unit-I

(08 Hours)

Fundamental structures and Basic Logic:

Sets, Venn diagram, Completeness, Cartesian Product, Power Sets, Pigeonhole Principle, Cardinality and Count-ability. Propositional Logic, Logical Connectives, Truth Tables, Normal Forms, Validity, Predicate Logic, Limitations of Predicate Logic, Universal and Existential Quantification, Modus Ponens and Modus Tollens.

Unit-II

(08 Hours)

Functions and Relations:

Subjective, Injective, Bijective and Inverse Functions, Composition of Function. Reflexivity, Symmetry, Transitivity, and Equivalence Relations, Poset & Recurrence Relation.

Unit-III

(08 Hours)

Proof Techniques:

Notions of Implication, Converse, Inverse, Contra-positive, Negation and Contradiction, Structure of Formal Proofs, Directs Proofs, Proof by Counter Example, Proof by Contradiction, Mathematical Induction, Strong Induction, Recursive Mathematical Definitions, Well Orderings

Unit-IV

(09 Hours)

Graph Theory:

Basic Terminology, Multi Graphs and Weighted Graphs, Paths and Circuits, Shortest Path Problems, Euler and Hamiltonian paths, Representation of Graph, Factors of Graph, Isomorphic Graphs, Planar Graphs, Directed graphs.

Unit-V

(04 Hours)

Trees:

Trees, Rooted Trees, Path Length in Rooted Tree, Binary Search Trees, Spanning Trees And Cut set, Minimal Spanning Trees, Kruskal's and Prim's Algorithms for Minimal Spanning Tree.

Unit-VI

(11 Hours)

Algebraic Systems:

Algebraic Systems, Groups, Semi Group, Monoid, Subgroup, Isomorphism and Homomorphism, Rings and Fields, Lattices, Boolean lattices and Boolean Algebra, Group Codes.

Practical Assignments Scheme

Concerned staff member is directed to frame Two to Three Assignments on each Unit.

Text Books/References

C. L. Liu, Elements of Discrete Mathematics, 2nd Edition, McGraw Hill Pub

Kenneth H. Rosen, Discrete Mathematics, 5th Edition, McGraw Hill Pub

Tremblay Manohar, Discrete Mathematical Structures in Computer Science Applications

Lipschutz Lipson, Discrete Mathematics, 2nd Edition, TMH

V. K. Balakrishna, Graph Theory, TMH (Recommended for Graph)

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



TEACHING SCHEME

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Introduction And Algorithm Analysis:

Introduction to C, Pointers, Pointer to Structure: Concept of data, Data Types, Data Objects, Data Structure, Abstract Data Types (ADT) Using C and C++, Implementation of Data Structure (Static and Dynamic Implementation). Algorithm Analysis: Definition and Characteristics of Algorithm, Analyzing Programs, Time and Space Complexity, Big 'O' Notation, Graphical Representation of Time Complexity, best, Average and Worst Case of Complexity.

Unit-II

(10 Hours)

Linear Data Structure Using Sequential Organization And Stacks And Queues:

Sequential Organization: Concept of Sequential organization, Concept of linear and non linear data structure, array as ADT, Storage representation, Concept of ordered list and polynomial representation using array, representation of Sparse matrix using array, algorithm and, Time and Space complexity for Sparse matrix.

Stacks and Queues: Fundamental of stack and queue, Data structure and basic operations for stack and queue, concept as ADT, disadvantages and application. Circular queue using sequential organization, Multi-stack and queue, Priority queue.

Application of Stack: Polish notation (infix, prefix, postfix expressions), Evaluation of prefix and postfix expressions, conversion of infix, prefix and post fix by using user definer functions and recursive functions.

Unit-III

(06 Hours)

Linear Data Structure Using Linked Organization:

Link List: Concept of linked organization, Basic operation of single linked list, Double linked list, Circular linked list (Insertion, Deletion, Creation, Traversal), Representation and Manipulation using linked list,

Generalized Linked list, Polynomial representation, dynamic memory Allocation, Garbage Collection.

Unit-IV

(08 Hours)

Non-Linear Data Structure:

Trees and Binary Trees: Basic terminology, Data structure and representation of binary tree, Binary tree traversal (recursive and non recursive method for traversal) and algorithm, Basic operation of Binary tree, threaded Binary tree (1 way and 2 way), Insertion and Deletion of nodes in Inorder threaded Binary tree, Inorder, Preorder, Postorder Traversal for Threaded Binary Tree, Concepts of Binary Search Tree (Weighted BST), Traversal BST, AVL Tree, CONCEPT of B tree.

Unit-V

(10 Hours)

Graphs, Searching And Sorting:

Searching: Implementation of Searching, Sequential, Binary and Fibonacci Search (Algorithm and Complexity for all Searches).

Sorting: Algorithm, Time and Space Complexity for Bubble Sort, Selection sort, Insertion Sort, Quick Sort, Merge Sort, heap Sort, Radix Sort (Best, average and Worst Complexity for All). Graphs: Concept. Representation and Terminology for Graph using adjacency Matrix, List and Multilist, graph Traversal (DFS AND BFS), Spanning tree. Minimum weight Spanning tree, Kruskal's and Prim's Algorithm for MST, Dijkstra's algorithm for shortest Path.

Unit-VI

(06 Hours)

File Organization And Hashing Techniques:

File Organization: Sequential and Index files Organization. Hashing

Techniques: Hashing functions, Hash tables, Overflow Handling, Collision, Methods for Overflow Handling and Collisions, Linear Hashing Probing techniques.

Practical Assignment Scheme

Concerned Staff member is directed to frame Minimum two Assignments per Unit.

Text Books/References

S. Lipschutz, Data Structures, McGraw Hill Pub.

Y. Langsm, M. Augentin, A. Tanenbaum, Data Structure Using C and C++, Pearson Education Asia Pub.

Trembley & Soreson, Introduction to Data Structure, PHI Pub.

Thomson Corman, Algorithms, PHI Pub.

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



K30205: OBJECT ORIENTED PROGRAMMING

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(10 Hours)

Introduction To Object Oriented Programming:

Limitations of procedural oriented language, general object oriented philosophy, difference between procedural & OOP language advantages of object oriented programming, basic concepts in OOP, software usability, code sharing, rapid prototyping, information hiding.

Unit-II

(06 Hours)

Classes And Objects:

Classes, attributes and method, message passing between objects, constructor and destructor – theme behind this, types of constructors.

Unit-III

(06 Hours)

Functions:

Prototype, parameter passing, overloading, inline, static function, concept of friend, operators and operator overloading.

Unit-IV

(08 Hours)

Inheritance:

Concept and need, base class, friend class, static class, class scope, types of inheritance. Abstract class, virtual function, virtual base class, polymorphism, static and dynamic binding.

Unit-V

(08 Hours)

Input/Output And file Management:

Formatting and manipulating I/O, overloading I/O, file operations, file pointer and manipulation. Exception handling and templates: Concept and method.

Unit-VI

(10 Hours)

Object Oriented Design:

Class identification, defining inheritance, visibility and dependency coupling, object oriented notations and graphs, steps in designing object oriented system.

List of Practical Assignments

Write a class complex as follows: data members of the class complex are real, imaginary numbers and member functions are read, print, add, subtract, multiply, and divide.

Write a class string to handle character array. The data member is array of characters and the member functions are read, print, contact, substring, less, greater, equal. Also use constructors so that one can define like - string s1, s2 ("abcd"), etc, use destructor also.

Write a class matrix to handle two dimensional array of numbers. The data member is dynamically growing two dimensional array and member functions are-Transpose of matrix, inverse of matrix, multiplication of matrices & checking of whether a matrix is symmetric, magic square or skew.

Modify the complex class in assignment number 1 to tackle operator overloading.

Modify the string class in assignment number 2 tackle operator overloading and write a main program to sort array of strings.

Write a class date with members as dd, mm, yy, and the member functions as read the date, write the date.

Write a class person as a Container class which contains class date. Data members of person are name of person and date of birth. Member functions are reading information about person and writing information about person.

Write a class employee who is in turn a person. Data members and member functions are derived from class person. Addition to which is has, data members company name, designation, department & salary. Member functions - read information of employee and print information of employee. Write a class student who is a person. Data members and member functions are derived from class person. Addition to which it has, data members - branch of student, percentage marks and members functions - read information about student, print information about student.

Text Books/References

Bindu R. Rao, C++ and Paradigm, McGraw Hill

Ravi Sethi, Programming language concepts and constructs, Addison Wesley

Balaguruswamy, Object Oriented Programming, McGraw Hill

Bjarne Stroustrup, C++ Programming Language, Addison Wesley

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



TEACHING SCHEME

Lectures : 02 Hrs/week
Practical : 02 Hrs/week
Tutorials : 02 Hrs/week

EXAMINATION SCHEME

Duration : 03 Hrs (Pr/Or)
T. W. & Or. : 50 Marks
T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

An Introduction to Java:

History, Features of Java language, Object oriented features of Java, Benefits of using OOP, Applications of OOP, Virtual Machine and Java Programming Environment, Fundamental Programming Structures in Java. Java and Internet, Hardware and Software requirement, JDK, JVM, JRE.

Unit-II

(06 Hours)

Constant, Variables, Data types:

Declaration of variable, Scope of variable, Symbolic constant, Type Casting Operators and Expressions: Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Conditional, Bitwise, Special operator, Dot operator.

Expressions: Arithmetic, Evaluation of expressions, Type conversion in expressions.

Unit-III

(06 Hours)

Decision making, branching, looping:

Branching: Introduction, If statement, If...Else statement, Nesting of If...Else statement, The Else If ladder, The Switch statement, The?: Operator.

Looping: The while statement, The do statement, The for statement, Jumps in Loop, Labeled Loop.

Unit-IV

(06 Hours)

Classes, Objects and Methods:

Introduction, Defining a Class, Methods, Objects, Accessing class members, Constructors, Methods overloading, Static members, Nesting of methods, Inheritance: Extending a class, Defining a subclass,

Multilevel and hierarchical Inheritance. Overriding methods, Final variables, methods, Final Classes, Abstract methods and classes. Visibility and control.

Unit-V

(06 Hours)

Arrays, Strings and Vectors:

One dimensional arrays, Two-dimensional arrays, Strings: Strings arrays, String methods. Vectors, Wrapper classes.

Unit-VI

(06 Hours)

Interfaces:

Introduction, Defining interfaces, Extending Interfaces, Implementing Interfaces, Accessing interface available.

Practical Assignment Schemes

Concerned Staff is directed to frame 2-3 Assignments on each Unit.

Text Books/References

E. Balagurusamy, Programming with Java

Herbert Schildt, Java 2 Complete Reference - 5th Edition, Tata MGr Hill

Dietel & Dietel, Java How to Program



SEMESTER - IV



K30207: THEORY OF AUTOMATA & FORMAL LANGUAGES

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(10 Hours)

Introduction Mathematical Preliminaries & Notation:

Sets, functions and relations Basic Machine Concepts- Symbols, alphabets, string/word. Language, Abstract Machine, Acceptance of language by machine. Finite Automata (FA)- Definition, Types of FA- NFA and DFA, Language accepted by NFA and DFA, Making of finite state machines. Equivalence between DFA and NFA, Conversion of NFA to DFA, Minimization of FSM, Machines with Output- Moore and Melay machines, Designing, Intercor version of Moore and Melay, Application. Two way Finite Automata- Definition, Language acceptance, Uses.

Unit-II

(06 Hours)

Regular Expression:

Definition, Regular sets- properties and closure properties, Uses of Regular Expression, NFA with Epsilon moves- Definition, Uses, NFA without Epsilon moves. Pumping Lemma for Regular Sets- Statement, Application

Unit-III

(08 Hours)

Grammars:

Definition, Production rules, Derivation trees, Ambiguous Grammar, Removal of Ambiguity, Regular Grammar, Interconversion of RE to Grammar, Reduced form grammar- Removal of unit production, Removal of useless symbols, Removal of epsilon symbol.

Linear grammar left & right linear grammar Chomsky Hierarchy of Languages, Context Free Grammar- Definition, Context free language (CFL) - definition, Inherently ambiguous CFL. Normal Forms- Chomsky Normal Form(CNF), Griebach Normal Form(GNF)

Unit-IV

(06 Hours)

Push Down Automata (PDA):

Definition, Uses, Designing of PDA, Deterministic Push Down Automata and Non-Deterministic Push Down Automata- Definition, Language accepted by PDA, Equivalence of CFL and PDA, Properties of CFL, Pumping Lemma for CFL. Limitations of PDA, Application of PDA.

Unit-V

(08 Hours)

Turing Machine(TM):

Definition, Model, Comparison of TM, FSM, PDA, Design of TM, Examples of TM- Combinational TM, Iterative TM, Recursive TM, Universal TM, TM as a language acceptor, Some Problems that can not be solved by Turning Machines, Language accepted by TM, Recursive sets, partially Recursive functions, recursively enumerable sets. Church's Turing hypothesis, multitask TM, TM limitations, halting problem. Incompleteness and Undesirability.

Unit-VI

(10 Hours)

Applications of RE- Lexical Analyzer:

Text editor and searching using RE. Application of PDA- Expression conversion, Application of CFG - syntax analysis, language definition. Power OS: TM, PDA, FA, FSM, NFA, DFA, FA, TM.

Text Books/References

Hopcroft, Ullman, Introduction to Automata Theory, Language and Computation, erosa Publishing House

K. L. P. Mishra and N.Chandrasekaran, Theory of Computer Science(Automata, Languages and Computation), PHI

Martin J. C., Introduction to Languages and Theory of Computations, TMH

Papadimitrou, C. and Lewis, C. L., Elements of theory of Computations, PHI

Cohen D. I. A., Introduction to Computer theory, John Wiley & Sons

E. V. Krishnamurthi, Theory of Computer Science, EWP publications

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI





K30208: COMPUTER COMMUNICATIONS AND NETWORKS

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(08 Hours)

Digital Transmission Fundamentals:

Digital signals, Analog versus digital, Limits of achievable data rate in digital communication, Transmission impairment, Attenuation and attenuation distortion, delay distortion, Thermal noise, Inter modulation noise, Impulse Noise, Cross talk, Channel capacity, Point to Point, Multidrop Configuration, Simplex, Half Duplex, Duplex transmission.

Unit-II

(10 Hours)

Modulation Techniques:

Amplitude Modulation: Amplitude Modulation Principles, Modulation Index and Percentage of Modulation, Sidebands and Frequency Domain, Amplitude Modulation Power Distribution, Single Sideband Communications. Frequency Modulation Principles, Phase Modulation, Sideband and Modulation Index, AM Vs FM, FM with Binary Signals.

Digital Modulation: Modems, Digital continuous wave modulation techniques for Modem e.g. ASK, FSK, PSK, Baud rate, QAM, Modern constellation patterns, Interface control for typical modem, EIA 232/V.24 interface.

Unit-III

(08 Hours)

Multiplexing:

Introduction, Frequency Division Multiplexing, Time Division Multiplexing, Wave division multiplexing, Pulse Code Modulation. Multiplexing Applications: The Telephone System. Error Detection and Correction: LRC, VRC, CRC, Checksum, Hamming code.

Unit-IV

(10 Hours)

Transmission Media:

Guided Transmission Media (Physical description, Application,

Transmission Characteristics) Twisted pair (Unshielded and shielded twisted pair), Category 3, Category 5 UTP, Coaxial cable. Wireless transmission unguided media (Terrestrial microwave, Satellite microwave) Fiber optic Communication: Principle of light transmission, types and modes of fiber, Losses and dispersion in fiber, sources (light) and detectors. Satellite communication: Kepler's laws, Orbital aspects, Geostationary satellite and frequency plans, Frequency plans and polarization, transponders, Multiple access methods.

(06 Hours)

Unit-V

Network Fundamentals:

Need of networks/advantages of network, Structure of communication network (DTE, DCE, Application Process, Logical and Physical Connection), Network architectures(OSI model), TCP-IP protocol stack overview, Network interface hardware and network hardware components-connectors, transceivers and media converters, NICs , RS-232 and RS-449, PCI, USB Protocols

(06 Hours)

Unit-VI

Network Types:

Local Area Network: LAN applications, LAN architecture, LAN topologies [Bus, Star, Ring, And Tree], Medium access control [RR, Reservation, And Contention], MAC frame format. Devices used for extending LANs - Repeaters, Bridges, Routers, Gateway, Switches, MAN. Wide Area Networks: Different switching techniques, Circuit switching and telephone networks, Packet switching networks.

Text Books/References

Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw Hill, 2nd Edition

Stallings W., Data and Computer Communications, Sixth Edition, Prentice Hall of India

Dennis Roddy, John Coolen, Electronic Communication, PHI

Frenzel, Communication Electronics Principles and Applications, Third Edition, Tata McGraw Hill Publication.

Kennedy, Principles of Communication Systems, McGraw Hill

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Introduction to DBMS:

Basic concepts, Advantages of a DBMS over file-processing Systems, Data abstraction, Data Models and Data Independence, Components of a DBMS and overall structure of a DBMS, Life Cycle of a DBMS application. Database terminology, Role of database administrator.

Data Modeling: Basic Concepts, Types of data models, E-R data model and Object- Oriented data model. Relational, Network and Hierarchical data models and their comparison. Entity, attributes, relationships, constraints, keys, E-R and EER diagrams: Components of E-R Model, conventions, converting E-R diagram into tables, EER Model components, converting EER diagram into tables, normalization.

Unit-II

(06 Hours)

Relational Model:

Basic concepts. Attributes and domains. Intention and extensions of a relation, concept of integrity and referential constraints. Relational Query Languages (Relational algebra and relational calculus). Concepts of View and triggers. Updation using views, indexes, nulls.

Relational Database Design: Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependencies, The Process of Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.

Unit-III

(08 Hours)

SQL:

Structure of a SQL query, DDL and DML, SQL queries. Set Operations, predicates and Joins, Set Membership, Tuple variables. Set comparison. Ordering of tuples, aggregate functions, and nested queries. Database modification using SQL, Dynamic and Embedded SQL and concept of

stored procedures and Triggers. Characteristics and advantages, SQL Data Types and Literals, DDL, DML, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updation using Views, Indexes, Nulls, JDBC, ODBC, Cursors Database Analysis and Design Techniques: Information Systems Lifecycle, Application Lifecycle, Planning, System Definition, Requirement Analysis, Design, DBMS Selection, Application Design: Transaction and User-Interface Design, Prototyping, Implementation, Data Conversion and Loading, Testing, Data and Database Administration, Fact-Finding Techniques

Unit-IV

(08 Hours)

Storage and File Systems:

Secondary Storage, RAID, File Organization, Indices, Static and Dynamic Hashing, B-trees and B+ Trees.

Database Administration Issues: Overview, Measures of query cost, Selection and join operations, Evaluation of Expressions, Introduction to Query Optimization, Estimation, Transformation of Relational Expressions, DBA role, indexes, data dictionary, Security, Backups, replication, SQL support for DBA. Commercial RDBMS selection.

Unit-V

(10 Hours)

Transaction Management:

Basic concept of a Transaction, Properties of Transactions, Database Architecture, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Time stamping Methods, Optimistic Techniques, Multi-Version Concurrency Control, Different Crash Recovery methods such as Shadow-Paging and Log-Based Recovery: Deferred and Immediate, Checkpoints.

Object-Oriented Databases: Need of OODBMS, Storing Objects in Relational Database, Introduction to OO Data Models, Persistent Programming Languages, Pointer Swizzling Techniques, Persistence, Object Management Group, Object Database Standard ODMG, differences between relational & object oriented database, inheritance.

Unit-VI**Database Architectures:**

Centralized and Client-Server Architectures, Introduction to Distributed Database systems.

New Applications: Need for data analysis. Decision support systems, Data Warehouse, On-line Analytical Processing (OLAP), Data mining concepts, Spatial and Geographic databases, Multimedia databases, Data mart.

List of Practical Assignments

Creating a sample Database application using conventional file processing mechanisms and C language. The program should provide facilities for retrieving, adding, deleting and modifying records.

Prepare an E-R diagram for the given problem definition. Prepare and verify a relational database design using concepts of normalization techniques in appropriate normal form.

Creating a sample database files and indexes (for the design made in experiment no. 2) using any client server RDBMS (Oracle/Sybase) package using SQL DDL queries. This will include constraints (key referential etc) to be used while creating tables.

SQL DML queries: Use of SQL DML queries to retrieve, insert, delete and update the database created in experiment no. 3. The queries should include all SQL features such as aggregate functions, group by, having, order by, subqueries and various SQL operators.

Screen design and Report Generation: Sample forms and report should be generated using their Developer 2000 (in case of Oracle) or through Power-Builder or Visual Basic front end roots or any prototyping software engineering tool.

Case study of a MIS.

Text Books/References

Silberschatz A., Korth H., Sudarshan S., Database System Concepts, 4th Edition, McGraw Hill Publishers

Rab P. Coronel C., Database Systems Design, Implementation and Management, 5th Edition, Thomson Course Technology

Date C. J., An Introduction to Database Systems, 7th Edition, Pearson Education

Elmasri R., Navathe S., Fundamentals of Database Systems, 4th Edition, Pearson Education

Ramkrishna R., Gehrke J., Database Management Systems, 3rd Edition, McGraw-Hill

Bipin Desai, Introduction to Database Management Systems

Groff James R., Paul Weinberg, LAN times guide to SQL

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



K30210: MICROPROCESSOR ARCHITECTURE AND PROGRAMMING

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(08 Hours)

Introduction To Microprocessor:

8 bit processor architecture, 8085 microprocessor Architecture, Memory Interfacing, Memory Map and Address Decoding Logic. Introduction to 16 bit processor- 8086/8088 architecture, minimum and maximum mode Configurations, Supporting Chips 8284, 8286, 8288.

Unit-II

(08 Hours)

8086 Interrupt Structure:

Interrupt Service Routine, Interrupt Vector Table (IVT) - location of IVT in the memory, contents of IVT, Hardware interrupts and Software interrupts - INTR, NMI and INT N. Interrupt response, Execution of an ISR, priority of 8086 interrupts. 8259A priority interrupt controller.

Unit-III

(08 Hours)

I/O Interface:

Serial Communication Interface Asynchronous & Synchronous Communication, Physical Communication Standards, 8251A PCI, Parallel Communication, 8255A PPI, Interfacing and Programming, 4x4 Key Matrix Interfacing, Seven Segment Display Interfacing. 8257/8237 DMA Controller. 8253/8254 Programmable Timer.

Unit-IV

(08 Hours)

Multiprocessor Configurations:

Queue status & LOCK facilities, 8086/8088 based multiprocessing systems, Co-processor configurations, closely & loosely coupled configuration, Microcomputer networks, 8087 NDP coprocessor, Processor Architecture, 8089 I/O processor, IOP architecture, Communication between IOP & CPU.

Unit-V

(08 Hours)

8086 Programming :

Instruction set , Assembler directives, Assembling, Linking & Relocation, Stacks, Procedures, Interrupts & Interrupt routines, Macros, String Manipulation.

Unit-VI

(08 Hours)

DOS:

Internals of DOS, DOS loading, DOS Memory map, Internal & external commands, command interpreter POST Sequence, PSP Structure, Exe & Com file Structures and Conversion, Use of BIOS and DOS calls. INT 10H calls, DOS Calls, INT 21H Calls.

Difference Between DOS & BIOS, TSRs: Types , Structures, Details of TSR Types, Structures, Writing TSRs in Assembly language.

List of Practical Assignments

Write 8086 Assembly language program (ALP) to add array of N numbers stored in the memory

Write 8086 ALP to perform non-overlapped and overlapped block transfer

Write 8086 ALP to find and count negative numbers from the array of signed numbers stored in memory

Program to check the entered password is correct or not

Write 8086 ALP for the following operations on the string entered by the user

Calculate Length of the string

Reverse the string

Check whether the string is palindrome or not.

Write 8086 ALP to perform string manipulation. The strings to be accepted from the user is to be stored in code segment Module_1 and write FAR PROCEDURES in code segment Module_2 for following operations on the string:

Concatenation of two strings

Compare two strings

Number of occurrences of a sub-string in the given string

Find number of words, characters, number of lines and number of capital letters from the given text in the data segment

Note: Use PUBLIC and EXTERN directive. Create .OBJ files of both the modules and link them to create an EXE file.

Program for 32 bit hex multiplication

Write a program to arrange given set of numbers in Ascending/Descending order

Write assembly language program for BCD to Hex conversion

Write assembly language program for computing factorial of a numbers from 0 to 9

Text Books/References

Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085 - Penram International.

Douglas Hall , Microprocessor & Interfacing Programming & Hardware Tata McGraw Hill.

Liu Gibson, Microcomputer Systems 8086/8088 family PHI

Peter Abel, Assembly Language Programming.

Ray Denkon, DOS Programmers Manual.

Syllabus for Unit Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(06 Hours)

Introduction:

Signals, systems, classification of signals, elementary signals, analog and discrete signals, basic operation of signals.

Unit-II

(10 Hours)

Time Domain Representation for linear time invariant systems (Analog):

Convolution, series and parallel connection of systems, casual, non-casual, memory less, with memory, stable invertible systems, deconvolution, impulse, step and differential equation representation for continuous time linear time invariant.(CT LTI) systems.

Unit-III

(08 Hours)

Time Domain Representation for linear time invariant systems (Discrete):

Convolution, series and parallel connection of systems, casual, non-casual, memory less, with memory, stable invertible systems, deconvolution, impulse, step and differential equation representation for discrete time linear time invariant.(DT LTI) systems.

Unit-IV

(08 Hours)

Fourier Representation for Continuous time signals:

Representation of signals in terms of orthogonal functions, orthonormal signals, Fourier series, discrete time Fourier series, Fourier transform, discrete time Fourier transform, their properties, Fourier transform representation of periodic signals, inverse fourier transform for cts.

Unit-V

(06 Hours)

Laplace Transform:

Introduction to Laplace Transform and its properties, LT of elementary signals, unilateral LT, inversion of LT, using LT with or without initial

conditions, transfer function of systems, state variable descriptions, advantages & uses of LT.

Unit-VI

(06 Hours)

Z-Transform:

Introduction, Z-Transform of elementary signals, region of convergence (ROC), properties of Z-Transform, inversion of z-transform, system function solution of difference equation unilateral Z-Transform, advantages & uses of Z transform.

Note: Minimum two case studies of biomedical signals (ECG, EMG, EEG) using Above mathematical tools.

Practical Assignment Scheme

Concerned staff member is directed to frame two assignments on each Unit.

Text Books/References

Alan V. Oppenheim, Alan S. Willsky, Signal and systems, PHI

John G. Proakis, Digital signal processing, PHI

Rodger E. Ziemer, William H. Tranter, Signals and Systems, Continuous and discrete, MGH

Syllabus for Test

Unit Test 1	Units I & II
Unit Test 2	Units III & IV
Unit Test 3	Units III & IV



TEACHING SCHEME

Lectures : 02 Hrs/week
Practical : 02 Hrs/week
Tutorials : 02 Hrs/week

EXAMINATION SCHEME

Duration : 03 Hrs (Pr/Or)
T. W. & Or. : 50 Marks
T. W. & Pr. : 50 Marks

Unit-I

(06 Hours)

Introduction:

Visual studio Visual Basic-Flavors, Installation Issues, Event Driven Programming, VB Design Environment: Integrated Design Environment, MDI vs. SDI, Getting Started: Introductions, Adding a Project Standard Controls & Common Properties: Property, Standard Properties, Standard Controls, Placing Controls on a Form

Unit-II

(10 Hours)

Controls:

Text Box Control: Text Box Properties, Text Box Events, Methods, Creating Text Boxes
Additional Controls: List Box and Combo Box, Frames and Option Buttons Check Boxes, Scroll Bars, Timer, Common Dialog
Graphics Controls & Techniques: Picture Control,
Image Control: Shape Control, Creating Graphics
Variables and Constants: Basics, Types of Variables, Variable Names Variable Creation, Constants, Creating user defined data types with Type

Unit-III

(08 Hours)

Message boxes and input boxes:

Use of msg box & Input Box for input & output Returning values, Formatting the boxes,
Conditional statements: If-Then-Else, Case Statement, Creating condition
Loops: Types of loops, Do...loop, For...Next
Arrays: Declaration of arrays, Types of arrays

Unit-IV

(08 Hours)

String Manipulation:

Types of string Manipulation, Implementation

Procedure and function: Creating Procedures, Sub Routines, Creating Function, Built in functions (Numeric, string, Date-time, data conversion, formatting)

Variable & Procedure Scope: Declaring a Variable, Procedure & function Scopes.

Unit-V

(08 Hours)

Debugging:

Debugging techniques, Setting breakpoints, Immediate window.

Using Menus and Toolbars: Menu Editor, From Pop-up Menu, Adding Menus, Adding a Pop-up Menu, Creating a toolbars, Using toolbars

ActiveX & OLE: Building ActiveX documents, Building OLE.

Unit-VI

(06 Hours)

File I/O:

Working with Files, Retrieving Data, Free file Function, Open Statement/Input Statement, Print Statement,

Database Access: Data Controls, Bound Controls Additional Data Control Properties , Data Reports ,Creating a Database Access Application.

List of Practical Assignments

Use of dynamic arrays and multidimensional arrays (Matrix operations)

Program to print student merit list

Develop a scientific calculator using control array

Application to change color, type, style, size of font using list box and combo box.

Use of scroll bars to change the RGB colors and size of shape object

Develop a screen saver using timer control

Develop an application which create mark sheet using standard module

Develop a paint brush application

Develop a notepad application

Create a menu on MDI form and call different forms

Create a database application using ADO and generate data reports

Develop an application for file handling

Text Books/References

Gary Cornell, Visual Basic 6 from the Ground up - Tata McGraw Hill

Greg Peter, Sams Teach Yourself Visual Basic 6 in 21 Days – Sams Pub

Peter Norton, Michael Groh, Peter Norton's Guide to Visual Basic 6 - Sams

Noel Jerke, Visual Basic 6 (The Complete Reference) - Tata McGraw Hill



RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester- III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.

For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class



BHARATI VIDYAPEETH UNIVERSITY, Pune.

(Established under Section 3 of UGC ACT 1956)



C O U R S E S T R U C T U R E A N D S Y L L A B U S

**B. Tech. (PRODUCTION)
(Sem. III & IV)**





COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (PRODUCTION) (Sem. III & IV)



HIGHLIGHTS

Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

SALIENT FEATURES

Production Engineering Department was established in the year 1983. This is one of few departments to be established in the University of Pune, to which this college was affiliated from 1983 to 2000.

The department is trying to give best of academic & practical knowledge to students right from the inception. The departmental goals are:

Provide Students with a balance of intellectual and practical experiences that enable them to address society needs.

Quality improvement of staff and students for value added education.

Identifying emerging technologies and Design innovate methods for teaching and learning.

Project topics to focus on industrial needs and contribute to economic and social development.

Ensure the highest quality of teaching and learning, led by active research.

Promote Industry-Institute Interaction.

The workshop is the part of Production Engineering Department and it is having 2134 sq.mts area with different facilities spread over three floor.

Basement: Machine Shop, Moulding Shop and Black Smithy.

Ground Floor: Production Shop, Turning Shop, Welding Shop, Advanced Manufacturing Shop.

First Floor: Pattern Making Shop, Carpentry Shop, Tin Smithy Shop, Plumbing Shop, Fitting Shop, Plastic Moulding Shop. The department spreads over a built up area of 3068 sq.mts.

MAJOR GROUPS/AREAS

Manufacturing Processes, Advance Productivity Techniques, Industrial Engineering, Metallurgy, Manufacturing Automation, CAD/CAM, Product Design, Inspection and Testing.

EXPERTISE IN RESEARCH AND CONSULTANCY

Production Engineering Department has received grant of Rs. Five Lakhs from All India Council for Technical Education (AICTE), New Delhi for development of Non-Traditional Machining Processes Laboratory under MODROBS Scheme. Also a DST Project of 18 Lakhs has been received for further research in Non-Traditional Machining processes laboratory.

One of the faculty member has completed Ph.D programme at Indian - Institute of Technology, Kanpur under Quality - Improvement programme (QIP) and one staff member is pursuing Ph.D programme in U.S.A. Two staff members are pursuing Ph.D programme in Bharati Vidyapeeth University.

Our metallurgy lab has all the facilities required for inspection and testing of materials.

MAJOR EQUIPMENTS

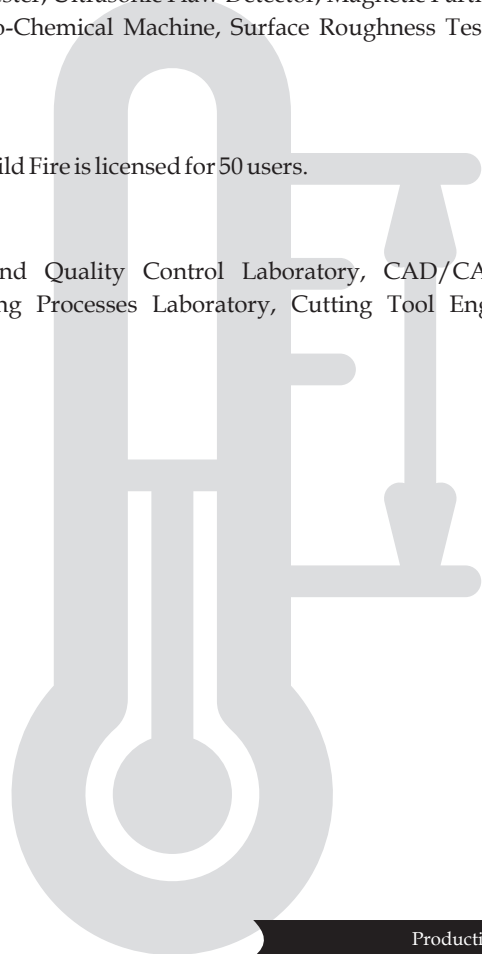
CNC Lathe, CNC lathe trainer, Spark erosion machine, Optical micrometer with CCTV, Vickers cum Brinell Hardness Tester, Ultrasonic Flaw Detector, Magnetic Particle Tester, Spark Erosion Machine, Electro-Chemical Machine, Surface Roughness Tester (Mitutoyo Make).

SOFTWARES

Ideas 10 NX and CATIA V-5 R-II. Proe Wild Fire is licensed for 50 users.

LABORATORIES

Metallurgy Laboratory, Metrology and Quality Control Laboratory, CAD/CAM Laboratory, Non-Traditional Machining Processes Laboratory, Cutting Tool Engg. Laboratory.





STRUCTURE & EXAMINATION PATTERN

B. Tech. - Production Engineering

Semester III								Total Duration : 34Hrs/Week
								Total Marks : 750
Subject Code	Subject	Teaching Scheme			Examination Scheme			Total
		L	P	D	Theory	Unit Test	TW & Or	
K60201	Strength of Machine Elements #	04	02	-	80	20	50	150
K60221	Industrial Engineering	04	-	-	80	20	-	100
K60222	Thermal Engineering	04	02	-	80	20	50	150
K60223	Manufacturing Processes I	04	02	-	80	20	50	150
K50261	Industrial Electronics & Electrical Technology #	04	02	-	80	20	50	150
K60261	Machine Drawing & Computer Aided Drafting	02	02	02	-	-	50	50
Total		22	10	02	400	100	250	750

Teaching Scheme			Examination Scheme			Total
Lectures	Practical	Drawing	Theory	Test	T. W. & Or.	
22	10	02	400	100	250	750

Semester IV										Total Duration : 31Hrs/Week
										Total Marks : 750
Subject Code	Subject	Teaching Scheme				Examination Scheme				Total
		L	T	D	P	Theory	Unit Test	TW & Pr	TW & Or	
K70208	Engineering Mathematics-III #	04	01	-	-	80	20	-	-	100
K60224	Manufacturing Processes- II	04	-	-	02	80	20	-	50	150
K60262	Theory Of Machines	04	-	02	-	80	20	-	50	150
K60225	Material Science & Composite Materials	04	-	-	02	80	20	-	50	150
K60226	Design Of Machine Elements	04	-	-	02	80	20	-	50	150
K60227	Production Practice - I	-	-	-	02	-	-	50	-	50
Total		20	01	02	08	400	100	50	200	750

Teaching Scheme				Examination Scheme				Total
Lectures	Practical	Drawing	Tutorial	Theory	Test	T. W. & Pr	T. W. & Or.	
20	08	02	01	400	100	50	200	750



RULES FOR CONDUCTING TESTS

Mode of the test

In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.

Each test shall carry 20 marks.

University examination pattern has given weightage of 20 marks for the tests.

To calculate these marks following procedure is followed:

- i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
- ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
- iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
- iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
- v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
- vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

Paper Pattern for Tests

- i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

- ii) There will not be any sub-questions.

For granting the term it is mandatory to appear for all the three tests conducted in each semester.

Roll numbers allotted to the students shall be the examination numbers for the tests.



SEMESTER - III



TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Simple Stresses & Strain in Machine Parts:

Concept of stress & strain, types of stresses, strains - linear, lateral, shear thermal, volumetric, hooks law, Poison's ratio, modulus of elasticity, modulus of rigidity, bulk modulus, stress-strain diagram for ductile & brittle material, yield strength, ultimate strength, buckling, impact loading, suddenly applied loading, Thermal stresses in machine elements

Unit-II

08 Hours)

Engineering Materials:

Mechanical properties of engineering materials, creep, stress concentration, selection of materials, cast iron, BIS system of designation of steel, plain carbon steel, overseas standards, cast steel, aluminum alloys, die casting alloys, weighted residual method.

Unit-III

(08 Hours)

Principle Stresses:

Normal & shear stresses & strain on any oblique plane, concept of principle planes, derivation of expression of principle stresses & maximum shear stresses, position of principle planes & planes of maximum shear, graphical solution using Mohr's circle, combined effect of axial force, bending & torsion.

Theories of Failure:

Maximum normal stress theory, Maximum shear stress theory, Maximum distortion energy theory, Maximum strain theory, Maximum strain energy theory, their application & limitation to engineering

material, composite member design.

Unit-IV

(08 Hours)

Shear force Diagram & Bending Moment Diagram of Shafts and Beams:

SFD & BMD of shaft with different end conditions, simply supported, cantilever, overhang, with all types loads, concentrated load conditions, torsional deflection of shaft, lateral deflection of shaft by Maculley's method, moment area method, Castigliano's theorem.

UNIT-V

(08 Hours)

Stress Analysis of Knuckle and Cotter Joint:

Bending of curved bars, stresses in ring, chain link, crane hook, eccentric loading, design of knuckle & cotter joint & chain link.

UNIT-VI

(08 Hours)

Threaded and Riveted Joints:

Basic types of screw fastenings, uniform strength bolts, ISO metric screw threads, Eccentrically loaded bolt joint load perpendicular to bolt axis, eccentric load on circular base, cylindrical bolts, turn buckle design.

Term work:

The Journal containing the record of following:

- i) Experiment on Tension test on M. S. bar.
- ii) Experiment on Compression test on M.S. bar.
- iii) Experiment on Shear test on M. S. bar.
- iv) Experiment on Torsion test on M. S. bar.
- v) Experiment on Impact test.

Drawing file containing two half imperial sheets:

- i) Drawing sheet of SFD – BMD of shafts using computer.
- ii) Drawing sheet of Mohr's circle.

Any two assignments based on above syllabus.

Oral

Based on above term work.

Text Books/References

Timoshenko & Young, Engineering Mechanics, Tata McGraw Hill Book Publishing Co. Ltd. 1985

James Gere, Mechanics of Materials, Thomson Learning

S Ramamrutham, Strength of Materials

V B Bhandari, Design of Machine Elements, Tata McGraw Hill Publication

J E Shigley, Mechanical Engineering Design, McGraw Hill

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K60221: INDUSTRIAL ENGINEERING & MANAGEMENT

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

Unit-I

(08 Hours)

Management-An Introduction:

Management- Meaning and Definitions, Management, Administration, and Organization concepts, Management as an Art and Science and profession, contribution of various thinkers to management thought, Types and Functions of Management.

Unit-II

(08 Hours)

Organization:

Different forms of business Organization -Individual proprietorship, Partnership, Joint stock company, Co-Operative enterprise, Public Sector, Undertakings, organizational structures in Industries, Line, Functional , Line and functional , Project, Matrix Organization and Committees

Unit-III

(08 Hours)

Financial, Marketing and Personnel Management:

Financial Management-Capital structure, Fixed capital, working capital, sources of finance, cost analysis, Break even analysis, Depreciation and Financial statement.

Marketing Management-Definitions, Marketing and Selling concept, market segmentation, distribution channels ,Market Research, Advertising and sales promotion and Sales forecasting.

Personnel Management-Definitions Recruitment, Selection and training of the employees, Job valuation and Merit rating ,wage administration-different methods of wage payments, incentives.

Unit-IV

(06 Hours)

Method Study:

Steps in method study, tools and techniques used, process chart symbols, flow diagrams, two handed chart, multiple activity chart, use of motion

pictures and its analysis. Simo charts, chorno & cycle graph, developing, presentation, installation and maintenance of improved methods.

Unit-V

(10Hours)

Work Measurement :

Time Study: Aim and objectives , terminology and tools, use of stop watch procedure in making a time study, elements, selection of operations time study forms, handling of foreign elements. Performance rating. Allowances: Personal, Fatigue and other allowances. Analysis and calculation of Standard Time. Determination of number of cycles time study for indirect functions such as Maintenance , Marketing etc., Most Technique.

Works Sampling: Definition, Objectives, theory of Work Sampling. Other applications of work sampling, errors in work sampling study.

Synthetic and Standard data Methods: Concepts, introduction to PMTS, MTM-1, WF, Basic motion time, MTM-2, and other second - generation methods timing of group operations.

Unit-VI

(08Hours)

Ergonomics and Industrial Safety:

Definitions, importance in industry, basic anatomy of human body, anthropometrics, measurement of physical work and its techniques, work and rest cycles, bio mechanical factors environment effects.

Importance of safety, planning, training, safety precautions, safety equipments, Government regulations on safety.

Introduction to Business Process Re-engineering (BPR), Concurrent Engineering, Reverse Engineering, JIT, KANBAN.

Text Books/References

O. P. Khanna, Industrial Engineering & Management, Dhanapat Rai & Sons.

M. C. Shukla, Business Organization and Management, S. Chand & Co. Ltd, New Delhi.

Harold Koontz & Heinz Enrich, Essentials of Management, McGraw Hill International.

M.N.Mishra, Organizational Behavior, Vikas publishing New Delhi.

Dale Yoder, Personnel Management.

Prasana Chandra, Financial Management, Theory & Practice.

Philip Kotler, Marketing Management.

Work Study, ILO.

S. S. Patil, Industrial Engineering & Management, Electrotech Publication.

Mansoor Ali & Dalela, Industrial Engineering & Management System, Standard Publisher distributions.

R. M. Currie, Work Study, ELBS.

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Second Law of Thermodynamics:

Limitations of first law, Heat engine, refrigerator & heat pump, Kelvin -Planks and Clausius statement, Equivalence of Kelvin - Planks and Clausius statement, Perpetual motion machine of second kind, Carnot cycle & Carnot heat engine, Entropy, Principle of increase of entropy. Steam Generators: Classification, Constructional details of Process & Power boilers, boilers mountings & accessories, equivalent evaporation, boiler efficiency, energy balance, boiler controls, boiler draught.

Unit-II

(08 Hours)

Refrigeration:

Systems of refrigeration, unit of refrigeration, reversed Carnot cycle, Bell Coleman cycle, Vapour compression cycle, Superheating and liquid sub cooling, C. O. P and Power requirements, TR Capacity, Use of p-h charts, Desirable properties of refrigerants, CFC & non-CFC & alternative refrigerants, Vapour absorption systems, Comparison of Vapour compression & Vapour absorption systems

Unit-III

(08 Hours)

Air conditioning:

Factors affecting human comfort, mixture of air & vapour, Dalton's law, psychrometry, definitions such as DBT, WBT, Specific humidity, relative humidity, degree of saturation, study of psychrometric chart, different psychrometric process such as sensible heating, cooling, humidification & dehumidification, combination of above process, evaporative cooling, Different Air conditioning systems such as winter, summer, year round, central and unitary, Applications of air conditioning.

Unit-IV

(08 Hours)

Reciprocating Air Compressors:

Introduction, Use of compressed air, construction & working of reciprocating air compressors, P-V diagrams of single stage air compressor, Effect of clearance on it, Volumetric efficiency, Power required to drive the compressor, Isothermal efficiency, Mechanical efficiency, Multi-staging of air compressor with ideal intermediate pressure and perfect inter cooling, Advantages of Multi-staging.

Unit-V

(08 Hours)

Internal Combustion Engine Systems:

Fuel Feeding Systems:

Introduction of carburetors in S.I. engines, Mixture requirements, Solex carburetor, M.P.F.I. system for modern automobile engines, Fuel injection systems in C.I. engines, Bosch fuel injection pump, fuel injectors, Type of nozzles.

Ignition Systems:

Battery ignition, magneto ignition, Electronic ignition systems.

Cooling and Lubrication Systems:

Necessity of cooling, Cooling systems, air cooling, indirect cooling, Thermo-siphon cooling, pressurized water cooling, evaporative cooling. Lubrication system for IC engines, Mist type, pressurized, Wet sump, Dry sump.

Unit-VI

(08 Hours)

Air Standard Cycles:

Introduction to Air Standard cycle, Air Standard otto cycle, Diesel cycle, Dual combustion cycle, comparison of above cycles, Actual cycle

Engine Testing & Performance:

Measurement of I.P, B.P, Rope brake dynamometer, Hydraulic dynamometer, Eddy current dynamometer, Measurement of F.P, Willian's line method, Morse Test, Measurement of fuel & air, Measurement of speed, Heat balance sheet.

Term Work :

Term work shall consists of record of minimum eight experiments of the following:

Study of package boiler/modern boiler.

Study of boilers mountings & accessories.

Study of solex carburetor.

Trail on Reciprocating Air Compressor, to determine Isothermal efficiency, Volumetric efficiency & FAD

Study of Fuel pump & Injector.

Study & Performance test on refrigeration test rig to determine actual, theoretical & relative COP, TR capacity of cooling coils.

Study and test on air conditioning test rig.

Trail on Diesel (computerized) engine to determine heat balance, BP, BSFC, Thermal efficiency, Mechanical efficiency.

Study of ignition system of IC engine.

Test on multicylinder Petrol engine to determine B.P, I.P, Brake thermal efficiency & mechanical efficiency.

Oral

Based on above term work.

Text Books/References

Y. Cengel & Boles, Thermodynamics-An engineering approach, Tata McGraw Hill Publications

C. P. Arora, Engineering Thermodynamics, Tata McGraw Hill Publications

P. L. Ballany, Thermal Engineering, Khanna Publications

Ganesan V., Internal Combustion Engine, Tata McGraw Hill Publications

Arora C. P., Refrigeration & Air-Conditioning, Tata McGraw Hill Publications, New Delhi

M. L. Mathur & R. P. Sharma, A Course in I. C. Engine, Dhanpat Rai & Sons

V. M. Domkundwar, Thermal Engineering, Dhanpat Rai & Co. (P) Ltd.

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks
T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Pattern And Mould Making:

Foundry Layout, Foundry departments and sections, Pattern and pattern making, Design and allowances for patterns, Colour codes for patterns, Storage of patterns, Types of moulding, Moulding and core making practice, Types of cores, Core print, Core boxes, Moulding sand and core sands, Ingredients of moulding sand, Sand testing methods and their importance in quality control, Gating risering and their design, Software available

Unit-II

(08 Hours)

Melting And Pouring Practice:

Melting furnaces and their selection, Cupola and its operation, Advantages and limitations, applications, Induction melting furnaces, Advantages, Limitations, applications, Pouring practice and equipments, Ladle technology, Solidification of castings, Strike out, Fettling, Cleaning and Surface preparation of castings, Inspection and testing of castings, Defects in castings.

Unit-III

(08 Hours)

Die Casting Process:

Pressure and gravity die casting, Shell mould casting, Investment casting, Continuous casting, Vacuum casting, centrifugal casting, Applications, Merits and limitations of all, Testing and inspection of die casting, Salvaging of casting, Machinability of castings, Foundry mechanization and automation, Use of robots in foundry, Quality control in foundry, Quality assurance and reliability, Dust problems and pollution control, Export potentials for cast products in Indian context.

Unit-IV

(08 Hours)

Introduction Of Welding Processes:

Classification of welding processes, Surface and edge preparation, Fundamentals including heat and fluid flow in fusion welding, Mass

transfer to base metal in gas, Metal arc welding.

Arc welding processes:

Carbon arc, Submerged arc, Tungsten inert gas (TIG), Metal inert gas (MIT), Electroslag, Plasma arc, Stud welding and related arc welding processes – Theory, Comparison on merits, limitation and applications, Fluxes used in arc welding.

Unit-V

(08 Hours)

Gas Welding And Electric Resistance Welding:

Gas welding – Processes and equipment used, Types of flames, Gas cutting– Merits, demerits and applications. Electric resistance welding – Process and equipment used, Spot, Seam, Projection, Butt, Percussion welding, Tube welding, Electric resistance welding process, its merits, demerits and application.

Unit-VI

(08 Hours)

Other Welding Processes:

Cold, Pressure, Diffusion, Ultrasonic, Explosive, Friction, Forge, Thermit, CO₂, Braze and braze welding, Soldering, Principle, Equipment used, Flux used, Merits demerits and application of the above process. Laser beam welding, Electron beam welding, Welding of dissimilar metals, Welding of polymers, Welding inspection, Welding defects and their Classification. Importance of ASME codes, ISO standards on joining processes.

Term Work

List of experiments (Any Five)

Mechanical test on weldment (weld)- Tension bend, drop weight, tear test.

Moulding and core sand testing (Clay content test, moisture content test etc).

Fluidity test using fluidity spiral pattern

Permeability test.

Green strength mould and Green strength core.

Mould and core hardness test.

List of Assignments (Any Five)

Macro examination of brazing and joint section inspection.

Plasma Arc welding.

TIG MIG or CO2 Welding to exhibit welding defects such as shrinkage, porosity, and burnout

Sieve analysis of sand

CO2 Moulding and shell moulding processes.

Oral/Practical

Term work and oral will be based on above syllabus

Text Books/References

O. P. Khanna, A text book of Welding Technology, Dhanpat Rai and Sons

O. P. Khanna, A text book of Foundry Technology, Dhanpat Rai and Sons

P L Jain, Principles of Foundry Technology, Tata Mc Graw-Hill, New Delhi

Steel Casting ASM Hand book, Vol. No. I.

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K 50261 : INDUSTRIAL ELECTRONICS AND ELECTRICAL ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

D.C. Machines:

Construction, generator action, e.m.f. equations, types, shunt, series, compound generators (elementary treatment). Motoring action, types - Shunt and series, significance of back e.m.f., torque - speed equations, torque - armature, current speed - armature current, torque - speed characteristics, different methods of speed control for shunt and series motor, starters of DC motors. Applications Of DC motors

Unit-II

(08 Hours)

Three Phase Induction Motors:

Concept of rotating magnetic field Principle of operation, slip, slip torque equation, torque slip characteristics, Methods of starting of I M , relation between slip, of mechanical power developed and copper loss, efficiency of motor, applications of 3-phase IM

Principle of working, construction and applications (descriptive treatment only) of

- i) Single phase induction motors: Resistance split phase, capacitor split phase and shaded pole motors.
- ii) Special purpose motors: Stepper motors, servomotors, A.C. series motors, Universal motors.

Unit-III

(08 Hours)

Synchronous Machines:

Alternators: Constructional features, salient pole and cylindrical type rotors, synchronous speed. Frequency of induced e.m.f., e.m.f. Equations, winding factors, regulation of an alternator.

(Synchronous impedance method only).

Synchronous motors: Principle of working phasor diagram, effect of variation of load and excitation, methods of starting, general applications,

application as synchronous condensers.

Unit-IV

(08 Hours)

Study of Power Control Devices:

Construction and working of SCR, Triac, Power MOSFET, IGBT, Characteristics and, Triggering circuits using Diac / UJT, simple applications like Controlled rectifiers light dimmers, fan regulators. .Study of UPS (Only block diagram)

Unit-V

(08 Hours)

Linear and Digital ICs:

Introduction to IC Op-Amp (like 741), ideal parameters, open loop and closed loop gain, Op-Amp with negative feedback as a small signal amplifier (e.g. Inverting and non-inverting configurations) Op-Amp as Instrumentation Amplifier, Audio Power Op-Amp. IC's like TBA 810, LM380, Op-Amp as comparator, Op-Amp as wave form generator (Square and ramp), case study of Waveform generator IC such as 8038 or XR 2206. Timing Circuits Using IC 555 as mono stable and astable multivibrator and its applications in Mechanical Engg., sequential timers. Binary and BCD adder, Subtractor, Study of flip-flops, shift registers, counters, applications of digital circuits such as staircase, traffic light, lift controller, sequential controllers, display devices like LED, LCD, opto-isolators and opto-couplers.

Unit-VI

(08 Hours)

Industrial Applications:

Advantage of electrical heating, various methods of heating

- i) Resistance heating: Requirements of heating element materials, various heating element materials, design of Heating elements.
- ii) Induction heating: Core type furnace, Ajax - Wyatt furnace, coreless induction type furnace, high frequency. Eddy current heating.

Dialectical heating: General principles Resistance welding and arc welding transformers, storage welding, RF heating, ultrasonic method of testing of materials, principles at LASER and applications, Use of CRO as display devices for industrial applications.

List of Practical

The Term-work shall consist of record of following experiments (Any Eight)
(4 from Electronics and 4 from Electrical)

Study of UPS Systems: Instruments : UPS Kit, CRO, Dmm

Or

Controlled rectifiers wing SCR with UJT triggering for a lamp load .Instruments :
Power – Scope, DMM

Applications of Op-Amp. Using 741 (Any Two)

i) Square wave generators / ramp. Generator

ii) Instrumentation Amplifier

iii) Op-Amp as comparator and Schmitt trigger

Instruments : Dual trace CRO, Dual power supply, Function
generator

Sequential timer using IC555 and square wave generator.

Instruments : Power supply, Dual trace CRO, stop-watch.

Application of logic gates (one bit comparator) and combinational circuits, e.g.
traffic lights

Combinational lock lift, control, code conversion

Shift register IC 7495 and its application as a sequence generator
OR

Programmable counter (frequency and time measurement).

Instruments for digital experiments, Power supply, dual trace CRO, pulse
generator, DMM

Experiment on CNC programming (to be conducted in workshop)

Speed control of D. C. shunt motor by armature voltage and flux control methods
and study Of D.C. shunt motor starters

Load test on D. C. shunt motor

Load test on D. C. series motors

Regulation of alternator by synchronous impedance method

Load test on three phase induction motor

Regulation of alternator by direct loading method

Study of various single-phase Induction motor

Text Books/References

Boylested and Nastelsky, Electronic Devices and Circuits – PHI

Malvino and other Digital Principles and Applications – McGraw Hill

Allen Mottershed, Electronic Devices and Circuits, PHI

Harish C, Raj : Industrial and Power Electronics, Umesh Pub., Delhi

E Huges, Basic Electrical Engineering, PHI

C. S. Rangan, Sharma, Mahi, Instrumentation, Devices and system, WIE

Curtis Johnson, Process Instrumentation, PHI

Groover and Zeimmers, CAD / CAM, PHI

Pillai S. K., First course in Electrical Drives : Wiley Eastern

H. Cotton Electrical Technology

Openshow Taylor: Utilization of Electrical Energy

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K60261: MACHINE DRAWING AND COMPUTER AIDED DRAFTING

TEACHING SCHEME

Lectures : 02 Hrs/Week

Drawing : 02 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

T. W. & Or. : 50 Marks

Unit-I

(06 Hours)

Dimensioning Practices:

Terms and Notations, Leader, Extension Lines, Terminations and Origin indication, Functional dimension, Non-functional dimension, Datum dimension, Redundant and auxiliary dimension, Chain dimensioning, Running dimensioning, Co-ordinate dimensioning, Symmetrical or equidistant dimensioning, Methods of dimensioning
Common features: Diameters, Radii, Hole sizes, chamfers, Screw threads, Chords, Arcs, Angles, Spheres, Cylinders, Squares.

Conventional Representation of Machine Components As per SP-46 (1988)

ISO Systems of Tolerancing

Tolerance and Allowances, Unilateral and Bilateral limits, Maximum Material Condition (MMC), Methods of tolerance, Indications of deviations and limits of sizes, Tolerances for linear and Angular dimensions, Types of fits with symbols and applications.

Surface Roughness

Surface feature, Machining symbols, Roughness value (Ra) Roughness grade numbers, Conventional representation on part Drawing, Manufacturing process and Surface finish.

Unit-II

(05 Hours)

Types of joints:

Thread forms and their properties, Standard Tables of ISO Metric Threads, Threads designation, Single and multi start threads, Right and left hand threads, Types of screws, bolt and nuts, Types of nut locking Arrangements, Threaded hole and stud assembly, Set screws, Grubs screws, Screwed Joints Welded Joints, Types of pipes and pipe joints, Flange joint Spigot and socket joints, Cotter joint, Hydraulic pipe joints Screwed and flanged union, Expansion joints, Stuffing box and Gland, Piping Layouts, Conventional representation of pipe fittings.

Unit-III

(04 Hours)

Assembly and Part Drawing:

Production Drawing, Bill of Materials Assembly and Part Drawings, such as: Boiler mounting, Steam engines, Machine tools, Automobile Parts.

Unit-IV

(05 Hours)

Introduction to Computer Aided Drafting:

Working Interface of AutoCAD, Drawing Limits, Creating 2-D Drawing in AutoCAD, AutoCAD commands, Editing commands in AutoCAD, Dimensioning in AutoCAD, Creating text in AutoCAD, Changing object properties Scale, Object Snap Mode, Display control in AutoCAD, Layer.

Unit-V

(04 Hours)

3-D Drawing, Surface Modeling:

Introduction, WCS, View Point, UCS, Working with UCS, Orthographic Views Surface Modeling: Box, Wedge, Pyramid, Cone, Sphere, Dome, Dish

Unit-VI

(02 Hours)

Introduction to Solid Modeling:

Box, Wedge, Cylinder, Cone, Sphere, Extrude, Revolved, Slice section, Union, Subtract.

Term Work

First sheet based on dimensioning practice, conventional and symbols in machine drawing

Two Drawing Assignments based on Assembly and Details of Machine Parts, Automobile parts, Engine, Boiler parts etc. (One Drawing assignment preferably on AutoCAD)

Six AutoCAD drawing assignments

Oral

Termwork and oral will be based on above syllabus

Text Books/References

Engineering Drawing Practice for School and Colleges, 1988, SP 46

George Omura, The ABC's of AutoLisp, BPB Publications, 1990, New Delhi

Warren J. Luzadder and Jon M. Duff, Fundamentals of Engineering Drawing, PHI Pvt.

Ltd., 11th edition, 1995, New Delhi

K. L. Narayana, P. Kannaiah and K. Venkata Reddy, Machine Drawing, New Age Int. (P) Ltd., 2nd edition, 1999, New Delhi

N. D. Bhatt and V. M. Pancha, Machine Drawing, Charotar Publishing House, 33rd edition, 2000, Anand

R. B. Gupta, Machine Drawing, Satya Prakashan, 7th edition, 2000, New Delhi

P. S. Gil, Machine Drawing, S. K. Kataria & Sons, 17th edition, 2004, Delhi

N. Sidheswar, P. Kannaiah and V. V. S. Sastry, Machine Drawing, Tata McGraw Hill, 28th reprint, 2004, Delhi

N. D. Junnarkar, Machine Drawing, Pearson Education (Singapore) Pvt. Ltd., 1st edition, 2005, Delhi

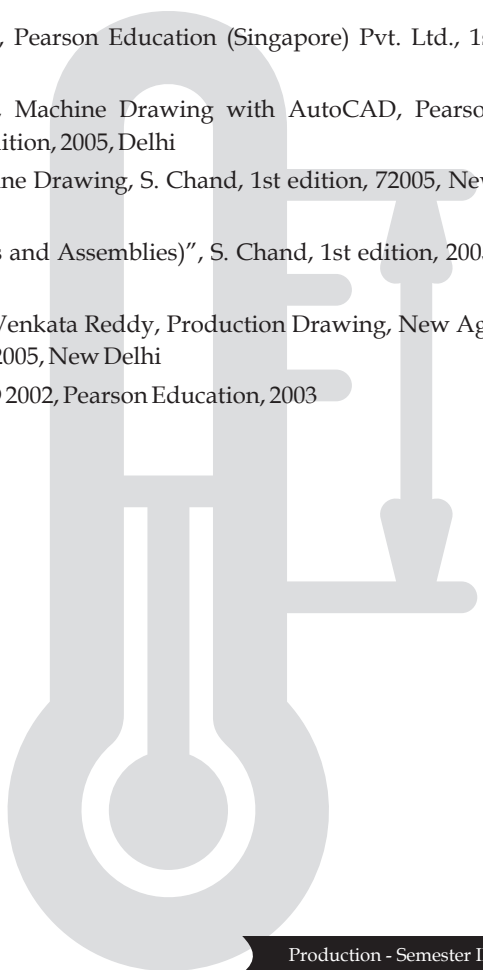
Goutam Pohit and Goutam Ghosh, Machine Drawing with AutoCAD, Pearson Education (Singapore) Pvt. Ltd., 1st edition, 2005, Delhi

R. K. Dhawan, A Text Book of Machine Drawing, S. Chand, 1st edition, 72005, New Delhi

P. H. Joshi, Drawing Machines (Parts and Assemblies)", S. Chand, 1st edition, 2005, New Delhi

K. L. Narayana, P. Kannaiah and K. Venkata Reddy, Production Drawing, New Age Int. (P) Ltd., 1st edition, 1997, Reprint 2005, New Delhi

Engineering Graphics with Auto CAD 2002, Pearson Education, 2003





SEMESTER - IV



TEACHING SCHEME

Lectures : 04 Hrs/Week
Tutorials : 01 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks
Duration : 03 Hours
Unit Test : 20 Marks

Unit-I

(08 Hours)

Differential equations:

Solution of Linear differential equation of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's (Homogeneous type) and Legendre's linear equations.

Simultaneous linear differential equations, Total differential equation, Symmetrical Simultaneous differential equations.

Unit-II

(08 Hours)

Applications of differential equations:

Application to mass spring systems with coupled masses, equivalent electrical circuits. Solution of multi degree of freedom systems (Vertical and Horizontal) by matrix method, Natural frequencies and normal modes of vibration.

Applications of Partial differential equations:

Solution of wave equation, one and two-dimensional heat flow equation by method of separating variables. Application to mechanical and allied engineering problems.

Unit-III

(08 Hours)

Transforms:

Fourier transforms: Fourier integral theorem, Fourier sine and cosine integrals, Fourier Transform, Fourier sine and cosine transforms, Inverse Fourier transforms, Solution of boundary value problems using Fourier transform (Diffusion equation only).

Laplace Transform: Definition, Properties and Theorems, Inverse Laplace transform, Methods of finding inverse Laplace transform, Application to solution of linear differential equations.

Unit-IV

(09 Hours)

Statistics and Probability:

Measures of central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates.

Probability density function and probability mass function, Binomial, Poisson's, Normal and Hypergeometric distributions, Test of Hypothesis: Chi-Square test of goodness of fit and Independence of attributes, Introduction to Decision and Quality control.

Unit-V

(09 Hours)

Vector Differentiation:

Radial, Transverse, Tangential, Normal components of linear velocity and acceleration, Gradient, Divergence and Curl, Directional derivative, vector identities Irrotational and Solenoidal Vector fields.

Unit-VI

(08 Hours)

Vector Integration:

Line integral, Surface integral and Volume integral, Work done, Gauss-Divergence theorem, Stoke's theorem and Greens lemma.

Applications to fluid flow, Streamline's, Continuity equation, Motion equation and Bernoulli's equation.

Text Books/References

Wylie C. R. and Barrett L. C., Advanced Engineering Mathematics, McGraw-Hill

M. D. Greenberg, Advanced Engineering Mathematics, 2e, Pearson Education

B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, Delhi

P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volume I & II), Vidyarthi Griha Prakashan

Irwin Miller and John E. Freund, Probability and Statistics for Engineers, Prentice-Hall of India

Peter V. O'Neil, Advanced Engineering Mathematics, 5e, Thomson learning

Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd

Syllabus for Unit Test

Unit Test 1	Unit I & IV
Unit Test 2	Unit II & V
Unit Test 3	Unit III & VI





TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Lathe, capstan and turret lathe:

Introduction, function, types, specification of lathe machines, construction accessories, attachments, operations Tool Geometry. Difference between capstan and turret and engine lathe, turret indexing mechanism, Bar feeding mechanism, work holding devices, tool holding devices, turret tooling layout.

Unit-II

(08 Hours)

Drilling and milling machines:

Types, construction, spindle assembly operation & applications. Fundamentals of milling process, Specification of Drilling and Milling Machines, cutters-types and geometry, operations performed on milling & drilling machines. Dividing head, methods of indexing. Gear train calculations for helical and cam milling.

Unit-III

(08 Hours)

Abrasive machining processes and Surface Treatment Process:

Abrasive machining, abrasive-types, size and geometry. Specifications of Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, Grinding faults, Honing, lapping, super finishing, buffing, burnishing process. Electroplating, phosphating, metal spraying, anodizing, shot Peening. Effects of surface treatment processes.

Unit-IV

(08 Hours)

Gear Manufacturing & Thread Manufacturing:

Gear cutting processes, forming and generation, gear cutting on milling machine, gear hobbing, gear shaping, gear shaving, gear grinding. Specifications of gear and thread manufacturing machines.

Thread cutting, internal and external, chasers, dies, thread milling, thread

rolling, thread grinding, thread whirling.

Unit-V

(08 Hours)

Broaching & Numerical control and Machining Centers:

Types of broaching machines - Horizontal, vertical pull up, pull down broaching machines. Broaching machines parts and their function, components machined on broaching machines broach geometry. Introduction to NC. CNC, DNC machines, comparison between NC conventional machine tools, basic principles of NC machine, tolling requirements, Advantages of NC machines, Introduction to machining centers.

Unit-VI

(08 Hours)

Non Conventional Methods of Machining :

Difference between conventional and non conventional machining, Introduction to chemical machining, Electric discharge machining, Electron beam machining, Ion beam machining, plasma arc machining, Laser cutting and welding, Abrasive jet machining, Ultrasonic machining.

Term Work

Experiments and assignment:

- Study and demonstration of ECM and EDM machine.
- Study and demonstration of NC and CNC machine programme.
- Study of Gear generating process on milling machine.
- Study of dividing indexing mechanism.
- Study of Single point cutting tool, Twist drill, Milling cutter
- 6 Assignments based on above syllabus & Industrial visit

Oral

Termwork and oral will be based on above syllabus

Text Books/References

- Roy A. Lindberg, Process & Materials of Manufacture, PHI
- P. C. Sharma, Production Engineering, S. Chand Publications
- R. K. Jain, Production Technology, Khanna Publishers

E. P. DeGrmo, J. T. Black and A. Kosher, Material and processes in manufacturing, PHI
Kundra, Rao, Tiwari, Computer Aided Manufacturing, TMH Publications
Pabla, Adithan, CNC Machines, New age International (P) Ltd.
Amitabh Ghosh, Malik, Manufacturing Science, East West Publications
HMT Handbook, Production Technology, TMH
Hajra Chaudhari, Workshop Technology, Vol.-II

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 04 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Basic Concept and Definition:

Link - Binary, ternary, quaternary, Structure, Machine, Mechanism, Kinematic pair - Classification, Kinematic Chain and Mechanism - Grubler's criteria for movability of chains and mechanism as locked constrained, Unconstrained based on grubler's criteria, Inversion of single slider and double slider crank chain. Inversion of four bar mechanism.

Unit-II

(08 Hours)

Mechanism with lower Pair:

Study of Pantograph, Study of exact straight line motion mechanism, Study of approximate straight line motion mechanism, Steering Gear Mechanism, Hook's or Universal joint, Ratchets and Escapement Mechanism, Swinging / Rocking Mechanism, Indexing Mechanism.

Unit-III

(08 Hours)

Velocity and Acceleration Analysis:

Instantaneous centre method to determine velocities, Methods of locating Instantaneous center, Kennedy's theorem of three centers, Body and space Centroides, Relative velocity and Relative acceleration Method, Coriolis component of acceleration, Klien's construction, Approximate analytical method for velocity and acceleration.

Unit-IV

(08 Hours)

Gear Manufacturing & Thread Manufacturing:

D'Alemberts Principle, Radius of gyration of rigid bodies, Theory of compound pendulum, Bifillar, Trifillar Suspension, Dynamically equivalent system, correction couple, Inertia in I.C. Engine Mechanism by analytical and graphical Method.

Type, Number and Dimensional Synthesis, Function Generation, Path Generation and Body Guidance, Two position synthesis of slider crank

mechanism, Two position synthesis of crank and rocker mechanism, Inertia of Geared system.

Unit-V

(08 Hours)

Balancing:

Balancing of rotating masses in one and several plane, Balancing of reciprocating masses in single and multi-cylinder engine, Inline, Radial and V-type Engines, Primary and Secondary Balancing Analysis, Concept of Direct and Reverse Crank, Static and Dynamic Balancing machine.

Unit-VI

(08 Hours)

Cam and Follower:

Cam Mechanism and its uses, Types of cam and follower, Main consideration affecting choice of cam profile, Determination of Cam profile for given follower motion, Analysis of cam with specified contours – Circular arm cam, tangent cam, cycloidal cam, Kinematic equivalent system.

Term Work

A journal consisting of –

Experimentation on

- i) Determination of Moment of inertia by Bifilar/Trifillar Suspension Method.
- ii) Compound Pendulum.
- iii) Experimental verification of displacement relation of different shaft angle for single Hooke's joint

Assignment

- i) Developing a computer program for velocity and acceleration analysis of slider crank mechanism / Four bar mechanism
- ii) Study of steering gear mechanism

Drawing sheets (Half imperial size)

1. Graphical solution of problem on Velocity and acceleration Mechanism by:
 - i) Velocity by Instantaneous centre method.
 - ii) Relative velocity and Relative acceleration method.
 - iii) Coriolis component of acceleration.
2. Straight line Mechanism.

3. Inertia force analysis using graphical method.
4. Draw cam profile for various types of follower motion.

Oral/Practical

Termwork and oral will be based on above syllabus

Text Books/References

Thomas Bevan, Theory of Machine, CBS Publication

J. E. Shingley, Theory of Machine, McGraw Hill

John Hannah and R. C. Stephens, Mechanics and Machines – Advanced theory and examples, Edward Arnold

R. S. Khurmi and J. K. Gupta, Theory of Machines – Eurasia Publishing House

S. S. Rattan, Theory of Machines - McGraw Hill

Abdulla Shariff, Theory of Machine – Dhanpat Rai Publication

P. L. Ballney, Theory of Machines – Khanna Publications

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



K60225: MATERIAL SCIENCE AND COMPOSITE MATERIALS

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(06 Hours)

Crystal Structure of Metals and Plastic Deformation:

Study of crystal structure, Indexing of planes and directions, Imperfections in crystals, Mechanism of plastic deformation, Critical resolve shear stress, Deformation of single crystal and polycrystalline metals, Work Hardening , Cold and hot working, Annealing and recrystallization.

Unit-II

(08 Hours)

Mechanical Testing of Metals:

Study of destructive testing Tensile test , Engineering stress and true stress strain, evolution of properties, Numerical based Tensile test, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non Destructive testing such as Liquid dye penetrate test, Magnaflux test, Eddy current test , Ultrasonic testing and Radiography testing.

Unit-III

(06 Hours)

Study of Equilibrium Diagrams:

Related terms and their definitions, Hume Ruther's rule of solid solubility, Allotropy and polymorphism, Solidification, Dendritic growth, Cooling curves, Plotting of Equilibrium diagrams, Lever rule, Coring, Isomorph system, Eutectic system, Partial eutectic and eutectoid system, Non Equilibrium cooling and it's effects.

Unit-IV

(10 Hours)

Powder Metallurgy:

Introduction, Advantages and limitations of powder metallurgy, Production of metals powder, Characteristics of powder, Powder conditioning, Powder Compacting, Sintering and sintering furnaces, Production of powder metallurgical parts such as self lubricating bearings,

ferrites, electric contact materials, Carbide cutting tools etc.

Unit-V

(10 Hours)

Study of Composite Materials and Ceramic :

Introduction, Classification of composites, Types of composite, Properties, Metal matrix composite, Ceramic matrix composite, Fiber Reinforced plastic, Manufacturing methods, Applications in Different field. Ceramic, Properties and applications of ceramics. Manufacturing of ceramics.

Unit-VI

(08 Hours)

Corrosion and Prevention:

Introduction, Types of corrosion, Oxide film growth laws, Action of hydrogen, Polarization, Stress corrosion, Season Cracking, Prevention of corrosion, Design of component, Modification of environment, Cathodic Protection, Deposition and coating, Ion Implantation, PVD, CVD, Powder coating etc.

Term Work:

List of practical: (Any Eight)

Tensile test to determine strength and other mechanical properties

Hardness test Brinell and Vickers

Rocwell and Poldi hardness test

Micro-Hardness test

Erichsen Cupping test

Magnetic Particle test

Liquid penetrate test

Ultrasonic Test

Visual inspection of casting and welded components.

Oral

Term work and oral will be based on above syllabus

Text Books/References

Dr. V. D. Kodgere, Material Science and Physical Metallurgy, Everest Publication, Pune

S. H. Avner, Physical Metallurgy, Tata Micro hill Publication, Delhi
O. P. Khanna, Material Science and Metallurgy, Khanna Publication , Delhi
R K Rajput, Material Science and Engineering, S K Kataria and Sons Publication, Delhi
Calliste, Material Science and Engineering

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(08 Hours)

Design of levers, Shafts, keys, coupling:

Transmission shafts, shaft design on strength basis, shaft design on torsional rigidity basis, ASME code for shaft design. Design of shaft on basis of lateral rigidity, Introduction to castigliano's theorem.

Keys, saddle, sunk, feather and woodruff keys. Design of flat, square, kennedy keys and splines.

Couplings, Design of muff coupling, flange coupling, flexible bushed pin coupling

Unit-II

(08 Hours)

Springs:

Types, application and material, stress deflection equation for helical spring, styles of ends, design of helical compression spring, multileaf spring, springs in series and parallel.

Power screws :

Forms of threads, multiple threaded screws, torque analysis with square and trapezoidal threads, self locking screws, collar friction, torque, stresses in power screw, screw jacks and c-clamp design, construction and application of recirculating ball screw.

Unit-III

(10Hours)

Clutch:

Types classification and selection of friction clutches, torque transmitting capacities and design of single and multiplate clutch, cone, centrifugal clutches, Types of friction materials and their advantages, limitation.

Brakes:

Energy absorbed by brakes, design considerations block brakes, pivoted block brakes, internal expanding shoe brake, disk and band –brake.

Unit-IV

(06 Hours)

Rolling contact bearing:

Types, static and dynamic load carrying capacities, stibek's equation. Equivalent bearing load, load life relation ship, selection of bearing life, selection of rolling contact bearing from manufacture's catalogue.

Bearing with probability of survival other than 90%, lubrication and mounting of bearings, construction, selection and materials of oil seals, gaskets. Pre-loading of rolling contact bearing.

Sliding Contact Bearing:

Only introduction

Unit-V

(08Hours)

Belt, chain and rope drives:

Belt drives construction and material of belt, comparison between flat belts and V belts, law of belting and types of belt drives, power rating of belts, maximum power condition, selection of flat and V belts, belt tensioning methods, relative advantages and limitations of flat and V belts, construction and applications of timing belt

Construction and application of roller chains, length of chain and number of links, polygonal effect, power rating of chains, constructions of sprocket wheels, silent chains, relative advantages and limitation of chain drive.

Rope drives-construction of wire ropes, lay of wire ropes stresses in wire ropes, selection of wire ropes, rope drum construction and design.

Unit-VI

(08 Hours)

Fatigue design:

Design of components subjected to fatigue loading, reversed load and infinite life, reverse load and finite life, fluctuating load and infinite life, soderberg criterion, Goodman criterion, modified Goodman diagram, Grubler criterion, fluctuating load and finite life, fatigue design under combined stresses, fatigue design of bolted joints, fatigue design of helical springs, cumulative damage in fatigue.

Term Work

Six assignments on above topics.

A design project: consisting of two imperial size sheets - one involving assembly drawing and part list and overall dimension and other sheet involving drawing of individual components. Manufacturing tolerances, surfaces symbols and geometric

tolerances should be specified so as to make it working drawing. A design report making all necessary calculations of design of components and assembly should be submitted along with the above assignments.

Oral

Based on above term work.

Text Books/References

Shigley J. E. and Mischke C. R., Mechanical Engineering Design, MCgraw Hill publication Co. Ltd.

Spott M. F. and Shoup T. E., Design of Machine Elements, Prentice Hall International

Bhandari V. B., Design of Machine Elements, Tata MCgraw Hill Publication Co. Ltd.

Black P. H. and O. Eugene Adams, Machine Design, MCgraw Hill Publication Co. Ltd.
Design Data, PSG College of Technology, Coimbatore

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Practical : 02 Hrs/Week

EXAMINATION SCHEME

T. W. & Pr. : 50 Marks

Term Work

Each candidate shall be required to complete and submit the following jobs:

1. Welding-TIG / MIG /Resistance (One Job)
2. Pattern making:
A split pattern consisting of wood turning or a core box. (One Job)
It should follow the colour code in pattern making..
3. Plain turning, step turning, taper turning, facing, knurling. (One Job)

Note

Practical examination of 3 hours duration based on above termwork will be conducted at the end of semester.



RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

A. T. K. T.

A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.

A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.

A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.

A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.

A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.

A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.

A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

CONTINUOUS ASSESSMENT

In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester- III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.

For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class

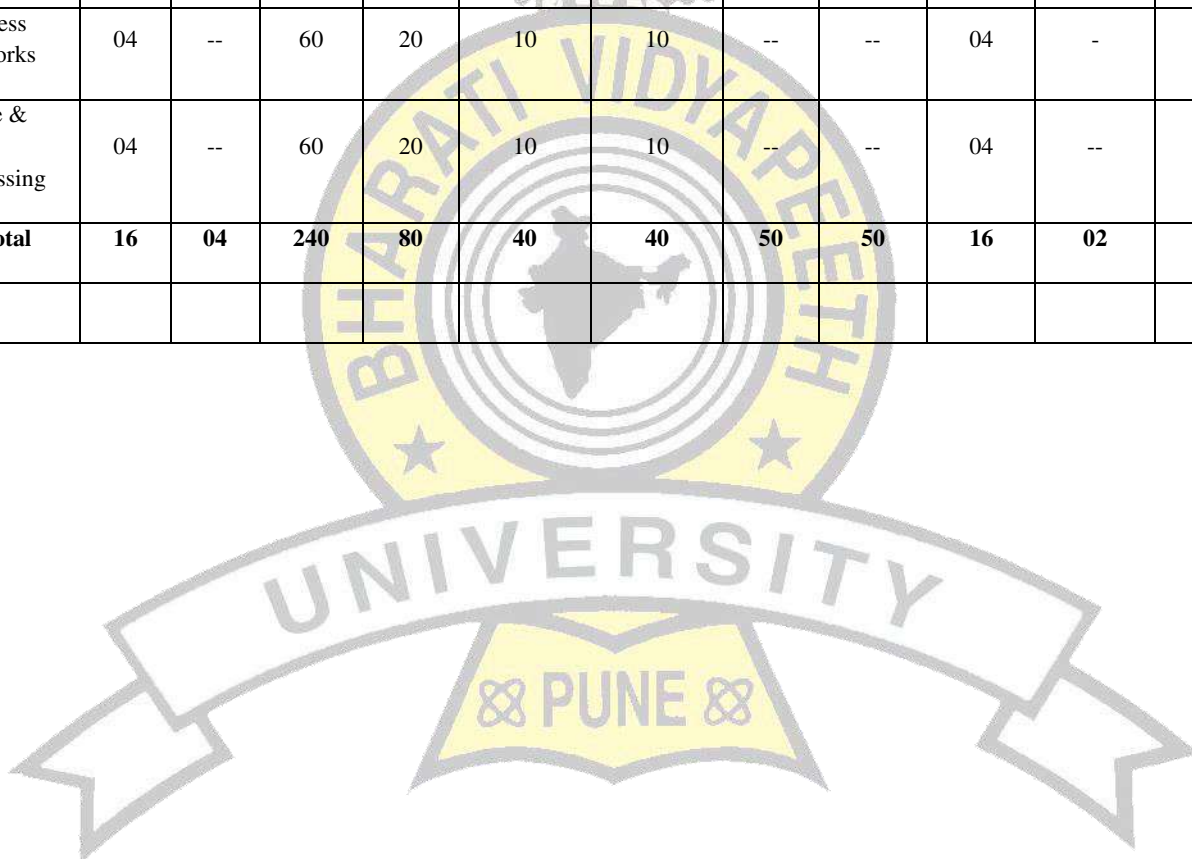
Structure of M.Tech Electronics Engineering (VLSI)

Based on Credit Pattern

STRUCTURE & EXAMINATION PATTERN

Semester I											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18	
Subject	Teaching Scheme (Hrs)		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits	
	Hrs./Week		Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
	L	P										
Digital VLSI design	04	02	60	20	10	10	25	25	04	01	05	
Embedded System & processors	04	02	60	20	10	10	25	25	04	01	05	
Advanced Digital communication system	04	--	60	20	10	10	--	--	04	--	04	
Linear algebra & random processes	04	--	60	20	10	10	--	--	04	--	04	
Total	16	06	240	80	40	40	50	50	16	02	18	

Semester II											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR/OR		
Analog VLSI Design	04	02	60	20	10	10	25	25	04	01	05	
Advanced digital signal processing	04	02	60	20	10	10	25	25	04	01	05	
Wireless Networks	04	--	60	20	10	10	--	--	04	-	04	
Image & video processing	04	--	60	20	10	10	--	--	04	--	04	
Total	16	04	240	80	40	40	50	50	16	02	18	





M.Tech.(Electronics) Sem-I



ADVANCED DIGITAL COMMUNICATION SYSTEM

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

Knowledge of random processes and linear system theory (Transforms, convolution, sampling)

Course objective:

To provide students with the knowledge & understanding of modern communication systems.

Course Outcomes: Upon Completion of the course, the students will be able to

1. To identify and describe different techniques in modern communication systems.
2. To understand the basic theory of modulation & demodulation techniques.
3. To possess knowledge of different codes.
4. To apply fundamentals of communication systems to solve the Engineering Problems.

Contents:

UNIT I

(08 Hours)

Basic digital pass band modulation

Introduction, Binary amplitude shift keying(BASK), Binary Phase shift keying(BPSK), Binary frequency shift keying(BFSK),Performance comparison of BASK, BFSK,BPSK, Digital modulation techniques for spectral efficiency, Quadrature Phase shift keying(QPSK),

Offset Quadrature Phase shift keying(OQPSK), Minimum shift keying(MSK), Comparison of M-ary signaling techniques.

UNIT II

(08 Hours)

Demodulation:

The matched filter, The correlator, envelop detector, output signal to noise ratio, Binary demodulation, coherent PSK,DPSK,FSK, non-coherent FSK,DPSK ,MSK .

UNIT III

(08 Hours)

Channel coding

Reed soloman codes, Interleaving & concatenated codes, coding and Interleaving applied to the compact disc digital audio system, Linear block codes, Cyclic Redundancy check (CRC), Turbo codes, Automatic repeat request (ARQ).

UNIT IV

(08 Hours)

Fading Channels

Multipath propagation, Flat & frequency selective fading, Fast and slow fading Random channel models, Signal design for radio channels, Diversity, Modulation, Coding.

UNIT-V

(08 Hours)

Advanced Modulation techniques

Trellis –coded modulation, Direct sequence modulation, IS-95 forward link, Code division multiple Access (CDMA), IS-95 reverse link, Frequency hop Spread Spectrum (FH-SS) ,CDMA, Pseudorandom sequences: generation & properties, Rake receiver

UNIT VI

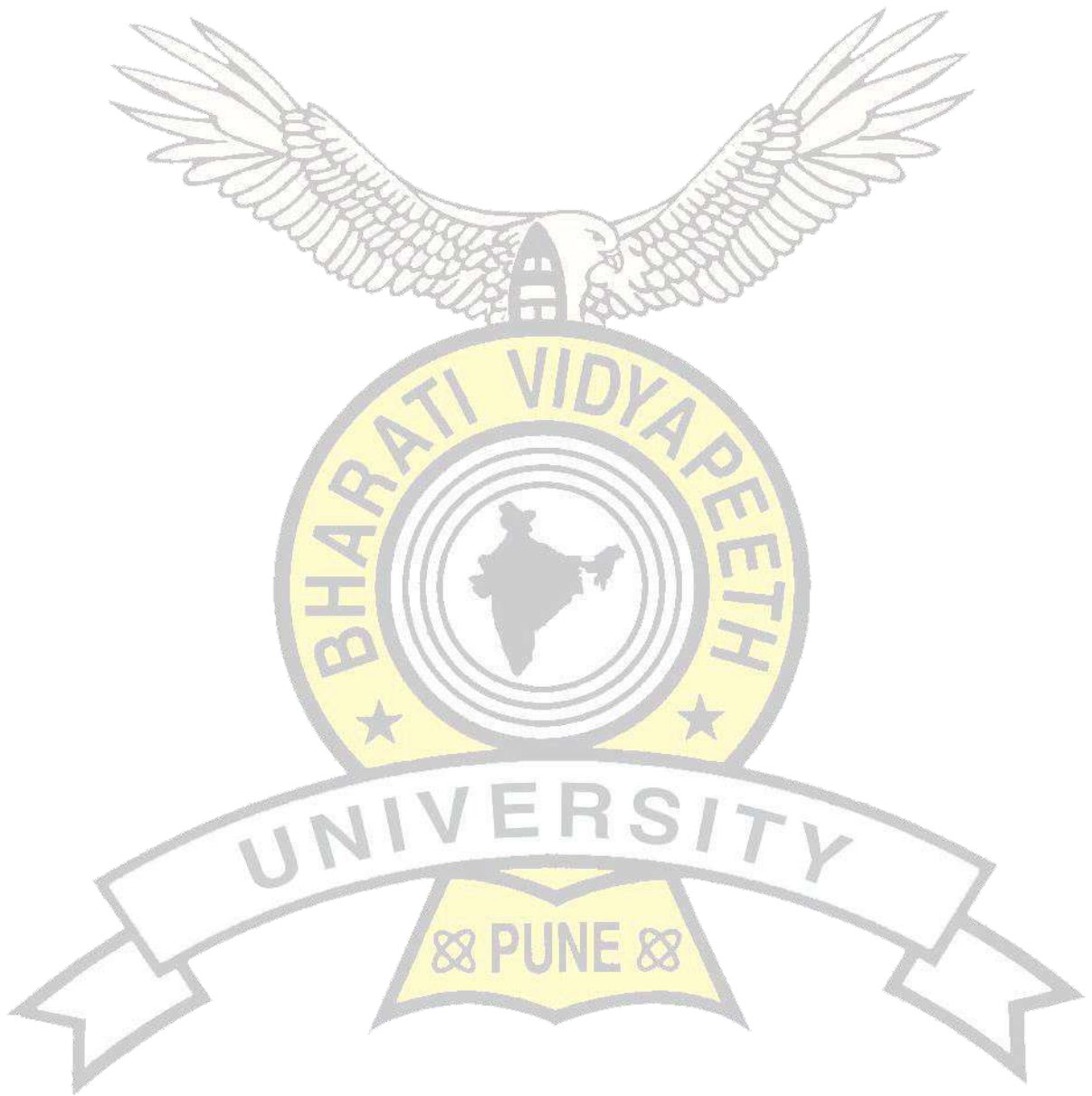
(08 Hours)

OFDM

Introduction to OFDM, Low mobility, High mobility, Time diversity, Frequency diversity, Receiver antenna diversity (SIMO), Transmit antenna diversity (MISO), Transmit receive antenna diversity.

Text Books/ References:

1. Digital communications- Simon Haykin, John Wiley and sons, 1998
2. Digital Communications- Bernard Sklar, Second edition, Pearson Education, 2001.
3. Nguyen Ha, Shwedyk Ed, “ A First Course in Digital Communications, Cambridge University Press.
4. Digital communication, 4th ed. - J. G. Proakis, MGH International edition.
5. Principle of Communication Systems – Taub, Schilling, TMH
6. Communication Systems, 4th ed. – A. Bruce Carlson, Paul B. Crilly, Janet C. Rutledge, MGH International edition.
7. Advanced Digital Communication Sytems-NIIT,PHI learning.





DIGITAL VLSI DESIGN

TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40

Marks

TW&OR: 50 Marks

Total Credits: 05

Course Prerequisite:

Knowledge of Digital Electronics

Course Objective:

To understand theory and to learn design of digital system. The course will involve design and simulation of digital circuits using VHDL

Course Outcomes: On successful completion of this course, students will be able to

- Ability to apply various modeling styles for digital circuits.
 - Ability to design sequential and combinational circuits using VHDL.
 - Ability to conceptualize FSM.
 - Ability to simulate digital circuits.
 - Ability to apply concepts of PLD designs.
-

Contents:

UNIT I

(08 Hours)

VHDL Basics

Objectives of VHDL, Entity-Architecture Concepts, Introduction to various modeling styles of VHDL (Behavioral, Dataflow, Structural and Mixed), VHDL Basic Elements (Data types, Data objects and Operator), Configuration, Package declaration.

UNIT II
VHDL Modeling-1

(08 Hours)

Dataflow Modeling: Example based on dataflow modeling, When-Else and With Select Statement, Concept of Delta delay and multiple drivers, Generate and Block Statements
Structural modeling: Concept of Component

UNIT III

(08 Hours)

VHDL Modeling-2

Behavioral and mixed modeling for digital design, If-else, Loop, Case, Assert and Report statements, State Machine Design, Moore and Mealy FSM Design using VHDL

UNIT IV

(08 Hours)

EDA tools

Digital Design Flow, RTL Synthesis, Synthesis Flow, Functional and Timing simulation, Physical Verification, Floor planning, Place and route, IP Design

UNIT V

(08 Hours)

Programmable Logic Devices

Overview of PLDs, SPLD, CPLD, FPGA, Case study of Xilinx family XC 4000 and XC9500, Modes of configuration.

UNIT VI

(08 Hours)

Designing with PLDs

Designing with ROM, PLA, PAL, GAL, CPLD and FPGA, Implementing functions in PLDs.

Text Books/ References:

1. VHDL: Programming by Example-Douglas Perry, McGraw Hill, Fourth Edition, 2002.
2. Fundamentals of Logic Design-Charles Roth, Larry Kinney, Cengage Learning, Seventh edition, 2014.
3. A VHDL Primer-J. Bhaskar, PHI Learning, Third Edition, 1998.
4. CMOS VLSI Design: A Circuits and system perspectives- Neil H.E. Weste, Davir Harris, Pearson Education 3rd Edition, 2004.

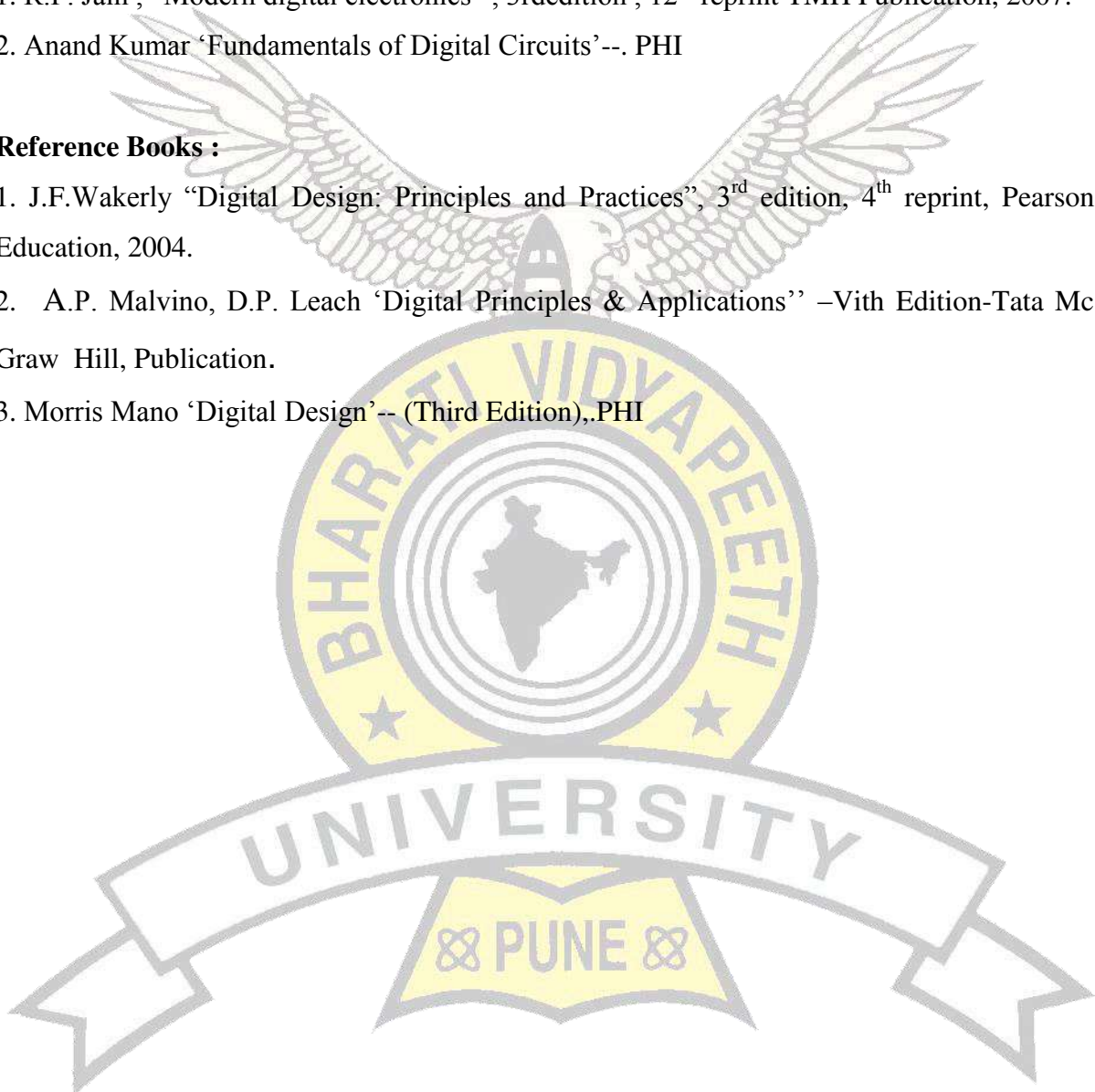
5. Circuit Design and Simulation with VHDL- V. Pedroni, MIT Press, Second Edition, 2010

Text Books:

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12th reprint TMH Publication, 2007.
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI

Reference Books :

1. J.F.Wakerly “Digital Design: Principles and Practices”, 3rd edition, 4th reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano ‘Digital Design’-- (Third Edition),.PHI





**Bharati Vidyapeeth Deemed University,
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EMBEDDED SYSTEMS AND PROCESSORS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW&OR:50 Marks

Total Credits: 04

Course Prerequisites:

Knowledge of microcontrollers like 8051, PIC and ARM

Course objective:

- To understand need and application of ARM Microprocessors in embedded system.
 - To understand architecture and features of typical PSoC.
 - To learn the importance of interprocess communication.
 - To learn Real time operating system and its application.
-

Course Outcomes: After successfully completing the course students will be able to

- Describe the PSoC architectures and its feature.
- Interface the advanced peripherals to ARM based microcontroller.
- Design embedded system with available resources.

Contents:

UNIT I (08hours)

ARM7 & ARM 9 Based Microcontroller

Review of ARM7, ARM9, &ARM11 processors .
Interfacing of ARM7 & ARM 9 processors with real world: LED, LCD, KEYPAD,SDI card,UART.

UNIT II (08hours)

Interprocess Communication

Multiple processes in an application, problem of shared data, interprocess communication, RTOS task scheduling, interrupt latency and response time, interrupt service mechanism
Context and context switching.

UNIT III (08hours)

Real Time systems

Kernel, Scheduler, Non-Preemptive Kernel , Preemptive Kernel, Reentrancy, Round robin scheduling, Task Priorities, Static & Dynamic Priority, Priority Inversion, Assigning task priorities, Mutual Exclusion, Deadlock, Clock Tick, Memory requirements, Advantages & disadvantages of real time kernels

UNIT IV (08hours)

Introduction to PSoC

PSoC technology, programmable routing and interconnect, configurable analog and digital blocks, cpu sub system, families of PSoC .

PSoC 3/5, architecture – block diagram, system wide resources, I/O interfaces, CPU sub system,
memory organization, digital sub systems, analog sub systems

UNIT V (08hours)

PSoC components:

Universal digital blocks (UDB), UDB arrays and counter and PWM, digital filter gain amplifiers, switched capacitor / continuous time, analog routing, flash temperature sensors,DTMF dialers, sleep timers, UART, I2 C, SPI,USB,CAN buses.

UNIT VI

(08hours)

μCOS II

Features of. Kernel structure. μCOS II RTOS services:Task management, Time management, Intertask Communication and Synchronization.

Text Books:

1. Andrew Sloss, Dominic Symes. Chris Wright, 'ARM System Developer s Guide- Designing and Optimizing System Software', ELSEVIER
2. Joseph Yiu, 'The Definitive Guide to the ARM Cortex –M', ELSEVIER
3. Rajkamal , 'Embedded System –Architecture, Progrmming and design,' TMH Publication, edition 2003
4. PSoC 3, PSoC 5 Architecture technical reference manual, Cypress website
5. Robert Ashby, My First Five PSoC 3 design (e-book), , Cypress website

Reference Books:

1. LPC 214x User manual (UM10139);-www.nxp.com
2. LPC17xx User manual (UM10360);-www.nxp.com
3. ARM architecture reference manual:-www.arm.com
4. Trevor Martin, ' An Engineer's Introduction to the LPC2100 Series', Hitex (UK) Ltd.
5. Designer Guide to the Cypress PSoC, Robert Ashby, Elsevier Publications
6. Introduction to Mixed Signal Embedded Design, Alex Doholi, Springer
7. The Beginners Guide to Using PSoC Express: Mixed-Signal Microcontroller Development without Code, Oliver H. Bailey, Timelines Industries Incorporated, 2007
8. PSoC Mikrocontroller by Fredi Kruger Franzis, 2006

• Web References:

1. www.cypress.com/go/psoc
2. www.cypress.com/go/training
3. www.cypress.com/go/support
4. www.psocdeveloper.com



LINEAR ALGEBRA AND RANDOM PROCESS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

Knowledge of Group theory, ring theory, Field theory

Course objective:

- To develop the ability to use the concepts of linear algebra and special functions for solving problems to related networks
 - To formulate and construct a mathematical model for linear programming problem in real life situations
-

Course Outcomes: On successful completion of this course, students will be able to

- To achieve an understanding of the basic concepts of algebraic equations and methods of solving them
- To familiarize the students with special functions and solve problems associated with engineering applications

Contents:

UNIT I

(08 Hours)

LINEAR Algebra:

Vector spaces-norms-inner products-Eigen values using QR transformations-QR factorization-generalized eigenvectors-canonical forms-singular value decomposition and applications-pseudo inverse-least square approximation-Toeplitz matrices and some applications

UNIT II

(08 Hours)

LINEAR PROGRAMMING:

Formulation-graphical solution-simplex method-Two phase method-Transportation and assignment models , Efficient computational algorithms , Duality, Parametric Linear programming, integer Linear Programming.

UNIT III

(08 Hours)

ORDINARY DIFFERENTIAL EQUATIONS:

Runge-kutta methods for system of IVP's , numerical stability, Adams-Bashforth multistep method, solution of stiff ODE's shooting method, BVP: Finite difference method, orthogonal collocation method, orthogonal collocation with finite element method, Galerkin finite element method

UNIT IV

(08 Hours)

TWO DIMENSIONAL RANDOM VARIABLES:

Joint distributions- marginal and conditional distributions- functions of two dimensional random variables- regression curve- correlation.

UNIT V

(08 Hours)

QUEUEING MODELS:

Poisson's process- Markovian queues- single and multi server models- little's formula – machine interference model- steady state analysis- self service queue. Pure Birth and Death Models (Relationship between the Exponential And Poisson Distribution.)

UNIT VI

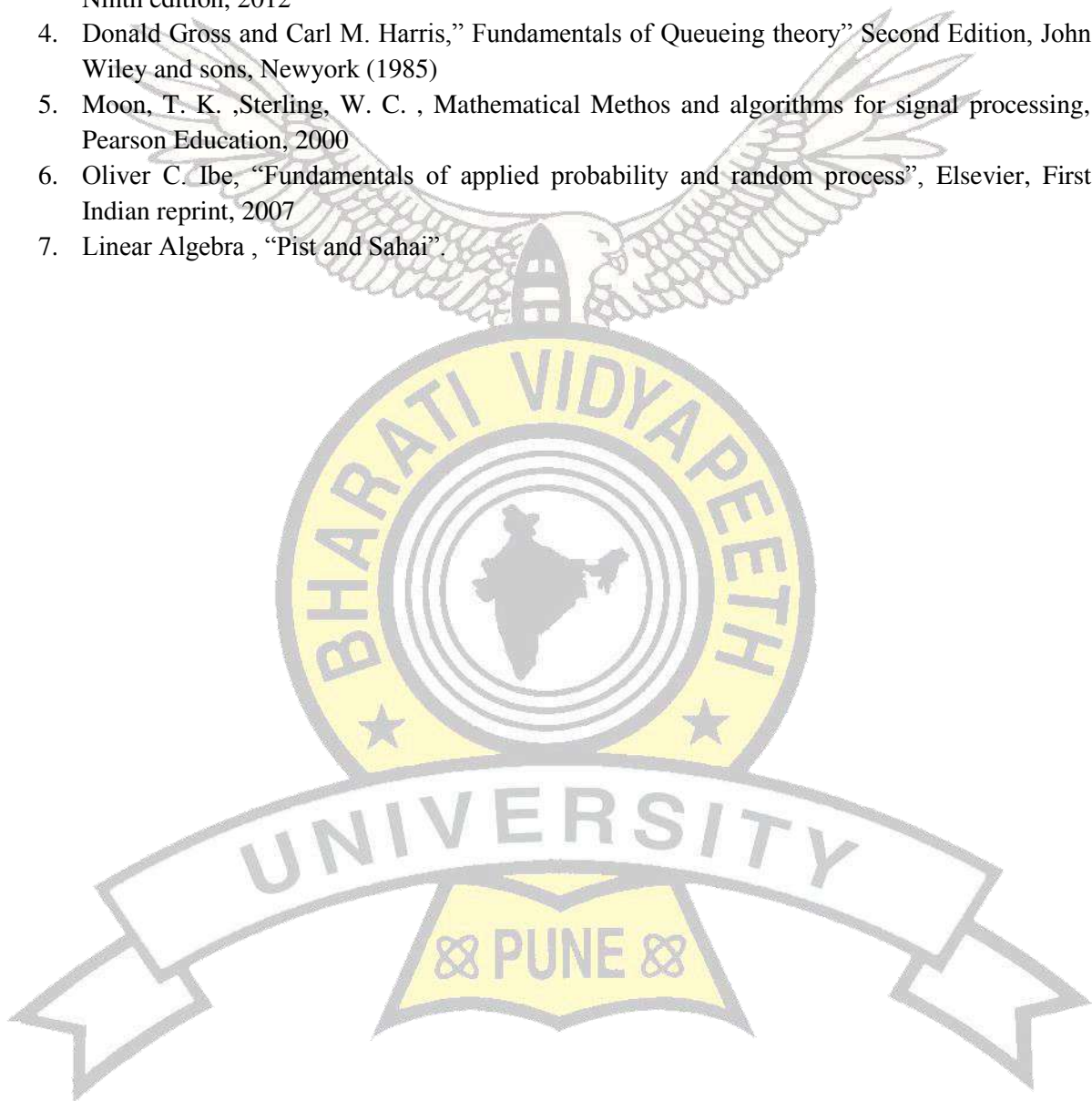
(08 Hours)

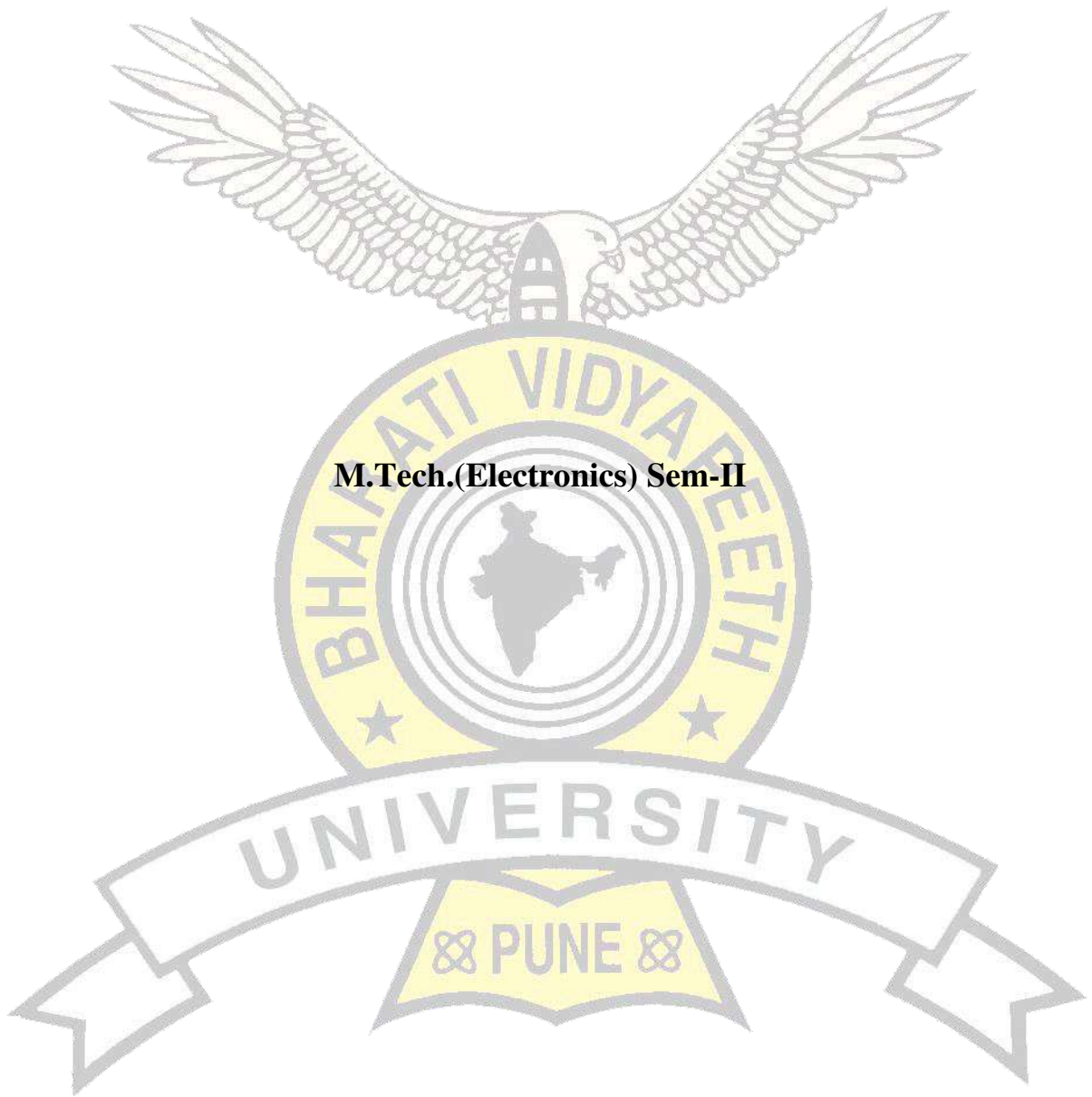
RANDOM PROCESS:

Averages of a random process, stationary random process, ergodic random process, random process-mean and covariance function, linear filtering of random process, power spectral density, spectral analysis of random process, Gaussian Poisson random process.

Text Books/ References:

1. Richard Bronson, Gabriel B. Costa, “ Linear Algebra”, Academic press, Second edition, 2007
2. Richard Johnson, Miller and Freund, “Probability and Statics for Engineers”, Seventh edition, Prentice-Hall of India, private limited, New Delhi (2007)
3. Taha H. A. “ Operations research, and Introduction”, Pearson Eductaion Asia, New Delhi, Ninth edition, 2012
4. Donald Gross and Carl M. Harris,” Fundamentals of Queueing theory” Second Edition, John Wiley and sons, Newyork (1985)
5. Moon, T. K. ,Sterling, W. C. , Mathematical Methos and algorithms for signal processing, Pearson Education, 2000
6. Oliver C. Ibe, “Fundamentals of applied probability and random process”, Elsevier, First Indian reprint, 2007
7. Linear Algebra , “Pist and Sahai”.





M.Tech.(Electronics) Sem-II



**Bharati Vidyapeeth Deemed University,
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ADVANCED DIGITAL SIGNAL PROCESSING

TEACHING SCHEME

Lectures: 04 Hrs/Week
Practicals: 2Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs
Theory: 60 Marks
Internal Assessment: 40 Marks
TW&OR: 50 Marks
Total Credits: 05

Course objective:

- This course covers the fundamental aspects of digital signal processing.
- To introduce the various techniques that is fundamental to a variety of application areas.

Course Outcomes: On successful completion of this course, students will be able to

1. To apply fundamental mathematical tools, in the analysis and design of signal processing systems.
2. To identify estimation problems and design, implement algorithms for solving them.
3. To understand the basic theory of wavelet transform and the concepts of using Simple wavelets for simple applications.

Contents:

UNIT I

(08 Hours)

Linear Prediction:

Forward and Backward Linear prediction, optimum reflection coefficient for lattice backward and forward prediction, solution of normal equations (Levinson-Durbin algorithm and Schur algorithm), properties of linear prediction filters.

UNIT II

(08 Hours)

Adaptive Filters:

Applications of adaptive filters: System identification, adaptive channel equalization echo cancellation in data transmission over telephone channels, linear predictive coding of speech signals, adaptive direct form filters-LMS algorithm, RLS algorithm.

UNIT III

(08 Hours)

Power Spectrum Estimation:

Estimation of power spectrum and correlation, Non-parametric and parametric methods, Minimum Variation Estimation methods, Eigen Analysis algorithm, Power Spectrum analysis using DFT.

UNIT IV

(08 Hours)

Programmable Digital Signal Processors:

Multiplier accumulator unit (MAC), modified bus structures, Multiple Access memory, VLIW architecture, pipelining, special addressing modes in P-DSP's.

UNIT V

(08 Hours)

An Overview of TMS320C6X DSPs:

Introduction, features of TMS320C6X processors, Internal Architecture, CPU & data paths, Addressing modes, memory architecture, pipeline, peripherals, program development.

UNIT VI

(08 Hours)

Wavelet Transforms:

Fourier Transform and its limitations, Short Time Fourier Transform, Continuous Wavelet Transform, Discretization of the Continuous wavelet Transform, Multiresolution Approximations; wavelet and Scaling Function Coefficients, Orthonormality of Compactly Supported Wavelets, Bi-orthogonal Decomposition, Harr wavelets, The Daubechies Wavelets Construction, Fast Wavelet Transform and Image Compression, Denoising using wavelets, Perfect Reconstruction Filter bank design using Wavelets.

Text Books/References:

1. Digital Signal Processing Using MATLAB by V.K.Ingle and J.G.Prokakis (Books/Colle,2000)
2. Digital Signal Processing:Principles,Algorithms and Applications by J.G.Prokakis and D.G.Manolakis



**Bharati Vidyapeeth Deemed University,
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ANALOG VLSI DESIGN

TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW&OR:50 Marks

Total Credits: 05

Course prerequisites:

Basic Electronics and Physics

Course objective:

To understand theory and to learn design of analog systems at transistor level. The course will involve design, layout and simulation of analog VLSI circuits using various CAD tools.

Course Outcomes: On successful completion of this course, students will be able to

- Ability to apply modeling for MOS circuits.
- Ability to design Analog CMOS sub-circuits.
- Ability to conceptualize CMOS amplifiers.
- Ability to characterize CMOS Op-amps.
- Ability to apply concepts of Switched Capacitor Circuits.

Contents:

UNIT I

(08 Hours)

MOS Devices and Modeling

The MOS Transistor, CMOS Device Modeling -Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Sub-threshold MOS Model.

UNIT II (08 Hours)

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors, Current and Voltage References, Band gap Reference.

UNIT III (08 Hours)

CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers

UNIT IV (08 Hours)

CMOS Operational Amplifiers

Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power-Supply Rejection Ratio of Two -Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT V (08 Hours)

High Performance CMOS OP AMP

High Speed/Frequency OP AMP, Micro Power OP AMP, Low Noise OP AMP, Low Voltage OP AMP.

UNIT VI (08 Hours)

Switched Capacitor Circuits

Switched Capacitor Circuits Switched Capacitor Amplifiers, Switched Capacitor Integrators.

Text Books/ References:

1. CMOS Analog Circuit Design -Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
2. Analysis and Design of Analog Integrated Circuits -Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.
3. Analog Integrated Circuit Design-David A. Johns, Ken Martin, Wiley Student Edn, 2013
4. Design of Analog CMOS Integrated Circuits-Behzad Razavi, TMH Edition, 2002.
5. CMOS: Circuit Design, Layout and Simulation-Baker, Li and Boyce, PHI, 2010.



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DIGITAL IMAGE AND VIDEO PROCESSING

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course objective:

- This course provides an introduction to basic concepts, algorithms of digital image and video processing.
- To provide different analytical tools and methods applied in Digital Image processing

Course Outcomes: On successful completion of this course, students will be able to

- To apply principles and techniques of digital image processing in applications related to digital imaging system.
- To use and implement basic algorithms for image & video compression

Contents:

UNIT I

(08 Hours)

Fundamentals of Image processing

Introduction to Digital Image Processing : Digital image fundamentals:, Applications of Image Processing, Simple image formation model, Image sampling and quantization - Basic relationships between pixels, connectivity, adjacency. Distance between the pixels . Elements of human visual perception, MTF, Image statistics.

UNIT II

(08 Hours)

Image Enhancement

Image Enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Image zooming, Spatial filtering - smoothing filter, sharpening filter. 2D-DFT, FFT, Frequency domain filtering: low pass filtering, high pass filtering, and Homomorphic filtering.

UNIT III (08 Hours)

Image Compression

Image Compression: Fundamentals, Lossless Compression schemes like Huffman, Arithmetic, LZW and lossless Prediction. 2D-DCT, KL, Hadamard Image compression using DCT, zig-zag scanning, still image compression standard - baseline JPEG. Vector Quantization

UNIT IV (08 Hours)

Image Segmentation

Image Segmentation: Fundamentals, point, line and edge and combined detection, Thresholding Edge linking Hough transform, Region oriented segmentation - basic formulation, region growing by pixel aggregation, region splitting and merging, Segmentation using watersheds

UNIT V (08 Hours)

Image Restoration

Morphological Operations: Erosion and Dilation, Opening and Closing, Hit and Miss transform, Boundary extraction, region filling, Extraction of connected components. Image Restoration: Image degradation/restoration model, Noise models, Linear Position invariant degradation, Estimation of degradation function, inverse filtering, Wiener filter.

UNIT VI (08 Hours)

An overview of Video processing

Analog Video, Digital Video, Motion estimation and detection, video enhancement, Video compression fundamentals.

Text Books/References:

1. Gonzalez and Woods, "Digital Image Processing", 3rd Edition, Pearson Education.
2. Pratt William K. "Digital Image Processing", John Wiley & sons .
3. S. Jayaraman, S. Esakkiraian "Digital Image Processing", Tata McGraw-Hill Education .
4. Al.Bovik," Handbook of Image and Video Processing " Academic Press.
5. B,Chanda and D.Datta Mujumdar " Digital Image Processing and Analysis", Prentice Hall of India.
6. Madhuri Joshi," Digital Image Processing" Prentice Hall of India.
7. Joshi, Madhuri A., Mehul S. Raval, Yogesh H. Dandawate, Kalyani R. Joshi, and Shilpa P. Metkar. *Image and Video Compression: Fundamentals, Techniques, and Applications*. CRC Press, 2014.



WIRELESS NETWORKS

TEACHING SCHEME

Lectures: 04 Hrs/Week

Practical: --Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course objective:

- To introduce the concepts and techniques associated with Wireless Cellular Communication systems.
- To familiarize with state of art standards used in wireless cellular systems.

To understand the concept of new technologies in wireless systems

Course Outcomes: On successful completion of this course, students will be able to

1. Explain the Classification of mobile communication systems
2. Analyze the radio channel characteristics and the cellular principle
3. Ability to analyze improved data services in cellular communication

Contents:

UNIT I

(08 Hours)

Introduction

Systems and Design Fundamentals, Propagation Models Description of cellular system, Frequency Reuse, Co channel and Adjacent channel interference, Propagation Models for Wireless Networks, Multipath Effects in Mobile Communication, Models for Multipath Reception.

UNIT II (08 Hours)

Cellular Communications

Introduction to Cellular Communications, Frequency reuse, Multiple Access Technologies, Cellular Processes-Call Setup, Handover etc, Teletraffic Theory, Capacity Building, Blocking Probability

UNIT III (08 Hours)

CDMA

Introduction to CDMA, Walsh codes, Variable tree OVVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization

UNIT IV (08 Hours)

GSM

Architecture and Protocols - Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multiframe, Control (Signaling) Channel Multiframe, Frames, Multi-frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber.

UNIT V (08 Hours)

MIMO

Introduction to MIMO, MIMO Channel Capacity, SVD and Eigen modes of the MIMO Channel, MIMO Spatial Multiplexing – BLAST, MIMO Diversity – Alamouti, MIMO Diversity-OSTBC, MIMO Beam Forming-MRT, MIMO - OFDM

UNIT VI (08 Hours)

3G and 4G Wireless Standards/UWB

GPRS, WCDMA, LTE, WiMAX, UWB Definition and Features, UWB Wireless Channels, Bit-Error Rate Performance of UWB

Text Books/ References:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed.2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.

3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.
4. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002
5. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
6. Wireless Communication and Networking – William Stallings, 2003, PHI.
7. Wireless Communication – Upen Dalal, Oxford Univ. Press
8. Wireless Communications and Networking – Vijay K. Gary, Elsevier.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune
Structure of M.Tech (Electronics -VLSI)
Based on Credit Pattern**

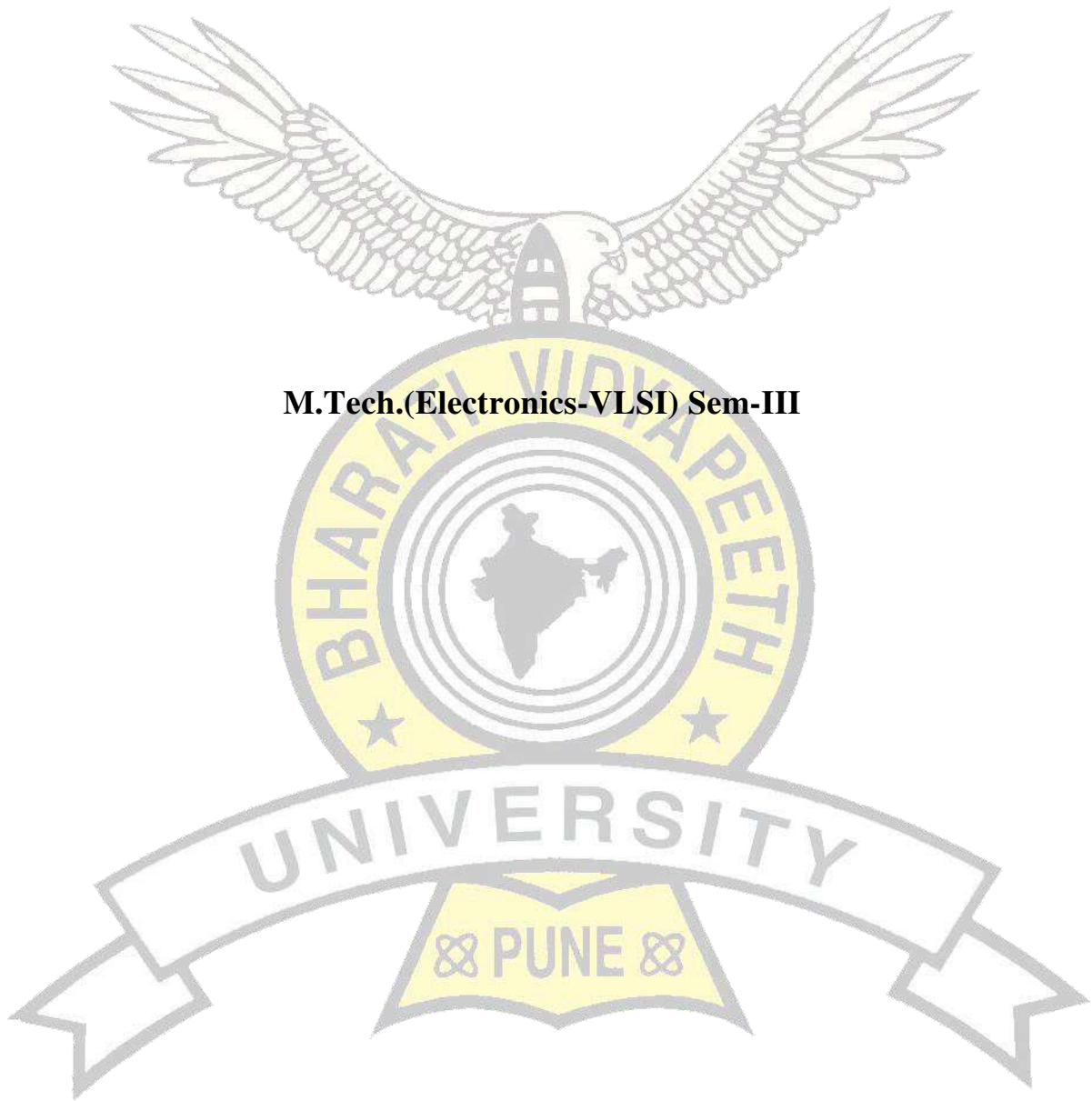
Semester III											Total Duration: 28 hrs/week
											Total Marks : 475
											Total Credits: 40
Subject	Teaching Scheme (Hrs)		Examination Scheme						Examination Scheme		Total Credits
	Hrs./Week		Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR /OR	
L	P										
Elective –I	04	02	60	20	10	10	25	25	04	01	05
Elective –II	04	02	60	20	10	10	25	25	04	01	05
**Self-Study Paper-I	* 04	--	60	20	10	10	-	-	04	-	04
Dissertation Stage –I	-	07	-	-	---	---	25	--		21	21
Seminar	-	05	-	-	--	--	25	25	-	05	05
Total	12	16	180	60	30	30	100	75	12	28	40

Elective – I	Elective - II
<ul style="list-style-type: none"> • Programmable System on chip • Nano electronics • Algorithms for VLSI Design Automation 	<ul style="list-style-type: none"> • ASIC Design • Testing & Verification of VLSI Design • Artificial neural networks

Semester IV											Total Duration: 14 hrs/week	
											Total Marks : 325	
											Total Credits: 34	
Subject	Teaching Scheme (Hrs)		Examination Scheme						Examination Scheme		Total Credits	
	Hrs./Week		Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR /OR		
L	P											
**Self-Study Paper-II	* 04	--	60	20	10	10	-	-	04	-	04	
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30	
Total	04	10	60	20	10	10	150	75	04	30	34	

List of Self Study Subjects

Sr. No.	SELF STUDY PAPER- I (SEM-III)	SELF STUDY PAPER- II (SEM-IV)
1	Low power VLSI Design	Genetic algorithms & optimization techniques
2	IC Fabrication Technology	Fuzzy logic systems
3	In-Vehicle Networking	Biomedical Instrumentation
4	Research methodology	Computer aided VLSI Design
5	Intellectual property rights	Human values & professional ethics



M.Tech.(Electronics-VLSI) Sem-III



Elective I- PROGRAMMABLE SYSTEM ON CHIP

TEACHING SCHEME

Lectures: 04 Hrs/Week
Practicals: 02 Hrs/week

EXAMINATION SCHEME

Duration: 03 Hrs
Theory : 60 Marks
Internal Assessment: 40 Marks
TW&OR: 50 Marks
Total Credits: 05

Course prerequisites:

Knowledge of microprocessors and microcontrollers

Course objective:

1. To introduce the students to the Cypress PSoC technology
 2. To study the architecture of PSoC
 3. To learn interfacing of real world with PSoC
-

Course Outcomes: Upon Completion of the course, the students will be able to

1. Describe and identify the features of PSoC
 2. Design the system for interfacing to the real world.
-

Contents:

UNIT I

(08 hours)

Introduction to PSoC

PSoC Technology, Programmable Routing and Interconnect Configurable Analog and Digital Blocks, CPU Sub System, Families of PSoC (PSoC1, PSoC2, PSoC3,) Difference between PSoC and Conventional MCU.

UNIT II (08 hours)

Introduction to PSoC 3/5

PSoC3/5 architecture-block diagram system wide resources, I/O interfaces, CPU Subsystem, memory organization digital subsystems, analog subsystems

UNIT III (08 hours)

PSoC Design Modules

Cypress PSoC Structure, PSoC Designer Suit, limitations of PSoC improvements of the PSoC, PSoC Subsystem design, PSoC memory management.

UNIT IV (08 hours)

Mixed –Signal Embedded design

Overview of mixed-signal embedded system designs, hardware and software subsystems of mixed-signal architectures, PSoC Hardware components, PSoC software components, PSoC interrupt subsystem, Introduction to PSoC Express, System design using PSoC express.(8hrs)

UNIT V (08 hours)

PSoC Components

Universal Digital Blocks (UDB), UDB arrays and digital System Interconnect (DSI),Timer, Counter and PWM,Digital Filter Blocks (DFB),ADC topologies and Circuits Programmable gain amplifiers, Switched capacitor / continuous time, analog routing, flash temperature sensors,DTMF Dialers, Sleep times,UART,12C,SPI,USB,CAN buses.

UNIT VI (08 hours)

System design using PSoC

Interfacing of temperature Sensors and Tachometers, SPI and UART based task communications, Lower Noise Continuous Time Signal Processing with PSoC Data Acquisition and Control System with PSoC, Ultra wide-band RADAR, Serial Bit Receiver with Hardware Manchester Decoder, DTMF Detector, and Ultrasonic Vehicle Parking Assistant, Universal wide-Range Signal Generator.

Text Books:

1. PSoC3, PSoC5 Architecture Technical Reference Manual-Cypress website
2. My First Five PSoC3 Designs (e-book)by Robert Ashby-Cypress website

Reference Books:

1. Designers Guide to the Cypress PSoC by Robert Ashby –Elsevier Publications
2. Introduction to Mixed Signal Embedded Design, Alex Boboli-Springer
3. The Beginners Guide to Using PSoC Express: Mixed –Signal Microcontroller Development Without code by Oliver H.Bailey-Timelines Industries Incorporated,2007
4. PSoC Microcontroller by Fredi Kruger Franzis,2006

Web references

www.cypress.com/go/psoc

www.cypress.com/go/training

www.cypress.com/go/support

www.psocdeveloper.com





**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Elective I-NANO ELECTRONICS

TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

TW&OR: 50 Marks

Total Credits: 05

Course Prerequisite:

Physics, Basic electronics

Course Objective:

To learn and understand basic and advance concepts of nanoelectronics.

Course Outcomes: On successful completion of this course, students will be able to

1. Understand basic and advanced concepts of nanoelectronic devices
2. Gain knowledge about Nanostructure devices and logic devices.
3. Know the techniques of fabrication and measurement.

Contents:

UNIT I

Basics of nanoelectronics

Capabilities of nanoelectronics – physical fundamentals of nanoelectronics – basics of information theory – the tools for micro and nano fabrication – basics of lithographic techniques for Nanoelectronics

(08 hours)

UNIT II**(08 hours)****Quantum electron devices**

classical to quantum physics: upcoming electronic devices – electrons in mesoscopic structure – short channel MOS transistor – split gate transistor – electron wave transistor – electron spin transistor – quantum cellular automate – quantum dot array – Principles of Single Electron Transistor (SET) – SET circuit design – comparison between FET and SET circuit design

UNIT III**(08 hours)****Fabrication and Measurement Techniques**

Growth, fabrication, and measurement techniques for nanostructures- Bulk crystal and heterostructure growth- Nanolithography, etching, and other means for fabrication of nanostructures and nanodevices- Techniques for characterization of nanostructures- Spontaneous formation and ordering of nanostructures- Clusters and nanocrystals- Methods of nanotube growth- Chemical and biological methods for nanoscale fabrication- Fabrication of nano-electromechanical systems

UNIT IV**(08 hours)****Nanostructure Devices -I**

Electron transport in semiconductors and nanostructures- Time and length scales of the electrons in solids- Statistics of the electrons in solids and nanostructures- Density of states of electrons in nanostructures- Electron transport in nanostructures-Electrons in traditional low-dimensional structures- Electrons in quantum wells- Electrons in quantum wires- Electrons in quantum dots

UNIT V**(08 hours)****Nanostructure devices- II**

Resonant-tunneling diodes- Potential-effect transistors- Light-emitting diodes and lasers- Nano-electromechanical system devices- Molecular electronics – elementary circuits – flux quantum devices – application of superconducting devices –Strain –oxide nanowire, Nano designs and Nanocontacts – metallic nanostructures

UNIT VI**(08 hours)****Logic Devices and Applications**

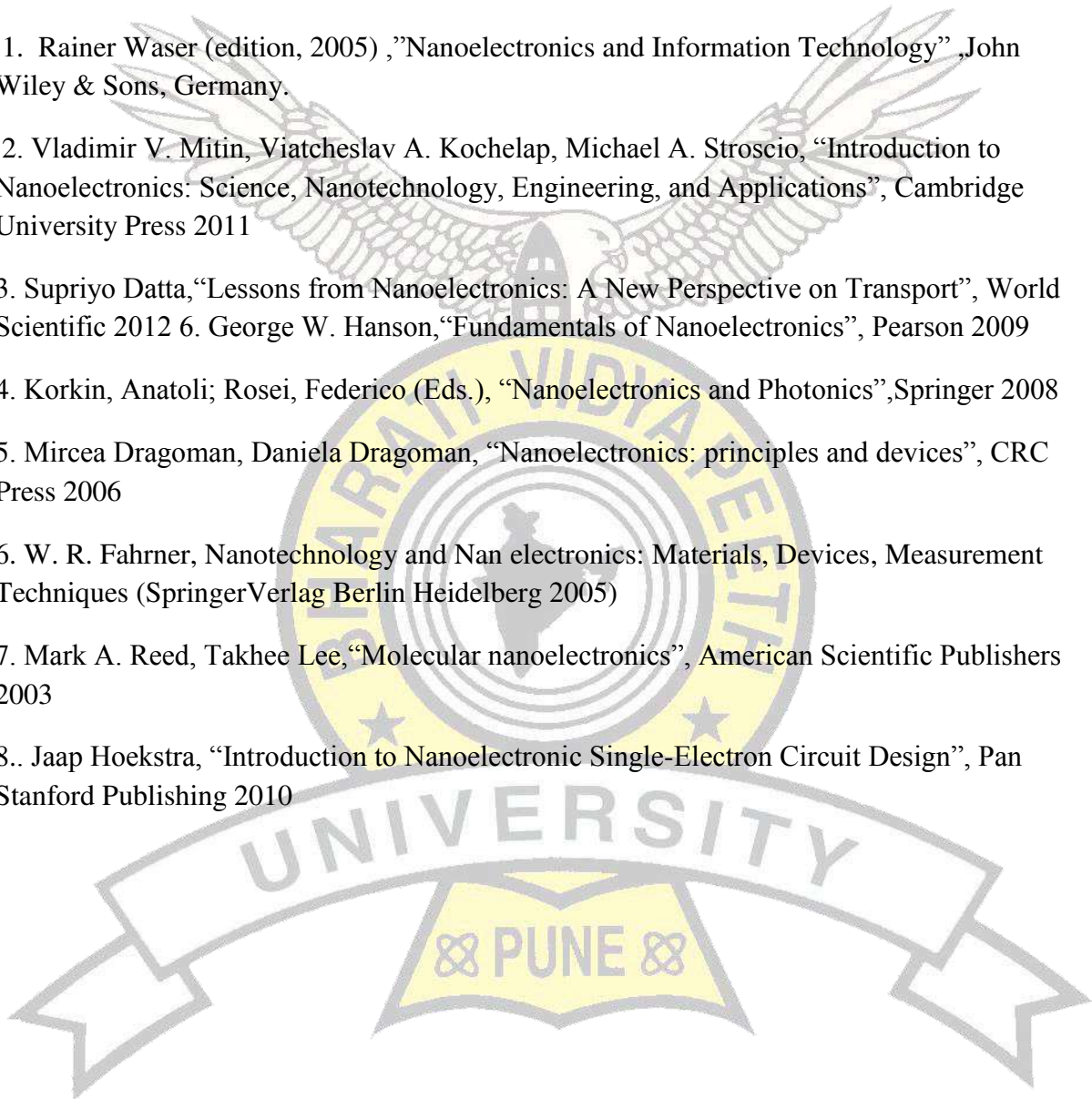
Logic Devices-Silicon MOSFETs-Ferroelectric Field Effect Transistors-Quantum Transport Devices Based on Resonant Tunneling-Single-Electron Devices for Logic Applications-Superconductor Digital Electronics-Quantum Computing Using Superconductors-Carbon Nanotubes for Data Processing- Molecular Electronics

Text Books :

1. Karl Goser, Peter Glösekötter, Jan Dienstuhl, "Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum Devices", Springer 2004
2. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, "Nanotechnology: basic science and emerging technologies", Overseas Press (2005)

Reference Books:

1. Rainer Waser (edition, 2005) , "Nanoelectronics and Information Technology" ,John Wiley & Sons, Germany.
2. Vladimir V. Mitin, Viatcheslav A. Kochelap, Michael A. Stroscio, "Introduction to Nanoelectronics: Science, Nanotechnology, Engineering, and Applications", Cambridge University Press 2011
3. Supriyo Datta, "Lessons from Nanoelectronics: A New Perspective on Transport", World Scientific 2012
6. George W. Hanson, "Fundamentals of Nanoelectronics", Pearson 2009
4. Korokin, Anatoli; Rosei, Federico (Eds.), "Nanoelectronics and Photonics", Springer 2008
5. Mircea Dragoman, Daniela Dragoman, "Nanoelectronics: principles and devices", CRC Press 2006
6. W. R. Fahrner, Nanotechnology and Nan electronics: Materials, Devices, Measurement Techniques (SpringerVerlag Berlin Heidelberg 2005)
7. Mark A. Reed, Takhee Lee, "Molecular nanoelectronics", American Scientific Publishers 2003
- 8.. Jaap Hoekstra, "Introduction to Nanoelectronic Single-Electron Circuit Design", Pan Stanford Publishing 2010





Elective I-ALGORITHMS FOR VLSI DESIGN AUTOMATION

TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW&OR:50 Marks

Total Credits: 05

Course Prerequisites:

Analog and Digital VLSI Design, Engineering Mathematics

Course objective:

To introduce the student to the algorithms used for VLSI Design Automation

Course Outcomes: After successfully completing the course students will be able to

1. Apply various algorithms for VLSI design.
 2. Conceptualize placement, floorplanning and pin assignment.
 3. Plan global and detailed routing.
 4. Apply concepts of via minimization and compaction
-

Contents:

UNIT I

(08 Hours)

Basic Algorithms

Basic Terminology, Complexity issues, NP- hardness, Graph algorithms, Computational geometry algorithms.

UNIT II

(08 Hours)

Partitioning

Problem formulation, Classification of partitioning algorithms, Group migration algorithms, Simulated annealing & evolution, Other partitioning algorithms.

UNIT III

(08 Hours)

Placement, Floor Planning and Pin Assignment

Problem formulation, Classification of Placement algorithms, Overview of placement algorithms, Constrain based floor planning, Floor planning algorithms for mixed block and cell design, General and channel pin assignment.

UNIT IV

(08 Hours)

Global Routing

Problem formulation, classification of global routing algorithms, Maze routing algorithms, Line probe algorithm, Steiner tree based algorithms, ILP based approaches.

UNIT V

(08 Hours)

Detailed Routing

Problem formulation, classification of routing algorithms, single layer routing algorithms, Two layer channel routing algorithm, Three layer channel routing algorithm & switch box routing algorithms.

UNIT VI

(08 Hours)

Over The Cell Routing & Via Minimization:

Two layers over the cell routers, Constrained & unconstrained via minimization.

Compaction:

Problem formulation, one-dimensional compaction, Two dimension based compaction, hierarchical compaction.

Text Books/ References:

1. Naveed Shervani, "Algorithms for VLSI physical design Automation", Kluwer Academic Publisher, Third edition, 1999.
2. Christophn Meinel & Thorsten Theobold, "Algorithm and Data Structures for VLSI Design", Springer, 1998.
3. Rolf Drechsheler, "Evolutionary Algorithm for VLSI", Second edition KAP, 1998
4. Trimburger, "Introduction to CAD for VLSI", Kluwer Academic publisher, 2002



Elective II -ASIC DESIGN

TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

Total Credits: 05

Course prerequisites:

Digital VLSI Design

Course objective:

The course focuses on the semi custom IC Design and introduces the principles of design logic cells, I/O cells and interconnects architecture, with equal importance given to FPGA and ASIC styles.

Course Outcomes: On successful completion of this course, students will be able to

1. Apply fundamentals of ASIC and its design methods
 2. Understand block level abstractions of FPGA and ASIC design
 3. Gain knowledge on programmable architectures for ASICs
 4. Conceptualize the physical design of ASIC.
-

Contents:

UNIT-I

(08 Hours)

Introduction to ASICS, CMOS Logic and ASIC Library Design

Types of ASICS, Design flow, Combinational Logic Cell, Sequential logic cell, Data path logic cell, Transistors as Resistors, Transistor Parasitic Capacitance, Logical effort.

UNIT-II

(08 Hours)

Programmable ASICS, Programmable ASICS Logic Cells and Programmable ASICS I/O Cells

Anti fuse, static RAM , EPROM and EEPROM technology, Actel ACT , Xilinx LCA, Altera FLEX , Altera MAX DC & AC inputs and outputs , Clock & Power inputs, Xilinx I/O blocks.

UNIT-III

(08 Hours)

Programmable ASIC Logic Cells

Actel ACT, Xilinx LCA , Xilinx EPLD, Altera MAX 50 00 and 7000 , Altera MAX 9000 , Altera FLEX, Design systems, Logic Synthesis , Half gate ASIC, Schematic entry, Low level design language.

UNIT-IV

(08 Hours)

Logic Synthesis, Simulation and Testing

VHDL and logic synthesis, Types of simulation, Boundary scan test, Fault simulation, Automatic test pattern generation.

UNIT-V

(08 Hours)

ASIC Floor Planning, Placement and Routing

System partition, FPGA partitioning, Partitioning methods, Floor planning, Placement, Physical design flow, Global routing, Detailed routing

UNIT-VI

(08 Hours)

Optimization Algorithms

Planar subset problem(PSP), single layer global routing single layer detailed routing wire length and bend minimization technique, over the cell(OTC) Routing, multichip modules(MCM), Programmable logic arrays, Transistor chaining, Weinberger Arrays, Gate Matrix Layout.

Reference Books:

1. M.J.S.Smith, " Application Specific Integrated Circuits", Pearson,2003
2. Steve Kilts, "Advanced FPGA Design," Wiley Inter-Science.
3. Roger Woods, John McAllister, Dr. Ying Yi, Gaye Lightbod , "FPGA based Implementation of Signal Processing Systems", Wiley, 2008
4. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing ", Mc Graw Hill, 1994.
5. Douglas J. Smith, HDL Chip Design , Madison, AL, USA: Doone Publications, 1996.
6. Jose E. France, Yannis Tsividis, "Design of Analog Digital VLSI Circuits for Telecommunication and Signal Processing", Prentice Hall, 1994
7. Farzad Nekoogar and Faranak Nekoogar, "From ASICs to SOCs: A Practical Approach", Prentice Hall PTR, 2003.



Elective II -TESTING AND VERIFICATION OF VLSI DESIGN

TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW&OR:50 Marks

Total Credits: 05

Course prerequisites:

Analog and Digital VLSI Design

Course objective:

To introduce the student to the mathematical and scientific principles based on which systematic test and validation can be carried out on multimillion transistor VLSI design.

Course Outcomes: On successful completion of this course, students will be able to

1. Apply various fault modeling for digital circuits.
 2. Test VLSI circuits.
 3. Conceptualize Verification process.
 4. Plan verification using verification tools.
 5. Apply concepts of DFT and BIST.
-

Contents:

UNIT I

(08 Hours)

Introduction to Verification

Importance of verification, Testbench, Human factor, What is being verified, Functional verification approaches, Testing v/s Verification, Verification and design reuse, Cost of verification.

UNIT II (08 Hours)

Verification Tools

Linting Tools, Simulators, Third party models, Waveform viewers, Code coverage.

UNIT III (08 Hours)

Verification Plan

Role of verification plan, Levels of verification, Verification strategies, From specification to features, From features to testcases, From testcases to testbenches.

UNIT IV (08 Hours)

Basics of Testing and Fault Modeling

Introduction to Testing, Faults in digital circuits, Modeling of faults, Logical Fault Models, Fault Detection, Fault dominance, Delay fault models.

UNIT V (08 Hours)

Test Generation for Combinational and Sequential Circuits

Test generation for combinational logic circuits, Testable combinational logic circuit design, Test generation for sequential circuits, Design of testable sequential circuits.

UNIT VI (08 Hours)

DFT and BIST

Design for Testability, Ad-hoc design, Scan based design, Built-In-Self-Test.

Text Books/ References:

1. Janick Bergeron ,”Writing Testbenches: Functional Verification of HDL Models”, Springer, Second Edition, 2003
2. M.L. Bushnell and V.D. Agrawa,”Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits- 1, “Kluwer Academic Publishers, 2002
3. A.L.Crouch ,”Design Test for Digital IC’s and Embedded Core Systems”, Prentice Hall International, 2002.
4. M.Abramovici, M.A.Breuer and A.D. Friedman ,”Digital systems and Testable Design”, Jaico Publishing House, 2002.



Elective II-ARTIFICIAL NEURAL NETWORK

TEACHING SCHEME

Lectures: 04 Hrs/Week
Practicals: 02 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs
Theory : 60 Marks
Internal Assessment: 40 Marks
TW&OR:50 Marks
Total Credits: 05

Course prerequisites:

- Basic knowledge of human nervous systems.
- Basic knowledge of mathematical concepts like state-space, Matrix fundamentals.

Course objective:

This course provides in depth knowledge of Artificial Neural Network and role of ANN in different application areas.

Course Outcomes: On successful completion of this course, students will be able to

- 1 Identify potential use of learning approaches of ANN.
2. Analyze role of perceptron, Adaline & Madeline networks
3. Evaluate different application scenarios of ANN

Contents:

UNIT I

(08 Hours)

Introduction and ANN Structure.

Biological neurons and artificial neurons, Model of an ANN, ANN Terminologies, Activation functions used in ANNs, Typical classes of network architectures, Mc-Culloch-Pitts Neuron Model, Learning rules.

UNIT II

(08 Hours)

Mathematical Foundations and Learning mechanisms.

Re-visiting vector and matrix algebra, State-space concepts, Concepts of optimization, Error-correction learning, Memory-based learning, Hebbian learning, Competitive learning.

UNIT III

(08 Hours)

Single layer perceptrons. Adaline & Madeline Networks

Structure and learning of perceptrons, Pattern classifier - introduction and Bayes' Classifiers, Perceptron as a pattern classifier, Perceptron convergence, Limitations of a perceptrons, Adaline architecture, algorithm, MR-I, MR-II algorithms.

UNIT IV

(08 Hours)

Feedforward ANN.

Structures of Multi-layer feedforward networks, Back propagation algorithm, Back propagation - training and convergence, Functional approximation with back propagation, Practical and design issues of back propagation learning. Radial Basis Function Networks, Pattern separability and interpolation, Regularization Theory, Regularization and RBF networks, RBF network design and training, Approximation properties of RBF.

UNIT V

(08 Hours)

Competitive Learning and Self organizing ANN

General clustering procedures, Learning Vector Quantization (LVQ), Competitive learning algorithms and architectures, Self organizing feature map, Properties of feature maps, Mexican Net, Hamming Net.

UNIT VI

(08 Hours)

Special Networks & Applications of Neural Networks

Support Vector machines, Design of an SVM, Examples of SVM, Probabilistic Neural Network, Boltzmann Machine with learning, cognitron, simulated annealing, applications of Neural Networks in bioinformatics, forecasting, healthcare, robotics, pattern recognition.

Text Books/ References:

- Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
- Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.
- Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.
- S.N. Sivanadam, "Introduction to Neural Networks using MATLAB", The McGraw-Hill, 2006.



Self Study Paper I -LOW POWER VLSI DESIGN

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

Analog and Digital VLSI Design

Course objective:

To introduce the student to the concept of low power VLSI design, power estimation and power optimization

Course Outcomes:

1. Ability to apply various low power techniques at device and circuit level.
1. Ability to design low power VLSI circuits.
2. Ability to conceptualize low power VLSI basics.
3. Ability to plan low power architectures.
4. Ability to apply concepts of low power design at system level.

Contents:

UNIT I

(08 Hours)

Low Power Basics

Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits, Emerging Low power approaches, Physics of power dissipation in CMOS devices.

UNIT II

(08 Hours)

Impact of Device & Technology on Low Power

Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.

UNIT III

(08 Hours)

Low Power Design

Circuit level:

Power consumption in circuits, Flip Flops & Latches design, High capacitance nodes, Low power digital cells library

Logic level:

Gate Reorganization, Signal Gating, Logic Encoding, State Machine Encoding, Pre-Computation Logic

UNIT IV

(08 Hours)

Low power Architecture & Systems

Power & performance management, Switching activity reduction, Parallel and Pipeline architecture for low power memory design.

UNIT V

(08 Hours)

Low power Clock Distribution

Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co-design of clock network

UNIT VI

(08 Hours)

Algorithm & architectural level methodologies

Introduction, design flow, Algorithmic level analysis & optimization, Architectural level estimation & synthesis.

Text Books/ References:

1. Gary K. Yeap ,”Practical Low Power Digital VLSI Design”, KAP, 2002
2. Rabaey, Pedram ,”Low power design methodologies”, Kluwer Academic, 1997
3. Kaushik Roy, Sharat Prasad ,”Low-Power CMOS VLSI Circuit Design”,Wiley,2000



Self Study Paper I -IC FABRICATION TECHNOLOGY

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

Physics, Chemistry

Course objective:

To understand theory and to learn IC Fabrication Technology..

Course Outcomes: On successful completion of this course, students will be able to

1. Conceptualize steps required for IC fabrication.
2. Apply concepts of Oxidation, Lithography , Chemical Vapour Deposition and Metal Film Deposition.

Contents:

UNIT-I (08 Hours)

Environment for VLSI Technology

Basic Fabrication Steps, Concepts of Clean room and safety requirements, Wafer cleaning processes and Wet chemical etching techniques.

UNIT-II (08 Hours)

Oxidation

Kinetics of Silicon dioxide growth for thick, thin and ultrathin films. Oxidation technologies in VLSI and ULSI, High k and Low k dielectrics

UNIT-III (08 Hours)

Lithography

Photolithography, E-beam lithography and newer lithography techniques for VLSI/ULSI.

UNIT-IV

(08 Hours)

Chemical Vapour Deposition Techniques

CVD techniques for deposition of polysilicon, silicon dioxide, silicon nitride and metal film

UNIT-V

(08 Hours)

Metal Film Deposition

Evaporation and sputtering techniques, Failure mechanisms in metal interconnects Multi-level metallization schemes

UNIT-VI

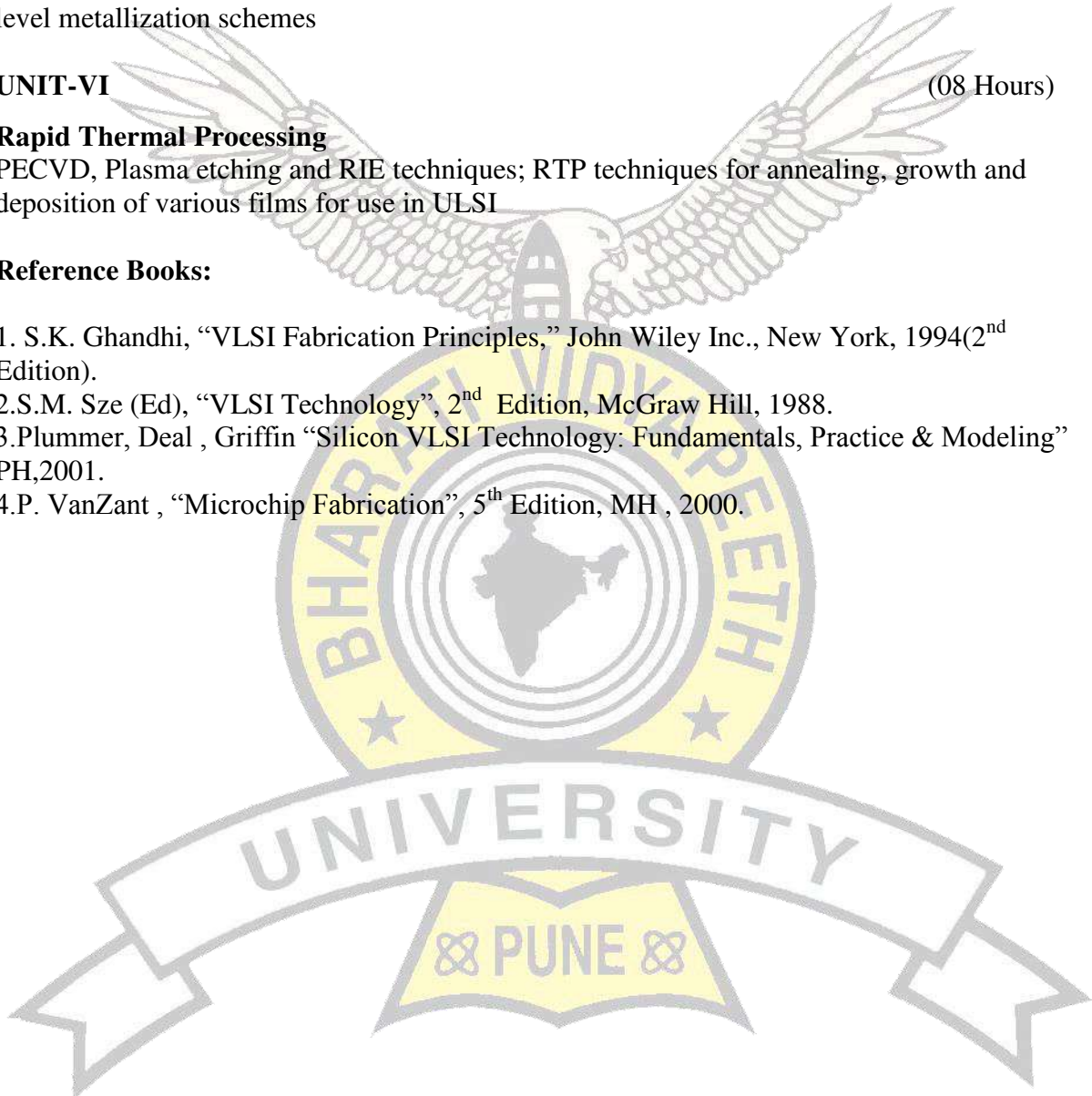
(08 Hours)

Rapid Thermal Processing

PECVD, Plasma etching and RIE techniques; RTP techniques for annealing, growth and deposition of various films for use in ULSI

Reference Books:

1. S.K. Gandhi, "VLSI Fabrication Principles," John Wiley Inc., New York, 1994(2nd Edition).
- 2.S.M. Sze (Ed), "VLSI Technology", 2nd Edition, McGraw Hill, 1988.
- 3.Plummer, Deal , Griffin "Silicon VLSI Technology: Fundamentals, Practice & Modeling" PH,2001.
- 4.P. VanZant , "Microchip Fabrication", 5th Edition, MH , 2000.





Self Study Paper I -IN-VEHICLE NETWORKING

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

Knowledge of Basic Electronics and Physics

Course objective:

1. To Provide Students with a working of in-vehicle network systems and exposure to aspects of design, development, application issues associated with those systems.
2. To Provide Knowledge in concepts of capture of Sensor data, Storage and exchange of data to obtain remote services.

Course Outcomes: On successful completion of this course, students will be able to

1. Get knowledge in Information –intensive applications that are being enabled for vehicles by a combination of telecommunication computing technology.
2. Develop communications, and navigation/in automotive telemetries.

Contents:

UNIT I

Basics of In-vehicle Networking

(08 hours)

Over view of Data communication and networking –need for In-Vehicle networking-layers of OSI reference model –multiplexing and de-multiplexing concepts-vehicles

UNIT II

Networks and Protocols

(08 hours)

Over view of general purpose networks and protocols –Ethernet, TCP, UDP, IP, ICMP, ARM, RARP, Over view CAN-Fundamentals-selecting CAN controller-CAN development tools-CAN application areas.

CAN protocol: principles of Data exchange –real time transmission –message frame formats, bit encoding bit physical layer standards

UNIT III (08 hours)

CAN Higher Layer Protocol

Introduction to CAN open-Device net –TTCAN-SAE J1939-overview of CAN open and application in transportation electronics –CAN open standards

UNIT IV (08 hours)

LIN Protocol

LIN standard over view – applications- LIN communication concept message frame-development flow

UNIT V (08 hours)

MOST and Flex Ray

MOST over view –Data rates –data types-topology –application areas –Flex Ray Introduction-network topology –ECUs and bus interfaces –controller host interface and protocol operation controls-media Access Control and frame and Symbol processing – Coding/decoding unit-Flex Ray Scheduling –message processing –wakeup/Startup-applications

UNIT VI (08 hours)

Wireless Systems

Introduction to wireless system –GPS –Setting receivers-Positioning-activating the navigation function –Concept of latitude and grid System-mapping and location technologies-Application.

Reference Books:

1. B.Hoffman-Wellenhof,H.Lichtenegger and J.Collins,"GPS Theory and practice ".4th revised edition, Spriger, Wein New York,1997
2. A.Leick,"GPS satellite Surveying",2edition,John Wiley and Sons, New York, 1995
3. Wireless Systems,W.C.Y.lee,prentice hall Publ. (LBS) -mobile and Wireless design
4. Konrad Etschberger, Controller Area Network, IXXAT Automation August 22, 2001.
5. Olaf Pfeiffer, Andrew Ayre,Christian Keydel,Embedded Networking with CAN and CAN open ,Anna books/Rtc Books,November 1,2003
6. Ronald K Jurgen, Automotive Electronics Handbook, McGraw-Hill Lnc.1999.
7. Dennis Foy,Automotive Telemetric ,Red Hat,2002.



Self Study Paper I -RESEARCH METHODOLOGY

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

TW & OR : 50 Marks

Total Credits: 04

Course prerequisites:

- Basic knowledge of modeling and simulation.
- Basic knowledge of probability and statistics

Course objective:

This course provides basic knowledge of Research Methodology in different areas.

Course Outcomes: On successful completion of this course, students will be able to

1. Learn research fundamentals like objectives, literature review process.
2. Apply the various methods of modeling and simulation.
3. Apply the probability statistics in the simulation.
4. Write the technical research paper with required presentation.
5. Know about of Information communication technology: e-research, indices, patents, virtual lab etc

Contents:

UNIT I

(08 Hours)

Research fundamentals

Definition, objectives, motivation, types of research and approaches, research- descriptive, conceptual, theoretical, applied and experimental

UNIT II

(08 Hours)

The initial research process

Literature review, research design, assortment of the problem, identification of problem, defining a problem, objective, sub objective and scope, assumptions, validation criteria, research proposal(synopsis)

UNIT III

(08 Hours)

Mathematical modeling and simulation

Mathematical modeling – need, techniques and classification, system models –types, static, dynamic, system simulation – why to simulate, technique of simulation, Monte Carlo simulation, types, continuous modeling, discrete model

UNIT IV

(08 Hours)

Probability and statistics in simulation

Role of probability and statistics in simulation, statistical distributions, inference about the difference in means, statistical output analysis

UNIT V

(08 Hours)

Design of experiment

Strategy of experimentation, types, basic principle, guidelines, need of precision, types of errors

UNIT VI

(08Hours)

Report writing and presentation of results

Need, report structure, formulation, sections, protocols, graphs, tables, IEEE format, evaluation of report, writing abstract, writing technical paper, Introduction of Information communication technology: e-research, indices, patents, virtual lab, digital lab, ethical issues in research

Reference books:

1. Yogesh Kumar Sing ,”Fundamental of Research Methodology and Statistics” , New Age International Publishers
2. C.R. Kothari, “Research Methodology: Methods and Techniques,” New Age International Publishers, 2nd revised Edition
3. Deepak Chawla, Neena Sondhi ,”Research Methodology, Concepts and Cases” , Vikas Publishing House Pvt. Ltd
4. Hamdy A. Taha ,”Simulation Modeling and Simnet” , Prentice Hall International Edition
5. Geoffrey Gorden ,”System Simulation” , Prentice Hall of India Pvt. Ltd.
6. J N Kapur ,”Mathematical Modeling” , Wiley Eastern Ltd

7. Douglas C. Montgomery ,”Design and analysis of Experiments” , Wiley Student Edition, 7th Edition
8. Capt. Dr.Nitin P. Soaje ,”Role of ICT in Doctoral Research “





Self Study Paper I -INTELLECTUAL PROPERTY RIGHTS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW & OR: 50 Marks

Total Credits: 04

Course objective:

- To introduce fundamental aspects of intellectual property rights to students.
- To provide case studies to demonstrate the application of legal concepts in engineering.

Course Outcomes: On successful completion of this course, students will be able to

- Understand the international intellectual property rights system.
- Use the necessary analytical tools to understand intellectual property in its broader environment

Contents:

UNIT I

(08 Hours)

Overview of Intellectual Property

Introduction and need for Intellectual Property Rights (IPR), Different categories of IP in instruments, Rational behind Intellectual Property, Rights of the owner of the IP. IPR in India-Genesis & development, International Background of Intellectual Property, some important examples of IPR.

UNIT II (08 Hours)

Patents

Introduction to patents, Concept: Novelty, Utility, Patent document, Granting of patent, Rights of a patent, Drafting of a patent, Filing of a patent, The Indian Patent law, Infringement

UNIT III (08 Hours)

Copyright

Introduction to Copyright, Originality, Works protected under Copyright Law, Authorship and Ownership

UNIT IV (08 Hours)

Trademarks

Introduction, Rights of trademark, Need for protection of trademarks, Types of trademarks, Registration of trademarks, Rights of Registered Trademark Owners, Infringement of trademarks

UNIT V (08 Hours)

Acquisition & maintenance of Intellectual Property Rights

Introduction to Acquisition & maintenance of Intellectual Property Rights, Intellectual property offices (IPOs), Costs-Patents, costs-Trademark, Costs-Copyright

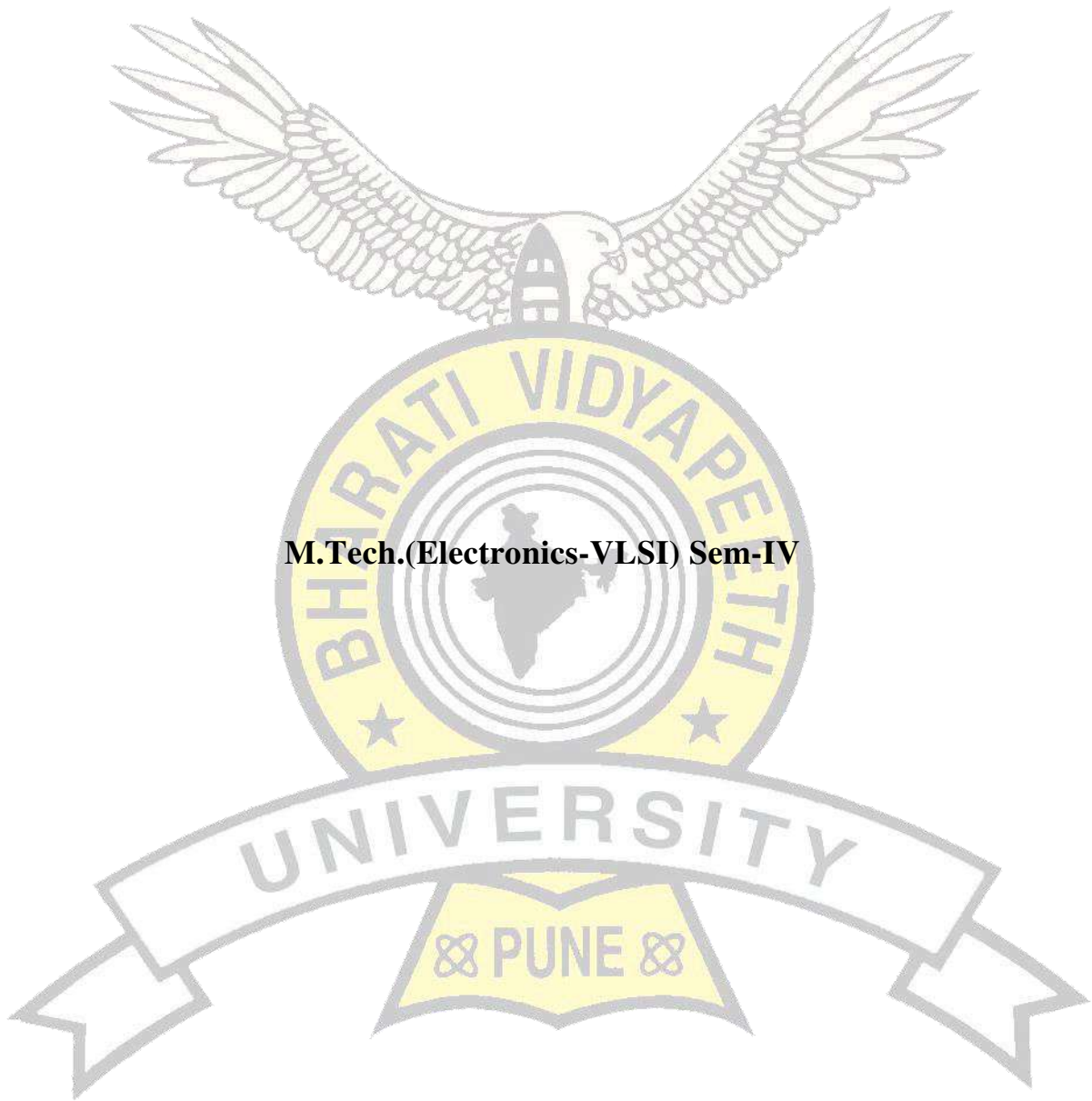
UNIT VI (08 Hours)

Enforcement of Intellectual Property Rights

Introduction to Enforcement of Intellectual Property and Global economy. The knowledge of economy & IP, valuation & accounting of Intangible assets, Management of IP in knowledge economy.

Text books/Reference

- 1) W.R. Cornish, 'Intellectual Property', Sweet & Maxwell, London (2000)
- 2) N.S. Gopalakrishnan & T.G. Agitha, 'Principles of Intellectual Property' Eastern Book Company, Lucknow.
- 3) P. Narayana, 'Patent Law', Wadhwa Publication.
- 4) V. V. Sopale, 'Managing Intellectual Property: The Strategic Importance', Second edition, PHI.



M.Tech.(Electronics-VLSI) Sem-IV



Self Study Paper II- GENETIC ALGORITHMS FOR VLSI DESIGN

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

TW & OR: 50 Marks

Total Credits: 04

Course prerequisites:

Analog and Digital VLSI Design

Course objective:

To introduce the student to the concept of Genetic Algorithm for VLSI

Course Outcomes:

1. Ability to apply Genetic Algorithm for VLSI Design.
 2. Ability to optimize VLSI Design through algorithm.
 3. Ability to conceptualize VLSI design flow through Genetic Algorithm .
-

Contents:

UNIT I (8 hours)

VLSI Design

Design Methodology and Hardware Implementation Methodologies, Digital ASIC Implementation

UNIT II (8 hours)

Genetic Algorithms

Components of a GA Based Optimization Engine, Individual Encoding, Fitness of an Individual, Selection Mechanism Genetic Operators, Crossover Operators, Uniform Crossover, Elitism in Genetic Algorithms, Multi-Objective Genetic Algorithms

UNIT III

(8 hours)

Multi-Objective Genetic Floorplanning For Vlsi Asics

Multi-objective Optimization, Floor planning and Floor planning Using Sequence Pair Representation, Conversion from a Floor plan to a Sequence Pair, Conversion from a Sequence Pair to a Floor plan

UNIT IV

(8 hours)

FPGA Based Genetic Algorithm

Pseudo-Random Number Generation and GA Performance, Basics of Evolvable Hardware, FPGA Based Genetic Algorithm, Implementation and Interfacing, Design Considerations for ASIC Implementation, RT-Level Simulations, Runtime Comparison of Implemented design.

UNIT V

(8 hours)

Power Estimation

Application of GA-Standard cell placement-GA for ATG-problem encoding- fitness function-GA vs Conventional algorithm

UNIT VI

(8 hours)

Hybrid Genetic

Genetic encoding-local improvement-WDFR-Comparison of Cas-Standard cell placement-GASP algorithm-unified algorithm.

Text Books

1. Pinaki Mazumder, E. M. Rudnick, "Genetic Algorithm for VLSI Design, Layout and test Automation", Prentice Hall, 1998.

References :

1. Randy L. Haupt, Sue Ellen Haupt, "Practical Genetic Algorithms" Wiley – Interscience, 1977.

2. Ricardo Sal Zebulum, Macro Aurelio Pacheco, Marley Maria B.R. Vellasco, Marley

Maria Bernard Vellasco "Evolution Electronics: Automatic Design of electronic

Circuits and Systems Genetic Algorithms”, CRC press, 1st Edition Dec 2001.

3. John R.Koza, Forrest H.Bennett III, David Andre , Morgan Kufmann, “Genetic Programming Automatic programming and Automatic Circuit Synthesis”, 1st Edition , May 1999.





Self-Study Paper II: FUZZY LOGIC SYSTEMS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

- Basic knowledge of set & probability theory.
- Basic knowledge of propositional logic & control systems

Course objective:

This course provides in depth knowledge of Fuzzy Logic and role of Fuzzy Logic systems in different application areas.

Course Outcomes: On successful completion of this course, students will be able to

1. Analyze basic concepts of fuzzy sets, fuzzy relation and fuzzy arithmetic.
2. Identify potential use of fuzzy logic controller in different applications.
3. Evaluate fuzzy logic systems with fuzzy classification, fuzzy pattern recognition and hybrid systems.

Contents:

UNIT I

(08 Hours)

Classical Sets and Fuzzy Sets

Crisp Sets: An Overview, Fuzzy Sets: Basic Types, Fuzzy Sets: Basic Concepts, Characteristics and Significance of the Paradigm Shift, Additional Properties of alpha Cuts, representations of Fuzzy Sets, Extension Principle for Fuzzy Sets, Types of Operations, Fuzzy complements, Fuzzy Intersections: t-Norms, Fuzzy Unions: t-Conorms, Multivalued Logic, Fuzzy Propositions, Fuzzy Quantifiers.

UNIT II

(08 Hours)

Classical Relations and Fuzzy Relations

Cartesian Product, crisp relations, operations on crisp Relations, properties of crisp relations, composition, Fuzzy Relations, operations on fuzzy relations, properties of fuzzy relations, Fuzzy Tolerance and Equivalence Relations, Fuzzy Compatibility Relations, Fuzzy Ordering Relations.

UNIT III

(08 Hours)

Fuzzy Arithmetic, Fuzzification and Defuzzification

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on intervals, Arithmetic Operations on Fuzzy Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations, Fuzzification, Defuzzification to Crisp Sets, λ -Cuts for Fuzzy Relations, Defuzzification to Scalars.

UNIT IV

(08 Hours)

Fuzzy Systems

Conventional Control Systems, Analysis, Design, PID Control, Fuzzy Logic Controller (FLC), Design, Defuzzification, Analysis, Simplified Examples of Applications- Washing machine, Vacuum cleaner. Fuzzy Control System Design, Aircraft Landing Control Problem, Fuzzy Engineering Process Control, Fuzzy Statistical Process Control. Fuzzy Neural Networks, Fuzzy Automata.

UNIT V

(08 Hours)

Fuzzy Classification & Fuzzy Pattern Recognition

Classification by Equivalence Relations, Cluster Analysis, Cluster Validity, c -Means Clustering, Hard c -Means (HCM), Fuzzy c -Means (FCM), Fuzzy c -Means Algorithm, Classification Metric, Hardening the Fuzzy c -Partition, Similarity Relations from Clustering, Feature Analysis, Partitions of the Feature Space, Single-Sample Identification, Multifeature Pattern Recognition.

UNIT VI

(08 Hours)

Hybrid Systems & Applications of Fuzzy Logic

Hybrid Systems, Fuzzy Neuron, Multilayer FNN Architectures, Fuzzy ART, Fuzzy ARTMAP Neural Fuzzy Systems, economics application, civil & industrial applications, Fuzzy Systems and Genetic Algorithms, Fuzzy Regression, Interpersonal Communication.

Text Books/ References:

1. Timothy Ross, "Fuzzy Logic with Engineering Applications", Third Edition, Wiley publication.
2. George J. Klir & Bo Yuan, "Fuzzy Sets & Fuzzy Logic Theory & Applications", Prentice Hall India, 2007.
3. Ahmad M. Ibrahim "Fuzzy Logic for Embedded Systems Applications" 2003, Elsevier Science.



Self-Study Paper II: BIOMEDICAL INSTRUMENTATION

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

- Knowledge of basic cell structure, organs and systems in the human body

Course objective:

1. To make student understand different body systems.
2. To introduce amplifiers in order to design ECG Preamplifier system to pick up ECG waveform from the body.
3. To introduce various types of blood pressure monitoring and pulse oxymetry techniques.
4. To make student understand the importance of respiratory organs and parameters.
5. To make student understand various types of clinical lab equipments and its applications.
6. To introduce importance of electrosurgical equipment and electrodes used for electrosurgical

Course Outcomes: On successful completion of this course, students will be able to

1. Classify different body systems with their functions.
 2. Design ECG preamplifier system to pick up ECG waveform from the body.
 3. Categorize various pressure transducers as well as measurement techniques used for blood pressure monitoring.
 4. Describe respiratory system organs, parameters and respiratory transducers.
 5. Describe clinical equipments used in the pathology lab for blood test and analysis.
 6. Classify various electrodes and techniques used for surgery.
-

Contents

UNIT I (08 hours)

Human Body System

Human body as a uniquely adaptable organism , Overview of Different systems

UNIT II (08 hours)

Amplifier Systems for ECG

Introduction to amplifiers in biomedical electronics,ECG wave form,Standard lead system,ECG Preamplifier.

UNIT III (08 hours)

Blood Pressure and Blood Flow Measurements

Physiological pressures, Blood pressure measurements, Pressure transducers, pulse oximetry

UNIT IV (08 hours)

Respiratory System Measurements

Introduction to human respiratory system,organs of Respiration,Parameters of respiration,Respiratory transducers, plethysmography.

UNIT V (08 hours)

Clinical Laboratory Equipments

Blood components, overview of Laboratory measurements,Blood gas Analyzer,Blood cell counters,Spectrophotometer,Blood Tests and analyzers.

UNIT VI (08 hours)

Electrosurgical Equipments

Introduction to Electrosurgical Unit ,electro surgery circuits, Electro surgery safety, Patients safety

Text Books:

1. Joseph.J.Carr and John.M.Brown, "Introduction to Biomedical Equipment Technology", Pearson Education.

References:

1.Arthur C Guyton, "Medical Physiology", Prism Book.

2.Leslie Cromwell,Fred.J.Weibel,"Biomedical Instrumentation and Measurements", PHI.



Self-Study Paper II: COMPUTER AIDED VLSI DESIGN

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

VLSI Design

Course objective:

The course will introduce CAD tools required for VLSI.

Course Outcomes:

On successful completion of this course, students will effectively utilize various CAD tools for VLSI design.

Contents

UNIT I

Digital Design and Design Environments: (08 hours)

Design, Hierarchy, Views, Connectivity, Spatial Dimensionality, Introduction of Design Environments, System Level, Algorithm Level, Component Level, Layout Level

UNIT II

Representation: (08 hours)

Introduction, General Issues of Representation, Hierarchy Representation, View Representation, Connectivity Representation, Geometry Representation.

UNIT III

Synthesis Tools: (08 hours)

Introduction, Cell Contents Generation and Manipulation, Generators of Layout outside the Cells, Cells and Their Environment, Silicon Compilers, Post layout Generators,

UNIT IV

Static Analysis Tools, Dynamic Analysis Tools:

(08 hours)

Node Extraction, Geometrical Rule Checker, Electrical Rule Checker, Verification, Circuit–Level Simulators, Logic-Level Simulators, Functional and Behavioral Simulation Issues, Event Driven and Hardware Simulation

UNIT V

Output of Design Aids and Programmability:

(08 hours)

Introduction, Circuit Boards, Integrated Circuits, Implementation Issues, Imperative Programming, Declarative Programming, Hierarchy.

UNIT VI

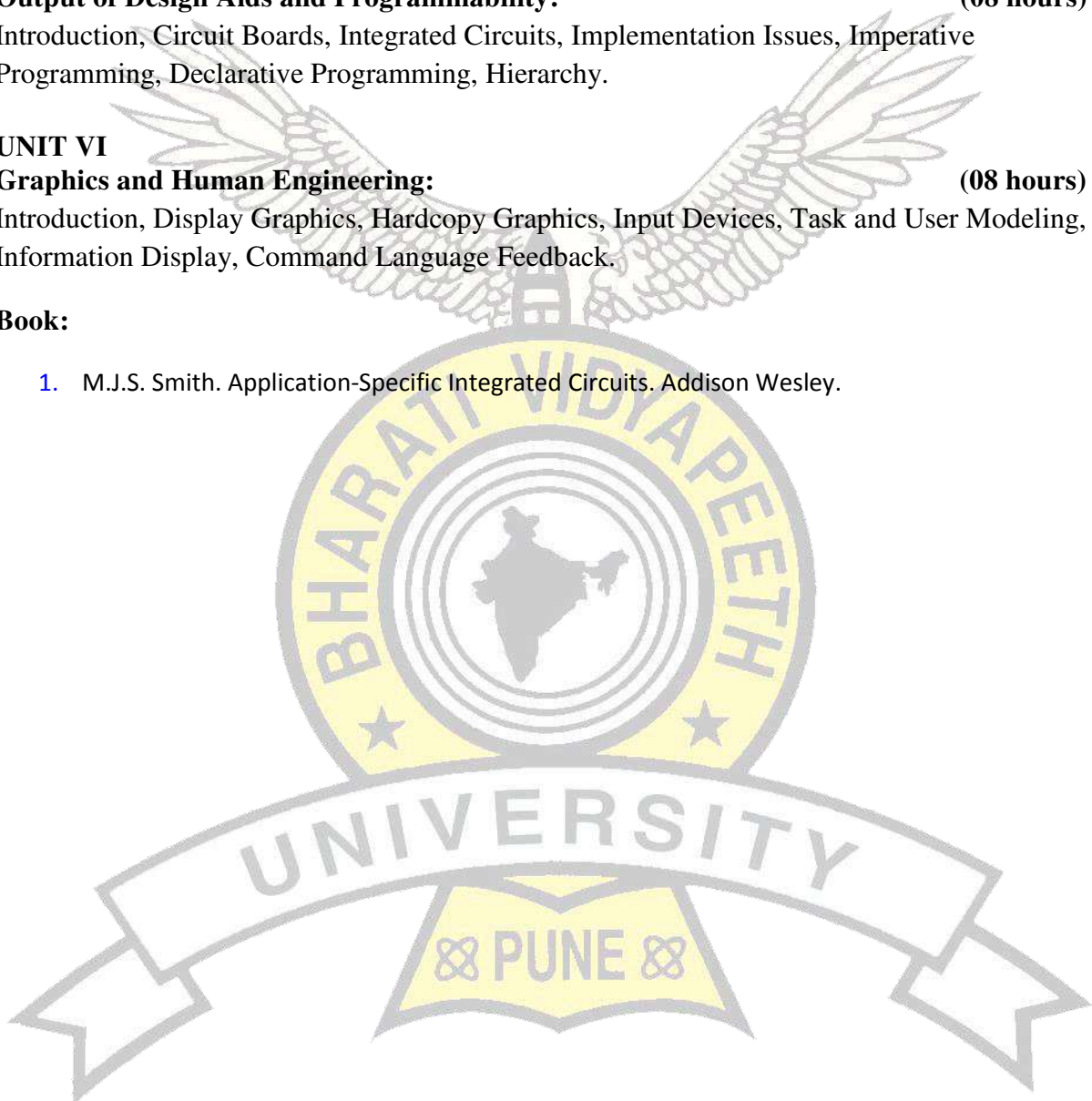
Graphics and Human Engineering:

(08 hours)

Introduction, Display Graphics, Hardcopy Graphics, Input Devices, Task and User Modeling, Information Display, Command Language Feedback.

Book:

1. M.J.S. Smith. Application-Specific Integrated Circuits. Addison Wesley.





Self-Study Paper II: HUMAN VALUES & PROFESSIONAL ETHICS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

Course prerequisites:

- Listening skills for academic and professional purposes.
- Ability to speak effectively in English in real-life situations.

Course objective:

1. To create awareness on engineering ethics and human values
2. To understand social responsibility of an engineer
3. To appreciate ethical dilemma while discharging duties in professional life

Course Outcomes: On successful completion of this course, students will be able to

1. Familiar with the ethical issue and professional issue in the engineering profession.
2. Familiar with social impact of decision and the action of participants in the engineering profession

Contents

UNIT I

Human Values

(08 Hours)

Morals, Values and Ethics - Integrity, - Work Ethics - Service Learning - Civic Virtue - Respect for others - Living Peacefully - Caring - sharing - Honesty - Courage - Valuing Time- Cooperation - Commitment - Empathy – Self-Confidence - Character - spirituality

UNIT II

Engineering Ethics

(08 Hours)

Senses of engineering ethics - Variety of Moral Issues - Types of inquiry - Moral Dilemmas Moral Autonomy - Kohlberg's Theory - Gilligan's Theory - Consensus and Controversy -

Models of Professional Roles - Theories about Right Action - Self-Interest - Customs and Religion .

UNIT III

(08 Hours)

Safety, Responsibilities and Rights

Safety and Risk - Assessment of safety and Risk - Risk Benefit Analysis and Reducing Risk - The Three Mile Island. And Chernobyl Case Studies. Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Whistle Blowing - Professional Rights – Employee Rights - Intellectual Property Rights (IPR) – Discrimination

UNIT IV

(08 Hours)

Global Issues

Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development - Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors - Sample Code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), etc.

UNIT V

(08 Hours)

Engineer's responsibility for safety

Collegiality and loyalty-respect of authority-collective bargaining-confidentiality-conflicts of interest-occupational crime- professional rights-employee rights-Intellectual property rights(IPR).

UNIT VI

(08 Hours)

Engineering as social Experimentation

Engineering as social experimentation-engineers as responsible experimenters-codes of ethics-a balanced outlook on law- the challenger case study

Text Books/ References:

- Bayles, M.D.: Professional Ethics, California: Wadsworth Publishing Company, 1981.
- Koehn, D.: The Ground of Professional Ethics, Routledge, 1995.
- R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006 .
- Mike Martin and Ronald Schinzinger, Ethics in Engineering”, McGraw-Hill, New YORK 1996
- Camenisch, P.F.: Grounding Professional Ethics in a Pluralistic Society, N.Y.: Haven Publications, 1983.
- Wuest, D.E. : Professional Ethics and Social Responsibility, Rowman & Littlefield, 1994.

**Proposed Structure of M.Tech Electrical Engineering (Power Systems)
CBCS Pattern (2015-16)**

STRUCTURE & EXAMINATION PATTERN

Semester I											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR	
Research Methodology	04	--	60	20	10	10	-	--	04	-	04
FACTS and HVDC	04	--	60	20	10	10	-	--	04	-	04
Advanced Microcontroller & Its Applications	04	02	60	20	10	10	25	25	04	01	05
Power System Modeling	04	02	60	20	10	10	25	25	04	01	05
Total	16	04	240	80	40	40	50	50	16	02	18

Semester II											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR	
Power Systems Dynamics	04	--	60	20	10	10	--	--	04	-	04
Digital Protection of Power System	04	02	60	20	10	10	25	25	04	01	05
PLC & SCADA	04	02	60	20	10	10	25	25	04	01	05
Elective - I	04	--	60	20	10	10	--	--	04	--	04
Total	16	04	240	80	40	40	50	50	16	02	18

Semester III									Total Duration: 28 hrs/week Total Marks : 500 Total Credits: 40		
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR	
Power Quality Issues	04	02	60	20	10	10	25	25	04	01	05
Elective –II	04	02	60	20	10	10	25	25	04	01	05
Self-Study Paper-I	04	--	60	20	10	10	-	-	04	-	04
Dissertation Stage –I	-	07	-	-	---	--	25	25		21	21
Seminar	-	05	-	-	--	--	25	25	-	05	05
Total	12	16	180	60	30	30	100	100	12	28	40

Elective – I	Elective - II
a) Power Sector Restructuring & Deregulation b) Power system planning & reliability	a) Advanced Control system b) Advanced Power Electronics & Drives

Semester IV									Total Duration: 14 hrs/week Total Marks : 325 Total Credits: 34		
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR	
Self-Study Paper-II	04	--	60	20	10	10	-	-	04	-	04
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30
Total	04	10	60	20	10	10	150	75	04	30	34

List of Self Study paper I & II

Self Study Paper I	Self Study Paper II
Condition Monitoring of Electrical Equipments	Electrical Power Capacitors
Energy Storage Devices	Nano technology & its applications in Electrical Engineering
Digital Measurement Techniques	High voltage insulation system & design
Energy Conservation & Audit	Use of synchronized measurement techniques in power system
Solar PV & Wind energy systems	Distributed Generation
Demand response & demand side management	Smart Grid - Automation System for State Transmission Utility
Digital Signal Processing Applications in Power Systems	Substation design

RESEARCH METHODOLOGY		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
UNIT - I	Fundamentals	(08 Hours)
	Definition, Research Characteristics, Research Need, Objectives and types of research, Motivation and objectives – Research methods vs Methodology, Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical	
UNIT - II	Formulation of research problem	(08 Hours)
	Research Formulation – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis. Summarizing a Technical Paper -summary template , Online tools - Google, CiteSeer, ACM Digital Library, IEEE, The on-line Computer Science bibliography, Searching patents	
UNIT - III	Research design methods	(08Hours)
	Research design, sampling design and scaling techniques – Research design – Basic Principles- Need of research design — Features of good design – Important concepts relating to research design, basic principles of experimental designs, implications of sample design, steps in sample design, criteria of selecting sampling procedure, characteristics of good sampling design, different types of sample design. Scaling techniques: measurement scales, sources of error, technique of developing measurement tool, important scaling techniques, scale construction techniques.	
UNIT - IV	Statistical analysis	(08 Hours)
	Data Collection and analysis:- Observation and Collection of primary and secondary data - Methods of data collection, processing operations, types of analysis, statistics in research, measures of central tendency, measures of dispersion, measures of asymmetry, measures of relationships, simple regression analysis, multiple correlation and regression, partial correlation.	
UNIT - V	Research Paper & Thesis writing	(08 Hours)
	Reporting and thesis writing – Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes - Oral presentation – Planning – Preparation –Practice – Making presentation –	

	Use of visual aids - Importance of effective communication - Documentation and presentation tools: LATEX. Types of technical papers - Journal papers, Conference papers, Survey papers, Poster papers, Review papers Comparison, Structure of a survey, conference and journal paper, Organization and flow of thesis/ Project report, Research proposal: preparation, budgeting, presentation, funding agencies for engineering research,	
UNIT - VI	Research ethics, IPR and publishing	(08 Hours)
	Ethics: ethical issues. IPR: intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights Publishing: design of research paper, citation and acknowledgement, plagiarism tools, reproducibility and accountability.	
Text Books:		
1. Kothari, C.R., Research Methodology: Methods and Techniques. New Age International		
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., An introduction to Research Methodology, RBSA Publishers		
3. Suresh Sinha, Anil K Dhiman, Research Methodology, ESS Publications, Volumes 2		
4. Day R.A., How to Write and Publish a Scientific Paper, Cambridge University Press		
5. Wadehra, B.L. Law relating to patents, Trade Marks, copyright designs and geographical indications. Universal Law Publishing		
Reference Books:		
1. Louis Cohen, Lawrence Manion and Keith Morrison, Research Methods in Education, 7th Edition, Cambridge University Press, ISBN – 978-0415-58336-7		
2. Anthony, M., Graziano, A.M. and Raulin, M.L., Research Methods: A Process of Inquiry, Allyn and Bacon		
3. Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, 2nd Edition, APH Publishing Corporation		
4. Leedy, P.D. and Ormrod, J.E., Practical Research: Planning and Design, Prentice Hall		
5. Fink, A., Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications		
6. Leslie Lamport, 'Latex: A document preparation system' Addison Wesley, Reading, Massachusetts, second		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

FACTS & HVDC

FACTS & HVDC		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
UNIT - I	FACTS:	(08 Hours)
	Conventional methods to increase transmission capacity, Series, Shunt reactors, Phase shifting transformers, Synchronous condensers, Flexible AC transmission controllers Basics, Challenges and needs, Static Power converter structures, AC controller based structures, DC link converter topologies, Converter output and harmonic control, Power converter control issues	
UNIT - II	Shunt and Series Compensation:	(08 Hours)
	Operation and control of thyristor controlled reactor, Thyristor switched Capacitor, SVC, STATCOM configuration and control, Applications of SVC, Power oscillation damping, Mitigation of sub-synchronous resonance, TCSC operation, Layout and protection, Applications of TCSC, Static Synchronous Series Compensator (SSSC)	
UNIT - III	Unified Power Flow Controller:	[08 Hrs]
	UPFC configuration, Independent real and reactive power flow control, Control scheme for UPFC, Basic control system for P and Q control, Dynamic performance, Operational constraints of UPFC, Power flow studies in UPFC embedded systems	
UNIT - IV	General Background of HVDC Transmission:	(08 Hours)
	EHV AC versus HVDC Transmission, Different configurations of HVDC link - Monopolar, Bipolar, Back to Back, Power flow through HVDC link, Equation for HVDC power flow, Connections of three phase six pulse and twelve pulse converter bridges, Voltage and current waveforms. Effect of delay angle, Extinction angle, Overlap angle, Control of DC voltage	
UNIT - V	Multi Terminal HVDC:	(08 Hours)
	Bipolar HVDC terminal, Converter transformer connections, Switching arrangements in DC yard for earth return to metallic return, HVDC switching system, Switching arrangements in a bipolar HVDC terminal, Sequence of switching operations, HVDC circuit breakers, DC current interruption, Commutation principle, Probable types and applications of HVDC circuit breakers, Multi-terminal HVDC systems, Parallel tapping, Reversal of power, Configurations and types of multi-terminal HVDC systems, Commercial multi terminal systems	
UNIT - VI	Protection and Control:	(08 Hours)
	Faults and abnormal condition in bipolar, Two terminal HVDC system, Pole-wise segregation, Protective zones, Clearing of DC line faults and reenergizing, Protection of converters, Transformer, Converter valves, DC yards, Integration of protection and controls, Hierarchical levels of control, Block diagram, Schematic diagram, Current control, Power	

	control, DC voltage control, Commutation channel, Master control, Station control, Lead station, Trail station, Pole control, Equidistant firing control, Synchronous HVDC link, Asynchronous HVDC Link	
Text Books:		
1. E.Acha, V.A.Agelidis, O.Anaya-lara and TJE MillerNewnes, Power Electronic control in Electrical Systems Oxford.		
2. N.G. Hingorani and L.Gyugi, Understanding FACTS- IEEE Press, New York.		
3. J. Arrilaga, Y.H.Liu and N.R.Watson, Flexible Power Transmission- The HVDC Options, John Wiley and sons Ltd., New York.		
Reference Books:		
1. T J E Miller, “Reactive Power Control in Electric Systems”, John Wiley		
2. Padiyar K R “FACTS Controllers in Power Transmission & Distribution”, New Age.		
3. R. Mohan and R.K.Varma, “Thyristor-Based FACTS Controllersfor Electrical Transmission Systems”, IEEE Press.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

Advance Micro controllers and applications

Advance Micro controllers and applications		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
	TW&OR : 50 Marks	01 Credits
UNIT - I	Introduction to PIC 16F8XX family and development tools. CPU architecture and instruction set. Harvard architecture and pipelining, program memory considerations, register file structure and addressing modes, CPU registers.	(08 Hours)
UNIT - II	PIC peripherals I/O ports, external interrupts and timers, timer operation, ADC, short overview of synchronous serial port, serial peripheral interface I2C bus.	(08 Hours)
UNIT - III	Learning MPLAB (V 5.0 or above) Integrated development environment from Microchip (Assembler and simulator), Study of applications like motor control, temperature control, lamp dimmer, 4X4 matrix keyboard and LCD interfacing etc.	(08 Hours)
UNIT - IV	ARM & AVR Processors : RISC, ARM design philosophy, ARM fundamentals, instruction set, thumb instruction set, exception & interrupt handling, efficient C programming, optimizing ARM assembly code, AVR architecture, instruction set, hardware interfacing, communication links and design issues.	(08 Hours)
UNIT - V	Interfacing considerations: Intel process communication, synchronization of processes, tasks, threads, devices & buses for networks, hardware-software co-design embedded programming in C/RT Linux	(08 Hours)
UNIT - VI	Real time operating systems: Survey of software architectures- round robin, with interrupts, function queue scheduling, RTOS architecture, selecting an architecture, task states, task and data semaphores and shared data, message queues, mailboxes ,pipes, timer functions, events, memory management, interrupt routines in an RTOS environment, basic design using RTOS, embedded software development tools, Micro C/OS- II, VX works.	(08 Hours)
Reference Books:		
<ol style="list-style-type: none"> 1. Microchip PIC family Microcontroller handbook 2. Design with PIC microcontrollers –John Peatman, Pearson Education Asia ,LPE 3. Rajkamal, ”Embedded system –architecture, programming and design”,TMH Publication, edition 2003 4. David Simon, ” An embedded software Primer”, Pearson education , Asia 5. Jonathan W. Valvano, Brooks, Cole” Embedded Microcomputer systems-Real time interfacing” Thomson Learning 		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

Power System Modeling		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04Hours / Week	End Semester Examination: 60 Marks	04Credits
	Continuous Assessment: 40 Marks	
	PR & OR : 50 Marks	01 Credits
UNIT – I	Modeling of Non-Electrical Parameters:	(08 Hours)
	Different areas of power system analysis, Need for mathematical modeling of power system, Simplified models of non-electrical components such as boiler, steam & hydro turbine, governor system	
UNIT – II	Modeling of Transformers:	(08 Hours)
	Transformer modeling for two winding transformer, tap-changer, phase shifting transformer, three winding transformer and auto-transformer	
UNIT – III	Modeling of Transmission Line:	(08 Hours)
	Modeling of transmission network, Transformation to Alpha-Beta components using D-Q components, Steady state equations	
UNIT – IV	Synchronous Machine Modeling:	(08 Hours)
	Introduction, Park's Transformation, Flux Linkage Equation, Voltage Equations, Formulation of State-Space Equation, Current Formulation, Per Unit Conversion, Normalizing Voltage equations, Normalizing Torque Equations, Torque & Power Equivalent Circuit of Synchronous Machine	
UNIT – V	Excitation System Modeling :	
	Types of excitation systems, Control and protective systems, Modeling of excitation systems (excitation system components and entire excitation system, Voltage Response Ratio, Exciter voltage ratings	(08 Hours)
UNIT – VI	Load Modeling:	
	Basic Load Modeling concepts, Static load representation, Dynamic load representation, Induction motor (as load) modeling, synchronous motor (as load) modeling, acquisition of load model parameters	(08 Hours)
Text Books:		
1. K. R. Padiyar", Power System Dynamics", B.S. Publications		
2. John J. Granier & W.D. Stevenson Jr., "Power System Analysis ", 4 th Edition, McGraw Hill International Student Edition		
3. Olle Elegard, "Electrical Energy System Theory - An Introduction", TMH Publishing Company, 2 nd Edition		
4. Kundur, "Power System Dynamics & Control", IEEE Press, New York		
Reference Books:		
1. Anderson & Foud, "Power System Control & Stability", Vol-I, IEEE Press, New York		
2. P.S.R Murthy, " Power System Operation & Control"		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II	
Unit Test -2	UNIT – III, UNIT – IV	
Unit Test-3	UNIT –V, UNIT-VI	

Power System Dynamics		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
UNIT - I	Classical Methods of Power System Dynamic Studies	(08 Hours)
	Equality and inequality constraints in power system operation, state transition diagram, concept of system security and stability, classical model of system of one machine connected to infinite bus, Clark diagram for two machines series reactance system, extension of Clark diagram to cover any reactance network, elementary model of overall power system	
UNIT - II	Small Signal Stability:	(08 Hours)
	Small signal analysis, analysis of synchronizing & damping torque, state equation for small signal model, Simplified synchronous machine model, calculation of initial conditions, system simulation, improved model of synchronous machine, small signal stability of multi machine system	
UNIT - III	Large Signal Analysis:	(08 Hours)
	Elementary view of transient stability, Large signal analysis, Analysis using numerical integration methods (Modified Euler's, Runge-Kutta), Simulation of power system dynamic response, Analysis of unbalanced faults, Case study of a large system	
UNIT - IV	Power System Stabilizers:	(08 Hours)
	Basic concepts of control signals in power system stabilizers (PSS), Structure and tuning, Field implementation, PSS design and application, Future trends	
UNIT - V	Multi-machine system:	(08 Hours)
	Simplified model, Improved model of the system for linear load, Inclusion of load and SVC, Introduction to analysis of large power system	
UNIT - VI	Voltage stability:	(08 Hours)
	Definition, Factors affecting voltage stability & collapse, Analysis & comparison of angle & voltage stability and voltage instability & collapse, Control of voltage instability, islanding - necessity, methods, advantages and disadvantages, implication on power system dynamic performance	
Text Books:		
1. Anderson & Foud, "Power system Control & Stability", IEEE press, New York		
2. OlleElgerd, "Electrical Energy System Theory - An Introduction", TMH		
Reference Books:		
1. K R Padiyar, "Power System Dynamics", B S Publications		
2. PrabhaKundur, "Power system Stability & control", TMH		
3. C.W.Taylor, "Power System Voltage Stability", TMH		
4. R. A. Walling, "Distributed Generation Islanding", N.W. Miller		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

Digital Protection of Power System

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04Hours / Week		End Semester Examination: 60 Marks	04 Credits
		Continuous Assessment: 40 Marks	
		TW & OR : 50 Marks	01 Credit
UNIT – I	Introduction:		(08 Hours)
	Need for Power system protection, Digital Protection: State of Art, Merits of Microprocessor relaying scheme, Power System Components, Basic Philosophy of Protection Scheme, Section of Protection Scheme, Circuit Breakers and Relays, Types and Applications. Architecture of Modern Digital Relay		
UNIT - II	Static Relays:		(08 Hours)
	Introduction to Static Relay, Overcurrent Relay, Distance Relay, Protection Schemes of transmission lines, Switched distance relay, Poly-phase relay, Relay as Comparator - Dual input Comparator, Relay characteristics by comparison of constants, Multi-input comparator, Pilot Relaying Scheme		
UNIT - III	Elements of Digital Protection:		(08 Hours)
	Basic components of a digital relay, Signal conditioning subsystem: Transducers, Surge protection circuits, Analog filtering and analog multiplexers, Conversion subsystems, Sampling Theorem, Digital filter signal aliasing error, Sample and hold circuit, Digital multiplexing, Digital to analog conversion, Analog to digital conversion, Digital relay subsystem, Digital relay as unit		
UNIT – IV	Digital Protection of Transmission Line:		(08 Hours)
	Protection scheme of transmission line, Distance Relay, Travelling wave relays. Digital protection scheme based on fundamental signal: hardware design, software design, Digital protection of EHV/UHV transmission line based on travelling wave phenomena, New relaying scheme using amplitude comparison		
UNIT – V	Digital Protection of Transformer and Synchronous Generator:		(08 Hours)
	Faults in Transformer, Schemes used for Transformer Protection, Digital Protection of Transformer Faults in Synchronous generator, Protection schemes for Synchronous generator, Digital Protection of Synchronous Generator		
UNIT – VI	Artificial Intelligence in Power System Protection:		(08 Hours)
	Introduction, An Expert System (ES) for Protective Relay Settings: Introduction, Problem Description, ES Approach, Typical Application, Fuzzy Logic (FL) for Power system Protection: Introduction, Problem Description, FL Approach, Artificial Neural Network (ANN) in Phase Selection: Introduction, Problem Description, Measurement of fault generated in high frequency components, ANN Approach		

Text Books:

1. "Digital Protection – Protective Relaying from Electro-Mechanical to Microprocessor" By L.P. Singh. 2nd Edition, Reprint-2004, New Age International Publisher, New-Dehli.
2. "Digital Power System Protection" By S.R. Bhide. PHI Learning Private Limited, New Delhi.
3. "Artificial Intelligence Techniques in Power Systems", By Kevin Warwick, Auther Ekwue & Raj Aggarwal, Publication : Institution of Electrical Engineers, London, UK.
4. "Digital Protection for Power system" by A.T Johns and S.K. Salman. Peter Peregrinus Ltd. Of The Institute of Electrical Engineers, London, United Kindom.
5. "Soft Computing Techniques and its Applications in Electrical Engineering" By Dr. Devendra Chaturvadi,

Publication: Springer – Verlag Berlin Heidelberg.

Reference Books:

1. “Power System Protection 4: Digital Protection and Signalling” edited by ETA Electricity Training Association. Published by Institute of Engineers, London, UK.

2. “Digital Signal Processing in Power System Protection and Control” By Waldemar Rebizant, Janusz Szafran, Andrzej Wiszniewski.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

PLC and SCADA

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
	Term Work: 50 Marks	01 Credits

UNIT – I	Introduction to PLC	(08 Hours)
	Definition & History of PLC, Overall PLC system, PLC Input and Output modules, CPU, Interfaces, Power supplies, PLC advantages and disadvantages, Selection criteria for PLC, Architecture of Industrial Automation Systems, Process Control, PID Control, Predictive Control, Introduction to Sequence Control, PLCs and Relay Ladder Logic, Hardware environment	
UNIT – II	PLC Programming	(08 Hours)
	Programming equipments, Construction of PLC ladder diagram, Basic components and symbols in ladder diagram, Ladder logic, Functional block, Structural text, Instruction, trouble shooting, features, programming ON/OFF Inputs to produce ON/OFF outputs, Networking of Sensors, Actuators and Controllers: The Fieldbus, The Fieldbus Communication Protocol	
UNIT – III	PLC Applications	(08 Hours)
	Analog PLC operation, PID control of continuous processes, simple closed loop systems, closed loop system using Proportional, Integral & Derivative (PID), PLC interface, Motors Controls: AC Motor starter, AC motor overload protection, DC motor controller, Variable speed (Variable Frequency) AC motor Drive	
UNIT – IV	SCADA	(08 Hours)
	Need of SCADA system, Features, SCADA architecture – First generation, Second generation, Third generation, HMI, MTU, RTU, IED's, 7 Layers of OSI, Communication requirements for SCADA (communication protocols – DNP, IEC, Ethernet, TCP/IP, Modbus, UDP), Client – Server based communication concept, SCADA Benefits	
UNIT – V	SCADA in Power System	(08 Hours)
	Operation and control of interconnected power system, Automatic substation control, SCADA configuration, Energy Management System (EMS), system security, State estimation, SCADA system security issues overview	
UNIT – VI	Supervisory Management	(08 Hours)
	Networked SCADA environment with implementation examples, Substation Automation and Equipment condition monitoring using SCADA, Distribution system design mapping, trouble call management, Customer level intelligent automation system, computer level monitoring and control of equipments	

Text Books:

1. Terson, "Power System Control Technology", Prentice Hall
2. Green, J. N, Wilson, R, "Control and Automation of Electric Power Distribution Systems", Taylor and Francis, 2007
3. Turner, W. C, " Energy Management Handbook", 5th Edition, 2004
4. Gary Dunning, "Introduction to Programmable Logic Controllers", Thomson, 2nd Edition
5. John W. Webb, Ronald A. Reis, "Programmable Logic Controllers: Principles and Application", 5th Edition
6. Stuart A Boyer, "SCADA supervisory control and data acquisition"

Reference Books:

1. Handschin, E. "Energy Management Systems", Springer Verlag, 1990
2. Gordan Clark, Deem Reynders, "Practical Modem SCADA Protocols"

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

(Elective – I) Power Sector Restructuring & Deregulation		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
UNIT - I	Power Sector in India Introduction to various institutions in an Indian Power sector such as CEA, Planning Commissions, PGCIL, PFC, Ministry of Power, State and Central governments, REC, Load Dispatch Centers, Utilities and their roles. Critical issues / challenges before the Indian power sector, Electricity act 2003-Provision in the Generation, Transmission & Distribution Sector, Various national policies and guidelines under this act.	(08 Hours)
UNIT - II	Fundamentals of Economics & Power Sector Regulation Fundamentals of economics applicable to Power Sector, Consumer behavior, Supplier behavior, Market Equilibrium, Short-run & Long-run costs, Various costs of production- Total cost (TC), Average fixed cost (AFC), Average variable cost (AVC), Average cost (AC) and Marginal cost (MC), Relationship between short-run and long-run average costs, Perfectly competitive market, Concept of life cycle cost, Annual rate of return, methods of calculations of Internal Rate of Return (IRR) and Net Present Value (NPV) of project, Role of regulation and evolution of regulatory commission in India, Types and methods of economic regulation, Regulatory process in India.	(08 Hours)
UNIT - III	Power Tariff Different tariff principles (marginal cost, cost to serve, average cost), Consumer tariff structures and considerations, different consumer categories, telescopic tariff, fixed and variable charges, time of day, interruptible tariff, and different tariff based penalties and incentives etc., Subsidy and cross subsidy, life line tariff, Comparison of different tariff structures for different load patterns. Government policies in force from time to time. Effect of renewable energy and captive power generation on tariff, Availability based tariff, Latest reforms and amendments	(08 Hours)
UNIT - IV	Power sector restructuring and market reform Introduction to power sector restructuring, Reasons for restructuring / deregulation of power industry, Understanding the restructuring process-Entities involved, The levels of competition, The market place mechanisms and Sector-wise major changes required, Different industry structures and ownership models, Market models based on contractual arrangements-Monopoly Model, Single buyer Model, Wholesale competition model and Retail competition model, Market architecture, Timeline for various energy markets, Bilateral / forward contracts, The spot market, Models for trading arrangements, ISO or TSO model, Reasons and objectives of deregulation of various power systems across the world-The US, The UK, The Nordic Pool and The developing countries. Congestion Management, Ancillary Services	(08 Hours)
UNIT - V	Electricity Markets Pricing and Non-price issues Electricity price basics, Market Clearing price (MCP), Zonal and locational MCPs, Dynamic, spot pricing and real time pricing, Dispatch based pricing, Power flows and prices. Optimal power flow Spot prices for real and reactive power. Unconstrained real spot prices, constraints and real spot prices. Non price issues in electricity restructuring (quality of supply and service, environmental and social considerations), Global experience with	(08 Hours)

	electricity reforms in different countries.	
UNIT - VI	Transmission Planning and Pricing Transmission planning & operation in open access power systems, Introduction & Principles of transmission pricing, Different transmission pricing methods, Transmission cost allocation methods, Marginal & Composite pricing Paradigms & their comparison, Introduction to transmission loss allocation & various methods of loss allocation, Debated issues in transmission pricing, Congestion issues and management, Ancillary Service Management, Forward ancillary service auction. Power purchase agreements.	(08 Hours)
Reference Books:		
<ol style="list-style-type: none"> Loi Lei Lai, 'Power System Restructuring & Deregulation, John Wiley & Sons Ltd. "Know Your Power", A citizens Primer On the Electricity Sector, Prayas Energy Group, Pune Sally Hunt, "Making Competition Work in Electricity", 2002, John Wiley Inc Electric Utility Planning and Regulation, Edward Kahn, American Council for Energy Efficient Economy D. S. Kirschen & G. Strbac, 'Fundamentals of Power System Economics', John Wiley & Sons Ltd. Steven Stoft, 'Power System Economic Designing markets for Electricity, Wiley-Inter Science. M Shahidepour, Hatim Yamin, Zuyi Li, 'Market Operations in Electrical Power Systems, Forecasting, Scheduling and Risk Management', Wiley Inter Science. 		
References:		
<ol style="list-style-type: none"> Regulation in infrastructure Services: Progress and the way forward - TERI, 2001 Maharashtra Electricity Regulatory Commission Regulations and Orders - www.mercindia.com Various publications, reports and presentations by Prayas, Energy Group, Pune www.prayaspune.org Central Electricity Regulatory Commission, Regulations and Orders - www.cercind.org Electricity Act 2003 and National Policies – www.powermin.nic.in Market Operations in Electric Power Systems Forecasting, Scheduling and Risk Management – Mohammad Shadepur, Hatim Yatim, Zuyi Li. Bhanu Bhushan, "ABC of ABT - A primer on Availability Tariff" - www.cercind.org 		
Website: NPTEL-Phase II-		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

(Elective – I) POWER SYSTEM PLANNING AND RELIABILITY		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
UNIT - I	Unit 1: Load Forecasting :	(06 Hours)
	Introduction, Factors affecting Load Forecasting, Load Research, Load Growth Characteristics, Classification of Load and Its Characteristics, Load Forecasting Methods - (i) Extrapolation (ii) Co-Relation Techniques, Energy Forecasting, Peak Load Forecasting, Reactive Load Forecasting, Non-Weather sensitive load Forecasting, Weather sensitive load Forecasting, Annual Forecasting, Monthly Forecasting, Total Forecasting, Objectives & Factors affecting to System Planning , Short Term Planning, Medium Term Planning, Long Term Planning. [10 hrs]	
UNIT - II	Unit 2: Probability theory	(06 Hours)
	Introduction to probability, Probability distributions : Random variables, density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution. Normal Gaussian, Gamma and Beta distribution. Correlation and regression	
UNIT - III	Unit 3: Reliability	(06 Hours)
	Reliability, Failure, Concepts of Probability, Evaluation Techniques (i) Markov Process (ii) Recursive Technique, Stochastic Prediction of Frequency and Duration of Long & Short Interruption, Adequacy of Reliability, Reliability Cost.	
UNIT - IV	Unit 4: Generation Planning and Reliability :	
	Objectives & Factors affecting Generation Planning, Generation Sources, Integrated Resource Planning, Generation System Model, Loss of Load (Calculation and Approaches), Outage Rate, Capacity Expansion, Scheduled Outage, Loss of Energy, Evaluation Methods. Interconnected System, Factors affecting interconnection under Emergency Assistance.	
UNIT - V	Unit 5: Transmission Planning and Reliability	(06 Hours)
	Transmission Planning and Reliability: Introduction, Objectives of Transmission Planning, Network Reconfiguration, System and Load Point Indices, Data required for Composite System Reliability.	
UNIT - VI	Unit 6: Distribution Planning and Reliability	(06 Hours)
	Radial Networks – Introduction, Network Reconfiguration, Evaluation Techniques, Interruption Indices, Effects of Lateral Distribution Protection, Effects of Disconnects, Effects of Protection Failure, Effects of Transferring Loads, Distribution Reliability Indices. Parallel & Meshed Networks -Introduction, Basic Evaluation Techniques, Bus Bar Failure, Scheduled Maintenance, Temporary and Transient Failure, Weather Effects, Breaker Failure.	

Text Books:	
1. Roy Billinton & Ronald N. Allan, Reliability Evaluation of Power System - Springer Publication.	
2. R.L. Sullivan Power System Planning -, Tata McGraw Hill Publishing Company Ltd.	
3. Miler & Freund's, Probability and Statistic for Engineers, Pearson Education, Richard Johnson.	
Reference Books:	
1. X. Wang & J.R. McDonald, Modern Power System Planning -, McGraw Hill Book Company	
2. T. Gönen, Electrical Power Distribution Engineering - McGraw Hill Book Company	
3. B.R. Gupta Generation of Electrical Energy -, S. Chand Publications	
4. A.S. Pabla, Electrical Power Distribution Tata McGraw Hill Publishing Company Ltd.	
5. T.W. Berrie, Electricity Economics & Planning -, Peter Peregrinus Ltd., London	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Power Quality Issues

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
		Continuous Assessment: 40 Marks			
UNIT - I	Voltage sag; swells and interruptions Introduction; importance of power quality; terms and definitions of power quality as per IEEE std. 1159. Sources & Effects of Power Quality Problems; Sources of sag; swell and interruptions; Estimation of voltage sag performance; Fundamental principles of protection; solutions at end user level; utility systems and fault clearing issues; motor starting sags; evaluation of the economics of different alternatives.				[8Hrs]
UNIT - II	Transient Over- Voltages Sources of transient over voltages; capacitor switching; lightening; Ferro resonances and other switching transients; Principles of over voltage protections; devices of over voltage protections; Utility capacitor switching transients; Utility system lightening protection; managing Ferro resonance; switching transients problems with loads; computer tools for transient analysis.				[8Hrs]
UNIT - III	Fundamentals of Harmonics and its Analysis Introduction; the Mechanism of Harmonic Generation; Definitions and Standards: Factors Influencing the Development of Standards, Existing Harmonic Standards, General Harmonic Indices. Introduction to Harmonic Analysis; Fourier Series and Coefficients; Simplifications Resulting from Waveform Symmetry; Complex Form of the Fourier Series; Convolution of Harmonic Phasors; The Fourier Transform; Sampled Time Functions; Discrete Fourier Transform (DFT); The Nyquist Frequency and Aliasing; Fast Fourier Transform (FFT); Window Functions; Efficiency of FFT Algorithms; Alternative Transforms.				[8Hrs]
UNIT - IV	Harmonic Sources and Distortions Harmonic Sources : Introduction; Transformer Magnetization Nonlinearities; Rotating Machine Harmonics; Distortion Caused by Arcing Devices; Single-Phase Rectification; Three-Phase Current-Source Conversion; Three-Phase Voltage-Source Conversion; Thyristors-Controlled Reactors. Harmonic Distortion : Introduction; Resonances; Effects of Harmonics on Rotating Machines; Effect of Harmonics on Static Power Plant; Harmonic Interference with Power System Protection; Effect of Harmonics on Consumer Equipment; Interference with Communications.				[8Hrs]
UNIT - V	Computation, Assessment and Harmonic Elimination Harmonic Computation : Introduction; Direct Harmonic Analysis; Derivation of Network Harmonic Impedances from Field Tests; Transmission Line Models; Underground and Submarine Cables; Load Models; Computer Implementation; Examples of Application of the Models; Harmonic Elimination : Introduction; Filter Design Criteria; Network Impedance for Performance Calculations; Tuned Filters; Damped Filters; Conventional Filter				[8Hrs]

	Configurations; Band-Pass Filtering for Twelve-Pulse Converters; Distribution System Filter Planning; Filter Component Properties; D.C. Side Filters; Active Filter	
UNIT - VI	<p>Power quality monitoring; Assessment & Mitigation</p> <p>Need and approaches followed in power quality monitoring; objectives and requirements; Initial site survey; Power quality Instrumentation; Selection of power quality monitors; monitoring location and period; Selection of transducers; Harmonic monitoring; Transient monitoring; event recording and flicker monitoring.</p> <p>Power Quality assessment; Power quality indices and standards for assessment; waveform distortion; voltage and current unbalances; Power assessment under waveform distortion conditions. Power quality state estimation; State variable model; observability analysis; capabilities of harmonic state estimation; Test systems; Mitigation techniques at different environments.</p>	[8Hrs]
<p>References:</p> <ol style="list-style-type: none"> 1. Understanding power quality problems; voltage sag and interruptions - M. H. J. Bollen IEEE press; 2000; series on power engineering. 2. "POWER SYSTEM HARMONICS", Second Edition By Jos Arrillaga and Neville R. Watson; John Wiley and Publication, 2003 ISBN: 0-470-85129-5. 3. Electrical power system quality - Poge C. Dugan; Mark F. McGranghan; Surya santoso; H. Wayne Beaty; second edition; McGraw Hill Pub. 4. Power system quality assessment - J. Arrillaga; M.R. Watson; S. Chan; John Wiley and sons. 5. Electric power quality - G. J. Heydt. 6. Power system harmonics: Computer modeling and analysis- Enriques Acha; Manuel Madrigal; John wiley and sons ltd. 7. Power System Harmonics – J. Arrillaga & N. Watson 8. IEEE std 519-1992/ IEEE std 1159 IEEE recommended practices and requirements for harmonics control in electrical power system. 9. ECBC Code 2007 (Edition 2008) published by Bureau of Energy Efficiency; New Delhi Bureau of Energy Efficiency Publications Rating System; TERI PUBLICATIONS GRIHA Rating System; LEEDS Publications 		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

(Elective – II) Advanced Control System

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
UNIT - I	PID Control:	(08 Hours)
	Review of classical and modern control concepts: PID control and tuning approaches, Selection of Variables for Control, PID Controller Tuning for Dynamic Performance - Determining Tuning Constants for Good Control Performance, Ziegler-Nichols method, Correlations for Tuning Constants, Fine-Tuning the Controller Tuning Constants, Controller tuning based on stability – Dead beat and self tuning, Rate feedback	
UNIT - II	State Variable Analysis:	(08 Hours)
	Control System Analysis Using State Variable Methods, Conversion of transfer function to phase variable and canonical variable model, Eigen value and eigen vector, Kalman's test and Gilbert's Test for controllability and observability analysis and design of control system in state space, Pole placement, State observer, Design of control system with Luenberger observer	
UNIT - III	Nonlinear and Robust Control:	(08 Hours)
	Nonlinear Systems and Equilibrium Points, Concepts of Stability, Describing function analysis, Phase plane analysis, Linearization, Feedback Linearization, Input-output linearization, Input-State Linearization Concept of robust control, Description and categorization of system uncertainties, System and signal norms, Small gain theorem, Robust stability, Design of robust control, Introduction to H-∞ control.	
UNIT - IV	Digital Control:	(08 Hours)
	Structure of the Digital Control System, ADC, DAC, Effects of Sampling of continuous time signals, Quantization, Sample and hold, Reconstruction of signal, Sampling Theorem, Aliasing, Elementary discrete-time signals, Impulse response, Linear convolution and its properties, Z transform: Basics, Properties, Inverse Z transform using power series and partial fraction difference equation, Stability analysis in z- plane with Jury's stability criteria	
UNIT - V	Frequency Analysis:	(08 Hours)

	<p>Frequency response of first order and second order systems, Polar plot, Bode plot, Bode plot from Sweep Frequency Response Analysis (SFRA) of transformer and its conclusion, Phase and group delays, Ideal filters and their pole zero locations, Zero phase and linear phase transfer functions</p> <p>Exponential representation of Fourier series and Fourier transform of continuous time signals, The Fourier series for discrete-Time periodic signals (only concept), The Fourier transform of discrete-time a periodic signals (only concept), Discrete Fourier Transform, Properties: Periodicity, Linearity, Symmetry properties, Circular convolution, Linear convolution using circular convolution, Fast Fourier Transform: Radix 2 DIT and DIF algorithms</p>	
UNIT - VI	Optimal Control:	(08 hours)
	<p>Parameter optimization and optimal control problems, Hamiltonian formulation of optimal control problem, Hamilton-Jacoby equation, Linear regulator problem, Quadratic performance criterion, Numerical solution of Matrix Riccati equation, Pontryagin's minimum principle, Application to optimal control of discrete and continuous systems (quadratic performance index, analysis and design of finite and infinite time), Linear Quadratic Regulators, Introduction to Linear Quadratic Gaussian approach</p>	
Text Books:		
1. 'Modern Control Engineering' - Katsuhiko Ogata, Prentice Hall India, 5th edition 2010.		
2. 'Non-linear Systems', by Hassan Khalil, Prentice Hall.		
3. Digital Control – Ogata , Prentice Hall India		
Reference Books:		
1. Digital Control- B.C.Kuo		
2. 'Digital Control and State Variable Methods' by M. Gopal, Tata-McGraw-Hill Publishing Company Limited		
3. Optimal Control: Linear Quadratic Methods' Brian D. O. Anderson, John Barratt Moore, Dover Publications, 2007		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

(Elective – II) ADVANCED POWER ELECTRONICS AND DRIVES

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
UNIT - I	Converters:				(08 Hours)
	Voltage Source Converters Review of 3-ph-full wave bridge converter, operation and harmonics, 3 level voltage source converters. PWM converter. Generalized technique of harmonic elimination and voltage control. Advanced modulation techniques (space vector modulation, 3 rd harmonic PWM) Comparison of PWM techniques. Converter rating Current source converters (i) Matrix Converter: 3×3 matrix converter, principle of working, mathematical treatment, comparison of matrix converter with multipulse converter (ii) Self and Line commutated current source converter: Basic concepts of CSC, converters with self commutating devices				
UNIT - II	Multilevel Inverters:				(08 Hours)
	Multilevel concept, Types of multilevel Inverters, diode clamped multilevel inverter, flying-capacitors multilevel inverters, cascaded multilevel inverter, switching device currents, D.C. link capacitor voltage balancing, features of multilevel inverters, comparison of multilevel inverters. Applications of multilevel Inverter: Reactive power compensation Back to back intertie system				
UNIT - III	DC Drives:				(08 Hours)
	Single phase and 3 phase converter drives. Four quadrant Chopper drives, closed loop control of DC motor, Permanent magnet DC motor drives, DC Servo drives, applications				
UNIT - IV	Induction Motor Drives:				(08 Hours)
	3 phase induction motor control, stator voltage control/rotor voltage control, voltage and frequency control, current control, closed loop control of 3-phase induction motor. Soft starters, comparison of variable frequency drives, Speed control by static slip power recovery, induction motor servo drives, applications.				
UNIT - V	Synchronous Motor Drives:				(08 Hours)
	Voltage and frequency control, closed loop control of synchronous motors. Synchronous motor servo drive with sinusoidal waveform, synchronous motor servodrive with trapezoidal waveform. Load commutated inverter drives, speed control of synchronous motors by cyclo-convertors, applications				
UNIT - VI	Akagi's p-q theory				(08 Hours)
	Conventional concepts of active and reactive power in single phase and three phase circuits-Equation of power with sinusoidal voltage source and non-linear loads - $\alpha\beta$ transformation of three phase four wire system-Akagi's instantaneous power (pq) theory-relationship between Akagi's components and conventional active and reactive power application of pq theory to reactive and harmonic power compensation in simple circuits.				

Text Books:	
1.	Bimal K Bose, Modern power electronics and AC drives, Pearson education asia
2.	G. K. Dubey, Fundamentals of Electrical Drives CRC press 2002
3.	VedamSubrahmanyam Electric Drives: Concepts &Appl Tata McGraw-Hill
4.	Power electronics convertors, applications and design, Ned Mohan, Tore M Undeland, William P Robbins, Wiley India Pvt. Ltd., 2009
5	E. Acha, Miller & Others, Power Electronic Control in Electrical Systems (Newnes, Oxford publication) – first Edition
6	M. H. Rashid Power Electronics, Prentice Hall of India Pvt. Ltd. New Delhi, (3rd Edition)
7.	R Krishnan, Electric motor drives, modeling, analysis and control, PHI learning Pvt. Ltd. 2001
8.	S.K. Pillai, A first course in electrical drives, Newage international publishers. 2010
Reference Books and Papers:	
1.	E. H. Watanube, R.M. Stephen and Maurico Ardes “New Concepts of instantaneous active and reactive powers in Electrical systems with Generic loads” (IEEE transaction on Power Delivery Vol.8, no.2 April 1993, PP-697-703
2.	L. Benchaïta, S. Sadaate and A. Salemnia – “A comparison of voltage source and current source shunt Active filter by simulation and Experimentation” (IEEE Transaction on Power Systems, Vol 14, No.2, May 99, PP 642-647
3.	H. Akagi, E.H. Watanabe and M. Aredes “Instantaneous Power Theory and Applications to Power Conditioning, IEEE Press, New York
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Bharati Vidyapeeth University
College of Engineering
Department of Mechanical Engineering
M.Tech. (CAD/CAM) CBCS 2015 Course

Semester I										Total Duration: 24 Hrs/Week Total Marks: 500 Total Credits: 20	
Subjects	Teaching Scheme (Hrs) Hrs/Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial /Assignments	TW	Pract/Orals	TH	TH/PR/OR	
Computer Aided Design	4	4	60	20	10	10	-	50	4	2	6
Modeling and Simulation	4	4	60	20	10	10	-	50	4	2	6
Computer Integrated Manufacturing	4	-	60	20	10	10	-	-	4	-	4
Product Design and Development	4	-	60	20	10	10	-	-	4	-	4
Total	16	8	240	80	40	40	-	100	16	4	20

Semester II										Total Duration: 24 Hrs/Week Total Marks: 500 Total Credits: 20	
Subjects	Teaching Scheme (Hrs) Hrs/Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial /Assignments	TW	Pract/Orals	TH	TH/PR/OR	
Advanced Finite Element Methods	4	4	60	20	10	10	-	50	4	2	6
Control Systems	4	4	60	20	10	10	-	50	4	2	6
Precession Engineering	4	-	60	20	10	10	-	-	4	-	4
Optimization for Engineering Design	4	-	60	20	10	10	-	-	4	-	4
Total	16	8	240	80	40	40	-	100	16	4	20

Semester III									Total Duration:24 Hrs/Week Total Marks:375 Total Credits:34		
Subjects	Teaching Scheme (Hrs) Hrs/Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial /Assignments	TW	Pract/Orals	TH	TH/PR/OR	
Elective I	4	-	60	20	10	10	-	-	4	-	4
Elective II	4	-	60	20	10	10	-	-	4	-	4
Self-Study paper I	4	-	60	20	10	10	-	-	4	-	4
Dissertation Stage I	-	7	-	-	-	-	25	25	-	15	15
Seminar	-	5	-	-	-	-	25	-	-	7	7
Total	12	12	180	60	30	30	50	25	12	22	34

Elective I

1. Advanced Stress analysis
2. Manufacturing Information Systems
3. Computational Fluid Dynamics
4. Micro-electro Mechanical Systems

Elective II

1. Composite Materials
2. Analysis and Synthesis of Mechanisms
3. Artificial Intelligence
4. Design of Experiment

Self-Study Paper I

1. Advanced Manufacturing Processes
2. Machine Condition Monitoring and Diagnostics
3. Product Lifecycle Management
4. Robust Design of Product & Process
5. Computer Aided Process Planning
6. Flexible Manufacturing System
7. Product Design & Process Planning
8. Experimental Technique and Data analysis
9. Tribology in Design
10. Manufacturing System and Simulation

Semester IV									Total Duration: 14 Hrs/Week Total Marks: 325 Total Credits:36		
Subjects	Teaching Scheme (Hrs) Hrs/Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial /Assignments	TW	Pract/Orals	TH	TH/PR/OR	
Self-Study paper II	4	-	60	20	10	10	-	-	4	-	4
Dissertation Stage II	-	10	-	-	-	-	150	75	-	32	32
Total	4	10	60	20	10	10	150	75	4	32	36

Self-Study Paper II

1. CAD/CAM Practices in Metal Forming
2. Optimization Techniques
3. Robotics and Sensors
4. Rapid Prototyping
5. Design for Manufacture
6. Theory of Elasticity & Plasticity
7. Design of Dies
8. Integrated Product Design & Development
9. Design for Manufacturing & Assembly
10. Concurrent Engineering

Computer Aided Design

TEACHING SCHEME

Lectures : 04 Hrs/week
Practicals : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Pract/Oral : 50 Marks
Total Credits : 06

Unit I

(08 Hours)

CAD TOOLS

Definition of CAD Tools, Types of system, CAD/CAM system evaluation Criteria, Graphics standards, functional areas of CAD, Modeling and viewing, software documentation, efficient use of CAD software.

Wire frame modeling -Types of mathematical representation of curves, wire frame models, wire frame entities, parametric representation of synthetic curves - Hermite cubic splines, Bezier curves, B-Splines, rational curves - NURBS.

Unit II

(08 Hours)

SURFACE MODELING

Mathematical representation of surfaces, Surface model, Surface entities, surface representation, Parametric representation of surfaces, plane surface, ruled surface, surface of revolution, Tabulated surface.

Unit III

(08 Hours)

SURFACE MODELING

Hermite Bicubic surface, Bezier surface, B-Spline surface, COONs surface, Blending surface, Sculptured surface, Surface manipulation - Displaying, Segmentation, Trimming, Intersection, Transformations - 2D and 3D, Orthogonal and Perspective transformations.

Unit IV

(08 Hours)

SOLID MODELLING

Solid Representation - Boundary Representation (B-rep), Constructive Solid Geometry (CSG) and other methods, Design Applications: Mechanical tolerances, Mass property calculations, CAD database structure.

CAD/CAM Data Exchange: Evaluation of data- exchange formats, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF.

Unit V

(08 Hours)

ADVANCED MODELING CONCEPTS:

Feature Based Modeling, Assembly Modeling, Behavioral Modeling, Conceptual Design & Top-down Design. Techniques for visual realism - hidden line - Surface removal - Algorithms for shading and Rendering. Parametric and variational modeling, Feature recognition, Design by features, Assembly and Tolerance Modeling, Tolerance representation - specification, analysis and synthesis, AI in Design.

Unit VI

(08 Hours)

COLLABORATIVE ENGINEERING:

Collaborative Design, Principles, Approaches, Tools, Design Systems. Product Data Management (PDM).

Text Books/ References

1. Ibrahim Zeid, CAD/CAM Theory and Practice, McGraw Hill international.
2. P. N. Rao, CAD/CAM Tata McGraw Hill.
3. Foley, Van Dam, Feiner and Hughes, Computer Graphics Principles and Practice,

second edition, Addison–Wesley, 2000.

4. Martenson, E. Micheal, Geometric Modelling, John Wiley & Sons, 1995.
5. Hill Jr, F.S., Computer Graphics using Open GL, Pearson Education, 2003.
6. Singeresu S. Rao, Engineering Optimization-Theory and Practice, New Age International Limited Publishers, 2000.
7. Johnson Ray, C. Optimum Design of Mechanical Elements, Wiley, John & Sons, 1981.
8. P. Radhakrishnan, S. Subramanyam, CAD/CAM/CIM, New Age International.
9. V. Ramamurti, Computer Aided Mechanical Design and Analysis, Tata McGraw Hill-1992.

Termwork

Eight Assignments using either of UG, SolidWorks, CATIA, ProE, Hyperwork

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Modeling and Simulation

TEACHING SCHEME

Lectures : 04 Hrs/week
Practicals : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Pract/Oral : 50 Marks
Total Credits : 06

Unit I

(08 Hours)

System Concept and Modeling

Physical model, Mathematical model, Types of mathematical model, Dynamic Versus Static Models, Continuous-Time Versus Discrete-Time, Dynamic Models, Quantitative Versus Qualitative Models, Mechanical system modeling examples.

Simulation Basics, When Simulation Is the Appropriate Tool, when Simulation Is Not Appropriate, Advantages and Disadvantages of Simulation, Areas of Application, Steps in a Simulation Study

Unit II

(08 Hours)

Simulation Concepts

Simulation Basics, When Simulation Is the Appropriate Tool, when Simulation Is Not Appropriate, Advantages and Disadvantages of Simulation, Areas of Application, Steps in a Simulation Study

Simulation and analytical methods, Basic nature of simulation, The simulation process, Types of system simulation, Generation of random numbers .Monte Carlo Simulation.

Unit III

(08 Hours)

Probability as Used in Simulation

Basic Probability Concepts, Discrete Random Variable, Expected Value and Variance of a Discrete Random Variable, Measure of Probability Function, Continuous Random Variable, Exponential Distribution, Mean and Variance of Continuous Distribution, Normal Distribution.

Unit IV

(08 Hours)

System Simulation

Introduction, Simulation of Pure pursuit problem, exponential growth model, simulation of water reservoir system, Trajectory simulation, suspension system, simulation of pendulum.

Unit V

(08 Hours)

Simulation Models

Discrete Simulation, Continuous System Simulation. Simulation of Queuing Systems, Inventory Control Models

Unit VI

(08 Hours)

Design and Evaluation of Simulation Experiments.

Introduction, development of simulation experiments, principles of verification, validation and accreditation, Simulation experimentation, classical experimental design, validation of simulation experiments, evaluation of simulation experiments.

Simulation Languages

Text Books/ References

1. Robert E. Shannon, "System Simulation The art and science", , Prentice Hall, New Jersey, 1995.
2. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2001.
3. Geoffrey Gordon ,System Simulation; Prentice Hall.
4. Robert E. Shannon ; System Simulation: The Art and Science ;Prentice Hall
5. J. Schwarzenbach and K.F. Gill Edward Arnold; System Modelling and Control

6. M Close and Dean K. Frederick; Modeling and Analysis of Dynamic Systems ;Houghton Mifflin

Term Work

1. Simulation of water reservoir system.
2. Trajectory simulation.
3. Suspension system.
4. Simulation of pendulum.
5. Discrete Simulation,
6. Continuous System Simulation.
7. Simulation of Queuing Systems,
8. Inventory Control Models

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Computer Integrated Manufacturing

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks

Total Credits : 04

Unit I

(08 Hours)

CONCEPT OF CIM

Introduction to CIM, Types of Manufacturing, CIM hardware and software, Elements of CIM, Product development through CIM Design Activities in a networked environment, networking in a manufacturing company, hardware elements of networking.

Unit II

(08 Hours)

CIM DATABASE

Introduction, Database requirements of CIM, Database, Database management, Database Models, EDM, Product Data Management (PDM), Advantage of PDM., Collaboration Engineering.

Unit III

(08 Hours)

WORK CELL & FLEXIBLE MANUFACTURING SYSTEM

Manufacturing cell, Group Technology, Cellular Manufacturing. DNC system and transfer of program from PC to machine. Introduction to FMS, Manufacturing integration model, flexible manufacturing strategy, Components of Flexible Manufacturing- Pallets and fixtures, machining centers, inspection equipment, material handling stations, storage system, In-process storage, manually operated stations, allied operation centers

Unit IV

(08 Hours)

INTEGRATIVE MANUFACTURING PLANNING AND CONTROL

Role of integrative manufacturing in CAD/CAM integration, Over view of production control - Forecasting, Master production schedule, Capacity planning, M.R.P., Order release, Shop-floor control, Quality assurance, Planning and control systems, Cellular manufacturing, JIT manufacturing philosophy.

Unit V

(08 Hours)

WEB BASED MANUFACTURING

Integrating process with web, Process management and control through web, Applications of web based manufacturing, casting, machining, forming & forging.

Unit VI

(08 Hours)

FUTURE TRENDS IN MANUFACTURING SYSTEMS

Lean Manufacturing: Definition, Principles of Lean Manufacturing, Characteristics of Lean Manufacturing, Value of Product, Continuous Improvement, Focus on Waste, Relationship of Waste to Profit, Four Functions of Lean Production, Performance Measures, The Supply Chain, Benefits of Lean Manufacturing. Introduction to Agile and Web Based Manufacturing systems.

Text Books/ References

1. Paul G. Ranky, The Design and Operation of FMS, I.F.S. Publications 1983
2. Harrington J, Computer Integrated Manufacturing Krieger Publications 1979
3. Richard N. Shover, An Analysis of CAD/CAM Application with Introduction to C.I.M. Prentice hall
4. David Bedworth et.al Computer Integrated Design and Manufacturing McGraw hill 1991

5. Scolz B. Reiter C.I.M Interfaces Chapman & Hall 1992
6. David L. Goetsch, Fundamental of CIM Technology, Delmar Publication 1988
7. Groover, M.P., (2004), Automation, Production Systems & Computer Integrated Manufacturing second edition, Pearson Education ISBN: 81-7808-511-9
8. Groover, Weiss, Nagel, Audrey, Industrial Robotics-Technology, Programming and Applications, McGraw Hill.
9. Nanua Singh, Systems Approach to Computer Integrated Design and Manufacturing, John Wiley Publications.
10. Alavudeen, Venkateshwaran, Computer Integrated Manufacturing, Prentice- Hall India

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Product Design And Development			
<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<u>Unit I</u>			(08 Hours)
Introduction			
	<p>Characteristics of successful product development, Design and development of products, duration and cost of product development, the challenges of product development.</p> <p>Development Processes and Organizations: A generic development process, concept development: the front-end process, adopting the generic product development process, the AMF development process, product development organizations, the AMF organization.</p>		
<u>Unit II</u>			(08 Hours)
Product Planning			
	<p>The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect all the results and the process. Identifying Customer Needs: Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process.</p> <p>Product Specifications: What are specifications, when are specifications established, establishing target specifications, setting the final specifications.</p>		
<u>Unit III</u>			(08 Hours)
Concept Generation			
	<p>The activity of concept generation clarify the problem, search externally, search internally, explore systematically, reflect on the results and the process.</p> <p>Concept Selection: Overview of methodology, concept screening, and concept scoring, Concept Testing: Define the purpose of concept test, choose a survey population, choose a survey format, communicate the concept, measure customer response, interpret the result, reflect on the results and the process.</p>		
<u>Unit IV</u>			(08 Hours)
Product Architecture			
	<p>What is product architecture, implications of the architecture, establishing the architecture, variety and supply chain considerations, platform planning, related system level design issues.</p>		
<u>Unit V</u>			(08 Hours)
Industrial Design			
	<p>Assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design process, assessing the quality of</p>		

	<p>industrial design. Design for Manufacturing: Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors. Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes.</p>		
Unit VI	(08 Hours)		
Product Development Economics			
	<p>Elements of economic analysis, base case financial mode,. Sensitive analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis. Managing Projects: Understanding and representing task, baseline project planning, accelerating projects, project execution, postmortem project evaluation.</p>		
Text Books/ References			
	<ol style="list-style-type: none"> 1. Product Design and Development - Karl.T.Ulrich, Steven D Eppinger - Irwin McGrawHill - 2000. 2. Product Design and Manufacturing - A C Chitale and R C Gupta, PH1, - 3rd Edition, 2003. 3. New Product Development - Timjones. Butterworth Heinmann -Oxford. UCI -1997 4. Product Design for Manufacture and Assembly - Geoffery Boothroyd, Peter Dewhurst and Winston Knight - 2002 		
Syllabus for Unit Test			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

Semester II

K60504: ADVANCE FINITE ELEMENT METHOD

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
Practicals	: 02 Hrs/week	Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Term Work	: 25 Marks
		Pract/Oral	: 25 Marks
		Total Credits	: 05
Unit I			(08 Hours)
	Basic concepts of FEM, Weak formulation, Variational methods of approximation-Rayleigh Ritz Method, Stress strain relations, shape functions- linear and quadratic. Approximation errors in FEM, Accuracy of solution, p & h refinement		
Unit II			(08 Hours)
	One dimensional problems – Finite element modeling, Basic boundary condition, Multipoint constraints, Convergence of results , Potential energy approach, Global stiffness matrix, properties of stiffness matrix, load vector, Penalty approach, Elimination approach, Methods of Weighted Residuals-Least Square Method, Subdomain Method, Collocation Method, Garlekin's method.		
Unit III			(08 Hours)
	Finite Element Analysis of 2-D problems. Basic boundary value problems in 2-D, Triangular, Quadrilateral, Higher order elements. Constant strain triangle. Introduction to plate bending problems. Kirchhoff's theory, Mindlin plate element.		
Unit IV			(08 Hours)
	Isoparametric formulation – Natural Co-ordinate system, Lagrangian interpolation polynomials, Isoperimetric element, Numerical Integration Newton Cotes formula, Guass Quadrature formula in two and three dimensions, triangular elements, rectangular elements.		
Unit V			(08 Hours)
	Dynamic Analysis, Formulation of Dynamic problems, Consistent and Lumped Mass Matrices. Solution of Eigen Value Problems. Transformation Method, Jacobi Method, Vector Iteration Method, Subspace Iteration Method. Forced Vibration- Steady State and Transient vibration analysis, Analysis of damping, Mode of Super position Scheme, Direct Integration Method, Implicit and Explicit numerical methods.		
Unit VI			(08 Hours)
	Special Topics: - Linear Buckling Analysis, Adaptive Finite Element Technique .Sub modeling and substructuring.		

Term Work	
	Term work shall consists of three assignment based on above syllabus. Four computer program assignments to be developed for FEA. Using programming language. Two assignment of structural Analysis using FEA Software
Oral/Practical	
	Term work and Oral will be based on above syllabus.
Text Books/ References	
	<ol style="list-style-type: none"> 1. K. J. Bathe, "Finite Element Procedures", PHI 2. R. D. Cook, D. S. Malus, M. E. Plesha, "Concepts and Applications of Finite Element Method Analysis", John Wiley 3. J. N. Reddy, "An introduction to Finite Element Method Analysis", MGH 4. Desai & Abel, "Introduction to Finite Element Methods" 5. S. Riaseleharan, "FEA in Engineering Design" 6. D. L. Logan, "A course in the Finite Element Method", Third Edition, Thomson Learning 7. T. R. Chandrupatia, A. D. Belegundu, "Introduction to Finite Elements in Engineering", Third Edition, PHI 8. Seshu P, "Text Book of Finite Element Analysis", PHI Learning Pvt..Ltd. New Delhi.
Syllabus for Unit Test	
Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Control Systems

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
Practicals	: 04 Hrs/week	Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Pract/Oral	: 50 Marks
		Total Credits	: 06
Unit I			(08 Hours)
Introduction to Control System			
	Introduction to control systems. Classification of control system, basic characteristic of feedback control systems. Mathematical modeling of control systems, concept of transfer function. Basic control actions:-On-Off Control, Proportional, Integral, Derivative and PID, Feedback and feed forward control system and their applications.		
Unit II			(08 Hours)
Time Response Analysis of Control System			
	Time response analysis: Time response of control system, standard test signal, Time Response Analysis of First and Second order system, Time Domain specifications. Step response of second order system. Steady-state errors, static error constants, steady state, analysis of different type of Systems using step. Ramp and parabolic inputs.		
Unit III			(08 Hours)
Control System Stability Analysis			
	Classification of control systems according to types of systems, Stability Analysis: Introduction to concepts of stability. The Routh-Hurwitz's Stability criteria. Stability in the sense of Lyapunov and absolute stability, autonomous systems, the invariance principle, linear systems and linearization, non autonomous systems, linear time varying systems and linearization.		
Unit IV			(08 Hours)
Root Locus and Frequency Response Methods			
	Frequency Response Analysis, Frequency domain specifications Correlation between time and frequency response. Polar Plots. Bode Plots, Nyquist Plots stability in frequency domain, frequency domain methods of design, compensation and their realization in time and frequency domain, improving system performance.		
Unit V			(08 Hours)
State Space Modeling			
	Concept of state, state variable, state model State space method. State space representation using physical and phase variables, decomposition of transfer function, diagonalisation. solutions of homogeneous and non homogenous equations, zero and pole placement using state space techniques. Transfer function from state model. Controllability and observability of linear system. State transition matrix, state controllability matrix, state observability matrix.		
Unit VI			(08 Hours)
Non-Linear Control Systems			
	Discrete time systems and Z-Transformation methods, State space analysis, Optimal and adaptive control systems, Non-Linear Systems Phase plane analysis: Phase portraits, Singular points characterization. Compensation (Introduction only): Types of compensator, selection of Compensator, Lead, Lag and Lag-Lead compensation. Control system Components : servomotor, stepper motors, Synchronos, Potentiometer, amplifiers		

Text Books/ References			
1. Control System Engineering: by Nagrath LT. and Gopal .M., Wiley Eastern Lid. 2. Modern Control engineering: by K.Ogata, Prentice Hall. 3. Benjamin C. Kuo, Automatic Control Systems, Pearson education, seventh edition. 4. Madan Gopal, Control Systems Principles and Design, Tata McGraw Hill, seventh edition, 1997 5. Nise, control system Engineering, John wiley& sons, 3rd edition 6. Norman Nise, Control System Engineering, Prentice Hall India, Fourth Edition 7. Anand Kumar, —Control System Theory, Prentice Hall India. 8. M.Vidyasagar, "Nonlinear systems analysis", Second Edition, Prentice Hall, 1993 9. H.Khalil, "Nonlinear Systems", Macmillan Publishing Company, NY, 1992. 10. A. Isidori, —Nonlinear Control Systems, 3rd edition, Springer Verlag, London, 1995. 11. Jack Golten, Andy Verwer, “Control System Design and Simulation”, McGraw Hill 12. F.H.Raven, ”Automatic Control Engineering”, Third edition, McGraw Hill, 1983. 13. Schaum Series, ” Theory and Problems of Feedback and Control Systems”. (MGH) 14. Dr.N.K.Jain, ”Automatic Control Systems Engineering”, Dhanpat Rai Publishing Company.			
Term Work			
Two Experiments on PID controller Four computer based assignments using MATLAB			
Syllabus for Unit Test			
Unit Test I	Unit I,II,III		
Unit Test II	Unit IV,V,VI		

Precession Engineering

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
Unit I		(08 Hours)	
Concepts Of Accuracy			
	Introduction - concept of accuracy of machine tools - spindle and displacement accuracies - Accuracy of numerical control systems - Errors due to numerical interpolation - Displacement measurement system and velocity lags.		
Unit II		(08 Hours)	
Geometric Dimensioning And Tolerancing			
	Interpretation, measurement and application of form tolerances - datum system and targets – tolerance of position Tolerance zone conversions - Surfaces, features, features of size, datum features-Datum, oddly configured and curved surfaces as datum features, equalizing datum.		
Unit III		(08 Hours)	
Surface and form metrology			
	Flatness, roughness, waviness cylindricity etc. Methods of improving accuracy & surface finish, Influence of forced vibration on accuracy, Dimensional wear of cutting tools and its influences on accuracy		
Unit IV		(08 Hours)	
Precision Measuring Systems			
	Units of length - legal basis for length measurement – Traceability - Processing system of nanometer accuracies - LASER light source - LASER interferometer - LASER alignment telescope - LASER micrometer-on-line and in-process measurements of diameter and surface roughness using LASER - Micro holes and topography measurements -.- In processing or in-situ measurement of position of processing point-Post process and on-machine measurement of dimensional features and surface-mechanical and optical measuring systems. Straightness and flatness measurement – Optoelectronic Measurement Systems in Metrology, Opto electronic devices contact and non contact types Applications - Tool wear measurement - 3D Surface roughness - Pattern generation studies.		
Unit V		(08 Hours)	
Nano-Positioning Systems Of Nano Accuracy & Repeatability			
	Guide systems for moving elements - Servo control systems for tool positioning - Computer Aided digital and ultra precision position control.		
Unit VI		(08 Hours)	
Computer Integrated Quality Assurance			
	Concept of Total quality control & quality assurance - Zero defects-POKA-YOKE Statistical evaluation of data using computer- CNC CMM applications - Computer Aided measurement, data integration of 3D-CMM		
Text Books/ References			
	1. MURTHY,R.L., - " Precision Engineering in Manufacturing ", New ageInternational(P) Limited, publishers, 1996.		

	<p>2. JAMESD. MEADOWS, - "Geometric Dimensioning and Tolerancing ", Marcel Dekker Inc.1995.</p> <p>3. "Dimensioning and tolerancing of mass production", Prentice Hall, 1983</p> <p>4. WATSON .J., " Optoelectronics " - Van Nostrand Rein hold(UK)Co ltd.,1988</p> <p>5. ROBERT.G. SEIPPEL, - "Optoelectronics for technology and engineering ", Prentice Hall NewJersey,1989</p> <p>6. ULRICH-REMBOLD, ARMBRUSTER AND ULZMANN-" Interface technology for computer controlled manufacturing processes ", Marcel Dekker Pub. New York, 1993</p> <p>7. Engg.Metrlogy by Shotbolt.</p> <p>8. THOMAS.G.G. - "Engineering metrology", Butterworth PUB.1974.</p> <p>9. NORIO TANIGUCHI, - " Nano Technology ", Oxford university,Press,1996.</p>
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Syllabus for Unit Test			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

Optimization for Engineering Design

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	:04
Unit I			(08 Hours)
Introduction			
	Optimal problem formulation-Design variables, constraints, objective function, variable bound. Engineering optimization problems, Optimization algorithms		
Unit II			(08 Hours)
Single Variable Optimization			
	Optimality criteria, Bracketing methods, region elimination method, point estimate method, gradient based method, root finding using optimization techniques.		
Unit III			(08 Hours)
Multivariable Optimization			
	Optimality criteria, unidirectional search, direct search method- evolutionary optimization, simplex search, Hooke-Jeeves pattern search method, gradient based methods,-steepest descent method, Newton's method, Marquardt's method.		
Unit IV			(08 Hours)
Constrained Optimization			
	Kuhn-Tucker conditions, transformation methods, sensitivity analysis, direct search for constrained minimization, linearized search techniques, feasible direction method.		
Unit V			(08 Hours)
Specialized Algorithms			
	Integer programming, penalty function, branch-and-bound method Geometric programming		
Unit VI			(08 Hours)
Nontraditional Optimization			
	Genetic algorithm, simulated annealing, global optimization using steepest descent, genetic algorithm and simulated annealing.		
Text Books/ References			
	<ol style="list-style-type: none"> 1. Optimization for Engineering Design: Algorithms and Examples-Kalyanmoy Deb, PHI Learning Pvt. Ltd., 2004 2. Optimization Concepts and Applications in Engineering-Ashok D. Belegundu, Tirupathi R. Chandrupatla, Cambridge University Press, 2011 3. An Introduction to Numerical Methods and Optimization Techniques-Richard W. Daniels, North-Holland, 1978 4. Optimization: theory and applications-S. S. Rao, Wiley Eastern, 1979 		
Syllabus for Unit Test			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

Semester III

Elective I : Advanced Stress analysis

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
Unit I			(08 Hours)
Theory of Elasticity			
	Elasticity problems in two dimensions - stress strain relationship for brittle materials, ductile materials. Compatibility equations in two and three dimensions, free body diagram of complicated structures and stress calculations, stress functions in rectangular and cylindrical coordinate systems, evaluation of stresses in flat rectangular plates with different clamp and load conditions evaluation of the stresses in the flat and circular plate with center hole/holes using stress function		
Unit II			(08 Hours)
Theory of Plasticity			
	Different criteria for three dimensional stress analysis using plasticity, evaluation of stress concentration factors in different geometries using plasticity theorem, practical problems on stress analysis for plasticity-stress in the sharp groove of the shaft, stress in the L shaped bracket under cantilever load, strain rate effects on highly deformable materials and stress calculations.		
Unit III			(08 Hours)
Stress Analysis of Engineering Plastics and Composites			
	Types of engineering plastics (Nylon, ABS, PP) failure modes, failure phenomenon in two and three dimensional stress analysis, wear and tear of plastics, impact properties of plastics, types of composites (fiber reinforced plastics), evaluation of elastic properties of composites, stress analysis of composite circular tubes (internal and external pressure), flat plate fixed at the edges and concentrated load, uniformly distributed load		
Unit IV			(08 Hours)
Plate bending			
	Bending of plate to cylindrical surface, bending of a long uniformly loaded rectangular plate, pure bending in two perpendicular directions, bending of circular plates loaded symmetrically w.r.t. center, bending of circular plates of variable thickness, circular plate with circular hole at center symmetrically loaded and load distributed along inner and outer edges		
Unit V			(08 Hours)
Contact stresses			
	Geometry of contact surfaces, method of computing contact stresses and deflection of bodies in point contact, stress for two bodies in line contact with load normal to contact area and load normal and tangent to contact area, gear contacts, contacts between cam and follower, ball bearing contacts		
Unit VI			(08 Hours)
Experimental stress analysis			
	Dimensional analysis, analysis techniques, strain gauges, types of strain gauges, materials, configuration, instrumentation, characteristics of strain gauge measurement, theory of photoelasticity, elements of polariscope, simple and circular polariscope, fringes in dark and white field, isoclinic and isochromatic fringe patterns, evaluation of stresses from these fringe patterns		

Text Books/ References

1. Advanced Mechanics of Materials – Cook and Young, Prentice Hall
2. Advanced Strength and Applied Stress Analysis – Richard G. Budynas, McGraw Hill
3. Advanced Mechanics of Materials – Boresi, Schmidt, Sidebottom, Willey
4. Theory of Elasticity – Timoshenko and Goodier, Mc Graw Hill
5. Advanced Strength of Materials, Vol. 1, 2 – Timoshenko, CBS
6. Advanced Strength of Materials – Den Harteg
7. Experimental Stress Analysis – Dally & Riley
8. Theory of Plates and Shells – Timoshenko Mc Graw Hill
9. The Mathematical Theory of Plasticity - R. Hill, Oxford University Press, 1998

Syllabus for Unit Test

	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

Elective I: Management Information Systems

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I (08 Hours)

Knowledge based system, Introduction, Development of data base and knowledge bases, knowledge representing paradigms – rule based, object oriented, semantic nets and frames, uncertainty, fuzzy logic, neural nets.

Unit II (08 Hours)

Interference mechanism, goals, control strategies forward and backward chaining, conflict resolution, explanation, blackboard model.

Unit III (08 Hours)

Implementation issues: knowledge acquisition, coding, expert system shells, PROLOG, and LISP

Unit IV (08 Hours)

Selected applications in manufacturing: product design, process planning and scheduling, robot movement, factory layout, defect analysis, diagnostic maintenance, quality control.

Unit V (08 Hours)

Knowledge based approaches for engineering design, blackboard architecture, other knowledge based approaches.

Unit VI (08 Hours)

Artificial intelligence.

Term Work

Three case studies from the following

- ÿ Information and knowledge requirement in Manufacturing Function
- ÿ Inventory control systems
- ÿ Production Planning and Control System – Scheduling and capacity requirement calculation.
- ÿ Design information systems.

Oral/Practical

Based on above termwork.

Text Books/ References

1. Kerr R., "Knowledge Based Manufacturing Management", Addison Wiley, 1991
2. Addis T. R., "Designing Knowledge Based System", Prentice Hall, 1985
3. Roltson D. W., "Principles of Artificial Intelligence and Expert Systems Development", McGraw Hill Publications, 1988
4. Chung P. W. H., Love Grove G., "Industrial Engineering Applications of AI and Expert Systems", Gordon & Breach Science Pub., 1993
5. Maus R. and Keyes J., "Hand Book of Expert Systems in Manufacturing", McGraw Hill Publications, 1991
6. C. S. Krishnamurthy, S. Rajeev, "Computer Aided Design" Narosa Pub. House

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Elective I: Computational Fluid Dynamics

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction to Fluid Dynamics, Concepts of Fluid Flow, Pressure distribution in fluids, Reynolds transport theorem, Integral form of conservation equations, Differential form of conservation equations, Different Types of Flows, Euler and Navier Stokes equations, Properties of supersonic and subsonic flows, Flow characteristics over various bodies.

Unit II

(08 Hours)

Geometric Modeling and CAD Repairing Geometric transformations, Parametric representation of curves and surfaces, Concept of topology, Surface modeling, Faceted models, Solid modeling. Creation of water tight geometry, Faceted Boolean operations, Dependent and independent CAD errors.

Unit III

(08 Hours)

Introduction to CFD, Philosophy of CFD, Governing equations of fluid dynamics and there physical meaning, Mathematical behavior of governing equations and the impact on CFD , Simple CFD techniques and CFL condition.

Unit IV

(08 Hours)

Numerical Methods in CFD, Finite Difference, Finite Volume, and Finite Element, Upwind and downwind schemes, Simple and Simpler schemes, Higher order methods, Implicit and explicit methods, Study and transient solutions

Unit V

(08 Hours)

Surface mesh generation, Surface mesh repair, Volume grid generation, Volume mesh improvement, mesh smoothing algorithms, grid clustering and quality checks for volume mesh. Adaptive, Moving and Hybrid Grids, Need for adaptive and, moving grids, Tet, pyramid, prism, and hex grids, using various elements in combination.

Unit VI

(08 Hours)

Introduction to Turbulence Modeling, Introduction and background, Algebraic models, One equation models, Two equation models, Near wall treatment, Reynolds stress models, Introduction to Multiphase Modeling Fundamentals of multiphase flows, Eulerian - Lagrangian (ELAG) approach, Eulerian- Eulerian (E2P) approach, Volume Of Fraction (VOF) approach.

Term Work

Minimum four assignments on above topic to study CFD analysis.

Use of Any CFD software like FLUENT – Basic issues, model development, and post process sing.

Oral/Practical

Based on Term work.

Text Books/ References

1. John D. Anderson, "Computational Fluid Dynamics: The Basics with Applications", McGraw Hill, 1995
2. V. V. Ranade, "Computational Flow Modeling for Chemical Reactor Engineering", Process Engineering Science, Volume 5, 2001
3. Patrick Knupp and Stanly Steinberg, "Fundamentals of Grid Generation", CRC Press, 1994
4. D. C. Wilcox, "Turbulence Modelling for CFD", 1993
5. Pieter Wesseling, "An Introduction to Multigrid Methods", John Wiley & Sons, 1992
6. J. F. Thompson, Z. U., A. Warsi and C. W. Mastin, "Numerical Grid Generation: Foundations and Applications", North Holland, 1985
7. S. V. Patankar, "Numerical Heat Transfer and Fluid Flow", McGraw-Hill, 1981
8. Thomas B. Gatski, M. Yousuff Hussaini, John L. Lumley, "Simulation and Modelling of Turbulent Flows", Eds., Oxford University Press, 1996
9. Laney, C. B., "Computational Gas Dynamics", Cambridge Uni. Press, 1998

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Elective I : Micro-electro Mechanical Systems

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
Unit I			(08 Hours)
Introduction			
	Micro-Electro-Mechanical Systems (MEMS), Microsystems and their products, miniaturization, applications, mechanical MEMS, thermal MEMS, micro-opto electromechanical systems, magnetic MEMS, radio frequency (RF) MEMS, micro fluidic systems, bio and chemo devices, Nanotechnology - definition, nanoscale, consequences of the nanoscale for technology and society, need and applications of nano electromechanical systems (NEMS)		
Unit II			(08 Hours)
Micro Fabrication Processes & Materials			
	Materials for MEMS - substrate and wafers, silicon as a substrate material, crystal structure, single crystal and polycrystalline, mechanical properties, silicon compounds, silicon piezo-resistors, gallium arsenide, quartz, piezo-electric crystals, polymers, packaging materials; Fabrication Processes - Bulk micro manufacturing, photolithography, photoresists, structural and sacrificial materials, X-ray and electron beam lithography, Thin film deposition - spin coating, thermal oxidation, chemical vapour deposition (CVD), electron beam evaporation, sputtering; Doping - diffusion, ionimplantation; Etching - wet etching, dry etching; Surface micromachining, bulk vs. surface micromachining; Wafer bonding - glass-frit, anodic and fusion bonding; LIGA process and applications.		
Unit III			(08 Hours)
Microsensors and actuators			
	Sensing and actuation, Chemical sensors, Optical sensors, Pressure sensors, Thermal sensors - thermopiles, thermistors, micromachined thermocouple probes, thermal flow sensors, MEMS magnetic sensor, Piezoelectric material as sensing and actuating elements - capacitance, piezomechanics, Piezoactuators as grippers, microgrippers, micromotors, microvalves, micropumps, microaccelerometers, microfluidics, shape memory alloy based optical switch, thermally activated MEMS relay, microspring thermal actuator, data storage cantilever.		
Unit IV			(08 Hours)
Microsystem Design			
	Design constraints and selection of materials, selection of manufacturing process, selection of signal transduction technique, electromechanical system and packaging.		
Unit V			(08 Hours)
Nanomaterials:			
	Molecular building blocks to nanostructures - fullerenes, nanoscaled biomolecules, chemical synthesis of artificial nanostructures, molecular switches and logic gates, nanocomposites; Carbon nanotubes -structure, single walled, multi walled, properties of carbon nanostructures and their synthesis, Potential applications of nano-structures.		
Unit VI			(08 Hours)
Nanofinishing Techniques			
	Abrasive flow machining, magnetic abrasive finishing, magnetorheological finishing, elastic emission machining, ion beam machining, chemical mechanical polishing, Nanomanipulation,		

	Nanolithography, Top-down versus bottom - up assembly, Visualisation, manipulation and characterization at the nanoscale; Applications - in Energy, Tribology, Informatics, MDSicine, etc.		
Text Books/ References			
	<p>1. Bharat Bhushan (Ed.), (2004), Handbook of Nanotechnology, Spinger-Verlag Berlin Heidelberg New York, ISBN 3-540-01218-4</p> <p>2. Hsu, Tai-Ran, (2003), MEMS & MICROSYSTEMS: Design & Manufacture, TMH, ISBN:0-07-048709-X</p> <p>3. Mahalik, N. P., (2007), MEMS, TMH, ISBN: 0-07-4454. Mahalik, N.P. (Ed.) (2006), Micromanufacturing & Nanotechnology, Springer India Pvt. Ltd., ISBN: 978-81-8128-505-8 (Distributed by New Age International, New Delhi)</p> <p>5. Nanosystems: Molecular Machinery, Manufacturing & Computation, K E Drexler, (Wiley),1992), ISBN 0471575186</p> <p>6. P.Rai- Choudhury, Handbook of Microlithography, Micromachining & Microfabrication, SPIE,1997.</p> <p>7. David Ferry, Transports in Nanostructures, Cambridge University Press, 2000.</p> <p>8. Poole, Charles & Owen, Frank J., - Introduction to Nanotechnology, Wiley (India) Pvt. Ltd. ISBN: 978-81-265-10993</p>		
Syllabus for Unit Test			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

Elective II : Composite Materials

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
Unit I		(08 Hours)	
Basic concepts and characteristics			
	Definition and characteristics of composite materials, overview of advantages and limitations of composite materials, significance and objectives, sciences and technology, types and classification of typical composite materials, current status and future prospects.		
Unit II		(08 Hours)	
Macromechanical behaviours of lamina:			
	Stress-strain relations for anisotropic materials, engineering constants for orthotropic materials, stress-strain relations for a lamina of arbitrary orientation, biaxial strength theories.		
Unit III		(08 Hours)	
Micromechanical behaviour of a lamina			
	Mechanics of materials approach to stiffness, elasticity approach to stiffness, comparison of approaches to stiffness, mechanics of materials approach to strength.		
Unit IV		(08 Hours)	
Hygrothermal effects			
	Hygrothermal effects on mechanical behaviours, hygrothermal stress-strain relations, coefficients of thermal and moisture expansion of unidirectional lamina		
Unit V		(08 Hours)	
Macromechanical behaviours of a laminate			
	Classical lamination theory, lamina stress-strain behaviour, strain and stress variation in a laminate, laminate forces and moments, special cases of laminate, interlaminar stresses, design of laminates.		
Unit VI		(08 Hours)	
Manufacture and testing of composite materials			
	Manufacturing: Stamp moulding, diaphragm forming, thermoforming, filament winding, pultrusion, compression moulding, injection moulding. Testing: Determination of physical properties such as density, fibre volume ratio, void volume ratio, co-efficient of thermal expansion, determination of tensile, compressive and shear properties of unidirectional lamina, determination of interlaminar and intralaminar strength, biaxial testing, characterisation of composites with stress concentration.		
Text Books/ References			
	1. Mechanics of Composite Materials by R.M.Jones, McGrawhill-Kogakusha Ltd., Tokyo. 2. Engineering Mechanics of Composite Materials by Issac M.Daniel and Ori Ishai, Oxford University Press. 3. Analysis and Performance of Fiber Composites by B.D.Agarwal and L.J.Brotuman, John Wiley & Sons.		

Syllabus for Unit Test			
	Unit Test I		Unit Test I
	Unit Test II		Unit Test II

Elective II : Analysis and Synthesis of Mechanisms

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I (08 Hours)

Introduction:

Review of fundamentals of kinematics, D. O. F; Multi loop kinematics chains, Gross motion concepts; Position analysis -Vector loop equations for four bar slider crank.

Unit II (08 Hours)

Kinematic Analysis:

Inverted slider crank - Geared five bar and six bar linkages; Analytical method for velocity and acceleration analysis - Four bar linkage jerk analysis - Plane complex mechanism

Unit III (08 Hours)

Path Curvature Theory:

Fixed and Moving centroids, inflection points and inflection circle; Graphical constructions - Cubic of stationary curvature; Dimensional synthesis – Function generation; path generation, motion generation.

Unit IV (08 Hours)

Synthesis of Mechanisms

Graphical methods; Coupler; curve synthesis, design of six bar mechanisms. Algebraic methods. Application of instant centre in linkage design; Cam mechanism - Determination of optimum size of Cams.

Unit V (08 Hours)

Dynamic of Mechanisms

Static force analysis with friction - Inertia force analysis - combined static and inertia force analysis; shaking force, Kinetostatic analysis. Introduction to force and moment; balancing of linkages. The Matrix Method.

Unit VI (08 Hours)

Spatial Mechanism and Robotics:

Kinematic analysis of spatial RSSR mechanism; Denavit - Hartenberg parameters; Forward and inverse Kinematics of robotic manipulators.

Term Work

Practical in Use Of Mechanical Software Packages- Tutorials.

Oral/Practical

Based on Term work.

Text Books/ References

1. Ā Erdman A G & Sandor, G N, “Mechanism Design: Analysis and Synthesis”, prentice hall of India
2. Ā Mallik, A K, Ghosh A, and Gunter Dittrich, “Kinematic Analysis and Synthesis of Mechanisms”, CRC Press London
3. Ā Robert L Norton, “Design of Machinery” McGraw Hill Book Co.
4. Ā Robert HA, “Mechanical Design Systems Handbook”, McGraw Hill Book Co.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Elective II : Artificial Intelligence

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
Unit I		(08 Hours)	
Human and machine intelligence			
	Concepts of fifth generation computing, programming in AI environment, developing artificial intelligence system, natural language processing, neural networks.		
Unit II		(08 Hours)	
Introduction to fuzzy logic			
	Basic concepts in fuzzy set theory – operations of fuzzy sets – fuzzy relational equations – propositional, predicate logic – inference – fuzzy logic principles – fuzzy inference – fuzzy rule based systems – fuzzification and defuzzification – types.		
Unit III		(08 Hours)	
Fuzzy logic applications			
	Fuzzy logic controllers – principles – various industrial applications of fuzzy logic control – adaptive fuzzy systems – fuzzy decision making – fuzzy classification – fuzzy pattern recognition – image processing applications – fuzzy optimization.		
Unit IV		(08 Hours)	
Introduction to artificial neural networks			
	Fundamentals of neural networks – neural network architectures – learning methods – taxonomy of neural network architectures – standard back propagation algorithms – selection of various parameters – variations.		
Unit V		(08 Hours)	
Associative memory			
	Associative memory – exponential bidirectional associative memory – adaptive resonance theory – introduction – adaptive resonance theory 1 – adaptive resonance theory 2 – applications – Kohen self organizing maps – counter propagation networks – industrial applications. Expert system development: Definition, choice of domain, collection of knowledge base, selection of inference mechanism, case studies of expert system development in design and manufacturing.		
Unit VI		(08 Hours)	
Industrial application of AI and expert systems			
	Robotic vision systems, image processing techniques, application to object recognition and inspection, automatic speech recognition. Recent advances: Fundamentals of genetic algorithms – hybrid systems – meta heuristic techniques like simulated annealing, tabu search, ant colony optimization, perpetual self organizing, artificial immune systems – applications in design and manufacturing		
Text Books/ References			

	<ol style="list-style-type: none"> 1. Robert Levine et al, "A comprehensive guide to AI and expert systems", McGraw Hill Inc, 1986 2. Henry C. Mishkoff, "Understanding AI", BPB Publication, New Delhi, 1986 3. Peter Jackson, "Introduction to expert systems", First Indian Reprint, 2000, Addison Wesley 4. Stuart Russell and Peter Norvig, "Artificial intelligence: a modern approach", Prentice Hall, 1995 5. Elaine Rich et al., "Artificial intelligence", McGraw Hill, 1995 6. Winston P H, "Artificial intelligence", Addison Wesley, Massachusetts, Third Edition, 1992
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Syllabus for Unit Test			
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	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

Elective II : Design of Experiment

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
Unit I			(08 Hours)
Introduction			
	Strategy of Experimentation, Some Typical Applications of Experimental Design, Basic Principles, Guidelines for Designing Experiments, A Brief History of Statistical Design, Summary: Using Statistical Techniques in Experimentation		
Unit II			(08 Hours)
Simple Comparative Experiments			
	Introduction, Basic Statistical Concepts, Sampling and Sampling Distributions, Inferences About the Differences in Means, Randomized Designs, Hypothesis Testing, Confidence Intervals, Choice of Sample Size, Comparing a Single Mean to a Specified Value		
Unit III			(08 Hours)
Experiments with a Single Factor:			
	The Analysis of Variance, Analysis of the Fixed Effects Model, Decomposition of the Total Sum of Squares, Statistical Analysis, Estimation of the Model Parameters ,Unbalanced Data, Model Adequacy Checking, The Normality Assumption,Plot of Residuals in Time Sequence, Plot of Residuals Versus Fitted Values, Plots of Residuals Versus Other Variables, Practical Interpretation of Results, A Regression Model, Comparisons Among Treatment Means ,Graphical Comparisons of Means		
Unit IV			(08 Hours)
Introduction to Factorial Designs			
	Basic Definitions and Principles, The Advantage of Factorials, The Two-Factor Factorial Design, Statistical Analysis of the Fixed Effects Model , Model Adequacy Checking , Estimating the Model Parameters , Choice of Sample Size ,The General Factorial Design, Fitting Response Curves and Surfaces , Blocking in a Factorial Design		
Unit V			(08 Hours)
The 2^k Factorial Design			
	Introduction, the 2 ² Design, the 2 ³ Design, the General 2 ^k Design, a Single Replicate of the 2 ^k Design, 2 ^k Designs are Optimal Designs, The Addition of Center Points to the 2 ^k Design		
Unit VI			(08 Hours)
Response Surface Methods and Designs			
	Introduction to Response Surface Methodology, The Method of Steepest Ascent, Analysis of a Second-Order Response Surface, Location of the Stationary Point, Characterizing the Response Surface, Ridge Systems, Multiple Responses, Experimental Designs for Fitting Response Surfaces, Designs for Fitting the First-Order Model, Designs for Fitting the Second-Order Model, Blocking in Response Surface Designs, Optimal Designs for Response Surfaces		
Text Books/ References			
	<ol style="list-style-type: none"> 1. Design and analysis of experiments, Douglas C. Montgomery, Wiley, 2008 2. Introduction to the Design And Analysis of Experiments, Geoffrey Mallin Clarke, R. E. Kempson, Arnold, 1994 		

	3. Experimental Design and Statistics, Stephen Henry Miller, Methuen, 1975		
Syllabus for Unit Test			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

Self Study Paper I : Advanced Manufacturing Processes

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

METAL CUTTING AND MECHANICS OF METAL CUTTING

Introduction to metal removal processes, Chip formation, forces acting on cutting tool and their measurement, Chip thickness, Theory of Ernest and Merchant, theory of Lee and Shafer, Tool wear and tool life, surface finish, thermal aspects, friction in metal cutting and testing of machine tools.

Unit II

(08 Hours)

ABRASIVE PROCESSES

Introduction, Grinding wheel-designation and selection, grinding process, grinding process parameters, creep feed grinding, honing, lapping and other finishing processes

(08 Hours)

Unit III

FORMING PROCESSES.

Sheet metal forming, punching, extrusion, coning. Plastic molding process, injection molding, blow molding, compression molding. Metal injection molding, powder injection molding, sintering process, and their applications

Unit IV

(08 Hours)

UNCONVENTIONAL MACHINING PROCESSES

Need for unconventional processes, Range of non conventional machining processes USM, WJM, AJM, chemical machining, Electrochemical machining, Electrolytic grinding, EDM, LBM, EBM, Plasma arc cutting.

Unit V

(08 Hours)

HIGH SPEED MACHINING

Introduction to high speed machining, economics of high speed machining, brief historical perspective, material properties at high strain rates, influence of increasing speed on chip formation, stainless steel, aerospace aluminum and titanium and recommendations.

(08 Hours)

Unit VI

GENERATIVE MANUFACTURING PROCESSES (GMP) FOR RAPID PROTOTYPING

General features and classification, Issues related to CAD and GMP software, Overviews of generative manufacturing processes, two dimensional layer-by-layer techniques and direct three-dimensional techniques for RP

Text Books/ References

1. G. Boothroyd and W. A. Knight, Fundamentals of Machining and Machine Tools, CRC Press.
2. E. M. Trent and P. K. Wright, Metal Cutting, Butterworth- Heinemann, Boston.
3. P. N. Rao, Manufacturing Technology, Tata Mc-Graw Hill.
4. D. A. Stephenson and J. S. Agapiou, Metal Cutting Theory and Practice, CRC Press
5. Amitabha Ghosh, Rapid Prototyping
6. Kalpak Jain S. and Schmid S. R., Manufacturing Processes for Engineering Materials, Addition Wesley,
7. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, John Wiley & Sons.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Elective II : Machine Condition Monitoring and Diagnostics

TEACHING SCHEME

Lectures : 04 Hrs/week
Practicals : 02 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Term Work : 25 Marks
Pract/Oral : 25 Marks
Total Credits : 05

Unit I (08 Hours)

Predictive Maintenance Techniques:

Predictive maintenance basics, Maintenance philosophies, Evolution of maintenance philosophies, Plant machinery classification and recommendations, Principles of predictive maintenance, Predictive maintenance techniques, Vibration analysis – a key predictive maintenance technique.

Unit II (08 Hours)

Fundamentals of Vibrations:

Vibration basics, Spring-mass system: mass, stiffness, damping, System response, What is vibration? The nature of vibration, Harmonics, Limits and standards of vibration.

Unit III (08 Hours)

Data Acquisition:

Introduction, Collection of vibration signal – vibration transducers, characteristics and mountings, Conversion of vibrations to electrical signal.

Unit IV (08 Hours)

Signal Processing, Applications and Representation:

The fast Fourier transform (FFT) analysis, Time waveform analysis, Phase signal analysis, Spectral signal processes.

Unit V (08 Hours)

Machinery Fault Diagnosis Using Vibration Analysis:

Commonly witnessed machinery faults diagnosed by vibration analysis, correcting faults that cause vibration; Balancing, Alignment, Resonance vibration control with dynamic absorbers.

Unit VI (08 Hours)

Oil and Particle Analysis Oil Fundamentals:

Condition-based maintenance and oil analysis, Setting up an oil analysis program, Oil analysis – sampling methods, Oil analysis – lubricant properties, Oil analysis – contaminants in lubricants, Particle analysis techniques, Alarm limits for various machines.

Term Work

Term work shall consist of
Data acquisition using a velocity pickup.
Data acquisition using an accelerometer.

Data acquisition of sound signals.
Spectral analysis of velocity, acceleration noise signals.
Experiment demonstrating balancing of rotating shaft shaft.
Three assignments based on above syllabus.

Oral/Practical

Based on Term work.

Text Books/ References

1. Thomson, W. T., "Theory of Vibration with Applications", CBS Publishers and Distributors, New Delhi, 1990
2. Gupta K., "Introductory Course on Theory and Practice of Mechanical Vibrations", New Age International Ltd., 1984
3. J. S. Rao., "Vibratory Condition Monitoring of Machines", Narosa publishing house, New Delhi
4. Cyril M. Harris, Allan G. Piersol, "Shock and Vibration Handbook", McGraw-Hill Publishing Co.
5. C. Scheffer, Paresh Girdhar, "Practical Machinery Vibration Analysis and Predictive Maintenance", Newnes an imprint of Elsevier

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper I : Product Lifecycle Management

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Product Life Cycle Environment

Background, Overview, Need, Benefits, Concept of Product Life Cycle. Components / Elements of PLM, Emergence of PLM, Significance of PLM, Customer Involvement. Product Data and Product Workflow, Company's PLM vision, The PLM Strategy, Principles for PLM strategy, Preparing for the PLM strategy, Developing a PLM strategy, Strategy identification and selection, Change Management for PLM.

Unit II

(08 Hours)

Product Development Process

Integrated Product development process Conceive – Specification, Concept design, Design - Detailed design, Validation and analysis (simulation), Tool design, Realize - Plan manufacturing , Manufacture, Build/Assemble , Test (quality check) , Service - Sell and Deliver , Use , Maintain and Support, Dispose.

(08 Hours)

Unit III

Product Development Approaches

Bottom-up design, Top-down design, Front-loading design workflow, Design in context, Modular design. Concurrent engineering, partnership with supplier, collaborative and Internet based design, work structuring and team deployment, Product and process systemization, problem, identification and solving methodologies, improving product development solutions

Unit IV

(08 Hours)

Product Modelling

Product Modelling - Definition of concepts - Fundamental issues - Role of Process chains and product models -Types of product models – model standardization efforts-types of process chains - Industrial demands. Foundation technologies and standards (e.g. visualization, collaboration and enterprise application integration),

Unit V

(08 Hours)

Product Data Management (PDM) Technology

Product Data Management – An Introduction to Concepts, Benefits and

Terminology, PDM functions, definition and architectures of PDM systems, product data interchange, portal integration, PDM acquisition and implementation. Information authoring tools (e.g., MCAD, ECAD, and technical publishing), Core functions (e.g., data vaults, document and content management, workflow and program management), Functional applications (e.g., configuration Management)

(08 Hours)

Unit VI

Recent Advances

Intelligent Information Systems - Knowledge based product and process models - Applications of soft computing in product development process - Advanced database design for integrated manufacturing.

Text Books/ References

1. Product Life Cycle Management - by Antti Saaksvuori, Anselmi Immonen, Springer, 1st Edition (Nov.5, 2003)
2. Product Design & Process Engineering, McGraw Hill – Kogalkusha Ltd., Tokyo, 1974.
3. Product Design & Development – by Kari Ulrich and Steven D. Eppinger, McGraw Hill International Edns, 1999.
4. Effective Product Design and Development – by Stephen Rosenthal, Business One Orwin, Homewood, 1992 ISBN 1-55623-603-4.
5. Burden, Rodger PDM: Product Data Management, Resource Pub, 2003. ISBN 0970035225
6. Clements, Richard Barrett. Chapter 8 ("Design Control") and Chapter 9 ("Document Control") in Quality Manager's Complete Guide to ISO 9000, Prentice Hall, 1993. ISBN 013017534X

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper I : Robust Design of Product and Process

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Concepts of Quality Engineering

Taguchi's Approach to Quality, On-line and Off-line Quality Control, Difference from Classical Approach, Quality Loss Function, System Design, Parameter Design, Tolerance Design, Causes of Variation, Classification of Parameters, Parameter Design Strategy.

Unit II

(08 Hours)

Introduction to Robust Design

Robustness Strategy & its primary tools: P-Diagram, Quality Measurement, Quality Loss Function, Signal to Noise (S/N) Ratios, Orthogonal Arrays, Steps in Robust Parameter Design. Robust design and Six-Sigma for Lean Enterprises.

(08 Hours)

Unit III

Introduction to Taguchi's Experiment Design

Criteria for the Use of Experiment Design Methods, Applying Experiment Design Methods According To Situation; Problem Analysis and Empiric Parameter Reduction. Orthogonal Arrays, Graphical representation of factor combinations, linear graphs, Variance Analysis (ANOVA), Inner-Outer arrays Design.

Unit IV

(08 Hours)

Parameter Design according to Taguchi

Direct product design, indirect variance analysis, Product design with characteristic values, taking cost into account, Signal-to-noise ratio according to Taguchi.

Unit V

(08 Hours)

Data Analysis

Deterministic and random data, Uncertainty analysis, Tests for significance: Chi-square, Regression modeling, Direct and Interaction effects, ANOVA, F-test, Time Series analysis, Autocorrelation and Autoregressive modeling.

(08 Hours)

Unit VI

Response surface Methodology

Linear experiment designs, quadratic experiment designs.

Text Books/ References

1. Montgomery D (2001). Design and Analysis of Experiments, 5th edition, Wiley
2. Phadke, M (1989). Quality Engineering using Robust Design, Prentice Hall.
3. Ross, P (1996). Taguchi Techniques for Quality Engineering, 2nd edition, McGraw Hill.
4. J. Krotmaier, Optimizing Engineering Design, McGraw Hill Ltd.
5. A. Mitra, Quality Control and Improvement, Pearson Publications.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper I : Computer Aided Process Planning

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

INTRODUCTION

The Place of Process Planning in the Manufacturing cycle - Process Planning and Production Planning – Process Planning and Concurrent Engineering, CAPP, Group Technology.

Unit II

(08 Hours)

PART DESIGN REPRESENTATION

Design Drafting - Dimensioning - Conventional tolerancing - Geometric tolerancing - CAD - input / output devices - topology - Geometric transformation - Perspective transformation - Data structure – Geometric modelling for process planning - GT coding - The optiz system - The MICLASS system.

(08 Hours)

Unit III

PROCESS ENGINEERING AND PROCESS PLANNING

Experienced, based planning - Decision table and decision trees - Process capability analysis - Process Planning -Variant process planning - Generative approach - Forward and Backward planning, Input format.

Unit IV

(08 Hours)

COMPUTER AIDED PROCESS PLANNING SYSTEMS

Logical Design of a Process Planning - Implementation considerations -manufacturing system components,production Volume, No. of production families - CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO,CPPP.

Unit V

(08 Hours)

AN INTERGARTED PROCESS PLANNING SYSTEMS

Totally intergarded process planning systems - An Overview - Modulus structure -Data Structure, operation -Report Generation, Expert process planning.

(08 Hours)

Unit VI

Simulation

Major activities, purpose, simulation process, types methodology, simulation packages, process quality simulator, computer requirements trends, applications simulation of manufacturing systems.

Text Books/ References

1. Gideon Halevi and Roland D. Weill, " Principles of Process Planning ", A logical approach, Chapman & Hall, 1995.
2. Tien-Chien Chang, Richard A.Wysk, "An Introduction to automated process planning systems ", Prentice Hall, 1985.
3. Chang, T.C., " An Expert Process Planning System ", Prentice Hall, 1985.
4. Rao, " Computer Aided Mnuufacturing ", Tata McGraw Hill Publishing Co., 2000.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper I : Flexible Manufacturing System

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Evolution of Manufacturing Systems

FMS definition and description, General FMS considerations, Manufacturing cells, Cellular versus Flexible Manufacturing. Systems Planning: Objective, introduction planning, preparation guidelines, the project team, supplier selection, system description and sizing, facility preparation planning, FMS layouts. Human resources: staff considerations, team work, communication and involvement, the supervisors role, personnel selection, job classifications, employee training.

Unit II

(08 Hours)

Manufacturing's Driving Force

Definition, description and characteristics. Just in-time manufacturing, definition and description, benefits and relationship to FMS, implementation cornerstones, quality and quantity application principles. Single manufacture Cell – design scheduling of jobs on single manufacturing cells. Group Technology: Concepts, classification and coding, benefits and relationship to FMS, design of group technology using rank order clustering technique.

(08 Hours)

Unit III

FMS Design

Using Bottleneck, Extended bottleneck models, Processing and Quality Assurance: Turning centres, Machining centre, construction and operations performed, axes, programming, and format information, work-holding and work-changing equipment, automated features and capabilities, cleaning and deburring – station types and operation description, importance to automated manufacturing, coordinate measuring machines, types, construction and general function, operation cycle description, importance to flexible cells and systems.

Unit IV

(08 Hours)

Automated movement and storage systems

AGVs, Robots, automated storage and retrieval systems, storage space design, queuing carousels and automatic work changers, coolant and chip Disposal and recovery systems, auxiliary support equipment, cutting tools and tool Management – introduction, getting control of cutting tools, Tool Management, tool strategies, data transfer, tool monitoring and fault detection, guidelines, work holding considerations, General fixturing, Modular fixturing. FMS and the relationship with workstations – Manual, automated and transfer lines design aspects.

Unit V

(08 Hours)

FMS Software

Communications networks and Nanotechnology – general functions, and manufacturing usages, hardware configuration, programmable logic controllers, cell controllers, communications networks. FMS implementation.

(08 Hours)

Unit VI

FMS and Simulation

System issues - Types of software - specification and selection - Trends -Application of simulation - software -Manufacturing data systems - data flow -CAD/CAM considerations - Planning FMS database.

Text Books/ References

1. Parrish, D.J., ‘Flexible Manufacturing’, - Butter Worths – Heinemann, Oxford, 1993.
2. Groover, M.P., ‘Automation, Production Systems and CIM’, - Prentice Hall India, 1989.
3. Kusiak, A., ‘Intelligent Manufacturing Systems’, - Prentice Hall, 1990.
4. Considine,D.M., & Considine,G.D., ‘Standard Handbook of Industrial Automation’,-Chapman & Hall, 1986

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper I : Product Design & Process Planning

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Product design and process design functions

Selection of a right product, essential factors of product design, Morphology of design, sources of new ideas for products, evaluation of new product ideas. Product innovation procedure-Flow chart. Qualifications of product design Engineer. Criteria for success/failure of a product. Value of appearance, colours and Laws of appearance.

Unit II

(08 Hours)

Product reliability

Mortality Curve, Reliability systems, Manufacturing reliability and quality control. Patents: Definitions, classes of patents, applying for patents. Trademarks and copyrights. Cost and quality sensitivity of products, Elements of cost of a product, costing methods, cost reduction and cost control activities. Economic analysis, Break even analysis Charts. Value engineering in product design, creativity aspects and techniques. Procedures of value analysis – cost reduction, material and process selection.

(08 Hours)

Unit III

Various manufacturing processes

Degree of accuracy and finish obtainable, process capability studies. Methods of improving tolerances. Basic product design rules for Casting, Forging, Machining, Sheet metal and Welding. Physical properties of engineering materials and their importance on products. Selection of plastics, rubber and ceramics for product design.

Unit IV

(08 Hours)

Industrial ergonomics

Man-machine considerations, ease of maintenance. Ergonomic considerations in product design- Anthropometry, Design of controls, man-machine information exchange. Process sheet detail and their importance, Advanced techniques for higher productivity. Just-in-time and Kanban System. Modern approaches to product design; quality function development, Rapid prototyping

Unit V

(08 Hours)

Role of computer in product design

Management of manufacturing, creation of manufacturing data base, Computer Integrated Manufacturing, communication network, production flow analysis, Group Technology, Computer Aided product design and process Planning. Integrating product design,

manufacture and production control.

(08 Hours)

Unit VI

Computer Aided Process Planning

Logical Design of a Process Planning - Implementation considerations -manufacturing system components,production Volume, No. of production families - CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO

Text Books/ References

1. Niebel, B.W., and Draper, A.B., Product design and process Engineering, Mc Graw Hill – Kogalkusha Ltd., Tokyo, 1974
2. Chitale, A.K, and Gupta, R.C., Product Design and Manufacturing, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
3. Mahajan, M. Industrial Engineering and Production Management, Dhanpath Rai & Co., 2000.
4. Considine,D.M., & Considine,G.D., ‘_Standard Handbook of Industrial Automation’,-Chapman & Hall, 1986

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper I : Experimental Technique and Data analysis

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<u>Unit I</u>			(08 Hours)
Research Modeling			
	(a) Mathematical – Classification of Models, Development of Models, Stages in Model building, Principles of Modelling, Use of Analogy, Models as Approximations, Data consideration and Testing of Models (b) Heuristics and Simulation – Definition, Applications and reasons for using Heuristics, Heuristic Methods and approaches, Meta-Heuristics; Simulation – Meaning, Applications and Classification of Simulation Models, Process of Simulation, Steps and Features of Simulation Experiments and their Validation.		
<u>Unit II</u>			(08 Hours)
Experimentation			
	Objective, Strategies, Factorial Experimental Design, Applications of Experimental Design, Basic Principles – Replication, Randomization and Blocking, Guidelines for designing experiments; Laboratory Experiments, Methods of manipulating Variables, Errors in Experiments, Steps in Design of Experiments.		
<u>Unit III</u>			(08 Hours)
Introduction to Data and Errors			
	Types Of Data counts, measurements. Types of error: inherent, instrument, operator. Statistical distributions: Uniform, Binomial, Poisson, Exponential, Normal Estimation of means, proportions, population sizes, variances		
<u>Unit IV</u>			(08 Hours)
Hypothesis testing			
	Procedures for hypothesis testing, means, proportions, variances, contingency, goodness of fit of data to a proposed model. Use of hypothesis tests to compare products or processes.		
<u>Unit V</u>			(08 Hours)
Design and analysis			
	Principles of experimental design: randomisation, replication, blocking. Analysis of variance: one-way and two-way analyses, with and without interaction. Cross-classified and nested forms. Fixed and random effect models. Factorial experiments versus one-at-a-time experiments.		
			(08 Hours)

<u>Unit VI</u>		
Regression analysis		
	Simple and multiple regression analysis. Use of transformation, analysis of residuals, variable selection procedures	
Text Books/ References		
	<ol style="list-style-type: none"> 1. C.R Kothari, Research Methodology, Methods & Technique; New Age International Publishers, 2004 2. R. Ganesan, Research Methodology for Engineers, MJP Publishers, 2011 3. Experimental Methods for Engineers, J. P. Holman, McGraw-Hill Education (2000) ISBN 0071181652. 4. Experimental Methods: An Introduction to the Analysis and Presentation of Data, L. Kirkup, Wiley Text Books (1995) ISBN 0471335797 5. An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, 2nd Edition, J. R. Taylor, University Science Books (1997) ISBN 093570275X. 	
<u>Syllabus for Unit Test</u>		
	Unit Test I	Unit I,II,III
	Unit Test II	Unit IV,V,VI

Self Study Paper I : TRIBOLOGY IN DESIGN

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction to Tribology:

Introduction, Friction, Wear, Wear Characterization, Regimes of lubrication, Classification of contacts, lubrication theories. Newton's Law of viscous forces, Effect of pressure and temperature on viscosity.

Unit II

(08 Hours)

Hydrodynamic Lubrication:

Newton's Law of viscous forces, Flow through stationary parallel plates. Hagen's poiseuille's theory, viscometers. Concept of lightly loaded bearings, Petroff's equation, Hydrodynamic Bearings, Pressure development mechanism. Converging and diverging films and pressure induced flow. Reynolds's 2D equation with assumptions. Introduction to idealized slide bearing with fixed shoe and Pivoted shoes. Expression for load carrying capacity. Location of center of pressure.

Unit III

(08 Hours)

Hydrostatic Bearings:

Types of hydrostatic Lubrication systems Expression for discharge, load carrying capacity, Flow rate, Condition for minimum power loss. Torque calculations.

Unit IV

(08 Hours)

Elasto Hydrodynamic Lubrication:

Introduction to Elasto - hydrodynamic lubricated bearings. Introduction to 'EHL' constant. Grubin type solution, Different regimes in EHL contact

Unit V

(08 Hours)

Porous, Gas Bearings and Magnetic Bearings:

Introduction to porous bearings. Equations for porous bearings and working principal, Fretting phenomenon and it's stages. Introduction to gas bearing, Governing Equation, Infinitely long journal bearings, Externally pressurized gas bearing. Introduction to magnetic bearings, Active magnetic bearings. Different equations used in magnetic bearings and working principal. Advantages and disadvantages of magnetic bearings, Electrical analogy, Magneto-hydrodynamic bearings.

Unit VI

(08 Hours)

Tribo Measurement In Instrumentation:

Surface topography measurements - Electron microscope and friction and wear measurements - Laser method - Instrumentation - International standards - Bearings performance measurements - Bearing vibration measurement.

Text Books/ References

1. Cameron, A. "Basic Lubrication Theory", Ellis Horwood Ltd. , UK,1981
2. Hulling , J. (Editor), "Principles of Tribology", MacMillan ,1984
3. Williams J. A ., "Engineering Tribology", Oxford Univ. Press ,1994
4. Neale M. J., "Tribology Hand Book ", Butterworth Heinemann, 1995
5. Basu S. K., Sengupta S. N., Ahuja B. B., "Fundamentals of Tribology" Prentice Hall of

India Privata Ltd. New Delhi, 2005

6. Mujamdar B. C ., "Introduction to Tribology of Bearing", Wheeler Publishing, New Delhi 2001
7. Susheel Kumar Srivasthava, "Tribology in industry", S. Chand and Co.
8. Dudley D. Fuller, " Theory and practice of Lubrication for Engineers", New York Company 1998
9. Moore, "Principles and applications of Tribology", Pergamon press
10. Pinkus Stemitch, "Theory of Hydrodynamic Lubrication"
11. Gerhand Schwetizer, Hannes Bleuler & Alfons Traxler, "Active Magnetic bearings", Authors working group
12. Radixmovsky, "Lubrication of Bearings - Theoretical Principles and Design" The
13. Oxford press Company, 2000

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper I : Manufacturing System and Simulation

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Fundamentals System concept and design

Hierarchical structure, Decision making procedure, System types in manufacturing environments; Manufacturing Systems: Structural aspects, transformational aspects, procedural aspects, integrated manufacturing systems; Modes of Production-Jobbing/Intermittent/ Continuous; Mass Production-Economies of Scale, Optimum production scale, Mass Customization; Multi-Product Small Batch Production- Economies of Scope with Diversification; Logistic Systems- Material flow: conversion / transportation / storage

Unit II

(08 Hours)

Product / Process Planning and Design

Product Life Cycle, Planning of a new product, Product Design Aspects, Design cost considerations, Concurrent Engineering; Process and Operation Design-Computer Aided Process Planning, Optimum routing analysis using Dynamic Programming and Network Techniques, Criteria for line balancing.

(08 Hours)

Unit III

Manufacturing Optimization

Criteria for Evaluation, Optimization of single stage manufacturing- Unit production time and cost; Optimization of multistage manufacturing system-Scope, basic mathematical models; Cost Estimating- Classical metal cutting cost analysis, Industrial cost estimation practices, Estimating material, setup and cycle times.

Unit IV

(08 Hours)

Information Systems in Manufacturing

Database structures, hierarchical, network, Relational- concepts, keys, relational operations, query languages; Shop Floor Data Collection Systems-Types of data, on-line and off-line data collection, Automatic data collection systems

Unit V

(08 Hours)

Computer Simulation in Manufacturing System Analysis

Characteristics, Models, applications of probability and statistics; Design and evaluation methodology, General framework, Analysis of situation, Setting objectives, Conceptual modeling, Detailed design, Evaluation and Decision.

(08 Hours)

Unit VI

Modern approaches in Manufacturing

Cellular Manufacturing- Group Technology, Composite part, Rank Order Clustering Technique, Hollier method for GT cell layouts; Flexible Manufacturing- Concept, components, architecture; Lean Production concept, principles, Agile Manufacturing- concept, principles and considerations for achieving agility.

Text Books/ References

1. Katsudo Hitomi, (1998), “Manufacturing Systems Engineering”, Viva Low Priced Student Edition, ISBN 81-85617-88-0
2. B. Wu, “Manufacturing Systems Design & Analysis: Context and Techniques” (2/e), Chapman & Hall, UK, ISBN 041258140X
3. Mikell P. Groover, (2002), “Automation, Production Systems and Computer Integrated Manufacturing”, (2/e), Pearson Education, ISBN 81-7808-511-9
4. Radhakrishan P., Subramaniyan S. and Raju V., “CAD / CAM / CIM”, (3/E), New Age International Publication
5. Luca G. Sartori,(1998), “ Manufacturing Information Systems”, Addison Wesley Publishing Co.
6. N. Viswanadhan & Y, Narhari, (1998), “Performance Modeling of Automated Manufacturing Systems”, Prentice Hall of India

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

DISSERTATION STAGE I

TEACHING SCHEME

Practicals : 07 Hrs/week

EXAMINATION SCHEME

Term Work : 25 Marks

Practical/Oral : 25 Marks

Total Credits : 15

Stage-I:

The aim of the dissertation work is to carry out research and development work. Every student will be required to choose the topic of dissertation in consultation with the faculty guide.

This stage will include a report consisting of synopsis, the plan for experimental/theoretical work and the summary of the literature survey carried out till this stage.

SEMINAR

TEACHING SCHEME

Practicals : 05 Hrs/week

EXAMINATION SCHEME

Term Work : 25 Marks

Total Credits : 07

The student will be required to choose the topic of seminar on advanced topics based on courses taught in first and second semester and present the work during the seminar.

SEMESTER – IV

Self Study Paper II : CAD/CAM Practices in Metal Forming

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Fundamentals of Material Forming:

Introduction of forming processes. Concept of Formability, formability limits and formability diagram. Wire and Tube Drawing: Introduction rod and wire drawing machines - construction and working. Preparation of stock for wire drawing. Wire drawing dies, material and design. Heat treatment, variables in wire drawing, Maximum reduction in wire in one pass, forces required in drawing. Multiple drawing, work hardening, lubrication in wire drawing. Tube drawing: Methods, force calculation, stock penetration. Lubrication in tube drawing.

Unit II

(08 Hours)

Forging:

Introduction, classification of forging processes. Forging equipment- Hammers, presses, furnaces etc. construction working capacities and selection of equipment. Basic forging operations such as drawing, fullering edging, blocking etc. Forgability tests, design of forging as a product, friction in forging. Forging defects and the remedies. New technologies: Liquid metal forging, Isothermal forging, No draft forging, P/M forging, Rotary swaging, Roll forging, lubrication in forging.

(08 Hours)

Unit III

Rolling of Metals:

Scope and importance of rolling. Types of Rolling Mills- construction and working. Roll bite, reduction, elongation and spread. Deformation in rolling and determination forces required. Process variables, redundant deformation. Roll flattening, Roll camber - its effect on rolling process, mill spring. Defects in rolling. Automatic gauge control- Roll pass classification & design. Lubrication in rolling.

Unit IV

(08 Hours)

Sheet Metal Working:

Sheet Metal properties, gauges and surface conditions. Study of presses and equipments used, various cutting and forming operations, types of dies used, force requirement, theory of shear, methods of force reduction, defects, lubricants used. Miscellaneous sheet metal working operations: Metal spinning, fine blanking, coining, embossing, rubber forming, stretch forming.

Design of Press Tools:

General classification and components of press tools, types of dies simple, compound, combination dies, various press working operations such as punching, blanking, deep drawing, bending, forming etc. Design and calculations for above press working

dies.

(08 Hours)

Unit V

Extrusion:

Types: Direct, reverse, impact, hydrostatic extrusion. Dies for extrusion, stock penetration. Extrusion ratio of force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants. Manufacture of seam-less tubes. Advanced Metal Forming Processes:

High velocity forming- principles, comparison of high velocity and conventional forming processes. Explosive forming, Magnetic pulse forming, Electro hydraulic forming. Stretch forming, Coining Embossing, Curling, Spinning, Flow forming advantages, limitations and application of the process.

(08 Hours)

Unit VI

Finite-Element Method

Basics of Metal Forming and Finite-Element Method - Comparison of Finite-Difference and Finite Element Methods with Analytical Solutions - Spatial Discretization - Shape Functions - Assembly of the Stiffness Matrix. Finite Elements for Large Deformation - Solution of Linear Finite-Element Systems and Nonlinear Finite-Element Systems, Typical Finite Elements.

Text Books/ References

1. Dieter, "Mechanical Metallurgy"
2. P. N. Rao, "Manufacturing Technology", Tata McGraw Hill
3. G.W. Rowe, "Principles of Industrial Metal Working Process", Edward Arnold
4. Dr. R. Narayanswamy, "Metal Forming Technology", Ahuja Book Co
5. Surender Kumar, "Principles of Metal Working"
6. "ASM Metal hand book Vol: 4 forming"
7. Shiro Kobayashi, Soo Ik oh and Taylan Atlan , "Metal Forming and Finite Element Method", Oxford pub, 1992.
- 8.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Optimization Techniques

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction to Optimization

Statement of an Optimization Problem - Design Vector, Design Constraints, Constraint Surface, Objective Function, Objective Function Surfaces. Classification of Optimization Problems - Classification Based on the Existence of Constraints, Nature of the Design Variables, Physical Structure of the Problem, Nature of the Equations Involved, Permissible Values of the Design Variables, Deterministic Nature of the Variables, Separability of the Functions and Number of Objective Functions

Unit II

(08 Hours)

One-Dimensional Unconstrained Minimization

Introduction , Theory Related to Single Variable (Univariate) Minimization , Unimodality and Bracketing the Minimum, Fibonacci Method, Golden Section Method ,Polynomial-Based Methods. Programming using MATLAB

(08 Hours)

Unit III

Unconstrained Optimization

Introduction Necessary and Sufficient Conditions for Optimality Convexity Basic Concepts: Starting Design, Direction Vector, and Step Size. The Steepest Descent Method The Conjugate Gradient Method Newton's Method Quasi-Newton Methods Approximate Line Search Using MATLAB

Unit IV

(08 Hours)

Stochastic Programming

Introduction, Basic Concepts of Probability Theory, Stochastic Linear Programming, Stochastic Nonlinear Programming and Stochastic Geometric Programming

Unit V

(08 Hours)

Modern Methods of Optimization

Genetic Algorithms, Simulated Annealing, Particle Swarm Optimization, Neural-Network-Based Optimization and Ant Colony Optimization

(08 Hours)

Unit VI

Multiobjective Optimization

Introduction, Concept of Pareto Optimality, Generation of the Entire Pareto Curve. Methods to Identify a Single Best Compromise Solution .

Text Books/ References

1. Singeresu S. Rao, Engineering Optimization-Theory and Practice, New Age International Limited Publishers.
2. J. S. Arora, Introduction to Optimum Design, McGraw Hill, New York
3. S. S. Stricker, Optimizing Performance of Energy Systems, Battelle Press, New York.
4. Ashok D. Belegundu and Tirupathi R. Chandrupatla Optimization concepts and applications in engineering

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Robotics and Sensors

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction

Brief History, Basic concepts, Three laws of Robotics, Robot and Robotic mechanism, Automation and Robotics, Need for industrial Robots, Robot generations, Robot anatomy, Classification, Robot performance parameters, Socio-Economic aspects of Robotisation.

Unit II

(08 Hours)

Grippers

Introduction, types of end effectors, types of grippers, tools as end effectors, Guidelines for design of robotic gripper, force analysis of mechanical pneumatic and hydraulic grippers. Robot Drives Introduction, Classification of Drives, Characteristics of Drives, Types of Drives, Comparison of Drive system, Actuation Schemes, Reduction and Transmission Systems.

(08 Hours)

Unit III

Sensors and Controllers

Internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder. Robot vision: image processing fundamentals for robotic applications, image acquisition and pre-processing. Segmentation and region characterization object recognition by image matching and based on features.

Unit IV

(08 Hours)

Kinematics

Introduction, Rotation and Transformation, Denavit-Hartenberg Parameters, Mapping revisited, Forward kinematics, Inverse kinematics.

Unit V

(08 Hours)

Vision System for Robotics

Introduction, Need, Robot Vision System – Levels of processing, Functions of Machine Vision System, Image Acquisition, Sampling, Image Processing, Image Processing Technique, Edge detection, A typical vision system for robot, System hardware and function.

(08 Hours)

Unit VI

Robot Programming

Robot languages: AL, AML, RAIL, RPL, VAL, Demonstration of points in space :
Continuous path (CP), Via points (VP), Programmed points (PP).

Text Books/ References

1. Groover, Weiss, "Industrial Robotics", Tata McGraw-Hill.
2. Fu Ks, Re Congalez and CSG Lee, "Robotics- Control, Sensing, Vision and Intelligence", Tata McGraw Hill.
3. Koren Yoram, "Industrial Robotics", Tata McGraw-Hill.
4. Puranik M.T. and P.R.Ghorpade, "Robotics Fundamental", Nirali Publication, Pune.
5. Spong M.W., S. Huchrison and M. Vidyasagar, "Robot Modelling and Control", Willey-2006.
- 6.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Rapid Prototyping

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction

Need - Development of RP systems – RP process chain - Impact of Rapid Prototyping on Product Development –Digital prototyping - Virtual prototyping-Rapid Tooling - Benefits-Applications, materials used in rapid prototyping

Unit II

(08 Hours)

Reverse Engineering and CAD Modeling

Basic concept- Digitization techniques – Model Reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data Requirements – geometric modeling techniques: Wire frame, surface and solid modeling – data formats -Data interfacing, Part orientation and support generation, Support structure design.

(08 Hours)

Unit III

Liquid Based Rapid Prototyping

Stereolithography (SLA): Apparatus: Principle, per-build process, part-building, post-build processes, photo polymerization of SL resins, part quality and process planning, recoating issues, materials, advantages, limitations and applications.

Unit IV

(08 Hours)

Solid Based Rapid Prototyping System

Solid Ground Curing (SGC): working principle, process, strengths, weaknesses and applications. Fused deposition Modeling (FDM): Principle, details of processes, process variables, types, products, materials and applications

Unit V

(08 Hours)

Powder Based Rapid Prototyping Systems

Selective Laser Sintering(SLS): Principle, process, Indirect and direct SLS- powder structures, modeling of SLS, materials, post processing, post curing, surface deviation and accuracy, Applications. Laser Engineered Net Shaping(LENS): Processes, materials, products, advantages, limitations and applications– Case Studies.

(08 Hours)

Unit VI

Other Rapid Prototyping Technologies

Three dimensional Printing (3DP):Principle, basic process, Physics of 3DP, types of printing, process capabilities, material system. Solid based, Liquid based and powder based 3DP systems, strength and weakness, Applications and case studies. Examples and case studies

Text Books/ References

1. Rapid prototyping: Principles and applications, second edition, Chua C.K., Leong K.F and Lim C.S., World Scientific Publishers, 2003.
2. Rapid prototyping, Andreas Gebhardt, Hanser Gardener Publications, 2003
3. Rapid Prototyping and Engineering applications : A tool box for prototypedevelopment, Liou W.Liou, Frank W.Liou, CRC Press, 2007.
4. Rapid Prototyping: Theory and practice, Ali K. Kamrani, Emad Abouel Nasr, Springer,2006.
5. Rapid Tooling: Technologies and Industrial Applications, Peter D.Hilton,Hilton/Jacobs, Paul F.Jacobs, CRC press, 2000

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Design for Manufacture

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction

General design principles for manufacturability, strength and mechanical factors, mechanisms selection, evaluation method, geometrical tolerances, tolerance control and utilization. Economic Use of Raw Materials: Ferrous steel, hot rolled steel, cold finished steel, stainless steel, non ferrous materials aluminum, copper, brass, non metallic materials, plastics, rubber and composites

Unit II

(08 Hours)

Components Design I

Metal extrusion, metal stamping, fine blanking, four slide parts, spring and wire forms, spun metal parts, cold headed parts, extruded parts, tube and section bends, rolled formed parts, power metal parts, forging electro forming parts, specialized forming methods, turned parts, machined round holes, drilled parts, milled parts.

(08 Hours)

Unit III

Components Design II

Planned shaped and slotted parts, screw threaded contoured and internal ground parts, center less ground, electrical discharged, rolled furnished parts, electro chemical and advanced machine parts. Sand cast, die cast, investment cast and other cast products. Non Metallic Components Design Thermosetting plastic, injection moulded and rotational moulded parts, blow moulded, welded plastic articles, ceramics

Unit IV

(08 Hours)

Composite Materials

Introduction, Classification of composites, Types of composite, Properties, Metal matrix composite, Ceramic matrix composite, Fiber Reinforced plastic, Manufacturing methods, Applications in Different field. Ceramic, Properties and applications of ceramics. Manufacturing of ceramics.

Unit V

(08 Hours)

Assembled Parts Design I

Welded parts, arc, resistance, brazed and soldered parts, gear box assembly, bearing assembly.

(08 Hours)

Unit VI

Assembled Parts Design II

Retention, bolted connection, screwed connections, flanged connections, centred connections, press fitted connections, surface finishing, plated parts, heat treated parts, NC machining, group technology, low cost automation, computer aided manufacture, product design requirements.

Text Books/ References

1. James G. Bralla, —Hand book of product design for manufacturing| McGraw Hill Co., 1986
2. K.G. Swift —Knowledge based design for Manufacture| Kogan page Limited, 1987.
3. S H Avner, Physical Metallurgy, McGraw Hill Publication

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Theory of Elasticity & Plasticity

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Basic Concepts of Stress

Definition, State of Stress at a point, Stress tensor, invariants of stress tensor, principle stresses, stress ellipsoid, derivation for maximum shear stress and planes of maximum shear stress, octahedral shear stress, Deviatoric and Hydrostatic components of stress, Invariance of Deviatoric stress tensor, plane stress.

Unit II

(08 Hours)

Basic concepts of Strain

Deformation tensor, Strain tensor and rotation tensor; invariants of strain tensor, principle strains, derivation for maximum shear strain and planes of maximum shear strain, octahedral shear strain, Deviatoric and Hydrostatic components of strain tensor, Invariance of Deviatoric strain tensor, plane strain.

(08 Hours)

Unit III

Generalized Hooke's Law

Stress-strain relationships for an isotropic body for three dimensional stress space, for plane stress and plane strain conditions, differential equations of equilibrium, compatibility equations, Material (D) matrix for Orthotropic Materials.

Unit IV

(08 Hours)

True stress and true strain

Von-Mise's and Tresca yield criteria, Haigh–Westergard stress space representation of von - Mise's and Tresca yield criteria, effective stress and effective strain, St. Venants theory of plastic flow, Prandtl–Reuss and Levy–Mise's constitutive equations of plastic flow, Strain hardening and work hardening theories, work of plastic deformation.

Unit V

(08 Hours)

Analysis methods

Slab method, Slip line field method, uniform deformation energy method, upper and lower bound solutions. Application of Slab method to forging, wire drawing, extrusion and rolling processes.

(08 Hours)

Unit VI

Stresses in flat Plate

Stresses in circular and rectangular plates due to various types of loading and end conditions
buckling of plates

Text Books/ References

1. Timoshenko and Goodier, Theory of Elasticity, Mcgraw Hill Publications 3Rd Edition,
2. Madleson, Theory of Plasticity,
3. J. Chakrabarty, Theory of Plasticity, 2 nd edition, McGraw Hill Publications 1998
4. George E Dieter, Mechanical Metallurgy, McGraw Hill Publications 1988

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Design of Dies

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Design principles

Design principles for dies of thermo-plastic and thermo-setting components. Impression core cavities, strength of cavities, guide pillars and bushes, ejection systems, cooling methods, bolster types. Split moulds, methods of actuating the splits, moulds of threaded components, internal & external under cuts, moulds with under – feed systems. Design principles and standards for Transfer and compression moulding dies. Design of Tools: Mould for a spindle component with sleeve, pin ejection. Mould with splits Multi-cavity mould with stripper plate, inserts, and ejectors.

Unit II

(08 Hours)

Specifications & Elements of Blow Moulding

Determination of number of cavities, types of cooling system, design of cooling channels, heat transfer considerations, types of ejectors, determination of mould opening force & ejection force, use of CAD for mould design, defects and remedies

(08 Hours)

Unit III

Design of Dies for metal mould Castings

Design of Dies for metal mould Castings, Die casting, Shell moulding. Design of casting cavity, sprue, slug, fixed and movable cores, finger cam, core, pin, draft, ejector pins, ejector plate, gate, goose-neck, nozzle, over-flow, platen plunger, runner, slot, slide, vent, water line. Design of hot chamber, cold chamber machines, vertical, horizontal,, die locking machines, toggle and hydraulic systems, injection systems, rack and pinion, knockout pins and plates, hydraulic ejection, Other parts of die casting machines

Unit IV

(08 Hours)

Design of various types of dies

Design of various types of dies – Single cavity, multi cavity, combination, unit dies. Alignment of dies with sprue. Design approach for die elements. Selection of materials and heat treatment for die casting dies and elements – die casting alloys – types of die casting alloys, Case studies on executed dies and design details. Finishing, Trimming, and inspection. Gravity die casting – Die design with cores and inserts – Bulk forming tools. Mould flow analysis. Softwares used for Die Design.

Unit V

(08 Hours)

Open die forging

Open die forging, Advantages of open die forging over closed die forging. Calculation of allowances and tolerances. Methods of open die forging. Design of dies. Closed die forging. Preparation of material for forging. Calculation of raw-stock, cutting off, heating in furnaces. Allowances and tolerances for closed die forging as per IS: 3469 1974.

(08 Hours)

Unit VI

Die blocks for forging operations

Die blocks for forging operations. Design of fuller impression, Roller impression, Bender impression, Blocker impression, Finisher impression. Swaging tools. Planning layout of multi impression dies. Flash and cutter calculations –additional operations on forging, piercing, and trimming dies, coining dies. Horizontal forging machines. Design of upsetting dies. Calculations on upsetting dies

Text Books/ References

1. Rusinoff S.E., Forging & Forming Metals, Taraporewala, Bombay, 1952.
2. Dochlar H.H., Die Casting Dies, McGrawhill, 1951.
3. I.S. Standards, BSI., New Delhi.
4. Pye R.G.W., Injection Mould Design, Longman scientific & Technical Publishers, London, 1989.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Integrated Product Design & Development

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction

Definition and morphology of product design (seven phases), standardization, simplification and specialization in product design, modern approaches-concurrent design and quality function deployment, product development, product development versus product design, types of design and redesign, modern product development process, product development team and product development planning with reference to ISO standard, difference between product verification and production validation.

Unit II

(08 Hours)

Product Development – Technical and Business Concerns

Technology Forecasting and Technology S-Curve (Technology Stage), Mission Statement and Technical Questioning, Economic Analysis of Product, Customer Needs and Satisfaction, Customer Population and Market Segmentation, Customer Needs-Types and Models, Gathering Customer Needs Information, Analysis of Gathered Information.

(08 Hours)

Unit III

Product Development from Concept to Product Function

Generating concepts, information gathering, and brainstorming, morphological analysis, concept selection-design evaluation, estimation of technical feasibility, concept selection process, Pugh's concept, selection charts, numerical concept scoring, process of concept embodiment, system modeling, FMEA, functional modeling and decomposition, fast method, subtract and operate procedure, establishing system functionality, augmentation and aggregation.

Unit IV

(08 Hours)

Product Development in the Context of Reverse Engineering

Product Teardown Process, Tear Down Methods - Force Flow Diagrams, Measurement and Experimentation, Applications of Product Teardown, Benchmarking Approach and Detailed Procedure, Tools Used In Benchmarking -Indented Assembly Cost Analysis, Function - Form Diagrams, Trend Analysis, Setting Product Specifications, Introduction to Product Portfolio and Architecture.

Unit V

(08 Hours)

Design for Manufacture, Assembly and Environment

Design guidelines, design for manufacture, design for assembly, design for piece part production,

manufacturing cost analysis, need and importance of design for environment, global, local and regional issues, basic DFE methods-guidelines and applications, life cycle assessment - basic method, weighed sum assessment method, life cycle assessment method, DFX, product testing, product validation, field trials, virtual trials, iterations.

(08 Hours)

Unit VI

Product development Methodology:

Integrated product development process invariant, Integrated product development process, steps in IPD methodology, Product requirement planning and management, problem identification and solving methodology

Text Books/ References

1. K. Chitale; R.C. Gupta, Product Design and Manufacturing, Prentice - Hall India.
2. Effective Product Design and Development, Stephen Rosenthal, Business One Orwin, Homewood, 1992, ISBN, 1-55623-603-4
3. Tool Design – Integrated Methods for successful Product Engineering, Stuart Pugh, Addison Wesley Publishing, New York, NY, 1991, ISBN 0-202-41639-5
4. Concurrent Engineering Fundamentals volume II Integrated Product development, Biren Prasad, Prentice Hall International series in Industrial and system Engineering
5. Product Design and Development, Karl T. Ulrich and Steven D. Eppinger, McGraw – Hill International Edns. 1999
6. Dieter George E., Engineering Design McGraw Hill Pub. Company, 2000
7. Kevin Otto and Kristin Wood, Product Design: Techniques in Reverse Engineering and New Product Development, Pearson Education Inc.
8. Grieves, Michael, Product Lifecycle Management McGraw-Hill, 2006. ISBN 0071452303
9. Bralla, James G., Handbook of Product Design for Manufacturing, McGraw Hill Pub. 1986

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Design for Manufacturing & Assembly

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction

Design philosophy – steps in Design process – General Design rules for manufacturability – basic principles of designing for economical production – creativity in design. Application of linear & non-linear optimization techniques. Materials: Selection of Materials for design – Developments in Material technology – criteria for material selection – Material selection interrelationship with process selection – process selection charts. Philosophy for design for X.

Unit II

(08 Hours)

Machining Process

Overview of various machining processes – general design rules for machining -Dimensional tolerance and surface roughness – Design for machining – Ease –Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

(08 Hours)

Unit III

Metal Casting

Appraisal of various casting processes, selection of casting process, - general design considerations for casting – casting tolerances – use of solidification simulation in casting design – product design rules for sand casting.

Unit IV

(08 Hours)

Metal joining

Appraisal of various welding processes, Factors in design of weldments – general design guidelines – pre and post treatment of welds – effects of thermal stresses in weld joints – design of brazed joints. Forging – Design factors for forging – Closed die forging design – parting lines of dies drop forging die design – general design recommendations

Unit V

(08 Hours)

Extrusion and sheet Metal work

Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, and Deep Drawing – Keeler Goodman Forming Line Diagram –Component Design for Blanking.

(08 Hours)

Unit VI

Plastics

Visco-elastic and creep behavior in plastics – Design guidelines for Plastic components – Design considerations for Injection Moulding – Design guidelines for machining and joining of plastics Assembly: Compliance analysis and interference analysis for the design of assembly Design and development of features for automatic assembly – liaison diagrams. Influence on the productivity and cost.

Text Books/ References

1. A K Chitale, R C Gupta “ Product Design and Manufacturing”, PHI, New Delhi, 2003
2. George E Deiter, “Engineering Design”, Mc GrawHills Intl, 2002.
3. John Cobert, “Design for Manufacturing”, Addison Welsely, 2000.
4. Surender Kumar and Gautham S., “ Design and Manufacturing”, Oxford & IBH Publishing Co Pvt Ltd, New Delhi, 1998.
5. Material Selection and Design Handbook, Vol – 20, ASM International, 1997.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

Self Study Paper II : Concurrent Engineering

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Total Credits : 04

Unit I

(08 Hours)

Introduction:

Background and challenges faced by modern production environment, sequential engineering process, Concurrent engineering definition and requirement, meaning of concurrent objectives of CE, benefits of CE. Sequential engineering.

Unit II

(08 Hours)

Product Life Cycle Management :

Life cycle design of products, life cycle costs. Support for CE: Classes of support for CE activity, CE organizational, structure CE, team composition and duties, Computer based Support, CE Implementation Process.

(08 Hours)

Unit III

Quality Function Deployment:

Industrial Design, Quality Function Deployment, house of quality, Translation process of quality function deployment (QFD). Modeling of Concurrent Engineering Design: Compatibility approach, Compatibility index, implementation of the Compatibility model, integrating the compatibility Concerns.

Unit IV

(08 Hours)

Design for Manufacture (DFM):

Introduction, role of DFM in CE, DFM methods, e.g. value engineering, DFM guidelines, design for assembly, creative design methods, product family themes, design axioms, Taguchi design methods, Computer based approach to DFM. Evaluation of manufacturability and assimilability

Unit V

(08 Hours)

Quality by Design:

Quality engineering & methodology for robust product design, parameter and Tolerance design, Quality loss function and signal to noise ratio for designing the quality, experimental approach.

(08 Hours)

Unit VI

Design for X-ability:

Design for reliability, life cycle serviceability design, design for maintainability, design for economics, decomposition in concurrent design, concurrent design case studies.

Text Books/ References

1. Concurrent Engineering- Kusiak - John Wiley & Sons
2. Concurrent Engineering- Menon - Chapman & Hall
3. David M. Anderson, Design For Manufacturing And Concurrent Engineering, CIM press, 2004
4. G. H. Haung, Design for X: Concurrent Engineering Approach, Chapman & Hall, 1996.
5. Shina, S.G., Concurrent Engineering and Design for Manufacture of Electronics Products, Van Nostrand Reinhold, New York, 1991.

Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

DISSERTATION STAGE II

TEACHING SCHEME

Practicals : 10 Hrs/week

EXAMINATION SCHEME

Term Work : 150 Marks
Pract/Oral : 75 Marks
Total Credits : 32

Stage-II:

This stage will include comprehensive report on literature survey, design and fabrication of experimental set up and / or development of model, relevant computer program. The student is require to publish at least one national/international paper based on the dissertation work. The publication / accepted paper for publication shall be included in the report.

Student has to submit the authentic copy of dissertation Stage-I report.

Bharati Vidyapeeth University
College of Engineering
Department of Civil Engineering

Proposed Structure of M.Tech (Civil – Hydraulic Engineering) 2015
Based on Choice Based Credit System

Semester I										Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18		
Subjects	Teaching Scheme (Hrs/Week)		Examination Scheme (Marks)							Examination Scheme (Credits)		
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Oral	Total Marks	TH	TW & OR	Total Credits
Advanced Fluid Mechanics	04	02	60	20	10	10	25	25	150	04	01	05
Irrigation Water Management	04	02	60	20	10	10	25	25	150	04	01	05
Computational Methods in Hydraulic Engineering	04	--	60	20	10	10	-	-	100	04	-	04
Hydrology	04	--	60	20	10	10	-	-	100	04	-	04
Total	16	04	240	80	40	40	50	50	500	16	02	18

Semester II										Total Duration: 20 hrs/week		
										Total Marks :500		
										Total Credits: 18		
Subjects	Teaching Scheme (Hrs/Week)		Examination Scheme (Marks)							Examination Scheme (Credits)		
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Oral	Total Marks	TH	TW &OR	Total Credits
Sediment Transport & River Engineering	04	02	60	20	10	10	25	25	150	04	01	05
Hydraulic Structures	04	--	60	20	10	10	--	--	100	04	-	04
Open Channel Flow	04	--	60	20	10	10	--	--	100	04	-	04
Optimization Techniques in Hydraulics	04	02	60	20	10	10	25	25	150	04	01	05
Total	16	04	240	80	40	40	50	50	500	16	02	18

Semester III										Total Duration: 28 hrs/week Total Marks : 475 Total Credits: 40		
Subject	Teaching Scheme (Hrs/Week)		Examination Scheme (Marks)							Examination Scheme (Credits)		
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Oral	Total Marks	TH	TW & OR	Total Credits
Elective –I	04	02	60	20	10	10	25	25	150	04	01	05
Elective –II	04	02	60	20	10	10	25	25	150	04	01	05
**Self-Study Paper-I	* 04	--	60	20	10	10	-	-	100	04	-	04
Seminar	-	05	-	-	--	--	25	25	50	-	05	05
Dissertation Stage –I	-	07	-	-	---	--	25	--	25		21	21
Total	12	16	180	60	30	30	100	75	475	12	28	40

Elective – I	Elective – II
<ul style="list-style-type: none"> Coastal Engineering Hydraulic Modeling Techniques 	<ul style="list-style-type: none"> Water Power Engineering Environmental Fluid Mechanics Numerical Methods in Hydraulic Engineering

Semester IV										Total Duration: 14hrs/week Total Marks : 325 Total Credits: 34		
Subject	Teaching Scheme (Hrs/Week)		Examination Scheme (Marks)							Examination Scheme (Credits)		
	L	P	Theory	Unit Test	Attendance	Tutorial /assignments	TW	Oral	Total Marks	TH	TW & OR	Total Credits
**Self-Study Paper-II	* 04	--	60	20	10	10	-	-	100	04	-	04
Dissertation Stage -II	-	10	-	-	--	-	150	75	225		30	30
Total	04	10	60	20	10	10	150	75	325	04	30	34

List of Self Study Papers

Sr.No	SELF STUDY PAPER- I (SEM-III)	SELF STUDY PAPER- II (SEM-IV)
	1	Water Resources Planning and Management
2	Ground Water Hydrology	Urban Water Management
3	Instrumentation in Hydraulics	River Engineering
4	Disaster Management	Planning of Ports
5	Operation and Maintenance of Hydraulic Structures	Soil conservation and Watershed Management
6	Application of Remote Sensing To Water Resources	Reservoir Sedimentation
7	Floods and Flood management	Tides and Tidal Hydraulics
8	Environmental Impact assessment for Water Resources Projects	Dam break analysis

SEMESTER I

1: ADVANCED FLUID MECHANICS

TEACHING SCHEME

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Term Work : 25 Marks
Oral. : 25 Marks
Credits : 5

Unit-I

(08 Hours)

Kinematics of Flow: Flow visualization, stream lines, streak lines, path lines, continuity equation in cartesian and cylindrical polar coordinates system, accelerations, rotation, vorticity.

Unit-II

(08 Hours)

Velocity potential and stream function, flow-net, Laplace equation and its solution by graphical and relaxation methods, simple flow patterns.

Unit-III

(08 Hours)

Dynamics of Flow: Integration of Euler's equation along streamline and in cartesian coordinate system. Bernoulli's equation, momentum equation, applications of energy and momentum equations to different problems.

Unit-IV

(08 Hours)

Navier-Stokes equations for incompressible fluids, Stokes law, creeping flow, Helle-shaw motion, flow between parallel plates, flow near suddenly accelerated plate, flow in a circular pipe. Review of dimensional analysis, drag on immersed bodies.

Unit-V

(08 Hours)

Boundary layer on flat plate, b. L. equations, Blasius solution, Karman's momentum and Integral equation, laminar and turbulent boundary layers, transition mechanisms, b.L.separation

Unit-VI

(08 Hours)

Turbulent Flow: Nature of turbulence, scales of turbulence, different averages, Reynolds rules of averaging, Reynolds equations, statistical approach, isotropic and homogeneous turbulence, spectrum of turbulence.

Text Books / References

Shames, "Mechanics of Fluids", McGraw Hill
Rouse H. Ed, "Advanced Fluid Mechanics", John Wiley, 1959
Schlichting H., "Boundary Layer Theory", McGraw Hill series in Mechanical Engineering
Garde R. J., "Turbulent Flow", New Age Publisher, New Delhi, 1994
Garde R. J., Mirajgaoker A. G., "Engineering Fluid Mechanics", SciTech Publisher, Chennai, 2004

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I , II & III
Units IV, V & VI

2: IRRIGATION WATER MANAGEMENT

TEACHING SCHEME

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
T. W. : 25 Marks
Or. : 25 Marks
Credits : 5

Unit – I

(08 Hours)

Soil Plant water relationship-Water relation of soils, Soil moisture and plant growth, estimating water requirement of crops, evapotranspiration and consumptive use , soil water availability to plants..

Unit – II

(08 Hours)

Water Application methods- Surface and sub surface irrigation methods ,Border Irrigation, Check basin, Furrow, Sprinkler and drip irrigation.Prospective new methods of irrigation

Unit – III

(08 Hours)

Design of drip and sprinkler irrigation systems-Hydraulic design of various Components of Drip and sprinkler Irrigation

Unit – IV

(08 Hours)

Measurement of Irrigation Water-Various methods, Weirs, Parshall flumes, orifices, meter gates, tracer method. Irrigation efficiency, components of project irrigation efficiency, efficiency of irrigation practices, water use and operation of irrigation system..

Unit – V

(08 Hours)

Scheduling of irrigation , time of irrigation ,frequency and interval of irrigation ,Water conveyance and control-Surface water distribution system, under ground Pipe line Irrigation distribution system.

Unit VI

(08 Hours)

Study Salt problems in Irrigated Agriculture-Salt balance, Quality of irrigation water, Plant response to saline and alkali soils, Reclamation and management of salt affected soils, Case studies.

Text Books / References

Irrigation Theory and Practice –A.M.Michael, Vikas Publishing House.
Irrigation Engineering- G.L. Asawa, Wiley Eastern Ltd.
Irrigation water management- D.K.Majumdar. PHI Pvt. Ltd, 2013

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I, II & III
Units IV, V & VI

3: COMPUTATIONAL METHODS IN HYDRAULIC ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit-I

(08 Hours)

Complex Variables: Function of complex variables, Analytic function, Cauchy-Riemann equations (Cartesian and polar form), Harmonic functions, Construction of Analytic function, Milne-Thompson method.

Unit-II

(08 Hours)

Complex Variables: Transformations or Mapping, Conformal mapping, Bilinear transformations, The Schwarz-Christoffel transformation, Complex Integration, Cauchy's Integral theorem, Cauchy's Integral formula, Residue theorem, Taylor's and Laurent's series. Applications to boundary value problems.

Unit-III

(08 Hours)

Numerical Solution of Partial Differential Equations: Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems. System of Linear equations- Jacobi, Gauss Seidel, Relaxation methods.

Unit-IV

(08 Hours)

Numerical Methods: Curve fitting : Method of least squares, Straight line, Second degree parabola, Exponential curve. Numerical Integration-General Quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule, Newton-Cotes Integration formulae, Gauss-Quadrature two point and three points formulae.

Unit-V

(08 Hours)

Statistics: Measure of central tendency, measures of dispersion, Moments, Skewness and Kurtosis. Coefficient of Correlation and Regression, Multiple and Partial Correlation coefficient, Reliability of regression estimates (standard error of estimates).

Unit-VI

(08 Hours)

Probability : Classical definition of probability, Addition and multiplication theorem of probability, Conditional Probability, Random variable, discrete and continuous random variables, Binomial, Poisson, Normal, Geometric, Exponential Beta, Gamma Distributions, Sampling distributions, Testing of Hypothesis, Large sample tests for means and proportions, small sample tests based on Chi-square test of goodness of fit and independence of attributes.

Text Books / References

Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd. Mumbai
Wylie C. R., Barret L. C., "Advanced Engineering Mathematics", McGraw-Hill
B.S.Grewal, "Engineering Mathematics" (Khanna Publications, Delhi)
P.N.Vertikar & J. N. Vertikar, "Applied Mathematics"(Volume I & II) , P.V.G.Publications, Pune.

Murray R. Spiegel, "Schaum's Outline of theory and problems of "Complex Variables", McGraw Hill Book Company

S. C. Gupta & V. K. Kapoor, "Fundamentals of Mathematical Statistics", S. Chand & Sons , Delhi

S.S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall of India Pvt. Ltd., New Delhi

Irwin Miller & John E. Freund, "Probability & Statistics For Engineers", Prentice Hall of India Pvt. Ltd., New Delhi

Syllabus for Unit Test

Unit Test 1

Unit Test 2

Units I , II & III

Units IV, V & VI

4: HYDROLOGY

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit-I (08 Hours)

Forms of precipitation, hydrologic cycle, climate and seasons in India. Water availability in India and world. Methods of measuring precipitation, location of rain gauge, rainfall mass curve and rainfall hyetograph, intensity-duration-frequency analysis, depth-area-duration analysis, PMP,

Unit-II

Evaporation , Evaporimeters, empirical evaporation equations, empirical method of evaporation estimation, Evapotranspiration , Measurement of evapotranspiration, evapotranspiration equations , Infiltration , Infiltration capacity, measurement of infiltration, modeling infiltration capacity , infiltration indices.

Unit-III (08 Hours)

Runoff: runoff components, factors affecting runoff, basin yield, runoff-rainfall relations.

Data Analysis: Correlation, regression analysis, transformations, stochastic process, and time series analysis ,auto correlation analysis and synthetic flow generation models using random variates.

Unit-IV (08 Hours)

Unit Hydro graph, S-curve and IUH, Cleark's method of IUH. Synthetic Unit-hydrograph. Floods: Frequency analysis, normal, log-normal and Gumbel's distributions, envelope curves, empirical formulae and regional flood frequency analysis.

Unit-V (08 Hours)

.Flood Routing- Introduction , basic equations, Hydrologic/ storage routing in reservoir and channels, Hydraulic methods of flood routing, Simple cases.

Unit-VI (08 Hours)

Ground Water Hydraulics: Types of aquifers, distribution of surface and sub surface water in global and Indian context, Darcy's law, Dupuits assumptions, application of Darcy's law to simple flow systems, differential equation for confined and unconfined aquifers, wells fully and partially penetrating, multiple wells, interference of wells, pumping test with steady and unsteady flow. Ground Water Development: Ground water exploration, types of wells, construction and design of wells, screens, pumping equipment, ground water quality, ground water pollution

Text Books / References

P. Jayarami Reddy, "Textbook of Hydrology", Laxmi Publication, New Delhi

P. Jayarami Reddy, "Stochastic Hydrology", Laxmi Publication, New Delhi

R. H. Mccuen and W. M. Snyder, "Hydrologic Modelin Statistical Methods and Applications"
Prentice Hall, New Jersey, U. S. A

K. N. Mutreja, "Applied Hydrology", Tata McGraw Hill Publication

V.T.Chow, "Applied Hydrology", Tata McGraw Hill Publication

Raghunath H. M., "Ground water", New Age International Publication
Linsely ,Kohler ,Pauhlas, Applied Hydrology, Mcgraw hill Publishers.

Syllabus for Unit Test

Unit Test 1

Units I , II & III

Unit Test 2

Units IV, V & VI

SEMESTER II

5 : SEDIMENT TRANSPORT AND RIVER ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/week
Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
T.W. : 25 Marks
Oral : 25 Marks
Credits : 5

Unit-I (08 Hours)

Introduction: Sediment problems, significant sediment properties, beginning of sediment movement – Shields analysis, critical tractive stress of non uniform materials.

Unit-II (08 Hours)

Bed Forms and Resistance: Description of bed forms, flow regimes, their significance, resistance analysis, different resistance laws.

Unit-III (08 Hours)

Modes of sediment transport, bed load transport, Dubuoy's equation. Einstein's approach, Meyer Peter and Muller's equation, suspended load transport, total load transport microscopic and macroscopic methods.

Unit-IV (08 Hours)

Design of stable channels: Regime method, Kennedy's method, Lacey's method, Blench and Simons-Albertson method and tractive force approach.

Unit-V (08 Hours)

Sediment Measurement: Bed load measurement, suspended load measurement, erosion from catchments, aggradation, degradation, silting of reservoirs, scour around bridge piers in uniform and non-uniform sediments.

Unit-VI (08 Hours)

Planforms and their prediction, river channel dimensions and their analysis, river training: objectives of river training, methods of river training by guide banks, spurs, levees, cut offs, pitched island and vanes, methods of bank protection.

Text Books / References

Garde R. J., Ranga Raju K. G., "Mechanics of Sediment Transportation and Alluvial Stream Problems", New Age International (P) Limited, New Delhi, 2004
Garde R. J., "River Morphology", New Age International (P) Limited, New Delhi, 2006

Syllabus for Unit Test

Unit Test 1	Units I , II & III
Unit Test 2	Units IV, V & VI

6: HYDRAULIC STRUCTURES

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit-I

(08 Hours)

Gravity Dams-Concrete, masonry , Forces acting on a gravity dam, earthquake force-pseudo static and dynamic response approach, load classification, stability analysis, distribution of shear and normal stresses, principal stresses .

Unit-II

(08 Hours)

Stress concentration around opening, foundation treatment, use of colgrout masonry in gravity dams, Roller Compacted Concrete Dams: Materials for R.C.C mixture, design concepts, construction methods, advantages.

Unit-III

(08 Hours)

Earth Dam: Cross section of earth dam, Seepage through dam and its foundation, stability analysis for sudden draw down condition and steady seepage condition, during construction stages.

Unit-IV

(08 Hours)

Seismic effects, pore pressure, protection of upstream and down stream slopes, design of filters. Rock fill Dams: Relevant rock fill characteristic, general design principles, method of construction and compaction.

Unit-V

(08 Hours)

Spill ways: Determination of capacity, types of spillways, ogee, siphon, chute, side, shaft, orifice spillway and stepped spillway, their hydraulic design, crest profile, energy dissipaters and divide walls.

Unit-VI

(08 Hours)

Spillway gates: Vibration, types of gates, radial, drum, vertical lift and automatic gates. Instrumentation in Dams: necessity, measurements and their purpose, planning of installation of instruments. Weirs and Barrages, water bridges and culverts ,design concepts .

Text Books / References

Bharat Singh,Varshney R.S.“Engineering of Embankment Dams”, Oxford & IBH Publishing Co.,1995.

Thomas, “The Engineering of Large Dams”, John Wiley & Sons

Varshney R. S., “Concrete Dams”, Oxford and IBH Publishing Co.

Vishcher D. L. and Hager W. H.,“Dam Hydraulics”,John Wiley & Sons

“Design of Small Dams”, USBR Oxford IBH Publishers

USBR Monogram -25, Stilling basins.

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

7: OPEN CHANNEL FLOW

TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit-I (08Hours)
Basic Concepts of Fluid Flow: Classification of flow, differential form of continuity and momentum equations, energy equation, energy and momentum correction coefficients, pressure variation in vertical.

Unit-II (08 Hours)
Steady Uniform Flow in Rigid Boundary Channels: Shear stress on the boundary, velocity distribution in the vertical, resistance laws and their limitations, Stickler's equation, conveyance and section factor.

Unit-III (08 Hours)
Specific energy, specific force and critical depth, control section, applications of specific energy and critical depth concepts.

Unit-IV (08 Hours)
Gradually varied flow, governing equations, classification of surface curves, computation of gradually varied flow in prismatic and non-prismatic channels, graphical, direct and numerical integration methods

Unit-V (08 Hours)
Rapidly varied flow and application of momentum equation, hydraulic jump in horizontal and sloping rectangular channels, location and length of jump.

Unit-VI (08 Hours)
Unsteady flows : Waves and classification, celerity of waves, surges , equations of motion, and method of characteristics.

Text Books / References

K .G. Ranga Raju, "Flow Through Open Channels", Tata McGraw Hill Publication 1993

Chaudhry M.H., 'Open channel flow', Springer, New York, 2007.

F. M. Henderson, "Open Channel Flow", The McMillan Company, N. Y., 1966

K. Subramanya, "Flow in Open Channels", Tata McGraw Hill Publication, 1990

V. T. Chow, "Open Channel Flow", McGraw Hill Publication, 1990

Garde R. J. & Mirajgaokar, "Engineering Fluid Mechanics", SciTech Publishers, Chennai , 2004

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

8: OPTIMIZATION IN HYDRAULICS

TEACHING SCHEME

Lectures : 04 Hrs/week
Practicals : 02 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Marks : 40 Marks
Term Work : 25 Marks
Oral. : 25 Marks

Unit-I (08 Hours)
Concept and need of Optimization; Linear Programming: Formulation of problem, graphical solutions, simplex method, Big M method, Two-phase method, duality.

Unit-II (08 Hours)
Transportation problems-BFS-Optimality test, maximization problems. Assignment Problems - minimization, maximization.

Unit-III (08 Hours)
Nonlinear Programming: Unconstrained one dimensional search methods - Dichotomous search, Fibonacci, golden section; Multivariable unconstrained methods-gradient techniques, steepest ascent, descent methods, Newton's method .

Unit-IV (08 Hours)
Nonlinear Programming :Constrained method : Lagrangian multiplier techniques, Khun- Tuckers conditions, Dynamic Programming: Principle of optimality, recursive equation.

Unit-V (08 Hours)
Introduction to genetic algorithms, simulated annealing, neural networks and fuzzy systems for solving optimization problems.

Unit-VI (08 Hours)
Model formulation and case studies : Conjunctive use of ground water and surface water, hydropower optimization, crop yield optimization, multi-basin and multi-reservoir systems.

Text Books / References

Rao S.S., 'Engineering Optimization -Theory and Practice', New Age International(P) Ltd., 1914.
Taha H.A., "Operation Research - An Introduction", Prentice - Hall, 2009.
Wagner, H. M., 'Principles of Operations Research', Prentice - Hall, 1975.
Vedula S. and Mujumdar P. P.'Water resources engineering', Tata McGraw Hill Education, 2005.
Deb Kalyanmoy. 'Optimization for Engineering Design - Algorithms and Examples' PHI Learning (P) Ltd, 2012.
Louks D. P, Stedinger J. R. and Haith D. A., Water Resources Systems Planning and Analysis, Prentice Hall, Inc. Engelwood Cliffs, 1981.

Syllabus for Unit Test

Unit Test 1 Units I , II, III
Unit Test 2 Units IV, V, VI

SEMESTER III

9 : ELECTIVE I: COASTAL ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/week
Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Termwork : 25 Marks
Oral : 25 Marks
Credits : 5

Unit-I

(08 Hours)

Basic understanding of wave mechanics including wave generation, propagation, form and assessment in the surf zone. Statistical and spectral analysis of recorded wave data and prediction in coastal zone.

Unit-II

(08 Hours)

Global tidal cycle, tidal analysis. Types of tides, effect of tides, significance in coastal engineering, Coastal process-erosion/accretion due to waves, estimation of littoral drift, Effect of construction of coastal structures on stability of shoreline / beaches, shoreline configuration

Unit-III

(08 Hours)

Introduction to Coastal structures:, Design criteria and functional aspects of coastal structures: sea wall, revetment, bulk-head, quay- wall, jetties, breakwater types : rubble-mound, composite, floating and pneumatic types, design of RBW , offshore structures: oil platform, design criteria for sub marine pipelines, cables, response of oil platform members , floating structure to wave load –vibration and spacing of piles, forces on piles.

Unit-IV

(08 Hours)

Dredging technology: types of dredgers, Radio active tracers studies for feasibility of dumping ground for dredged materials- environmental aspects of dredging etc.

Unit-V

(08 Hours)

Planning and management of port and Harbors, Modern trends and techniques in port engineering.- Roll on-Roll off/ Lift on –Lift off etc. Special purpose ports: Concepts of twin /mother port, SBM , outer to outer port etc. Significance of port cost analysis economics.

Unit-VI

(08 Hours)

Pollution in Coastal zone, disposal of waste/dredged spoils, design criteria of coastal outfall inlets and system. Oil spills and contaminants, coastal zone management: activities in coastal zone, CRZ, Issues related to Integrated coastal zone management. Coastal regulation zone.

Text Books / References

Basic Coastal Engineering-R.M.Sorensen,2006.
Coastal Hydrodynamics-J.S.Mani ,I IT Madras
Shore Protection Manual-U.S.Waterways Experiment Station Corps of Engineer,
Coastal Protection Manual 2002.
Narasimhan and S. Kathirolu, “ Harbour and Coastal Engineering”, Vol I&II, Ocean and Coastal Engineering Publication, NIOT, Chennai

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I, II & III
Units IV, V & VI

9 : ELECTIVE I : HYDRAULIC MODELLING TECHNIQUES

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Term work : 25 Marks

Oral : 25 Marks

Credits : 5

Unit-I

Dimensional analysis: Units, dimensions of physical quantities, different methods of obtaining dimensionless parameters viz., Rayleigh's method, method of repeating variables, Buckingham π theorem, Reynolds number, Froude number, Mach number, Euler Number and Weber number.

Unit-II

(08 Hours)

Determination of scales for models, Necessity of distortion of scales, scale effects. Movable bed models. Construction and operation of hydraulic models. Wind tunnels, flumes-2D, comprehensive models-3D.

Unit-III (08 Hours)

Measuring Equipments: Flumes, Weirs, flow meters, pressure transducers, hot film anemometer, Current meter, Laser Doppler, pointer gauges.

Unit-IV

(08 Hours)

Application to coastal and tidal problems. Design of Regular & Random (3D and 2D) wave modelling techniques, stability of coastal structures, Simulation of littoral drift, Design of sand trap, Distorted scale tidal modelling technique (rigid/movable) for Estuarine Ports,

Unit-V

(08 Hours)

Rigid bed models and movable bed models, bank protection works, barrages and weirs, canal offtakes, power intakes, gates, bridges and intakes. Applications for structures in hilly regions – Dams, spillways and energy dissipaters, combination of rigid and movable bed models, sedimentation and flushing of reservoirs.

Unit-VI (08 Hours)

Introduction to basic mathematical modelling techniques for hydraulic phenomena & processes related to various hydraulic structures, Advantages & limitations for interpretation of the results, need of validation with field/prototype data- Typical case studies using software.

Text Books / References

“Langhaar- Dimensional Analysis”

Hydraulic Modeling”, IAHR Bulletin no 7

“Fluid Mechanics”, Dr. R. J. Garde Scitech Publications Chennai

River behaviour control and training-CBIP Publications (60) revised no (279)

Narasimhan and S. Kathirola, “ Harbour and Coastal Engineering”, Vol I&II, Ocean and Coastal Engineering Publication, NIOT, Chennai

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

10 : ELECTIVE II WATER POWER ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/week
Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Term work : 25 Marks
Oral : 25 Marks
Credits : 5

Unit -I (08 Hours)

Classification of Hydropower plants, low & high head plants. Run of river plants, High head diversion plants, pumped storage plants, Electrical load on turbines load factor, power factor, capacity factor, load duration curve, firm power, secondary power.

Unit -II (08 Hours)

Assessment of available power, Essential stream flow data for water power studies flow duration curves, Intakes structures, location and intake type, shape of inlet, aeration in inlets, design of intake, sediment exclusion arrangement.

Unit -III (08 Hours)

Penstocks and Accessories, classification of pen stocks, design criteria for penstocks, Economical diameter of penstocks, Anchor blocks, conduit valves, Bends & manifolds.

Unit -IV (08 Hours)

Water hammer and surges, channel surges, water hammer, resonance in penstocks. Function of surge tank, Types of surge tanks, Differential surge tanks.

Unit -V (08 Hours)

Turbines- Type of turbines, Hydraulic features, Turbine size, lay out arrangements, Hydraulics of turbines, draft turbines, cavitation in turbines, characteristics of turbines.

Unit -V (08 Hours)

Planning of power house – Power house structure, under ground power station, components of under ground power house, types of layouts, small scale Hydropower, Potential of small scale Hydropower.

Text Books / References

Dandekar M.M., K.N.Sharma “Water Power Engineering “ Vikas Publishing house.
Varshney R.S.”Hydro power Structures” Nemchand & Bros, Roorkey.

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I, II & III
Units IV, V & IV

10 : ELECTIVE II: NUMERICAL METHODS IN HYDRAULIC ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/week
Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Term work : 25 Marks
Oral : 25 Marks
Credits : 5

Unit-1

(08 Hours)

Governing equations of 1-D and 2-D unsteady flow : St. Venant equations, Boussinesq equations, groundwater flow equations and boundary conditions.

Unit-2

(08 Hours)

Numerical method for one dimensional flow : Method of characteristics, characteristics, initial and boundary conditions, characteristic grid method, method of specified intervals, other numerical methods.

Unit-3

(08 Hours)

Numerical method for one dimensional flow : Finite difference method, explicit finite difference schemes, implicit finite difference schemes, stability.

Unit-4

(08 Hours)

Numerical method for two dimensional flow : Finite difference method, explicit finite difference schemes, implicit finite difference schemes, stability.

Unit-5

(08 Hours)

Numerical method for ground water flow : Explicit finite difference method, Implicit finite difference method, finite element method, application.

Unit-6

(08 Hours)

Applications of unsteady flows using commercial 1-D and 2-D software.

References

Chaudhry M. Hanif, Open Channel Flow, Spinger, 2007.
Abbott M. B. and Minns A. W., Computational Hydraulics, Gower Technical, 1998.
Vreugdenhil, C. B., Computational Hydraulics, 1989.
Fenton, J., Computational Hydraulics, 2010
Popescu I., Computational Hydraulics, Numerical methods and modelling paperback, IWA Publishing, 2014.
Rastogi A. K., Numerical ground water hydrology, Penram, 2007.
Pinder G. F. and Gray W. G., Finite Element Simulation in Surface and Subsurface Hydrology, 1977.

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I, II & III
Units IV, V & VI

10 ELECTIVE II: ENVIRONMENTAL FLUID MECHANICS

TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Term work : 25 Marks

Oral : 25 Marks

Credits : 5

Unit-I

(08 Hours)

Global wind currents, atmospheric boundary layer, simulation of boundary layer in wind tunnel and applications to forces on structures, use of wind tunnel for studying dispersion, diffusion. Cyclones, anti cyclones, and tornadoes, Tsunami.

Unit-II

(08 Hours)

Waves, deep and shallow water waves, braking of waves, littoral drift and sediment transport by waves, dispersion and diffusion in coastal waters, ocean out falls.

Unit-III

(08 Hours)

Vortex formation at intakes, similarity criteria, hydraulic design of sumps, design of water intakes.

Unit-IV

(08 Hours)

Heated water disposal in reservoirs and channels, mathematical considerations, solution techniques, physical modeling.

Unit-V

(08 Hours)

Thermal plumes, dispersion and diffusion in atmosphere.

Unit-VI

(08 Hours)

Problem and numerical solution.

Dam break

Text Books / References

Fisher H. B., List E. J., Imberger J. and Brooks N.H., "Mixing of Inland and Coastal Waters, Academic Press, NY, 1979

Bernard Le, Mehaute, "Introduction to Hydrodynamics and Water Waves, Springer-Verlag", NY, 1996

Khauss J., "Swirling Flow Problems at Intakes, Hydraulic Structure Design Manual-I", IAHR, Ed. 1987

Fredsoe J and Deigaard R., "Mechanics of Coastal Sediment Transport"

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

11 SELF STUDY PAPER I

12 SEMINAR

TEACHING SCHEME

Practical : 01 Hrs/week

EXAMINATION SCHEME

Term work : 25 Marks:

Oral : 25 Marks

Credits : 5

Each student will select a topic in the area of Hydraulic Engineering keeping track of the recent technological trends and developments. Students will make a seminar presentation using audio visual aids and submit the seminar report in the form of bound journal.

13 DISSERTATION STAGE I

TEACHING SCHEME

Practical : 02 Hrs/week

EXAMINATION SCHEME

Term work : 25 Marks

Credits : 21

Dissertation stage-I will include identification of problem, preparation of synopsis literature survey and formulation of problem.

SEMESTER IV

14 : SELF STUDY PAPER II

15 : DISSERTATION STAGE II

TEACHING SCHEME

Practical : 04 Hrs/week

EXAMINATION SCHEME

Term work : 150 Marks

Oral : 75 Marks

Credits : 30

Dissertation stage-II will include experimentation, data analysis and submission of final report.

11 : SELF STUDY PAPER I: WATER RESOURCES PLANNING AND MANAGEMENT

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit-I

(08 Hours)

Water Resources of India: Land resources of India, water sources per capita water availability, Irrigation potential, methods of assessment of water resources.

Unit-II

(08 Hours)

Water Resources Development: Objectives, planning for water resources development, water resources system design, economics of water resources development, micro and macro economics, discounting factors, discounting techniques – present worth, rate of return, benefit cost analysis, annual cost methods, profitability analysis.

Unit-III

(08 Hours)

Integrated and conjunctive use of water, allocating water for various uses. Irrigation water management, constraints in irrigation development. National water policy.

Unit-IV

(08 Hours)

Augmentation of water resources: Conservation of water, augmentation of water resources, method of artificial recharge.

Unit-V

(08 Hours)

Water quality: Quality of water for irrigation and municipal use, water pollution and its control. Development of water resources and environment. Environmental impacts of water storage reservoirs.

Unit-VI

(08 Hours)

Water logging and land reclamation: Causes of water logging, anti logging measures, factors responsible for formation of saline and alkali soils, ill effects of salinity and alkalinity, land reclamation methods.

Text Books / References

Ray K. Linsley, Joseph B. Franzini, "Water Resources Engineering", McGraw Hill Publication

R. K. Sharma, T. K. Sharma, "Hydrology and Water Resources Engineering", Dhanpat Rai Publication

P. P. Mujumdar, Vedula, "Water Resources Engineering", Tata McGraw Hill Publications.

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

11 : SELF STUDY PAPER I: GROUND WATER HYDROLOGY

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit – I (08 Hours)

Hydrological cycle, role of ground water in hydrological cycle, aquifers, classification and characteristics.

Unit – II (08 Hours)

Ground water hydraulics- Darcy's law and application, flow nets-application.

Unit – III (08 Hours)

Ground water hydraulics- mass conservation, aquifer flow equation, heterogeneity, anisotropy, unsaturated flow, recharge, stream-aquifer interaction, well hydraulics.

Unit – IV (08 Hours)

Application of ground water hydraulics for estimation of yield- case study.

Unit – V (08 Hours)

Model (Numerical) in ground water hydraulics

Unit – VI (08 Hours)

Working organization: Global and Indian data collection, water quality and control.

Text Books/References

Groundwater Hydrology, David Keith Todd and Larry W. Mays

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

11: SELF STUDY PAPER I: INSTRUMENTATION IN HYDRAULICS

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Credits : 4

Unit – I (08 Hours)

Definition of instruments, purpose of instrumentation, system of application of instrumentation, different classifications of instruments, main hydraulic and other civil engineering parameters involved.

Unit – II (08 Hours)

Qualifications and characteristic of instruments, calibration and errors – definitions, utility and dependability, transducers - their purpose, characteristics and usage, decision on the requirements for selection of instruments, need of system analysis before the selection of instruments.

Unit – III (08 Hours)

Specific instruments : measurement of velocity and discharge, requirements for field and laboratory, methods of measurement and different structures used, supporting structure requirements, designs parameters.

Unit – IV (08 Hours)

Methodologies adopted for observations, requirements for good instruments and Instrumentation, application of above requirements to instrument systems.

Unit – V (08 Hours)

Specific instruments : measurement of pressure and strain, requirements for field and laboratory methods of measurement and different structures used, supporting structure requirements, designs parameters.

Unit – IV (08 Hours)

Modern electronic and high precision instruments. hot film anemometer, 3D observations for velocities, eddies, etc.

Text Books/References

Handbook for Flow measurement and documentation – South Florida Management District, USA
Calibration of Pressure Measurements – University of Porto Rico
Calibration of Pressure Measurements – USBR No 1040-1989
Discharge measurement structures – USBR; Agricultural research Service
Experimental Uncertainty and Measurement errors – An update - World Water and Environment Conference May 2005

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I, II & III
Units IV, V & IV

11 : SELF STUDY PAPER I : DISASTER MANGEMENT

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Credits : 4

Unit – I

(08 Hours)

Factors causing disaster & damage to properties & human lives- Natural man made, cause & short term / long term effects & needs to take measures.

Unit – II

(08 Hours)

Extreme value conditions- Waves, flooding, storm surge, earthquake & Tsunami etc.

Unit – III

(08 Hours)

Failure of hydraulic structures - dams, fires in plants, (Thermal, Nuclear etc.), oil tanker leakage, sinking etc.

Unit – IV

(08 Hours)

Measures to avoid disasters (manmade), measures for minimum damage natural Disasters.

Unit – V

(08 Hours)

Warnings systems pre disaster- remote sensing, satellite, media, (Radio, Tv), communication systems.

Unit – VI

(08 Hours)

Rescue operation, -Helicopter, Life saving systems, transportation, detection of areas of disaster, Global, National, Local management systems for all various activities.

Text Books/References

- Harsh K. Gupta, Disaster Management, Universities Press(India), 2003.
Sundar I., Sezhiyan T., Disaster Management,, Sarup and Sons, 2007.
Thomas D. Schneid and Larry R. Collins, Disaster Management and Preparedness, 2002.
Awasthy Amit, Disaster Management : Warning response and Community Relocation, Global India Publications, 2009.
Pinkowski Jack, Disaster Management Handbook, CRC Press, 2008.
Sharma Vinod K., Disaster Management : First India Disaster Management Training Country Workshop, New Delhi, 1993.

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

11 : SELF STUDY PAPER I : OPERATION AND MAINTENANCE OF HYDRAULIC STRUCTURES

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Credits : 4

Unit – I

(08 Hours)

Introduction : Hydraulic structures, types, major hydraulic structures requiring operation and maintenance, dams, types.

Unit – II

(08 Hours)

Dam failures : historic dam failures, their causes, modes of failures of Embankment dams, external erosion, internal erosion, structural failure, safety requirements/measures, Modes of failures of concrete dams, external erosion, internal erosion, structural failure, safety requirements/measures

Unit – III

(08 Hours)

Guidelines for operations of dams, Operations of typical embankment dam and concrete dam

Unit – IV

(08 Hours)

Inspection guidelines of dams, inspection of embankment dam : the crest, the upstream slope, the downstream slope, the abutments, the downstream toe etc. inspection of concrete dam , inspection, of appurtenant works, spillway, outlets etc.

Unit – V

(08 Hours)

Monitoring and surveillance of embankment dams : Task and purpose of monitoring, Monitoring of pore pressure, seepage, monitoring of displacements, measurements of stresses, seismic measurements , general principles on the selection and positioning layout of measuring instruments, Monitoring and surveillance of concrete dams : On monitoring, surveillance and instrumentation of concrete dams in general, Monitoring by precise survey methods, surveillance with embedded instruments

Unit VI

(08 Hours)

Maintenance of embankment dam, maintenance of concrete dam, maintenance of appurtenant works, spillway, outlets etc.

Text Books / References

Ljubomir Tanchev, *St. Cyril and Methodius University, Skopje, Macedonia (Emeritus)*, Dams and Appurtenant Hydraulic Structures, Taylor & Francis, 2005.
British Columbia, Dam Safety Guidelines Inspection and Maintenance of Dams, 2011.
Texas commission on Environmental Quality, Guidelines for operation and Maintenance of dams in Texas

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I, II & III
Units IV, V & VI

11 : SELF STUDY PAPER I: APPLICATION OF REMOTE SENSING TO HYDRAULICS

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Credits : 4

Unit – I (08 Hours)

Principles of electromagnetic remote sensing, electromagnetic spectrum. aerial photography, satellite imagery.

Unit – II (08 Hours)

Infra red photography, temperature difference in water, aeromagnetic surveys at Low Altitude.

Unit – III (08 Hours)

Photographic techniques by aircrafts, satellites their principles & interpretation, aerial magnetic surveys a) subsurface rock structure b) flow of ground water.

Unit – IV (08 Hours)

Electrical conductance of rock, velocity of sound through different rocks , Electrical resistivity surveys.

Unit – V (08 Hours)

Preparation of maps on political land use, physiographic land gradient, methodology, geology of soil, hydrology and water shed , ground water potential, hydrogeology, agronomy, forestry, Civil engineering, A R. S. system classification a) Passive b) Active (A) Remote Sensing Characteristics i) Spatial resolution ii) Spectral resolution iii) Radiometric resolution iv) (B) Temporal resolution , 1D Extraction of information, fundamentals of Photogrammetric, Thermal infrared sensor (C) Side looking airborne radar (SLAR) (D) Land remote sensing satellite systems- satellites of different nations their sensors, No. of bands.

Unit – VI (08 Hours)

Fundamental concepts in computer aided image classification, data preprocessing : radiometric correction, geometric correction, large classifications : soft x hard classifiers, Contextual x Neural networks Classifiers, integration of Remote Sensing & GIS – Separate but equal, Seamless integration, Total integration.

Text Books/References

Chor Pang Lo, Albert K. W. Yeung, Concepts & Techniques of geographic information system, Prentice Hall, 2002

Paul Longly, Geographic Information Systems and Science, John Wiley & Sons, 2005.

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

11 : SELF STUDY PAPER I : ENVIRONMENTAL IMPACT ASSESSMENT FOR WATER RESOURCES PROJECT

Unit – I

(08 Hours)

Environmental Aspects of Water Resources Development, Rehabilitation of people affected by the project, submergence of the forest area, water logging and salinity in command areas, adverse effects on wild life ,water borne diseases, siltation of manmade reservoirs.

Unit – II

(08 Hours)

Effect of dam construction on downstream river regime. Sediment transport, National water policy and recommendations for environmental monitoring of water resources projects.

Unit – III

(08 Hours)

Environmental Impact Assessment methodology. Description of site and its Development description of present and projected conditions, assessment of probable impacts, compliance with regulations , review of alternatives.

Unit – IV

(08 Hours)

Environmentally sound water resources management, Various Case studies, catchment area treatment, compensatory afforestation, command area treatment , status of environmental monitoring of water resources development projects.

Unit – V

(08 Hours)

Socio economic issues related to water resources project. Deforestation ,submergence of land, change in land use pattern, submergence of existing roads, construction of new approach roads, construction of new town ships and other infrastructure.

Unit – VI

(08 Hours)

Environmental legislation in India with respect to water resources projects. Water-prevention and control of pollution act, wild life protection act, forest conservation act, environmental protection act.

Text Books/References

Government of India National water policy
Central water commission Guide lines for sustainable water resources development and management, 1992.
Central board of Irrigation and Power- Seminar on Environmental Management of Water Resources and Power Projects, 1995

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I, II & III
Units IV, V & VI

11:SELF STUDY PAPER I– FLOODS AND FLOOD MANAGEMENT

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit – I

(08 Hours)

Introduction, Necessity, General information on flood damages at global level and in India. Various methods of flood estimation and models.

Unit – II

(08 Hours)

Flood routing through channels , various method, with case studies.

Unit – III

(08 Hours)

Flood Mitigation, Identification of floods and flood zones.

Unit – IV

(08 Hours)

Flood control – Single & multipurpose reservoir , reservoir operation , rule curve, routing, zones of reservoir, structural and non structural measures.

Unit – V

(08 Hours)

Special floods- Estimation , dam break, PMF, Application for damage evolution.

Unit – VI

(08 Hours)

Aspects of flood management- identification of areas, extent & duration of flood, Environmental & Ecological aspects, economics of flood control project.

Text Books/References

“Flood & Flood control” Workshop proceedings at CWPRS Pune

“Flood forecasting & Warning” CWC guideline.

“Flood & Flood control” NIH Roorkey.

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

14 : SELF STUDY PAPER II : OFFSHORE STRUCTURES

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit – I (08 Hours)

Types of ocean Structures,- Onshore / Offshore, Requirement of structures, its types/ classification- depth, function, design aspect.

Unit -II (08 Hours)

History of development of offshore structures, installation of platforms, development in Indian continental shelf in future, need for crude oil and availability

Unit -III (08 Hours)

Basic design criteria for drag/ lift forces, design principles for structural members , spacing, wave data and vibration analysis.

Unit -IV (08 Hours)

Additional facilities/ functions related for oil transportations, storage, transport, pumping from oil well to the refinery .

Unit -V (08 Hours)

Safety of offshore structures natural/ manmade ,accidental- case studies , factors affecting stability, design of pipe lines.

Unit -VI (08 Hours)

Environmental aspects- oil leakages, pollution, fire protection, extreme wave conditions-storm, Tsunami etc. Economic aspects in design, Installation, maintenance, and operations related to offshore structures

Text Books/References

Brunn Per, B. U. Naik, "Shore Protection Manual", NIO Goa

Quinn A. D., "Port Planning", McGraw Hill Book Co., New York

Richard Silvester, " Coastal Engineering" Vol. I, II, University of western Australia.

Shore Protection Manual – 1984 and Coastal Protection Manual – 2002,

US Waterways Experiment Station, Corps of Engineer, Coastal Engineering research centre, Vicksburg , USA

Narasinhan and Kathirolu, "Harbor and Coastal Engineering", Vol. I & II, Ocean and Coastal engineering Publication, NIOT, Chennai

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

14 : SELF STUDY PAPER II: URBAN WATER MANAGEMENT

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Credits : 4

Unit – I (08 Hours)

Drinking water qualities, potable limits, water softening processes, common impurities, alkalinity, acidity, Water purification, storage, treatment of waters, settling basins, slow sand filters, pressure and gravity filters

Unit – II (08 Hours)

Storage of water, service reservoirs, cisterns, elevated tanks, pressure equalizing Reservoirs, distribution of waters, demand of water for domestic and public purpose, wastage of water, prevention of leakages, different methods of distribution, design of distribution system, intermittent and constant system of supply

Unit – III (08 Hours)

Pipes of different metals, cement concrete pipes, Valves, meters taps

Unit – IV (08 Hours)

Pumping of water, suction and delivery pipes, water pumps, design of pumping stations

Unit – V (08 Hours)

Ground water and wells, water bearing strata, discharge from wells, tests of yields, depression head, cone of depression

Unit – IV (08 Hours)

Methods of boring, strainers, well lining

Text Books/References

Water supply and sanitary engineering by G. s Birdie and J. S. Birdie.,
Dhanpatrai Publications, 2006.

Water supply engineering by B. C. Punmia, Laxmi publications, 2009.

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

14 : SELF STUDY PAPER II : RIVER ENGINEERING

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Credits : 4

Unit – I

(08 Hours)

Classification of Rivers: Based on different approach/criteria, River plan forms and their Characteristics, Development/variation of plan forms in meandering and migration, braiding, its characteristics and causes for their development.

Unit – II

(08 Hours)

Rivers in equilibrium: Channel stability, regime relations and applications, Natural constraints and their effects on the river regime, Hydraulic structures and their effects in the river regime.

Unit – III

(08 Hours)

Rivers in dynamics: Bed level changes, aggradation and degradation confluences and braiding, their causes and effects on river regime.

Unit – IV

(08 Hours)

River flow control structures: weirs, barrages, intakes, bridges and diversion structures, design and operational concepts, river improvement methods.

Unit – V

(08 Hours)

Rivers training works: Rivers training structures for weirs, barrages, intakes, bridges, diversion structures, hydraulic design and operational concepts, river improvement.

Unit – VI

(08 Hours)

Rivers navigation: Advantages and disadvantages, hydraulic structures for river navigation, river dredging, necessity and effects.

Text Books/References

River mechanics, Pierre Y, Julian (2002), Cambridge University Press
Brown S. A. 1985a, "Design of spur – type, Stream stabilization structure, final report," Federal highway administration.
Knighton, D., 1998, Fluvial forms and processes, Arnold, Baltimore.

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

14 : SELF STUDY PAPER II : PLANNING OF PORTS

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Credits : 4

Unit – I

(08 Hours)

Port development requirement, world port development- Major, Minor Fisheries, Indian port service, General planning of port requirement, Roll of modeling in planning of port, present status of Indian port & future demands of next four decades

Unit -II

(08 Hours)

Modern port facilities, roll of road / rail link with planning of ports, Automation in port development

Unit- III

(08 Hours)

Analysis of case studies- evaluation , comments suggestions
Special purpose berths in ports- Container, oil, Car transport .

Unit -IV

(08 Hours)

Port cost analysis and economics', maintenance of port structures, Modern trends- Roll of management techniques , skill in operation for safety purpose ,concept of GDP/GNP.

Unit -V

(08 Hours)

Concept of mother port, outer to outer port, offshore port etc. SBM linked transport, efficacy of port-Transport ,cost per tonne, VLCC

Unit -VI

(08 Hours)

Limiting factors for planning of ports-facilities, pollution, draft requirement, maintenance of port, measures for various aspects, development, National policy

Text Books/References

Quinn A. D., "Port Planning", McGraw Hill Book Co., New York.
Shore Protection Manual – 1984 and Coastal Protection Manual – 2002,
US Waterways Experiment Station, Corps of Engineer, Coastal Engineering
research centre, Vicksburg , USA
Narasimhan and Kathirolu, "Harbor and Coastal Engineering", Vol. I & II, Ocean
and Coastal engineering Publication, NIOT, Chennai

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

14 : SELF STUDY PAPER II : SOIL CONSERVATION AND WATERSHED MANAGEMENT

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit – I

(08 Hours)

Watershed concept-Size , shape, physiographic , climate, drainage, land use, vegetation, geology and soils, hydrology , hydrogeology.

Unit – II

(08 Hours)

Water Erosion- Mechanics of water erosion, types of erosion, estimation of water erosion losses, measurement of water erosion.

Unit – III

(08 Hours)

Water erosion control- land classification for soil conservation, mechanical methods of water erosion control , biological methods of water erosion control.

Unit – IV

(08 Hours)

Soil conservation in special problem areas – hilly areas, control of gullies, ravine reclamation, waterlogged and wetlands.

Unit – V

(08 Hours)

Land use management practices in semiarid and arid zones –problems of soil and water Management in semi arid and arid zones of India, control measures.

Unit – VI

(08 Hours)

Watershed Management- Planning for watershed management, measures for watershed management , land use planning, water harvesting and recycling ,socio economic aspects, recent trends in watershed management.

Text Books/References

Watershed Management-JVS Murthy, New Age International Publishers, 2009

Soil Erosion and conservation, R.P. Tripathy , H.P.Sing, New Age International Publishers, 2008

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

14 : SELF STUDY PAPER II : RESERVOIR SEDIMENTATION

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

(08 Hours)

Unit – I

Introduction : Scope and significance of reservoir sedimentation, properties of sediments. Basic concepts of sedimentation, bed load, suspended load sediment inflow, sediment out flow, trap efficiency, retention time.

Unit – II

(08 Hours)

Reservoir sedimentation process Settling of sediments, Density currents, pattern of reservoir sedimentation . Aggradation above dams, Degradation below dams, sources of sediments.

Unit – III

(08 Hours)

Reservoir sedimentation Prediction , Factors affecting sedimentation, various methods of predicting sedimentation Empirical studies, Mathematical modeling.

Unit – IV

(08 Hours)

Measurement of reservoir sedimentation , need for measurement , measurement of sediments in Rivers, streams etc. Measurements of suspended load, reservoir survey for sediments methods of measurements of sediments , sediments transport ,capacity survey, remote sensing techniques.

Unit – V

(08 Hours)

Sedimentation of reservoirs in India case studies, control of reservoir sedimentation, soil conservation measures, vegetation land treatment measures to check inflow of sediments in to reservoirs. Removal of sediments from reservoir.

Unit – VI

(08 Hours)

Estimate life of reservoir , different concepts and procedures practiced in USA, Japan, India.

Text Books/References

Reservoir sedimentation and control Central water Commission 1991, New Delhi.

Sedimentation of reservoirs-National Institute of Hydrology Dept. RN – 26-1985-86.

Life of reservoir – Technical report No.19. CBIP – New Delhi

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

14 : SELF STUDY PAPER II: TIDES AND TIDAL HYDRAULICS

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Internal Assessment : 40 Marks
Credits : 4

Unit I

Definition of tide, Generation of tides, reasons for formation , Role of celestial bodies, Global tidal Phenomenon, Amphedormic point, Co-tidal lines, tidal constituents, coriolis force, Harmonic analysis, High water, low water, intertidal zones.

Unit II

Sidereal day ,Solar day, Lunar day, Declination of moon, Sidereal year, Lunar month, Apibelson, Peribelson , Apogee, Perigee, Force diagram for tide generation, if of lunar and earth axis

Unit III

Theories of tides, Tidal predictions, tidal inequality, types of tides, tidal duration, Amplitude, tidal variaties, spring tides, neap tides, Effects of tide, tidal scenario in India and world, Diurnal tides, mixed tides, semi-dia tides, shift of tides.

Unit IV

Different similitude's, similarities, Hydraulic models, tidal in Distortions in model, Reasons for distortions, Fixed bed and movable bed tidal models, Layout of tidal model, different instruments for tidal model studies, Automatic tide generator in model, inferances from tidal model studies.

Unit V

Definition of tidal inlet, different features, stability of tidal inlet, Hydraulic processes near tidal inlet, tidal prism, formulae for assessment of stability of tidal inlets, different types of tidal inlets, meaoewes for stabilization of inlet effect of littoral drift, jarretts clarification, kenlegen's k, importance of tides in port and harbor operations.

Unit VI

Global tide ranges, range variation along Indian coast, different forms of unconventional/renewable energy their cheeris sources, tidal power, economies of tidal power, potential locations of tidal power plants around world and in India, single basin/double basin-single cycle/double cycle model of power generation, case study of existing/operating tidal power plants.

Text Books/References

Coastal Engineering Manual (CEM) USA corps of engineering

Ven Te Chow-Open Channel Hydraulics.

Jarrette M.A. : Stability of coastal inlets.

CWPRS Brochures on model Studies.

Indian institute of Ocean Technology : Coastal Manual Dr.Kathirolu, at Chennai.

Syllabus for Unit Test

Unit Test 1
Unit Test 2

Units I, II & III
Units IV, V & IV

14 : SELF STUDY PAPER II : DAM BREAK ANALYSIS

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

Unit – I (08 Hours)

Introduction: Review of dams in India, Necessity of Dam Break Analysis

Unit – II (08 Hours)

Design criteria of Dams: Earth, Gravity, Arc Dams with likelihood of Exceedence

Unit – III (08 Hours)

Types of Failures : Type of dam, Structural, Purpose, Parameters of Failure

Unit – IV (08 Hours)

Aspects in Dam Break Analysis : Economic, Managerial, Social, Environmental

Unit – V (08 Hours)

Hydraulics of Dam Break Analysis : St. Venant's equations - forms, methods of Solution Simulation Models – DAMBRK, FLDWAV, MIKE 11, HECRAS

Unit – VI (08 Hours)

Case Study, Review of Literature, Data Collection and Compilation.

Text Books/References

F M Henderson "Open Channel Flow", Macmillan Publishing Co, NY

Ven Te Chow " Open Channel Hydraulics", McGraw Hill Book Co. NY

Rouse H "Engineering Hydraulics", John Wiley & Sons, Inc.

Streeter V L and Wylie E B "Hydraulic Transients", McGraw Hill Book Co. NY

"HEC-RAS 4.1 : River Analysis System", US Army Corps Of Engineers, Hydrologic Engineering Centre, 'Hydraulic Reference Manual', CPD – 69, January 2010

"HEC-RAS 4.1 : River Analysis System", US Army Corps Of Engineers, Hydrologic Engineering Centre, 'User's Manual', CPD – 68, January 2010

"HEC-RAS 4.1 : River Analysis System", US Army Corps Of Engineers, Hydrologic Engineering Centre, 'Applications Guide', CPD – 70, January 2010

Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

Annexure B
Proposed Structure of M.Tech Computer Engineering
CBCS Pattern (2015-16)
STRUCTURE & EXAMINATION PATTERN

Semester I											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
Advanced Database Management System	04	02	60	20	10	10	25	25	04	01	05	
Advanced Software Engineering	04	02	60	20	10	10	25	25	04	01	05	
Mobile Operating System	04	--	60	20	10	10	-	-	04	-	04	
Distributed Computing	04	--	60	20	10	10	--	--	04	-	04	
Total	16	04	240	80	40	40	50	50	16	02	18	

Semester II											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
High Performance Computing	04	02	60	20	10	10	25	25	04	01	05	
Advanced Computer Algorithms	04	02	60	20	10	10	25	25	04	01	05	
Web Technologies	04	--	60	20	10	10	--	--	04	--	04	
Wireless Communication and Security	04	--	60	20	10	10	--	--	04	--	04	
Total	16	04	240	80	40	40	50	50	16	02	18	

Semester III											Total Duration: 28 hrs/week Total Marks : 500 Total Credits: 40	
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
Elective I	04	02	60	20	10	10	25	25	04	01	05	
Elective II	04	02	60	20	10	10	25	25	04	01	05	
Self Study Paper I	04	--	60	20	10	10	-	-	04	-	04	
Seminar	-	05	-	-	--	--	25	25		05	05	
Dissertation Stage I	-	07	-	-	--	--	25	-	-	21	21	
Total	12	16	180	60	30	30	100	75	12	28	40	

Elective – I	Elective - II
a) E-Commerce and ERP	a) Cryptography and Network Security
b) Information Storage Management	b) Parallel computing
c) Cyber Security	c) Wireless Sensor Network
d) Big Data & Analytics	d) Storage Area Network

Semester IV											Total Duration: 14 hrs/week Total Marks : 325 Total Credits: 34	
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
Self-Study Paper-II	04	--	60	20	10	10	-	-	04	-	04	
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30	
Total	04	10	60	20	10	10	150	75	04	30	34	

List of Self Study paper I & II

Self Study Paper I	Self Study Paper II
Enterprise Resource Planning	Grid Computing
Bioinformatics	Research Methods in Computer Science
Information Retrieval and Web Search	Middle ware Technologies
Speech Processing	Agile Systems
Sensor Network and Embedded Systems	Soft Computing
Computer Graphics and Visualization	E-Commerce and Payment Systems
Cloud Computing	Knowledge Representation and Reasoning
Pervasive computing	Computational Intelligence
Data Warehousing and Data Mining	High Performance Information systems
Software Security	Advanced Web Technologies

Advanced Database Management System

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		TW&OR : 50 Marks	01 Credits
UNIT - I	Parallel and Distributed Databases :		(08 Hours)
	Architectures for parallel database, Parallel query Evaluation, Parallelizing individual operation, Parallel Query Optimization, Distributed DBMS Architecture, Storing data in distributed DBMS, Distributed Catalog Management, Distributed query processing, Updating distributed data, Distributed concurrence control, Distributed recovery.		
UNIT - II	Web databases :		(08 Hours)
	Web search engines, web search architecture, Inverted indexes the IR way, Inverted indexes for web search engines, web crawling, web search statistics.		
UNIT - III	Data Warehousing and Data Mining:		(08Hours)
	Data Warehousing: Introduction Data Warehousing OLAP, Implementation Techniques for OLAP, Views and decision support. Data Mining: Introduction, Counting Co-occurrences, Mining for rules, Tree structured rules, Clustering, Similarity search over sequences, Additional data mining tasks.		
UNIT - IV	Object Database Systems and XML:		(08 Hours)
	Object Database Systems: User defined abstract data types, Structured types, Objects, Objects Identity and Reference types, Inheritance, database design for an ORDBMS, Comparing RDBMS with OODBMS and ORDBMS. XML: Introduction, Structure of XML Data, XML Document Schema, Querying and Transformation, API to XML, Storage of XML Data, XML Applications.		
UNIT - V	Spatial Data Management:		(08 Hours)
	Types of Spatial Data and Queries Application involving Spatial data, Introduction to spatial Indexes, Indexing based on space filling Curves, Grid files, R trees, High command Indexing.		
UNIT - VI	Deductive Databases AND Advanced Transaction Processing:		(08 Hours)
	Deductive Databases: Recursive Queries, Theoretical foundation, Recursive Queries with Negation, Efficient evaluation of Recursive Queries, Additional Transaction Processing, Advance transaction processing Integrated access to Multiply data sources, Mobile database, multiplying database, Geographic Information systems, Temporal and Sequence database, Information Visualization. Advanced Transaction Processing: Transact ion-Processing Monitors, Transactional Workflows, Main- Memory Databases, Real-Time Transaction Systems, Long-Duration Transactions and Transaction Management in Multi-databases.		

Reference Books:

1.	Rob & Colonel, "Database System Design Implementation & Management", Thomson Learning
2.	Date, "An Introduction to database system", Addison Wesley Pub
3.	Desai "Principles of Repagination database", Galgotia Publications
4.	Mallach, "Decision Support and Data Warehouse Systems", TMH
5.	Raghu Ram Krishnan, "Database Management Systems", IInd edition
6.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 5th Edition , McGraw Hill International Edition.
7.	Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Systems",Morgan Kaufmann publishers
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Advanced Software Engineering

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		TW&OR : 50 Marks		01 Credits	
UNIT - I					
Software Development Process:				(08 Hours)	
Software Processes, SDLC Models, Waterfall Model, The V Model, Prototyping Model, Iterative Model, Spiral Model. Agile Development, Agile Principles, XP, Scrum, AUP, Kanban, ASD, DSDM, FDD, Agile practices, Empirical Model in Software engineering					
UNIT - II					
Requirement Engineering and Black Box Testing:				(08 Hours)	
Requirement Engineering: Requirements phase and its importance, Requirement Elicitation and Analysis, Process models (DFD), Data models (ERD), Software, Requirement Specification Standard and Preparation, Characteristics of good SRS Documents, traceability matrix and its importance, CASE tool, and its basic features. Black box testing: Test case design and implementation, Automated testing and limitations, debugging methods, Black box testing methods.					
UNIT - III					
Process Improvement and Verification:				[08 Hrs]	
Process and product quality, Process classification, Process Measurement, Process Analysis and Modelling, Process change, The CMMI process improvement framework, Configuration Management Planning, Change management, Version and release management, System building, CASE tools for configuration management.					
UNIT - IV					
User interface Design, Maintenance and reengineering:				(08 Hours)	
User interface design issues: The UI design process, User analysis, User interface prototyping, Interface Evaluation. Software Maintenance: Reengineering, Business process reengineering, software reengineering, reverse engineering, restructuring, Forward engineering, The economics of reengineering.					
UNIT - V					
Software Reuse, CBSE:				(08 Hours)	
The reuse landscape, Design patterns, Frameworks, Generator based reuse, Application frameworks, Application system reuse, components and component models, The CBSE process, component composition, service oriented software engineering - services as reusable components, service engineering, software development with services.					
UNIT - VI					
Quality Management and SAQ:				(08 Hours)	
Quality Management - Quality Concepts, Software Quality, The review technique, cost impact of software defects, defect amplification and removal, Review metrics and their use, Reviews: A formal spectrum, Informal spectrum, Formal technical reviews, SQA: Background issues, Elements of SQA: SQA tasks, goals and metrics, Formal approaches to SQA: statistical SQA, Software reliability. The ISO 9126 quality factors, Mc Call's quality factors, The SQA plan					
References					
1. Ian Sommerville, "Software Engineering: Update", 8th Edition					

2. Roger S. Pressman and Roger, "Software Engineering: A Practitioner's Approach"	
3. Shari Lawrence Pfleeger and Joanne M Atlee, "Software Engineering", 3rd Edition	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

Mobile Operating System

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
		Continuous Assessment: 40 Marks			
UNIT - I	Introduction to Mobile Operating Systems:				(08 Hours)
	Brief History of Mobile Operating Systems, OS-Interfaces, Multilevel Views of OS, Categories, Small and Specialized OS, 64-Bit OS, Processes and Threads, System Performance and Models: Performance of Computer Systems, Performance Metrics, Workload and System Parameters, Simulation Models: Types, Discrete-Event Model, Stochastic Model.				
UNIT - II	Multiprogramming:				(08 Hours)
	System with Multiprogramming, Processor Scheduling, Synchronization, Deadlocks, File Management, Memory Management: Process Address Space, Contiguous Memory Allocation, Non Contiguous Memory Allocation, Virtual Memory, Paging with Virtual Memory.				
UNIT - III	Security and Protection:				(08 Hours)
	Components for Security and Protection, Physical Security, User Authentication, Protection, Secure Communications, Digital Certificates, System Vulnerabilities, Invasive and Malicious Software, Defending the System and User, Intrusion Detection Management.				
UNIT - IV	Mobile Ecosystems:				(08 Hours)
	Application Framework, Developing a Mobile Strategy, Mobile Information Architecture, Mobile Design: Elements of Mobile Design, Ubiquity in the Mobile Web, Mobile Web Development				
UNIT - V	Introduction to Linux:				(08 Hours)
	Command Line Interface, Files and Directories, Shell Variables, Script Files, Connecting a Remote Linux Server. Java Modeling Framework, Java and Posix Threads.				
UNIT - VI	Case Study:				(08 Hours)
	Android SDK, iOS, Windows, Mobile Web Apps vs. Mobile Applications				
Reference Books:					
[1] Jose M Garrido, Richard Schlesinger, Kenneth Hoganson, Principles of Modern Operating Systems.					
[2] By Brian Fling, Mobile Design and Development: Practical concepts and techniques for Creating Mobile Sites and Web Apps, O'Reilly Publications					
[3] Brian Fling, Mobile Design and Development, O'Reilly Publications.					
Syllabus for Unit Test:					
Unit Test -1	UNIT – I, UNIT – II, UNIT – III				
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI				

Distributed Computing

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 04Hours / Week		End Semester Examination: 60 Marks		04 Credits	
		Continuous Assessment: 40 Marks			
UNIT – I	Distributed System Concepts:				(08 Hours)
	Distributed Computing Models, Software Concepts, Issues in Designing Distributed Systems Client-Server Model. Case Studies. Network Communication: LAN and WAN Technologies, Protocols for Network Systems, Asynchronous Transfer Mode, Protocols for Distributed Systems.				
UNIT – II	Interprocess Communication:				(08 Hours)
	Message Passing, Advantages and Features of Message Passing Systems, IPC Message Format, IPC Synchronization, Message Buffering Strategies, Multidatagram Messaging, Process Addressing Techniques, Failure Handling Mechanism. Case Study: IPC in Mach				
UNIT – III	Remote Communication:				(08 Hours)
	Introduction, Remote Procedural Call, RPC Implementation, RPC Implementation, Parameter Passing Semantics, Server Management, RPC Call Semantics, Communication Protocols, Client Server Binding, Exception Handling and Security, RPC in Heterogeneous Environment, Failure Handling, RPC Optimization, Case Study: Sun RPC, Java RMI.				
UNIT – IV	Synchronization:				(08 Hours)
	Clock Synchronization, Physical Clocks, Clock Synchronization Algorithms, Logical Clocks, Global State, Mutual Exclusion, Election Algorithms, Deadlocks: Prevention, Detection Recovery, Deadlocks in Message Communication.				
UNIT – V	Distributed System Management:				
	Resource Management, Task Assignment Approach, Load Balancing Approach, Load Sharing Approach, Process Management in Distributed Environment, Process Migration, Threads, Fault Tolerance, Component Faults, System Failures and Use of Redundancy				(08 Hours)
UNIT – VI	Distributed Shared Memory:				
	Architecture, Types of DSM, Hardware DSM, and Design Issues in DSM Systems. Distributed File Systems, Naming, Security in Distributed Systems, Real Time Distributed Operating System, Distributed Database Management System, Emerging Trends in Distributed Computing.				(08 Hours)
Reference Books:					
1. H. Attiya, J. Welch Distributed Computing - Fundamentals, Simulation and Advanced Topics, Wiley Publications.					
2. Vijay Garg, Elements of Distributed Computing, Wiley Publications.					
3. S. Mahajan, S. Shan, Distributed Computing, Oxford Publications.					
Syllabus for Unit Test:					
Unit Test -1	UNIT – I, UNIT – II				
Unit Test -2	UNIT – III, UNIT – IV				
Unit Test-3	UNIT –V, UNIT-VI				

High Performance Computing

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04Hours / Week		End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		PR & OR : 50 Marks	01 Credits
UNIT - I	Computer organization:		(08 Hours)
	Memory, Registers, Instruction set architecture, Instruction processing, Pipelined processors: Pipelining, Structural, data and control hazards, Impact on programming. Cache memory: Organization, impact on programming, virtual caches, Operating systems: Processes and system calls, Process management, Program profiling.		
UNIT - II	Modern Computer Architectures :		(08 Hours)
	Memory, Floating-Point Numbers, Programming and Tuning Software - What a Compiler Does, Timing and Profiling, Eliminating Clutter, Loop Optimizations, Program execution, Program, Compilation, Object files, Function call and return, Address space, Data and its representation. Parallel Processing Concepts - Levels of parallelism instruction, transaction, task, thread, memory, and function, Models SIMD, MIMD, SIMT, SPMD, Dataflow Models, and Demand-driven Computation etc. Case Study: Cluster Computing network.		
UNIT - III	Parallel Algorithms:		(08 Hours)
	Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Irregular Algorithms: Lists, Trees, Graphs, Randomization: Parallel Pseudo-Random Number Generators, Sorting, Monte Carlo techniques		
UNIT - IV	Parallel Programming:		(08 Hours)
	Revealing concurrency in applications, Task and Functional Parallelism, Task Scheduling, Synchronization Methods, Parallel Primitives (collective operations), SPMD Programming (threads, OpenMP, MPI), I/O and File Systems, Parallel Matlabs (Parallel Matlab, Star-P, Matlab MPI), Partitioning Global Address Space (PGAS) languages (UPC, Titanium, Global Arrays).		
UNIT - V	High-End Computer Systems:		(08 Hours)
	Memory Hierarchies, Multi-core Processors: Homogeneous and Heterogeneous, Shared-memory Symmetric Multiprocessors, Vector Computers, Distributed Memory Computers, Supercomputers and Petascale Systems, Application Accelerators / Reconfigurable Computing, Novel computers: Stream, multithreaded, and purpose-built, Architectures: N-wide superscalar architectures, multi-core, multi-threaded		
UNIT - VI	Achieving Performance:		(08 Hours)
	Performance metrics and measurements, Measuring performance, Identifying performance bottlenecks, Restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, Using existing libraries, tools, and frameworks, CASE tools.		
Reference Books:			
1. Highly Parallel Computing", by George S. Almasi and Alan Gottlieb			
2. "Advanced Computer Architecture: Parallelism, Scalability, Programmability", by Kai Hwang, McGraw Hill 1993			
3. "Parallel Computer Architecture: A hardware/Software Approach", by David Culler Jaswinder Pal Singh, Morgan Kaufmann, 1999.			
4. "Scalable Parallel Computing", by Kai Hwang, McGraw Hill 1998.			

5. "Principles and Practices on Interconnection Networks", by William James Dally and Brian Towles, Morgan Kaufman 2004.	
6. GPU Gems 3 --- by Hubert Nguyen (Chapter 29 to Chapter 41)	
7. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Addison-Welsey, © 2003.	
8. Petascale Computing: Algorithms and Applications, David A. Bader (Ed.), Chapman & Hall/CRC Computational Science Series, © 2007.	
9. J. L. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.	
10. Silberschatz, P. B. Galvin, G. Gagne, Operating System Concepts, John Wiley.	
11. R. E. Bryant and D. R. O'Hallaron, Computer Systems: A Programmer's Perspective, Prentice Hall.	
12. John Levesque (Author), Gene Wagenbreth (Author), High Performance Computing: Programming and Applications (Chapman & Hall/CRC Computational Science)	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

Advanced Computer Algorithms		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	TW & OR : 50 Marks	01 Credit
UNIT – I	Introduction:	(08 Hours)
	Asymptotic notation, Models of Computation, Algorithm & their complexity, Random Analysis machines, Computational complexity of RAM programs, A stored program model, Abstractions of the RAM, A primitive model of computation(Turing Machines),Relational between Turing machine & RAM model ,Pidgin ALGOL A high level lang.	
UNIT - II	Algorithm Analysis and Algorithm Design techniques:	(08 Hours)
	Algorithm Analysis: Analyzing Algorithm, Designing Algorithm, Time & Space Complexity, Average & Worst case analysis, Lower Bounds. Algorithm Design techniques: Divide & Conquer, Search Traversals, Dynamic Programming, Backtracking, Branch & Bound, Greedy Algorithm	
UNIT - III	Sorting and Searching Algorithm :	(08 Hours)
	The Sorting problem, Radix Sorting, Sorting by comparison, Heap sort-an $O(n \log n)$ comparison sort, Quick Sort-an $O(n \log n)$ expected time sort, Expected time for Order statistics, Binary Search, binary search trees, optimal binary search tree, B-Trees Algorithms on graph: Elementary graph Algorithm, Minimum spanning tree, Single Source shortest Path, All pairs shortest path	
UNIT – IV	String Processing Algorithm and Divide and conquer method and Greedy method:	(08 Hours)
	String Processing Algorithm: The naive string matching, The Robin-Karp algorithm, String matching with Finite Automata, Knuth Morris Pratt Algorithm Divide and conquer method: Binary search, Mergesort, Quick sort, Strassen's matrix multiplication. The Greedy method: Knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees.	
UNIT – V	Dynamic Programming, Back Tracking, Branch & Bound:	(08 Hours)
	Dynamic Programming: Multistage graphs, OBST, 0/1 Knapsack, traveling sales man problem. Back Tracking: Eight Queens problem, graph coloring, Hamiltonian cycles, Knapsack problem, Maze problem. Branch & Bound: 0/1 Knapsack, Traveling salesman problem lower bound theory-comparisons trees for sorting/searching, lower bound on parallel computation.	
UNIT – VI	NP-hard and NP-complete problems:	(08 Hours)
	Algorithms, Complexity- intractability, Non-Deterministic Polynomial time (NP) Decision problems, Cooks Theorem, NP-Complete problems- satisfiability problem, vertex cover problem. NP-Hard problems-graph, scheduling, code generation problems, Simplified NP Hard Problems, Approximation Algorithm for NP Hard Problem.	
Reference Books:		
1. Bressard, "Fundamental of Algorithm"		
2. Horowitz, Sahani, "Fundamentals of Computer Algorithms", Galgotia		
3. Thomas H. Cormen and Charles E. L. Leiserson, "Introduction to Algorithm", PHI		
4. V. Aho and J. D. Ullman, "Design and Analysis of Algorithms", Addison Wesley		

5. E. V. Krishna Murthy, "Introduction to Theory of Computer"

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Web Technologies

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	

UNIT – I	Web Environment:	(08 Hours)
	<p>WWW, HTTP, Web Server and its deployment, N-Tier Arch., Services of Web Server – Mail server, News server, Proxy server, Multimedia server.</p> <p>XML Primer :</p> <p>Mark-up languages, XML, Uses of XML. WELL-FORMED XML: Parsing XML, Tags, text, elements, attributes, comments and empty elements. XML Declaration, Processing, Instructions, Errors in XML</p> <p>XML NAMESPACES: Need for namespaces, How XML namespaces work, URIs, When to use, namespace. VALIDATION: Document type definitions (DTD), Sharing vocabularies, Anatomy of DTD, Developing DTDs, DTD Limitations.</p> <p>XML SCHEMAS: Benefit of XML schemas, Elements of XML Schema Definition, Creating a Schema from multiple documents. XPATH, XSLT, Xquery</p>	
UNIT – II	JSP :	(08 Hours)
	JSP overview, JSP language basics, JSP translation and compilation directives, Standard java objects from JSP, JSP configuration and deployment, actions and tags of JSP; Java servlets – Arch, servlet interface, applications of servlets.	
UNIT – III	ASP :	(08 Hours)
	Objects and Components, Handling databases, Data Retrieval from Databases, applications of ASP, session management, ASP with .NET	
UNIT – IV	Web Technologies :	(08 Hours)
	<p>Server side programs. CGI programs. Client side scripts. The Applet Concept.</p> <p>Search Engine Optimization: Strategies, Optimizing Search strategies, Robots, Spiders and Crawlers, Mobile Search Engine Optimization.</p>	
UNIT – V	The Web as an example of client server computing :	(08 Hours)
	<p>Characteristics of web servers: handling permissions. File Management Capabilities of common server architectures , Role of client Computer.</p> <p>Nature of Client server relationship. Web protocols Support tools for website creation and management. Developing Internet Information servers. Publishing information and application.</p>	

UNIT – VI	Building Web applications :	(08 Hours)
	Protocols at the application layer. Principles of Web engineering. Database driven websites. RPC. Lightweight distributed objects. The role of the middleware. Support tools. Security issues in Distributed object systems. Enterprise- wide web base.	
Reference Books:		
	1. Information Architecture for the World Wide Web, Peter Morville and Louis Rosenfied, O'REILLY, 2007	
	2. Internet and World Wide Web: How to Program, Deitel and Deitel, 4th Edition, Prentice Hall, 2009	
	3. Beginning XML, David Hunter et al, 4th Edition, Wrox/John Wiley, 2007	
	4. Herbert Schildt, "Complete Reference JAVA 2", TMH	
	5. Jerri L. Ledford, "Search Engine Optimization", 2 nd Edition, Wiley Publication	
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Wireless Communication And Security

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	04 Credits
		Continuous Assessment: 40 Marks	
UNIT - I	Introduction :		(08 Hours)
	A Short history of wireless communication. A market for mobile communication. Some research topics. A simplified reference model. Wireless Transmission. Frequencies for Radio Transmission: Signal antennas, signal propagation. Multiplicity, modulation, spread spectrum, cellular systems.		
UNIT - II	Medium Access Control:		(08 Hours)
	Motivation for a specialized MAC. SDMA, FDMA, TDMA, CDMA, Comparison of S/T/F/CDMA. Telecommunication Systems: GSM, DECT, TETRA, UMTS.		
UNIT - III	Satellite Systems :		(08 Hours)
	Basics, Routing, Localization, Handover. Broadcast Systems : Cyclic repetition of data, digital audio broadcasting, digital video broadcasting		
UNIT - IV	Wireless LAN: Infrared vs. radio transmission, Ad-Hoc networks, IEEE802.11, Bluetooth, Case Study on WLAN. Wireless ATM : Motivation for WATM, WATM services reference model, functions, radio access layer, handover, location management, addressing, mobile quality of service, access point control protocol, Case Study on WATM.		(08 Hours)
UNIT - V	Mobile Network Layer:		(08 Hours)
	Mobile IP, Dynamic host configuration protocol, Ad-hoc Networks. Mobile Transport Layer : Traditional TCP, Indirect TCP, Mobile TCP.		
UNIT - VI	Performance Issues :		(08 Hours)
	QOS issues, Security issues, Non line of sight issues, Power control issues. Security Encryption and Authentication, Key pre-distribution and management, Secure Ad-Hoc Networks, Denial-of-Service Attacks, Energy-aware Security Mechanisms		
References:			
[1] Jochen Schiller, "Mobile Communication", Pearson Education, Asia			
[2] Mallick, "Mobile and Wireless Design Essentials", Wiley computer publication			
[3] Andy Dornan, "The Essential Guide of Wireless Communications Applications", Pearson Education Asia			
[4] Weisman, "The Essential guide to RF and wireless", Pearson Education Asia			
[5] Lee, "Mobile Cellular Telecommunications", MGH			
Syllabus for Unit Test:			
Unit Test -1	UNIT – I, UNIT – II, UNIT – III		
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI		

E-Commerce and ERP

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 50 Marks		01 Credit	
UNIT - I					
Ecommerce business models and concepts, EC infrastructure, Ecommerce:				(06 Hours)	
Ecommerce business models and concepts, EC infrastructure, Ecommerce -Frame work, anatomy of E-Commerce applications					
E-Commerce Consumer applications, E-Commerce organization. Applications. Consumer Oriented Electronic commerce - Mercantile Process models					
UNIT - II					
E-Security and payment systems, Electronic payment systems :				(06 Hours)	
Esecurity and payment systems, Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Implementation, Value added networks.					
UNIT - III					
Concepts and communications, ethical, social and political EC issues, Intra Organizational Commerce:				(06 Hours)	
Concepts and communications, ethical, social and political EC issues, Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.					
Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research. Marketing, online retailing, services, content and media, social networks.					
UNIT - IV					
Introduction To ERP:					
Introduction To ERP: Evolution of ERP, What is ERP? Reasons for the growth of ERP, Scenario and Justification of ERP in India, Evaluation of ERP, Various Modules of ERP, Advantage of ERP.					
UNIT - V					
Overview of Enterprise:					
An overview of Enterprise, Integrated Management Information, Business Modeling, ERP for Small Business, ERP for make to order companies, business Process Mapping for ERP Module Design, Customized ERP, Hardware Environment and its Selection for ERP Implementation.				(06 Hours)	
UNIT - VI					
ERP Market:				(06 Hours)	
ERP Market: Introduction, SAP AG, Baan Company, Oracle Corporation, People Soft, JD Edwards World Solutions Company, System Software Associates, Inc. (SSA) QAD, A Comparative Assessment and Selection of ERP Packages and Modules.ERP implementation lifecycle, issues in implementing Vendors, Consultants and users, In-House Implementation - pros and cons, vendors, consultants, end user.					
Reference Books:					
1. Laudon K., C. G. Traver, E-Commerce Prentice Hall, 2010					
2. William S. Davis, John Benamati, E-Commerce Basics: Technology Foundations and E-Business Applications, Prentice Hall.					
3. Enterprise Resource Planning – Alexis Leon					
4. ERP Ware: ERP Implementation Framework – V.K. Garg & N.K. Venkitakrishnan					

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Information Storage and Management

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 04Hours / Week		End Semester Examination: 60 Marks		04Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		PR & OR : 50 Marks		01 Credits	
UNIT - I	Introduction to Storage Technology:				[8Hrs]
	Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, Traditional file storage and it's pitfalls. The five pillars of technology, Overview of 12 storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.				
UNIT - II	Storage Systems Architecture:				[8Hrs]
	Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.				
UNIT - III	Introduction to Networked Storage:				[8Hrs]
	JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.				
UNIT - IV	Introduction to Information Availability:				[8Hrs]
	Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques. Case study: Storage Network for Business Continuity.				
UNIT - V	Managing & Monitoring:				[8Hrs]
	Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change , Problem reporting, prioritization, and handling techniques, Management tools overvie				
UNIT - VI	Information storage on cloud:				[8Hrs]
	Concept of Cloud, Cloud Computing, storage on Cloud, ClouVocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.				

References:

- 1) Information Storage and Management Storing, Managing, and Protecting Digital Information , by EMC, Hopkinton and Massachusetts, Wiley, ISBN:9788126521470
- 2) G. Somasundaram & Alok Shrivastava (EMC Education Services) editors; Information Storage and Management: Storing, Managing, and Protecting Digital Information; Wiley India.

- 3) Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained: Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE, Wiley India.
- 4) John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

Cyber Security

Cyber Security		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04Hours / Week	End Semester Examination: 60 Marks	04Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	PR & OR : 50 Marks	01 Credits
UNIT - I	Cyber Security Fundamentals:	(08 Hours)
	Network and Security Concepts, Authentication, Authorization, Non repudiation, Confidentiality, Integrity, Availability, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System, Firewalls, Virtualization, Microsoft Windows Security Principles	
UNIT - II	Attacker's Techniques:	(08 Hours)
	Types of Proxies, Tunneling Techniques, Phishing, Smishing, Vishing, and Mobile Malicious Threat Infrastructure.	
UNIT - III	Exploitation:	(08 Hours)
	Shell code, Stack-Based Buffer Overflows, Format String Vulnerabilities, Malicious PDFs, Web Exploit Tools, Brute Force and Dictionary Attacks, Misdirection, Reconnaissance, and Cross-Site Scripting, DNS Amplification Attacks.	
UNIT - IV	Malicious Code:	(08 Hours)
	Self-Replicating Malicious Code, Virtual Machine Obfuscation, Persistent Software Techniques, Privileged User Accounts and Escalation of Privileges, Token Kidnapping, Man-in-the-Middle Attack.	
UNIT - V	Defense and Analysis Techniques:	(08 Hours)
	Memory Forensics, Capabilities of Memory Forensics, Memory Analysis Frameworks, In-Memory Forensics and Using Volatility, Honey pots, Malicious Code Naming, Automated Malicious Code Analysis Systems	
UNIT - VI	Cyber Security Real World Impact:	(08 hours)
	Cyber security and internal political security, International conflict in cyberspace, Nation-state cyber attack mitigation strategies, IP V6 address space, Improved security, privacy concerns, uneven world wide deployment. Case study	
Reference Books:		
1. Cyber security essentials by James Graham, Richard Howard, Ryan Olson		
2. Strategic Cyber Security by Kenneth Geers		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

Big Data Analytics

Big Data Analytics		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04Hours / Week	End Semester Examination: 60 Marks	04Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	PR & OR : 50 Marks	01 Credits
UNIT - I	Introduction:	(08 Hours)
	Introduction to Big data, Data Exposition, Types of data, Need for big data, Big data & its sources, Three Characteristics of big data, Challenges of Conventional Systems – Big data Problem, Traditional IT Analytics Approach, Big data use cases, Handling limitations of Big data, big data platform. Evolution of Analytic Scalability.	
UNIT - II	Big Data Storage and Computing Platforms:	(08 Hours)
	Big Data Storage and Computing Platforms: Traditional RDBMS, NoSQL, NewSQL, and Hadoop, Parallel computing systems, Programming models for batch, interactive, and streaming applications, Trade-offs between programming models, Survey of new emerging database and storage systems for Big Data, Tradeoffs between reduced consistency, performance, and availability, MangoDB: Introduction, overview, Design Goals for MangoDB, MangoDB shell, MangoDB applications, Multimedia database application.	
UNIT - III	Regression Modeling - Multivariate Analysis:	(08 Hours)
	Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods	
UNIT - IV	Introduction To Streams Concepts:	(08 Hours)
	Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.	
UNIT - V	Mining Frequent Itemsets:	(08 Hours)
	Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in Non-Euclidean Space – Clustering for Streams and Parallelism	
UNIT - VI	MapReduce:	(08 Hours)
	MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association-Intelligence from unstructured information-Text analytics-Understanding of emerging trends and technologies-Industry challenges and application of Analytics.	
Text Books:		
1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.		
2. Ohlhorst, Frank J. Big Data Analytics: Turning Big Data into Big Money. Copyright © 2012 SAS Institute Inc., Cary, North Carolina, USA.		
3. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.		
4. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced		

Analytics”, John Wiley & sons, 2012.	
5. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007	
6. Pete Warden, “Big Data Glossary”, O’Reilly, 2011	
7. Jiawei Han, MichelineKamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Cryptography and Network Security

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04Hours / Week		End Semester Examination: 60 Marks	04Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		PR & OR : 50 Marks	01 Credits
UNIT - I	Introduction:		(08 Hours)
	Services, Mechanisms and Attacks, The OSI Security Architecture, A Model for Network Security. Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography. Block Ciphers and the Data Encryption Standard: Simplified DES, Block Cipher Principles, The Data Encryption Standard, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.		
UNIT - II	Introduction to Finite Fields:		(08 Hours)
	Introduction to Finite Fields: Groups, Rings, Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form GF, Polynomial Arithmetic, Finite Fields of the Form GF. Advanced Encryption Standard: Evaluation Criteria for AES, The AES Cipher. Contemporary Symmetric Ciphers: Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, RC4 Stream Cipher. Confidentiality Using Symmetric Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation		
UNIT - III	Public-Key Encryption and Hash Functions:		(08 Hours)
	Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms. Public-Key Cryptography and RSA, Principles, The RSA Algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography		
UNIT - IV	Message Authentication and Hash Functions:		(08 Hours)
	Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions. Hash Algorithms: MD5 Message Digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard.		
UNIT - V	Authentication Applications:		(08 Hours)
	Kerbos, X.509 Authentication Service, E-mail Security, Pretty Good Privacy, S/MIME, IP Security, Architecture, Authentication Header, Encapsulation Security Payload, Combining Security Associations, Key Management Web Security: Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.		
UNIT - VI	System Security:		(08 Hours)
	Intruders, Intrusion Detection, Password Management. Malicious Software, Firewalls: Firewall Design Principles, Trusted Systems.		
<ol style="list-style-type: none"> 1. William Stallings, "Cryptography and Network Security", Principles and Practices, Pearson Education, Sixth Edition. 2. Behrouz A. Forouzan, "Cryptography and Network Security", McGraw Hill Publication 3. Atul Kahate, "Cryptography and Network Security", McGraw Hill(India)Publication, Third Edition. 			
Syllabus for Unit Test:			

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Parallel Computing

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 50 Marks	01 Credit
UNIT - I	Introduction to Parallel Programming Paradigms:		(08 Hours)
	Types of Parallelism , Parallel Computation Models, Memory less Parallel Computers, Parallel Computers with Memory, Flynn's Taxonomy, The Data-Parallel Model, Networked Computers, The Performance of Parallel Algorithms, Amdahl's Law, Gustafson Barsis's Law, Karp-Flatt Metric, Multidimensional Meshes, Hypercube-Based Machines, Routing in Networks, The PRAM Model.		
UNIT - II	Convergence of Parallel Architecture:		(08 Hours)
	Communication Architecture, Shared Address Space, Message Passing, Convergence, Data parallel processing, Other Parallel Architectures, A Generic parallel architectures, shared memory systems and cache coherence, distributed-memory systems, interconnection networks and routing, Architectural Trends, Application Trends, Technology Trends, Supercomputers case study: Param.		
UNIT - III	Programming scalable systems:		(08 Hours)
	The message-passing model, the message-passing interface, MPI standard basic concepts of MPI: MPI_Init, MPI_Comm_size, MPI_Comm_rank, MPI_Send, MPI_Recv, MPI_Finalize, timing the MPI programs: MPI_Wtime, MPI_Wtick, collective communication: MPI_Reduce, MPI_Barrier, MPI_Bcast, MPI_Gather, MPI_Scatter, case studies: the sieve of Eratosthenes, Floyd's algorithm, Matrix-vector multiplication.		
UNIT - IV	Shared-Memory Programming:		(08 Hours)
	Shared-memory model, OpenMP standard, Parallel for loops, Parallel for pragma, private variables, critical sections, reductions, parallel loop optimizations, general data parallelism, functional parallelism, case studies: the sieve of Eratosthenes, Floyd's algorithm, matrixvector multiplication – distributed shared-memory programming, DSM primitives.		
UNIT - V	Implications for Programming Models and Case Study:		(08 Hours)
	Naming, Replication, Overhead and granularity of communication, Block Data transfer, Synchronization, Hardware Cost and Design Complexity, Case Study: Ocean, Ray trace, Data mining.		
UNIT - VI	Fundamental Design issues:		(08 Hours)
	Partitioning of data, Mapping of data onto the processors, Reproducibility of results, Synchronization, Scalability and Predictability of performance, Performance & Scalability, Performance Requirements, Types of performance requirements, Performance Metrics of Parallel Systems, Communication Abstraction, Programming model requirements, Communication and Replication, Starssen's Matrix multiplication to compute complexity less than $O(n^3)$.		
References:			
1. Parallel Programming – Techniques and applications Using Networked Workstations and Parallel Computers, Barry Wilkinson and Michael Allen, Prentice Hall, 1999			

2. Multi-Core Programming - Increasing Performance through Software MultiThreading, Shameem Akhter and Jason Roberts, Intel Press 2006.	
3. Parallel Programming in C with MPI and OpenMP, Michael J. Quinn, McGraw Hill 2003.	
4. Introduction to Parallel Computing by AnanthGrama, George Karypis, Vipin Kumar, and Anshul Gupta.	
5. Programming Massively Parallel Processors by D.Kirk and W. Hwu	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Wireless Sensor Networks

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 50 Marks	01 Credit
UNIT - I	Introduction & Characteristics of Wireless Sensor Networks :		(08 Hours)
	Introduction, Brief Historical Survey of Sensor Networks. Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Mote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.		
UNIT - II	Medium Access Control Protocols:		(08 Hours)
	Schedule-based protocols - SMAC - BMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol, Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling, ZigBee.		
UNIT - III	Routing And Data Gathering Protocols:		(08 Hours)
	Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Point-to-Point VPN Tunneling Protocol and Challenges- Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GAF, GPSR – Real Time routing Protocols – APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB,		
UNIT - IV	Embedded Operating Systems:		(08 Hours)
	Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS –OSPM - EYES OS. Introduction to Tiny OS – NesC – Interfaces and Modules- Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM.		
UNIT - V	Transport Control Protocols and Middlewares for Wireless Sensor Networks :		(08 Hours)
	Traditional Transport Control Protocols: TCP (RFC 793), UDP (RFC 768), MobileIP, Introduction, WSN Middleware Principles, Middleware Architecture: Existing Middleware: MiLAN (Middleware Linking Applications and Networks), IrisNet (Internet-Scale Resource-Intensive Sensor Networks Services)		
UNIT - VI	Applications of WSN:		(08 Hours)
	WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications.		
References:			
1. Kazem Sohrawy, Daniel Minoli and Taieb Znati, “ Wireless Sensor Networks Technology, Protocols, and Applications”, John Wiley & Sons, 2007.			
2. Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Ltd, 2005.			
3. K. Akkaya and M. Younis, “A survey of routing protocols in wireless sensor networks”, Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325—349.			

4.	Philip Levis, “ TinyOS Programming”.
5.	Anna Ha’c, “Wireless Sensor Network Designs”, John Wiley & Sons Ltd.
6.	Wireless sensor networks Edited by C. S. Raghavendra Pub: Springer.
7.	Fundamentals of Sensor Network Programming: Applications and Technology By Sridhar S. Iyengar, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, Wiley.
8.	Ad Hoc Wireless Networks: Architectures And Protocols By Murthy Pub: Pearson Education
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Storage Area Network

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 50 Marks		01 Credit	
UNIT - I	Information Storage and Data Centre Environment:				(08 Hours)
	Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing, Application, Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Disk I/O Controller Utilization, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application Requirements and Disk Performance, Data Protection: RAID.				
UNIT - II	Data and Information in SAN:				(08 Hours)
	Data organization: File vs. Block, Object, Data store, Searchable models, File Systems, Volume Managers, Caches, Prefetching, Storage Networking Technologies, What Storage Networking Is, What to Expect from SANs, Leading up to SANs, Killer Apps for SANs				
UNIT - III	SAN Hardware Ecosystem:				(08 Hours)
	Components of an Intelligent Storage System, Front End, Cache, Back End, Physical Disk, Storage Provisioning, Virtual Storage Provisioning, Types of Intelligent Storage Systems – DAS, SAN, NAS, Comparing DAS, SAN & NAS, Host Bus Adapters, SFPs, FC Cables and Connectors, SCSI/SATA/SAS Cables and Connectors, JBODs, RAID Arrays, RAID Controllers, External Storage Boxes, Tape Drive, Tape Library, NAS Device, NAS Head, Fiber Channel Switches, Bridges, FC Appliances.				
UNIT - IV	Storage Virtualization:				(08 Hours)
	Storage Virtualization, Disk Virtualization, Block Virtualization, File Virtualization, File system Virtualization, Tape Virtualization, Tape Library Virtualization, Host Based Virtualization, Network Based Virtualization, Storage Device Virtualization.				
UNIT - V	Protocols in SAN:				(08 Hours)
	ATA and SATA, SPI – Parallel SCSI, SAS – Serial Attached SCSI, SAS Topology, SAS Devices, FC Topologies, FC Ports, FC Protocol Layers, FC WWNs, FC Addresses, FC Frame, FC Flow Control, Zoning, Lun Masking, iSCSI Topology, iSCSI Initiators and Targets, iSCSI Names and Addresses, Speeding Up iSCSI, iSCSI Advantages, iSCSI Limitation, Comparing Storage Protocols.				
UNIT - VI	SAN Managements and Storage Systems:				(08 Hours)
	Storage Management, Storage Vs. Data Classification, Information Lifecycle Management, Hierarchical Storage Management, RTO and RPO, Backup and Restore, Snapshot & CDP, De-duplication, Storage Provisioning, Storage Migration, SRM, Case study - Google FS/BigTable, Programming models: Hadoop, NAS.				
References:					
[1] Storage Area Network Essentials: A complete Guide to Understanding and Implementing SANs (Hard Cover) By Richard Barker, Paul Massigliar By Wiley 2001.					
[2] Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS iSCSI and InfiniBand By Ulf Troppens, Rainer Erkens, Wolfgang Miiller Wiley 2004.					
[3] Using SANs and NAS By W. Curtis Preston, Mike Loukides.					
[4] Information Storage and Management, 2nd Edition, Edited by Somasundaram Gnanasundaram, Alok					

Shrivastava	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)**

STRUCTURE & EXAMINATION PATTERN

MTech Information Technology

Semester I		Total Duration : 20 Hrs/Week Total Marks : 500 Total Credits : 18										
Subjects	Teaching Scheme (Hrs)		Examination Scheme (Marks)							Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/Assignments	TW	Pract / Oral	TH	TW/PR/OR		
Software Architecture	04	02	60	20	10	10	25	25	04	01	05	
Machine Learning	04	02	60	20	10	10	25	25	04	01	05	
Mobile Networks & Communication	04	--	60	20	10	10	--	--	04	--	04	
Parallel Programming & Algorithms	04	--	60	20	10	10	--	--	04	--	04	
Total	16	04	240	80	40	40	50	50	16	02	18	

M.Tech (IT) Semester - I		Subject : SOFTWARE ARCHITECTURE
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory :04
Practical : 02 hrs/week	Continuous assessment : 40 Marks	Practical : 01
	Term Work:25 Marks	Total Credits : 05
	Prat/Oral : 25 Marks	
The aim of the course is to design a system to provide the solution to the existing system		
Course Objectives:		
1) Analyze the problem in existing system.		
2) Apply the efficient solution by wisely designing the architecture.		
Course Prerequisites:		
Students should have knowledge of		
1) Basic knowledge of java programming.		
...		
Course Outcome:		
Students will be able to:		
1) Understand problems in existing system		
2) Analyze feasibility of design proposed.		
3) Analyze the technology suitable to build the proposed system.		
4) Understand the use of design pattern to design the architecture		
5) Analyze the adherence of solution with the requirement		
6) Apply the efficient architecture to optimize the performance of the system		
...		
UNIT-I	INTRODUCTION TO SOFTWARE ARCHITECTURE	(Hours)
	Introduction to Software Architecture, Architecture of Business Cycle, software architecture requirements, Types of Architecture, Documenting software architectures, recent trends in software architectures.	06
UNIT-II	DESIGN CONCERNS	(Hours)
	Introduction to the issues in design, Considering important aspects during the design SRS, Cost, Security, Resources, Compatibility, Scalability, dependency. Selection of Technology according to the requirement.	06

UNIT-III	DESIGN PATTERNS	(Hours)
	Introduction to Design patterns, principles and expectations Types of design patterns Singleton, Factory, Adaptor, Facade, Proxy, Iterator, Observer, Mediator, composite. Rules and regulations to select design patterns.	06
UNIT-IV	TECHNOLOGIS USED IN MIDDLEWARE	(Hours)
	Types of Middleware, Application servers, Introduction to Java EE, Introduction to Java EE , JDBC, RPC, RMI, EJB Architecture, Entity, Session, Message beans, XML, XSLT. Specifications and characteristics of Middleware technologies. Recent advances in Middleware technologies.	06
UNIT-V	N TIER ARCHITECTURE	(Hours)
	Introduction to tiers in Architecture, Types of Tiers , XML, Client side technologies HTML, DHTML, Java Applets, ActiveX controls, DOM, AJAX. Client side technology in multi-tier architectures Examples of three tier and n-tier architectures, client side technologies.	06
UNIT-VI	SERVER SIDE TECHNOLOGY	(Hours)
	Multi-tier architectures, introduction to server side technologies: JSP, JSF, SOA, MVC. Java Servlets, introduction to framework struts, spring.	06

Assignment List:

- 1) **Design an architecture to solve collision problem in Traffic Signaling System**
- 2) **Design generalized and specialized approach to simulate traffic signaling system.**
- 3) **Implement all types of driver to connect front end with back end using modular approach.**
- 4) **Implement and maintain cookies in a structured relational database.**
- 5) **Implement data and page transfer using servlet.**
- 6) **Implement library management system using JSP.**
- 7) **Implement**
- 8) **Implement CRUD functionality using MVC architecture with struts framework.**

Text Books:

- 1) Software Architecture in Practice, Second Edition By Len Bass, Paul Clements, Rick Kazman
Publisher: Addison Wesley
- 2) Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Pearson Publication
- 3) OCM Java EE 6 Enterprise Architect Exam Guide (Oracle Press) by Paul Allen , Joseph Bambara, Oracle Press.

Reference Books:	
1)	Software Architecture in Practice, Second Edition By Len Bass, Paul Clements, Rick Kazman Publisher: Addison Wesley
2)	Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Pearson Education
3)	Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions Gregor Hohpe, Bobby Woolf, Publisher: Addison Wesley
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech (IT) Semester - I Subject : Machine Learning		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory :04
Practical : 02 Hrs	Continuous assessment : 40 Marks	Practical : 01
	Term Work:25 Marks	
	Prat/Oral : 25 Marks	Total Credits : 05
Course Objectives:		
1) Introduces fundamental concepts and methods for machine learning		
2) Familiarize with basic learning algorithms and techniques and their applications		
Course Prerequisites:		
Students should be familiar with logic, elementary probability theory, elementary linear algebra, and multivariable calculus		
Course Outcome:		
..		
Students will be able to:		
1) Understand regression		
2) Understand basic probability theory		
3) Understand estimation and classification techniques		
4).Understand Bayesian and Monto Carlo methods		
5).Understand concepts of Lagrange multipliers and Clustering		
6) Understand Hidden Markov Models		
UNIT-I		(08 Hours)
	<p>Introduction to Machine Learning: Types of Machine Learning, A simple problem.</p> <p>Linear Regression: The ID case, Multidimensional inputs, Multidimensional outputs.</p> <p>Non Linear Regression: Basis function regression, Over fitting and Regularization,</p> <p>Artificial Neural Networks, K-Nearest Neighbors.</p>	

	Quadratics: Optimizing a quadratic.	
UNIT-II		(08 Hours)
	Basic Probability Theory: Classical logic, Basic definitions and rules, Discrete random Variables, Binomial and Multinomial distributions, Mathematical expectations. Probability Density Functions(PDFs): Mathematical expectation, mean, and variance, Uniform distributions, Gaussian distributions: Diagonalization, Conditional Gaussian Distribution.	
UNIT-III		(08 Hours)
	Estimation: Learning a binomial distribution, Bayes' Rule, parameter estimation: MAP, ML, and Bayes' Estimates, Learning Gaussians, MAP nonlinear regression. Classification: Class Conditionals, Logistic Regression, Artificial Neural Networks, K-Nearest Neighbor Classification, generative vs. Discriminative models, Classification by LS Regression, Naïve Baye's: Discrete Input Features, Learning, Gradient Decsnt: Finite differences.	
UNIT-IV		(08 Hours)
	Cross Validation, Bayesian methods: Bayesian Regression, Hyperparameters, Bayesian model Selection. Monte Carlo Methods: Sampling Faussions, Importance Sampling, Markov Chain Monte Carlo (MCMC). Principal Components Analysis: The model and learning, Reconstruction, Properties of PCA, Whitening, Modelling, Probabilistic PCA.	
UNIT-V		(08 Hours)
	Lagrange Multipliers: Examples, Least-Squares PCA in one-dimension, Multiple constraints, Inequality constraints. Clustering: K-means Clustering, K-medoids Clustering, Mixtures of Gaussians: Learning, Numerical issues, the Free Energy, proofs, Relation to K-means, Degeneracy. Determining the number of clusters.	
UNIT-VI		(08 Hours)
	Hidden Markov Models: Markov Models, Hidden Markov Models, Viterbi Algoriyhm, The Forward Algorithm,	
Assignment List:		
1)	To study and implement K-Nearest neighbor algoritm	
2)	Problems solving on Probability density functions and Gaussian distribution	
3)	Solving problems related to classification and estimation	
4)	Solving problems related to Bayesian method and Monte Carlo methods	
5)	To study and implement K-means clustering	

6)	Comparison of various Hidden Markov Models	
Text Books:		
1)	Y Kononenko, "Machine Learning And Data Mining: Introduction to Principles and Algorithms", Horwood Publishing	
2)	Kevin Patrick Murphy, "Machine Learning: a Probabilistic Perspective", MIT Press	
Reference Books:		
1)	Tom Mitchell, "Machine Learning", McGraw-Hill, 1997	
2)	Michael Berry & Gordon Linoff, "Mastering Data Mining", John Wiley & Sons	
3)	Cios, W. Pedrycz, R. Swiniarski, L. Kurgan, "Data Mining: A Knowledge DiscoveryK. Approach", Springer	
Syllabus for Unit Test:		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV, V and VI	

M.Tech (IT) Semester - I Subject : MOBILE NETWORKS AND COMMUNICATION		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory :04
	Continuous assessment : 40 Marks	Total Credits : 04
Course Objectives:		
To gain an understanding of the principles behind the design of wireless communication systems and technologies.		
Course Prerequisites:		
Students should have knowledge of		
Computer Networking & communication system		
Course Outcome:		
Students will be able to:		
1) Understand mobile cellular architecture.		
2) Understand the multiple access schemes & IEEE802.11		
3) Analyze the technology channel interference in path propagation.		
4) Understand the technology switching and traffic system.		
5) Analyze the GSM System.		
6) Understand the technology HEPERLAN & Android system.		
UNIT-I	Introduction to Mobile Communication	(Hours)
	Cellular mobile architecture overview and cellular system design , Frequency management and channel assignment, Frequency reuse channels, concepts of cell splitting, handover in cellular system, handoff algorithms and dropped calls.	08
UNIT-II	Multiple Access Schemes	(Hours)
	SDMA, FDMA, TDMA, CDMA, comparison of S/T/F/CDMA based on terminals signal separation and advantages and disadvantages; IEEE 802.11 & 802.16 wireless standards, System architecture.	08
UNIT-III	Propagation Path Loss and Propagation Models	(Hours)
	Co-channel & Non-co-channel interference: Exploring co-channel interference areas in system, reduction of co channel interference, Different types of non-co channel interferences, different ways to reduce interference and in turn improve cell coverage.	08
UNIT-IV	Switching and traffic	(Hours)
	General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and	08

	mobility management.	
UNIT-V	Practical Cellular Mobile system-GSM	(Hours)
	Cellphone generations 1G, 2G, 3G, Standards for wireless communication system UMTS etc; GSM architecture and interfaces, GSM subsystems, mapping of GSM layers on to OSI layers. CDMA: Major attributes IS-95 system architecture, air interface, physical and logical channel and call processing.	08
UNIT-VI	Wireless Local Area Networks	(Hours)
	Introduction, Types of WLANs, Hidden station problem, HIPERLAN Type 1: HIPERLAN/1 MAC sublayer, HIPERLAN/1 CAC layer, HIPERLAN/1 physical layer. IEEE 802.11 WLAN standards: IEEE 802.11 physical layer, IEEE 802.11 MAC sublayer. IEEE 802.11 and HIPERLAN standards for 5 GHz band: HIPERLAN/2 physical layer, HIPERLAN /2 data link control layer. Bluetooth: Introduction, User Scenario, Architecture, protocol. Introduction to Android Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features	08
Text Books:		
1)	William C.Y.Lee, “Mobile cellular Telecommunication” ,2nd Ed. McGraw-Hill Ā	
2)	Jochen Schiller, “Mobile Communication” Pearson Education Ā	
3)	V. K. Garg, J. E. Wilkes, “Principle and Application of GSM”, Pearson Education	
Reference Books:		
1)	V. K. Garg, “IS-95 CDMA &CDMA 2000”, Pearson Education	
2)	W. Frank Ableson,Robi sen, Chris King, “ Android IN ACTION “, Third Edition, Dreamtech Press	
3)	Mobile Computing By Rajkamal (Oxford).	
Syllabus for Unit Test:		
Unit Test - 1	Unit I ,II and III	
Unit Test - 2	Unit IV, V and VI	

M.Tech (IT) Semester - I Subject: MOBILE NETWORKS AND COMMUNICATION		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory :04
	Continuous assessment : 40 Marks	Total Credits : 04
Course Objectives:		
To gain an understanding of the principles behind the design of wireless communication systems and technologies.		
Course Prerequisites:		
Students should have knowledge of		
Computer Networking & communication system		
Course Outcome:		
Students will be able to:		
1) Understand mobile cellular architecture.		
2) Understand the multiple access schemes & IEEE802.11		
3) Analyze the technology channel interference in path propagation.		
4) Understand the technology switching and traffic system.		
5) Analyze the GSM System.		
6) Understand the technology HEPERLAN & Android system.		
UNIT-I	Introduction to Mobile Communication	(Hours)
	Cellular mobile architecture overview and cellular system design , Frequency management and channel assignment, Frequency reuse channels, concepts of cell splitting, handover in cellular system, handoff algorithms and dropped calls.	08
UNIT-II	Multiple Access Schemes	(Hours)
	SDMA, FDMA, TDMA, CDMA, comparison of S/T/F/CDMA based on terminals signal separation and advantages and disadvantages; IEEE 802.11 & 802.16 wireless standards, System architecture.	08
UNIT-III	Propagation Path Loss and Propagation Models	(Hours)
	Co-channel & Non-co-channel interference: Exploring co-channel interference areas in system, reduction of co channel interference, Different types of non-co channel interferences, different ways to reduce interference and in turn improve cell coverage.	08
UNIT-IV	Switching and traffic	(Hours)

	General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and mobility management.	08
UNIT-V	Practical Cellular Mobile system-GSM	(Hours)
	Cellphone generations 1G, 2G, 3G, Standards for wireless communication system UMTS etc; GSM architecture and interfaces, GSM subsystems, mapping of GSM layers on to OSI layers. CDMA: Major attributes IS-95 system architecture, air interface, physical and logical channel and call processing.	08
UNIT-VI	Wireless Local Area Networks	(Hours)
	Introduction, Types of WLANs, Hidden station problem, HIPERLAN Type 1: HIPERLAN/1 MAC sublayer, HIPERLAN/1 CAC layer, HIPERLAN/1 physical layer. IEEE 802.11 WLAN standards: IEEE 802.11 physical layer, IEEE 802.11 MAC sublayer. IEEE 802.11 and HIPERLAN standards for 5 GHz band: HIPERLAN/2 physical layer, HIPERLAN /2 data link control layer. Bluetooth: Introduction, User Scenario, Architecture, protocol. Introduction to Android Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features	08
Text Books:		
1)	William C.Y.Lee, “Mobile cellular Telecommunication” ,2nd Ed. McGraw-Hill Ā	
2)	Jochen Schiller, “Mobile Communication” Pearson Education Ā	
3)	V. K. Garg, J. E. Wilkes, “Principle and Application of GSM”, Pearson Education	
Reference Books:		
1)	V. K. Garg, “IS-95 CDMA &CDMA 2000”, Pearson Education	
2)	W. Frank Ableson,Robi sen, Chris King, “ Android IN ACTION “, Third Edition, Dreamtech Press	
3)	Mobile Computing By Rajkamal (Oxford).	
Syllabus for Unit Test:		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV, V and VI	

**Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)**

STRUCTURE & EXAMINATION PATTERN

MTech - Information Technology

Semester II												Total Duration : 20 Hrs/Week Total Marks : 500 Total Credits : 18		
Subjects	Teaching Scheme (Hrs)		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits			
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	T W	Pract/ Oral	TH	TW/ PR/ OR				
Research Foundation	04	--	60	20	10	10	--	--	04	--	04			
Information Retrieval	04	02	60	20	10	10	25	25	04	01	05			
Real Time Systems	04	--	60	20	10	10	--	--	04	--	04			
Information Security	04	02	60	20	10	10	25	25	04	01	05			
Total	16	04	240	80	40	40	50	50	16	02	18			

M.Tech IT Semester II		Subject: Research Foundation	
Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks		Theory : 04
	Continuous assessment : 40 Marks		Total Credits : 04
Course Objectives:			
1) Assist students in planning and carrying out research projects, further research oriented studies or jobs			
2) The students are exposed to the principles, procedures and techniques of implementing a research finding.			
3) Students involve with finding out the literature using information technology / computer technology and with using the tools for data analysis in various sectors, and writing the reviews, papers, reports and thesis.			
Course Prerequisites:			
Students should have knowledge of			
1) Problem definition			
2) Project Preparation and publications			
3) Mathematical and Statistical Analysis			
Course Outcome:			
Students will be able to:			
1) Define and describe the research, research process and research methods.			
2) Understand and apply research methods including design, data analysis, and interpretation.			
3) Project Report, and Research Paper writing			
UNIT-I	Research Idea		(Hours)
	Introduction to research. Research: objectives, motivation, types, approaches, methods and methodology. Research and scientific method.		08
UNIT-II	Research Processes		(Hours)
	How research is done, research processes, research criteria, research problem definition, problem selection, need of defining the problem, techniques involved in defining a problem.		08
UNIT-III	Research Design		(Hours)
	Research design: idea, why research designs, characteristics of design, types of designs, experimental design.		08
UNIT-IV	Novelty		(Hours)
	Novelty and Originality in Research: Resources, skills, time management, role of supervisor and research scholar, interaction with subject experts.		06
UNIT-V	Paper, Thesis and Report Writing		(Hours)
	Thesis Writing: Title, Abstract, Introduction, Literature review / previous works, Methodology, Result / Data analysis, Comparisons		08

	with earlier works, Conclusion, Future Scopes and References (IEEE / Springer / ACM / Elsevier formats). Importance of literature review, source of literature: books, journals, proceedings, thesis and dissertations, unpublished documents. On-line Searching: Database, SciFinder, Scopus, Science Direct, Searching research articles, Citation Index, Impact Factor, H-index.	
UNIT-VI	Tools	(Hours)
	Analytical tools, Introduction to data analysis, linear data and non-linear data, exponential type data, logarithmic type data, power function data and polynomials of different orders. Plotting and fitting of linear, Non-linear, Gaussian, Polynomial, and Sigmoidal type data. Quantitative Techniques: Steps of quantitative analysis, reliability of the data, errors classification, accuracy, precision, statistical errors. LaTeX: Writing scientific report, research report, revision, writing project proposal, paper writing for international journals, conference presentation, Slides preparation, pictures, graphs and citation styles.	10
Assignment List:		
1)	Briefly describe the different steps involved in a research process. What do you mean by research? Explain its significance in modern times.	
2)	Write short notes on: Design of the research project; Ex post facto research; Motivation in research; Objectives of research; Criteria of good research; Research and scientific method.	
3)	Describe the different types of research, clearly pointing out the difference between an experiment and a survey.	
4)	What is the necessity of defining a research problem? Explain.	
5)	Explain the meaning of the following in context of Research design: (a) Extraneous variables; (b) Confounded relationship; (c) Research hypothesis; (d) Experimental and Control groups; (e) Treatments.	
6)	Distinguish between an experiment and survey. Explain fully the survey method of research.	
7)	Write short notes on the following: (a) Cross tabulation; (b) Discriminant analysis; (c) Coefficient of contingency; (d) Multicollinearity; (e) Partial association between two attributes.	
8)	5. Distinguish between the following:	

	<p>(a) Statistic and parameter; (b) Confidence level and significance level; (c) Random sampling and non-random sampling; (d) Sampling of attributes and sampling of variables; (e) Point estimate and interval estimation.</p> <p>7. 8. In a sample of 400 people, 172 were males. Estimate the population proportion at 95% confidence level.</p>
9)	<p>(a) 500 articles were selected at random out of a batch containing 10000 articles and 30 were found defective. How many defective articles would you reasonably expect to find in the whole batch? (b) In a sample of 400 people, 172 were males. Estimate the population proportion at 95% confidence level.</p>
10	<p>“We can teach methods of analysis, yet any extensive research... requires something equally important: an organisation or synthesis which provides the essential structure into which the pieces of analysis fit.” Examine this statement and show how a good research report may be prepared.</p>
Text Books:	
1)	C. R. Kothari, Research Methodology Methods and Techniques, 2nd. ed. New Delhi: New Age International Publishers, 2009.
2)	P. Oliver, Writing Your Thesis, New Delhi: Vistaar Publications, 2004.
Reference Books:	
1)	R. Panneerselvam, Research Methodology, New Delhi: PHI, 2005.
2)	F. Mittelbach and M. Goossens, The LATEX Companion, 2nd. ed. Addison Wesley, 2004.
3)	J. W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd. ed. Sage Publications, 2008.
4)	Kumar, Research Methodology: A Step by Step Guide for Beginners, 2nd. ed. Indian: PE, 2005.
5)	B. C. Nakra and K. K. Chaudhry, Instrumentation, Measurement and Analysis, 2nd. ed. New Delhi: TMH publishing Co. Ltd., 2005.
6)	Gregory, Ethics in Research, Continuum, 2005.
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester II		Subject : Information Retrieval		
Teaching Scheme		Examination Scheme		Credit Allotted
Theory : 04 hrs/week		End Semester Examination : 60 Marks		Theory :04
Practical :02		Continuous assessment : 40 Marks		Practical : 01
		Term Work:25 Marks		
		Prat/Oral : 25 Marks		Total Credits : 05
Course Objectives:				
1) To provide students with an overview of the main principles and methods underlying the domain of Information Retrieval.				
2) To address more recent developments in IR such as collaborative filtering and Latent Semantic Indexing.				
Course Prerequisites:				
Students should have knowledge of				
1) Basic basic information retrieval techniques.				
2) Data Structures and Algorithm Analysis				
Course Outcome:				
Students will be able to:				
1) Understand the impact on web of information retrieval.				
2) Understand basic information retrieval models.				
3) understand experimental evaluation of information retrieval				
4) understand information retrieval implementation in search engines				
5) understand language-model based retrieval				
6) understand Information Extraction and Integration				
UNIT-I	Introduction			(Hours)
	Goals and history of IR. IR Basics: inverted index, query and document representations, boolean retrieval, simple tf/idf and other ranking schemes.			08
	The impact of the web on IR. Information behavior, browsing vs seeking, types of search			
UNIT-II	Basic IR Models			(Hours)
	Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity.			08
	Basic Tokenizing, Indexing, and Implementation of Vector-Space Retrieval:			
	Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; Java implementation.			

UNIT-III	Experimental Evaluation of IR	(Hours)
	Performance metrics: recall, precision, and F-measure; Evaluations on benchmark text collections. Query Operations and Languages: Relevance feedback; Query expansion; Query languages. Text Representation: Word statistics; Zipf's law; Porter stemmer; morphology; index term selection; using thesauri. Metadata and markup languages (SGML, HTML, XML).	08
UNIT-IV	Web Search	(Hours)
	Search engines; spidering; metacrawlers; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank); shopping agents. Text Categorization: Categorization algorithms: Rocchio, nearest neighbor, and naive Bayes. Applications to information filtering and organization.	08
UNIT-V	Language-Model Based Retrieval	(Hours)
	Using naive Bayes text classification for ad hoc retrieval. Improved smoothing for document retrieval. Text Clustering: Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM). Applications to web search and information organization.	08
UNIT-VI	Recommender Systems	(Hours)
	Collaborative filtering and content-based recommendation of documents and products. Information Extraction and Integration: Extracting data from text; semantic web; collecting and integrating specialized information on the web.	08
Assignment List:		
1)	Study impact of Information retrieval on web	
2)	Write a program to implement TF-IDF to rank data	
3)	Write a program to normalize the data	
4)	Write a program to analyze indexer	
5)	Write a program to analyze recall and F-measure top 3 popular search engines.	
6)	Analyze working of open source crawlers.	
7)	Implement naïve bayes algorithm to retrieve the data	
8)	Write a program to implement k-means algorithm.	
9)	Write a program to design dynamic forms for collaborative filtering	

10)	Write a program to to collect feedback using various recommendation techniques
Text Books:	
1)	Introduction to Information Retrieval, by C. Manning, P. Raghavan, and H. Schütze. Cambridge University Press, 2008
Reference Books:	
1)	Search Engines: Information Retrieval in Practice by W. Bruce Croft, Donald Metzler, and Trevor Strohman
2)	Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schutze, Cambridge University Press. 2008
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester II		Subject : Real Time Systems	
Teaching Scheme	Examination Scheme		Credit Allotted
Theory : 04 hrs/week	End Semester Examination	: 60 Marks	Theory :04
	Continuous assessment	: 40 Marks	
			Total Credits : 04

Course Objectives:		
1) The aim of the course is to introduce the student to the theory of formal verification methods and techniques used for real time systems.		
2) This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in Real Time System.		
Course Prerequisites:		
Students should have knowledge of		
1)Basic understanding of C.		
2) Basic understanding of Computer Architectures.		
3) Basic understanding of Operating Systems		
Course Outcome: Real time system is one of class of f complex systems whose performance must be analyzed at the earlier phases of development. The methods and techniques in this course are widely used now a day in industries for these verifications of Real Time System. The students would have then a strong background of modeling, simulation and verification..		
Students will be able to:		
1) Clearly differentiate the different issues that arise in soft and hard real-time systems. Explain the various concepts of time that arise in real-time systems.		
2) Understand basic multi -task scheduling algorithms and approaches for scheduling.		
3) Understand basic for periodic, aperiodic, and sporadic tasks as well as understand the impact of the latter two on scheduling.		
4)Able to understand the desired language characteristics of real time programming languages.		
5) Clearly differentiate the Real Time Vs Gerenal – Purpose Databases.		
6)Understand the real time communication.protocols.		
UNIT-I	Introduction	(08 Hours)
	Real time Applications,Hard Versus Soft Real Time Systems, A reference model of Real Time Systems ,Issues in Real-Time Computing, Structure of real time systems, Task Classes, characterizing Real -Time Systems: Performance Measures for Real Time Systems., Estimating Program Run Times	
UNIT-II	Real Time Scheduling	(08 Hours)
	Approaches to Real Time Scheduling : Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach Scheduling : Introduction, Classical Uniprocessor Scheduling - Rate Monotonic scheduling Algorithm,Preemptive Earliest Deadline First(EDF) Algorithm Uniprocessor scheduling of IRIS tasks- Identical Linear Reward Functions,Nonidentical Reward Functions,0/1 Reward Functions,Identical	

	Concave Reward Function, Non identical Concave Reward Function,	
UNIT-III	Task Assignment	(08 Hours)
	Utilization Balancing Algorithm,A Next – Fit Algorithm for RM Scheduling,A Bin – Packing Assignment Algorithm for EDF,A Myopic Offline Scheduling (MOS) Algorithm,The Buddy Strategy,Assignment and Precedence Conditions.	
UNIT-IV	Programming Languages and Tools	(08 Hours)
	Introduction,Desired language characteristics,Data Typing,Control Structures,Facilitating Hierarchical Decomposition,Packages,Run Time Error Handling,Multitasking,Task Scheduling,Timing specifications,Experimental Languages:Flex,Euclid Run Time Support: Compiler,Linker,Debuuger,Kernel	
UNIT-V	Real Time Databases	(08 Hours)
	Introduction,Real Time Vs Gerenal – Purpose Databases,Main memory databases,Transaction Priorities,Transaction Aborts,Concurrency Control Issues,Disk Scheduling Algorithm,A Two-Phase Approach to improve predictability,Mainaining serilaliation Consistency,Databases for Hard real Time systems.	
UNIT-VI	Real Time Communication	(08 Hours)
	Introduction,Model Of Real Time Communication,Priority based Service Disciplines for switched network,Weighted Round Robin service disciplies,Medium Access control protocols of Broadcast networks,Real Time Protocols,Communication in multicomputer systems	

Text Books:

- | | |
|----|--|
| 1) | C.M.Krishna,Kang G.Shin “Real Time Systems”,Tata McGraw Hill Edition |
| 2) | Jane W.S.Liu,”Real Time Systems” Pearson Educatio |

Reference Books:

- | | |
|----|---|
| 1) | Real-Time Systems: Theory and Practice Kindle Edition by Rajib Mall |
|----|---|

Syllabus for Unit Test:

Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester II Subject :Information Security		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 Hrs/week	End Semester Examination : 60 Marks	Theory: 04
Practical :02 Hrs/week	Continuous assessment : 40 Marks	Practical : 01
	Term Work : 25 Marks	Total Credits:05
	Prat/Oral : 25 Marks	
Course Objectives:		
<ul style="list-style-type: none"> • Discuss various administrative, technical, governance, regularity and policy aspects of Information Security Management. 		

- Provide hands on approaches will be discussed to better understand and to devise strategies related to security policy.

Course Prerequisites:

Students should have knowledge of

1 Fundamentals of Telecommunication and computer networks.

Course Outcome:

Students will be able to:

- 1)** Understand mathematical formulation in security algorithms.
- 2)** Understand aspect of information security management including planning, process, policy, procedure and security model as well as hardware and software technologies to safeguard organizational assets.
- 3)** develop skills of security management progression within an organization.
- 4)** Perform email and graphic image recovery as well as investigations.
- 5)** Implement cryptography algorithms.
- 6)** Learn business continuity planning concepts.

UNIT-I	MATHEMATICAL FOUNDATIONS OF INFORMATION SECURITY :	(6 Hours)
	Topics in elementary number theory: O and Ω notations ,Euclidean algorithm ,Congruence's, Euler's phi function , Fermat's Little Theorem , Chinese Remainder Theorem , Applications to factoring ,finite fields , quadratic residues and reciprocity: Quadratic residues ,Legendre symbol , Jacobi symbol. Simple Cryptosystems: Enciphering Matrices, Encryption Schemes, Symmetric and, Asymmetric Cryptosystems, Cryptanalysis, Block ciphers, Use of Block Ciphers, Multiple Encryption, Stream Ciphers, Affine cipher, Vigenere, Hill, and Permutation Cipher, Secure Cryptosystem.	
UNIT-II	SECURITY ELEMENTS:	(6 Hours)
	Authorization and Authentication - types, policies and techniques - Security certification - Security monitoring and Auditing - Security Requirements Specifications - Security Polices and Procedures, Firewalls, IDS, Log Files, Honey Pots .Access control, Trusted Computing and multilevel security - Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors – Security awareness, training , Email and Internet use policies, Third Party Development - Intellectual Property Issues .	
UNIT-III	INFORMATION SECURITY POLICIES: INDUSTRIES PERSPECTIVE:	(6 Hours)
	Introduction to Information Security Policies, About Policies, why Policies are Important ,When policies should be developed , How Policy should be developed - Policy needs – Identify what and from	

	whom it is being protected , Data security consideration, Backups, Archival storage and disposal of data - Intellectual Property rights and Policies – Incident Response and Forensics - Management Responsibilities – Role of Information Security Department.	
UNIT-IV	SECURITY THREATS :	(6 Hours)
	Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crime Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation – Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools -Threat identification - Threat Analysis - Threat Modeling - Model for Information Security Planning.	
UNIT-V	PUBLIC KEY CRYPTOSYSTEMS:	(6 Hours)
	The idea of public key cryptography, RSA Cryptosystem , Bit security of RSA , ElGamal Encryption , Discrete Logarithm , Knapsack problem , Zero-Knowledge Protocols . Primality and Factoring: Pseudo primes , the rho (γ) method , Format factorization and factor bases ,the continued fraction method , the quadratic sieve method. Number Theory and Algebraic Geometry: Elliptic curves, basic facts , elliptic curve cryptosystems , elliptic curve primality test ,elliptic curve factorization.	
UNIT-VI	AUDITING AND BUSINESS CONTINUITY PLANNING	(6 Hours)
	: Introduction to information security audit and principles of audit. Business continuity planning and disaster recovery. Case study: 9/11 tragedy. Backup and recovery techniques for applications and storage. Computer forensics: techniques and tools. Forensic tools VMware,Security testing tool BackTrack, Audit Tools: NISSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues.	
Assignment List:		
1.	Assume a web-based system that has a state-less front-end web server (which just processes requests as it is with no state being tracked), an application engine (such as a Java servlet engine) that receives requests forwarded by the front-end, and a database that is used store/retrieve/manage data by the application engine. The application engine hosts application for a bank. The web-based system allows for a user to carry out online transactions, online viewing of accounts as well as other common tasks. (a) What types of logging mechanisms should be used for the front-end, the application engine, and for the database in order to audit the requests received, their processing, and the privilege modes/user ids in which requests are processed. (b) What auditing should such a system support?	

2.	Pretend you've just seen a new type of malware that places the malicious code in an audio file, by using different frequencies to correspond to different instructions. Existing vulnerabilities are used to get access to the system and install a small interpreter that reads the infected audio files and executes them. Assume that you are unable to detect/prevent the interpreter (and that it doesn't do anything harmful by itself anyway) - your job is to detect or prevent it from executing malicious audio files. (a) List one or more ways you could <i>detect</i> an infected audio file. Provide a brief (one paragraph) description of each approach.
3.	Write a program to perform substitution ciphers to encrypt the explain text to Caesar cipher and to decrypt it back to plain text.
4.	Write a program to generate Symmetric Keys for the following Cipher algorithms DES, AES, Blowfish, TripleDES.
5.	Write a program to encrypt input string by using SecretKey of the following algorithms, and then decrypt the encrypted string and compare the decrypted string with the input string. Use the following algorithms for encryption and decryption: a.RSA b.AES c.DSA
6.	Write a program to perform transposition ciphers to encrypt the plain text to cipher and to decrypt it back to plain text using Simple Columnar technique.
7.	Assignment based on the presentation on either of following topics: ISO 17799 Standard NESSUS and NMAP Audit Tools ElGamal Encryption Asymmetric Cryptosystems
8.	Case study on secure configuration of Email Server.
Text Books:	
1)	Neal Koblitz, "A Course in Number Theory and Cryptography", 2 nd Edition, Springer, 2002.
2)	Johannes A. Buchman, "Introduction to Cryptography", 2 nd Edition, Springer, 2004.
3)	Serge Vaudenay, "Classical Introduction to Cryptography – Applications for Communication Security", Springer, 2006.
4)	Victor Shoup, "A Computational Introduction to Number Theory and Algebra", Cambridge University Press, 2005.
5)	William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.
6)	Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic Principles & Application", Thomson Delmar Learning, 2004.
Reference Books:	
1)	.Nina Godbole, Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Wiley, 2009
2)	Information Security Policies, Procedures, and Standards:Guidelines for Effective

	Information Security Management (Paperback) Auerbach, 1 st edition, 2001
3)	Neal Koblitz, "A Course in Number Theory and Cryptography", 2 nd Edition, Springer, 2002.
4)	Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press, 2004.
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

**Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)**

STRUCTURE & EXAMINATION PATTERN

MTech - Information Technology

Semester III											Total Duration : 28 Hrs/Week	
											Total Marks : 475	
											Total Credits : 40	
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
Elective –I	04	02	60	20	10	10	25	25	04	01	05	
Elective –II	04	02	60	20	10	10	25	25	04	01	05	
Self-Study Paper-I	04	--	60	20	10	10	-	-	04	-	04	
Dissertation Stage –I	-	07	-	-	---	--	25	--		21	21	
Seminar	-	05	-	-	--	--	25	25	-	05	05	
Total	12	16	180	60	30	30	100	75	12	28	40	

Elective – I	Elective - II
<ul style="list-style-type: none"> • Natural Language Processing & Understanding • Computer Forensics & Cyber Laws • Advanced MIS • Wireless Networks • Data Warehousing & E-Commerce 	<ul style="list-style-type: none"> • Bio-informatics • Advanced Computer Architecture • Usability Engineering • Advanced Database Management • Advanced Operating System

M.Tech IT Semester III ELECTIVE I: Natural Language Processing And Understanding		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory :04
Practical : 02 Hrs	Continuous assessment : 40 Marks	Practical : 01
	Term Work :25 Marks	
	Prat/Oral : 25 Marks	Total Credits : 05
Course Objectives:		
1. To understand natural language processing and to learn how to apply basic algorithms in this field.		
2. To conceive basics of knowledge representation, inference, and relations to the artificial intelligence.		
3. To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics, as well as the resources of natural language		
Course Prerequisites:		
Students should have knowledge of working of compiler phases		
Course Outcome:		
Students will be able to:		
1. Evaluate language technology components.		
2. Understand various parsing methodologies.		
3. Understand various language models and relate them in probability perspective.		
4. Map and solve the language parsing problem with dynamic programming.		
5. Understand machine learning techniques and can assess which ones are suitable for a given problem.		
UNIT-I	Introduction and Overview:	(08 Hours)
	Introduction, Overview and Linguistics, Grammars and Languages, Basic Parsing Techniques, Semantic analysis and Representation Structures, Natural Language Generation, Natural Language Systems, What is Natural Language Processing ?,Ambiguity and Uncertainty in language.	
UNIT-II	Parsing and CFG:	(08 Hours)
	<p>String Edit Distance and Alignment: Key algorithmic tool: dynamic programming, First a simple example, its use in optimal alignment of sequences. String edit operations, edit distance, examples of use in spelling correction, machine translation.</p> <p>Context Free Grammars: Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing; Bottom-Up Parsing, and the Problems with each. Non-probabilistic model.</p> <p>Parsing: Efficient CFG parsing with CYK, another dynamic programming algorithm. Designing a little grammar and parsing with it on some test data.</p>	

UNIT-III	Information Theory :	(08 Hours)
	What is information? Measuring it in bits. Entropy, cross-entropy, information gain. Its application to some language phenomena. Language modeling and Naive Bayes: Probabilistic Language modeling and its applications. Markov models. Estimating the Probability of a Word, and Smoothing. Generative models of language and their Application.	
UNIT-IV	Hidden Markov Models :	(08 Hours)
	Part of Speech Tagging and Hidden Markov Models : The concept of Parts-of-speech, Examples, usage. The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs), definition and use. Viterbi Algorithm for Finding Most Likely HMM Path : Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese Word Segmentation, Prosody, information extraction, Weighted Context Free Grammars. Weighted CYK. Pruning and Beam Search.	
UNIT-V	Classifiers and Models:	(08 Hours)
	Maximum Entropy: The maximum entropy principle, and its relation to maximum likelihood. The need in NLP to integrate many pieces of weak evidence. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks. Maximum Entropy Markov Models & Conditional Random Fields: Part-of-speech tagging, Noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP.	
UNIT-VI	Machine Translation:	(08 Hours)
	Probabilistic models for Translating any Language into English. Alignment, translation, Language generation.	
Text Books:		
1.	Jurafsky, Dan and Martin, James, Speech and Language Processing, Prentice Hall.	
Reference Books:		
1.	Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.	
2.	Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.	
3.	Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.	

4.	Radford, Andrew et. al., Linguistics, an Introduction, Cambridge University Press, 1999.
	Assignment list :
1.	Implement part of a noisy-channel model for spelling correction.
2.	Write regular expressions that extract phone numbers and regular expressions that extract email addresses.
3.	Using Naïve Bayes algorithm classify selected movie review as positive or negative
4.	Build a maximum entropy Markov model (MEMM) for identifying person names in newswire text.
5.	Implement two translation models, IBM model 1 and IBM model 2, and apply these models to predict English word alignments.
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester III Subject: Elective - I Advanced MIS		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical : 02 Hrs	Continuous assessment : 40 Marks	Practical : 01
	Term Work : 25 Marks	
	Prat/Oral : 25 Marks	Total Credits : 05
Course Objectives:		
1) Explain the changing organizational environment and the use of information technology to manage contemporary organizations		
2) Identify the business impacts of business and social networking		
3) Explain the technological foundations of information systems, i.e., hardware, software and telecommunications		
Course Prerequisites:		
Students should have knowledge of		
1) Information System Management		
2) System Analysis and design		
3) Management information system		
Course Outcome:		
Students will be able to:		
1) Explain the organizational context of information systems, including decision making and information processing concepts		
2) Identify, conceptualize, and develop solutions to prepare conceptual design report		
3) Based on conceptual system design the student should able to prepare detailed system design alongwith technological foundations of information systems, i.e., hardware, software,informationprocessing.		
4).To understand implementation evaluation of system and pitfalls in MIS.		
5).Identify applications of MIS in manufacturing sector.		
6)Understand design of business systems using contemporary tools.		
UNIT-I	Introduction:	(08 Hours)
	<p>Foundation of Information System : Introduction to Information System and MIS, Decision support and decision making systems, systems approach, the systems view of business, MIS organization within company, Management information and the systems approach.</p> <p>Information Technology: A manager's overview, managerial overviews, computer hardware & software, DBMS, RDBMS and Telecommunication.</p>	
UNIT-II	Conceptual System Design:	(08 Hours)
	Define the problems, set systems objective, establish system constraints, determine information needs, determine information sources, develop alternative conceptual design and select one document ,the system concept, prepare	

	the conceptual design report.	
UNIT-III	Detailed System Design :	(08 Hours)
	Inform and involve the organization, aim of detailed design, project management of MIS detailed design , identify dominant and trade of criteria, define the sub systems, sketch the detailed operating sub systems and information flow, determine the degree of automation of each operation, inform and involve the organization again, inputs outputs and processing, early system testing, software, hardware and tools propose and organization to operate the system, document the detailed design, revisit the manager user.	
UNIT-IV	Implementation Evaluation and Maintenance of the MIS :	(08 Hours)
	Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train the operating personnel, computer related acquisitions, develop forms for data collection and information dissemination, develop the files , test the system, cut-over, document the system, evaluate the MIS control and maintain the system. Pitfalls in MIS development.	
UNIT-V	Advanced Concepts in Information Systems :	(08 Hours)
	Enterprise Resources Management(ERP), Supply Chain Management, CRM, Procurement Management System. Applications of MIS in Manufacturing sector, Service sector	
UNIT-VI	Designing of business systems :	(08 Hours)
	Design of business systems using contemporary tools and methods such as SQL, CASE tools, OOD tools, etc. Advanced Case Studies in MIS.	
Text Books/Referemnce Books:		
1)	Kenneth C. Laudon , “Management Information Systems”, Eighth Edition, PHI	
2)	James O'Brien and George Marakas, “Management Information Systems	
3)	Effy Oz, “Management Information Systems”, Course TechEffy	
Assignment List :		
1)	Introduction to MIS	
2)	Generating conceptual system design report	
3)	Case study on detailed system design based on conceptual system	
4)	Implementation ,evaluation and maintainance of MIS.	

5)	Analysis of pitfalls in MIS development
6)	Case study of advanced concepts in information system.
7)	To study applications of MIS in service sector.
8)	Design of business system using contemporary tools and methods such as SQL.
9)	Study of CASE tools and OOD tools.
10	Case study of software used for building information system.
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester III Subject: Elective-I WIRELESS COMMUNICATION NETWORK

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week Practical : 02 hrs/week	End Semester Examination : 60 Marks	Theory :04
	Continuous assessment : 40 Marks	Practical :01
	Term Work :25 Marks	Total Credits : 05
	Prat/Oral : 25 Marks	

Course Objectives:

To gain an understanding of the principles behind the design of wireless communication systems and technologies.

Course Prerequisites:

Students should have knowledge of

...Computer Networking And Communication

Course Outcome:

Students will be able to:

- 1) Understand mobile cellular architecture.
- 2) Understand the multiple access schemes & Handover, Handoff system.
- 3) Analyze the technology digital cellulare system.
- 4) Understand the technology WLAN ,Bluetooth.
- 5) Understand the GPRS System.
- 6) Understand the technology ADHOC & 802.16 system.

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UNIT-I	INTRODUCTION OF WIRELESS COMMUNICATION	(Hours)
	Challenges in wireless networking, Wireless communications standards Overview, evolution of cellular system, Cellular system architecture & operation, Performance criteria. Multiple access schemes for wireless communication -TDMA, FDMA, CDMA, SDMA	08
UNIT-II	WIRELESS NETWORK PLANNING AND OPERATION	(Hours)
	frequencies management, channel assignments, frequency reuse, System capacity& its improvement, Handoffs & its types, roaming, co channel & adjacent channel interference .	08
UNIT-III	DIGITAL CELLULAR NETWORKS	(Hours)
	GSM architecture& interfaces, signal processing in GSM, frame structure of GSM, Channels used in GSM, The European TDMA Digital cellular standard.	08
UNIT-IV	WIRELESS LAN TECHNOLOGY	(Hours)

	Overview, WLAN technologies, infrared LANs, Spread Spectrum LANs Narrowband Microwave LANs IEEE 802.11- Architecture, protocols, MAC layer .MAC frame, MAC management. BLUETOOTH Overview, Radio specification, Base band specification, Link manager specification, logical link control & adaptation protocol.	08
UNIT-V	MOBILE DATA NETWORKS	(Hours)
	Introduction, Data oriented CDPD networks, GPRS WIRELESS ACCESS PROTOCOL WAP architecture , Wireless Datagram ,Wireless Transport layer security, wireless transaction ,Wireless Session ,Wireless Application Environment ,WML	08
UNIT-VI	Emerging Wireless Network Technology	(Hours)
	IEEE 802.11 WLAN, ETSI HIPER LAN Technology, IEEE 802.15 WPAN Technology, IEEE 802.16 WMANTechnology, Mobile Adhoc Network, Mobile IP and Mobility Management, Mobile TCP, Wireless Sensor Networks, RFID Technology.	08
Text Books:		
1)	William C.Y.Lee, “Mobile cellular Telecommunication” ,2nd Ed. McGraw-Hill ĳ	
2)	Jochen Schiller, “Mobile Communication” Pearson Education ĳ	
3)	V. K. Garg, J. E. Wilkes, “Principle and Application of GSM”, Pearson Education	
Reference Books:		
1)	William Stalling,” Wireless Communication & Networking”	
2)	Rampantly,” Mobile communication”	
3)	Kamilo Feher,” Wireless digital communication”, PHI, 1999	
Syllabus for Unit Test:		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV, V and VI	

M.Tech IT Semester III Subject: Elective –I DATA WAREHOUSING AND E-COMMERCE		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory :04
Practical : 02	Continuous assessment : 40 Marks	Term Work : 01
	Term Work : 25 Marks	Total Credits : 5
	Oral/Practical : 25 Marks	
Course Objectives:		
1) Techniques for Developing Proper Data Warehouses		
2) Analyze the E-Commerce Payment Mechanism and Risk		
3) Recognize the business impact and potential of e-Commerce		
Course Prerequisites:		
Students should have knowledge of		
1) Information Systems		
Course Outcome:		
Students will be able to:		
1) Understand the analysis Decision Support System, Types and architecture.		
2) Understand and analyze process for Development of DSS.		
3) To understand Data Warehouse Concept and database.		
4) To understand E-Commerce & Third Parties		
5) To understand Risk and E-Commerce Payment Mechanism		
6) To understand E-Commerce payment mechanism		
UNIT-I		(Hours)
	Types of Decision Support System: The DSS hierarchy, Generalising the categories, Matching the DSS to the Decision type, Individual and group DSS. Matching the DSS to the user Community, Matching DSS to the decision Maker's Psychological type, User modes institutional Vs ad-hoc DSS. DSS Architecture, Hardware and Operating Systems Platform: Defining the DSS Arch. The major options, the internet and client-server computing in DSS, DSS using shared data on separate system, DSS on stand alone system, Open system and DSS, DSS user interface. DSS Software Tools: DSS software categories, standard packages, Specialized tools and generators, programming languages for DSS, DSS user interfaces	08
UNIT-II		(Hours)
	Building & Implementing Decision Support System: The DSS development process, DSS development project particulars. The implementation stage, system conversion. Overcoming resistance to change, DSS implementation issues, using the list of issues, Ethical issues in DSS.	08

UNIT-III	Data Warehousing & Executive Information System Fundamentals: Definitions uses & necessity of a data warehousing, Data warehouse concepts, Executive information systems. The Data Warehouse Database: Contents of the data warehouse database, database structures, and Getting data into data warehouse, Media.	(Hours)
		08
UNIT-IV	E-Commerce & The Role of Independent Third Parties: Introduction, consulting parties & accountant's independence, CPA version project, New assurance project, New assurance services undefined by the AICTE the Elliot committee 7 the Cohen Committee, three views of E-Commerce. E-commerce integrity & security assurance, internal control framework, competition, risk assessment assurance, impact of e-commerce on the traditional assurance function, continuous auditing, third party assurance of web based e-commerce, security of data, business plitics, transactions processing integrity, privacy of data, web-site seal options, better business bearu. Trustee, veri-sign, ACSA, AICPA/CICA web trust, business practices, transaction integrity, information protection, report issuance, implication for the accounting, professional skill sets, expansion of assurance services, consulting and international services	(Hours)
		08
UNIT-V	E-Commerce & Internet: Introduction, traditional EDI system, the origin of EDI, non-EDI systems, value added network(VANS) and pre-established trading partners, partially integrated EDI systems, benefits of EDI systems, Data transfer and standards, Department of Defense transaction,. Examples, financial EDI, EDI systems and Internets, Security concerns, security of data during transmission, audit trials and acknowledgements, authentication, interact trading relationship; consumer to business, business to business, government to citizen benefits, EDI web browser transaction, software, insights EDI and internet systems. Real time EDI inventory links with suppliers, integrated delivery links with federal express, web based sales, Impact of EDI internet applications on the accounting profession, Increased complexity of auditing through the computer, integrity of reliance in the VANs, Extension of audit to trading partners systems, increased technological skill of smaller accounting firms.	(Hours)
		08
UNIT-VI	Risk of Insecure Systems: Introduction, Overview of risks associated with internet transactions, internet associated risks, risks of customers, false or malicious web sites, stealing visitor's hard id, & passwords, stealing visitor's credit card and information, spying on visitor's hard drive, theft of customer data from selling	(Hours)

	<p>agents and ISPs, Privacy and use of cookies, risk to selling agents, customer impersonation, denial of service attacks, data theft, internet associated risks, sabotage by former employees, sniffers, financial fraud, down loading of data, emails proofing, social engineering, risks associated with business transaction data transferred between trading partners, intranet extranet and internet relationship, data interception, message origin authentication, proof of delivery, message integrity & unauthorized viewing of messages, timely delivery of messages, risk associated with viruses and malicious code overflows, viruses, Trojan Horses, hoaxes, buffer overflows, implication for the accounting profession, intranet internet controls web site assurance.</p> <p>E-Commerce Payment Mechanism: Introduction, the SET protocol. SET v/s SSI, version 1.0, payment gateway, Certificate Insurance, Certificate trust chain, Cryptography methods, Dual signature, the set logo, Compliance testing, Status of software implementation, version 2.0, and intermediate releases, magnetic strip cards, smart cards, Electronic cheques, The FSTC's electrons cheques, the FSTC's BIPS specification, audit implications, Electronic bill presentation & payment system.</p>	
		08
Assignment List:		
1)	What is Decision Support System? Explain Types of Decision Support System.	
2)	Case Study: DSS Software Tools	
3)	Explain Building & Implementing Decision Support System	
4)	Case Study: Trustee, veri-sign, ACSA, AICPA/CICA web trust	
5)	Explain EDI, non-EDI systems, value added network (VANS) with example.	
6)	What are the types of digital wallets? Explain	
7)	Relationship-Based Smart Credit Cards	
Text Books and References::		
1)	Efrem G. Mallach, "Decision support & data warehouse system", MGH International	
2)	Green Stein, FeinMan , "Electronic Commerce", MGH International	
3)	W.S.Jawadekar, "Management Information System", MGH International	
4)	Daniel Minoli, "Web Commerce technology handbook", MGH International	
5)	Mathews Leon, "The E-biz Primer- Alexis Leon", MGH International	
Syllabus for Unit Test:		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV, V and VI	

M.Tech IT Semester III Subject: Elective I: Computer Forensics and Cyber Laws		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical : 02 hrs/week	Continuous assessment : 40 Marks	Term Work : 01
	Term Work : 25 Marks	Total Credits: 05
	Pract/Oral : 25 Marks	
Course Objectives:		
1) Computer Forensics is a rapidly changing field. Simple things, like stronger encryption introduced into operating systems, create new challenges for forensic examiners every day.		
Course Prerequisites:		
Students should have knowledge of		
1) Practical experience of Computer Network and Network Security		
Course Outcome:		
Students will be able to:		
1) Know the role of computer as forensic investigator		
2) Know techniques for recovering data, tools used for recovery		
3) setting up remote logging in Windows		
4) Apply data recovery mechanism with the help of tools.		
5) Analyze the security audit with the help of logs		
6) Apply copyright protection standard to the innovative network		
UNIT-I	Overview:	(08 Hours)
	Concept of Computer Forensic, Types of Forensic Science, Storage device, Storage device characteristics, types of storage device. Forensic Investigator: Role of Computer Forensic Investigator, line of investigation, investigation steps, responsibilities of Computer Forensic Investigator.	
UNIT-II	Evidence:	(08 Hours)
	Definition of evidence, life cycle of evidence, types of evidence, rules for evidence, evidence. Storage and its Security Incident Response: Introduction, Investigations, Pre-Incident Preparations, Formation of Incident Response Team, Role of Incident Response Team. Data Recovery: Definition of data recovery, data recovery mechanism, techniques for recovering data, tools used for recovery.	
UNIT-III	Investigating Logs:	(08 Hours)
	Audit logs and security, system log, remote logging, configuring Windows, logging, setting up remote logging in Windows, event	

	reporter and Application Logs.	
UNIT-IV	Forensic Tools:	(08 Hours)
	WinHex, X-Ways, Index.dat Analyzer, Data Doctor. Disaster Recovery: Preparing for disaster recovery, backing up data, scheduling backup jobs, restoring data, recovering from server failure, selecting disaster recovery methods.	
UNIT-V	Battling Cyber Squatters and Copyright Protection in the Cyber World :	(08 Hours)
	Concept of domain name and reply to cyber squatters, meta-tagging, legislative and other innovative moves against cyber squatting, freedom and control on the internet, works in which copyright subsists and meaning of copyright, copyright ownership and assignment, license of copyright, copyright term and respect for foreign works, copyright infringement, offences and remedies, copyright protection and content on the internet, copyright notice, disclaimer and acknowledgment, downloading for viewing contents, hyper-linking and framing, liability of ISPs for copyright, violation in the cyber world, legal developments in the US, Napster and its cousins, computer software piracy	
UNIT-VI	Digital Signature, Certifying Authorities and E-Governance :	(08 Hours)
	Digital signature, digital signature certificate, certifying authorities and liabilities, digital signature Governance in India.	

Assignment List:

1)	Analyze various types of storage structures
2)	Understand line of investigation in the form of steps
3)	Analyze life cycle of evidence for security
4)	Apply data recovery mechanism with the help of tools.
5)	Analyze the security audit with the help of logs
6)	Analyze WinHex in detail
7)	Apply disaster recovery techniques to preserve data
8)	Apply copyreight protection standard to the innovative network.

Text Books/References:

1)	Jay A. Siegel, "Forensic Science: The Basics "
2)	Joe Nickell and John F. Fischer, "Crime Science: Methods of Forensic Detection"
3)	Anthony J. Bertino, "Forensic Science: Fundamentals and Investigations"
4)	Stuart H. James and Ph. D., Jon J. Nordby, "Forensic Science: An Introduction to Scientific and Investigative Techniques", 2nd edition
5)	Colin Evans, "The Casebook of Forensic Detection: How Science Solved 100 of the

	World's Most Baffling Crimes”
6)	Edward Amoroso, “Cyber Security, Computer Network Security and Cyber Ethics”, 2nd edition by Joseph Migga Kizza
7)	Robert McCrie, “Security Operations Management”, Second Edition Andy Jones and Debi Ashenden, “Risk Management for Computer Security:
8)	Andy Jones and Debi Ashenden, “Risk Management for Computer Security
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester III Subject: Elective II: BIOINFORMATICS		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory :04
Practical : 02	Continuous assessment : 40 Marks	Term Work : 01
	Term Work : 25 Marks	
	Oral/Practical : 25 Marks	Total Credits : 05
Course Objectives:		
1. Receive an introduction and historical perspective to the field of bioinformatics		
2. Learn the key methods and tools used in bioinformatics		
3. Understand the theoretical basis behind bioinformatics		
4. Analyze protein sequences, identify proteins, and retrieve protein structures from databases. View and interpret these structures.		
...		
Course Prerequisites:		
Students should have knowledge of		
1) Advanced Molecular Biology (or equivalent)		
...		
Course Outcome:		
Students will be able to:		
1) Understand the Basic concepts of Bioinformatics		
2) Understand and analyze Sequence Alignment and Database Searching		
3) To understand Protein Structure		
4) To understand Protein-protein Interactions and Algorithms.		
5)To understand Protein function and Computer tools for phylogenetic analysis		
...		
UNIT-I	Bioinformatics Basics: Basic concepts, Protein and amino acid , DNA & RNA, Sequence, structure and function. Bioinformatics databases: Introduction, Motivation, Type of databases, Nucleotide sequence databases, Protein sequence databases, Sequence motif databases, Protein structure databases, Other relevant databases.	(08 Hours)
UNIT-II	Sequence Alignment and Database Searching: Single sequence alignments, Biological motivation, Pairwise alignments, Scoring matrix, Gap penalty, Dynamics programming, Needleman- Wunsch, Smith-Waterman, Heuristic methods, FASTA, BLAST, Statistics of sequence alignment score, E-Value, P-Value, Multiple sequence alignments, ClustalW, Profile, Profile-sequence	(08 Hours)

	<p>alignment, Profile-profile alignment, PSI-BLAST, Hidden Markov Models.</p> <p>Protein structure alignments : Structure superposition, structure alignment, Different structure alignment algorithms.</p>	
UNIT-III	<p>Protein Structure:</p> <p>Protein secondary structure predictions: Protein secondary structure, Hydrogen bond, secondary structure element, Methods for predicting secondary structure.</p> <p>Protein tertiary structure modeling: Basic concepts Protein folding and dynamic simulation, Comparative modeling, Threading, Ab initio modeling, Combined modeling approaches, CASP: A blind protein structure prediction competition. Experimental methods for protein structure determination: X-ray crystallography, Nuclear magnetic resonance (NMR).</p>	(08 Hours)
UNIT-IV	<p>Protein-protein Interactions: Experimental identification of protein-protein interactions, Yeast two- hybrid assay, High-throughput mass spectrometry, Interaction networks and system biology.</p> <p>Protein quaternary structure modeling: Basic concepts, Degrees of freedom, Presentation of protein conformations, Hydrophobicity factor, Shape complementary, Docking Scoring function, Protein-protein docking algorithms, Protein-ligand docking algorithms, Drug design, Multiple-threading algorithms, Homology modeling of protein-protein interactions, Protein and ligand binding, CAPRI.</p>	(08 Hours)
UNIT-V	<p>Biomolecular Simulations: Basic concepts, Units and derivatives , Force field and energy landscape, Truncation of nonbonded interactions.</p> <p>Conformational Sampling: Introduction, Minimization and algorithms, Molecular dynamics, Ensembles (statistical mechanics), Monte Carlo simulations.</p>	(08 Hours)

	Solvation: Introduction, Periodic boundary condition, Ewald summation, Implicit solvent model and continuum electro statics, Monte Carlo simulation on parallel computers. Advanced Techniques: Introduction, Replica-exchange simulations, Restraint potentials, Free energy calculations, Membrane simulations.	
UNIT-VI	<p>Biological Membranes: Introductions, Biological roles, Structural features, Membrane lipids, General structures, Aggregation states, Polymorphism, Thermal transitions, Electrostatic effects, Molecular dynamics, Membrane proteins, MD simulation of Membrane proteins.</p> <p>Protein function: Sequence to function, Structure to function, Protein function identification methods and databases. Phylogenetics, Sequence-based taxonomy, Models, assumptions, and interpretations, From multiple alignment to phylogeny, Computer tools for phylogenetic analysis.</p>	(08 Hours)
Assignment List:		
1)	Explain Bioinformatics Basics.	
2)	Explain concept of Sequence Alignment and Database Searching.	
3)	Explain Protein Structure and Protein quaternary structure modeling	
4)	Explain Bio-molecular Simulations.	
5)	Explain Conformational Sampling.	
6)	Explain in detail Biological Membranes.	
7)	Explain Protein function with examples.	
Text Books and References::		
1)	David Mount, "Bioinformatics", Cold Spring Harbor Press"	
2)	James Jisdall, "Beginning Perl for Bioinformatics"	
3)	David W. Mount, "Bioinformatics- Sequence & Genome Analysis"	
Syllabus for Unit Test:		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV, V and VI	

M.Tech IT Semester III Subject: Elective – II Advanced Computing Architecture		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week Practical : 02 hrs/week	End Semester Examination : 60 Marks	Theory :04
	Continuous assessment : 40 Marks	Practical : 01
	Term Work : 25 Marks	Total Credits : 05
	Practical / Oral : 25 Marks	
The aim of the course is to design distributed computing architecture to improve the efficiency of system.		
Course Objectives:		
1) Analyze the structure of distributed computing		
2) Apply the efficient solution with respect to suitable distributed computing Architecture.		
Course Prerequisites:		
Students should have knowledge of		
2) Basic knowledge of distributed system		
Course Outcome:		
Students will be able to:		
1) Understand distributed environment.		
2) Analyze performance of distributed Architectures		
3) Analyze the computing parameters.		
4) Understand data and computing measures		
5) Analyze bottlenecks during the enhancement		
6) Apply the suitable architecture to enhance the performance.		
UNIT-I	Introduction to cloud computing	(Hours)
	Introduction to to various distributed computing architectures – Grid, cluster, cloud. Structure of cloud, computing parameters of cloud, boost in the performance due to cloud.	06
UNIT-II	Architecture of cloud computing	(Hours)
	Service Models – Infrastructure As a Service (IaaS) , Platform as a Service (PaaS), Software as a Service (SaaS) Deployment Models – Public cloud, private cloud, Hybrid cloud, community cloud	06
UNIT-III	Big Data	(Hours)
	Concept of Big Data, Challenges to deal with Big Data , solution with respect to big data, data Analytics.	06
UNIT-IV	Data Intensive Computing	(Hours)
	Introduction to hybrid data, concept of Hadoop Distributed	06

	File Structure (HDFS), data node, name node, job tracker, Task Tracker.	
UNIT-V	Architecture of Map Reduce Algorithm	(Hours)
	Concept of unstructured data, Introduction to Map Reduce Algorithm, Implementation with word count example.	06
UNIT-VI	Case Study of advanced computing Architecture	(Hours)
	Cloudstack, Eucalyptus, Azure, big data analytics, Hadoop, Implementation of MapReduce -II	06
Assignment List:		
1)	Design cluster using apache web server	
2)	Design cloud computing environment using public cloud	
3)	Design cloud computing environment using private cloud	
4)	Analyse the Complete data of BVUCOE using big data analytics	
5)	Use HDFS to deal with huge data.	
6)	Implement Map Reduce Algorithm to prove the rise in the efficiency	
7)	Implement Map Reduce II	
8)	Analyze various computing environments like cloudstack , openstack.	
Text Books:		
1)	Architecture the cloud, Michael J. Kevis, Wiley publication	
2)	Microsoft Big Data Solution, Adam Jorgensen, Wiley publication	
3)	Hadoop: The Definitive Guide, Tom White, O'REILLY' publication	
Reference Books:		
1)	Building the Infrastructure for cloud security, Raghu Yelori, Enrique castro-Leon	
2)	Hadoop Operations, Eric Sammer, O'REILLY' publication	
3)	MapReduce Design Patterns: Building Effective Algorithms and Analytics Donald Miner, O'REILLY' publication	
Syllabus for Unit Test:		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV, V and VI	

M.Tech IT Semester III Subject: Elective II: Usability Engineering		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical : 02 hrs/week	Continuous assessment : 40 Marks	Term Work : 01
	Term Work : 25 Marks	Total Credits: 05
	Pract/Oral : 25 Marks	
Course Objectives:		
1) To present the basic principles and practical knowledge regarding the design, development and evaluation of human-computer interfaces in the light of usability		
Course Prerequisites:		
Students should have knowledge of		
2) Practical experience of software system analysis and design		
Course Outcome:		
Students will be able to:		
2) Define and distinguish between the different types of user interface		
2) Develop a more usable interface		
3) To identify techniques and technologies that can satisfy usability and accessibility specifications		
4) To apply usability methods in developing interactive systems		
5) To identify and analyze the various components of the overall context of use of an interactive system		
6) To develop usability and accessibility specifications that can be used in evaluating and developing interactive systems-		
UNIT-I	Introduction	(08 Hours)
	Introduction, Importance, Human computer interface, Characteristics of GUI, Direct manipulation graphical system, Web user interface, Mobile UI, Popularity of graphics Generations of User Interfaces: Batch Systems, Line-Oriented Interfaces, Full-Screen Interfaces	
UNIT-II	Development Processes	(08 Hours)
	Managing Design Processes: Organizational Design to Support Usability, The three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design Review, Legal issues Evaluating Interface Designs: Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments	

UNIT-III	User Interface Software and Specifications	(08 Hours)
	Languages and tools for specifying and building interfaces, Dialogue independence, UIMS (user interface management system) approach, Languages and software abstractions for user, interfaces, Programming support tools	
UNIT-IV	Develop System Menus and Navigation Schemes	(08 Hours)
	Menus: Structures, Functions, Content, Formatting of Menus, Phrasing the Menu, Selecting Menu Choices, Navigating Menus, Kinds of Graphical Menus Windows: Window Characteristics, selection of window, Components of a Window, Window Presentation Styles, Types of Windows, Window Management, Organizing Window Functions, Window Operations, Web Systems	
UNIT-V	Interaction Styles, Devices and Techniques	(08 Hours)
	Interaction Styles: Question and answer, Form-based, Command language Menus, Natural language, direct manipulation Interaction Devices: Keyboard and function keys, pointing device, speech recognition digitization and generation, image and video displays, drivers New Interaction Techniques: New modes of human-computer communication, Voice, Gesture, Eye movement, Tangible, user interfaces, Brain-computer interfaces	
UNIT-VI	UI Feedback, Guidance and Assistance	(08 Hours)
	Providing the Proper Feedback: Response Time, Dealing with Time Delays, Blinking for Attention, Use of Sound UI Guidance and Assistance: Preventing Errors, Problem Management, Providing Guidance and Assistance, Instructions or Prompting, Help Facility	
Assignment List:		
1)	Introduction to fundamentals of Usability Engineering	
2)	Study on User Interface Software and Specifications	
3)	Design a sport watch interface	
4)	Design a web application interface for online grocery shopping	
5)	Design a touch screen interface for an Automatic Teller Machine (ATM) geared towards kids aged 10-15 whose parents have opened a savings account for them	
6)	Design an interface and list user experience for a universal remote to be used in home settings	
Text Books:		
1)	Shneiderman, C. Plaisant, M. Cohen, and S. Jacobs, <i>Designing the User Interface:</i>	

	<i>Strategies for Effective Human-Computer Interaction</i> , Addison-Wesley, Reading, Mass. (any recent edition)
2)	Y. Rogers, H. Sharp, and J. Preece, <i>Interaction Design: Beyond Human-Computer Interaction</i> , John Wiley & Sons. (any recent edition)
Reference Books:	
1)	Don Norman, <i>The Design of Everyday Things</i>
2)	Jakob Nielsen, <i>Usability Engineering</i>
3)	Jakob Nielsen and Raluca Budiu, <i>Mobile Usability</i>
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester III Subject: Elective II: Advanced Database Management System

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical : 02 hrs/week	Continuous assessment : 40 Marks	Practical : 01
	Term Work : 25 Marks Prat/oral : 25 Marks	Total : 05

Course Objectives:

- 1) Introduce principles and foundations of distributed databases and parallel databases
- 2) Understand the operations in Transaction management

Course Prerequisites:

Students should have knowledge of

- 1) Basic database management system concepts and their operations.

Course Outcome:

Students will be able to:

- 1) Understand distributed database architecture and design
- 2) Understand the processing and optimization of distributed queries
- 3) Understand the performance issues in high performance databases
- 4) Understand the working of parallel database management system
- 5) Understand the transaction management process
- 6) Understand latest advancement in database management systems

UNIT-I	Distributed databases: Architecture and Design	(Hours)
	Distributed data processing, What is a DDBS; Advantages and disadvantages of DDBS, Problem areas Distributed DBMS Architecture: Transparencies in a distributed DBMS, Distributed DBMS architecture, Global directory issues, Distributed Database Design: Alternative design methodologies and strategies, Distributed design issues, Types and role of Fragmentation, Types and role of replication, Data allocation	08
UNIT-II	Distributed query processing and optimization	(Hours)
	Distributed Query processing: Problem of query processing, Distributed query, Query decomposition, Distributed Query Processing Methodology, translation global queries to fragment	08

	<p>queries</p> <p>Distributed Optimization: Objectives of query optimization, Factors governing query optimization, Ordering of fragment queries, optimization of join operation, Load balancing, Distributed query optimization algorithms</p>	
UNIT-III	Issues and Concerns in High Performance Databases	(Hours)
	<p>Database Tuning and Performance: benchmarking, TPC benchmarks, object oriented benchmarks, TP Monitors, TPC and Wisconsin benchmarks, performance measurement, and performance tuning.</p> <p>Semantic data Control : View management, Data security, Semantic Integrity Control</p> <p>Indexing structures: Btrees, hash files, multi-attribute indexing.</p>	08
UNIT-IV	Parallel Database Management System	(Hours)
	<p>Introduction: Types of parallelism in database systems, Parallel Query Processing, multiprocessor architectures, parallel relational operators, parallelism in main-memory DBMS, parallel handling of integrity constraints, Integrated I/O parallelism</p> <p>Parallel Query Processing and Optimization: Inter-query parallelism, intra-query parallelism, intra-operation parallelism, inter-operation parallelism, objectives of parallel query optimization, parallel query optimization, load balancing, parallelism in join queries, testing the quality of query optimization</p>	08
UNIT-V	Advanced concepts in Transaction Management	(Hours)
	<p>Transaction Management: ACID properties, pessimistic locking, optimistic locking, flat transactions, nested transactions, deadlock detection and management and their algorithms, Recovery Methods</p> <p>Concurrency control and Reliability in Distributed Databases: Concurrency control in centralized database systems vs Concurrency control in DDBSs, Distributed concurrency control algorithms, Deadlock management, Reliability issues in DDBSs; Types of failures, Reliability techniques, Commit protocols, Recovery protocols</p>	08
UNIT-VI	Emerging trends in databases	(Hours)
	<p>Mobile Databases, Distributed Object Management, Multi-databases, Semantic databases, Hadoop Distributed File Systems, MapReduce Overview, NoSQL Databases, Design and Comparison of NoSQL Databases, Active and Deductive databases</p>	08

Assignment List:	
1)	To study and implement different types of Views in SQL
2)	Study and implementation of all types of Joins using SQL
3)	Implementation of hash files
4)	Study of transaction and implementing transaction operations using SQL/PL-SQL
5)	Installation and study of Hadoop.
6)	Installation and study of any NoSQL database
7)	Comparison and Implementation of locking techniques
8)	Case study of the operations of any real time distributed DBMS and parallel DBMS
Text Books:	
1)	Stefano <i>Ceri</i> and Giuseppe <i>Pelagatti</i> , “Distributed databases principles and systems”, Tata Hill
2)	Raghu Ramkrishnan, "Database Management System", McGraw-Hill
3)	Silberschatz, Korth and Sudharshan, “Data base System Concepts”, Mc-GrawHill
Reference Books:	
1)	M. Tamer Özsu and Patrick Valduriez, “Principles of Distributed Database Systems”, Springer Science & Business Media, 2011, 3 rd edition
2)	Elmasri and Navathe, “Fundamentals of Database Systems”, Addison-Wesley, 2007
3)	Thomas Connolly, Carolyn Begg, “Database Systems: A Practical Approach to Design, Implementation and Management “, Pearson Education, LPE
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester III Subject: Elective-II- Advanced Operating Systems		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical :02	Continuous assessment : 40 Marks	Practical : 01
	Term Work :25 Marks	
	Prat/Oral :25 Marks	Total Credits : 05
Course Objectives:		
1) To provide students with an overview of operating systems with change in technologies and use		
Course Prerequisites:		
Students should have knowledge of		
1) Basic concepts of operating systems.		
2) Basic algorithms in operating systems.		
Course Outcome:		
Students will be able to:		
1) Understand core structure of operating systems		
2) Understand distributed operating systems.		
3) Understand distributed resource management.		
4) Understand multiprocessor and database operating systems.		
5) Understand real time and mobile operating systems.		
UNIT-I		
INTRODUCTION		(Hours)
Overview – Functions of an Operating System – Design Approaches – Types of Advanced Operating System – Synchronization Mechanisms – Concept of a Process, Concurrent Processes – The Critical Section Problem, Other Synchronization Problems – Language Mechanisms for Synchronization – Axiomatic Verification of Parallel Programs – Process Deadlocks – Preliminaries – Models of Deadlocks, Resources, System State – Necessary and Sufficient conditions for a deadlock – Systems with Single-Unit Requests, Consumable Resources, Reusable Resources.		08
UNIT-II		
DISTRIBUTED OPERATING SYSTEMS		(Hours)
Introduction – Issues – Communication Primitives – Inherent Limitations - Lamport’s Logical Clock; Vector Clock; Casual Ordering Global State; Cuts; Termination Detection. Distributed Mutual Exclusion – Non Token Based Algorithms – Lamport’s Algorithm – Token-Based Algorithms – Suzuki-Kasami’s Broadcast Algorithm – Distributed Deadlock Detection – Issues – Centralized Deadlock Detection Algorithms – Distributed Deadlock-Detection Algorithms, Agreement Protocols – Classification – Solutions – Applications.		08

UNIT-III	DISTRIBUTED RESOURCE MANAGEMENT	(Hours)
	Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed Shared Memory – Architecture – Algorithm – Protocols – Design Issues, Distributed Scheduling – Issues – Components - Algorithms	08
UNIT-IV	FAULT RECOVERY AND FAULT TOLERANCE	(Hours)
	Basic Concepts – Classification of Failures- Basic Approaches to Recovery; Recovery in Concurrent Systems; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues – Two phase and Non-blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols.	08
UNIT-V	MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS	(Hours)
	Structures – Design Issues – Threads –Processing Synchronization – Process Scheduling – Memory Management – Reliability / Fault Tolerance; Database Operating Systems –Introduction – Concurrency Control – Distributed Database Systems – Concurrency Control Algorithms.	08
UNIT-VI	REAL TIME AND MOBILE OPERATING SYSTEMS	(Hours)
	Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management – File system.	08
Assignment List:		
1)Study of hardware and software requirements of different operating systems		
2) Implement CPU scheduling policies.		
3)Implement Lamport’s Algorithm – Token-Based Algorithm		
4) Implement Suzuki-Kasami’s Broadcast Algorithm		
5) Study of distributed file systems – architecture		
6)Study of fault recovery and fault tolerance		
7) Implement file storage allocation techniques.		
8) Study of Concurrency Control Algorithms.		

9) Case study of mobile operating systems	
10) Case study of real time operating systems	
Text Books:	
1)	Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
2)	Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.
Reference Books:	
1)	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.
2)	Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O’Reilly, 2005.
3)	Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011.
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

**Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)**

STRUCTURE & EXAMINATION PATTERN

MTech Information Tecnology

Semester IV											Total Duration : 14 Hrs/Week	
											Total Marks : 325	
											Total Credits : 34	
Subject	Teaching Scheme (Hrs)		Examination Scheme							Examination Scheme (Credits)		Total Credits
	Hrs./Week											
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/P R/OR		
Self-Study Paper-II	04	--	60	20	10	10	-	-	04	-	04	
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30	
Total	04	10	60	20	10	10	150	75	04	30	34	

List Of Self Study Subjects

Sr. No.	Self Study Paper I Sem-III	Self Study Paper II Sem-IV
1	Real Time & Fault Tolerant System	Information Storage and Management
2	Ad-hoc Network	Organizational Behavior
3	Computer Oriented Numerical & Statistical Methods	Computer Vision and Digital Image Processing
4	Semantic Networks	Artificial Intelligence & Applications
5	Embedded System and Applications	Design and Analysis of Algorithms
6	Distributed Computing	Compiler Design
7	Information Theory Coding and Cryptography	Computer Oriented Optimization Techniques
8	Soft Computing	Information Security System

BHARATI VIDYAPEETH UNIVERSITY COLLEGE OF ENGINEERING**CHEMICAL ENGINEERING DEPARTMENT****M.TECH CHEMICAL (CBCS -2015 COURSE)****M.TECH STRUCTURE (CHEMICAL)****Choice Based Credit System****SEMESTER-I**

Semester I												
Total Duration: 20 hrs/week												
Total Marks : 500												
Total Credits: 18												
Subject Code	Subject	Teaching Scheme (Hrs)		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
		Hrs./Week		Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/P R/OR	
L	P											
K10501	Applied Mathematics for Chemical Engineering	04	02	60	20	10	10	25	25	04	01	05
K10502	Advanced Momentum and Heat Transfer	04	--	60	20	10	10	-	--	04	-	04
K10503	Thermodynamics of Phase Equilibria	04	--	60	20	10	10	-	-	04	-	04
K10504	Multiphase Reactors	04	02	60	20	10	10	25	25	04	01	05
Total		16	04	240	80	40	40	50	50	16	02	18

SEMESTER-II

Semester II		Total Duration: 20 hrs/week										
		Total Marks : 500										
		Total Credits: 18										
Subject Code	Subject	Teaching Scheme (Hrs)		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
		L	P	Theory	Unit Test	Attendance	Tutorial / assignments	TW	Pract/ Oral	TH	TW/ PR/OR	
K10505	Modeling & Simulation of Chemical Processes	04	02	60	20	10	10	25	25	04	01	05
K10506	Chemical Reactor Analysis and Design	04	--	60	20	10	10	--	--	04	--	04
K10507	Synthesis & Design of Chemical Processes	04	--	60	20	10	10	--	--	04	--	04
K10508	Advanced Mass Transfer	04	02	60	20	10	10	25	25	04	01	05
Total		16	04	240	80	40	40	50	50	16	02	18

SEMESTER-III

Semester III												Total Duration: 28 hrs/week	
												Total Marks : 475	
												Total Credits: 40	
Subject Code	Subject	Teaching Scheme (Hrs)		Examination Scheme						Examination Scheme (Credits)		Total Credits	
		Hrs./Week	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH		TW/PR /OR
K10601	Elective –I	04	02	60	20	10	10	25	25	04	01	05	
K10602	Elective –II	04	02	60	20	10	10	25	25	04	01	05	
	**Self-Study Paper-I	* 04	--	60	20	10	10	-	-	04	-	04	
K10604	Dissertation Stage –I	-	07	-	-	---	--	25	--		21	21	
K10603	Seminar	-	05	-	-	--	--	25	25	-	05	05	
	Total	12	16	180	60	30	30	100	75	12	28	40	

Elective – I	Elective - II
<ul style="list-style-type: none"> • Advanced Process Control • Non Conventional Energy Sources • Industrial Waste Water Treatment • Heterogeneous Catalysis • Catalyst Materials 	<ul style="list-style-type: none"> • Membrane Separation • Bio-process Engineering • Multicomponent Separation • Food Process Engineering • Fluidization Engineering

SEMESTER-IV

Semester IV		Total Duration: 14 hrs/week										
		Total Marks : 325										
		Total Credits: 34										
Subject Code	Subject	Teaching Scheme (Hrs)		Examination Scheme						Examination Scheme (Credits)		Total Credits
		L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR /OR	
	**Self-Study Paper-II	* 04	--	60	20	10	10	-	-	04	-	04
K10605	Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30
	Total	04	10	60	20	10	10	150	75	04	30	34

Sr.No.	SELF STUDY PAPER- I (SEM-III)	SELF STUDY PAPER- II (SEM-IV)
1	Optimization Techniques in Process design	Technology Transfer Practices –Bridge to Industry
2	Non Conventional Energy System	Polymer Engineering
3	Mechanical Aspects in Chemical Engineering	Food Technology
4	Green Chemistry & Technology	Modeling & Simulation of Processes
5	Cavitation Techniques	Nanoscience
6	Safety Engineering in Industries	Petrochemical Engineering
7	Petroleum Engineering	Physical Concepts of Unit Operations
8	Fluid Particle Technology	Multiphase Reactor Engineering

SEMSETER-I

K10501 APPLIED MATHEMATICS FOR CHEMICAL ENGINEERING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures : 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	
Topics covered		
UNIT-I	Introduction: Approximation and round-off errors, significant figures, accuracy and precision, error definitions, truncation errors. Taylor series, error propagation, total numerical error, formulation errors and data uncertainty. Tests of significance. Analysis of variance.	(08 Hours)
UNIT-II	Numerical solution of linear & nonlinear algebraic equations: Linear systems of equations, solutions by Creamer's Rule, Matrix methods, Gaussian, Gauss-Jordan, Jacobean, Gauss-Seidel and Relation methods. Non-linear equations: Bisection, Regula-falsi, Secant and Newton- Raphson methods.	(08 Hours)
UNIT-III	Curve fitting: Least square regression: Linear regression, polynomial regression. Interpolation: Newton's divided-difference interpolating polynomials, Lagrange interpolating polynomials, coefficient of an interpolating polynomial. Fourier approximation.	(08 Hours)
UNIT-IV	Numerical integration and differentiation: Newton-cotes integration of equations. Integration of equations: Romberg integration, Gauss Quadrature. Partial differential equations: Finite difference: Elliptic equations, parabolic equations, finite element method. Diffusion/convection form of partial differential equations in chemical engineering. Characteristics and partial differential equation types and their analytical solution.	(08 Hours)
UNIT-V	Numerical solution of ordinary differential equations: Formulation of linear and non-linear first and second order ordinary differential equations, higher order linear, differential equations for systems involving momentum, heat and mass transfer with and without chemical reactions and their analytical solutions. Ordinary differential equations: Runge-Kutta, Euler's and Milne's predictor corrector methods. Boundary-value and eigenvalue problems, general methods of boundary-value problems.	(08 Hours)
UNIT-VI	Mathematical analysis and engineering problem-solving: Design and analysis of experiments: data analysis, treatment, generalization and interpretation on engineering data. Formulation of physical problems: mathematical statement of the problem, representation of problems, problem solving with appropriate mathematical method, analysis of results with statical tests.	(08 Hours)

Term Work:	
Oral examination will consist of assessment of the termwork (duly certified by the teacher and HOD) and oral exam based on the term work/practical. The term work shall consist of the following: Minimum 8 practical based on solving numerical methods mentioned in the syllabus using C, C++ language, or TK solver software, or any chemical Engineering Software.	
Assignment: : Each student will submit assignments based on different topics in consultation with faculty, in the area of application of mathematics in chemical engineering, keeping track of the recent technological trends and developments..	
Text Books/References:	
1.	S. C. Chapra and R. P. Canale, Numerical Methods for Engineers, 6th Ed., McGraw Hill, 2010.
2.	S. C. Chapra, Applied Numerical Methods with MATLAB: for Engineers and Scientists, 2nd Ed., Tata McGraw Hill, New Delhi, 2010.
3.	S. K. Gupta, "Numerical Techniques for Engineers", Wiley Eastern, 1995.
4.	M.K. Jain, S.R.K. Iyengar and R. K. Jain, "Numerical Methods for Scientific and Engineering Computations", 1992.
5.	Kreyszig, Erwin: Advanced Engineering Mathematics, 8th Edition, Wiley Eastern, New Delhi, 2002.
6.	H.S.Mickley, T.K. Sherwood and C.E. Reid, "Applied Mathematics in Chemical Engineering", II Edn., Tata McGraw Hill, New Delhi, 1978.
7.	Teukolsky S.A., W.H. Press, "Numerical Recipes in 'C' ", Cambridge University press
8.	Constantinides A., "Applied Numerical Methods with Personal computer", McGraw Hill publishers
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10502 ADVANCED MOMENTUM AND HEAT TRANSFER

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

Topics covered

UNIT-I	<p>Shear stress in laminar flow: Newtonian and non Newtonian fluids; Rheological models; theories of transport properties of gases and liquids; effect of pressure and temperature.</p> <p>One dimensional momentum transport in laminar flow (shell balance): General method of shell balance approach to momentum transfer problems; momentum flux and velocity distribution for flow of Newtonian and non-Newtonian fluids in pipes, planes, slits and annulus; Fluid flow of two immiscible fluids.</p>	(08 Hours)
UNIT-II	<p>Differential equations of fluid flow: Control volume approach; Differential continuity equation; Navier-Stokes Equation and Bernoulli's equation; Applications of differential equations of fluid flow</p> <p>Effect of turbulence on momentum transfer: Description of turbulence; Turbulent shearing stresses; The mixing length hypothesis, velocity distribution from the mixing length theory; The universal velocity distribution; The turbulent boundary layer on a flat plate</p>	(08 Hours)
UNIT-III	<p>Fluid flow in closed Conduits: Friction factors for fully developed laminar, turbulent and transition flow in circular conduits; Friction factors for flow in the entrance to a circular conduit; Friction factors for packed columns.</p> <p>Macroscopic momentum balances: The macroscopic mass, momentum and mechanical energy balances; Use of macroscopic balances for steady-state problems; Use of macroscopic balances for unsteady-state problems.</p>	(08 Hours)
UNIT-IV	<p>Mechanism of energy transport: Fourier's law of heat conduction; Thermal conductivity of liquids and solids; Effective thermal conductivity of composite solids.</p> <p>Temperature distribution in solids and in laminar flow: Heat conduction through composite walls; Heat conduction in a cooling Fin; Forced convection; Free convection.</p>	(08 Hours)
UNIT-V	<p>The equation of change for non isothermal systems: The equation of energy; The equation of motion for forced and free convection; Use of equations of change to solve the steady-state problems</p> <p>Unsteady Heat Conduction in Solids: Heating of a semi-infinite slab; Heating of a finite slab; Unsteady heat conduction near the wall with sinusoidal heat flux</p> <p>Temperature distribution in turbulent flow: Time smoothed equation of change for incompressible non isothermal flow; Time smoothed temperature profile near a wall; Empirical expressions for the turbulent heat flux; Temperature distribution for turbulent flow in tubes</p>	(08 Hours)
UNIT-VI	<p>Interphase transport in non-isothermal systems: Heat transfer coefficients for forced convection in tubes and through packed beds; Heat transfer coefficients for free and mixed convection; Heat transfer coefficients for condensation of pure vapors</p>	(08 Hours)

	on solid surfaces. Analogies of momentum and heat transfer: Reynolds and Chilton Colburn analogy	
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Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of advanced momentum and heat transfer, keeping track of the recent technological trends and developments.

Text Books/References:

1.	W. E. Stewart, E. N. Lightfoot, R. B. Bird, "Transport Phenomena", John Wiley & Sons
2.	J. R. Welty, C. W. Wicks, R. E. Wilson, G. Rorrer, "Fundamentals of momentum, heat and mass transfer, Wiley INDIA
3.	J.C. Slattery, "Advanced transport phenomena", Cambridge University Press
4.	J. G. Knudsen, D. L. Kaz, "Fluid Dynamics and Heat Transfer", McGraw Hill

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10503 THERMODYNAMICS OF PHASE EQUILIBRIA

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

Topics covered

UNIT-I	Thermodynamics of Multicomponent mixtures: Ideal mixtures and excess mixture properties, Fugacity of species in gaseous, liquid and solid mixtures, Criteria for phase equilibrium in multicomponent systems, Modified Rault's law and its significance, Gibbs Duhem equation, Hydrogen bonding and charge transfer complexing Equilibrium	(08 Hours)
UNIT-II	Vapor liquid Equilibrium of mixtures Vapor Liquid equilibrium (VLE) of ideal mixtures, Low pressure VLE in non-ideal mixtures, High pressure VLE using equation of states, Solubility of gas in liquid, Liquid-Liquid Equilibrium, Vapor Liquid-Liquid Equilibrium, Models for activity coefficient, UNIFAC method, UNIQUAC equation, Osmotic pressure, osmotic equilibrium	(08 Hours)
UNIT-III	Mixture phase equilibrium involving solids Solubility of solid in liquid and supercritical fluid, Solid Liquid Equilibrium, Partitioning of solid between two liquid phases, distribution coefficient, Freezing point depression of solvent due to presence of solute, freezing point of liquid mixtures in presence of solid.	(08 Hours)
UNIT-IV	Chemical Reaction Equilibria: Chemical equilibrium in single phase system, Heterogeneous chemical reactions, Chemical equilibrium when several reaction occurs in single phase, Combined chemical and phase equilibrium. Phase rule and Duhem's theorem for reacting systems, Degree of freedom analysis for non-reacting and reacting systems	(08 Hours)
UNIT-V	Surfaces, Interfaces and Adsorption Thermodynamics of interfaces, Gibbs surface model and surface tension, Surface energy of solids, Surface effects on heterogeneous phase equilibrium, effect of particle size on vapor pressure, effect of bubble size on the boiling temperature of pure substances, solubility and nucleation, effect of particle size on melting temperature, Gibbs adsorption equation	(08 Hours)
UNIT-VI	Thermodynamics of acid, alkali interaction, Energy analysis Acidity of solutions, ionization of chemicals, solubilities of weak acids, weak bases, pharmaceuticals as function of pH, Gibbs-Donnan equilibrium. Defining Energy, Control Volume Energy Rate Balance, Exergetic Efficiency, Introduction to Energy Costing .	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of thermodynamics of phase equilibria, keeping track of the recent technological trends and developments.

Text Books/References:

1.	J. M. Smith & H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics"
2.	Stanley I. Sandler, "Chemical, Biochemical and Engineering Thermodynamics"
3.	Savein Stolen, Tor Grande, Neil Allan, "Chemical Thermodynamics of Materials"
4.	K.V.Narayanan," Chemical Engineering Thermodynamics"
5.	Kenneth Denbigh, "Principles of Chemical Equilibrium"
6.	Y. V. C. Rao, "Chemical Engineering thermodynamics"
7.	B. F. Dodge, "Chemical Engineering Thermodynamics"
8.	T. E. Daubert, " Chemical Engineering Thermodynamics"
9.	Glasstone S., "Thermodynamics for Chemists"
10.	B. G. Kyle, "Chemical and Process Thermodynamics"

Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10504 MULTIPHASE REACTORS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

Topics covered

UNIT-I	Introduction to Multiphase Reactor Engineering: Types, Classification, Application of Industrial Importance.	(08 Hours)
UNIT-II	Thermodynamics and kinetics: Notable industrial heterogeneous systems and thermodynamic role. Application of equilibrium criteria to chemical reactions. The Gibbs energy change and equilibrium constant. Estimation of equilibrium constant for heterogeneous system by defining standard state of the phases involved. Determination of rate controlling step: intrinsic kinetics for heterogeneous systems.	(08 Hours)
UNIT-III	Hydrodynamic Characteristics: Hydrodynamic characteristics of different multiphase reactors: Mechanically Agitated Contactors (MAC), Bubble Columns, Slurry Reactors, Fluidized Beds, Loop Reactors and Modified Versions.	(08 Hours)
UNIT-IV	Mixing Studies : Effect of geometrical, system, and operating parameters on phase mixing in multiphase reactors. Quantification of phase mixing. Development of a mathematical model.	(08 Hours)
UNIT-V	Heat Transfer and Mass Transfer Studies : Effect of geometrical, system, and operating parameters on heat transfer coefficient in multiphase reactors. Quantification of heat transfer coefficient. Application of correlations available to different multiphase reactors. Experimental techniques used for estimation of mass transfer coefficient and selection of suitable technique for a multiphase reactor. Effect of geometrical, system, and operating parameters on mass transfer coefficient in multiphase reactors. Quantification of mass transfer coefficient. Application of correlations available to different multiphase reactors.	(08 Hours)
UNIT-VI	Design Aspects of Multiphase Reactors: Pressure drop, Fractional phase hold-up, mass and heat transfer coefficient, extent of mixing, etc.	(08 Hours)

Term Work:

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of multiphase reactors, keeping track of the recent technological trends and developments.

Text Books/References:

1.	L. K. Doraiswamy and M. M. Sharma, "Heterogeneous Reactions", 2 nd Edition, Volume I and II.
2.	G. B. Tatterson, "Fluid Mixing and Gas Dispersion in Stirred Reactors", 10 th Edition, Academic Press, London, 1994
3.	W. D. Deckwer, "Bubble Column Reactors", Cambridge University Press, New York, 2000.
4.	DiazoKunji and O. Levenspiel, "Fluidization Engineering", 2 nd Edition, Butterworth Heinemann, 1991.
5.	J. F. Devidson and Harrison, "Fluidization", 10 th Edition, Academic Press, London, 1994.

Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SEMESTER-II

K10505 MODELLING AND SIMULATION OF CHEMICAL PROCESSES

TEACHING SCHEME:			EXAMINATION SCHEME:			CREDITS ALLOTTED:		
Lectures: 4 Hours/Week			End Semester Examination: 60 Marks			Theory : 04		
Practical: 2 Hours/Week			Unit Test: 20 Marks			TW/PR/OR: 01		
Total : 6 Hours/Week			Assignment: 10 Marks			Total credits: 05		
			Attendance: 10 Marks					
			TW : 25 Marks					
			Oral: 25 Marks					
			Total : 150 Marks					
Topics covered								
UNIT-I	Basics of phenomenological modelling Introduction to modeling, systematic approach to model building, fundamentals of mathematical modeling-principles of formulations, fundamental laws: continuity equations, energy equation, equation of motion, transport equations, equation of state, equilibrium, chemical kinetics, advantages and limitations of models and applications of process models of stand-alone unit operations and unit processes, classification of models-simple vs. rigorous, lumped parameter vs. distributed parameter, Steady state vs. dynamic, concept of degree of freedom for steady state and unsteady state systems.						(08 Hours)	
UNIT-II	Empirical modelling building and analysis Development of steady state and dynamic lumped and distributed parameter models based on first principles, analysis of ill-conditioned systems, development of grey box models, empirical model building, statistical model calibration and validation, population balance models; Examples: simple hydraulic tank, variable hydraulic tank, mixing Vessel, mixing with reaction, steam jacked vessel						(08 Hours)	
UNIT-III	Mathematical models of heat-transfer equipments: shell & tube heat exchangers, evaporators, partial condensers; Mathematical models of mass-transfer equipments: batch and continuous distillation columns, reactive distillation columns, packed absorption columns; Mathematical models of reactors: batch reactors, continuous-stirred tank reactors, plug-flow reactors, reactor with axial dispersion, etc.						(08 Hours)	
UNIT-IV	Basics of simulation Fundamentals of simulations – Ab-initio methods, basis sets, Hartree-Fock theory, density functional theory, geometry optimization, vibrational analysis; elementary, classical statistical mechanics, elementary concepts of temperature, ensembles and fluctuations, partition function, ensemble averaging, ergodicity; molecular dynamics methodology – force field, integrating algorithms, periodic box and minimum image convention, long range forces, non bonded interactions, temperature control, pressure control, estimation of pure component properties, radial distribution function; molecular dynamics packages.						(08 Hours)	
UNIT-V	Parameter estimation and sensitivity analysis Parameter estimation, parameter sensitivity analysis, statistical validity, discrimination between two models, solution strategies for lumped parameter models, stiff differential equations, solution methods for initial value and boundary value						(08 Hours)	

	problems, solving the problems using <i>MATLAB or other chemical engineering software</i> , solution strategies for distributed parameter models..	
UNIT-VI	Modern approaches Broad overview of tools, deterministic and stochastic approaches, statistical decision theory, Markov processes, queuing theory, renewal theory, reliability theory, Non-traditional techniques: Simulated annealing, ant colony method or ANN, particle swarm method, neural networks, genetic programming, genetic algorithm, fuzzy logic, Wavelet, principal component analysis, etc.	(08 Hours)

Term Work: Oral examination will consist of assessment of the termwork (duly certified by the teacher and HOD) and oral exam based on the term work/practical. The term work shall consist of the following:

Minimum 6 practical based on solving numerical methods mentioned in the syllabus using MATLAB/SCILAB, any language, or TK solver software, or any chemical Engineering Software.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of modeling and simulation of chemical processes, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Franks R. E. G., "Modeling and Simulation in Chemical Engineering", Wiley Interscience, NY
2.	John Ingam, Irving J. Dunn, "Chemical Engineering Dynamic Modeling with PC Simulation", VCH Publishers
3.	William L. Luyben, "Process Modeling Simulation and Control for Chemical Engineers", McGraw Hill International Edition Publishing Company
4.	Himmelblau D., K. B. Bischoff, "Process Analysis and Simulation", John Wiley & Sons
5.	Wayne Blackwell, "Chemical Process Design on a Programmable Calculator", McGraw Hill
6.	Wayne Bequette, "Process Dynamics, Modeling, Analysis and Simulation", Prentice Hall
7.	S. S. Tambe, B. D. Kulkarni, P. B. Deshpande, Elements of Artificial Neural Networks with Selected Applications in Chemical Engineering, and Chemical & Biological Sciences, 1 st Ed., Louisville: Simulations & Advanced Controls Inc., KY 1996.
8.	C.D.Holland, Fundamentals and Modeling of Separation Processes, Prentice-Hall Internal Publications
9.	Asghar Hussain, Chemical Process Simulation, Wiley Eastern Ltd., New Delhi (1986).
10.	M.E.Davis, Modeling and Numerical Methods in Chemical Engineering, John Wiley & Sons, 1984.
11.	B.Carnahan, H.A. Luther and J.O.Wilkes, Applied Numerical Methods, McGraw-Hill, New York (1969).
12.	K. M. Hangos and I. T. Cameron, "Process Modeling and Model Analysis", Academic Press, 2001.
13.	Singiresu S. Rao, "Applied Numerical Methods for Engineers and Scientists" Prentice Hall, Upper Saddle River, NJ, 2001
14.	W. F. Ramirez, "Computational Methods for Process Simulation", 2 nd ed., Butterworths, 1997
15.	Modeling and analysis of dynamic systems, by C.M .Close, D.H. Fredrick and J. C. Newell, John Wiley & Sons, 2002
16.	Bruce A. Finlayson, Introduction to Chemical Engineering Computing, Wiley, 2010.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV ,V,VI

K10506 CHEMICAL REACTOR ANALYSIS AND DESIGN

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

Topics covered

UNIT-I	Chemical factor affecting the choice of the reactor, Model for batch reactor optimum operation policies and control strategies, optimal batch operation time, optimal temperature policies.	(08 Hours)
UNIT-II	Transient and steady state analysis, Optimal design of reactors, Multiphase reactors: fluidized, trickle bed, slurry etc	(08 Hours)
UNIT-III	Steady state non isothermal reactor design, the energy balance, adiabatic operation, tubular reactor with heat exchange, equilibrium conversion, CSTR with heat effects, multiple steady states.	(08 Hours)
UNIT-IV	Unsteady state non isothermal reactor design. Energy balance on batch reactor, Adiabatic operation of batch reactor, Batch reactor with interrupted isothermal operation, Semi batch reactors with a heat exchanger, Unsteady operation of CSTR, Unsteady operation of plug flow reactors	(08 Hours)
UNIT-V	Design of fixed bed catalytic reactors, isothermal ,adiabatic ,non isothermal	(08 Hours)
UNIT-VI	Non ideal flow in reactors, Estimation of dispersion/back mixing, design aspects of reactors with non ideal flow, micro and meso mixing in reactors.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of chemical reactor analysis and design, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Froment G. F. and K. B. Bischoff, “ Chemical Reactor Analysis and Design”, John Wiley & Sons
2.	Fogler H. S., “Elements of Chemical Reaction Engineering”, Prentice - Hall, 1986
3.	Smith J. M., " Chemical Engineering Kinetics ", McGraw Hill, 1981
4.	Denbigh K. G. and J. C. Turner, “ Chemical Reactor and Theory – An Introduction”,3rd edition Cambridge University Press.
5.	Bruce Nauman, “ Chemical Reactor Design”, John Wiley & Sons.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10507 SYNTHESIS AND DESIGN OF CHEMICAL PROCESSES

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

Topics covered

UNIT-I	Introduction to SDCP Significance of SDCP in chemical process industry, Hierarchy of chemical process design: Hierarchy, approach to process design, performance. Preliminary Process Synthesis, Synthesis of reaction: Function of process recycle, vapor cycles and purges, vapor versus liquid cycles, batch processes, process yield	(08 Hours)
UNIT-II	Choice of reactor: Reaction path, types of reaction systems, reactor Continuous or Batch Processing, Chemical state, Process Operations, Synthesis Steps, Synthesis Tree, Heuristics, Algorithmic Methods.	(08 Hours)
UNIT-III	Recycle structure, Recycle material balances, Reactor heat effects, Equilibrium limitations, Reactor design, Separation system, vapor recovery system, Liquid separation system, Distillation column sequencing, azeotropic systems, Residue Curves for Heterogeneous Systems.	(08 Hours)
UNIT-IV	Heat exchanger networks Pinch Methodology: Problem representation, temperature enthalpy diagram, simple match matrix. Heat content diagram, Temperature interval diagram. Pinch Design and Optimization: Networks for maximum energy recovery, Pinch design method, Flexibility criteria of the pinch, case studies	(08 Hours)
UNIT-V	Industrial Safety and risk management Hazards: Chemical hazards classification. site selection and plant layout. Industrial lighting and ventilation. Occupational diseases and prevention methods. Instrumentation and control for safe operation. Personal protective equipments. Management and Risk Analysis: Case studies pertaining to chemical industries. Legislations and economics: Factory Act. Environmental Act. Provisions under various acts.	(08 Hours)
UNIT-VI	Introduction to scale-up methods, pilot plants, models and principles of similarity. Industrial applications. Computer–Aided Design application in chemical process industries, complete plant simulation.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of synthesis and design of chemical processes, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Robin Smith, “Chemical Process Design”, McGraw Hill
2.	Hartmann K., K. Kaplick, “Analysis and Synthesis of Chemical Process System”, Elsevier, Amsterdam
3.	Jordan D.G., “Chemical Process Development – Part I”, Robert K. Krieger Publishing Company
4.	James M.Douglas, “Conceptual Design of Chemical Processes” McGraw Hill.

5.	Warren D.Seider,J.D.Seader,Daniel R. Lewin, “Process Design Principles Synthesis ,Analysis and Evaluation,” John Wiley & Sons Inc.
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Syllabus for Unit Test:	
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Unit Test -I	UNIT – I ,II,III
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Unit Test -II	UNIT – IV,V,VI
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K10508 ADVANCED MASS TRANSFER

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures : 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	

Topics covered

UNIT-I	Diffusion: Steady State diffusion with heterogeneous chemical reaction, Steady state diffusion accompanied by homogeneous Chemical reaction. Unsteady state molecular diffusion in isotropic media, unsteady state diffusion for typical cases of mass transfer in infinite, semi-infinite and finite plane media and in spherical and cylindrical media.	(08 Hours)
UNIT-II	Ionic Separations : Controlling factors, applications, Theory mechanism and equipments for electrophoresis, dielectrophoresis and electro dialysis, commercial applications and design considerations.	(08 Hours)
UNIT-III	Adsorption Techniques : Mechanism, Thermal-Swing Adsorption, Pressure-Swing Adsorption, Continuous, Countercurrent Adsorption Systems, Slurry Adsorption , Fixed-Bed Adsorption (Percolation), Simulated-Moving-Bed Systems, affinity chromatography and immuno chromatography, types of equipment and commercial processes, recent advances and process economics.	(08 Hours)
UNIT-IV	Multicomponent Distillation: Tray by Tray calculation, feed plate location, operating reflux and plates, recent advances in column design and operation-Petlyuk, divided wall, kaibel, pre fractionators, post fractinator. Azeotropic distillation, Extractive distillation, Molecular distillation, Reactive distillation.	(08 Hours)
UNIT-V	Membrane Separations : Classification of membrane processes; Liquid permeation membrane processes or dialysis – Series resistance in membrane processes, Dialysis processes, Types of equipment for dialysis; Gas permeation membrane processes – Types of membranes and permeability for separation of gases, Types of equipment for gas permeation membrane processes (flat membranes, spiral-wound membranes, hollow-fibre membranes); Types of flow in gas permeation; Complete-mixing model, cross-flow model and countercurrent flow model for gas separation by membranes; Effect of processing variables on gas separation by membranes.	(08 Hours)
UNIT-VI	Novel Separation Techniques : Supercritical fluid extraction, Reactive extraction, Zone melting, separation based on thermal diffusion, separation based on surface science, adductive crystallization.	(08 Hours)

Term Work :

Oral examination will consist of assessment of the term work (duly certified by the teacher and HOD) and oral exam based on the term work/practical. The term work shall consist of the following.

Seminar presented and duly report prepared on any topic given from syllabus.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of advanced mass transfer, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Phillip C. Wankat , Separation Process Engineering (2nd Edition), Printice Hall,2007
2.	Marcel Mulder, Introduction to Membrane Science and Technology, Marcel Dekker, 1992.
3.	Rousseau, R. W., Handbook of Separation Process Technology, John Wiley, New York, 2009.
4.	Humphrey, J and G. Keller, Separation Process Technology, McGraw-Hill, 1997
5.	King, C. J., Separation Processes , Tata McGraw Hill Co., Ltd., 1982.
6.	T.K.Sherwood, R.L.Pigford and C.R.Wilke, Mass Transfer, McGraw-Hill, New York (1975).
7.	R.E.Treybal, Mass-Transfer Operations, McGraw-Hill, New York (1980).
8.	Anthony L Hines , Robert N Maddox , Mass Transfer Fundamentals and Applications.
9.	Sherwood, T. K., Pigford, R. L. & Wilke, C. R, Mass Transfer Mc Graw Hill, 1975
10.	Skelland, A. H. P. : Diffusional Mass Transfer, John Wiley & Sons, 1974.
11.	Crank J, The Mathematics of Diffusion, Oxford University Press London 1956

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SEM-III

K10601 ELECTIVE - I ADVANCED PROCESS CONTROL		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	
Topics covered		
UNIT-I	Response of Control Loop Components and Transfer Functions: Open loop response, most useful forcing functions, step function, sinusoidal function and the pulse function, respective responses of the forcing functions. Response of a more complex system to forcing functions.	(08 Hours)
UNIT-II	Types of Controls: Feed forward control: Advantages and drawbacks, typical examples. Feedback control: Advantages and drawbacks, typical examples.	(08 Hours)
UNIT-III	Adaptive and Inferential Control Systems: Adaptive - Feed forward, feedback Inferential - Need for a model Examples for illustration.	(08 Hours)
UNIT-IV	Response Analysis: Stability and Testing Step response analysis Frequency response analysis Bode criterion, Nyquist Diagram, Root-Locus, Routh-Hertzwitz criterion. Pulse function Laplace transforms, transfer function of various system.	(08 Hours)
UNIT-V	Dynamics of Various Systems: Dead time, distance-velocity lag, inverse response systems, dynamic analysis, Qualitative characteristics, Distributed parameter systems.	(08 Hours)
UNIT-VI	Control Strategies for various unit operations and processes: Distillation, Drying, Absorption column, Stirred tanks. Processes: Process Design, Product quality control. Computer control: Direct Digital Control (DDC), Supervisory Digital Control, Economic justification for supervisory digital control.	(08 Hours)
Term Work: based on the term work/practical. The term work shall consist of the following.		
<ul style="list-style-type: none"> • Ability of the student to explain the theory and related course material. • The process control modules are now extensively used in industry. The student should demonstrate their working principles and the utility citing at least 4 chemical industries. • The controllers used in chemical industry need careful monitoring. • Students should briefly describe the type of maintenance for controllers. 		
Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of advanced process control, keeping track of the recent technological trends and developments.		

Text Books/References:	
1.	George Stephanopoulos, "Chemical Process Control - An Introduction to Theory and Practice"
2.	Coulson and Richardson, "Chemical Engineering Vol 3"
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10601 ELECTIVE – I : NON CONVENTIONAL ENERGY SOURCES		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical:2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	
Topics covered		
UNIT-I	Renewable Sources of Energy: Solar energy: Thermodynamic and heat transfer aspects of solar collection; Energy storage; Solar distillation; Solar drying; Wind energy; Tidal, Wave and ocean thermal energy; Geothermal energy.	(08 Hours)
UNIT-II	Fuel Cells: Introduction, Principles; Types of fuel cells; phosphoric acid, molten salt, solid oxide and other types of fuel cells; Anodes and cathodes; Fuel cells as alternative energy source.	(08 Hours)
UNIT-III	Biomass and biofuels: Introduction, Biofuel classification; Biomass production for energy farming; Direct combustion for heat; Pyrolysis (destructive distillation); Thermochemical processes; Alcoholic fermentation; Anaerobic digestion for biogas; Vegetable oils and biodiesel; Economics of bio-mass energy systems.	(08 Hours)
UNIT-IV	Hydro-power: Introduction, Principles, Assessing the resource for small installations, An impulse turbine, Reaction turbines, Hydroelectric systems, The hydraulic ram pump, Social and environmental aspects	(08 Hours)
UNIT-V	Tidal power: Introduction, The cause of tides, Enhancement of tides, Tidal current/stream power, Tidal range power, World range power sites 447 Ocean thermal energy conversion (OTEC):	(08 Hours)

	Introduction, Principles, Heat exchangers, Pumping requirements, Practical considerations.	
UNIT-VI	Utilization of Wastes: Utilization of fly ash, blast furnace slag in cement and concrete, Wastes and residues	(08 Hours)

Term Work: The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of non conventional energy sources, keeping track of the recent technological trends and developments

Text Books/References:

1.	John Twidell & Tony Weir, Renewable Energy Resources, Second edition, Taylor & Francis, 2006
2.	Douglas C., Energy Technology Handbook, Tata McGraw Hill Publishers
3.	Rao C. S., Environmental Pollution Control Engineering, Wiley Eastern
4.	Majumdar B., A Textbook of Energy Technology, APH Publications
5.	J. T. McMullan, R. Morgan and R. B. Murray, Energy Resources and Supply, John Wiley & Sons, London, 1976
6.	K.C. Khandelwal, S.S.Mahdi, Biogas Technology, Tata MGH
7.	G.D. Rai, Solar Energy Utilization, Khanna Publishers, Delhi
8.	A.W. Culp, Principles of energy conservation, Tata MGH

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10601 ELECTIVE I:INDUSTRIAL WASTE WATER TREATMENT

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical:2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	

Topics covered

UNIT-I	Introduction, Source of Industrial waste water, Physical, Chemical & Biological characteristics Of Industrial Waste Water. Measurement of polluting strength of Ind.Waste water (physical, chemical & biological)	(08 Hours)
UNIT-II	Physical Unit operations: Sedimentation & Design of Settling Chambers. Filtration & Design of Filters. Coagulation, Flocculatores, Froth Flotation	(08 Hours)
UNIT-III	Conventional Waste Water Treatment: Primary Treatment (Physical).Design Principles of Grit chambers & screens. Principles of Aeration .Secondary treatments (Biological), Kinetics of Growth & Food utilization, Design Principles of A.S.P. Trickling Filters, oxidation ponds, stabilization ponds, Aerobic, anaerobic Lagoons	(08 Hours)
UNIT-IV	Sludge Treatment & Disposal: Anaerobic digestion, Aerobic Digestion, Sludge disposal, composting	(08 Hours)
UNIT-V	Advanced Waste Water Treatment:- Carbon adsorption, Ion exchange, membrane processes. Nitrogen removal, Phosphorous removal, Chemical oxidation, Recovery of materials from process effluents	(08 Hours)
UNIT-VI	Solid Waste Management: Characteristics, Solid waste collection & transport, Solid Waste Processing & recovery, Disposal of Solid waste. Hazardous waste management & Risk assessment. Types of hazardous waste, health Effects, Treatment methods & Final disposal	(08 Hours)

Term Work: The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of industrial waste water treatment, keeping track of the recent technological trends and developments

Text Books/References:	
1.	Metcalf & Eddy, "Waste Water Engineering" Treatment & Reuse, Tata Mc Graw-Hill. Fourth Edition 2003
2.	C.S.Rao., "Environmental Pollution Control Engineering", Wiley Eastern Ltd. New Age International, Second print 1994
3.	A. P. Sincero, G. A. Sincero, "Environmental Engg.", A design approach, Prentice Hall of India Pvt. Ltd. New Delhi 1996
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10601 ELECTIVE I: HETEROGENEOUS CATALYSIS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	
Topics covered		
UNIT-I	Adsorption, Desorption: Definition, rates of adsorption and desorption, surface areas for physical adsorption. Experimental aspects of adsorption and allied phenomena on catalyst surfaces	(08 Hours)
UNIT-II	Significance of Pore Structure and Surface Area in Heterogeneous Catalysis: Importance of pore structure and surface area, experimental methods to determine surface area, methods of ascertaining pore volume and diameter .Kelvin equation, pore size distribution by gas adsorption, pressure porosimeter, density measurement. Pore structure of adsorbents and catalysts: Hysteresis and shape of capillaries, surface area from hysteresis loops, modes for characterizing pore structures. Reaction rates in pores catalysts: Mass transfer, concentration profiles, reaction rates, pressure and temperature gradients, catalyst deactivation	(08 Hours)

UNIT-III	Role of Lattice Imperfections in Heterogeneous Catalysis: Classification of lattice imperfections, role of point dislocations and point defects, lattice imperfections and polymerization catalysts, role of geometric and electronic factors in catalytic activity.	(08 Hours)
UNIT-IV	Dynamics of Selective and Poly-functional Catalysis: Catalyst selectivity, selective formation of intermediate products, effect of pore size on electivity, mass transport of intermediate product in non-trivial poly-step reactions, selectivity of poly-functional catalysts Zeolites in catalysis: Structural aspects and synthesis of zeolites, modification of zeolites, diffusion in zeolites, applications.	(08 Hours)
UNIT-V	Fischer-Tropsch synthesis: Synthesis and Decomposition of Ammonia Catalyst cracking: catalyst composition and chemical properties, mechanism of cracking reactions. Catalysis of electrode reactions. Kinetics of catalytic reactions: Rate of chemical reaction, overall reaction rate, mass transfer through gas phase, mass transfer in pores.	(08 Hours)
UNIT-VI	Mass and heat transfer in solid catalyst beds. Design calculations: Isothermal conditions, adiabatic conditions, non-adiabatic conditions. Thermal selectivity of packed bed reactors. Fluidized bed reactors. Optimum design: Continuous variation of parameter along the reaction path, temperature profiles for reversible and consecutive reactions, optimum catalyst concentration in bi-functional catalyst systems	(08 Hours)

Term Work: The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of heterogeneous catalysis, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Thomas J. M., Thomas W. J., "Introduction to The Principles of Heterogeneous catalysis", Academic Press
2.	Srivastav R. D., "Heterogeneous catalytic Science", CRC Press
3.	Thomas S. J., Webb G., "Heterogeneous Catalysis", Oliver & Boyd Ltd.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV, V,VI

K10601 ELECTIVE I: CATALYST MATERIALS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

Topics covered

UNIT-I	Bimetallic Catalysts: Introduction, nature, method of preparation and characterization, catalytic properties of bimetallic systems. Supported bimetallic catalyst, chemical nature, factors affecting efficiency and uniformity of co clustering, structure, surface composition, catalytic properties.	(08 Hours)
UNIT-II	Perovskite Related Oxides: Solid state properties, Zeolite, crystal structure, non-stoichiometry, magnetic and electrical properties, ferro electric and acoustic properties, applications. Crystal chemistry and catalytic properties of oxides with scheelite structure, crystal chemistry, olefin oxidation, and mechanism. Catalytic properties of synthetic layered silicates and alumino silicate, synthetic mica-montmorillonite and nickel reducibility, layered metalsilicate catalyst.	(08 Hours)
UNIT-III	Biological Catalyst: Enzymes, incentives for using enzymes, methodology, chemical and physical properties, activity, pH-activity behavior, stability, application.	(08 Hours)
UNIT-IV	Catalyst Design: Optimization of catalyst distribution in a single pellet, the case of single and multiple reaction, isothermal and non-isothermal conditions, complex reaction system, factors affecting catalytic dispersion, optimal distribution of catalytic loading.	(08 Hours)
UNIT-V	Optimization of Catalyst Distribution in a Reactor: Single reaction and multiple reaction, isothermal and non-isothermal conditions. Catalytic deactivation, non-selective and selective poisoning.	(08 Hours)
UNIT-VI	Membrane Reactor: Membrane reactor with non-uniform catalytic distribution, optimal catalyst distribution in pellets for an inert membrane reactor and catalytic membrane reactor, preparation of catalytic membrane.	(08 Hours)

Term Work: The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in

the area of catalyst materials, keeping track of the recent technological trends and developments.	
Text Books/References:	
1.	Burton J. J. and Garton R. L., "Advanced materials in catalysis", Academic press, London, 1977.
2.	Morbideilli M., Gavriilidis A. and Varma A., "Catalyst design: Optimal distribution of catalyst in pellets, reactorts and membrane", Cambridge university press, Cambridge,2001.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

ELECTIVE II: MEMBRANE SEPERATION		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical:2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	
Topics covered		
UNIT-I	Introduction Separation Processes, Introduction to membrane processes, Definition of Membrane Merits of the Processes. Classification of the membrane separation process.	(08 Hours)
UNIT-II	Materials & Materials Properties Membrane Polymers, Molecular weight, Porous & Porous membrane, Thermal, Chemical & Mechanical Properties of Inorganic membranes, Biological membranes. Retention & rejection co-efficient. Factor affecting the	(08 Hours)

	separation processes. Effect of polymeric structure on Tg Glass transition temperature depression.	
UNIT-III	Preparation of Synthetic Membranes Phase inversion membranes, Preparation by evaporation, Precipitation from the vapour phase. Precipitation by controlled evaporation, Thermal & immersion precipitation. Flat membranes, Tubular membranes, Zeolite membranes, Dense membrane. Preparation Technique for Composite Membrane, Inorganic Membranes	(08 Hours)
UNIT-IV	Characteristics of porous membrane, Bubble Point Method, Mercury intrusion method, Permeability Method, Ultrafiltration, Gas-adsorption desorption, Characterisation of ionic membranes, characterisation of nonporous membrane.	(08 Hours)
UNIT-V	Transport in membrane, Knudsen flow, Friction Model, Transport through non-porous membrane. Determination of diffusion co-efficient & solubility co-efficient. Transport in ion exchange membranes.	(08 Hours)
UNIT-VI	Membrane Processes, M.F, U.F, R.O, Nano filtration Dialysis, Electrodialysis, Piezodialysis, Diffusion Dialysis, Membrane reactors & membrane bioreactors, Polarization & Fouling Phenomena in Membranes, C.P in electro dialysis, Temperature Polarization, Membrane Fouling, Method to reduce Fouling.	(08 Hours)

Term Work: The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of membrane separation, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Osada Yoshohito, Nakagawa T., "Membrane Science and Technology", Marcel Dekker Inc.
2.	Mulder, "Basic Principles Membrane Technology", Kluwer Academic Marcel of Publishers, Netherlands, 1998
3.	C.J.King, "Separation Processes", Tata Mc Graw-Hill

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10602 ELECTIVE II: BIOPROCESS ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

Topics covered

UNIT-I	Introduction, Biotechnology & Bioprocess Engineering types & structure of cells ,Growth kinetics, Growth cycle phase, effect of substrate concentration, cell concentration and death rate on growth of M.O.	(08 Hours)
UNIT-II	Simple Enzyme Kinetics, Michaelis-Menten Kinetics, evaluation of M.M equation parameters, line weaver, Burk plot, Eadie-Hofstee plot, factors influencing enzyme activity, immobilized enzyme technology ,immobilized kinetics	(08 Hours)
UNIT-III	Selection, Scale-up & Control of Bioreactors Ideal, on-ideal Bioreactors, Fed Batch reactor, sterilization reactor, Aeration & Agitation & mass transport in cellular system. Scale up difficulties, Bioreactor instrumentation & control.	(08 Hours)
UNIT-IV	Recovery & Purification of Product Separation of insoluble products. Cell disruption, separation of soluble products, finishing steps for purification, integration of reaction & separation	(08 Hours)
UNIT-V	Industrial Production of Chemicals Ethanol, Acetic acid, Citric acid, Gluconic acid. Solvents such as Glycerol, acetone, butanol. Anti-biotics such as penicilline, streptomycine, tetracycline. Production of High Fructose Corn Syrup (HFCS), production of Bakers Yeast Single Cell Protein	(08 Hours)
UNIT-VI	Medical & other applications of Bioprocess Engg. introduction, Tissue Engineering, Gene Therapy, Stem cell, Use of microbes in mineral beneficiation & oil recovery, Biofertilizers & Biopesticides, Biopolymer Biological treatment of Industrial Waste	(08 Hours)

Term Work: The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in

the area of bioprocess engineering, keeping track of the recent technological trends and developments.	
Text Books/References:	
1.	Michael L. Shuler, F. Kargi, "Bioprocess Engineering Basic Concept", Prentice Hall, India, 2nd Edition, 2002
2.	Bailey, James Ollis, Davis F, "Biochemical Engg." Mc Graw-Hill, Publications
3.	Aiba A, Humphry A. E, "Biochemical Engg
4.	Wingard L. B., "Enzyme Engg."
5.	Paulinemdoran, "Bioprocess Engg. Principles", Elsevier Publications
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10602 ELECTIVE II: MULTICOMPONENT SEPERATION

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	
Topics covered		
UNIT-I	Characteristics and selection of separation process: Importance and variety of separation, economic significance, characteristics, inherent separation factor, selection, factors influencing the choice of separation process, solvent selection, selection of equipment.	(08 Hours)
UNIT-II	Multicomponent separation: General short-cut equation, Edmister method, distillation, absorption, extraction, alternate short-cut method, Fenske and Underwood equation.	(08 Hours)
UNIT-III	Multicomponent separation: Distillation, Rigorous method, Lewis-Matheson method, Thiele-Geddes method, Amundson-Pontinen method.	(08 Hours)
UNIT-IV	Azeotropic and extractive distillation: Activity coefficient, equilibrium relationship, binary and ternary azeotropes, selection of solvent, calculations..	(08 Hours)
UNIT-V	Multicomponent separation: Extraction, Rigorous method, stripping factor equation, material balance, single and cross-current multiple contact, calculations.	(08 Hours)
UNIT-VI	Multicomponent separation: Absorption, Rigorous method for absorption, calculations.	(08 Hours)
Term Work: The term work shall consist of the following. Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the		

product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of multicomponent separation, keeping track of the recent technological trends and developments

Text Books/References:

1.	Smith B. D., "Design of Equilibrium Stage Processes", McGraw Hill Book Company Ltd.
2.	King C. J., "Separation Processes", McGraw Hill Book Company Ltd.
3.	Treybal R. E., "Mass Transfer Operation", McGraw Hill
4.	Treybal R. E., "Liquid Extraction", McGraw Hill Book Company Ltd.
5.	Phillip C. Wankat, "Equilibrium Staged Separations", Prentice Hall

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10602 ELECTIVE II: FOOD PROCESS ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical:2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	

Topics covered

UNIT-I	Introduction: Characteristics and nutritional properties of food texture, taste, flavour and aroma. Geometric, physical and functional properties of food material. Preparation for food processing, energy conservation, material and energy balance	(08 Hours)
UNIT-II	Processing Methods: Heating : Balancing and pasteurization, freezing, dehydration, canning, additives. Fermentation: Extrusion cooking, hydrostatic pressure cooking. Dielectric heating microwave processing and asptic processing, infrared radiation processing, concept and equipment used	(08 Hours)

UNIT-III	Drying: Moisture content: Definition, method of determination, direct and indirect methods. Equilibrium moisture content: Hysteresis Effect. Psychometric of air water vapour mixture, Drying mechanism, constant rate period and falling rate period , Method and equipments used, factor affecting rate of drying	
UNIT-IV	Food conservation Operation: Sieve reduction, fibrous foods, dry foods and liquid foods. Theory and equipment, membrane	(08 Hours)
UNIT-V	Material handling: types of candling and conveying system food products, and their design, belt conveyors, screw conveyors, bucket elevator and pneumatic conveyor.	(08 Hours)
UNIT-VI	Preservation of food material: Preservation by drying, preservation by low temperature, chemical preservation .Thermal death time curve	(08 Hours)

Term Work: The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of food process engineering, keeping track of the recent technological trends and developments

Text Books/References:

1.	Shivshankar B., "Food Processing and Preservation", Prentice Hall of India Pvt. Ltd., New Delhi 110001, 2002
2.	Sahay and Singh, "Unit Operation in Agricultural Processing
3.	Dennis R. H., " Food Process Engineering"
4.	Rao M. A. & Rizvi S. S. H, " Engineering Properties of Food

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K10602 ELECTIVE II: FLUIDIZATION ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

Topics covered

UNIT-I	Introduction and Application : Phenomenon of Fluidisation, Liquid like behavior of a fluidized bed, comparison with other methods , Advantages and Disadvantages, Types of Fluidisation. Gas behavior Of Fluidised bed : Fixed beds, minimum fluidisation velocity, Terminal velocity, and pressure drop, importance of distributor, voidage, TDH, viscosity and fluidity of fluidized beds.	(08 Hours)
UNIT-II	Bubbles and Emulsion phase in Dense bubbling beds: Single rising bubble, Stream of bubbles from single source, Ordinary Bubbling bed. Experimental findings. Bubbling bed model for Emulsion phase	(08 Hours)
UNIT-III	Flow pattern of gas through fluidized bed: Experimental findings , Bubbling bed model for gas interchange. Evaluation of inter change coefficient. Radial and Axial dispersion of gas. Mass and heat transfer b/w fluid and solid.	(08 Hours)
UNIT-IV	Conversion of gas in bubbling beds: Two region model, Model using distribution. Catalytic conversion, reaction rate, contacting efficiency, application to successive reactions, control of bubble size, baffling and scale-up.	(08 Hours)
UNIT-V	Entrainment and Elutriation : Entrainment at or above TDH, Entrainment below TDH. Model for entrainment from dense fluidized bed and its applications	(08 Hours)
UNIT-VI	Application in physical operations: Synthesis reactions, cracking and reforming of hydrocarbons, carbonization and gasification. Gas solid reactions	(08 Hours)

Term Work: The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of fluidization engineering, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Smith B. D., "Design of Equilibrium Stage Processes", McGraw Hill Book Company Ltd.
2.	King C. J., "Separation Processes", McGraw Hill Book Company Ltd.
3.	Treybal R. E., "Mass Transfer Operation", McGraw Hill
4.	Treybal R. E., "Liquid Extraction", McGraw Hill Book Company Ltd.

5.	Phillip C. Wankat, "Equilibrium Staged Separations", Prentice Hall
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

K 10604 DISSERTATION STAGE –I		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical:7 Hours/Week	TW :25 Marks	TW: 21
Total : 7Hours/Week	Total :25 Marks	Total credits: 21
<p>This stage will include comprehensive report on literature survey, design and fabrication of experimental set up and/or development of model, relevant computer programs and the plan for stage II.</p>		

K 10603 SEMINAR		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical:5 Hours/Week	TW :25 Marks	TW: 5
Total : 5Hours/Week	Oral:25Marks	Total credits: 5
	Total :50 Marks	
<p>The students will be required to select advanced research topics for the seminar and present the seminar during the semester. A detailed report should also be submitted and assessment will be based on the quality in terms of the research and development.</p>		

SELF STUDY PAPER-I

SELF STUDY PAPER -I : OPTIMIZATION TECHNIQUES IN PROCESS DESIGN		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total: 4 Hours/Week	Internal assessment: 40 Marks	Total credits:04
	Unit Test: 20 Marks	
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	
Topics covered		
UNIT-I	Introduction to optimization Scope and Hierarchy of optimization, Essential features of optimization Problems, General Procedure for solving optimization problems, obstacles to optimization, Developing Models for optimization, Classification of Models, How to build Model, Selecting functions to fit empirical data, degree of Freedom, Formulation of objective function .	(08 Hours)
UNIT-II	Classification of Optimization Techniques , Single variable, Multivariable optimization with no constraints ,equality constraints ,inequality constraints	(08 Hours)
UNIT-III	Linear Programming Simplex method, Geometry of LPP, solution to linear simultaneous equations, Pivotal reduction of a general system of equations, sensitivity Analysis	(08 Hours)
UNIT-IV	Non Linear Programming One dimensional minimization method, unimodal function, Dichotomous search, Fibonacci Method, Golden section Method, Interpolation Method, Scanning and bracketing Method	(08 Hours)
UNIT-V	Non linear Programming unconstrained optimization & constrained Optimization Direct Search Method, Random Search method, Descent Method, Conjugate Gradient Method , Introduction to NLP constrained optimization Direct and Indirect Methods .	(08 Hours)
UNIT-VI	Examples and case study for different engineering applications..	(08 Hours)
Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of optimization techniques in process design, keeping track of the recent technological trends and developments.		
Text Books/References:		
1.	Edgar T F , Himmelblau D N , “Optimization of Chemical Processes”, MC Graw Hill Publication .	
2.	S S Rao, Optimization theory and Application, Wiley Eastern Publication	

Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER -I: NON CONVENTIONAL ENERGY SYSTEMS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

Topics covered

UNIT-I	Renewable Sources Of Energy Renewable sources of energy such as hydro, solar, wind, biomass, tidal and geothermal – their availability and limitation. Energy crisis and energy demand projection.	(08 Hours)
UNIT-II	Solar Energy Solar radiation, photovoltaic cell, pyranometer, solar thermal collectors, solar air heaters, solar constant, solar cell, applications of solar energy.	(08 Hours)
UNIT-III	Wind Energy Wind map of India, mean wind speed and wind density during different months in specific areas. Types of wind mills, their assembly and application as electric converters, pumping motors. Concept of wind farms, its applications.	(08 Hours)
UNIT-IV	Bio-Mass Energy Bio-mass as a source of energy, energy plantation, pyrolysis classification and anaerobic fermentation, types of biogas plant, their comparative status, design and application.	(08 Hours)
UNIT-V	Other Alternate Sources Of Energy Tidal power, sites for tidal power plants in India, micro-hydel power station, geothermal energy, limitations and applications of such power plants.	(08 Hours)
UNIT-VI	Energy Conversation And Auditing Conservation of energy in – domestic application and industries, use of fuel efficiently in vehicles, waste recycling fuel gas and heat recovery, energy demand management, energy accounting and auditing.	(08 Hours)

Text Books/References:

1.	John Twidell & Tony Weir, Renewable Energy Resources, Second edition, Taylor & Francis, 2006
2.	Douglas C., Energy Technology Handbook, Tata McGraw Hill Publishers
3.	Rao C. S., Environmental Pollution Control Engineering, Wiley Eastern

4.	Majumdar B., A Textbook of Energy Technology, APH Publications
5.	J. T. McMullan, R. Morgan and R. B. Murray, Energy Resources and Supply, John Wiley & Sons, London, 1976
6.	G.D. Rai, Solar Energy Utilization, Khanna Publishers, Delhi
7.	A.W. Culp, Principles of energy conservation, Tata MGH

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of non conventional energy systems, keeping track of the recent technological trends and developments.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER -I: MECHANICAL ASPECTS IN CHEMICAL ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test : 20 Marks	Total credits: 04
	Assignment : 10 Marks	
	Attendance :10 Marks	
	Total :100 Marks	

Topics covered

Topics covered		
UNIT-I	Mechanical aspects of piping design and layout, Pipe and its representation, pipe fittings, methods of pipe joining, piping insulation, Piping insulation, piping symbols, design of piping systems, piping isometrics, plot plan and Pipe racks.	(08 Hours)
UNIT-II	Chemical equipment design - mechanical aspects, Design of Support for process vessels, basic theory for vertical vessels, design of skirt support, Bracket or lug support, leg support, ring support, horizontal support, saddle support, leg support, Ring support, engineering materials, classification and commercial applications.	(08 Hours)
UNIT-III	Principles of mechanical engineering in chemical engineering, Power conversion devices such as steam turbines, IC engines, different types of pumps, Air conditioning and refrigeration, ON-OFF valves, Non return and other type of valves.	(08 Hours)
UNIT-IV	Energy conservation and heat pumps, Energy conservation in India and World, mechanical vapor compression , heat pumps, various thermodynamic cycles, actual vapor compression heat pumps with liquid sub cooling, various types of heat pumps.	(08 Hours)

UNIT-V	Mechanical aspects in chemical process engineering, Alternative routes in process engineering , general approach to plant design, process research and pilot studies, process design and development , preparation of operating manual instructions, cost cutting machines, trouble shooting , green engineering and process intensification.	(08 Hours)
UNIT-VI	Mechanical engineering aspects in chemical engineering and technology, Study of general purpose tools and special purposes tools and machines, lathes, milling, drilling and accessories. EDM , TWEDM, hobbling, electroplating, ,ECM, arc welding, gas welding, brazing, soldering, riveting, TIC, MIG welding processes, equipment used and applications, drop forging, press forging , role forging, and industrial applications.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of mechanical aspects in chemical engineering, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Coulson and Richardson , Chemical Engineering , Volume 2, Paragon press Oxford , New York.
2.	Treybal R.E., Mass transfer Operation Operations, third edition, Mc Hill International Publishers.
3.	Smith R, Chemical Process Design , McGraw Hill International Publishers
4.	Dodge B. F., Chemical Engineering Thermodynamics, McGraw Hill International Publishers.
5.	Thakori S B and Bhatt B I, Introduction to Process engineering and Design, Mcgraw Hill Companies
6.	Brownwell L,E, and Young E H, Process equipment design, John Willey and Sons, Inc. New York.
7.	Shingles ,J and MischkaC, Mechanical Engineering Design, McGraw Hill Edition
8.	Vijayrangan S, and Rajendran I, Materials and Mechanical Engineering Narosa Publishing Company New Delhi, Chennai, Mumbai and Kolkata
9.	Arora C P, Refrigeration and Air-conditioning, TataMcgraw Publishing Companies Ltd. New-Delhi.
10.	Agarawal B, Agarawal C, M, Basic Mechanical Engineering, Wiley India Publishers and Editions.
11.	Myer Kutz ,Mechanical Engineers Hand Book John Willey and Sons (New York)
12.	Perry R, and Green D, Perrys Chemical Engineers Hand Book Sixth Edition, International Students Edition

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER -I: GREEN CHEMISTRY AND TECHNOLOGY

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test : 20 Marks	Total credits: 04
	Assignment : 10 Marks	
	Attendance :10 Marks	
	Total:100 Marks	

Topics covered

UNIT-I	Introduction: Definition, the twelve basic principles of green chemistry. Use of Renewable Feedstock, Reduction of Derivatives, Catalysis, Design for Degradation, Real-time Analysis for Pollution Prevention, Inherently Safer Chemistry for Accident Prevention.	(08 Hours)
UNIT-II	Green synthetic methods: Microwave synthesis, electro-organic synthesis, Design and development of environmentally friendly chemical pathways: challenges and opportunities. Materials for green chemistry and technology: Catalysis, environmental friendly catalysts, Bio-catalysis, biodegradable polymers, alternative solvents.	(08 Hours)
UNIT-III	Biochemical conversion: anaerobic digestion, alcohol production from biomass; Chemical conversion process: hydrolysis and hydrogenation; Biophotolysis: Hydrogen generation from algae biological pathways; Storage and transportation; Applications.	(08 Hours)
UNIT-IV	Green innovation & sustainability: Criteria for choosing appropriate green energy technologies, life cycle cost; the emerging trends – process/product innovation-, Eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity- WEHAB (eco-restoration/ phyto-remediation, ecological sanitation, renewable energy technologies.	(08 Hours)
UNIT-V	Global warming; greenhouse gas emissions, impacts, mitigation and adaptation; future energy Systems- clean/green energy technologies; International agreements/conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCCC); sustainable development.	(08 Hours)
UNIT-VI	Environmental reporting and ISO 14001; climate change business and ISO 14064; green financing; financial initiative by United Nations Environment Programme (UNEP); green energy management; green product management , green tax incentives and rebates (to green projects and companies); green project management in action; business redesign; eco-commerce models.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of green chemistry and technology, keeping track of the recent technological trends and developments.

Text Books/References:

- Philip G. Jessop, Chao-Jun Li ,Peter Wasserscheid , Annegret Stark, Handbook of Green Chemistry,

	3 Volume Set, Green Solvents, Wiley-VCH.
2.	Paul T. Anastas, Istvan T. Horvath, Green Chemistry for a Sustainable Future.
3.	V. K. Ahluwalia, M. Kidwai, New Trends in Green Chemistry, Kulwer Academic Publisher.
4.	Paul T, John C., Green Chemistry: Theory and Practice, Oxford University Press, USA.
5.	Baird, C. and Cann, M., Environmental Chemistry, 4 th Edition, W.H. Freeman and Company, New York, 2008.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER I- CAVITATION TECHNIQUES

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4 Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance: 10 Marks	
	Total : 100 Marks	

Topics covered

UNIT-I	Introduction The physical phenomenon , Definition, Vapor pressure, The main forms of vapor cavities, Cavitation regimes, Typical situations favorable to cavitation , The main effects of cavitation in hydraulics , Specific features of cavitating flow, Pressure and pressure gradient, Liquid-vapor interfaces, Thermal effects, some typical orders of magnitude, Non-dimensional parameters: Cavitation number, Cavitation number at inception, Relative under pressure of a cavity.	(08 Hours)
UNIT-II	Acoustic Cavitation Cavitation Bubble Temperature, Classification of Acoustic Cavitation, Sonoluminescence, Sonochemistry, Experimental Factors that Control Sonochemistry, Sites where Sonochemical Reactions Occur, The Classification of Sonochemical Reactions.	(08 Hours)
UNIT-III	Synthesis of Inorganic Materials Ultrafine powders and nanostructured materials, metal oxides, metal powders, supported nano powders etc.	(08 Hours)

UNIT-IV	Synthesis of organic Materials Homogeneous reactions, heterogeneous sono chemistry, Synthesis using alkylation reactions, addition reactions, reduction and oxidation reactions etc.	(08 Hours)
UNIT-V	Environmental protection and remediation Degradation of organic pollutants, Water purification, application of cavitation alone, combined application of cavitation and ozone, combined application of cavitation and ultraviolet light, combined application of cavitation and advanced oxidation processes(AOPs)	(08 Hours)
UNIT-VI	Other applications of cavitation <u>Polymers:</u> Degradation of polymers, factors affecting polymer degradation, polymer synthesis, ultrasonic processing of polymers. <u>Sonoelectrochemistry:</u> Electroplating in presence of ultrasound, zinc, iron, copper, nickel etc. Sonoelectro - organic synthesis.	(08 Hours)
Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of Cavitation techniques, keeping track of the recent technological trends and developments.		
Text Books/References:		
1.	Jean-Pierre Franc, Jean-Marie Michel, "Fundamentals of Cavitation", Kluwer Academic Publishers, Dordrecht.	
2.	"Sonochemistry- Kirk-Othmer Encyclopedia of Chemical Technology", John Wiley & Sons, Inc.	
3.	T. J. Mason and J. P. Lorimer, "Applied sonochemistry: Uses of power ultrasound in chemistry and processing", Wiley-VCH publishers.	
Syllabus for Unit Test:		
Unit Test -I	UNIT – I ,II,III	
Unit Test -II	UNIT – IV,V,VI	

SELF STUDY PAPER-I: SAFETY ENGINEERING IN INDUSTRIES

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

Topics covered

UNIT-I	Types of chemical Process Industries, various hazards in industries, handling of Hazardous chemicals, case study (one or two), chemical composition of hazards, case Study (one or two), first aid measures, fire fighting measures, accidental release Measures, personal protection and storage.	(08 Hours)
UNIT-II	Process Selection, plant operation, plant selection, construction, process system Engineering.	(08 Hours)
UNIT-III	Industrial pollution, pollution control aspects, pollution control acts, various Toxic materials, handling of toxic materials, and industrial gases.	(08 Hours)
UNIT-IV	Safety program, engineering ethics, accident and loss statistics, acceptable Risk, nature of accidental process, one or two case studies	(08 Hours)
UNIT-V	Government regulations, identification, MSD sheets, evaluation and control.	(08 Hours)
UNIT-VI	Relief concept, definitions, location of relief, relief types, relief scenario, Data for sizing relief, relief systems, design considerations and recommendations	(08 Hours)

Text Books/References:

1.	Environmental Engineering,Howard S Peavy, Donald R Rowe and George Tchobanogloglons, Mc Graw Hill Book company.
2.	Shreve s Chemical Process IndustriesG,eorge T Austin, Mc Graw Hill International Edition
3.	Pollution Control in Chemical Process Industries, Mahajan S B, Tata Mc Graw Hill edition (P) Ltd.
4.	Introduction to process Engineering and Design ,Thakore S.B and Bhatt B. I. Mc Graw Hill Publishing Company Ltd. New Delhi

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of safety engineering in industries, keeping track of the recent technological trends and developments.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER -I: PETROLEUM ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

Topics covered

UNIT-I	Distribution of Reserves Worldwide distribution of oil and gas reserves, Subsurface data sampling and data interpretation, Measurement scaling	(08 Hours)
UNIT-II	Origin of Hydrocarbons , accumulation and migration of hydrocarbons, Reservoir traps.	(08 Hours)
UNIT-III	Properties of reservoir rocks and fluids, Rock – fluid interface, Reservoir description by direct and indirect methods, Oil and Gas in place. Chemical, physical and thermodynamic properties of petroleum and reservoir fluids	(08 Hours)
UNIT-IV	Drilling of oil and gas wells, Classification of wells, Drilling operating systems, Drilling fluids.New trends in drilling engineering.	(08 Hours)
UNIT-V	Hazard and safety measures in handling of natural gas, transportation and storage of oil and gas ,Storage of oil and gas , Types of storage tanks, underground storage of natural gas Catalytic cracking, Catalytic reforming, Hydrodesulfurization, Hydrocracking	(08 Hours)
UNIT-VI	Recent developments in Hydrocarbon production techniques, Hydrocarbon recovery mechanisms, Non-conventional hydrocarbon energy sources, International trading in oil and gas.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of petroleum engineering, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Bradley, “Petroleum Engineering Handbook”, SPE
2.	Mian, M. A., “Petroleum Engineering Handbook for Practicing Engineer”, Vol. I and II, Pennwell Publication.
3.	Deshpande, B.G., “World of Petroleum”, Wiley.
4.	John, F., Cook, M., and Graham, M., “Hydrocarbon Exploration and Production”, Elsevier.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER- I: FLUID PARTICLE TECHNOLOGY

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

Topics covered

UNIT-I	Applications of fluidized beds Introduction. Industrial application of fluidized beds. Physical operations and reactions.	(08 Hours)
UNIT-II	Fluidization and analysis of phases Fluidization and analysis of phases for gas-solid, liquid-solid, and gas-liquid-solid fluidized beds. Hydrodynamic characteristics: pressure drop, velocity mapping, and fractional hold- up.	(08 Hours)
UNIT-III	Mixing studies in fluidized beds Effect of geometrical, system, and operating parameters on phase mixing in fluidized beds. Quantification of phase mixing. Development of a mathematical model.	(08 Hours)
UNIT-IV	Heat and mass transfer in fluidized beds Mass and heat transfer between fluid and particles. Effect of geometrical, system, and operating parameters on heat and mass transfer coefficients. Application of correlations available for estimating heat and mass transfer coefficients	(08 Hours)
UNIT-V	Circulating Fluidized Beds Fluid and particle distribution in a fluidized bed. Introduction to circulating fluidized bed and its application. Hydrodynamic aspects of circulating fluidized beds. Standardization of circulating fluidized beds.	(08 Hours)
UNIT-VI	Design of fluidization system for physical operations, catalytic and non-catalytic reactions, three phase fluidization and its standardization with regards to pressure drop, fractional phase hold- up, mass and heat transfer coefficient, extent of mixing, etc.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of fluid particle technology, keeping track of the recent technological trends and developments.

Text Books/References:

1.	Diazo Kunji and O. Levenspiel, “Fluidization Engineering”, 2 nd Edition, Butterworth Heinemann, 1991.
2.	J. F. Devidson and Harrison, ” Fluidization”, 10 th Edition, Academic Press, London, 1994.

3.	Jackson, R., “The Dynamics of Fluidized Particles”, Cambridge University Press, New York, 2000.
4.	Fan, L. S. And C. Zhu, “Principles of Gas- Solid Flows”, Cambridge University Press, New York, 1998.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SEM –IV

K 10605 DISSERTATION STAGE –II		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 10 Hours/Week	TW :150 Marks	TW & Oral:30
	Oral:75 Marks	
Total : 10Hours/Week	Total :225 Marks	Total credits: 30
<p>This is the final stage in the dissertation work. This stage will include comprehensive report on the work carried out at this stage and relevant portions from stage I, including experimental studies, analysis and/or verification of theoretical model, conclusions. The student is required to publish at least one national/international paper based on the dissertation work. The publication/ accepted paper for publication shall be included in the report</p>		

SELF STUDY PAPER-II

SELF STUDY PAPER-II-TECHNOLOGY TRANSFER PRACTICES –BRIDGE TO INDUSTRY		
TEACHING SCHEME:		
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total:100 Marks	
Topics covered		
UNIT-I	Innovation and the dynamics of technological change. The interactive and non-linear nature of Innovation, Defining the Innovation Need, Dynamics of Technological Change and Systems of Innovation	(08 Hours)
UNIT-II	Theory and practice of processes of technology transfer and diffusion: Commercialization of technology; intellectual property rights. Product innovation: impact of product innovation, Product Innovation within OEM (case studies)	(08 Hours)
UNIT-III	success factors for product innovation; developing a product innovation strategy: Interactive learning and networks of innovation: technology Platforms; firms taxonomy	(08 Hours)
UNIT-IV	Systems of Innovation and the corporate value chain: fostering clustering effects. Regional innovation strategies	(08 Hours)
UNIT-V	SWOT Analyses of company and product, Product Portfolio Analyses: Product Life Cycle (PLC) Product Innovation and Design consultancies (case studies), New Product-Service-System development	(08 Hours)
UNIT-VI	External trends (PESTED) and company core competences, Strategic Gap, Selection of ideas, Market implementation	(08 Hours)
<p>Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of technology transfer practices-bridge to industry, keeping track of the recent technological trends and developments.</p>		
Text Books/References:		
1.	Mytelk, L. K. and Smith, K. (2003), “Interactions Between Policy Learning and Innovation Theory”, in “Innovation, Competence Building, And Social Cohesion In Europe: Towards a Learning Society”, Editors: Pedro Conceição, Manuel V. Heitor and Bengt-Åke Lundvall, Edward Elgar	
2.	Lundval, B.-A., and Christensen, J.L. (2003), “Broadening the Analysis of Innovation Systems – Competition, Organisational Change and Employment Dynamics in the Danish System”, in “Innovation, Competence Building, and Social Cohesion In Europe: Towards a Learning Society”, Editors: Pedro Conceição, Manuel V. Heitor and Bengt-Åke Lundvall, Edward Elgar	
3.	Edquist, C. (1997). “Systems of innovation a introduction” (Chapter 1), in: “Systems of Innovation”, ed. C. Edquist, pp. 1-35	

Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER-II: -POLYMER ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hrs/week	End Semester Examination: 60 Marks	Theory : 04
Total: 4 Hrs/week	Internal assessment: 40 Marks	Total Credits:04
	Total :100 Marks	

Topics covered

UNIT-I	Introduction to polymer technology Types of polymerization, effect of temperature and pressure on polymerization, degree of polymerization, molecular weight determination.	(08 Hours)
UNIT-II	Polymerization process Manufacturing process of phthalic anhydride, propylene, acrylonitrile, adipic acid, tetraphthalic acid, LDPE, HDPE, PVC, PP, PC, polystyrene, polyurethanes, PTFE, polyester via terephthalic acid, nylon-6.	(08 Hours)
UNIT-III	Polymerization reactors Batch, continuous, plugflow, CSTR, Design consideration of batch reactor, design consideration in high pressure LDPE reactors LLDPE & HDPE Fluid bed reactor. Types of agitators for polymerization reactors, polymer drying.	(08 Hours)
UNIT-IV	Polymer characterization & rheology. Mechanical properties of polymer, crystallinity, glass transition temperature (T _g), heat distribution temperature, mathematical models of viscoelastic behaviour of plastic, viscosity determination of polymer.	(08 Hours)
UNIT-V	Plastic processing – injection moulding , compression moulding , rotational moulding , transfer moulding , coating polymer blends , & composites – polymer alloys , reinforced plastics.	(08 Hours)
UNIT-VI	Polymer adhesives technology - Different types of adhesive , polyvinyl alcohol , rubber cement , polymer applications , identification and waste management.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of polymer engineering, keeping track of the recent technological trends and developments.

Text Books/References:

1.	“Introduction to polymer science & technology” by Dr S.D Dawande , Denett & co 1 st edition 2006.
2.	Gawarikar V.R , Vishvanathan N.V , Sridhar j, polymer science , new age international p ltd,

	dariyaganj , New delhi.
3.	Bhatnagar M.S Text book of polymer vol I , II ,III. S.chand & co.ltd New delhi – 55.
4.	Rao natti S , Design formula for plastic engineering Hanser publication, Munich Viemna, New York (1991).
5.	Pattan Wj, plastic technology , theory , design , and manufacture, Ruston publishing Co Mumbai – 01.
6.	Athalye A.s plastic material handbook Vol 1 & 2 Multitech publishing Co. Ghatkopar Mumbai – 77.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER -II: FOOD TECHNOLOGY

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test : 20 Marks	Total credits: 04
	Assignment : 10 Marks	
	Attendance :10 Marks	

Topics covered

UNIT-I	Principle of food processing: Rheology of solid, semi-solid and liquid foods. Heat transfer and thermal death times, Schmidt plot procedure.	(08 Hours)
UNIT-II	Canning of food: Thermal processing, determining time of heat sterilization process. Conductive and convective foods.	(08 Hours)
UNIT-III	Balancing and freezing of foods: Balancing processes, freezing, Ultra-high temperature thermal processing, food sterilization, probability of non-sterile unit, Convective drying of food, rate of drying, time of drying.	(08 Hours)
UNIT-IV	Membrane processing of liquid foods: Principles, membrane configuration, types, evaporation concentration of liquid food, evaporator load calculation.	(08 Hours)
UNIT-V	Osmotic dehydration of food: Mechanism of osmotic dehydration, kinetics. Microwave heating of food, Frying of food, heat and mass transfer in frying.	(08 Hours)
UNIT-VI	Extrusion cooking of foods: extrusion process, role of moisture content. Packaging of foods, packaging materials, shelf life, water transmission rate, prediction of packaging	(08 Hours)

	time. Process control in food manufacturing.	
Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of food technology, keeping track of the recent technological trends and developments		
Text Books/References:		
1.	Frazier, W.C., and Westhoff, D.C., (1995). Food Microbiology. 4th ed. New Delhi: Tata McGraw-Hill publishing Company Limited.	
2.	Basic Food Microbiology; Bannett, Chapman and Hall	
3.	Potter, Norman N., Hotchkiss, Joseph H., Food Science, fifth edition.	
4.	Frazier, Food Microbiology, Tata McGraw Hill, (2007).	
5.	Norman W. Desrosier, James N. Desrosier, The technology of food preservation, 4th ed. Westport, Conn. : AVI Pub. Co., c1977.	
6.	Fennema Karrel, Principles of Food Science, Vol-I, Marcel Dekker publisher.	
7.	Food Science by Mudambi Robinson RK; 1996; Modern Dairy Technology, Vol 1 & 2; Elsevier Applied Science Pub.	
8.	Charm SE, The Fundamentals of Food Engineering; 1963, AVI Pub.	
9.	Sharan K., Mulvaney S. J., Rizvi S. H., Food process engineering, Wiley Interscience Publication	
Syllabus for Unit Test:		
Unit Test -I	UNIT – I ,II,III	
Unit Test -II	UNIT – IV,V,VI	

SELF STUDY PAPER-II- MODELING AND SIMULATION OF PROCESSES		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4 Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	
Topics covered		
UNIT-I	Introduction: Models, Open loop systems, Feedback controls, cascade controls, System analysis from models, The control engineers role.	(08 Hours)
UNIT-II	Modeling of dynamic systems:	(08 Hours)

	Modeling principles, Modeling physical components, Obtaining a transfer function for Analysis or Simulation with SIMULINK. Modeling of various systems.	
UNIT-III	Frequency response analysis: Mathematical basis, Application of frequency response diagram, using MATLAB to obtain gain margin (GM) and phase margin (PM).using MATLAB to produce a Nichols Chart, comparison of various methods.	(08 Hours)
UNIT-IV	Process identification: Purpose, Direct methods, time domain fitting of step test data, direct sine wave testing, digital evaluation of Fourier transformation, auto tuning, approximate transfer functions.	(08 Hours)
UNIT-V	Building blocks of feed forward neural network: Building blocks of ANN, processing elements, connections, weights, activation and transfer functions, learning rules	(08 Hours)
UNIT-VI	Computer Simulation for various industrial applications.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of modeling and simulation of processes, keeping track of the recent technological trends and developments

Text Books/References:

1.	Franks R. E. G., "Modeling and Simulation in Chemical Engineering", Wiley Interscience, NY
2.	John Ingam, Irving J. Dunn, "Chemical Engineering Dynamic Modeling with PC Simulation", VCH Publishers
3.	William L. Luyben, "Process Modeling Simulation and Control for Chemical Engineers", McGraw Hill International Edition Publishing Company
4.	Himmelblau D., K. B. Bischoff, "Process Analysis and Simulation", John Wiley & Sons
5.	Wayne Bequette, "Process Dynamics, Modeling, Analysis and Simulation", Prentice Hall
6.	K. M. Hangos and I. T. Cameron, "Process Modeling and Model Analysis", Academic Press, 2001.
7.	Singiresu S. Rao, "Applied Numerical Methods for Engineers and Scientists" Prentice Hall, Upper Saddle River, NJ, 2001
8.	W. F. Ramirez, "Computational Methods for Process Simulation", 2 nd ed., Butterworths, 1997
9.	Modeling and analysis of dynamic systems, by C.M .Close, D.H. Fredrick and J. C. Newell, John Wiley & Sons, 2002

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER -II: NANOSCIENCE

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

Topics covered

UNIT-I	Introduction, Scientific Revolutions – Types of nanomachines and nanotechnology-periodic table-Atomic structure molecules and phase Energy - Molecular and Atomic size -surfaces and dimensional space -Top down and bottom up.	(08 Hours)
UNIT-II	Nano material synthesis methods, Introduction to Nano scale materials - Synthesis and processing, method of nano structured materials preparation – mechanical grinding, wet chemical synthesis – sol-gel processing, gas phase synthesis, gas condensation processing, chemical vapor condensation – nano composite synthesis – processing.	(08 Hours)
UNIT-III	Nanomaterials properties Opportunity at the nano scale - Length and time scale in structures -energy landscapes-Inter dynamic aspects of inter molecular forces	(08 Hours)
UNIT-IV	Quantum dots - Nano wires-Nano tubes; 2D and 3D films; Nano and mesopores, micelles, nano machines-biological membranes.	(08 Hours)
UNIT-V	Physical properties of nanostructured materials, Influence of Nano structuring on Mechanical - Optical, electronic, magnetic and chemical properties – gramsize effects on strength of metals optical properties of quantum dots and quantum wires carbon nano tubes -magnetic behavior	(08 Hours)
UNIT-VI	Nanostructures-surface chemistry of tailored monolayer -self assembling; Characterization Techniques: X-ray Diffraction, Scanning Electron Microscopy (SEM), Transmission Electron microscopy (TEM), Optical spectroscopy, Atomic Force Micrograph (AFM), Partical Size Analyzer.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of Nanoscience, keeping track of the recent technological trends and developments

Text Books/References:

1.	Charles P. Poole, Frank J. Owens, “Introduction to Nanotechnology”, Wiley Interscience
2.	B S Murty, P Shankar, Baldev Raj, B B Rath, James Murday, “Textbook of Nanoscience and Nanotechnology” Universities Press (India) Private Limited
3.	Mark A. Ratner, Daniel Ratner, “Nanotechnology: A gentle introduction to the next Big Idea”, Prentice Hall, 1 st Edition
4.	Yury Gogotsi, “Nanomaterials Handbook”, CRC Press, Taylor & Francis Group
5.	Gu`nter Schmid, “Nanoparticles From Theory to Application”, Wiley-VCH Verlag GmbH & Co
6.	C. Br`echignac P. Houdy M. Lahmani, “Nanomaterials and Nanochemistry”, Springer Berlin Heidelberg

	New York
7.	Kenneth J. Klabunde, “Nanoscale Materials in Chemistry”, John Wiley & Sons, Inc
8.	Alain Nouailhat, “An Introduction to Nanoscience and Nanotechnology”, Wiley-ISTE; 1 st Edition
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER -II: PETROCHEMICAL ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total:100 Marks	

Topics covered

UNIT-I	Existing Feedstock Scenario Fossil fuel feedstock, Coal, Natural Gas and Petroleum, Reserves, Present and Future ,Production Trends, Statics for India and World, Distribution and utilization pattern of existing fossil reserves, Demand supply scenario, Cycle of oil prices, Need for alternative feedstocks	(08 Hours)
UNIT-II	Non conventional Fossil Fuels ,Coal Bed Methane, Coal Gasification, Shale Oil, Hydrates, Reserves, Potential, and Technologies for exploitation of these resources, Cost factor	(08 Hours)
UNIT-III	Coal Gasification Chemistry and Technology for coal gasification and Syngas production, Fischer TropschSynthesis, Chemistry, Catalyst and Process Technology, Other outlets for Syngas	(08 Hours)
UNIT-IV	Alco Chemicals -Pathways and technologies for chemicals from ethanol, isopropyl alcohol, n-butanol,isobutanol, Lube oil additives, Octane boosters	(08 Hours)
UNIT-V	Fundamentals of natural gas engineering, chemical composition of natural gas, Processing of Petroleum and Hydrocarbons.	(08 Hours)
UNIT-VI	Industrial Applications in Petrochemical Industry	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of Petrochemical Engineering, keeping track of the recent technological trends and developments

Text Books/References:

1.	Satterfield C. N., “Heterogeneous Catalysis in Industrial Practice”, Second Edition, McGraw Hill, 1993
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2.	Smith J. M., "Chemical Engineering Kinetics", Third Edition, McGraw Hill.
3.	Froment G. F. and Bischoff, K. B. "Chemical Reactor Analysis and Design", John Wiley & Sons.
4.	John, F., Cook, M., and Graham, M., "Hydrocarbon Exploration and Production", Elsevier.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER -II: PHYSICAL CONCEPTS OF UNIT OPERATIONS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

Topics covered

UNIT-I	Vapor-Liquid Equilibrium, relative volatility, boiling point diagram,Raolts law, Mc Cabe-Thiele method, Lewis-Sorel method, reflux ratio, partial condenser, H-X diagram,Azeotropes, steam distillation, different types of columns and analysis.	(08 Hours)
UNIT-II	Applications of liquid-liquid extraction, difference between distillation and extraction,Distribution coefficient,ternary systems, selection of solvent, different stages of operation,Various types of extraction equipments.	(08 Hours)
UNIT-III	Equilibrium data, solubility curves, crystallization theory, classification of crystallizationEquipments, types of crystallizers, mechanism of crystallisation.	(08 Hours)
UNIT-IV	Application of adsorption, nature of adsorption, types of adsorption, adsorption Isotherms, different stages of adsorption, breakthrough curves.	(08 Hours)
UNIT-V	Introduction to leaching operation, equilibrium diagram, various stages of operation, Countercurrent leaching operation, leaching of fine solids, dorr agitator.	(08 Hours)
UNIT-VI	General definitions of drying, equilibrium in drying, rate of drying curve, General classification and types of dryers.	(08 Hours)

Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of physical concepts of unit operations, keeping track of the recent technological trends and

developments	
Text Books/References:	
1.	Coulson J,M. and Richardson Chemical Engineering Volume 2
2.	Pergaon Press, Oxford, New York (USA) King C, J. Separation Processes Mc Graw – Hill Publications
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

SELF STUDY PAPER- II: MULTIPHASE REACTOR ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

Topics covered

UNIT-I	Introduction to Multiphase Reactor Engineering Types, Classification, Application of Industrial Importance	(08 Hours)
UNIT-II	Thermodynamics and kinetics Notable industrial heterogeneous systems and thermodynamic role. Application of equilibrium criteria to chemical reactions. The Gibbs energy change and equilibrium constant. Estimation of equilibrium constant for heterogeneous system by defining standard state of the phases involved. Determination of rate controlling step: intrinsic kinetics for heterogeneous systems.	(08 Hours)
UNIT-III	Hydrodynamic Characteristics Hydrodynamic characteristics of different multiphase reactors: Mechanically Agitated Contactors (MAC), Bubble Columns, Slurry Reactors, Fluidized Beds, Loop Reactors and Modified Versions	(08 Hours)
UNIT-IV	Mixing Studies Effect of geometrical, system, and operating parameters on phase mixing in multiphase reactors. Quantification of phase mixing. Development of a mathematical model.	(08 Hours)
UNIT-V	Heat Transfer and Mass Transfer Studies Effect of geometrical, system, and operating parameters on heat transfer coefficient in multiphase reactors. Quantification of heat transfer coefficient. Application of	(08 Hours)

	correlations available to different multiphase reactors. Experimental techniques used for estimation of mass transfer coefficient and selection of suitable technique for a multiphase reactor. Effect of geometrical, system, and operating parameters on mass transfer coefficient in multiphase reactors. Quantification of mass transfer coefficient. Application of correlations available to different multiphase reactors.	
UNIT-VI	Design Aspects of Multiphase Reactors Pressure drop, Fractional phase hold- up, mass and heat transfer coefficient, extent of mixing, etc.	(08 Hours)
Assignment: Each student will submit assignments based on different topics in consultation with faculty, in the area of multiphase reactor engineering, keeping track of the recent technological trends and developments		
Text Books/References:		
1.	L. K. Doraiswamy and M. M. Sharma, "Heterogeneous Reactions", 2 nd Edition, Volume I and II.	
2.	G. B. Tatterson, "Fluid Mixing and Gas Dispersion in Stirred Reactors", 10 th Edition, Academic Press, London, 1994	
3	W. D. Deckwer, "Bubble Column Reactors", Cambridge University Press, New York, 2000.	
4	Diazo Kunji and O. Levenspiel, "Fluidization Engineering", 2 nd Edition, Butterworth Heinemann, 1991.	
5	J. F. Devidson and Harrison, "Fluidization", 10 th Edition, Academic Press, London, 1994.	
Syllabus for Unit Test:		
Unit Test -I	UNIT – I ,II,III	
Unit Test -II	UNIT – IV,V,VI	

Structure of M.Tech (Nano Technology)

Based on Credit Pattern

STRUCTURE & EXAMINATION PATTERN

Semester I										Total Duration : 20hrs/week	
										Total Marks : 500	
										Total Credits : 18	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/ Assignments	TW	Pract/ Oral	TH	TW/PR /OR	
Nanoscience& Nanotechnology	04	02	60	20	10	10	25	25	04	01	05
Nano-Physics	04	--	60	20	10	10	--	--	04	--	04
Nano-Chemistry	04	--	60	20	10	10	--	--	04	--	04
Nano-Biology	04	02	60	20	10	10	25	25	04	01	05
Total	16	04	240	80	40	40	50	50	16	02	18

Semester II										Total Duration : 20hrs/week		Total Marks : 500		Total Credits : 18	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits				
	L	P	Theory	Unit Test	Attendance	Tutorial/Assignments	TW	Pract/Oral	TH	TW/PR/OR					
Nano-Computing	04	--	60	20	10	10	--	--	04	--	04				
Nano Fabrication and Advanced Synthesis Technology	04	02	60	20	10	10	25	25	04	01	05				
Nano Characterization	04	02	60	20	10	10	25	25	04	01	05				
Energy, Environment, Safety and Commercialization for Nanotechnology	04	--	60	20	10	10	--	--	04	--	04				
Total	16	04	240	80	40	40	50	50	16	02	18				

Semester III									Total Duration : 28hrs/week		
									Total Marks : 475		
									Total Credits : 40		
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/Assignments	TW	Pract/Oral	TH	TW/PR/OR	
Elective –I	04	02	60	20	10	10	25	25	04	01	05
Elective –II	04	02	60	20	10	10	25	25	04	01	05
**Self Study Paper – I	*04	--	60	20	10	10	--	--	04	--	04
Dissertation Stage - I	--	07	--	--	--	--	25	--	--	21	21
Seminar	--	05	--	--	--	--	25	25	--	05	05
Total	12	16	180	60	30	30	100	75	12	28	40

<u>ELECTIVE I:</u>	<u>ELECTIVE II:</u>
<ul style="list-style-type: none"> • Computational Nanoscience • Nano Electronics • Nano Medicine • Nano Engineered Devices 	<ul style="list-style-type: none"> • Nano Photonics • Industrial Nanotechnology • Nano Material Science • Nano Composites

Semester IV										Total Duration : 14 hrs/week	
										Total Marks : 325	
										Total Credits : 34	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/ Assignments	TW	Pract/ Oral	TH	TW/PR/ OR	
**Self Study Paper – II	*04	--	60	20	10	10	--	--	04	--	04
Dissertation Stage-II	00	10	--	--	--	--	150	75	--	30	30
Total	04	10	60	20	10	10	150	75	04	30	34

Sr.No.	SELF STUDY PAPER- I (SEM-III)	SELF STUDY PAPER- II (SEM-IV)
1	Modeling and Simulation of Nanosystems	Silicon Nanostructures & Carbon Nanotubes Based Nanoelectronics
2	Synthesis and Design Nanoscale Products	Nanobioelectronics
3.	Applications of Nanotechnology in Food and Agriculture	Compound Semiconductor Materials And Devices
4	Finite Element Methods for Nanoscale Structures	Nanoprocessing
5	MEMES/NEMES	Introduction To Nano-modelling

NANOSCIENCE AND NANOTECHNOLOGY

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

Unit-I

(08 Hours)

Title: Introduction

Scientific Revolutions – Types of nanomachines and nanotechnology-periodic table-Atomic structure molecules and phase Energy -Molecular and Atomic size -surfaces and dimensional space -Top down and bottom up. Misnomers and misconception of Nanotechnology.

Unit-II

(08 Hours)

Title: Nanomaterial Synthesis Methods

Introduction to Nano scale materials - Synthesis and processing, method of nano structured material preparation – mechanical grinding, wet chemical synthesis – sol-gel processing, gas phase synthesis, gas condensation processing, chemical vapor condensation – nano composite synthesis – processing.

Unit-III

(08Hours)

Title: NanoStructures

Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphenes and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials. Clusters of metals and semiconductors, rare gas and molecular clusters, nanowires and nanorods, size dependent properties, size dependent absorption, phonons in nanostructures. Quantum dots - Nano wires-Nano tubes 2D and 3D films Nano and mesopores, micelles, bilayers, vesicles, bio-nano machines-biological membranes. Dendritic and supramolecular structures, metal nanocluster composites, glasses. Biological building blocks, bionanopolymers, self-assembly by Nature. Polypeptide nanowire and protein nanoparticles, nucleic acids, DNA helix. Examples of biological nanostructures, proteins, micelles and vesicles, proteins, Amphiphilicity as a driving force in synthesis of biological structures. Multilayers. Bio-nano interface.

Unit-IV**(08 Hours)****Title: Nanomaterial Properties**

Opportunity at the nano scale - Length and time scale in structures -energy landscapes-Inter dynamic aspects of inter molecular forces -Evolution of band structure and Fermi surface.

Unit-V**(08hours)****Title: Physical Properties Of Nanostructured Materials**

Influence of Nano structuring on Mechanical - Optical, electronic, magnetic and chemical properties –grainsize effects on strength of metals optical properties of quantum dots and quantum wires –electronic transport in quantum wires and carbon nano tubes -magnetic behavior of single domain particles and nanostructures-surface chemistry of tailored monolayer -self assembling. Nano Characterization, mechanical characterization, structural characterization

Unit-VI**(08 Hours)****Title: Applications of Nanotechnology**

Industrial applications of nanomaterials, in the areas of electronics, photonics, biology, health and environment, medicine, defence, chemicals, catalysts, textiles, etc. Application of nanotechnology in remediation of pollution, photocatalysis and other nanocatalysts, greenhouse gases, global warming. Monitoring nanoparticles at work place and sensors used for this. Toxicity of nanoparticles, exposure to nanoparticles and CNTs and influence on respiratory systems.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. Mick Wilson, Kamali Kannargare., Geoff Smith, “Nano technology: Basic Science and Emerging technologies”, Overseas Press, 2005.
- 2 Charles P. Poole, Frank J. Owens, “Introduction to Nanotechnology”, Wiley Interscience, 2003.
3. Mark A. Ratner, Daniel Ratner, “Nanotechnology: A gentle introduction to the next Big Idea”, Prentice Hall P7R:1st Edition, 2002.
4. Nanostructures and Nanomaterials: synthesis, properties and applications, G. Cao and Y. Wang, World Scientific, 2nd edition, 2011
5. Encyclopedia of nanoscience and nanotechnology, Edited by H.S. Nalwa, American Scientific Publishers, 2007
6. Nanotechnology book by Prof. (Ms) Sulabha Kulkarni

REFERENCES

1. Nanoelectronics and nanosystems: from transistors to molecular and quantum devices, K. Gosser, P. Glosekotter and J. Dienstuhl, Springer 2005
2. Handbook of Thin Film Materials, volume 5, edited by H.S Nalwa, American Scientific Publishers, 2002
3. Nanoelectronics- principles and devices, M. Dragoman and D. Dragoman, Artech House publishers, 2005
4. Overview of Nanoelectronic Devices, D. Goldhaber Gordon, Proceedings of IEEE, volume 85, 1997
5. Nanoelectronics and Information Technology, W. Rainer, Wiley, 2003
6. Nanosystems, K.E. Drexler, Wiley, 1992
7. Science of fullerenes and carbon nanotubes, M.S. Dresselhaus and G. Dresselhaus, Academic press, 1996

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

NANO PHYSICS

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory	: 60 Marks
Duration	: 03 Hours
Unit Test –I	: 20 Marks
Unit Test –II	: 20 Marks
Theory Credits	: 04

Unit-I

(08 Hours)

Atomic and Molecular Physics:

Rutherford atom model, Electron orbits, Bohr atom, Energy levels and spectra, Atomic excitation and atomic spectra, Rotational & Vibrational energy levels, Rotational and Vibrational spectra. Electronic spectra of molecules. Bohr and Sommerfeld atom models - Vector atom model - Pauli's exclusion principle - various quantum numbers - angular momentum and magnetic moment - coupling schemes - LS and JJ coupling - Bohr magneton, Hund's rule, Stern and Gerlach experiment, Zeeman Effect and Stark Effect. Molecular bonding in homo and hetero nuclear molecules, polyatomic molecules, vibration and rotational levels, vibrations and Group frequencies.

Unit-II

(08 Hours)

Quantum Mechanics:

Wave-particle duality, Schrodinger equation and expectation values, Uncertainty principle. Solutions of the one-dimensional Schrodinger equation for free particle, particle in a box, particle in a finite well. Reflection and transmission by a potential step and by a rectangular barrier. Theory of radiation, transition probability for absorption and emission, forbidden transitions, decays, lifetime concepts. Solution of Time independent Schrödinger equation at higher dimensions. Particle in a three dimensional box, linear harmonic oscillator and its solution, density of states, free electron theory of metals. The angular momentum problem. The spin half problem and properties of Pauli spin matrices.

Unit-III

(08Hours)

Solid State Physics:

Amorphous, crystalline, crystals, polycrystals, symmetry. Unit Cells, Crystal Structures (Bravais Lattices), Crystallographic Directions, Crystallographic Planes, Miller Indices, Bragg's Law, X-ray Diffraction. Imperfections of crystal structure: point defects, Grain boundaries, phase boundaries, Dislocations: Screw, Edge and Mixed Dislocations. Free electron theory, Bloch theorem. Motion of electrons in solids, effective mass of electron and hole, reduced, periodic and extended zone scheme, Fermi surfaces, Direct and indirect band gaps in semiconductors, temperature dependence.

Electronic, ionic and orientational polarizabilities, Clausius-Mossotti relation, static and frequency dependence of dielectric constant, Kramers-Kronig relation. Mean field theory, Heisenberg interaction, magnons, origin of domains in magnetic materials.

Unit-IV

(08 Hours)

Electronics:

Semi conducting materials, p-n junction, space charge and electric field distribution at junctions, forward & reverse biased condition, minority & majority carrier currents, Zener and avalanche break downs, Schottky barrier, Shockley diode & silicon control rectifier, Zener diodes, tunnel diodes, photo diodes. Operational amplifier and Applications– Ideal op-amp, equivalent circuit of op-amp, open loop op-amp configurations – inverting, non-inverting and differential amplifiers, lock-in-amplifier. Active filters – types, first and second order active low and high pass filter. Oscillators – basic principles, types- phase shift oscillator, Wien bridge oscillator, triangular wave generator.

Unit-V

(08Hours)

Laser Technology:

Basic principles of lasers, properties of laser beams, population inversion in three and four level lasers, resonance frequencies, modifications of the laser output, single mode operation, Q-switching. Laser materials and types of lasers, solid state lasers, characteristics of dye lasers, semiconductor lasers. Laser applications.

Unit-VI

(08 Hours)

Electrodynamics:

Coulomb's law, Gauss's law, Electrostatic Potential Energy. Biot-Sevart law and Ampere Laws, faraday's law, Maxwell's Equations, Poynting Theorem, Conservation Laws.

Termwork

- At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. Herzberg (D. van Nostrand Co., Inc)
2. Berkley Series, Vol. II (Tata McGraw Hill)
3. Modern Quantum Mechanics, J. J. sakurai (Addison Wiley)
4. Quantum Mechanics, L. I. Schiff (McGraw Hill)
5. Quantum Physics, Robert Eisberg and Robert Resnick
6. Classical Electrodynamics, J. D. Jackson (John Wiley)
7. Introduction to Electrodynamics, D. Griffiths
8. Electricity and Magnetism, Reiz, Millford, Christy
9. Introduction to Solids State Physics, C. Kittel (Wiley Estern Ltd.)
10. Elementary Solid State Physics, M. Ali Omar (Addison Wesely)
11. The Art of Electronics, P. Horowitz and W. Hill (Cambridge University Press)

12. Electronic Principle, A. P. Malvino (McGrw Hill)
13. Principles of Quantum Mechanics 2nd ed. - R. Shankar
14. Thermodynamics and Statistical Mechanics - A N Tikhonov, Peter T Landberg, Peter Theodore Landsberg
15. Thermodynamics and Statistical Mechanics by John M. Seddon , J. D. Gale
16. Statistical Physics by K. Huang
17. Statistical Mechanics-Landau &Lifshitz
18. Statistical Mechanics – Sonntag.
19. Statistical Mechanics – Mc Le Leland

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

NANO CHEMISTRY

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory	: 60 Marks
Duration	: 03 Hours
Unit Test –I	: 20 Marks
Unit Test –II	: 20 Marks
Theory Credits	: 04

Unit-I

(08 Hours)

Title:

Atomic Bonding in solids, Types of bond: Metallic, Ionic, Covalent and vanderwaals bond; Hybridisation; H- bonding Molecular orbital theory for simple molecules such as diatomic molecule etc. Chemical bonding & theories (e.g. Valence band & Molecular Orbital), atomic structure– energy – molecular and atomic size and their properties, Ionic bond, covalent bond, coordination bond,

Unit-II

(08 Hours)

Title: Types of Material

Metals, Semiconductors, Composite materials, Ceramics, Alloys, Polymers, Their Failure Mechanisms, Properties and Application Areas, Solid state chemistry, Chemistry of surfactants, Polymer chemistry, metal complexes, Inorganic Chemistry, Alkoxide and sol-gel Chemistry, Organometallic chemistry, and their fundamentals for synthesis of oxides & other inorganic Nano composites.

Unit-III

(08Hours)

Title: Overview to Thermodynamics

The first and second laws of thermodynamics. Thermodynamic, functions, heat capacity, enthalpy, entropy. Phase equilibrium in one component system, real gases, the interactions between gases. Ehrenfest classification of phase transition, the physical liquid surface; surface tension, curved surfaces, capillary action. Theory of Solution and related topics: Liquid mixtures: free energy as a function of composition, ideal solutions and excess functions.

Unit-IV

(08 Hours)

Title: Chemical Equilibrium

Equilibrium Electrochemistry; electrochemical cells, Methods for calculation of thermodynamic equilibrium. Electrochemical processes, Inorganic complexes, Ionic Equilibria and spectroscopy (UV, IR, Raman), Atomic structure and properties, Organometallic chemistry, Thermodynamics of solids,.

Unit-V**(08Hours)****Title: Diffusion Kinetics**

Diffusion-Fick's Law, mechanisms of diffusion; generation of point defects; self-diffusion; the influence of the pressure and pressure gradient; Kirkendall effect; fast diffusion; influence of isotropic state; experimental methods of investigation of diffusion, Chemical kinetics, Chemistry of surfactants, Basic polymer chemistry, Solid state chemistry, Reactivity of solids, Quantum chemistry

Unit-VI**(08 Hours)****Title: Reaction Kinetics and Photochemistry**

Zero, First & Second order reactions. Dependence of k on Temperature. An overview of collision and activated complex theory. Steady State approximation. Laws of Photochemistry, Fluorescence, Phosphorescence, Chemiluminescence, Jablonski diagram and quenching, Photochemistry of nanomaterials.

Termwork

- At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. Physical Chemistry, 1st Edition –Ball.
2. Thermodynamics-Glasston.
3. Principals of Physical Chemistry-Marron-Pruton.
4. Advanced Physical Chemistry – Atkins Peter, Paula Julio
5. Inorganic chemistry-Cotton-Wilkinson.
6. Introduction to Theoretical Chemistry – Jack Simons.

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

NANO BIOLOGY

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

Unit-I (08 Hours)

The Cell: the basic unit of life, Molecular components (DNA, protein, lipids, carbohydrates), Expression of genetic information (Transcription, translation), Types of cells: plants, animals, bacteria, viruses and fungi, DNA: Structure, components, physical and chemical properties,

Unit-II (08 Hours)

Amino acids and proteins: structure and reactions of amino acids (hydrophilic and hydrophobic), structure of proteins (primary, secondary, tertiary and quaternary), Enzyme chemistry : kinetics of enzyme catalysis,

Unit-III (08Hours)

Lipids and carbohydrates: Structure and types of lipids, biological membranes, structure and types of carbohydrates, Basic immunology: Adaptive and innate immunity, cells of immune system, Antigens and antibodies structure and functions

Unit-IV (08 Hours)

Cytoskeleton: microtubules, intermediate filaments and microfilaments; cell motility Protein motors: ATP synthase F1 motor, Bacterial Flagellar motor, Proton motive forces, ion channels, chimeric kinesin and myosin motors, Cell signaling, G-protein transmembrane receptors, DNA nanostructures for mechanics and computing, DNA-Protein nanostructures, Biomimetic fabrication of DNA-based metallic nanowires, conjugates and networks.

Unit-V (08Hours)

Biological methods of synthesis: Use of bacteria, fungi, Actinomycetes for nanoparticle synthesis, Magnetotactic bacteria for natural synthesis of magnetic nanoparticles; S-layer proteins, Viruses as components for the formation of nanostructured materials; Synthesis process and application, Role of plants in nanoparticle synthesis

Unit-VI (08 Hours)

Nano-biotechnology: Interaction between biomolecules and nanoparticle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Nanosensors,

Nanomedicine: Nanotechnology in Diagnostics applications, materials used in Diagnostics and Therapeutic, Environmental and Agricultural Applications of nanotechnology.

Termwork

At least Eight Assignment based on above syllabus

Practicals (Any Five):

1. Microscopic observation of bacterial, plant, fungi and animal cells
2. Temporary preparation of cell / tissues
3. Demonstration of Cytotoxicity/cell viability- Tryphan blue dye exclusion
4. Absorbance spectra of biomolecules (DNA, proteins)
5. Immunodiffusion techniques
6. Isolation and purification of genomic DNA- 2
7. Isolation and purification of plasmid DNA -2
8. Estimation and purification of proteins -2
9. Biological Synthesis of nanoparticles (bacteria, fungi and plants)- 4
10. Demonstration of nanoparticles based drug delivery in cell line-3

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. Alberts, "Molecular Biology of the cell" Garland Science.
2. Lodish, "Molecular cell biology" FREEMAN
3. Watson, James, T.Baker, S.Bell, A.Gann, M.Levine, And R.Losick. "Molecular Biology of the gene", san francisco: Addison-Wesley,
4. Janis Kuby "Immunology" W H Freeman,
5. Nelson, D.L., Fox.M.M., "Lehninger Principles of Biochemistry", W.H.Freeman,
6. B.Lewin, "Genes IX", International Edition. Sudbury: Jones & Bartlett
7. R. Cantor, P.R.Samuel, "Biophysical Chemistry", W.H., Freeman & Co., 1985.
8. Watson, James, T.Baker, S.Bell, A.Gann, M.Levine, and R.Losick. "Molecular Biology of the Gene", 5th ed., San Francisco: Addison-Wesley, 2000.
9. Alberts, Bruce, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. Molecular Biology of the Cell. 4th ed. New York: Garland Science, 2002.
10. Branden, Carl-Ivar, and John Tooze. Introduction to Protein Structure. 2nd ed. New York: Garland Pub., 1991.
11. Creighton, E, Thomas, "Proteins: Structures and Molecular Properties", 2nd Ed. New York: W.H. Freeman, 1992.
12. Bionanotechnology: Lessons from Nature by David S. Goodsell
13. Nanomedicine, Vol. IIA: Biocompatibility by Robert A. Freitas
14. Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology - Hari SinghNalwa
15. Nanobiotechnology; ed. C.M.Niemeyer, C.A. Mirkin.
16. Nanocomposite Science & Technology Ajayan, Schadler & Braun
17. BioMEMS (Microsystems) - Gerald A. Urban

18. Introduction to Nanoscale Science and Technology (Nanostructure Science and Technology)
Massimiliano Di Ventra
19. Nanosystems: Molecular Machinery, Manufacturing, and Computation - K. Eric Drexler
20. Springer Handbook of Nanotechnology - Bharat Bhushan
21. Nanobiotechnology; ed. C.M.Niemeyer, C.A. Mirkin.
22. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
23. Nanomedicine, Vol. I: Basic Capabilities
24. Nanomedicine, Vol. IIA: Biocompatibility - Robert A. Freitas
25. Dendrimers I, II, III, Ed. F. Vogtle

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

NANO COMPUTING

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Unit Test –I : 20 Marks
Unit Test –II : 20 Marks
Theory Credits : 04

Unit-I

(08 Hours)

Title: Fundamental Principles Of Numerical Methods

Root finding, interpolation and approximation, numerical integration and differentiation, solution of systems of linear equations, least squares data fitting, eigenvalue problems, numerical methods for ODEs - initial value problems and boundary value problems, Scientific Modeling - Numerical data and Numerical operations -Numerical Algorithms -Numerical Programs - Numerical Software - Approximations in Mathematical Model building- Numerical integration - Differentiation -Variational finite element methods-Rayleigh's method-Ritz method.

Unit-II

(08 Hours)

Title: Mathematical Modeling

Introduction to mathematical modeling, review of basic calculus - physical simulation - advantages and limitations - Concept of physical domain and computational domain - assumptions and limitations in numerical solutions – Finite element method and Finite difference method.

Unit-III

(08Hours)

Title: Differential Equations & Applications

Equations of first order, linear differential equations of second order, power series solutions, Laplace transforms, nonlinear differential equations, Fourier series and boundary value problems. Euler method, Runge-Kutta method, boundary values- partial differential equations - separation of variables-wave equation-Laplace equation-nonlinear partial differential equations - Parabolic (Heat/Diffusion) Equation, Derivation, separation of variables, transformation of boundary conditions, Fourier series and transforms.

Unit-IV

(08 Hours)

Title: Simulation

Basic concepts of simulation- data manipulation, data exchange of the structure, properties and processing of materials- Molecular dynamics simulation, Derivation, D'Alembert principle, vibrating string/beam, finite Fourier transforms, method of characteristics, wave equation in 2D.

Unit-V

(08Hours)

Title: Monte Carlo Methods

Basics of the Monte Carlo method-Algorithms for Monte Carlo simulation-Applications to systems of classical particles-modified Monte Carlo techniques-percolation system-variation

Monte Carlo method-diffusion Monte Carlo method - Quantum Monte Carlo method, Finite difference methods - implicit and explicit schemes, truncation error, single step and multi-step schemes. Finite element methods - Galerkin approximation and solution.

Unit-VI

(08 Hours)

Title: Nanoscale Modeling and Simulations

Introduction to Matlab OR Mathematica (and their open source counterparts-Scilab and Octave); examples from nano-optics and nano-electronics, Molecular dynamics, computing and simulations, Simulations from ab initio to multiscale Modeling, Nanodesign Nano-CAD.

Termwork

- At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. S.C. Chapra and R.P.Canale, "Numerical methods for Engineers", Tata McGraw Hill, New Delhi, 2002.
2. Erwin Kreyzig, "Advanced Engineering Mathematics", John Wiley & Sons, 2004.
3. R.J. Schilling and S.L. Harris, "Applied Numerical Methods for Engineers using MATLAB and C", Thomson publishers, New Delhi, 2004..
4. D. Frenkel and B. Smith, "Understanding molecular simulation from algorithm to applications", Kluwar Academic Press, 1999.
5. K. Ohno, K. Esfarjani and Y. Kawazoe, "Introduction to Computational Materials Science from ab initio to Monte Carlo Methods", Springer-Verlag, 1999.
6. Partial Differential Equations for Scientists and Engineers, S. J. Farlow
7. Partial Differential Equations - Analytical and Numerical Methods, M. S. Gockenbach
8. Linear Partial Differential Equations for Scientists and Engineers, T. Myint-U and L. Debnath
9. An Introduction to Partial Differential Equations with MATLAB, M. P. Coleman

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

NANO FABRICATION AND ADVANCED SYNTHESIS TECHNOLOGY

TEACHING SCHEME

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Unit Test –I : 20 Marks
Unit Test –II : 20 Marks
TW/Pract./Oral : 50 Marks
Theory Credits : 04
Practical Credits : 01

Unit-I

(08 Hours)

Title: Bulk synthesis

Synthesis of bulk nano-structured materials –sol gel processing –Mechanical alloying and mechanical milling- Inert gas condensation technique – Nanopolymers – Bulk and nano composite materials

Unit-II

(08 Hours)

Title: Chemical Approaches

Self-assembly, self-assembled monolayers (SAMs). Langmuir-Blodgett (LB) films, clusters, colloids, zeolites, organic block copolymers, emulsion polymerization, templated synthesis, and confined nucleation and/or growth. Biomimetic Approaches: polymer matrix isolation, and surface-templated nucleation and/or crystallization. Electrochemical Approaches: anodic oxidation of alumina films, porous silicon, and pulsed electrochemical deposition.

Unit-III

(08Hours)

Title: Physical Approaches

Vapor deposition and different types of epitaxial growth techniques- pulsed laser deposition, Magnetron sputtering - Micro lithography (photolithography, soft lithography, micromachining, e-beam writing, and scanning probe patterning). Inert gas condensation, Arc discharge, RFplasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Ball Milling, Molecular beam epitaxy, Chemical Vapour Deposition method and Electro deposition.

Unit-IV

(08 Hours)

Title: Nanoporous Materials

Nanoporous Materials – Silicon - Zeolites, mesoporous materials - nanomembranes and carbon nanotubes - AgX photography, smart sunglasses, and transparent conducting oxides –molecular sieves – nanosponges.

Unit-V**(08Hours)****Title: Application of Nanomaterials**

Molecular Electronics and Nanoelectronics – Nanobots- Biological Applications – Quantum Devices – Nanomechanics - Carbon Nanotube – Photonics- Nano structures as single electron transistor –principle and design.

Unit-VI**(08 Hours)****Title: Lithography Techniques**

M based nanolithography and nanomanipulation, E beam lithography and SEM based nanolithography and nanomanipulation, Ion beam lithography, oxidation and metallization. Mask and its application. Deep UV lithography, X-ray based lithography.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. S.P. Gaponenko, Optical Properties of semiconductor nanocrystals, Cambridge University Press, 1980.
2. W.Gaddand, D.Brenner, S.Lysherski and G.J.Infrate(Eds.), Handbook of NanoScience, Engg. and Technology, CRC Press, 2002.
3. K. Barriham, D.D. Vvedensky, Low dimensional semiconductor structures: fundamental and device applications, Cambridge University Press, 2001.
4. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties &Applications , Imperial College Press, 2004.
- J.George, Preparation of Thin Films, Marcel Dekker, Inc., New York. 2005.
5. Microfabrication and Nanomanufacturing- Mark James Jackson

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

NANO CHARACTERIZATION

TEACHING SCHEME

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Unit Test –I : 20 Marks
Unit Test –II : 20 Marks
TW/Pract./Oral : 50 Marks
Theory Credits : 04
Practical Credits : 01

Unit-I

(08 Hours)

Title: MICROSCOPY

Optical absorption and emission spectroscopy – Basics - AAS – ICP OES – Electron Microscopy: Scanning electron microscopy – Transmission electron microscopy – Scanning tunneling electron microscopy – Image collection in electron microscopes – Environmental transmission electron microscopy – Electron energy loss spectroscopy at the nanometer scale – In-situ nano measurements.- Qualitative approach. Electron Energy Loss Spectroscopy; High Resolution Imaging Techniques- HREM, Atom probe field ion microscopy

Unit-II

(08 Hours)

Title: THERMAL ANALYSIS METHODS

Principle and Instrumentation of Thermogravimetry; Differential Thermal Analysis and Differential scanning calorimetry-Importance of thermal analysis for nanostructures.

Unit-III

(08Hours)

Title: SCANNING PROBE MICROSCOPY

Scanning Probe microscopy – Atomic manipulations – Atomic force microscopy – Scanning probe lithography – Optical microscopy – Confocal microscopy – Scanning near field optical microscopy – Secondary ion mass (SIMS) spectrometry – Matrix assisted laser desorption ionization mass spectrometry (MALDIMS).

Unit-IV

(08 Hours)

Title: SPECTROSCOPIC TECHNIQUES

Introduction to Molecular Spectroscopy and Differences-With Atomic Spectroscopy-Infrared (IR) Spectroscopy and Applications- Microwave Spectroscopy- Raman Spectroscopy and CARS Applications-Electron Spin Resonance Spectroscopy; New Applications of NMR Spectroscopy; Dynamic Nuclear Magnetic Resonance; Double Resonance Technique. Spectroscopy of semiconductors – Excitons – Infrared surface spectroscopy – Raman spectroscopy – Brillouin spectroscopy – Dynamic Light Scattering (DLS) – NMR Spectroscopy – ESR spectroscopy – Mossbauer spectroscopy

Unit-V**(08Hours)****Title: Nanoindentation Mechanical Characterisation**

Nanoindentation principles- elastic and plastic deformation -mechanical properties of materials in small dimensions- models for interpretation of nanoindentation load-displacement curves- Nanoindentation data analysis methods-Hardness testing of thin films and coatings- MD simulation of nanoindentation. Mechanical Characterization – Modulus and load carrying capability of nano region/ compression - microhardness – Fatigue – Abrasion and wear resistance – Super plasticity – Nano indentation – Nano tribology – Nano tribometre – Surface Force apparatus – Quartz crystal microbalance – Friction force microscope.

Unit-VI**(08 Hours)****Title: Structural Characterization**

Neutron and X- ray diffraction – Debye Scherrer formula – Dislocation density – Micro strain macromolecular crystallography using synchrotron radiation – Role for neutron scattering in nano science - Photoluminescence - Thermo luminescence – X-ray absorption Fine Structure (XAFS) – Extended X- ray absorption fine structure (EXAFS) – Electron scattering for chemical Analysis (ESCA). X-ray diffraction (XRD), X-Ray Photoelectron Spectroscopy, X-ray powder diffraction – single crystal diffraction techniques - Determination of accurate lattice parameters – structure analysis - profile analysis - particle size analysis using Scherer formula. X-Ray Characterization of Nanomaterials – EDAX and WDA analysis – EPMA – ZAP corrections.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. B. D.Cullity, “Elements of X-ray Diffraction”, 4th Edition, Addison Wiley, 1978.
2. M. H.Loretto, “Electron Beam Analysis of Materials”, Chapman and Hall, 1984.
3. R.M.Rose, L.A.Shepard and J.Wulff, “The Structure and Properties of Materials”, Wiley Eastern Ltd,
4. B.W.Mott, “Micro-Indentation Hardness Testing”, Butterworths, London, 1956.
5. Charles P Poole Jr and Frank J Ownes, “Introduction to Nanotechnology”, John Wiley Sons, 2003.
6. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkar Raguse, “Nanotechnology:Basic sciences and emerging technologies”, Overseas Press, 2005.
7. Willard, “Instrumental Methods of Analysis”, 2000.
8. Ewing. Etal, “Instrumental Methods for Chemical Analysis”, 2000.

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

ENERGY, ENVIRONMENT, SAFETY AND COMMERCIALIZATION FOR NANOTECHNOLOGY

TEACHING SCHEME

Lectures : 04 Hrs/Week

EXAMINATION SCHEME

Theory	: 60 Marks
Duration	: 03 Hours
Unit Test –I	: 20 Marks
Unit Test –II	: 20 Marks
Theory Credits	: 04

Unit-I (08 Hours)

Title: Renewable Energy Technology

Energy challenges, development and implementation of renewable energy technologies - nanotechnology enabled renewable energy technologies - Energy transport, conversion and storage, Nano, micro and meso scale phenomena and devices.

Unit-II (08 Hours)

Title: Micro Fuel Cell Technology

Micro-fuel cell technologies, integration and performance for micro-fuel cell systems - thin film and microfabrication methods - design methodologies - micro-fuel cell power sources,

Unit-III (08Hours)

Title: Microfluidic Systems

Nano-electromechanical systems and novel microfluidic devices - nano engines - driving mechanisms - power generation - microchannel battery - micro heat engine (MHE) fabrication - thermocapillary forces - Thermocapillary pumping (TCP) - piezoelectric membrane.

Unit-IV (08 Hours)

Title: Hydrogen Storage Methods

Hydrogen storage methods - metal hydrides - size effects - hydrogen storage capacity - hydrogen reaction kinetics - carbon-free cycle- gravimetric and volumetric storage capacities - hydriding/dehydriding kinetics - high enthalpy of formation - and thermal management during the hydriding reaction - distinctive chemical and physical properties - multiple catalytic effects - degradation of the sorption properties - hydride storage materials for automotive applications.

Unit-V (08Hours)

Title: Environmental Concerns of Nanomaterials

Identification of Nano - Specific Risks- Responding to the Challenge -Human health hazard – Risk reduction – Standards – Safety – transportation of NP– Emergency responders. Risk

assessment –Environmental Impact – Predicting hazard – Materials Characterization. Risk Assessment related to nanotechnology – Environmental and policy making - Ecotoxicity measurement of Polychlorinated biphenyl and intermediates in their degradation Vacuum Packaging under inert gas atmosphere, Methodology for Stabilization, Human safety in Nonmaterial processing area.

Unit-VI

(08 Hours)

Title: Product Development with Nanomaterials

Criteria for selection of product- Product development process- Design for Manufacture - Estimate the manufacturing cost- Reduce the support cost- Prototyping- Economics of Product development projects - Elements of Economic analysis- financial models - Sensitive analysis and influence of the quantitative factors.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. J. Twidell and T. Weir, Renewable Energy Resources, E & F N Spon Ltd, London, 1986.
2. Hydrogen from Renewable Energy Sources by D. Infield,
3. Fuel Storage on Board Hydrogen Storage in Carbon Nanostructures by R.A. Shatwell,
4. Fuel cell technology handbook. Hoogers. CRC Press, 2003.
5. Handbook of fuel cells: Fuel cell technology and applications by Vielstich. Wiley, CRC Press, 2003.
6. P.P. Simeonova, N. Opopol and M.I. Lus ter, “Nanotechnology - Toxicological Issues and Environmental Safety”, Springer 2006.

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2 -Units IV,V and VI

Elective I: COMPUTATIONAL NANOSCIENCE

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

Unit-I

(08 Hours)

Title: Fundamental Principles Of Numerical Methods

Scientific Modeling - Numerical data and Numerical operations -Numerical Algorithms - Numerical Programs -Numerical Software - Approximations in Mathematical Model building- Numerical integration -Differentiation -Variational finite element methods-Rayleigh's method-Ritz method.

Unit-II

(08 Hours)

Title: Mathematical Modeling

Mathematical modeling - physical simulation - advantages and limitations - process control - Transport phenomena- concept of physical domain and computational domain - assumptions and limitations in numerical solutions – Finite element method and Finite difference method.

Unit-III

(08Hours)

Title: Differential Equations & Applications

Euler method, Runge-Kutta method, Multi step-differential equations-boundary values- Elliptic equations-one dimensional parabolic equation-hyperbolic equation- partial differential equations -separation of variables-wave equation-Laplace equation-nonlinear partial differential equations - approximation methods of nonlinear differential equations.

Unit-IV

(08 Hours)

Title: Simulation

Basic concepts of simulation- data manipulation, data exchange of the structure, properties and processing of materials-Three dimensional model for capillary nanobridges and capillary forces. Molecular dynamics simulation.

Unit-V

(08Hours)

Title: Monte Carlo Methods

Basics of the Monte Carlo method-Algorithms for Monte Carlo simulation-Applications to systems of classical particles-modified Monte Carlo techniques-percolation system-variation Monte Carlo method-diffusion Monte Carlo method - Quantum Monte Carlo method.

Unit-VI

(08 Hours)

Title: Nanoscale Modeling and Simulations

Introduction to Matlab and Mathematics (and their open source counterparts-Scilab and Octave); examples from nano-optics and nano-electronics, Molecular dynamics, computing and simulations, Simulations from ab initio to multiscale Modeling, Nanodesign Nano-CAD.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. S.C. Chapra and R.P.Canale, "Numerical methods for Engineers", Tata McGraw Hill, New Delhi, 2002.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2004.
3. R.J. Schilling and S.L. Harris, "Applied Numerical Methods for Engineers using MATLAB and C", Thomson publishers, New Delhi, 2004..
4. D. Frenkel and B. Smith, "Understanding molecular simulation from algorithm to applications", Kluwar Academic Press, 1999.
5. K. Ohno, K. Esfarjani and Y. Kawazoe, "Introduction to Computational Materials Science from ab initio to Monte Carlo Methods", Springer-Verlag, 1999.

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

Elective I: NANO ELECTRONICS

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

Unit-I

(08 Hours)

Title: Semiconductor Nanodevices

Single-Electron Devices; Nano scale MOSFET – Resonant Tunneling Transistor - Single-Electron Transistors; Single-Electron Dynamics; Nanorobotics and Nanomanipulation; Mechanical Molecular Nanodevices; Nanocomputers: Theoretical Models; Optical Fibers for Nanodevices; Photochemical Molecular Devices; DNA-Based Nanodevices; Gas-Based Nanodevices; Micro and Nanomechanics.

Unit-II

(08 Hours)

Title: Electronic And Photonic Molecular Materials

Preparation –Electroluminescent Organic materials - Laser Diodes - Quantum well lasers:- Quantum cascade lasers- Cascade surface-emitting photonic crystal laser- Quantum dot lasers- Quantum wire lasers:- White LEDs - LEDs based on nanowires - LEDs based on nanotubes- LEDs based on nanorods High Efficiency Materials for OLEDs- High Efficiency Materials for OLEDs - Quantum well infrared photo detectors.

Unit-III

(08Hours)

Title: Thermal Sensors

Thermal energy sensors -temperature sensors, heat sensors- Electromagnetic sensors- electrical resistance sensors, electrical current sensors, electrical voltage sensors, electrical power sensors, magnetism sensors - Mechanical sensors -pressure sensors, gas and liquid flow sensors, position sensors - Chemical sensors - Optical and radiation sensors.

Unit-IV

(08 Hours)

Title: Gas Sensor Materials

Criteria for the choice of materials, Experimental aspects – materials, properties, measurement of gas sensing property, sensitivity; Discussion of sensors for various gases, Gas sensors based on semiconductor devices.

Unit-V

(08Hours)

Title: Biosensors

Principles- DNA based biosensors – Protein based biosensors – materials for biosensor applications- fabrication of biosensors—future potential

Unit-VI

(08 Hours)

Title: NanoBio Electronic Systems

Nano Bio Sensors, Bio-Characterization

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. W. Ranier, “Nano Electronics and Information Technology”, Wiley, (2003).
2. K.E. Drexler, “Nano systems”, Wiley, (1992).
3. M.C. Pettey, “Introduction to Molecular Electronics”.

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2 -Units IV,V and VI

Elective I: NANO MEDICINE

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

Unit-I

(08 Hours)

Applications of nano-medicine: Bio- Pharmaceuticals, biological implants, diagnostic tools, Genetic testing – imaging – nanoparticles probe

Unit-II

(08 Hours)

Microfabricated drug delivery systems: microneedles- micropumps-microvalves-implantable microchips,

Unit-III

(08Hours)

Nanocarriers : drug delivery : sustained / controlled/ targeted

Unit-IV

(08 Hours)

Polymeric nanoparticulate systems: polymeric micelles as drug carriers – dendrimers as nanoparticulate drug carriers - nanocapsules preparation, characterization and therapeutic applications

Unit-V

(08Hours)

Liposomes for genetic vaccines and cancer therapy - recent advances in microemulsions as drug delivery vehicles, lipoproteins as pharmaceutical carriers, solid lipid nanoparticles as drug carriers Tumor detection and targeting in vivo, Gene Therapy using nanoparticles

Unit-VI

(08 Hours)

Diagnosis, Characterization and Testing of Nano-Bio Systems.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Practicals:

1. Liposome based delivery of DNA (GFP based vector) in cells and their detection under fluorescence microscope-4
2. Delivery of nanoparticles based drugs in cells-3
3. Isolation of protein, estimation and running of gel, western blotting to detect a particular protein (e.g. p53)- 5

Books /Text References

1. Dr.Parag Diwan and Ashish Bharadwaj (eds) Nano Medicines, Pentagon Press
2. Vladimir P.Torchilin (Ed.) Nanoparticulates as Drug Carriers, Imperial College Press, North Eastern University, USA
3. Drug Delivery: Engineering Principles for Drug Therapy, M. Salzman.
4. Drug Delivery and Targeting, A.M. Hillery, CRC Press.
5. Drug Delivery: Principles and Applications, B. Wang, Wiley Interscience

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

Elective I: NANO ENGINEERED DEVICES

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

Unit-I

(08 Hours)

Title: Quantum Devices

Quantum Electronic devices – upcoming electronic devices – Electrons in mesoscopic structures – Shortchannel MOS Transistor – Split gate transistor – Electron wave transistor – Electron spin transistor – Quantum cellular Automata – Quantum Dot array – Quantum computer- Bit and Qubit – Coherence and Entanglement – Quantum Parallelism.

Unit-II

(08 Hours)

Title: Tunneling Devices

Tunneling element – Tunnel Effect and Tunneling Elements -Tunneling Diode – Resonant Tunneling Diode – Three -Terminal Resonate Tunneling Devices -Technology of RTD-Digital circuits design based on RTDs –Memory Applications – Basics Logic Circuits – Dynamic Logic Gates - Digital circuits design based on RTBT –RTBT Mobile – RTBT Threshold Gate – RTBT Multiplexer – Single Electron Transistor(SET) – Principle –Coulomb Blockade- Performance – Technology- Circuit Design- Writing and Drivers – Logic and Memory Circuits – SET adder as an Example of a Distributed Circuit – Comparison between FET and SET.

Unit-III

(08Hours)

Title: Superconducting Devices And Photonics

Basics - Macroscopic characteristics – Macroscopic model- Super conducting switching De vices – Cryotron-Josephson Tunneling Devices - Elementary circuits – Associative or Content – Addressable Memory - SQUID– Flux Quantum device –LC –Gate – Magnetic Flux Quantum – Quantum cellular Automata – Quantum computer with Single Flux devices – SFQD- RSFQD – Application of superconducting devices – Intergrated Electronics – Comparison of FET Electronics. Introduction to Photonics - Principle- Fabrication –application.

Unit-IV

(08 Hours)

Title: Uncertainty Of Nanodevices

Limits of Integrated Electronics - Survey of Limits – Replacement of Technologies – Energy Supply and Heat Dissipation – Parameter Spread as Limiting Effect – Limits due to Thermal

Particle motion - Debye Length –Thermal Noise- Reliability of as Limiting Factor – Physical limits – Thermodynamic Limits - Relativistic Limits– Equal Failure Rates by Tunneling and Thermal Noise – Final Objectives of Integrated Electronic Systems -Removal of uncertainty by Nanomachines – Uncertainties in Nanosystems - Uncertainties in the Development of Nanoelectronics.

Unit-V

(08Hours)

Title: Molecular And Bioelectronics

Bioelectronics – molecular processor – DNA Analyser molecular electronics – switches based on fullerenes and nanotubes – polymer electronic – self Assembling circuits – optical molecular memories – DNA computer – Information Processing with chemical reaction – Nanomachines – Parallel Processing - Drexler – Smalley debate – realistic projection- Synergy of Nano-Bio-Info.

Unit-VI

(08 Hours)

Title: Nanobio Systems

Reference(s) :

1Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. K. Goser, P. Glosekotter and J. Diens tuhl, “Nanoelectronics and Nanosystems -From Transistors to Molecular Quantum Devices” , Springer, 2004.
- 2 Herve Rigneault, Jean-Michel Lourtioz, Claude Delalande, Ariel Levenson, “Nanophotonics”, ISTE.
3. W.R.Fahrner, “Nanotechnology and Nanoelectronics – Materials, Devices and Measurement Techniques” Springer, 2006.

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

Elective II: NANO PHOTONICS

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

Unit-I

(08 Hours)

Title: Quantum Confined Materials

Quantum dots – optical transitions – absorption-inter-band transitions-quantum confinement intraband transitions-fluorescence/ luminescence–photoluminescence /fluorescence optically excited emission – electroluminescence emission.

Unit-II

(08 Hours)

Title: Plasmonics

Internal reflection and evanescent waves- plasmons and surface plasmon resonance (SPR)- Attenuated total reflection- Grating SPR coupling- Optical waveguide SPR coupling- SPR dependencies and materials- plasmonics and nanoparticles.

Unit-III

(08Hours)

Title: New Approaches in Nanophotonics

Near-Field Optics- Aperture near-field optics- Apertureless near-field optics- Near-field scanning optical microscopy (NSOM or SNOM)- SNOM based detection of plasmonic energy transport- SNOM based visualization of waveguide structures- SNOM in nanolithography- SNOM based optical data storage and recovery.

Unit-IV

(08 Hours)

Title: Biophotonics

Interaction of light with cells- tissues- nonlinear optical processes with intense laser beams- photoinduced effects in biological systems-generation of optical forces-optical trapping and manipulation of single molecules and cells in optical confinement-laser trapping and dissection for biological systems-single molecule biophysics- DNA protein interactions.

Unit-V**(08Hours)****Title: Photonic Crystals**

Important features of photonic crystals- Presence of photonic bandgap- Anomalous Group Velocity Dispersion- Microcavity-Effects in Photonic Crystals- Fabrication of photonic crystals- Dielectric mirrors and interference filters- Photonic Crystal Laser- PC based LEDs- Photonic crystal fibers (PCFs)- Photonic crystal sensing.

Unit-VI**(08 Hours)****Title: Nanobio Systems****Termwork**

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. H.Masuhara, S.Kawata and F.Tokunaga, Nano Biophotonics, Elsevier Science, 2007.
2. V.M. Shalaev and S.Kawata, Nanophotonics with Surface Plasmons (Advances in Nano-Optics and Nano-Photonics), 2007.
3. B.E.A. Saleh and A.C.Teich, Fundamentals of Photonics, John-Weiley & Sons, New York, 1993.
4. M.Ohtsu, K.Kobayashi, T.Kawazoe, and T.Yatsui, Principles of Nanophotonics (Optics and Optoelectronics), University of Tokyo, Japan, 2003.
5. P.N. Prasad, Introduction to Biophotonics, John Wiley & Sons, 2003.
6. J.D.Joannopoulos, R.D.Meade and J.N.Winn, Photonic Crystals, Princeton University Press, Princeton, 1995.

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

Elective II: INDUSTRIAL NANOTECHNOLOGY

TEACHING SCHEME

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory	: 60 Marks
Duration	: 03 Hours
Unit Test –I	: 20 Marks
Unit Test –II	: 20 Marks
TW/Pract./Oral	: 50 Marks
Theory Credits	: 04
Practical Credits	: 01

Unit – I

(08 Hours)

Title:Product Design

Concept generation- Product Architecture- Industrial Design Process- Management of Industrial design Process and Assessing the quality of Industrial Design - Establishing the product specification

Unit – II

(08 Hours)

Title: Product Development

Criteria for selection of product- Product development process- Design for Manufacture - Estimate the manufacturing cost- Reduce the support cost- Prototyping- Economics of Product development projects - Elements of Economic analysis- financial models - Sensitive analysis and influence of the quantitative factors.

Unit – III

(08 Hours)

Title:Management Techniques

Technology Management - Scientific Management - Development of management Thought-Principles of Management- Functions of management-planning- organization- Directing, Staffing and Controlling- Management by objective- SWOT analysis- Enterprise Resource planning and supply chain management.

Unit – IV

(08 Hours)

Title: Entrepreneurial Competence & Environment

Concept of Entrepreneurship- Entrepreneurship as a career- Personality Characteristic a successful Entrepreneur- Knowledge and skill required for an Entrepreneur- Business environment- Entrepreneurship Development Training - Center and State government policies and Regulations - International Business.

Unit–V Management Of Small Business (08 Hours)

Pre-feasibility study - Ownership - budgeting - project profile preparation - Feasibility Report preparation - Evaluation Criteria- Market and channel selection- Product launching - Monitoring and Evaluation of Business- Effective Management of Small business.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Reference Books:

1. Karal, T. Ulrich Steven, D. Eppinger, “Product Design and Development”, McGraw- Hill International, editions, 2003.
2. H. Koontz and H. Weihrich, “Essentials of management”, McGraw Hill Publishing company, Singapore international edition, 1980.
3. S. Rosenthal, “Effective Product Design and Development”, Irwin, 1992.
4. Nanotechnology Standards (Nanostructure Science and Technology) by Vladimir Murashov and John Howard (Feb 3, 2011)
5. Introduction to Nanoscience and Nanotechnology by Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta and John J. Moore (Dec 22, 2008)

Text Books:

1. J.J. Massie, “Essentials of Management” Prentice Hall of India Pvt. Ltd., 1985.
2. Hisrich, “Entrepreneurship” Tata Mc Graw Hill, New Delhi, 2001.
3. Nanotechnology: The Business (Perspectives in Nanotechnology) by Michael T. Burke (Sep 29, 2008)
4. Nanotechnology Demystified by Linda Williams and Wade Adams (Aug 29, 2006)
5. Microsystems and Nanotechnology by Zhaoying Zhou, Zhonglin Wang and Liwei Lin (Nov 28, 2011)

Syllabus for Unit Test

Unit Test 1-- Units I ,II and III

Unit Test 2- Units IV,V and VI

Elective II: NANO MATERIAL SCIENCE

TEACHING SCHEME

Lectures : 04 Hrs/Week
Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks
Duration : 03 Hours
Unit Test –I : 20 Marks
Unit Test –II : 20 Marks
TW/Pract./Oral : 50 Marks
Theory Credits : 04
Practical Credits : 01

Unit-I

(08 Hours)

Title: Physical Properties

Melting point and phase transition processes- quantum-size-effect (QSE). Size-induced metal-insulator-transition (SIMIT)- nano-scale magnets, transparent magnetic materials, and ultrahigh-density magnetic recording materials-chemical physics of atomic and molecular clusters.

Unit-II

(08 Hours)

Title: Physical Chemistry of Solid Surfaces

Surface energy – chemical potential as a function of surface curvature-Electrostatic stabilization-surface charge density-electric potential at the proximity of solid surface-Van der Waals attraction potential.

Unit-III

(08Hours)

Title: Chemistry Aspects

Photochemistry; Photoconductivity; Electrochemistry of Nanomaterials-Diffusion in Nanomaterials; Nanoscale Heat Transfer; Catalysis by gGold Nanoparticles; Transport in Semiconductor Nanostructures; Transition Metal Atoms on Nanocarbon Surfaces; Nanodeposition of Soft Materials; Nanocatalysis.

Unit-IV

(08 Hours)

Title: NanoStructures

Electronic Structure of Nanoparticles- Kinetics in Nanostructured Materials- Zero dimensional, one-dimensional and two dimensional nanostructures- clusters of metals and semiconductors, nanowires, nanostructured beams, and nanocomposites-artificial atomic clusters-Size dependent properties-size dependent absorption spectra-phonons in nanostructures.

Unit-V

(08Hours)

Title: Nanosystems

Nanoparticles through homogeneous nucleation-Growth controlled by diffusion-growth controlled by surface process-influences of reduction reagents-solid state phase segregation-kinetically confined synthesis of nanoparticles-template based synthesis.

Unit-VI

(08 Hours)

Title: Nano Electronics

Quantization of action, charge and flux – electrons in potential well – photons interacting with electrons in solids – diffusion processes – basic information theory – data & bits – data processing - Size Effects on structure and Morphology of free or Supported Nanoparticles – Size and confinement Effects – Fraction of surface atoms – Specific surface energy and surface stress.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. K.W. Kolasinski, “Surface Science: Foundations of Catalysis and Nanoscience”, Wiley, 2002.
2. Joel I. Gersten, “The Physics and Chemistry of Materials”, Wiley, 2001.
3. A. S. Edelstein and R. C. Cammarata, “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Pub., 1998.
4. S.Yang and P.Shen: “Physics and Chemistry of Nanostructured Materials”, Taylor & Francis, 2000.
5. G.A. Ozin and A.C. Arsenault, “Nanotechnology : A chemical approach to nanomaterials”, Royal Society of Chemistry, 2005.
6. The Physics and Chemistry of Solids - Stephen Elliott & S. R. Elliott

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

Elective II: NANO COMPOSITES

TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

Unit-I

(08 Hours)

Title: Metal Based Nanocomposites

Metal Oxide or Metal Ceramic Composites, Different aspects of their preparation techniques, their final properties and functionality.

Unit-II

(08 Hours)

Title: Polymer Based Nanocomposites

Preparation and Characterization of Diblock Copolymer based nanocomposites; Polymer – Carbon Nanotubes based composites, Their electrical, magnetic and mechanical properties. Polymer Dendrimer based composite .Percolation theory for CNT polymer based nanocomposite. Nanoscale reinforcement:Nanoclays:Carbon Nanomaterials,Polymer Matrix Nanocomposite. Lamellar nanocomposite.Application of different nanocomposite in industries:polymer:textile:automotive etc.,

Unit-III

(08Hours)

Title: Properties and Characterization of Nanocomposites

Unit-IV

(08 Hours)

Title: Bionano Composites for Tissue Engineering

Major Physiological systems of current interest to Biomedical Engineers: Cardiovascular, endocrine, nervous, visual, gastrointestinal systems. Tissue Engineering for specific organs such as, Bone marrow, skeletal muscles and cartilage, Cell biological fundamentals of tissue engineering. Application of nanomaterials in biomedical Transplant: architecture , assembly, transportation, nutrients. Concept of transplant and its rejection. Xenotransplantation. Imaging of cancer cells, Tissue imaging by QD, Nanoparticles: principles process, application .MRI.

Unit-V

(08Hours)

Title Manufacturing of Bionanomaterials

Natural and artificial (Microbial Nanoparticles production,Viral Nanoparticles production, Plant and diatoms Nanoparticles production), DNA, peptide, Protein ,enzyme based manufacturing: Application: architecture: electronics, (Topdown, Bottom up):Devices, Nano particles with

biosystems ,Natural biocomposite :spider silk:Bone :shells,CNT based biomaterials: using cnt as a template, Biosensors:using Nano materials with bio systems(Plant and animal cell,DNA,microtubules,antibodies,antigens etc..).Cellular imaging. Bionanoarrays: DNA, Protein, nucleotide based, viruses . DNA based computation . DNA as functional template for nanocircuitry. Nanomotors. Cellular nanosystem interaction :concept, process ,application,Biochip. Magnetic Nanoparticle by bacteria:mechanism of formation, application.

Unit-VI

(08 Hours)

Title: Properties and Characterization of Bionanomaterials

Use of AFM, SEM , TEM, XRD based bionanomaterial characterization, Properties of DNA structure as nanotechnology aspects, Surface modification properties of Cell, antibodies, antigens, proteins, enzymes.

Termwork

At least Eight Assignment based on above syllabus

Oral

Term work and oral will be based on above syllabus.

Books /Text References

1. Nanocomposite Science & Technology Ajayan, Schadler & Braun
2. Nanocomposites, By Challa S. S. R. Kumar, John Wiley & Sons.
3. Nanostructured Materials: Selected Synthesis Methods, Properties, and Applications, Philippe Knauth, Joop Schoonman
4. Polymeric Nanocomposites: Theory and Practice, By Sati N. Bhattacharya, Musa Rasim Kamal, Rahul K. Gupta, Hanser Verlag
5. Polymer Nanocomposites: Processing, Characterization, And Application, McGraw-Hill Prof Med/Tech
6. Introduction to Nanocomposite Materials: Properties, Processing, By Thomas E. Twardowski, Thomas Twardowski, DEStech Publications, Inc.
7. Nanobiotechnology II more concept and application chad A. Mirkin and christof M.niemeyer Publi WILY WH.
8. **Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology** - Hari Singh Nalwa.
9. **Bionanotechnology: Lessons from Nature** by David S. Goodsell.

Syllabus for Unit Test

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

SELF STUDY-I

MODELING AND SIMULATION OF NANOSYSTEMS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

Unit I:

Introduction to modeling and simulation

Abstract, what is modeling? ,What is simulation?, How to develop a simulation model, How to design a simulation experiment, how to perform simulation analysis, what makes a problem suitable for simulation modeling and analysis, How to select simulation software, benefits of simulation modeling and analysis, what are some pitfalls to guard against in simulation.

Unit II:

Computer Modeling of Nanostructured material

Introduction, Modeling Methods: Molecular dynamics and Monte Carlo Modeling, atomic potential energies and Forces, Multiscale Modeling, Nanostructured Materials: Nanoparticle properties

Unit III:

Microstructure Modeling

Microstructure Modeling, Sintering and grain growth dynamics, mechanical deformation and fracture, shock loading, irrational properties, Nan alloys, Prospects for future modeling

Unit IV:

Molecular Dynamics:

Overview, Nano statistical mechanics, Fundamentals of Molecular Dynamics

Unit V:

Software's for Molecular Dynamics Modeling

Principles of Nano Modeling, PES revisited, accuracy requirements, conclusions

Unit VI:

Application: Nanorobot modeling and simulation

Abstract, introduction, blood components, nanorobot modeling and design, nanorobot simulation

Books /Text References

1. Nanostructure material by Carl C. Koch
2. Nanosystems by K.Eric Drexler

Syllabus for Unit Test

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

SYNTHESIS AND DESIGN OF NANOSCALE PRODUCTS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

Unit I:

Fundamental concepts of Nanoscale materials, various types of nanomaterials used in Nanotechnology such as CNTs, fullerenes, nanorods, metal oxides, quantum dots, etc.

Unit II:

Approaches such as top-down approach, bottom up approach, biomimetic and functional approach to construct nanomaterials

Unit III:

Nanomaterials related to nanoionics and nanoelectronics, Reticular synthesis and the design of new materials, Synthesis of highly ordered mesoporous materials from layered polysilicates, Flexible Synthesis of Composite Aerogels

Unit IV:

Nanoscale integrated three dimensional circuits

Unit V:

Nanoscale materials for bulk applications

Unit VI:

Toxicological aspects of nanoscaled materials

Books /Text References

1. Mick Wilson, Kamali Kannargare., Geoff Smith, “Nano technology: Basic Science and Emerging technologies”, Overseas Press, 2005.
2. Nanostructures and Nanomaterials: synthesis, properties and applications, G. Cao and Y. Wang, World Scientific, 2nd edition, 2011
3. W.Gaddand, D.Brenner, S.Lysherski and G.J.Infrate (Eds.), Handbook of NanoScience, Engg. and Technology, CRC Press, 2002.
4. K. Barriham, D.D. Vvedensky, Low dimensional semiconductor structures: fundamental and device applications, Cambridge University Press, 2001.
5. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties &Applications, Imperial College Press, 2004.

Syllabus for Unit Test

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV, V and VI

APPLICATIONS OF NANOTECHNOLOGY IN FOOD AND AGRICULTURE

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

Unit I:

Use of nanotechnologies in the agriculture sector

Precision farming for basic agriculture, real time monitoring of soil conditions, combating the crop pathogens and the treatment of waste

Unit II:

Strategic applications of Nanotechnology in agriculture

Development of innovative products in food production, processing, preservation and packaging and applications in agriculture, animal feed and agrochemicals, disease detection tools, targeted treatments

Unit III:

Impact of nanotechnologies in the food sector

Nanotechnology-based food and health food products and food packaging materials, Nano-enabled food contact materials (FCMs) and packaging, Polymer composites with various nanomaterials, coatings containing nanoparticles

Unit IV:

Nanosensors in food sector

Intelligent packaging concepts based on nanosensors, use of nanodiagnostic tools for detection and monitoring in food production, sensing applications, biosensors for detection of herbicides, pesticides and pathogens

Unit V:

Encapsulation technology for nanodelivery systems

Use of micelles, liposomes or biopolymer-based carrier systems, processed nanostructures, inorganic and organic nanomaterials in health food products, surface functionalized nanomaterials

Unit VI:

Health aspects

Assessment of human health risks associated with the use of nanotechnologies and nanomaterials in the food and agriculture sectors, safety, current risk assessment approaches used by FAO/WHO, environmental, ethical, policy and regulatory issues

Books /Text References:

1. Nanotechnology in the Agri-food Sector, Lynn J. Frewer , Willem Norde, Arnout Fischer and Frans Kampers, 2011
2. Bionanotechnology: Lessons from Nature by David S. Goodsell
3. Nanomedicine, Vol. IIA: Biocompatibility by Robert A. Freitas
4. Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology - Hari Singh Nalwa
5. Nanobiotechnology; ed. C.M. Niemeyer, C.A. Mirkin.

Syllabus for Unit Test

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

FINITE ELEMENT METHODS FOR NANOSCALE STRUCTURES

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

UNIT I:

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principle of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis

UNIT II:

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates

UNIT III:

Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equations by Galerkin's method, Solving cantilever beam problem by Galerkin's approach Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrilateral elements.

UNIT IV:

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super -parametric elements, Concept of Jacobin matrix.
Numerical Integration: Numerical Integration, one point formula and two point formulas

UNIT V:

Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermite shape functions

UNIT VI:

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy Invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, direct method for deriving shape functions using Langrage's formula, Plane stress problems

Books /Text References:

1. J.J. Massie, “Essentials of Management” Prentice Hall of India Pvt. Ltd., 1985.
2. Hisrich, “Entrepreneurship” Tata Mc Graw Hill, New Delhi, 2001.
3. Nanotechnology: The Business (Perspectives in Nanotechnology) by Michael T. Burke (Sep 29, 2008)
4. Nanotechnology Demystified by Linda Williams and Wade Adams (Aug 29, 2006)
5. Microsystems and Nanotechnology by Zhaoying Zhou, Zhonglin Wang and Liwei Lin (Nov 28, 2011)

Syllabus for Unit Test

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

MEMS & NEMS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

UNIT I:

Introduction

Basic Electronics, Application of Electronics to Mechanical Systems, Various Micro Mechano-Electronic Systems, Various Nano Mechano-Electronic Systems, Components and Applications

UNIT II:

Micro-electromechanical Systems (MEMS)

What is MEMS? Definitions and Classifications, History, Applications, Established MEMS Applications New MEMS Applications, MEMS Market Miniaturization Issues

UNIT III:

MEMS Fabrication Methods

Photolithography, Materials for Micromachining Substrate ,Additive Films and Materials, Bulk Micro machining ,Wet Etching, Dry Etching ,Surface Micro machining , Fusion Bonding, High-Aspect-Ratio-Micromachining,

UNIT IV:

NEMS Fabrication Methods

LIGA, self assembling system, Molecular Manipulation, Laser Micromachining, 3Computer Aided Design, Assembly and System Integration, Packaging, Multi-Chip Modules, Passivation and Encapsulation, Foundry Services

UNIT V:

Applications

MEMS Transducers, Piezoelectric MEMS, Interstitial MEMS, Biochemical analysis, Power MEMS, Acoustical MEMS, Microreactors, Optical MEMS

UNIT VI:

Future of MEMS

Industry Challenges, the Way Ahead, NEMS

Books /Text References/Web Site:

1. An Introduction to MEMS (Micro-electromechanical Systems) – By PRIME Faraday Partnership

<http://www.amazon.co.uk/exec/obidos/ASIN/1844020207>

2. MEMS and NEMS: Systems, Devices, and Structures. Sergey Edward Lyshevski, Rochester Institute of Technology, New York, USA. CRC Press, 2002.
3. Development of micro-diesel injector nozzles via MEMS technology and effects on spray characteristics Seunghyun Baik, James P. Blanchard and Michael L. Corradini (Pdf files)

Syllabus for Unit Test

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

SELF STUDY-II

SILICON NANOSTRUCTURES & CARBON NANOTUBES BASED NANOELECTRONICS

TEACHING SCHEME

Lectures: 04 Hrs/Week

EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

Unit I:

Semiconductor Nanostructures & Nanomaterials

Semiconductor Nanostructures & Nanomaterials: Introduction, Importance of Semiconductor Nanomaterials in Electronic Industry, Various Silicon Nanostructures, Silicon Nanowires

Silicon Quantum Dots, Silicon Nanotubes, Hybrid Silicon-Carbon Nanotubes

Silicon Carbide Nanotubes

Unit II:

Carbon Nanotubes Nanoelectronics

Carbon Nanotubes: Introduction, Synthesis of Carbon Nanotubes, Properties of Carbon Nanotubes, Specific Applications in Electronics, Carbon Nanotube based Field Emission Devices, Carbon Nanotube Transistors, Single Electron Transistor, Ballistic Carbon Nanotube Field Effect Transistor with Palladium Contact

Unit III:

Carbon Nanotubes: Nanoelectronics

Overview of Carbon Nanotube Field Effect Transistor Technology

Unit IV:

Notable Achievements in Nanoelectronics

Single-Molecule Electronics: Molecular electronics, Molecular logic gate, Molecular wires

Solid State Nanoelectronics: Nanocircuitry, Nanolithography, Nanosensors

Unit V:

Silicon Nanotechnology

Silicon Nanotechnology: CMOS Nanotechnology, Ballistic Properties, Memory

Unit VI:

Display Devices

Nano Emissive Display Devices, Quantum Dots, Nano Chips

Nano Electro Mechanical System (NEMS)

Books /Text References:

1. Nanotechnology Demystified by Linda Williams and Wade Adams (Aug 29, 2006)
2. Microsystems and Nanotechnology by Zhaoying Zhou, Zhonglin Wang and Liwei Lin (Nov 28, 2011)
3. Polymeric Nanocomposites: Theory and Practice, By Sati N. Bhattacharya, Musa Rasim Kamal, Rahul K. Gupta, Hanser Verlag
4. Polymer Nanocomposites: Processing, Characterization, And Application, McGraw-Hill.

Syllabus for Unit Test

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

SELF STUDY II

Subject: Nanobioelectronics

Unit I

Semiconductor Fabrication – Top-down techniques

Unit II

Introduction to Semiconductor and Carbon-based nanostructures

Introduction to Carbon-based electronic devices

Unit III

Electrical transport at nanoscale

Coupling of biology and nanoelectronics

Unit IV

Biorecognition and transduction events

Biosensors - Electrochemical and Impedance-based methods

Unit V

DNA bioelectronics

Protein (biomimetic) based nanodevices

Unit VI

Current applications in cancer, regenerative medicine, neuroscience,

SELF STUDY II

Subject: Compound Semiconductor Materials and Devices

Unit I

Introduction to the Compound semiconductor materials and devices

Miller Indices, Reciprocal lattice vector-1, Reciprocal vector -2.

Unit II

Bragg Diffraction-1, Bragg Diffraction-2.

Brillouin Zone, Bandstructure, Effective Mass, Infinite Quantum Well.

Unit III

DOS of Nanostructure-1, DOS of Nanostructure-2, Finite Quantum Well-1.

Finite Quantum Well-2, Triangular Well-1, Triangular well-2,

Double Quantum well-1, Double Quantum Well-2.

Unit IV

Bloch Theorem, Superlattice-1, Superlattice-2.

Heterostructure strain, Band gap engineering.

Unit V

Band alignment, anion rule, Auger recombination.

Unit VI

Long wavelength infrared photodetectors, Quantum cascaded lasers

SELF STUDY II

Subject: Nanoprocessing

Unit I

Introduction, Characterization and manipulation at nano-scale

Scanning electron microscope (SEM)

Transmission electron microscope (TEM)

Unit II

Scanning probe microscope (SPM)

Scanning tunneling microscope (STM)

Atomic force microscope (AFM)

Unit III

X-ray diffraction

Synthesis and processing 0D nanostructures – nanoparticles

Unit IV

Homogeneous nucleation

Synthesis of metallic nanoparticles

Synthesis of nonoxide semiconductor nanoparticles

Synthesis of oxide nanoparticles

Vapor phase synthesis

Solid-state synthesis

Unit V

Heterogeneous nucleation

Spatially confined growth

Core-shell nanoparticles

Unit VI

Synthesis and processing 1D nanostructures – nanowires/nanorods/nanotubes/nanofibers

Bottom-up approaches: Anisotropic growth

Top-down approach – electrospinning

Synthesis and processing 2D nanostructures – thin films

Vapor phase deposition

Liquid phase growth

SELF STUDY PAPER II: SEM IV

Subject: Introduction to Nano-modelling

Unit I

Computational Modelling – Process, Model, Mathematical Model, Methods of Computational Modelling, application to nano-engineering

Unit II

Molecular Dynamic – Modelling & Simulation, Analysis background, Potential Energy Function, Naoscale phenomena, approach to technique

Molecular mechanic – basic aspect, Mechanics of systems of particles, General co-ordinate system, Least Action Principle

Unit III

Energy Minimization - Concept, Methods - First order minimization, Second Order Minimization, Simplex Minimization. Application to molecular dynamic

Unit IV

Statistical Mechanics in Molecular Dynamics – Definition, Ensemble – Micro canonical, Canonical, Isobaric-Isothermal, MD and Time average, Ensemble average

Unit V

Boundary in MD – Periodic Boundary Condition – Fixed simulation cell, semi rigid atomistic boundary

Unit VI

MD Packages - GROMACS – Flow Chart, Computational Lab practical to use of this package

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B. Tech. (Electrical) – 2014 Course

Sem- I

Sr . N o.	Name of Course	Teaching Scheme				Evaluation scheme						Credits	
		The ory Hrs/ wee k	Tuto rial Hrs/ wee k	Practi cal Hrs/ week	Tot al	Theory				Practi cal	Tot al	The ory	P R
						ES E	Continuous Assessment			TW			
							Attend ance	Assign ment	Un it Te st				
1	Engineeri ng Mathem atics – I	3	1	--	4	60	10	10	20	--	10 0	3	1
2	Fundame ntals of Civil Engineeri ng	3	--	2	5	60	10	10	20	25	12 5	3	1
3	Engineeri ng Graphics	4	--	2	6	60	10	10	20	25	12 5	4	1
4	Engineeri ng Physics	4	--	2	6	60	10	10	20	25	12 5	4	1
5	Fundame ntals of Electrical Engineeri ng	3	--	2	5	60	10	10	20	25	12 5	3	1
6	Professio nal skill develop ment- 1	2	--	--	2	30	--	20	--	--	50	2	--
7	Worksho p Technolo gy	--	--	2	2	--	--	--	--	50	50	--	1
	Total	19	1	10	30	33 0	50	70	10 0	150	70 0	19	6

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**B. Tech. (Electrical) – 2014 Course
Sem- II**

Sr . N o.	Name of Course	Teaching Scheme				Evaluation scheme						Credits	
		The ory Hrs/ wee k	Tuto rial Hrs/ wee k	Practi cal Hrs/ week	Tot al	Theory			Practi cal	Tot al	The ory	P R	
						ES E	Continuous Assessment		TW				
							Attend ance	Assign ment					Un it Te st
8	Engineeri ng Mathem atics – II	3	1	--	4	60	10	10	20	--	10 0	3	1
9	Fundame ntals of Mechani cal Engineeri ng	3	--	2	5	60	10	10	20	25	12 5	3	1
10	Engineeri ng Mechani cs	4	--	2	6	60	10	10	20	25	12 5	4	1
11	Engineeri ng Chemistr y	4	--	2	6	60	10	10	20	25	12 5	4	1
12	Electrical and Electroni c Devices	3	--	2	5	60	10	10	20	25	12 5	3	1
13	Professio nal skill develop ment- 2	2	--	--	2	30	--	20	--	--	50	2	--
14	Fundame ntals of compute r program ming	--	--	2	2	--	--	--	--	50	50	--	1
	Total	19	1	10	30	33 0	50	70	10 0	150	70 0	19	6

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ENGINEERING MATHEMATICS-I

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

(08 Hours)

Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

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Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Civil Engineering

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:		
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits		
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks				
		Term Work: 25 Marks		01 Credit		
Course Pre-requisites:						
The Students should have						
1.	Concepts of units and conversions of units.					
2.	Basic knowledge of Chemistry					
3.	Basic knowledge of geography, concept of latitude and longitude.					
Course Objectives:						
To make student understand the scope and application of Civil Engineering						
Course Outcomes:						
Students will be able to understand						
1.	Different building components and material					
2.	Classification of surveying					
3.	Levelling of the ground					
4.	Planning of building					
5.	Methods of irrigation and water supply					
6.	Different methods of transportation					
UNIT - I	Civil Engineering Scope And Applications.				(06 Hours)	
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.					
UNIT - II	Surveying				(06 Hours)	
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.					
UNIT - III	Building Planning And Bye Laws				(06 Hours)	
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.					
UNIT - IV	Foundations and Earthquakes				(06 Hours)	
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.					
UNIT - V	Irrigation And Water Supply				(06 Hours)	
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures; Water supply, drinking water requirements and its quality, water and					

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	sewage treatment flow chart.	
UNIT - VI	Infrastructure	(06 Hours)
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
Term Work:		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
Reference Books:		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

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ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p>Lines and Dimensioning in Engineering Drawing Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p>Curves used in Engineering Practice Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p>Orthographic Projection Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p>Isometric Projections Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p>Projections of Points and Lines and planes Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p>Projection of Solids Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p>Section of Solids Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.
Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.

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2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks Term Work: 25marks	Practical: 01

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

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UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

(08 hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

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LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

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Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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02: Fundamentals of Electrical Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Mathematics	
2.	Physics	
Course Objectives:		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
Course Outcomes:		
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
5.	Define basic terms of single phase and three phase ac circuits and supply systems	
6.	Know and use electrical safety rules	
UNIT - I	Basic concepts	(06 Hours)
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	Network Theorems	(06 Hours)
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	Electrostatics	(06 Hours)
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	

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UNIT - IV	Magnetic Circuit & Transformer	(06 Hours)
	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.</p>	
UNIT - V	AC Fundamentals & AC Circuits	(06 Hours)
	<p>AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.</p>	
UNIT - VI	Electrical Wiring and Illumination system	(06 Hours)
	<p>Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.</p>	

Term Work:

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
 - a) Voltage and current ratios.
 - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books:

- 1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi
- 2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi
- 3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of

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India Pvt. Ltd	
Reference Books:	
1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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Workshop Technology

TEACHING SCHEME:

Theory: -
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -
Continuous Assessment: -
Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

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ENGINEERING MATHEMATICS-II

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

(08 Hours)

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Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition(1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar, Pune VidyarthiGrihaPrakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition(2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Thermodynamics- Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p>Introduction to I.C. Engines and turbines- Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p>Introduction to refrigeration, compressors & pumps- Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p>Energy Sources - Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p>Heat transfer- Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

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UNIT-IV	<p>Properties of fluids- Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p>Properties of Materials and their Applications- Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p>Mechanical devices - Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p>Mechanisms- Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p>Machine Tools- Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p>Introduction to manufacturing processes and Their Applications- Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

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References-

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

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10: Engineering Mechanics

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Scalar and Vector
2. Newton's law of motion
3. Law of friction
4. Concept of physical quantities, their units and conversion of units
5. Concept of differentiation and integration

Course Objectives:

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

Course Outcomes:

The student should be able to

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

UNIT - I	Resultant and Equilibrium	(06 Hours)
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
UNIT - II	Truss and Friction	(06 Hours)
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	Centroid and Moment of Inertia	(06 Hours)
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
UNIT - IV	Kinematics of Rectilinear motion of a Particle	(06 Hours)
	Equations of motion, Constant and variable acceleration, Motion Curves,	

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	Relative motion, Dependent motion.	
UNIT - V	Kinematics of Curvilinear motion of a Particle	(06 Hours)
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	Kinetics of a Particle	(06 Hours)
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	
Term Work:		
A) The term-work shall consist of minimum Five experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
B) The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.		
Text Books:		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
Reference Books:		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	

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ENGINEERING CHEMISTRY

Teaching Scheme:
Lectures: 4Hrs/Week
Practical: 2Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory: 04
Practical: 01
Term Work: 25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion
b) caustic embrittlement c) scales and sludges d) priming and foaming
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical
based on the zeolite process **(08 Hours)**

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects
(point and line defects), X-ray diffraction – Bragg's Law and numerical.
Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement,
chemistry of portland cement, chemical composition and compound constituents of portland cement,
properties of cement and its applications. **(08 Hours)**

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of
calorific values using Bomb calorimeter and Boys' gas calorimeter.
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of
coal, Numericals based on NCV, GCV. **(08 Hours)**

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical
and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.
Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating,
Hot dipping. **(08 Hours)**

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH,
Buffer solutions, Solubility Product, Redox Reactions.
Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage,
Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.
(08 Hours)

Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral
carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans
isomerism, E and Z isomers

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Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,
Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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02: Electrical & Electronic Devices		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Fundamentals of semiconductor physics	
Course Objectives:		
	This course introduces basic knowledge about electrical and electronics devices and measuring instruments .The course is designed for beginners to learn specifications, construction, characteristics and application circuits of It also introduces concepts of digital components	
Course Outcomes:		
1.	Classify different resistors, inductors and capacitors and select as per the application requirement.	
2.	Explain construction, characteristics, principle of operation of PMMC,MI, dynamometer type instruments and errors associated with them.	
3.	Describe and apply different methods of resistance measurement.	
4	Identify and describe electronic components, their circuits and electronic instruments (Diode, zener diode , LED, opto electronic device and CRO. Function generator, Digital mutimeter)	
5	Explain characteristics, principle of operation and applications of transistor and FET.	
6	Draw diagram and explain operation of transistor amplifiers , multivibrators and oscillators	
UNIT - I	Electrical Components	(06 Hours)
	Types of Resistors (Fixed, Variable, Precision-Carbon film, metal film, wire wound) ,their standard values, specifications and applications, Classification of capacitors based on dielectrics(Electrolytic, Ceramic, Polyester), their standard values, specifications and applications, Types of Inductors, Specifications & applications, Ferrite core, electromagnets	
UNIT - II	Electrical Measuring Instruments	(06 Hours)
	Static characteristics of an instrument, Accuracy, linearity, sensitivity, reproducibility, resolution, Types of errors, necessity of different torques in indicating instruments, recording instrument integrating instrument., Measurement of current and voltage : Construction, Principle of operation torque equation and sources of errors in PMMC, Moving Iron instrument, dynamometer type instrument, Extension of ranges using shunts and multipliers. Galvanometer: construction, principle of operation of D'Arsonval, vibration and ballistic galvanometer.	
UNIT - III	Measurement of Resistance	(06 Hours)
	Classification of resistances , measurement of Medium resistance ,	

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	ammeter voltmeter method , Wheatstone bridge, sensitivity of Wheatstone bridge, limitations of the method , measurement of low resistance .D.C. Potentiometer- Calibration of ammeter and voltmeter application, Kelvin bridge, Ohmmeter , measurement of high resistance , difficulties in measurement , use of guard circuit, direct deflection method , loss of charge method , earth tester and measurement of earth resistance, megger.	
UNIT - IV	Basic Electronic Devices	(06 Hours)
	Diode construction, characteristics , Half wave and full wave rectifier, filters, clipping and clamping circuits, zener diode, LED, seven segment display, photodiode , photo transistor ,opto coupler and optoisolator, DC regulated power supply, Series , Shunt regulator, line and load regulation, Three pin regulator ICs, Function Generator block diagram and working, front panel controls . Cathode Ray Oscilloscope block diagram and working, front panel controls, measurement of voltage and frequency , Digital multimeter block diagram and working	
UNIT - V	BJT Circuits	(06 Hours)
	Construction, characteristics and principle of operation of CE, CB, CC configuration, comparison, biasing circuits, DC operating point Transistor as an amplifier, current gain, α , β relationships, voltage gain , other parameters ,Hybrid parameters (for CE only), frequency response of amplifier . FET construction, characteristics, principle of operation, parameters, FET as an amplifier, Comparison of BJT and FET	
UNIT - VI	Amplifiers & Multivibrators	(06 Hours)
	Multistage transistor amplifier- direct, RC coupled and transformer coupled , Classes of Power amplifiers , efficiency of operation, Feedback amplifiers , concept effect of feedback on gain Transistor Oscillators- Tuned collector, Colpitt's, Hartley, Wien Bridge , RC phase shift oscillator , Transistor as switch - Multivibrators - Astable, Mono stable , Bi-stable.	

Term Work:

The term work shall consists of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.

1. Study of data sheets & specifications of Electrical Components
2. Study of PMMC,MI & Dynamometer type electrical measuring instruments.
3. Measurement of low resistance by Kelvin's Double Bridge.
4. Measurement of resistance by Voltmeter –Ammeter method.
5. Measurement of earth resistance.
6. Study and use of Megger.
7. Use of cathode ray oscilloscope for voltage and frequency measurement

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8. Study of half wave, full wave rectifiers with and without filter.
9. To plot characteristics of CB/ CE configuration of transistor.
10. To plot characteristics of FET.
11. Frequency response of RC coupled amplifier.
12. Study of Multivibrators.

Text Books:

1. V K Mehta – “Principles of Electronics” S. Chand Publications
2. B L Theraja – “Electrical Technology”, Vol I & III, S. Chand Publications

Reference Books:

1. A.K.Sawhney - “Electrical measurements & measuring instruments” Dhanpatrai Publications
2. Allen Mottershed, - “Electronics Device and circuit an introduction” PHI Publications
3. Boylestad - “Electronics Devices Circuits & Theory”, PHI Publications.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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02: Fundamentals of Computer Programming		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: -- Hours / Week	End Semester Examination: --	-- Credits
Practical: 02 Hours / Week	Continuous Assessment: --	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Knowledge of operation of computer as a user	
2.	Basic arithmetic concepts	
3.	Possible awareness of use of software programming language for computation	
Course Objectives:		
	Understand programming fundamentals like algorithms, flow charts, computations, data types, looping, conditions, variables, branching, arrays, files and reporting using C++ with future application in solving mathematical, analytical and algorithm based engineering problem computations..	
Course Outcomes:		
1.	Knowledge of programming fundamentals, programming practices and its use in solving problems	
2.	Knowledge of software programming language C++	
3.	Hands on practical experience of usage of C++ programming for various operations	
UNIT - I	INTRODUCTION TO COMPUTER FUNDAMENTALS	(06 Hours)
	Introduction to: Operating Systems, System Folders, Graphical User Interface, Types of Users, Configuration, System Files, Programming Languages (High level, Assembly, Machine level, Scripting, Natural, 4GL and others), Concept of automation and use of computer programming, Modern Computer Hardware Accessories (Dongle, Wi-Fi, Bluetooth, others)	
UNIT - II	INTRODUCTION TO PROGRAMMING FUNDAMENTALS	(06 Hours)
	Algorithms, Flow-charts, Use and practice of Algorithms and Flow-charts (exchanging values, ascending / descending order, evaluation of series like sin(x) and others), editors, compilers, libraries, interpreters, pseudo code, programming planning, Good programming practices	
UNIT - III	INTRODUCTION TO DATA TYPES AND COMPUTATIONS	(06 Hours)
	Various data types (Integer, Boolean, Binary, Character, Floating, Image, Long, Short and others), data formats like date, time, currency, etc, constants, computations (arithmetic, trigonometric, scientific and others), Concept of structured programming, Iterations, Looping, Flow of programming	
UNIT - IV	PROGRAMMING CONCEPTS USING C++	(06 Hours)
	History of C++, Structured programming concepts, C++ programming basics, Keywords, Include and header files, Instructions, Operands, Data	

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	formatting, Basic programming for printing on console, Printing in file, Accepting inputs and managing input and output, Basic reporting	
UNIT - V	OBJECT ORIENTED PROGRAMMING	(06 Hours)
	Object Oriented Programming (OOPS) concepts, Class and objects, Abstraction, Encapsulation, Inheritance, Polymorphism, Functions and its types (inline, static, virtual, member), Parameter passing, Overloading, Constructors and Destructors, Access control	
UNIT - VI	OBJECT ORIENTED PROGRAM DEVELOPMENT USING C++	(06 Hours)
	Software development process, Files and file structure, Common errors and debugging, Introduction to arrays, Programming using OOPS concepts, Functions, Arrays, Calculations and reporting	
<u>Term Work:</u>		
<ol style="list-style-type: none"> 1. Draw algorithm, develop flow chart and write pseudo code for arranging input in ascending / descending order 2. Develop flow-chart of a program using multiple data types, operations / calculations and printing the output in formatted manner (marks, grades and mark list printing) 3. Develop a basic C/C++ program to accept user input, format the input and print the input 4. Develop C/C++ program for experiment no. 1 5. Develop C/C++ program for experiment no. 2 6. Develop C/C++ program using functions and passing variables 7. Develop C/C++ program for using input and output files and arrays 8. Develop C/C++ program for printing report to console and output file using data from input file, user input and arrays with the use of functions 		
Text Books:		
1) Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw Hill Education, 2008		
2) Yeshwant Kanetkar, "Let Us C++", BPB Publications		
Reference Books:		
1) Robert Lafore, "Object Oriented Programming in C++", Techmedia Publications		
2) James P. Cahoon, Jack W. Davidson, "C++ Program Design", TMH Series		
3) Scott Meyers, "Effective C++", Addison-Wesley		
Syllabus for Unit Test:		
Unit Test -1	--	
Unit Test -2	--	

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Faculty of Engineering & Technology

Programme : B.Tech (Electrical) Sem – III (2014 Course)

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
15	Engineering Mathematics –III	3	--	1	60	20	10	10	--	--	100	4	--	4
16	Electrical Machines – I	4	2	-	60	20	10	10	50	--	150	4	1	5
17	Linear & Digital Integrated Circuits	3	2	-	60	20	10	10	--	50	150	3	1	4
18	Digital Computational Techniques	3	2	-	60	20	10	10	--	50	150	3	1	4
19	Electrical Measurements & Instrumentation	3	2	-	60	20	10	10	50	--	150	3	1	4
20	Professional skill development - 3	4	--	-	100	--	--	--	--	--	100	4	--	4
	Total	21	8	1	400	100	50	50	100	100	800	21	4	25

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Electrical) Sem – IV (2014 Course)

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
21	Power Electronics	3	2	--	60	20	10	10	--	50	150	3	1	4
22	Electrical Machines - II	4	2	--	60	20	10	10	50	--	150	4	1	5
23	Network Analysis	3	2	1	60	20	10	10	50	--	150	4	1	5
24	Generation, Transmission & Distribution	3	2	--	60	20	10	10	--	50	150	3	1	4
25	Electrical Engineering Materials	3	--	--	60	20	10	10	--	--	100	3	--	3
26	Professional skill development-4	4	--	--	100	--	--	--	--	--	50	4	--	4
	Total	21	8	1	400	100	50	50	100	100	800	21	4	25

Total Credits Sem – III : 25

Total Credits Sem – IV : 25

B.Tech (Electrical) – SEM-III

Engineering Mathematics-III		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
Students should have basic knowledge of:		
1.	Differential calculus	
2.	Integral calculus	
3.	Complex numbers	
4.	Vector algebra	
Course Objectives:		
	To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.	
Course Outcomes: At the end of the course , the students will be able to:		
1.	Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.	
2.	Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.	
3.	Apply theorems to compute the Laplace transform, inverse Laplace transforms.	
4	Solve difference equation by Z-transform.	
5	Calculate the gradients and directional derivatives of functions of several variables.	
6	Use Green's theorem to evaluate line integrals along simple closed contours on the plane.	
UNIT - I	Linear Differential Equations (LDE)	(09 Hours)
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.	
UNIT - II	Complex Variables	(09 Hours)
	Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem	
UNIT - III	Transforms	(09 hours)
	Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.	
UNIT – IV	Laplace Transform (LT)	(09 hours)
	Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.	
UNIT - V	Vector Differential Calculus	(09 Hours)

	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.	
UNIT - VI	Vector Integral Calculus	(09 Hours)
	Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.	
Term Work:		
1. Linear Differential Equations		
2. Complex Variables		
3. Transforms		
4. Laplace Transform		
5. Vector Differential Calculus		
6. Vector Integral Calculus		
Text Books:		
1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).		
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).		
Reference Books:		
1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).		
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).		
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)		
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).		
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Electrical Machines - I		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Practical : 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
	Basic of Machine, Magnetic theory, AC & DC Fundamentals	
Course Objectives:		
	To develop the students to identify, analyze & to understand the fundamentals, classification, application and selection of DC machine, Transformer & Induction Machines for a particular application as per the operational characteristics.	
Course Outcomes: The students will be able to		
1.	To draw equivalent circuit, phasor diagram and calculate the efficiency and regulation of single phase transformer	
2.	Identify the difference between the single phase and three transformers and also will Apply the concepts and application of the three phase transformer and also can analyze using the basics of additional terms & various connections of the three phase transformer.	
3.	Apply the concepts and application of Electromagnetic Laws, Energy balance.	
4.	Identify different parts, Describe the basics of machine, armature reaction, commutation, characteristics & applications of dc generators, dc motors	
5.	Apply the concepts and application of single phase induction motors and other small size motors.	
6.	Apply the concepts and application of advancements in DC machines & transformers.	
UNIT – I	Single Phase Transformers	(06 Hours)
	Introduction to Single phase transformer, Development of equivalent circuit, Approximate & Exact equivalent circuit, & Phasor diagram, Efficiency of a Transformer, Condition for maximum efficiency, All day efficiency of Transformer, single phase Autotransformer, saving in copper. Kapp regulation diagram, Back to back test, Open circuit and Short circuit tests on single phase Transformer, Routine and Type Test on single phase transformer as per IS, Parallel operation of single phase Transformer.	
UNIT – II	Polyphase Transformers	(06 Hours)
	Comparison between single three phase unit and three single phase units, standard connections & phasor groups, parallel operation of three phase transformers, Three winding transformers, On-Load Tap Changer. Concept of polarity & Polarity Test, open circuit and short circuit tests, Direct Load Test, Sumpner's test (Back to back), I.S. Specifications of transformers. Concept of routine and type tests. Testing of transformers as per I.S. specifications.	
UNIT – III	Principles of Electromechanical Energy Conversion	(06 Hours)
	Introduction, Basic Electromagnetic Laws, EMF induced in a coil rotating in a magnetic field, forces and torques in magnetic field systems, Energy balance, Energy in singly excited magnetic field systems, Determination of magnetic force and torque from Energy, Multiply excited magnetic field systems, Forces and torques in systems with permanent magnets, Dynamic equations	
UNIT – IV	DC Machines	(06 Hours)

	Basic principle of working, Construction, E.M.F. equation of D.C. generators. Process of commutation & types, causes of bad commutation and remedies, Basic principle of working of DC motor, Significance of Back e.m.f., Torque equation, Types, characteristics and applications of d.c. motors, Starting, reversing and armature voltage and field control method of speed control, Armature reaction, Losses, efficiency, condition for maximum efficiency and maximum power output. Testing of DC motor.	
UNIT – V	Fractional Kilowatt Motors	(06 Hours)
	Construction of single phase induction motors, types, double revolving field theory, methods of self-starting, torque-speed/slip characteristics, equivalent circuit, applications, Shaded Pole motor, Commutator motors, Universal motor, Repulsion motors, Servo motors	
UNIT – VI	Modern Trends in DC Machines and Transformers	(06 Hours)
	Construction, working, characteristics and applications of: PMDC Motor, Stepper motor, BLDC motor, Printed Circuit Board Motor, Air Motor, dry type transformer, isolation transformer, Optical CT/PT	
Term Work:		
The Practical's shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> 1. Open circuit and short circuit tests on a single phase transformer 2. Performance of standard connections (Scott and open delta) for three phase transformers 3. Sumpner's test on two identical single phase transformers 4. Parallel operation of two single phase transformers 5. Three phase to six phase transformation 6. Identification of DC machine windings and resistances 7. Speed control of D. C. Shunt motor by Armature and Field control 8. Brake test on DC shunt motor 9. Swinburn's Test on DC shunt Motor 10. Load test on single phase induction motor (Split phase induction motor) 11. Computation of Equivalent Circuit of single phase induction motor 12. Load test on ac series motor 		
Text Books:		
1. Nagrath Kothari, "Electrical Machines", Tata McGraw Hill		
2. A. E. Fitzgerald, Charles Kingsley, Jr. Stephen D. Umans, "Electric Machinery", Tata McGraw Hill		
3. M. G. Say, "Alternating Current Machines", Pitman Publishing Ltd.		
4. Ashfaq Husain, "Electric Machines", Dhanat Rai & Co.		
Reference Books:		
1. Dr. S. K. Sen, "Electric Machinery", Wiley Eastern		
2. B. H. Deshmukh, "Electrical Technology", Nirali Prakashan		
3. A. S. Langsdorff, "Theory of Alternator Current Machinery", Tata McGraw Hill		
4. Bhag S. Guru, Huseyin R. Hiziroglu, "Electric Machinery & Transformers", Oxford.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Linear and Digital Integrated Circuits		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral 25marks	01 Credit
Course Prerequisites:		
The students should have knowledge of		
1.	Fundamentals of semiconductor physics, electronics devices	
Course Objectives:		
	This course introduces basic knowledge about linear and Digital integrated circuits. It describes fundamentals of Operational amplifier characteristics and application circuits. It also introduces concepts of digital components, combinational and sequential circuits.	
Course Outcomes: After learning this course the students will be able to		
1.	Specify operational amplifier parameters and connect the operational amplifier to perform basic applications.	
2.	Describe the operation of circuit with proper component ratings, circuit diagram, input, output waveforms.	
3.	Compare specifications of voltage regulator ICs and select as per requirements. Identify pins of IC 555 and analyze circuits of IC 555	
4	Apply knowledge of number conversion and binary arithmetic and to use Boolean algebra to develop K map logic.	
5	Draw logic circuits of multiplexer , de-multiplexer, ADC, DAC	
6	Describe different flip- flops with circuit diagram, truth table and applications such as registers, counters	
UNIT - I	Operational Amplifiers	(06Hours)
	Block diagram and working of operational amplifier, pin diagram and specifications of IC 741, IC 324, operational amplifier parameters input offset current, input offset voltage, Common Mode Rejection Ratio (CMRR), PSRR, slew rate, bandwidth and frequency response, Basic op-amp applications: Inverting amplifier, Non-inverting amplifier, Adder, Subtractor, Instrumentation amplifier, AC voltage follower, V to I and I to V converter	
UNIT - II	Waveform Generators using Operational Amplifiers	(06 Hours)
	Integrator, differentiator, Square, triangular, sine wave generator, saw-tooth, Comparator, zero crossing detector, Schmitt trigger, precision rectifier, peak detector, clipper, clamper, V to F and F to V converter, sample and hold circuit	
UNIT - III	Applications of Op-Amp and Other IC's	(06Hours)
	Voltage regulators using ICs Viz. 78xx, 79xx, LM 317, IC 723 Active filters - configuration with frequency response, Analysis of first order low pass and high pass filters, Timer IC555 construction, working and modes of operation: astable, monostable and sequence timer	
UNIT - IV	Numbering Systems and Boolean Algebra	(06 hours)
	Numbering systems - binary, octal, decimal and hexadecimal and their conversion, codes - BCD, ASCII, Grey and excess3, Binary arithmetic: addition and subtraction by 1's and 2's compliment. Logic gates, Booleans algebra, De-Morgon's theorem, K-map: structure for two and three variables, SOP and POS form reduction of Boolean expressions by K-	

	map 1-bit comparator analysis using K-map	
UNIT - V	Combinational Logic Circuits	(06Hours)
	Comparator, parity generator, Multiplexer, De-multiplexer using K-map, adder, subtractor, arithmetic logic unit, decimal to BCD encoder (74147), BCD to 7 segment decoder/driver (7446/7447), display device, ADC, Dual slope SAR, DAC - binary weighted, ladder type, Memories: RAM - static and dynamic, ROM, PROMS and EPROMS, EEPROMS detailing.	
UNIT - VI	Sequential Logic Circuits	(06 Hours)
	Flip Flops: S-R, Clocked S-R, D latches, Edge triggered D flip-flops, Edge triggered JK flip flops, JK Master-slave flip flop, Registers, Buffer registers, shift registers, controlled shift registers, asynchronous counters, synchronous counter, twisted ring counters, N-module counters, Counter IC's	
Term Work:		
The term work shall consist of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.		
<ol style="list-style-type: none"> To Study Data sheet of IC 741, 324, IC555, IC 723 To observe op. amp as adder, subtractor To observe operational amplifier as square, triangular wave, sine wave generator. To observe operation of operational amplifier as comparator, ZCD, Schmitt trigger To observe input, output waveforms of an Operational amplifier as integrator and differentiator. Operational amplifier as low pass or high pass filter and observe frequency response To connect IC 555 as mono-stable multi vibrator and observe waveforms. To connect logic gates as per pin diagram and verify truth table To design half adder and full adder using basic gates. To verify operation of various flip flops by truth table To observe shift register operation using IC7495 To understand features of synchronous and asynchronous counter and use them for different modes such as up/down, mode N, frequency divider. To use BCD to 7 segment decoder (7446,7447) BCD to decimal decoder (7441, 7442) To study specifications of ADC and DAC chips 		
Text Books:		
1. D. Roy Choudhary, Shail Jain – “Linear Integrated Circuits” -Wiley Eastern Limited.		
2. R. P. Jain - “Modern Digital Electronics”-Tata McGraw hill		
3. K. R. Botkar –“Integrated circuits”- Khanna publishers		
Reference Books:		
1. Ramakant A. Gaikwad- “Op-amp and Integrated circuits”, Fourth edition, PHI Publication, 2002.		
2. L. K. Maheshwari and M.M. S Anand – “Analog Electronics” -Prentice Hall of India, New Delhi		
3. D. P. Leach, A. P. Malvino- “Digital principles and applications” -Tata McGraw Hill		
4. James - “Operational amplifier and linear Integrated Circuits Theory and applications”		
5. Charles H. Roth –“Fundamental of Logic Design” –Jaico book		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Digital Computational Techniques

Digital Computational Techniques		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Practical : 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Mathematics (integration, differentiation, simultaneous equations, polynomial equations), Basics of programming, C++ language, Program debugging skills, Flowchart and algorithm development	
Course Objectives:		
	To develop the students for understanding, analyzing and applying numerical methods using digital techniques (C++ and MATLAB) to solve mathematical and engineering problems.	
Course Outcomes: The students will be able to		
1.	Refresh the basics of C++ language and MATLAB and solve problems using multiple numerical techniques with C++ and MATLAB	
2.	Understand importance of high speed calculations, errors involved and preliminary mathematical theorems	
3.	Find the roots of transcendental & polynomial equations	
4.	Understand and use various numerical interpolation methods to solve polynomial equations	
5.	Perform numerical differentiation and integration using multiple methods/techniques	
6.	Solve linear algebraic simultaneous equations using elimination and iterative methods	
UNIT – I	Basics of C++ and MATLAB Programming	(06 Hours)
	Data types, Operator, Variables, Control Statements, Loops, Access Control, Arrays, Functions and their types, Object Oriented Programming (OOPS) concepts, Class and Object, Abstraction, Encapsulation, Inheritance, Polymorphism, Parameter passing, Function overloading, Inline functions, Virtual functions, Friend functions, Members and Functions, MATLAB Basics (operations, built-in functions, commands, arrays, display, files, programming in MATLAB	
UNIT – II	Introduction to Numerical Computations:	(06 Hours)
	Basic principle of numerical methods and necessity of computers for high speed calculations, Floating point algebra with normalized floating point technique, Significant digits, Mathematical preliminaries: Rolle's Theorem, Generalized Rolle's Theorem, Intermediate Value Theorem, Mean Value Theorem for derivatives, Errors and their computations: Absolute, Relative and Percentage errors	
UNIT – III	Transcendental and Polynomial Equations:	(06 Hours)
	Roots of an equation and methods to find the same, Solve equations using Bisection, Secant, Regula-Falsi and Newton-Raphson methods, Single variable and multi variable Newton-Raphson techniques, Curve fitting using least square approximation – first order and second order.	
UNIT – IV	Interpolation:	(06 Hours)
	Introduction to interpolation and calculus of finite differences, Polynomial interpolation methods: Lagranges, Newton's forward, backward & central difference methods, Sterling and Bessel's interpolation	
UNIT – V	Differentiation and Integration:	(06 Hours)
	Numerical differentiation using simple interpolation techniques like Lagrangian and Newton Gregory methods, Numerical integration using Trapezoidal, Simpsons	

	Rule, Solution of ordinary differential equation using Euler's, Modified Euler's, Taylor Series, Runge-Kutta second and fourth order techniques using Hune's and Polygon method	
UNIT – VI	Linear Algebraic Simultaneous Equations:	(06 Hours)
	Direct methods like Gauss Elimination method and Gauss Jordan method, Concept of pivoting – partial and complete, Iterative methods like Gauss-Siedel, Accelerated Gauss-Siedel and Jacobi's method, Matrix inversion using Jordan method and Eigen Values using Power method and Jacobi methods	
Term Work:		
The Practical's shall consist of record of minimum eight experiments.		
13. Newton-Rhapson method using C++ Programming 14. Gauss Elimination method using C++ Programming/MATLAB 15. Gauss Seidel Method using MATLAB 16. Jacobi Method using MATLAB 17. Lagranges Interpolation method using C++ Programming 18. Newtons Divided Difference Interpolation method using C++ Programming 19. Trapezoidal method using C++ Programming 20. Euler's method using C++ Programming 21. Runge-Kutta 4 th Order method using C++ Programming 22. C++ Program on Inheritance 23. C++ Program on Polymorphism 24. C++ Program on derived class constructor and destructor		
Text Books:		
3. S. S. Sastry, "Introductory Methods of Numerical Analysis", 4 th Edition, PHI		
4. M. K. Jain, R. K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering Computation", 6 th Edition, New Age International Publishers		
5. Balaguruswamy, "Object Oriented Programming in C++", Edition 2008, Tata McGraw Hill		
4. Yashavant Kanitkar, "Let Us C++", 2 nd Edition, BPB Publications		
5. Dr. J. S. Chitodia, "Numerical Methods", Technical Publications		
6. Rao V. Dukupati, "MATLAB – An Introduction with Applications", New Age International Publishers		
Reference Books:		
5. Santosh K. Gupta, "Numerical Methods for Engineers", Wiley Eastern Ltd.		
6. John R. Hubbard, "Schaum's Outline of Programming with C++", 2 nd Edition, Schaum's Series		
7. Babu Ram, "Numerical Methods", Pearson Publications		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Electrical Measurement and Instrumentation		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03	End Semester Examination: 60 Marks	03 Credits
Practical: 02	Continuous Assessment: 40 Marks	
	Practical:	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Basic electrical Engineering Parameters such as Voltage, current, Power, Energy, etc.	
2.	Various physical Parameters such as, Temperature, Pressure, Flow, vibration, etc.	
Course Objectives:		
	This course introduces knowledge about electrical measurement and instrumentation. The course is designed to learn different methods of measurements of various electrical parameters and also to learn the different physical parameters with the help of the various measurement and instrumentation techniques.	
Course Outcomes: After learning this course students will be able to		
1.	Explores the importance of measurement and various terms related to measurement. Measure /calculate unknown inductance and capacitance by balancing of AC bridge. State specifications of instrument transformers and use them for high voltage and high current measurement.	
2.	Draw circuit diagram, connect wattmeter for measurement of three phase active and reactive power and energy meter for measurement of energy.	
3.	Draw block diagram, state specifications, functions of various digital/automated meter, harmonic analyzer	
4.	Classify various types of transducers. Explain principle of operation, characteristics, specifications of displacement and level transducers and different methods of measurement.	
5.	Explain principle of operation, characteristics, specifications of Pressure and temperature transducers and different methods of measurement.	
6.	Select appropriate transducer, recorder and display device as per requirement	
UNIT – I	Introduction	(06 Hours)
	<p>Introduction: significance of measurement, classification of instruments, mechanical, electrical, electronic instruments, deflection and null type, applications of measurement system.</p> <p>AC Bridges: Introduction, sources and detectors for ac bridge, general equation for bridge at balance. Measurement of Inductance: Maxwell's Inductance & Maxwell's Inductance – Capacitance Bridge, Anderson's Bridge, Schering Bridge for measurement of capacitance, Wien's Bridge for measurement of frequency, Universal Impedance Bridge</p> <p>Instrument Transformers: Introduction to CT & PT as instrument transformers. Difference between CT operated meter & whole current meter. Advantages of instrument transformers over shunts and multipliers, Accuracy class, burden on instrument transformers, expression for ratio and phase angle errors in case of C.T. and P.T. (No derivation), and precaution in using instrument transformers. Clip on ammeter.</p>	
UNIT - II	Measurement of Power and Energy	(06 Hours)
	<p>Measurement of Power: Construction, working principle, torque equation, advantages/disadvantages, errors and their compensation of dynamometer type wattmeter, low power factor wattmeter, Active & reactive power measurement in three phase balanced & unbalanced system (one wattmeter and two wattmeter methods), Power Measurement using Instrument Transformer, Three Phase wattmeter.</p>	

	Measurement of energy: Energy Meters in AC circuits, Single Phase Induction Type Energy Meter - Construction, principle of operation, torque equation of induction type energy meter, errors and adjustments. Three phase three wires, and three phase four wire energy meter, Electronic energy meter	
UNIT - III	Electronic Devices and Signal Analyzer's	(06 Hours)
	Electronic Voltmeters and their Advantages, Vacuum Tube Voltmeters, difference Amplifier Type Voltmeters, DC Voltmeters with direct Coupled Amplifier, Measurement of Power at Audio and Radio Frequencies. Digital Storage Oscilloscope – Principle of operation and waveform reconstruction. Concept of: Numeric meter & its types (TOD, ABT, Prepaid & panel mounted meters.) Measurement of power & energy by sampling technique automatic meter reading (AMR) and advanced metering infrastructure (AMI), Meter reading instrument (MRI). Wave Analyzers – Frequency Selective Wave Analyzers and Heterodyne Wave Analyzers and its applications. Harmonic Distortion Analyzer, Spectrum Analyzer, Standing Wave Ratio, Power Analyzer.	
UNIT - IV	Displacement and Level Measurement	(06 Hours)
	Introduction to Transducers, classification, basic requirements for transducers and Advantages of Electrical Transducers. Displacement measurement: Potentiometer as displacement transducer, Strain Gauge: Theory of Strain Gauges, Types of strain gauges: Un-bonded and Bonded types their construction, working, advantages and disadvantages, load cell, LVDT & RVDT – construction, working, application, null voltage, specifications, advantages/disadvantages, effect of frequency on performance. Capacitive transducers – Advantages, Disadvantages and Applications. Level measurement: Introduction and importance of level measurement, level measurement methods: mechanical, hydraulic, pneumatic, Electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors	
UNIT - V	Pressure and Temperature Measurement	(06 Hours)
	Pressure Measurement:, classification of pressure as low/medium/ high, absolute/gauge/vacuum, static/dynamic & head pressure. Types of Pressure Measurements Devices, Pressure Measurement using Electrical Transducers as Secondary Transducers. Low Pressure Measurement – Thermocouple Vacuum Gauge, Pirani Gauges and Ionization Type Vacuum. Temperature Measurement: Electrical Resistance Thermometer, Platinum Resistance Thermometer, Semi conductor Thermometers, Thermocouples, Thermistors, Quartz Crystal Thermometers, Bimetallic Thermometers. Electrical methods of temperature measurement – signal conditioning of industrial RTDs and their characteristics – 3 lead and 4 lead RTDs.	
UNIT - VI	Measurement of Velocity and Flow, Recorders and Display Devices	(06 Hours)
	Measurement of Velocity – Moving Magnet Type, Moving Coil Type, Seismic Tape Type. Measurement of Angular Velocity. Measurement of flow – Turbine Meter, Electromagnetic Flow Meters, Hot Wire Anemometer, Ultrasonic Flow Meter. Recorders and Display Devices: Recording Requirement, Analog Recorders, Graphic Recorders, Strip Chart Recorders, Null Type Recorders, X-Y Recorders, Ultraviolet Recorders, Direct Recorders. Digital Display Methods, Digital display Units, Rear Projector Display, Light Emitting Diodes (LED), Liquid Crystal Diodes (LCD), Resolution and Sensitivity of Digital Meters	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> 1. Calibration of ammeter and voltmeter with the help of potentiometer. 2. To extend range of wattmeter by use of CT and PT. 3. To measure power in three phase balanced load by one wattmeter method. 4. To measure power in three phase balanced/ unbalanced load by two wattmeter method. 5. To measure reactive power in three phase circuit by one wattmeter method. 		

6. To study and analyze the various electrical parameters using Power Analyzer.
7. To calibrate single phase energy meter at (i) unity power factor (ii) 0.5 lagging power factor (iii) 0.5 leading power factor (analog / Digital)
8. Study of digital storage oscilloscope C.R.O.s of different types and their applications.
9. Measurement of capacitance and loss angle by Schering Bridge.
10. Measurement of inductance by Anderson's bridge.
11. Displacement measurement by LVDT.
12. Strain measurement using strain gauge.
13. Bourdon Tube
14. Study of process control application of using the instrumentation kit.
15. Introduction to thermography, detection of hot spots, oil level, defective winding in transformer using thermo vision techniques.

Text Books:

1. A Course in Electrical and Electronic measurements & Instrumentation – by A. K. Sawhney, Dhanpat Rai & Sons.
2. Electronic Instrumentation: H.S. Kalsi – THM, 2nd Edition 2004.
3. A Course in Electronic and Electronic measurements by J. B. Gupta, S. K. Kataria & Sons.
4. Measurement by Baldwin

Reference Books:

1. Electrical Measurement & Measuring Instruments Fifth edition, by E. W. Golding & Widdies, A. H. Wheeler & Co. Ltd.
2. Electronic measurement and instrumentation by Dr. Rajendra Prasad, Khanna Publisher, New Delhi.
3. Introduction to Measurements and Instrumentation, Second Edition by Ghosh, PHI Publication.
4. Introduction to Measurements and Instrumentation by Anand .PHI Publication

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

B.Tech (Electrical) - SEM-IV

Power Electronics		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral 25 marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Fundamentals of Electronics Engineering.	
Course Objectives:		
This course introduces basic knowledge about electronics devices used for control of power. It describes characteristics, application circuits of SCR and other power devices.		
Course Outcomes: After learning this course the students will be able to		
1.	Describe specifications, characteristics of power electronics components.	
2.	Explain operation of AC-AC converters at different load conditions with mathematical equation and waveforms	
3.	Explain operation of AC-DC converters at different load conditions with mathematical equation and waveforms	
4	Compare and select among switching device (IGBT, MOSFET, MCT) as per the application requirement.	
5.	Compare and select various Choppers based on application requirements.	
6.	Compare Voltage Source Inverter (VSI) and Current Source Inverter (CSI)	
UNIT - I	Thyristor Power Devices	(06 Hours)
	SCR - static and dynamic characteristics, specifications, two transistor analogy, gate characteristics, triggering circuits, protection of SCR Protection of power circuit from - over voltage, over current & temperature rise (thermal) Design of Snubber circuit.	
UNIT - II	AC to DC Convertors (Single phase and three phase)	(06 Hours)
	Single phase convertor, three phase semi controlled and fully controlled bridges with R, RL and RLE loads, derivation of average and RMS output voltage and current, rectification and inversion mode of operation, concept of overlap angle and associated voltage drop calculation, dual convertor and selection of transformer and semiconductor devices for convertors. Total Harmonic Distortion (THD).	
UNIT - III	AC Voltage Controllers	(06 Hours)
	DIAC, TRIAC - construction, characteristics, four mode operation, specifications, triggering of TRIAC using DIAC, AC voltage regulator principle, single phase and three phase analysis with R and RL Load, Harmonics and ripple factor, Applications of two stage, three stage and multistage voltage controllers, derivation of average and RMS output voltage and current	
UNIT - IV	Transistor Power Devices	(06 Hours)
	MOSFET, IGBT, MCT - Construction, Characteristics, Specifications, Safe Operating Areas, protection, switching action and their control circuit requirement, comparison and area of application of these devices, Diagram and working of Switched Mode Power supply (SMPS) and Uninterrupted Power Supply (UPS)	
UNIT - V	DC to DC Convertors	(06 Hours)
	Principle of operation of chopper, classification on the basis of operating quadrants control techniques, CLC, TRC, PWM and FM techniques, analysis of step up choppers and numerical with RLE load, area of application, necessity of input filter, derivation of average and RMS output voltage and current	
UNIT - VI	DC to AC Inverters	(06 Hours)
	Single phase and three phase inverters principle of operation, VSI and CSI inverters, applications, operating frequency range. PWM inverters: single pulse, multi-pulse and sinusoidal pulse modulation, PWM techniques for voltage control and harmonic elimination.	

Term Work:	
The term work shall consist of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.	
1. V-I Characteristic of SCR, DIAC & TRIAC	
2. V-I characteristic of power semiconductor devices GTO, MOSFET, IGBT	
3. 1 Phase half Controlled & Full controlled converter (R & RL Load)	
4. 3 phase converter (R, RL, RLE Load)	
5. Step down Chopper circuit (RC technique)	
6. 3 phase Voltage Source transistorized inverter	
7. Firing circuit for 3 phase converter	
8. 1 phase or 3 phase AC voltage regulator	
9. 3 phase AC – DC converter with RLE Load	
10. 1 phase PWM bridge inverter	
11. Commutation circuit of SCR	
12. Design of Snubber Circuit	
13. Collection of data sheets of Power Devices	
14. Summary reports of NPTEL videos on Power Devices	
Text Books:	
1. M. H. Rashid – “Power Electronics” 2009 Edition, Pearson publication	
2. Ned Mohan, Undeland, WP Robins - “Power Electronics” 3 rd edition, John Wiley & Sons International Student edition	
3. B. W. Williams – “Power Electronics” 2 nd edition -Macmillan publication	
4. Dr. P. S. Bhimbra - “Power Electronics” third edition, Khanna Publication	
5. K Hari Babu - “ Power Electronics” - Scitech Publication	
Reference Books:	
1. Vedam SubraManyam - “Power Electronics” - New Age international, New Delhi	
2. Dubey, Donald, Joshi, Sinha - “Thyristerised Power Controller”- Wiley Eastern New Delhi	
3. M. D Singh & K B Khandchandani, “Power Electronics” - Tata McGraw hill	
4. Jai P Agarwal - “Power Electronics, Systems theory & design” LPE Pearson Education	
5. L Umanand - “Power Electronic, Essentials & Applications” - Wiley publication	
6. Randall , Shaffer - “Fundamental of Power Electronics with Matlab”	
7. J. Michale, Jacob - “Power Electronics Principles & Applications”	
8. V K Mehta – “Principles of Electronics” – S. Chand Publications	
9. NPTEL website Video lectures by B. G. Fernandes	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Electrical Machines-II		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Basic laws of rotating machines like Faraday's Law, Lenz's Law, etc	
2.	Basics of Electrostatics and electromagnetic	
3.	Transformer operation	
4.	Induction machine operation	
5.	DC Machine operation	
Course Objectives:		
	To understand the theory, operation, characteristics and applications of Three phase Induction, Synchronous Machines and special purpose machines.	
Course Outcomes: The students will be able to		
1.	Describe the basics of synchronous generators & identify the different parts, different excitation systems, armature windings, to find the regulation by different methods of non-salient pole alternator.	
2.	Apply the concepts of three phase synchronous generator and analyze using the basics of different tests on Syn. Gen.	
3.	characteristics of alternators	
4	Understand the concept of synchronization and parallel operation of alternators	
5	Understand working principle, characteristics, operation and applications of synchronous motors	
6	Understand working, characteristics and usage of special purpose electrical machines	
UNIT - I	Synchronous Generators (Alternators) - Principles	(08 Hours)
	Types of synchronous machines & their constructional features, Excitation Systems. Synchronous generator (cylindrical rotor type): Principle of working, Armature Windings & Estimation of winding factor, EMF Equation, Rating of Generator, Generator on no load & balanced load, Armature reaction & its effect under load power factors, Synchronous Impedance, Equivalent Circuit & Phasor Diagram, Synchronous Generator (Salient Pole): Two Reaction Theory model, Estimation of Direct & Quadrature axes Synchronous Reactance by Slip Test, Phasor Diagram. Power Flow (Transfer) Equations, Power – Power angle relation and Capability Curves of synchronous generators.	
UNIT - II	Synchronous Generators (Alternators) - Operation	(08 Hours)
	DC resistance test, Open circuit Test & Short Circuit Test on synchronous generator, Determination of Voltage Regulation by direct load test & by Indirect Methods-EMF, MMF & Potier Triangle Method, Losses & Efficiency and Short Circuit Ratio. Parallel Operation of alternators - Necessity, Conditions, Prime Mover Characteristics & load Sharing. Concept of Infinite bus, alternators connected to infinite bus bar, Methods of	

	synchronizing alternators (synchronizing lamps and synchro-scope), Significance of Synchronizing Power Coefficient.	
UNIT - III	Three Phase Synchronous Motor	(08 Hours)
	Principle of operation, Methods of starting, Equivalent Circuit & Phasor Diagrams, Pull-in & Pull-Out Torque, Power Flow Equations, Operation with constant excitation & variable load and with Constant load & variable excitation (V Curves & Inverted V Curves), Phenomenon of Hunting & its remedies, Applications.	
UNIT - IV	Three Phase Induction Motor – Principles	(08 Hours)
	Construction (Squirrel cage, Wound rotor), Concept of rotating magnetic field, Principle of Operation, Concepts of Speed & Slip, Frequency of rotor voltage & current, Power Flow Diagram & development of Equivalent Circuits, Losses, Relationship between rotor copper loss, rotor input & gross mechanical power developed, Efficiency, Torque–Slip/Speed characteristics, Effect of rotor resistance on Torque-Slip characteristics, Condition for maximum torque, Relations between starting, Full load & Maximum torque.	
UNIT - V	Three Phase Induction Motor – Operation	(08 Hours)
	Starters for cage rotor & wound rotor induction motors (DOL, Star/Delta, Auto transformer, Stator resistance, Rotor resistance, soft starters), Open circuit and short circuit test, Circle diagram and computation of performance parameters, High Torque Cage Motors - Deep bar & Double cage rotor, Speed control mechanisms (VFD, cascading, pole changing, slip power recovery), Cogging & Crawling of induction motors, Applications.	
UNIT - VI	Special Purpose Machines	(08 Hours)
	Construction, working principle, characteristics and applications – Induction Generator, Induction Voltage Regulator, Linear Induction Motor, Synchronous Induction Motor, Permanent Magnet Synchronous Machine, Reluctance motor, Hysteresis motor, AC Series Motor.	
Term Work:		
The term work shall consist of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.		
<ol style="list-style-type: none"> 1. Direct loading test on alternator 2. Open circuit and short circuit test on alternator – regulation by emf and mmf method 3. Slip test on salient pole alternator – regulation by two reaction theory 4. Synchronization of alternator with bus bar 5. V-Curves of synchronous motor 6. Load test on synchronous motor 7. Load Test on three phase induction motor 8. No load & Blocked Rotor Test on three phase induction motor: Determination of Equivalent Circuit Parameters/Plotting Circle diagram 9. Measurement of Slip by Stroboscopic Method 10. Speed Control of Wound Rotor Induction Motor 11. Demo and study of three phase Linear Induction Motor 12. Study & comparison of Starters of three phase induction motor. 13. Load test on Universal Motor 15. Load Test on PMSM 		
Text Books:		
<ol style="list-style-type: none"> 1. Nagrath Kothari, “Electrical Machines”, Tata McGraw Hill 2. B L Theraja, “Electrical Technology”, Vol II, Chand Publications 		

Reference Books:	
1.	Dr. S. K. Sen, "Electric Machinery", Wiley Eastern
2.	B. H. Deshmukh, "Electrical Technology", NiraliPrakashan
3.	M. G. Say, "Alternating Current Machines", McGraw Hill
4.	A. S. Langsdorff, "Theory of Alternator Current Machinery", Tata McGraw Hill
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Network Analysis		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	Theory : - 03
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical : - 01
Tutorial:- 1Hr/Week	Term Work : 25 Marks, Practical: 25 Marks	Total : - 04
Course Pre-requisites:		
The Students should have knowledge of		
1.	Engineering Physics, Fundamentals of Electrical Engineering	
2.	Engineering Mathematics (Differential equations, Integrations, Laplace Transforms, Fourier Transform	
Course Objectives:		
	This course introduces concepts of Network Analysis such that simplification of any complex network applying theorems, classical method (Transient response) or Laplace transform method or Fourier transform method.	
Course Outcomes: The students will be able to		
1.	Calculate solution of differential equation of an active (Excited by an ac source or DC source), Linear, bilateral complicated network using various network theorems.	
2.	Analyze transient response of passive elements in pre-excited or unexcited conditions (initial conditions) using classical method	
3.	Apply Laplace Transform Technique to analyze the behavior & response of passive elements in pre-excited or unexcited conditions (initial conditions)	
4	Represent any network as two port network, Define and calculate various parameters like open circuit impedance, short circuit admittance, Transmission & Hybrid parameters and their applications in electrical domain	
5	Formulate network function for a given circuit and comment about stability from poles and zeros of function.	
6	Analyze a given circuit / waveform using Fourier Transform method.	
UNIT - I	Network Theorems in AC circuits	(06 Hours)
	Introduction, Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for AC networks, Concepts of super node and super mesh. Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Millman's theorem, Reciprocity theorem, Substitution theorem, Compensation theorem, Tellegen's Theorem	
UNIT - II	Transient Response of Passive Circuits	(06 Hours)
	Introduction, transient response of series R-L and R-C circuit having DC excitation, Transient response in RL and RC circuit with sinusoidal excitation. Transient response in RLC circuit with DC and sinusoidal excitation Resonance, Coupled circuits, Scattering matrix and its application in network analysis	
UNIT - III	Laplace Transformation and its application	(06 Hours)
	Laplace transform of a derivative and integration. Laplace transform of common forcing functions, Initial and final value theorem, Time displacement theorem, Convolution theorem, Impulse response of R-L and R-C Circuit, Application of Laplace transformation technique in electric circuit analysis.	
UNIT - IV	Two Port Networks:	(06 Hours)
	Short circuit admittance, open circuit impedance, transmission and inverse transmission, hybrid and inverse hybrid parameters. Relation between parameter sets, T, π , Ladder, lattice, twin T networks. Input and out put impedance in terms two port parameters. Interconnection of networks. Symmetry and reciprocity	
UNIT - V	Network Functions:	(06 Hours)
	Network function for one port and two port networks: ladder networks, general network,	

	poles and zeros of network functions, Restriction on poles and zeros for driving point functions and transfer functions. Network synthesis of RL,RC,LC circuits	
UNIT - VI	Fourier analysis	(06 Hours)
	Exponential form of Fourier series, trigonometric form of Fourier series, symmetry in Fourier series, Frequency spectrum, properties of Fourier analysis, shifting of function, applications in circuit analysis. Fourier series representation of periodic signals, Fourier integral & Fourier transform analysis with Fourier transform. Convolution integral.	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> 1. Verification of Superposition theorem in A.C. circuits. 2. Verification of Thevenin's theorem in A.C. circuits. 3. Verification of Reciprocity theorem in A.C. circuits. 4. Verification of Millmans' theorem. 5. Verification of Maximum Power Transfer theorem in A.C. circuits. 6. Determination of time response of R-C circuit to a step D.C. voltage input. (Charging and discharging of a capacitor through a resistor) 7. Determination of time response of R-L circuit to a step D.C. voltage input. (Rise and decay of current in an inductive circuit) 8. Determination of time response of R-L-C series circuit to a step D.C. voltage input. 9. Determination of parameter of Two Port Network. 10. Determination of Resonance of R-L-C Parallel circuit 11. Determination of Resonance, Bandwidth and Q factor of R-L-C series circuit. 		
Text Books:		
1. C. K Alexander and M. Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill, Fourth Edition, 2009 (ISBN: 0077263197 / 9780077263195)		
2. M. E. Van Valkenburg, "Network Analysis", PHI / Pearson Education, 3rd Edition. Reprint 2002.		
3. Roy Choudhury, "Networks and Systems", 2 nd edition, 2006 re-print, New Age International Publications		
4. F.F.Kuo, "Network analysis & Synthesis", Wayne Publication		
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai Publication		
6. G. K. Mithal, "Network Analysis", Khanna Publication		
Reference Books:		
1. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", TMH, 7 th Edition, 2010		
2. J. David Irwin / R. Mark Nelms, "Basic Engineering Circuit Analysis", John Wiley, 8 th edition, 2006.		
3. Charles K Alexander and Mathew N O Sadiku, "Fundamentals of Electric Circuits", Tata McGraw-Hill, 3 rd edition, 2009.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Generation, Transmission & Distribution		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03	End Semester Examination: 60 Marks	Theory : - 03
Practical: 02	Continuous Assessment: 40 Marks	Practical : - 01
	Term Work : 25 Marks, Practical: 25 Marks	Total : - 04
Course Pre-requisites:		
The Students should have knowledge of		
1.	Electromagnetic energy conversion system	
2.	Fundamentals of Electrical Engineering	
Course Objectives:		
	This course introduces knowledge about electrical power generation, its transmission and distribution. The course is designed to learn different methods of power generation. Also it focuses on performance of transmission line and distribution system along with its design consideration.	
Course Outcomes: Students will be able to		
1.	Draw block diagram and describe the function of components of various Power Generation techniques by Conventional energy Sources.	
2.	Define and analyze the significance of terms such as load factor , diversity factor etc on economics of power generation Draw block diagram and describe the function of components of various Power Generation techniques by Non Conventional energy Sources.	
3.	Draw block diagram and describe the function of components of various Power Generation techniques by Non Conventional energy Sources.	
4	Calculate string efficiency, sag and R, L, C parameters of different types of transmission line.	
5	Represent TEE and PI model of line and analyze the performance of transmission line.	
6	Explore different type of cables & its calculations along with the computation of performance of AC distribution.	
UNIT - I	Power Generation techniques by Conventional energy Sources	(06 Hours)
	Introduction to energy sources, selection of site – classification – general arrangements and operations – functions of each component – types of turbines – electric generators – advantages and disadvantages - list of major power stations : of Hydro electric , Thermal and Nuclear power plants in India with capacity. Basic layout and working of diesel and gas power plant. Concept of grid, types of grids	
UNIT - II	Load Curves and Economic Aspects	(06 Hours)
	Load Curves: load curve – base load station and peak load station - demand factor – maximum demand – average demand – diversity of load – load factor – diversity factor – significance of high load factor & diversity factor – plant factor – capacity factor – connected load – load duration curve – integrated load duration curve – selection of units. Per capita energy consumption of developed & developing countries. Concept of cogeneration and captive generation.	
UNIT - III	Power Generation techniques by Non -Conventional energy Sources	(06 Hours)
	Different types of Nonconventional Energy Sources, Comparative benefits over conventional type, contribution of conventional & nonconventional energy sources, Solar energy – Its characteristics, basic concept of solar power plant, major solar power plants in India/world, Wind power plant– schematic arrangement - vertical axis, horizontal axis – electrical generator Hybrid solutions : Wind Turbine, diesel, WT-solar etc. – major wind farms in India / world, Power generation by bio gas, biomass, geothermal energy and tidal energy– its types, Magneto Hydro Dynamics (MHD), Concept of carbon credit.	
UNIT - IV	Design of Transmission Line	(06 Hours)

	<p>Transmission Line Components and its types - Line Supports, Conductors, Insulators, Potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.</p> <p>Sag: Catenary curve – calculation of sag and tension – effects of wind and ice loading sag templates – vibration dampers for transmission lines.</p> <p>Corona and interference, Various effects – Skin, Proximity, Ferranti etc.</p> <p>Various Parameters of Transmission Line – Resistance, Inductance and capacitance - their calculation.</p>	
UNIT - V	Transmission Line Performance analysis :	(06 Hours)
	<p>Circuit Representation of Transmission Line: Representation and performance of short, medium and long transmission line – Surge Impedance Loading (SIL), Characteristic Impedance, Generalized circuit constants: - Representation of tee and pi models of lines as two port networks – evaluation and estimation of ABCD constants –sending end and universal power circle diagrams.</p>	
UNIT - VI	Underground Cables and Distribution System	(06 Hours)
	<p>Underground Cables - Classification – construction - insulation resistance – capacitance – dielectric stress in single core cable. Grading of cables. Laying of cables – cable jointing – causes of failure – cable faults and location of faults.</p> <p>Distribution System – Classification – A.C. distribution connection schemes - requirements of distribution system – design consideration – design of radial, ring distributors for concentrated, distributed loads</p>	
Term Work:		
The term work shall consist of record of minimum eight experiments from below list.		
<ol style="list-style-type: none"> 1. Measurement of A, B, C, D constants of short transmission line. 2. Measurement of A, B, C, D constants of Medium transmission line. 3. Measurement of A, B, C, D constants of Long transmission line. 4. Circle diagram of medium transmission line. 5. Circle diagram of short transmission line. 6. Drawing Sheet on power generation by Conventional energy Sources 7. Drawing Sheet on power generation by non Conventional energy Sources 8. Drawing Sheet on types of insulator 9. Drawing Sheet on types of cables 10. Industrial visit to cable manufacturing 11. Industrial Visit report of HPS 12. Industrial Visit report of TPS / GAS PP 13. Industrial Visit report of WPS / Solar PP 		
Text Books:		
<ol style="list-style-type: none"> 1. A Course in Power System - J. B. Gupta - S. K. Kataria & Son's 2. V. K. Mehta, "Electrical Power System", S. Chand Publications 		
Reference Books:		
<ol style="list-style-type: none"> 1. Electrical Power - S. L. Uppal - Khanna Publication 2. Energy Technology - S. Rao, Dr. B B Panelkar - Khanna Publication 3. A Course in Power Plant Engineering - Arrora, Domkundwar - Dhanpatrai & Co. Publications 4. A Course in Electrical Power - Soni, Gupta, Bhatanagar - Dhanpatrai & Co. Publications 		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Electrical Engineering Materials		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
Course Pre-requisites: Engineering Physics		
The Students should have knowledge of		
1.	Electrical Engineering materials	
Course Objectives:		
	To understand in detail the properties of interest of the materials used in Electrical Engineering	
Course Outcomes: Student should able to		
1.	get knowledge about conducting materials.	
2.	get knowledge about magnetic materials.	
3.	get knowledge about insulating materials.	
4	get knowledge about dielectric & optical properties of materials.	
5	get knowledge about Nano materials.	
6	get knowledge about materials for electronics components	
UNIT - I	Electrical Conducting Materials	(06 Hours)
	High conductivity materials : Copper, Aluminum, Iron & Steel ,Alloys of Copper Materials of High Resistivity: Materials used in precision work, Materials used for rheostat, materials used for heating devices. Electrical carbon materials, Superconductivity, Thermoelectric effects, operation of thermocouple, alloys, Thermobimetals, Study of Electrolyte.	
UNIT - II	Magnetic Materials	(06 Hours)
	Classification of magnetic materials: Diamagnetism, Paramagnetism, Ferromagnetism, Anti-ferromagnetism, Ferrimagnetism. Soft magnetic materials, Solid core materials, Sheet steel, electric steel, cold rolled grain oriented silicon steel, hot rolled grain oriented silicon steel, hot rolled silicon steel sheet. Special purpose alloy, Alloyed steels with silicon, high silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines. Common magnetic materials, Magnetic resonance, Magnetic Shielding	
UNIT - III	Insulating Materials	(06 Hours)
	Electrical properties of insulating materials, Temperature rise and insulating materials, Classification of insulating materials. Insulating materials used in modern electrical machines. Applications of insulating materials: Insulating materials for wires, Insulating materials for laminations, Insulating materials for machines, Insulating materials for transformers. Thermoplastic materials: Poly-vinyl chloride (PVC), Polyethylene, silicons, their important properties & applications. Natural insulating materials: Mica, Asbestos, Ceramic materials, Glass, Cotton, Silk, Jute, Paper, Rubber	
UNIT - IV	Dielectric & Optical Properties of Materials	(06 Hours)
	A).Dielectric Properties of Insulating Materials: Static Field ,Dielectric Parameters [Dielectric constant, Dipole moment, Polarization, Polarizability], Mechanisms of Polarizations-Electronic, Ionic and Orientational Polarization (Descriptive treatment only), Clausius Mossotti Equation, Piezo-Electric, Pyro-Electric & Ferro-Electric Materials, Dielectric Loss and loss Tangent. B) Optical Properties of Materials & Cells used for Power Generation: Photo-Conductivity, Photo-Electric Emission, Photo-Voltaic cells [Materials Used, Construction, Equivalent Circuit, Working and Application], Photo-Conductive cells, Photo-Emissive cells, Photo emitters, photo transistors, photo resistors, application of photo sensitive materials (CRT, Tube Light, Photo Panals)	
UNIT - V	Nano Materials	(06 Hours)

	Introduction, Concepts of Energy bands & various Conducting Mechanism in Nano-structures, Carbon Nano-structures, Carbon Molecules, Carbon Clusters, Carbon Nano-tubes, Applications of Carbon Nano-tubes, Special Topics in Nano Technology such as Single Electron Transistor , Molecular Machines, BN Nanotubes, Nano wires, Application of Nano materials in electrical engineering.	
UNIT - VI	Materials for Electronics Components	(06 Hours)
	Introduction, Resistors: Carbon composition resistors, Insulated moulded resistors, Film type resistors, Cracked carbon resistors, Alloy resistors, Metallic–oxide film resistors, Wire wound resistors, High value resistors, Non linear resistors, Varistors, Variable resistors. Capacitors: Capacitor paper, Loss tangent, Electric strength & operating stress, Mica dielectric capacitors, Ceramic dielectric capacitors, Glass dielectric capacitors, Vitreous enamel dielectric capacitors, plastic dielectric capacitors, Electrolytic capacitors, Air dielectric capacitors, variable capacitors Inductors : Construction, Air cored coils, cored coils	
Text Books:		
1. A Course in Electrical Engineering Materials by S. P. Seth, Dhanpat Rai and Sons, Delhi -6.		
2. Electrical Engineering Materials by K. B. Raina & S. K. Bhattacharya, S. K. Kataria & Sons, Delhi-06.		
3. Electrical & Electronics Engineering Materials By Navneet Gupta , Dhanpat Rai & Co.		
4. Nanotechnology - A gentle introduction to next big idea by Mark Ratner & Daniel Ratner, Pearson Education		
5. Introduction to Nanotechnology by Charles P. Poole, Jr. Frank & J. Ownes (Wiley Student Edition)		
6. Introduction to Nano Science & Technology – Chattopadhyay – PHI Publication		
Reference Books:		
1. Electrical Engineering Materials by C. S. Indulkar & S. Thiruvengadam, S. Chand & Com.Ltd		
2. Electrical Engineering Materials by S. P. Chalotra & B. K. Bhatt, Khanna Publishers		
3. Introduction to Material Science for Engineering by James F. Shackelford, M.K. Muralidhara, Pearson Education, Sixth Edition.		
4. Insulation Technology Course Material of IEEMA, Ratner, Pearson Education.		
5. Electrical Engineering Materials, Dekkar, PHI Publications.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Board of Studies
Electrical Engineering Bharati Vidyapeeth
University, Pune

STRUCTURE AND THE SYLLABI

B.TECH. [ELECTRICAL]

SEMESTER V AND VI

[2014 Course]

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B.Tech (Electrical) Sem – V (2014 Course)

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
27	Linear Control Systems	3	2	--	60	20	10	10	--	50	150	3	1	4
28	Micro controller	3	2	--	60	20	10	10	--	50	150	3	1	4
29	Electrical Machine Design	4	2	1	60	20	10	10	--	50	150	5	1	6
30	Electrical Estimation, Costing & Installation	3	--	--	60	20	10	10	--	--	100	3	--	3
31	Elective - I	3	--	--	60	20	10	10	--	--	100	3	--	3
32	Professional skill development- 5	4	--	--	100	--	--	--	--	--	100	4	--	4
33	*Seminar	--	2	--	--	--	--	--	--	50	50	--	1	1
	Total	20	8	1	400	100	50	50	--	200	800	21	4	25

Optional Subject

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
15	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

Bharati Vidyapeeth University, Pune
Faculty of Engineering & Technology
Programme : B.Tech (Electrical) Sem –VI (2014 Course)

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
34	Switchgear and Protection	3	2	--	60	20	10	10	--	50	150	3	1	4
35	Power System Analysis	4	2	--	60	20	10	10	50	--	150	4	1	5
36	Modern Control Systems	4	2	--	60	20	10	10	--	50	150	4	1	5
37	Elective - II	3	2	--	60	20	10	10	--	50	150	3	1	4
38	Industrial Organization & Management	3	--	--	60	20	10	10	--	--	100	3	--	3
39	Professional Skill development- 6	4	--	--	100	--	--	--	--	--	100	4	--	4
40	**Mini Project	--	2	--	--	--	--	--	--	--	--	--	--	--
Total		21	10	--	400	100	50	50	50	150	800	21	4	25

**** Mini Project : (Individual student has to carry out the mini project activity and it will be allotted following grade as per his/her performance in term work. The grades are A+, A, B+, B, C, D)**

Marks	Grades
>= 45 to 50	A+
>= 40 to > 45	A
>= 35 to > 40	B
>= 30 to > 35	B+
>= 25 to > 30	C
> 25	D

Total Credits Sem – III : 25
Total Credits Sem – IV : 25
Grant total : 50

Linear Control Systems

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral 25marks	01 Credit

Course Prerequisites:

The students should have knowledge of

Mathematics , Laplace transform , Ordinary differential equation

Course Objectives:

This course introduces concepts of feedback control system. It provides foundation for mathematical modeling of components. It includes application of analytical and graphical techniques for stability analysis of system. These techniques can be used for any industrial system.

Course Outcomes: After learning this course the students will be able to

1. Calculate transfer function of components using mathematical equations.
2. Draw block diagram and signal flow graphs of system and evaluate overall transfer function of closed loop system.
3. Apply different techniques for stability analysis of any system in time domain.
4. Design PID controller and design compensator using root locus technique.
5. Draw Bode plot and Nyquist. plot and comment about stability in frequency domain.
6. Design a system using compensator to meet the desired needs and specifications by bode plot

UNIT I	Introduction	(06 Hours)
	Classification of control system, open loop, closed loop, examples, Block Diagram reduction, signal flow graph, Mason's gain formula. Mathematical Modeling and Transfer function of Electrical, mechanical system , Analogy for mechanical and electrical systems, Potentiometer, Synchronos, AC- DC Servomotor, Stepper motor, Gear Trains, AC-DC servomechanism, Tachogenerator, optical encoder	
UNIT II	Time domain analysis	(06 Hours)
	Standard test signals, Type and order of the system ,Time response of first and second order system to unit step input , Specifications for second order system, Steady state error, static error constants, Characteristic Equation, its roots in complex plane and time response	
UNIT III	Stability analysis in time domain	(06 Hours)
	Concept of stability absolute, relative, Routh-Hurwitz stability criteria , special cases, limitations. Root Locus: Basic properties of root locus. Construction of root locus. Angle and magnitude condition for stable	

	system. Determination of gain for specified damping ratio, Effect of pole, zero addition on root locus, cancellation of poles and zeros	
UNIT IV	Design in time domain	(06 hours)
	Basic concept of PID controller, tuning rules of PID controller, step response of system without and with PID controller, rate feedback , Need of compensation, transfer function of lead, lag, lag- lead , lead and lag compensator design using root locus. Use of SISO design tool in MATLAB	
UNIT V	Frequency domain Analysis	(06 Hours)
	Frequency response of first order and second order system to sinusoidal input, frequency domain specifications, Correlation between time domain and frequency domain , Polar plot, Nyquist stability Criteria, Nyquist plot, Gain margin, Phase margin and stability analysis using polar plots, Bode plot, Determination of Gain margin , phase margins and stability analysis using Bode Plot, Deduction of transfer function using bode plot	
UNIT VI	Design in frequency domain	(06 Hours)
	Bode plot of lead, lag, lag- lead compensating network, Design specifications, Design of lead, lag compensators using bode plot. Comparison of lag, lead compensator effect on system performance. Use of SISO design tool in MATLAB	

Term Work:

The term work shall consist of record of minimum eight experiments. Four from first seven, four from next seven and to ensure at least one experiment on each unit.

1. To plot characteristics of potentiometer and observe potentiometer pair as an error detector.
2. To plot characteristics of Synchro and observe Synchro pair as an error detector.
3. To determine transfer function of D C servomotor.
4. To observe step response of RLC series circuit for different values of R.
5. To analyze i) effect of gain ii) effect of tachometer feedback on output response of D.C. position servomechanism
6. To tune PID controller and analyze step response of temperature/ pressure control system.
7. To plot root locus using MATLAB and determine value of K for given value of damping ratio from the plot. ii) To analyze effect of addition of zero/ pole on root locus
8. To observe frequency response and to draw bode plot of lag, lead network.
9. To analyze stability of system in frequency domain by i) Nyquist plot ii) Bode plot using MATLAB .
10. To design lead compensator using bode plot and observe step response of uncompensated and compensated system.(SISOTOOL in MATLAB)
11. To design lag compensator using root locus technique and observe step response of uncompensated and compensated system. .(SISOTOOL in MATLAB)
12. To design PID controller for second order system to obtain desired performance specifications.
13. To use various commands for block diagram reduction like series, parallel, append, connect, feedback.(MATLAB)

14. To calculate steady state error for different inputs and different types of system(MATLAB)	
Text Books:	
1. I.J. Nagrath, M. Gopal, ““Control System Engineering”, New Age International Publishers – Fourth edition	
2. Katsuhiko Ogata, “Modern control system engineering”, Prentice Hall, 2010.	
3. M.N.Bandopadhyay, “ Control Engineering Theory and practice”- Prentice Hall of India 2006	
Reference Books:	
1. Nise N. S. “Control Systems Engineering”, John Wiley & Sons, Incorporated, 2011	
2. D. Roy Choudhary, "Modern Control Engineering", PHI Learning Pvt. Ltd., 2005	
3. Dorf, Bishop - “Modern control system”, Pearson Education	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Assignments: Assignments should be able to verify course outcome and skills of group work, communication skills

1. To solve numerical on block diagram reduction to calculate overall transfer function of system and verify with Mason’s gain formula
2. To calculate transfer function of equivalent electrical system for given mechanical system.
3. Quiz –Multiple Choice Questions 20
4. To solve numerical on time domain and analyze parameter variations on transient response and steady state error.
5. Solve two years question paper of Pune university unit wise.
6. Solve two years question paper of GATE unit wise.
7. To observe NPTEL video lecture by M. Gopal on any topic of control and give presentations, group discussion.
8. To collect information about controllers used in process control in thermal power plant.
9. To collect information about controllers used in power system for voltage and frequency control.
10. To collect information about controllers used in machine control.
11. To validate the design by hardware.

Microcontroller

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral : 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Digital electronics & Microprocessor 8085.	
Course Objectives:		
	This course introduces basic knowledge of Microcontroller 8031/51 & PIC Microcontroller.	
Course Outcomes:		
1.	Understand basic architecture and block diagram of microcontroller 8051.	
2.	Understand the different addressing modes and use them to write instructions	
3.	Understand the basics of interrupt structure of 8051	
4	Understand the 8051 programming.	
5	Introduction to PIC microcontrollers	
6	Understand PIC peripherals	
Introduction		
UNIT - I	Introduction to the concept of micro-controllers. Comparison of microprocessor and microcontroller. Difference between RISC and CISC microcontrollers. Harvard and Von Neumann Architectures, Architecture of 8031/51 microcontroller, Pin diagram, special function registers. Ports, Internal Memory, External memory, Counters and timers in 8051, Clock, Timer modes.	(06 Hours)
UNIT - II	MCS-51 Addressing modes and Instructions Addressing modes, MCS-51 Instruction set, external data moves, code memory read only data moves, Push and Pop, data exchanges, byte level logical operations, bit level logical operations. Rotate and swap operations. Instructions affecting flags, incrementing/decrementing, Arithmetic operations, Jump and call instructions.	(06 Hours)
UNIT - III	Interrupts Serial data I/O, serial data mode interrupt, serial port interrupt, external hardware interrupts, software generated interrupts, interrupt control, interrupt priority in the 8051.	(06 Hours)
UNIT - IV	Applications Applications like Interfacing of 8051 with ADC , Interfacing of 8051 with DAC Interfacing of 8051 to stepper motor, Interfacing of 8051 to DC motor, Application for Traffic Control System.	(06 Hours)

UNIT - V	Introduction to PIC Microcontroller	
	Introduction to PIC 16F8XX family and development tools. CPU architecture and instruction set. Harvard architecture and pipelining, program memory considerations, register file structure and addressing modes, CPU registers.	(06 Hours)
UNIT - VI	PIC Peripherals	
	I/O ports, external interrupts and timers, timer operation, ADC, short overview of synchronous serial port, serial peripheral interface I2C bus.	(06 Hours)
Term Work:		
The term work shall consist of record of minimum eight experiments		
<ol style="list-style-type: none"> 1. Programs of addition, subtraction, multiplication etc. 2. Programs on logical and decision making group of instructions 3. Programs related to interrupt, timer and serial communication logic. 4. Programs related to data transfer between internal and external memory. 5. Simulator based programming. 6. Interfacing of 8051 with ADC 7. Interfacing of 8051 DAC 8. Interfacing of 8051 to stepper motor, DC motor 9. Application for Traffic Control System. 10. Interfacing PIC with LCD. 11. ADC conversion with PIC. 12. Interfacing PIC with keyboard. 		
Text Books:		
<ol style="list-style-type: none"> 1. B.Ram “Fundamentals of Microprocessors and Microcomputers”, edition 1995 Dhanapat Rai Publications 2. Ajay Deshmukh, ‘Microcontrollers Theory and Applications’, TATA McGraw Hill. 3. Myke Predko, ‘Programming and customizing the 8051 microcontroller’, TATA McGraw Hill 		
Reference Books:		
<ol style="list-style-type: none"> 1. M.A.Mazidi “The 8051 micro controller & embedded systems”, Pearson Education Publication 2. K.J.Ayala “The 8051 microcontroller Architecture programming and applications” 3. Kenneth Ayala , Delmar ,Cengage Learning ,” “The 8051 Microcontroller Architecture ,Programming & Applications” Third Edition , TATA McGraw Hill 4. Intel micro controller data book. 5. Microchip PIC family Microcontroller handbook 6. Design with PIC microcontrollers –John Peatman, Pearson Education Asia ,LPE 		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Assignments:

1. Group discussions on any one of the topics.
2. Watch the NPTEL video on this subject of any TWO modules and summarize it.
3. Open book class test on this subject.
4. Give presentation on PIC microcontroller.
5. Solve questioners in the class room on microcontroller.
6. List different microcontroller & compare them.
7. Prepare report on different microcontrollers used in your laboratory.
8. Give a presentation on “commercial aspects of microcontroller”.
9. Give presentation on different applications on PIC microcontroller.
10. Give presentation on different applications on 8051 microcontroller.
11. Program 8051 microcontroller for addition, subtraction & multiplication operations.
12. Write a note on PIC peripherals.
13. Study instruction set of 8051 microcontroller.
14. Study instruction set of PIC microcontroller.

Electrical Machine Design

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	05 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial: 01 Hours/ Week	Term Work: 25 Marks & Oral: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Various Materials Used in Electrical Machines
2. Types, construction & working of Transformers
3. Types, construction & working of DC & AC Machines

Course Objectives:

This course introduces Design of Electrical machines for the given specifications

Course Outcomes: The students will be able to

1. Apply the concepts of machines and materials in design of machines.
2. Analyze and estimate the transformer performance parameters
3. To estimate the main dimensions and performance parameters of 3- Induction Machines by understanding the general concepts and constraints in design.
4. To estimate the main dimensions and performance parameters of 1- Induction Machines by understanding the general concepts and constraints in design.
5. To estimate the main dimensions and performance parameters of Synchronous Machines & DC machines by understanding the general concepts and constraints in design.
6. To use different software (AutoCAD) for design.

UNIT - I	Fundamental Aspects, Thermal Design Aspects and General concepts, Constraints in design of Electrical Machines.	(10 Hours)
	<p>Introduction, Design factors, Limitations in design, Modern trends in Design of Electrical Machines, Basic Principles.</p> <p>Modes of heat dissipation, Heating and cooling curves, calculation of heating and cooling time constants, Rating of machines, selection of motor power ratings, Cooling of rotating of rotating machines, Types of duties and ratings and selection of motor capacity. Methods of measurement of temperature rise. Measurement of winding temperature.</p> <p>Relation between Rating and Dimensions of Rotating Machines: Main dimensions, Total loadings, Specific loadings, Output equation, Factors affecting size of rotating machines, Choice of specific magnetic & specific electric loading</p>	

UNIT - II	Design Of Transformer.	(08 Hours)
	Output equation with usual notations, design of core, yoke and windings of transformer. Estimation of resistance and leakage reactance of transformer. Estimation of no-load current, regulation of transformers. Calculation of mechanical forces, methods of cooling & tank design. Design of small single phase transformers.	
UNIT - III	Design of 3- Induction Motors.	(07 Hours)
	General Specifications of 3- Induction Motor. Stator winding design, Stator slot design, Stator teeth design, Depth of stator core, Rotor design: Air gap length, squirrel cage rotor and wound rotor, Design of rotor teeth & rotor core, Estimation of operating characteristics, Dispersion Coefficient.	
UNIT - IV	Design of 1- Induction Motors.	(07 Hours)
	Design of single phase Induction motor: Choice of specific loadings. Determination of main dimensions. Relative size of three phase and single phase Induction motor for same output. Design of main and starting winding for split phase, capacitor start motors. Design of rotor. Operating characteristics.	
UNIT - V	Design of DC & Synchronous Machines.	(08 Hours)
	Design of DC Machines: Design of field system and interpoles. Design of armature. Design of commutator and brushes. Design of heating coil, motor resistance starter, regulators, lifting magnets. Alternators: Output equation, Main dimensions, Choice of specific electric and magnetic loadings, choice of speed and number of poles, different types of pole structure used in synchronous machines. Design of armature: conductors, slots. Armature winding, Design of air-gap, Design of rotor: Height of pole, pole shoe, damper winding. open circuit characteristics, Losses and temperature rise.	
UNIT - VI	Modern Tools for Machine Design.	(08 Hours)
	Design optimization using various FEA (Finite Element Analysis) based machine design packages- Maxwell 2D, 3D, Magnet, 2D FEA analysis. FEMM (Finite Element Method Magnetics) free software.	

Industrial Visit: Industrial visit to a manufacturing unit of transformer or Induction motor.	
Term Work:	
The term work shall consist of 3 Drawing sheets and Design problems. (three in AutoCAD)	
<ol style="list-style-type: none"> 1. Details (Elevation, side view, top view) and assembly of 3- phase (power or distribution) transformer with design report. 2. Details and layout of AC & DC winding with design report. 3. Assembly of 3- phase induction motor.(only sheet) 4. Report based on Industrial visit to a manufacturing unit. (Transformer or Induction motor). 5. Details and assembly of 3-phase Alternator with design report. 6. Assembly of 1- phase transformer. 7. Details and assembly of 3- phase Induction Motor with design report. 8. Assembly of 1- phase Induction Motor. 	
Text Books:	
<ol style="list-style-type: none"> 1. Sawhney A. K., <i>Electrical Machine Design</i>, Dhanpath Rai & Co. (P) Ltd Sixth Edition: 2006 2. M.G. Say – Theory and Performance and Design of A.C. Machines, 3rd Edition, ELBS London. 3. P. P. Silvester and Ferraris’s book on Electrical Machine Design using FEA 	
Reference Books:	
<ol style="list-style-type: none"> 1. A Shanmugasundaram, G. Gangadharan, R. Palani, - Electrical Machine Design Data Book, 3rd Edition, 3rd Reprint 1988 - Wiely Eastern Ltd., - New Delhi 2. K.L. Narang , A Text Book of Electrical Engineering Drawings, Reprint Edition : 1993 / 94 – Satya Prakashan, New Delhi. 3. Vishnu Murti, “Computer Aided Design for Electrical Machines”, B.S. Publications 	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Assignments

1. Students should compile the list of vendors (manufacturers of Transformers, DC Machines, Single phase Induction Motors, PMDC motor, Stepper Motor, contact, and address) along with the details like types, specifications, and costs and should prepare the comparative for the same.
2. Students should prepare the report on “Estimation of no-load current of transformer” or “Estimation of operating characteristics of 3- Induction Motor”.
3. One industrial visit to the Manufacturing industry and the students will prepare the report which includes the consumption pattern of the products produced, process flow diagram and process description, major engineering problems in the industry.
4. Students should prepare the plant-layout for the industry visited.

5. Watch the NPTEL video on this subject of any TWO modules and summarize it
6. Solve Design problems for all types of machines.
7. Students should prepare the Datasheet for different machines.
8. Open book class test (Objective test).
9. Students have to study any One NPTEL videos related to a particular unit in group and prepare/present power point presentation.
10. Visit to Winding workshops, any machine repairing shop and prepare a report on detailed specifications of a machine, construction, types, material used and applications.
11. Students should prepare the report on modern tools in Design of Machines.
12. Prepare models for any types of machines related to the subject and write industrial applications.

Electrical Estimation, Costing & Installation

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits
		Continuous Assessment: 40 Marks		
Course Pre-requisites:				
The Students should have knowledge of				
1.	Introduction of Electrical supply system, typical A.C. power supply scheme, Classification of Supply systems			
2.	Single line diagram of electrical supply system			
Course Objectives:				
	1. To understand the basic concepts, installation, estimation and costing of distribution systems, substation and residential electrification.			
	2. To enable candidate to understand earthing system for residential and commercial Installation.			
	3. To understand practical aspects of condition monitoring and maintenance of various electrical equipments			
Course Outcomes: Student will be able to				
1.	Draft tender documents.			
2.	Do estimation and costing of residential and commercial buildings.			
3.	Select appropriate method for service connection.			
4	Calculate total electrical load.			
5.	Do detail Estimation and costing of industrial installation.			
UNIT - I	Contracts, Tenders And IE Rules			(06 Hours)
	Concept of Contracts and Tenders, Types of Contracts and Contractors, types of tenders, tender notice, procedure for submission and opening of tenders ,requirements of valid contract and good Contractor, comparative statements for selection of contractors, IE rules related to electrical installation, work to permit.			
UNIT - II	Service Connections			(06 Hours)
	Concept of service connections, types of service connections and their features, methods of installation of service connections, difference between underground and over head service connections, service connections for 11KV HT consumers, panel designing, cable jointing.			
UNIT - III	Electrification Of Residential Installation			(06 Hours)
	General rules and guidelines for installation of residential electrification and positioning of equipments, calculation of total electrical load in the residential installation, procedure for the design of number of sub circuits, load calculations and selection of size of wire by considering overload and future expansion, determine length of batten and length of wire, selection of rating for main switch, distribution board, MCB, ELCB			

	and wiring accessories, total estimation and costing of overall residential installation with proper cost of material, labor charges	
UNIT-IV	Electrification Of Commercial Installation	(06 Hours)
	Concept of commercial installation, difference between residential and commercial installation ,types of cables required for commercial installations according to size and core ,general requirements and selection factors for commercial installation, load calculations and selection of size of service connections and nature of supply, decide number of lighting and power sub circuits as per IE rules, decide length of wire required for every sub circuit, decide ratings of wiring accessories, main switch, bus bar MCB,ELCB etc. Decide proper method of earthing for commercial installation find out the estimation chart with proper cost of material,cost of labor, contingencies charges and profit margin.	
UNIT - V	Electrification Of Industrial Installation	(06 Hours)
	Concept of motor wiring circuit and single line diagram, guidelines about power wiring and motor wiring, design considerations of electrical installations in industry/factory/workshop, machine current calculations ,selection of size of wires, cables required for the machines and its controlling unit, decide length and size of cable required for every industrial load, decide ratings of wiring accessories, main switch, bus bar MCB,ELCB etc. for every industrial load, decide proper method of earthing for industrial installation with their costing, find out the estimation chart with proper cost of material, cost of labor, contingencies charges and profit charges and profit margin.	
UNIT - VI	Maintenance	(06 Hours)
	Definition, Need of maintenance, Types of maintenance, Breakdown maintenance, Preventive maintenance, Condition monitoring, Advanced tools and techniques of condition monitoring, Maintenance strategy, Maintenance type selection, Comparison of different maintenance types,	
Text Books:		
4. Surjit Singh – “Electrical Estimating and Costing” Dhanpat Rai Publications		
Reference Books:		
1. S. L. Uppal - “Electrical wiring, estimating & costing” Khanna Publishers		
2. B. V. S. Rao - “Operation and Maintenance of electrical equipments” (Vol. 2) Media promoters and publishers Pvt. Ltd.		
3. Raina.K.B and Bhattacharya S.K.,”Electrical design,Estimating and Costing”,Tata McGraw Hill,NewDelhi		
4. B.D. Arora-Electrical wiring,Estimation and costing-New Heights,New Delhi		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Assignments:

1. To solve numerical on calculations of total electrical load in the residential installation.
2. To solve numerical on calculations of total electrical load in commercial installation.
3. To solve numerical on calculations of total electrical load in industrial installation.
4. To calculate the total electrical load of electrical machine laboratory/any building.
5. To solve two years question papers of University unit wise.
6. To collect information about the recent/new installation techniques.
7. To observe and study the earthing system of our collage & to prepare a report on the earthing system which is used.

Elective I: Engineering Economics and Accountancy

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>		
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits		
		Continuous Assessment: 40 Marks				
Course Pre-requisites:						
The Students should have knowledge of						
1. Fundamental of Electrical Engineering Economics						
Course Objectives:						
<ul style="list-style-type: none"> This course will introduce various concepts and methods of economic analysis in engineering, including the time value of money and its effect on economic decisions, economic equivalence, economic measures of worth, cash flow analysis, equipment depreciation, effects of taxation and inflation, decision making under uncertainty, capital budgeting, replacement decisions, and benefit-cost analysis. 						
Course Outcomes:						
The student will be able to						
1. Understand the economic fundamentals.						
2. Learn about principles of decision making involved in engineering projects.						
3. They learn about: cash flows, time value of money and evaluation of investments and projects.						
UNIT - I	Introduction Managerial Economics - Relationship with other disciplines - Firms: Types, objectives and goals - Managerial decisions - Decision analysis.				(06 Hours)	
UNIT - II	Demand & Supply Analysis Demand - Types of demand - Determinants of demand - Demand function – Demand elasticity - Demand forecasting - Supply - Determinants of supply - Supply function -Supply elasticity.				(06 Hours)	
UNIT - III	Production And Cost Functions Production function - Returns to scale - Production optimization - Least cost input - Isoquants - Managerial uses of production function.				(06 Hours)	
UNIT - IV	Cost Analysis Cost Concepts - Cost function – Types of Cost - Determinants of cost - Short run and Long run cost curves - Cost Output Decision - Estimation of Cost.				(06 Hours)	

UNIT - V	Pricing	(06 Hours)
	Determinants of Price - Pricing under different objectives and different market structures - Price discrimination - Pricing methods in practice – role of Government in pricing control.	
UNIT - IV	Financial Accounting (Elementary Treatment)	(06 Hours)
	Balance sheet and related concepts - Profit & Loss Statement and related concepts - Financial Ratio Analysis - Cash flow analysis - Funds flow analysis – Comparative financial statements - Analysis & Interpretation of financial statements. Investments - Risks and return evaluation of investment decision - Average rate of return - Payback Period - Net Present Value - Internal rate of return.	
Assignment:		
1. Managerial Economics - Relationship with other disciplines		
2. Demand and supply Analysis		
3. Production and cost function		
4. Cost analysis		
5. Pricing		
6. Financial accounting		
Text Books:		
1. McGuigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy and Tactics', Thomson South Western, 10th Edition, 2005.		
2. Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill Publishing Ltd., 4th edition, 2005.		
Reference Books:		
1. Samuelson. Paul A and Nordhaus W.D., 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.		
2. Paresh Shah, 'Basic Financial Accounting for Management', Oxford University Press, New Delhi, 2007.		
3. Salvatore Dominick, 'Managerial Economics in a global economy'. Thomson South Western, 4th Edition, 2001.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

Elective I: Six Sigma

Elective I: Six Sigma		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Computer Programming	
Course Objectives:		
	<ol style="list-style-type: none"> 1. To explore the concept of six sigma thoroughly. 2. The actual working of six sigma in industries. 3. Various terms related with six sigma. 4. The outcome and analysis of six and sigma. 	
Course Outcomes: The students will be able to		
1.	Recognize the six sigma organization and concepts of six sigma matrix.	
2.	Explore the six sigma administration	
3.	Explore the Basic Quality Tools & Statistical concepts related with six sigma.	
4.	Explore the Capability Analysis Process capability indices.	
5.	Explicit the concept of DFSS.	
6.	Explore the various concepts regarding objectives and benefits of SPC and Lean Principles.	
UNIT - I	Introduction of Six Sigma Origin of Six Sigma & Basic concept	(06 Hours)
	<p>Six Sigma Overview:-Recognize why organizations use Six Sigma, how they apply its philosophy of Value Focus and goals. Concepts of CTQ / CTP / $Y=f(X)$</p> <p>Six Sigma Metrics:-Recognize key drivers for business (profit, market share, customer satisfaction, efficiency, product differentiation) and how key metrics and scorecards are developed and impact the entire organization. Calculate process performance metrics such as defects per unit (DPU), rolled throughput yield (RTY), cost of poor quality (COPQ), defects per million opportunities (DPMO) & sigma levels</p>	
UNIT - II	Six Sigma Administration	(06 Hours)
	<p>Describe the project selection process, Six Sigma improvement methodology (DMAIC). Six Sigma and other team roles and responsibilities, Describe and define the roles and responsibilities of participants on Six Sigma and others including Black Belt, Master Black Belt, Green Belt, Champion, executive, coach, facilitator, team member, sponsor, process owner.</p> <p>Voice Of Customer Use various methods to collect customer feedback (e.g., surveys, focus groups, interviews, observation) and identify the key elements that make these tools effective. Review survey questions to eliminate bias, vagueness, etc. Define Internal & External Customers,</p>	

	DEFINE Project charter, Stake-holders, Project Team dynamics	
UNIT - III	Basic Project Management & Planning Tools	(06 Hours)
	Describe Process Mapping, SIPOC/COPIS, process inputs, outputs. Design and process failure mode and effects analysis (DFMEA & PFMEA). Basic Tools:- 1) Affinity Diagrams, 2) Interrelationship Digraphs, 3) Tree Diagrams, 4) Prioritization Matrices, 5) Matrix Diagrams, 6) Process Decision Program (PDPC) Charts, 7) Activity Network Diagrams. Quality function deployment (QFD), Basic Quality Tools & Statistical concepts Graphical, Enumerative Tools, Population parameters and sample statistics. Data Types, Measurement scales, Sampling Techniques, Data collection tools - Check Sheets, Stratification. Data Analysis Tools - Pareto diagram, Cause & Effect analysis, Trend Charts, Multi-Vary analysis, Scatter Diagrams, Histogram & Control Charts. Basic Probability Concepts, Measures of Distribution, Dispersion and Central Tendency, Probability distributions - Discrete data - Binomial & Poisson. Continuous data - Normal distribution. Z transform, Central Limit Theorem. Student's t distribution & Chi square distribution.	
UNIT - IV	Capability Analysis Process capability indices	(06 Hours)
	- Short term - Process Capability - Cp, Cpk. Long Term - Process performance indices - Pp, Ppk. Confidence Intervals CI for Means & for Variance. Hypothesis Testing ANOVA & Regression One Way & Multiway ANOVA, Co-relation & Regression analysis MSA Bias, Linearity, Stability and precision/tolerance (P/T) ratio for Continuous data & Percent agreement for Discrete Data. Calculate, analyze, and interpret measurement system capability using repeatability and reproducibility (GR&R) for continuous data. Kappa agreement concepts for Discrete data.	
UNIT - V	DFSS Concepts	(06 Hours)
	DMADV (define, measure, analyze, design, verify) and IDOV (identify, design, optimize, verify), Robust Design Concept. Experimental Methods Introduction to Design of Experiments	
UNIT - VI	Control Methods	(06 Hours)
	Describe the objectives and benefits of SPC, including controlling process performance, identifying special and common causes, Rational sub-grouping, Control Charts for Continuous & Discrete data. Lean Principles Define and describe concepts such as Theory of Constraints, value chain, flow, pull, etc., and tools commonly used to eliminate waste, including kaizen, 5S, error-proofing, value-stream mapping, etc. Value-added and non-value-added activities Identify waste in terms of excess inventory, space, test inspection, rework, transportation, storage, etc., and reduce cycle time to improve throughput.	

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Text Books:	
1.	The Six Sigma Black Belt Handbook by MacCarty, Daniels, Bremer and Gupta, TMGH, 2010 Edition Juran Institute's Six Sigma Breakthrough and Beyond by De Feo and Barnard, TMGH. What is Six Sigma? by Peter Pande, TMGH
2.	Six Sigma Management by Blashka, TMGH
3.	All about Six Sigma by Warren Brussee, TMGH
Reference Books:	
1.	Lean Six Sigma by Hubert Ramprasad, Sara Books Pvt.Ltd.
2.	The Certified Six Sigma Black Belt Hand Book, Donald Benbow, Pearson
3.	The Certified Six Sigma Black Belt Hand Book, Donald Benbow, Pearson
4.	Achieving Business Excellence by Pravin Rajpal, Om Books International, India.
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Assignments: Assignments should be able to verify course outcome and skills of group work, communication skills

1. To solve numerical on block diagram reduction to calculate overall transfer function of system and verify with Mason's gain formula
2. To calculate transfer function of equivalent electrical system for given mechanical system.
3. Quiz –Multiple Choice Questions 20
4. To solve numerical on time domain and analyze parameter variations on transient response and steady state error.
5. Solve two years question paper of Pune university unit wise.
6. Solve two years question paper of GATE unit wise.
7. To observe NPTEL video lecture by M. Gopal on any topic of control and give presentations, group discussion.
8. To collect information about controllers used in process control in thermal power plant.
9. To collect information about controllers used in power system for voltage and frequency control.
10. To collect information about controllers used in machine control.
11. To validate the design by hardware.

Elective- I Risk and Derivatives

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
Course Prerequisites:		
The students should have knowledge of		
1.	Management Studies	
Course Objectives:		
	<ol style="list-style-type: none"> 1. To explore the concept of Risk and Derivatives thoroughly. 2. The actual working of Risk and Derivatives in industries. 3. Various terms related with Risk and Derivatives. 	
Course Outcomes: After learning this course the students will be able to		
1.	Explore the various terms related with derivatives	
2.	Explore the various contracts related with the future.	
3.	Explore the term options and various terms associated with options	
4.	Explore the term SWAPS and terms associated with SWAPS.	
5.	Explore to the meaning of risk management and associated terms .	
6.	Explore with various Instruments of External techniques of Risk Management	
UNIT I	<u>Derivatives</u>	(06 Hours)
	Definition and Types Forward Contracts, Futures Contracts, Options, Swaps, Differences between Cash and Future Markets, Types of Traders ,OTC and Exchange Traded Securities, Types of Settlement, Uses and Advantages of Derivatives, Evolution of Derivatives Market in India, Regulations – Framework, Exchange Trading in Derivatives	
UNIT II	<u>Futures Contract</u>	(06 Hours)
	Specifications of Futures Contract, Margin Requirements, Marking to Market, , Hedging using Futures, Types of Futures Contracts – Securities, Stock Index Futures, Currencies and Commodities, Delivery Options, Relationship between Future Prices, Forward Prices and Future Spot Prices, Commodity Futures, Contract Terminology and Specifications for Stock Options and Index Options in NSE, Contract Terminology and specifications for Stock Futures and Index futures in NSE, Contract Terminology and Specifications for Interest Rate Derivatives.	
UNIT III	<u>Options</u>	(06 Hours)
	Meaning and Definition, Exchange Traded Options, OTC Options – Specifications of Options, Call and put Options, American and European	

	Options, Intrinsic Value and Time Value of Options, Option payoff options on Securities, Stock Indices, Currencies and Futures, Options pricing models Differences between Future and Option contracts	
UNIT IV	<u>SWAPS</u>	(06 Hours)
	Definition of SWAP, Interest Rate SWAP, Currency SWAP, Role of Financial Intermediary, Warehousing, Valuation of Interest rate SWAPs and Currency SWAPs Bonds and FRNs	
UNIT V	Introduction to Risk Management	(06 Hours)
	Identifying types of risks, Management of Translation, Transaction and economic Exposure, Quantifying Risk and Hedging techniques, Internal and External Techniques viz Netting, Matching, Leading and Lagging, Price variation, Short Term borrowing, Pricing in Foreign Currency, Assets Liability Management	
UNIT VI	Instruments of External techniques of Risk Management	(06 Hours)
	Forwards, Futures, Swaps, Options, Forward Rate Agreement, Caps, Collars, Floors and their applications, Pricing techniques, Operational aspects.	
Text Books:		
1. Derivatives simplified – An Introduction to Risk Management- P.Vijaya Bhaskar & B.Mahapatra		
Reference Books:		
4. Options and Futures- Hull		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Assignments: Assignments should be able to verify course outcome and skills of group work, communication skills

1. To solve numerical on derivatives
2. Quiz –Multiple Choice Questions 20
3. Solve two years question paper of Pune university unit wise.
4. Solve two years question paper of GATE unit wise.
5. To observe NPTEL video lecture on any topic of control and give presentations, group discussion.
6. Case study on risk management related with any factory or commercial industry.

Elective I: Total Quality Management

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1. Power Quality Management

Course Objectives:

1. To introduce the fundamental concepts of total quality management, statistical process control, six sigma and the application of these concepts.
2. To introduce philosophies and strategies to quality related issues.
3. To provide skills in diagnosing and analyzing problems causing variation in manufacturing and service industry processes.
4. To provide a basic understanding of "widely-used" quality analysis tools and techniques.

Course Outcomes:

The student will be able to

1. Develop an understanding on quality management philosophies and frameworks
2. Develop in-depth knowledge on various tools and techniques of quality management
3. Learn the applications of quality tools and techniques in both manufacturing and service industry.

UNIT - I	Quality, Strategic Planning, and Competitive Advantages	(06 Hours)
	Brief History - Definitions of Quality. Quality in Manufacturing and Service Systems. Quality and Price - Quality and Market Share - Quality and Cost - Quality & Competitive Advantage.	
UNIT - II	Principles of Total Quality Management:	(06 Hours)
	Introduction - Elements of Total Quality Management - Malcolm Baldrige National Quality Award Criteria. Benefits of Total Quality Management. The Deming Management Philosophy – The Juran Philosophy – The Crosby Philosophy	
UNIT - III	Customer Focus :	(06 Hours)
	The Customer-Driven Quality Cycle - Quality Function Deployment –Customer Satisfaction Measurement Techniques - Customer Relationship Management Techniques.	
UNIT - IV	TQM Tools & Techniques (I)	(06 Hours)

	The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.	
UNIT - V	TQM Tools & Techniques (Ii)	(06 Hours)
	Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.	
UNIT - VI	Quality Systems	(06 Hours)
	Need for ISO 9000-2008 quality system – elements, documentation, quality auditing- as 9000 –ISO 14000 – concepts, requirements and benefits – case studies of TQM implementation in manufacturing and service sectors.	
Assignment:		
1. Quality , strategic Planning and competitive Advantages		
2. Principles of total quality management		
3. Customer Focus :		
4. TQM tools and techniques (I)		
5. TQM Tools & Techniques (II)		
6. Quality Systems		
Text Books:		
1. Total Quality Management – Sundarajan		
2, Quality Control & Total Quality Management – Jain		
3.Dale H.Besterfiled, et at., “Total Quality Management”, Pearson Education Asia,3rd Edition, Indian Reprint (2006).		
Reference Books:		
1.James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 6th Edition, South-Western (Thomson Learning), 2005.		
2.Oakland, J.S., “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 200UNIT III		
3.Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006.		
4.Janakiraman, B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd., 2006.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

Elective I: New Enterprise Creation and Management

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Progressive Skills	
Course Objectives:		
1.	Develop an understanding of the importance of entrepreneurship in society and the different forms of entrepreneurial activity	
2.	Develop an understanding of the new venture creation process and the life cycle of a new venture from idea development and launch through growth and various exit strategies	
3.	Gain knowledge of business plans, sources of capital, marketing and distribution strategies, operations, organization issues, as well as key legal and ethical considerations affecting entrepreneurial ventures	
Course Outcomes:		
The student will be able to		
1.	Develop your analytical skills: thinking, problem solving, and decision-making	
2.	Learn to analyze and critically evaluate ideas and viewpoints	
3.	Acquire an interest in learning more by questioning and seeking answers	
4.	Learn to find and use resources to answer your questions	
5.	Learn to form conclusions and recommendations and to support them with logic and Evidence.	
UNIT - I	Foundations of Entrepreneurship Development:	(06 Hours)
	<p>Concept and Need of Entrepreneurship Development Definition of Entrepreneur, Entrepreneurship, Innovation, Invention, Creativity, Business Idea, Opportunities through change.</p> <p>Concepts of Entrepreneur, Manager, Entrepreneur / Corporate Entrepreneur –Comparative study - Roles, Responsibilities, Career opportunities.</p> <p>Entrepreneurship as a career, Entrepreneurship as a style of management, The changing role of the entrepreneur: mid-career dilemmas – Closing the window: Sustaining Competitiveness - Maintaining competitive advantage.</p>	

UNIT - II	Theories of Entrepreneurship:	(06 Hours)
	Innovation Theory by Schumpeter & Imitating Theory of High Achievement by McClelland X-Efficiency Theory by Leibenstein Theory of Profit by Knight Theory of Social change by Everett Hagen	
UNIT - III	Influences on Entrepreneurship Development :	(06 Hours)
	Entrepreneurial Traits, External Influences on Entrepreneurship Development: Socio-Cultural, Political, Economic, Personal. Entrepreneurial culture with special reference to Entrepreneurship / Corporate Entrepreneurship. Entrepreneurial Success and Failure: Reasons and Remedies.	
UNIT - IV	Women Entrepreneurs and Business Planning Process	(06 Hours)
	Women Entrepreneurs: Challenges to Woman Entrepreneurs, Achievements of Woman Entrepreneurs, Role Models of Woman Entrepreneurs. Business Planning Process - The business plan as an entrepreneurial tool Elements of Business Plan, Objectives, Market Analysis, Development of Product / idea, Marketing, Finance, Organization & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones.	
UNIT - V	Creating Entrepreneurial Venture	(06 Hours)
	Entrepreneurship Development Cycle Entrepreneurship Development and Government. Role of Central Government and State Government in promoting Entrepreneurship with various incentives, subsidies, grants etc. – with special reference to ‘Export oriented unites’ Role of the following agencies in the Entrepreneurship Development DIC – District Industrial Center SISI – Small Industries Services Institute EDII – Entrepreneurship Development Institute of India NIESBUD – National Institute of Entrepreneurship and Small Business Development NEDB – National Entrepreneurship Development Board	
UNIT - VI	Project Management	(06 Hours)
	Technical, Financial, Marketing Personnel and Management feasibility Reports Financial schemes offered by various financial institutions like Commercial Banks, IDBI, ICICI, SIDBI, SFCs, Venture Capital Funding, Angle Capitalist Case studies of Entrepreneurs – successful, failed, turnaround ventures should be discussed in the class.	
Assignment:		
1. Foundation of entrepreneurship development		
2. Theories of entrepreneurship		
3. Influence pf entrepreneurship development		
4. Women Entrepreneurs and Business Planning Process		
5. Creating Entrepreneurial Venture		
6. Project management		

Text Books:	
1. Dynamics of Entrepreneurship Development – Vasant Desai.	
2. Entrepreneurship Development New Venture Creation – Satish Taneja, S.L.Gupta	
3. Entrepreneurship and Small Business Management – Siropolis	
Reference Books:	
1. Project management – K. Nagarajan.	
2. Corporate Entrepreneurship – Vijay Sathe	
3. New Vistas of Entrepreneurship: Challenges & Opportunities – A. Sahay, M.S.Chhikara	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

Elective I: Operational Research

TEACHING SCHEME:

Theory: 03 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

03 Credits

Course Pre-requisites:

The Students should have knowledge of

1. Basics about literature reviews and surveys.

Course Objectives:

1. The objective of this course is to help the students acquire quantitative tools, and use these tools for the analysis and solution of business problems.
2. The emphasis will be on the concepts and application rather than derivations.

Course Outcomes:

The student will be able to learn

1. Methods for making decisions
2. Analyzing the outcome of events
3. Mining and analyzing data using statistics
4. Programming methods
5. Problem-solving and organization
6. Computing algorithms

UNIT – I

Quantitative Techniques and Operations Research

(06 Hours)

Meaning, Scope of Quantitative Techniques and Operations Research in Management, Advantages and Limitations of Quantitative Techniques ,OR Models

UNIT – II

Linear Programming

(06 Hours)

Meaning of Linear .Programming, General Mathematical Formulation of LPP, Graphical Analysis, Simplex Method, Two-phase Method, Big M-Method. Duality and Post Optimality Analysis Advantage and Limitations of LPP.

UNIT - III

Transportation Model

(06 Hours)

Mathematical Formulation, Initial Basic Feasible Solution, Vogel's Approximation Method, Optimization (Minimization and Maximization) Using Modified Distribution Method and Stepping Stone Method.

UNIT - IV	Dynamic Programming	(06 Hours)
	Nature of Dynamic Programming Problem, Dynamic Programming Solutions for Knap Sack, Traveling Salesman (Stage Coach), Assignment of Salesmen to Sales Area and Capital Budgeting. Integer linear programming: Meaning, Application, integer programming algorithm (branch and bound algorithm, cutting plan algorithm).	
UNIT – V	Waiting Line Models and Replacement Models	(06 Hours)
	Introduction, Scope in Management Decisions, Queuing Models M/M/1 (Infinite and Finite Population), Probability Calculations and Application of M/M/C (Infinite Population) Introduction Scope in Management, Single Equipment Replacement Model and Group Replacement.	
UNIT - VI	Game Theory & Markov Chain Analysis	(06 Hours)
	Introduction to Games, Maximin and Minimax Principles, Pure and Mixed Strategies, Solution of Games Using-Algebraic and Graphical Methods. Computation of Sequential Probability of States for Different Periods, Steady State Probability of States and Application of Markov Chain.	
Assignment:		
1. Quantitative Techniques and Operations Research		
2. Linear Programming		
3. Transportation Model		
4. Dynamic Programming		
5. Waiting Line Models and Replacement Models		
6. Game Theory & Markov Chain Analysis		
Text Books:		
1. Hamdy A.Taha, Operations Research: An Introduction , Pearson 2008		
2. H.M. Wagner, Principles of Operations Research with Application to Managerial Decisions , PHI Learning. 2nd Ed., 2009.		
3.Chawla, Operation Research , Kalyani Publication Ludhiyana,2009		
Reference Books:		
1.V. K. Kapoor, Problems and Solutions in Operations Research , New Delhi, Saitan Chand and Sons, 2001		
2. F. Hillier, Introduction to Operation Research , TMH, 2005		
3. Bobby Srinivasan and C.L. Sandblom, Quantitative Analysis for Business Decisions , Singapore, McGraw Hill Publications, 2001.		
4. C.R. Kothari, An Introduction to Operational Research , New Delhi, Vikas Publications, 3rd Ed., 2009.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

Name of subject: Engineering Mathematics-IV (Optional Subject)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Continuous Assessment: 40 Marks	04 Credits

Course Pre-requisites:

The Students should have knowledge of

1. Determinants
2. Matrices
3. Differentiation
4. Integration of functions
5. Differential equation

Course Objectives:

The course aims at making the students familiar about the most basic numerical methods and Concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.

Course Outcomes:

The student should be able to

1. Derive appropriate numerical methods to solve algebraic and transcendental equations
2. Evaluate the accuracy of common numerical methods.
3. Develop appropriate numerical methods to solve a difference equation.
4. Be familiar with numerical interpolation and approximation of functions, numerical integration and differentiation.
5. Be familiar with numerical solution of ordinary differential equations.
6. To compute Numerical Solution of Partial Differential Equations.

UNIT - I	Numerical solutions of algebraic and transcendental equations	(08 Hours)
	Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.	
UNIT - II	Solution of system of linear algebraic equation	(08 Hours)
	Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.	
UNIT - III	Difference equation and Solution of difference equations	(08 Hours)
	Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.	
UNIT - IV	Interpolation and Numerical differentiation and integration	(08 Hours)
	Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting: Method of least squares. Straight line, Second degree, parabola, Exponential curve.	

	Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.	
UNIT - V	Numerical solution of I order ordinary differential equation	(08 Hours)
	Solution by Euler's, method Euler' Modified method Taylor's series. Runga-kutta method. Milne's Predictors and Correctors method.	
UNIT - VI	Numerical Solution of Partial Differential Equations	(08 Hours)
	Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.	
Text Books:		
1.Gupta P.P.& Malik G.S., <i>Calculus of Finite Differences and Numerical Analysis</i> , Krishna Prakashan Mandir,Meerut, 21/e, 2006.		
2. B.S.Grewal, <i>Engineering Mathematics</i> , Khanna Publishers, 12/e, 2006.		
Reference Books:		
1. Francis J. Scheid, <i>Schaum's Outline of Numerical Analysis</i> , McGraw-Hill, New York, 1989.		
2. S. S. Sastry, <i>Engineering Mathematics</i> , Vol I, II Prentice Hall Publication, 3/e, 2004.		
3. C.Ray Wylie & Louis C. Barretle, <i>Advanced Engineering Mathematics</i> , Tata McGraw Hill Publishing Co Ltd., 6/e,2003.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I,II,III	
Unit Test -2	UNIT – IV,V,VI	

Switchgear And Protection

Switchgear And Protection		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral : 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
	Generation, Transmission & distribution of electrical energy.	
Course Objectives:		
	To develop the students to identify, analyze & to understand the fundamentals, classification, application and selection of various switchgears and different protection schemes of power system components.	
Course Outcomes: The students will be able to		
1.	Elaborate construction and working principle of different types of Circuit interrupting devices & to compute fault levels.	
2.	Describe the need of protective Relaying and operating principles of different types of relays.	
3.	Study different type of faults in transformer, alternator, I.M. and various protective schemes related to them.	
4.	Learn transmission line protection schemes, and characteristics of different types of distance relays.	
5.	Learn over voltage protection schemes, and different neutral earthing.	
6.	Learn substation layouts and PC applications in short circuit studies for designing relaying scheme	
UNIT – I	Fundamentals of power system protection & Circuit interrupting devices.	(06 Hrs.)
	<p>Fundamentals of power system protection: Functions of protective system, Normal and abnormal conditions and their effects on power system, Fault-types, Causes, Essential qualities of protections, Short circuit kVA calculations, and Current limiting reactors.</p> <p>Circuit interrupting devices: Arc formation process, Methods of arc extinction, important terms - re-striking and recovery voltage RRRV. Construction, working & application of low tension switchgear - Fuses, Isolators, MCB, MCCB, ELCB, Contactor, ACB.</p> <p>Construction, working & application of low tension switchgear: - OCB, MOCB, SF6 CB, VCB. Rating of circuit Breaker, Resistance switching and current chopping, capacitive current breaking, auto re-closures. Introduction to HVDC circuit breaking.</p>	
UNIT – II	Protective Relaying	(06 Hrs.)
	Evolution of protective relaying, classification of relays, zones of protection, primary and backup protection, essential qualities of protective relaying. Trip circuit of circuit breaker. Various basic operating principles of protection- over current, (current graded & time graded),directional over current, differential, distance, induction type	

	<p>relay, torque equation in induction type relay, current and time setting in induction relay, Numerical on TSM, PSM and operating time of relay.</p> <p>Static & Digital Relaying</p> <p>Overview of Static relay, block diagram, operating principal, merits & demerits of static relay. Numerical Relays :-Introduction, Block diagram of numerical relay, Sampling theorem, Anti –Aliasing Filter, Block diagram of Phasor Measurement Unit (PMU).</p>	
UNIT–III	Protection of Power System Components	(06 Hrs.)
	<p>Protection of Alternator & Transformer</p> <p>Various faults in Alternator, abnormal operating conditions, protection against stator faults, Protection against rotor faults, protection against loss of excitation and loss of prime mover.</p> <p>Protection of Transformer :</p> <p>Types of faults in transformer. Percentage differential protection in transformers, Restricted E/F protection. Incipient faults, Buchholz relay. Protection against over fluxing. Protection against inrush current</p> <p>3 Phase Induction Motor Protection- Abnormal conditions & causes of failures in 3 phase Induction motor, single phasing protection, Overload protection, Short circuit protection.</p>	
UNIT–IV	Protection of Busbar & Transmission Line	(06 Hrs.)
	<p>Bus bar Protection: Differential protection of bus bars. Selection of C.T. ratios for bus bar protection. High impedance differential relay.</p> <p>Transmission line: over current protection for feeder using directional & non-directional over current relays, Introduction to distance protection, impedance relay, reactance relay, mho relay & Quadrilateral Relays, Introduction to PLCC, block diagram, advantages, disadvantages, three stepped distance protection, Effect of arc resistance, and power swing on performance of distance relay. Realization of distance relays (impedance, reactance and mho relay) using numerical relaying algorithm (flowchart, block diagram), Introduction to Wide Area Measurement (WAM) system.</p>	
UNIT – V	Over voltage protection & System grounding	(06 Hrs.)
	<p>Over voltage protection : Overvoltage, causes of overvoltage, Lightning phenomenon, direct & indirect strokes, protection of overhead transmission lines from direct lightning strokes, Lightning arresters, rod gap type, horn gap type, Thyrite type, Metal oxide (ZnO) type lightning arrester.</p> <p>System grounding: Introduction and importance of earthing, terms and definitions, types of earthing, substation earthing.</p>	
UNIT-VI	Substation layouts & PC applications in short circuit studies for designing relaying scheme :	(06 Hrs.)
	<p>Substation layouts : Classification of substation, selection & location of site, main connection schemes, Equipments used in substation, various symbols – C.B. , L.A., fuses, relays, power transformer, bus bar and its arrangement, CT.- PT, isolators, earthing switch, capacitor bank, batteries PLCC, control room, etc., Connection diagram and its layout.</p> <p>PC applications in short circuit studies for designing relaying scheme: Introduction, Types of faults, and Assumptions for conducting short circuit studies,</p>	

	steps in development of algorithm.	
Term Work:		
The Practical's shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> 1. To find the characteristics of MCB using relay testing kit. 2. To find the characteristics of MCCB using relay testing kit. 3. To find the characteristics of Fuse using relay testing kit. 4. To find the pickup and drop off voltage of Contactor 5. To find the characteristics of Induction type over current relay 6. To find the characteristics of Induction type under voltage relay 7. To find the characteristics of microprocessor based over current relay 8. To find the characteristics of microprocessor based under voltage relay 9. To find the characteristics of microprocessor based over voltage relay 10. Differential protection of 3 phase alternator. 11. Protection of transmission line. 12. Report on industrial visit to switchgear training centre /or switchgear/relay manufacturing unit/ or H.T. substation visit. 		
Text Books:		
1. S. Rao, "Switchgear Protection & Power Systems", Khanna Publications		
2. Y. G. Paithankar, S. R. Bhide, "Fundamentals of Power System Protection", Prentice Hall of India		
3. Bhavesh Bhalja, R.P. Maheshwari, N.G. Chothani," Protection and Switchgear", Oxford University Press, 2011 Edition.		
4. A Course in Electrical power – M L Soni, P V Gupta, U S Bhatanagar - Dhanpat Rai and sons		
Reference Books:		
5. Badri Ram, D. N. Vishwakarma, "Power System Protection & Switchgear", Tata McGraw Hill Publishing Co. Ltd.		
6. J. Lewis Blackburn , Thomas J. Domin, "Protective Relaying: Principles and Applications", Fourth Edition, CRC Press.		
7. Prof. Dr S.A. Soman, IIT Mumbai , A Web course on "Digital Protection of power System" http://www.cdeep.iitb.ac.in/nptel/Electrical%20Engineering/Power%20System%20Protection/Course_home_L27.html		
8. A.G. Phadke and J.S. Thorp , Computer relaying for Power System, Research Studies Press LTD, England.(John Willy & Sons Inc New York)		
9. Crussel Mason, "The Art and Science of Protective Relaying", Wiley Eastern Limited.		
10. Power system Protection and Switchgear – B Ravindranath and M M Chander – Wilsey Eastern Ltd.		
11. L. P. Singh, Digital Protection, New age international Publisher		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Assignments:

1. Market survey for various switchgear devices and prepare report on the same.
2. Industrial visits to Manufacturer of switchgear devices and prepare report.
3. Solve 3 University exam question papers.
4. Prepare report on NPTEL Video lectures on any topic related with syllabus.

5. Solved the unsolved questions from books for every Unit.
6. Solve the GATE question papers Unit wise.
7. Prepare self-study report on topics related with Units.

Power System Analysis

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	TW: 25Marks Practical:25 Marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Structure of Power System, Transmission & Distribution Systems, Network Analysis.	
Course Objectives:		
	This course aims at understanding the components of interconnected power system, Representation of these system components in terms of mathematical models and Tools for analyzing the system operation during the normal & abnormal operating conditions.	
Course Outcomes:		
1.	To apply the concepts of Complex Power.	
2.	To interpret Single Line Diagram of power systems & model the power system in per unit	
3.	To formulate the load flow problem for 3-4 bus system & interpret the results.	
4	To compute fault current on the occurrence of symmetrical fault on power system	
5	To convert the unbalanced system parameters to sequence components & vice versa & to compute fault current on the occurrence of SLG, LL and DLG fault on power system	
6	To Derive swing Equation & apply solution to understand the rotor dynamics of synchronous machines	
UNIT - I	Complex Power	(08Hour)
	Structure of Interconnected & Integrated Power System, Formation of National Grid, Present Indian Power Industry, Power system analysis and their necessity. Concept of complex power, Complex power flow through transmission lines, Load on the system, its composition, nature of load curves for various consumer categories, Load voltage-frequency specifications & permissible variations, Real power-frequency and reactive power- voltage dependency, Conventional methods of voltage control of Power system.	
UNIT - II	Power System Modeling	(08Hour)
	Representation of power system-Single line diagram, Representation and modeling of long line, Synchronous generator-simple model such as emf behind reactance, power transformer, three winding transformer. Impedance and Reactance diagrams of power systems and their use. The per unit system of parameter value representation-selection of base, change of base, advantages, its application to impedance/reactance diagram.	
UNIT - III	Load Flow Analysis	(08Hour)
	Development of mathematical models of simple systems by network reduction, Driving point & Transfer Admittance, Concept of Z-bus and Y-	

	bus matrices, Formation of Y Bus Matrix ,Introduction to load flow analysis, Classification of buses, Formation of power flow equations (PFES) for n bus power system, Classification of variables& solution techniques, Newton-Raphson Method(Polar form) for load flow solution ,Introduction to optimal power flow and DC power flow, its importance, necessity and difference from conventional power flow.	
UNIT - IV	Symmetrical Fault Analysis	(08Hour)
	Symmetrical faults on power system, Sudden three [phase short circuit fault on unloaded alternator, Sub-transient, transient and steady state currents and impedances, DC offset and effect of the instant of short circuit on the waveforms, Estimation of fault currents with and without pre-fault current for simple power system, Selection of circuit breakers and current limiting reactors.	
UNIT - V	Unsymmetrical Fault Analysis	(08Hour)
	Methods of symmetrical components, relationships, sequence impedances. Representation of power systems by positive, negative and zero sequence networks, Nature of sequence impedance of power system components. Line-Line, Line-Ground, Line-Line-Ground faults, Analysis of unloaded and pre loaded alternators and simple power systems with and without fault impedance.	
UNIT - VI	Power System Stability	(08Hour)
	Concept of steady state, dynamic and transient stability of power systems and the factors controlling each, Steady state stability, its evaluation and variation of limits of stability under system conditions, Transient stability and importance of rotating machine dynamics in the power system stability evaluation,. The swing equation, its derivation, Equal Area Criteria (Consideration of one machine-infinite bus problem only.)	
Term Work:		
The term work shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> 1. Study of effect of VAR compensation on receiving end voltage profile on a transmission line using capacitor bank. 2. Determination of steady state stability limit for transmission line. 3. Determination of steady state limit of a synchronous motor and plotting P- curve. 4. Measurement of sub transient reactance of a salient pole synchronous machine by Static impedance /Dalton – Cameron method. 5. Measurement of negative sequence reactance of synchronous machine. 6. Measurement of zero sequence reactance of synchronous machine. 7. Fault analysis for symmetrical fault by simulation or AC/DC network analyzer. 8. Unsymmetrical fault analysis by simulation or AC/DC network analyzer. 9. Computer aided solution of 3 bus load flow problem using Gauss-Seidel method. 10. Formation of Y bus matrix using computer programming. 11. Study of load flow on 3 bus system using by actual simulation/ AC network analyzer. 		
Text Books:		
<ol style="list-style-type: none"> 1. I J Nagrath , D P Kothari, "Modern Power System Analysis", Tata McGraw Hill Publication 2. Grainger Jhon J, W D Stevenson Jr, "Power System Analysis" Mc-Graw Hill Publication 		

Reference Books:	
1.	O I Elgerd, "Electrical Energy Systems Theory: An Introduction", Tata McGraw Hill Publication
2.	Hadi Sadat," Power Sysem Analysis", McGraw Hill International Publication
3.	A R Bergen and Vijay Vittal,"Power System Analysis", Pearson Education Asia.
4.	J D Glover and M Sarma," Power System Analysis & Design",
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Assignments:

1. Refer the following web sites& prepare presentation on Power Scenario of India
Ministry of Power, CERC, MNRE
2. Sketch the load curves for Residential, Industrial, Agriculture, Municipal and Commercial categories of consumers and compare them with reference to Load factor, Diversity factor. Also plot the monthly load curve of the college substation. Estimate the maximum demand, Load factor.
3. Sketch the single line diagram (SLD) of the college & department power supply system. Enter all the specifications of the power system components & develop SLD using the ETAP software.
4. Develop the power system model of the department/College power system/any other power system (up to 50 buses) & conduct the load flow analysis using E TAP software. Analyse the results using N-R method.
5. Develop the power system model of the department/College power system/any other power system (up to 50 buses) & conduct the short circuit analysis using E TAP software. Analyse the results to confirm the Circuit Breaker ratings.
6. Develop the model of long transmission line and synchronous machine & estimate the steady state stability limit using ETAP/MATLAB software.
7. Self-learn NPTEL sessions on i) Symmetrical Fault Analysis ii) Unsymmetrical Fault Analysis & Generate presentation to explain the concepts: i) Nature of Short Circuit Current ii) Selection of Circuit Breakers iii) Symmetrical components
8. Arrange Industrial Visit to Load Dispatch Center: Prepare Study Report on Control Functions applied by the load dispatcher for Power System Analysis

Modern Control Systems

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral 25marks	01 Credit
Course Prerequisites:		
The students should have knowledge of		
	Linear control system , methods of stability analysis, Matrix algebra, Z transform,	
Course Objectives:		
	This course introduces state space modeling and stability analysis of system. It includes phase plane and describing function method of stability analysis of nonlinear system. It also introduces fundamental mathematical concepts and stability analysis of digital control system	
Course Outcomes: After learning this course the students will be able to		
1.	Represent the system equation in various state space models (physical, phase variable, canonical	
2.	Draw block diagram and signal flow graph from state space model of system.	
3.	Calculate the solution of state equation; calculate transfer function from state space model.	
4	Recognize various nonlinearities and its effect on system stability	
5	Compare between Linear and nonlinear, analog and digital, state space and transfer function model	
6	Calculate pulse transfer function of digital system. Explain the mathematical model of digital system and select appropriate sampling frequency.	
7	Describe principle of operation and applications of adaptive control, robust control and Artificial neural network, Fuzzy logic .	
UNIT I	State Variable representation	(08Hours)
	Comparison of transfer function and state variable analysis, concept of state, state space, state vector, state equation of the system, state space representation using physical variable, phase variable and canonical variables with block diagram, Decomposition of transfer function, Eigen values and Eigen Vectors, Diagonalization of the system matrix with distinct and repeated roots.	
UNIT II	State variable stability analysis and design	(08Hours)
	Solution of state equation with and without inputs, State Transition Matrix (STM), Methods to determine STM using Infinite series method ,Laplace transform, Caley Hamilton theorem. Definition of controllability, observability, Kalman's test, Gilbert's test, Determination of transfer	

	functions from state model. State feedback control, pole placement design through state feed back	
UNIT III	Nonlinear system	(08Hours)
	Different types of nonlinearities, peculiar behavior of nonlinear system-response, jump resonance, limit cycle: stable and unstable, amplitude as function of frequency oscillation, nonlinear spring mass system, sub harmonic oscillation, asynchronous quenching, frequency Phase plane method, singular points, phase plane plots using delta method determination stability from state trajectory, relation with time domain analysis. Concept of Describing Function, derivation of describing function of various nonlinear elements, Stability analysis using describing function, existence of limit cycle, Merits demerits of describing function method	
UNIT IV	Discrete time system	(08Hours)
	Basic elements of discrete data system, merits of discrete system, Sampling and selection of sampling period, Sample and hold circuit, A/D and D/A converter, modeling of zero order hold , reconstruction of signals from samples, Shannon's sampling theorem. Z transform – definition, simple functions, Inverse Z transform, linear difference equations and their solution	
UNIT V	Analysis of Discrete time system	(08Hours)
	Derivation of Pulse Transfer function, , pulse transfer function of closed loop system, Bilinear transformation, stability in Z plane, Jury's test, Routh's criteria , State space representation of discrete time systems, state space models from pulsed transfer function.	
UNIT VI	Introduction to advances in control system	(08Hours)
	Adaptive control , Model reference Adaptive control block diagram and working with practical applications, Robust control ,Fuzzy logic , Artificial neural network, algorithm and learning architecture	

Term Work:

The term work shall consist of record of minimum eight experiments .To ensure that at least one experiment on each unit.

1. To convert transfer function into state model i) phase variable form ii) canonical form
2. To derive state model of DC servo motor from physical variables and observe step response, i.e. to solve state equation of DC servo motor
3. To determine Eigen values, Eigen vectors and diagonalises the system.
4. To determine controllability and observability by Kalman's test and Gilbert's test.
5. Design of state feedback gain matrix by pole placement.
6. To plot phase plane trajectory of system with nonlinear elements using SIMULINK.
7. To analyze stability of nonlinear system using describing function.
8. To convert continuous time system to discrete time system and to observe effect of sampling time on step response.
9. To determine the gain for stability in Z domain.

10. To study adaptive control and robust control applications with MATLAB demos.	
Text Books:	
4. I.J. Nagrath, M. Gopal, ““Control System Engineering”, New Age International Publishers – Fourth edition	
5. Katsuhiko Ogata, “Digital control system”, Prentice Hall, 2010.	
6. M.Gopal , “ Digital control system”	
7. Dorf and Bishop , “Modern Control systems”- Pearson education	
Reference Books:	
5. Nise N. S. “Control Systems Engineering”, John Wiley & Sons, Incorporated, 2011	
6. D. Roy Choudhary, "Modern Control Engineering", PHI Learning Pvt. Ltd., 2005	
7. Dorf, Bishop - “Modern control system”, Pearson Education	
8. M. N. Bandyopadhyay, “Control Engineering – Theory and Practice”, Prentice Hall of India Ltd. Delhi	
9. Geir E. Dullered, F.G.Paganini - “ A course in robust control theory “- Springer	
10. Jan Jan tzen- ‘Foundation of Fuzzy control – a practical apporoach – Wiley	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Assignments:

1. To solve numerical on decomposition of transfer function to state variable (different forms)and to draw state diagram
1. To identify state variables of physical system and write down state model.
2. To determine transfer function from given state model
3. To calculate STM by three different methods.
4. To derive describing function of different nonlinearities
5. To draw phase plane trajectory by isoclines method
6. To derive pulse transfer function
7. To prepare comparative analysis of discrete time and continuous time system.
8. To prepare chart of Z transform of standard functions
9. To solve question papers of GATE unit wise.
10. To study Research paper on adaptive control and prepare presentation.
11. To observe NPTEL video on robust control and group discussion related to it.

Industrial Organization & Management

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks Continuous Assessment: 40 Marks	03 Credits
Course Pre-requisites:		
The Students should have knowledge of Professional skill development 1 to 5.		
Course Objectives:		
<ul style="list-style-type: none"> • This course will help the students to understand the basic operations in any organization. • With the technical skill sets, there are also some more things that to be studied to be in any organization. • This course will help the students to learn these aspects. They are going to learn about Management related terms like Depreciation, Replacement engineering, Product Engineering, Production Planning and Inventory Control. • This course will also help to understand the Job Evaluation techniques, Personnel Management, Behavioral Aspects of Management and Operations Research. • This course will complete the overall aspects of the student with technical knowledge with needed management skills. 		
Course Outcomes:		
The student will be able to		
1.	Explore the basic terms related to management like function, principles. Leadership qualities will also get improved.	
2.	Explore the type of companies and the various financial aspects related with the company.	
3.	Exculpate the terms related with the depreciation, replacement and products of the company and to deal with it.	
4	Explore the production and inventory related terms. The control on the inventory and information related with it.	
5	Explore the company's requirement as per the human resource requirement, which also very important part in any company.	
6	Behaviors and ethics of an employee in the organization are to be studied which will be requiring in carrying out the operations research.	
UNIT - I Management		
	Introduction, Phases in Management: scientific management, Behavioral management and Information technology and operations research. Industrial Management, Contents and Principle of Management, Functions of Management: Planning, coordination, motivation and control. Leadership: Qualities of leader, Leading Process. Education and Training of Management. Elements of Quality Management System ISO 9001-2008.	(06 Hrs)

UNIT - II	Formation of Company and Financial Planning	(06 Hrs)
	Introduction, Company definition, Types of company Structure: Proprietorship, Partnership, Joint Stock companies, Limited and Unlimited Company, Private and Public, Corporative, Public, Private and Joint Sector, Trust and Holding Companies. Classification of Capital, Capital Procurement, Structure of Authorized Pattern, Economic Aspects of Cost Patterns, Breakeven Analysis, Financial Management.	
UNIT - III	Depreciation, Replacement and Product Engineering	(06 Hrs)
	Introduction, objective of Business Enterprise, Depreciation and Depreciation Calculation, Estimation of Life of an Engineering Aspects, Replacement of Plant and Machinery, Product Classification, Initiation of Product, Production Analysis, simplifications and Standardization, Product Research, Diversification and specialization, Patent Analysis.	
UNIT - IV	Production Planning and Inventory Control	(06 Hrs)
	Introduction, Production System, Production Types, Production Planning functions, Efficiency of Production planning and Drawing Office Organization. Inventory Control Functions, Procedures for Purchase, Principles of Inventory Control, Inventory Policies, Economic Batch Quantities, Purification of Inventory, control of incoming materials and store Issues. Information flow analysis.	
UNIT - V	Job Evaluation and Personnel Management	(06 Hrs)
	Introduction, Job Evaluations and Analysis, Classification of Job evaluation techniques, Evaluation of wages structures, system of merit rating, measurement of responsibility and wage incentives. Importance of personnel management, human relations, attitude of employers towards employees. Functions of personnel management. Personnel research, labour participation in management. Labour turnover, industrial disputes.	
UNIT - VI	Behavioral Aspects of Management and Operations Research	(06 Hrs)
	Scientific management, Hawthorne Studies, Elton Mayo, Theory X and Theory Y, Herzberg's motivation and Hygiene Theory, Organizational goals and Culture. Stresses at workplace, Interpersonal Behavior, power and Politics in organization. Phases of an Operations Research, formation of some typical problems, competitive model, Program Evaluation and Review Techniques, Graphical and Matrix solution of linear programming models.	

Assignment:

1. Introduction to management
2. Formation of Company and Financial Planning
3. Depreciation, Replacement and Product Engineering
4. Production Planning and Inventory Control
5. Job Evaluation and Personnel Management
6. Behavioral Aspects of Management and Operations Research

Text Books:

1. "Industrial Organization and Management", S. K. Basu, K. C. Sahu, B. Rajiv, PHI learning Private Limited, New Delhi.
2. "Industrial Engineering and Management", O.P. Khanna, Dhanpat Rai & Sons. New Delhi.

Reference Books:	
1. “Industrial Organization and Management: Principles and Practice”, S. Sundaramurthy, R. V. R. Sivagnanam, United Book Corporation.	
2. “Industrial Organization and Management Fundamentals”, Herman B. Henderson, Albert E. Haas Industrial Press.	
3. “Professional Management in Industrial Organisations”, K.P. Kaur, Deep and Deep Publications.	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Elective II: Renewable Energy Systems

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks		
		Term Work: 25 Marks Oral:25Marks		01 Credit
Course Pre-requisites:				
The Students should have knowledge of				
1.	Fundamentals of Electrical Engineering, Power Generation Techniques			
Course Objectives:				
1.	To create awareness of renewable energy sources like wind, solar energy, biogas plant, mini-hydro plant and fuel cell			
2.	To impart knowledge of biogas plant, tidal energy, wave energy, ocean thermal and geothermal energy			
3.	To impart knowledge of energy storage and hybrid systems.			
Course Outcomes:				
	Students are able to			
1.	Uses renewable energy sources			
2.	Utilize wind energy			
3.	Apply solar energy to any equipment			
4	Describe biogas plant, mini-hydro plant and fuel cell			
5.	Compare tidal energy, wave energy, ocean thermal and geothermal energy			
6.	Decide energy storage and hybrid systems for particular application			
UNIT - I	Energy scenario			(06 Hours)
	<p>Classification of energy sources, energy needs of India and energy consumption patterns, worldwide potential of these sources, energy efficiency and energy security, energy economics, energy conservation supply curves,</p> <p>Environmental issues, environmental impacts, global warming and climate change, carbon trading, concept of carbon credits, carbon footprints, carbon dioxide sequestration, atmospheric pollutants, Kyoto protocol, ozone depletion. Concept of clean development CDM and prototype carbon funds PCF. Impacts of renewable energy, Factors favoring and against renewable energy sources. Market survey, International electro technical commission standards for renewable energy sources.</p>			

UNIT - II	Wind energy systems	(06 Hours)
	Types of wind turbines, electrical generators for wind turbines, power in the wind, impact of tower height, measurement of wind speed, maximum rotor efficiency, various controls in wind turbines, fixed speed and variable speed wind turbines, power converters, wind turbine economics, specific wind turbine performance calculations, impacts of wind turbines. Wind turbine specification, stand alone and grid connected wind turbines, offshore wind farm, magnetic levitated wind turbine, floating wind turbine, wind turbines on vessels, installation, maintenance and commissioning of wind turbines. wind turbine system market survey, design, layout, costing, grid integration issues, case studies, data analysis, numericals	
UNIT - III	The solar resource and solar thermal systems	(06 Hours)
	The solar spectrum, the earth's orbit, altitude angle of the sun at solar noon, solar position at any time of day, sun path diagrams for shading analysis, solar time and civil (clock) time, clear sky direct-beam radiation, total clear sky insolation on a collecting surface, monthly clear-sky insolation, solar radiation measurements, average monthly insolation. Direct and diffused radiation and effect on power generation. Solar thermal water heating, types of collectors, efficiency, solar thermal energy generation. Applications of solar thermal system, solar ponds, solar cooker, issues in solar energy, case studies, data analysis, system design, layout, costing, numericals	
UNIT - IV	Solar photovoltaic systems	(06 Hours)
	Basic semiconductor physics, a generic photovoltaic cell, the simplest equivalent circuit for a photovoltaic cell from cells to modules to arrays, the P-V I-V curve under standard test conditions (STC), impacts of temperature and insolation on i-v curves, shading impacts on i-v curves, crystalline silicon technologies, single-crystal czochralski (CZ) silicon, ribbon silicon technologies, cast multi-crystalline silicon, crystalline silicon modules, thin-film photovoltaic, efficiency of PV system. Methods of measurements. : introduction to the major photovoltaic system types, current-voltage curves for loads, grid-connected systems: interfacing with the utility, dc and ac rated power, the "peak-hours" approach to estimating PV performance, capacity factors for PV grid-connected systems, stand-alone PV systems, concentrating solar power (CSP) technologies,PV-powered water pumping, building integrated solar systems, solar facades, solar cars, PV systems – off grid systems and scope for inclusive growth of rural India. Grid autonomy. Bi-directions metering. maximum power point tracking,Calculation of system details. Grid integration issues, case	

	studies, data analysis, grid-connected PV system economics, system trade-offs, dollar-per-watt ambiguities, amortizing costs, grid connected and standalone system sizing, design, layout, costing, payback period,numericals	
UNIT - V	Other sustainable energy sources and hybrid systems	(06 Hours)
	Micro-turbine generation, wave energy conversion systems, tidal energy conversion systems, ocean thermal energy systems, clean coal power plants, biogas, biomass to electrical energy conversion, gasifires, biomass fired boilers, co-firing, cogeneration in sugar industry, energy from municipal solid waste, geo-thermal energy, biomechanical energy, bio-chemical and photosynthesis techniques. Biomass for electricity, small hydro, mini hydro, micro-hydropower, pico hydro,nano hydro systems, electricity from water pipelines, fuel cells, fuel cell efficiency, types of fuel cells, hydrogen production, standalone system,hybrid systems, wind solar hybrid, wind diesel, solar diesel, wind mini hydro hybrid system, numericals	
UNIT - VI	Energy storage	(06 Hours)
	Battery storage, charge regulators, battery types, maintenance, management, fly wheel energy storage, pumped water energy storage, hydrogen energy storage, super capacitor energy storage systems, compressed air energy storage systems, cryogenic energy storage, thermal energy storage, seasonal thermal energy storage. Use of various energy storage techniques in renewable energy sources, numericals	
Term Work:		
1. Fabrication of solar over.		
2. Fabrication of solar cooker.		
3. Desalination of water using solar still.		
4. Fabrication of solar car.		
5. Fabrication of solar updraft tower.		
6.Fabrication of small horizontal axis wind turbine and testing.		
7. Fabrication of small vertical axis wind turbine and testing.		
8. Fabrication of small biogas plant.		
9. Fabrication of a simple fuel cell.		
10. Fabrication of small hydro turbine.		
11. Testing of super capacitor.		
12. Comparison of performance of wind turbine with and without flywheel.		
Text Books:		
1. G. D. Rai, “Non-Conventional Energy Sources”,Khanna Publication		
2. R. Ramesh, “ Renewable energy Technologies”,Narosa Publication		
3. S. Rao, Dr. B. B. Parulekar, “Energy Technology – Non Conventional, Renewable and Conventional”,Khanna Publication		
4. Mittal, “ Non-conventional systems ”,Wheelers publication		

5. Gilbert M. Masters, “Renewable and Efficient Electrical Power Systems”, Wiley -IEEE Press, August 2004

Reference Books

1. Dr. S. P. Sukhatme, “Solar Energy”, Tata McGraw Hills
2. S. Bandopadhyay, “Solar Energy”, Universal publishing.
3. Paul Gipe, “Wind Energy Comes of Age”, John Wiley & Sons Inc.
4. Njenkins, “Wind energy technology”, John wiley and sons
5. Mcniels, Frenkel , Desai , “Solar and wind energy technologies”, Wiley Eastern
6. G. N. Tiwari, SangeetaSuneja, “Solar Thermal Engineering Systems”,Narosa Publishing House
7. L. L. Freris, “Wind Energy Conversion System”, Prentice Hall
8. Mukund Patel, “ Wind and solar systems”, CRC press
9. TapanBhattachary, “Solar photovoltaics for terrestrials
10. MiliMajumdar, “Energy Efficient Buildings in India”, Published by Tata Energy Research Institute & MNRE
11. Thomas Ackermann, “Wind Power in Power Systems”, Wiley Publications
12. Tony Burton et al, “Wind Energy Hand Book”, John Wiley & Sons Inc.
13. Siegfried Heier, Rachel Waddington, “Grid Integration of Wind Energy Conversion Systems”, Wiley Publications

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Assignments

1. Market survey for solar thermal system for water heating and solar photo voltaic system for power generation. Collection of information charts brochures / leaflets from suppliers, manufacturers, cost, technical specification etc. comparative tables for techno commercial information of various products from various companies. List of solar power plants in India and nearby Pune city
2. Clean development mechanism CDM, Carbon credit, carbon credit certificate, types of Carbon Credits, carbon footprints, Measuring carbon footprints, Average carbon emissions per person by country
3. Various wind generators and their comparison w.r.t techno commercial information, their suitability to grid and standalone system, suitability of installation
4. Design of water pumping system for irrigation purpose using wind energy system with a 5 hp pump. Design of suitable water storage facility and drip irrigation system. Size of storage tank. Detailed design with required techno commercial information, turbine size, tower size, cost, market survey for procurement.
5. Design of solar thermal system for hot water system for Bharati Vidyapeeth College of engineering hostel and guest house. The report should involve all techno-commercial

information. Complete design of solar thermal system. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email-ID.

6. Design of solar Photovoltaic system for water pumping system for Bharati Vidyapeeth College of engineering campus. The report should involve all techno-commercial information. Complete design of photovoltaic system. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email id.
7. Detailed report for grid integration and challenges in grid integration. Recent trends in grid integration. Methods of grid integration for solar and wind power plants. Detailed report.
8. Design of Canteen waste management system for Bharati Vidyapeeth College of engineering canteen with detailed report for feasibility of biogas plant for cooking in canteen and possibility of generation of electricity. The report should involve all techno-commercial information. Complete design of biogas plant for canteen waste. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email id.
9. Design of fuel cells for a PMPML bus with all techno commercial information.
10. Design of Solid waste management for katraj area, Pune city, system design and detailed report with all techno commercial information and layout.
11. Design of micro hydro power plant for canal and piped drinking water at parwati pumping station with all techno commercial information and layout.
12. Design of nano hydro system for electrical energy generation system using kinetic energy of water through pipes in a large housing r society with suitable energy storage and illumination system using LED for parking of the society.
13. Types of storage systems for electrical energy. The storage systems suitable for wind energy, solar energy should be given. All other new unconventional methods of storage of energy along with conventional methods should be explained. e.g. super capacitors, compressed air storage, pumped water storage, hydrogen energy storage etc. Techno-commercial comparison all methods should be done. Actual sites where these methods are used should also be mentioned.
14. Industrial visit report for a renewable energy power plant.

Note : - Each practical needs power point presentation and detailed report with techno-commercial information.

Elective II: Programmable Logic Controllers

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral:25Marks	01Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Logic gates operations, Boolean algebra, Data types (integer, float, unsigned)	
Course Objectives:		
	This course aims at understanding the basic concepts PLC hardware and PLC software and Programming language like ladder, construction of ladder diagram, their symbol and component of the instruction. Knowledge of analog and digital input and Output devices, PID, SCADA and Communication Protocols.	
Course Outcomes:		
1.	Describe Programmable Logic Controller along with the block diagram with its components in detail.	
2.	Develop architecture of SCADA explaining each unit in detail.	
3.	Develop a software program using modern engineering tools and technique for PLC and SCADA.	
4	Enlist various industrial applications using PLC and SCADA.	
5	Describe the importance of SCADA in critical infrastructure.	
6	Execute, debug and test the programs developed for digital and analog operations.	
UNIT -I	Introduction to PLC	(06 Hours)
	History of PLC, PLC system, Block Diagram of general PLC, PLC input and output module, Sensors and actuators for PLC, Central Processing Unit, Monitors, solid state memory, Power supplies, HMI and Interfaces, Selection criteria for PLC, PLC advantages and disadvantages, Present PLC manufacturers.	
UNIT – II	Programming of PLC	(06 Hours)
	Input ON/OFF switching devices, Input analog devices, Output ON/OFF devices, Output analog devices, Programming equipments, Introduction of Programming languages, Basic components & symbols in ladder diagram, Construction of PLC ladder diagram for programming, Fundamentals of ladder diagram, Boolean logic & relay logic, programming ON/OFF Inputs to produce ON/OFF outputs.	
UNIT – III	PLC Applications	(06 Hours)
	Analog PLC operation, PID control of continuous processes, closed loop systems and common problems, closed loop system using Proportional, Integral & Derivative (PID), PLC interface. Industrial process example: Motors Controls - AC Motor starter, AC	

	motor overload protection, DC motor controller, Variable speed (Variable Frequency) AC motor Drive. Temperature, level and Flow control.	
UNIT - IV	SCADA Systems Overview	(06 Hours)
	Introduction and definitions of SCADA, Principles of SCADA systems, SCADA system evolution. Basic SCADA system Architecture: Human Machine Interface, Master Terminal Unit, Remote Terminal Unit. SCADA data transfer through PLCC. Communication Technologies, Communication system components, SCADA Communication in an electrical power system. SCADA system desirable Properties, Real Time System, SCADA server, SCADA functions.	
UNIT - V	SCADA Architecture	(06 Hours)
	First generation - Monolithic, Second generation - Distributed, Third generation – Networked Architecture, Intelligent Electronic Devices. Operation and control of interconnected power system, Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, State estimation, and SCADA system security issues overview. SCADA systems in the critical Infrastructure: Conventional Electric Power Generation, water Purification System, Chemical Plant, Petroleum Refining Process.	
UNIT - VI	The Evolution Protocols	(06 Hours)
	Overview of Open systems interconnection (OSI) Model, Functions of OSI Model Layers, OSI Protocols, Functions of Transmission control protocol / Internet protocol (TCP/IP) Layers, TCP/IP protocol, DNP3 protocol, IEC layered architecture, Ethernet/IP, Process Field bus (Profibus), Modbus, The Security Implications of the SCADA protocols.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.		
<ol style="list-style-type: none"> 1. Interfacing of lamp & button with PLC for ON & OFF operation. Verify all logic gates. 2. Performed delayed operation of lamp by using push button. 3. UP/DOWN counter with RESET instruction. 4. Combination of counter & timer for lamp ON/OFF operation. 5. Set / Reset operation: one push button for ON & other push button for OFF operation. 6. DOL starter & star delta starter operation by using PLC. 7. PLC interfaced with HMI& status read/command transfer operation. 8. Parameter reading of PLC interface with SCADA. 9. Alarm annunciation using PLC &SCADA. 10. Tank level control by using PLC &SCADA. 11. Temperature monitoring by using PLC &SCADA. 12. Reporting & trending in SCADA system. 		

Assignments:	
<ol style="list-style-type: none"> 1. Automation requirement in industries 2. Recent trends in automation 3. Basic concepts in Ladder diagrams 4. Basic programming for automation 5. A solar panels automatic tracking system based on PLC 6. Automated water supply control system using PLC 7. PID implementation of heating tank in industrial plant 8. PLC based SCADA for oil storage 9. Web based remote access laboratory using SCADA 10. Three layer PLC/SCADA system architecture in process automation 	
Text Books:	
3. John R. Hackworth, Frederick D., Hackworth Jr., “Programmable Logic Controllers Programming Methods and Applications”, PHI Publishers.	
4. John W. Webb, Ronald A. Reis, “Programmable Logic Controllers: Principles and Application”, PHI Learning, New Delhi, 5 th Edition.	
5. Ronald L. Krutz, “Securing SCADA System”, Wiley Publications.	
6. Wiley Boltan	
Reference Books:	
5. Batten G. L., “Programmable Controllers”, McGraw Hill Inc., Second Edition	
6. Gordan Clark, Deem Reynders, “Practical Modern SCADA Protocols”, ELSEVIER	
7. P. K. Srivstava, “Programmable Logic Controllers with Applications”, BPB Publications	
8. Krishna Kant, “Computer Based Industrial Control”, PHI	
9. Catalogues and user manuals PLC and SCADA	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Elective II: Signal and Systems

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS</u>
				<u>ALLOTTED:</u>
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks		
		Term Work: 25 Marks Oral:25Marks		01 Credit
Course Pre-Requisites:				
The Students should have				
1.	Mathematics			
2.	Physics			
3.	Fundamentals of Electrical Engineering			
Course Objectives:				
The course introduces fundamental concepts of signals,.				
Course Outcomes:				
1.	Understand and apply knowledge of various types of signals			
2.	Understand and apply knowledge of Fourier analysis to signals			
3.	Understand and apply knowledge of Laplace transforms in Analysis of CT systems .			
4.	Understand and apply fundamental concepts of DTFT			
5.	Understand and apply the Z transform analysis			
6.	Understand and apply the concept of Fourier and Laplace to real time applications			
UNIT - I	CLASSIFICATION OF SIGNALS AND SYSTEMS.			(06 Hours)
	Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & A periodic signals, Deterministic & Random signals, Energy & Power signals - CT systems and DT systems- Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & No causal, Stable & Unstable			
UNIT - II	ANALYSIS OF CONTINUOUS TIME SIGNALS			(06 Hours)
	Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis - Properties.			
UNIT - III	LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS			(06 Hours)
	Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis of CT systems .			
UNIT - IV	ANALYSIS OF DISCRETE TIME SIGNALS			(06 Hours)
	Baseband Sampling - DTFT – Properties of DTFT - Z Transform – Properties of Z Transform			
UNIT - V	LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS			(06 Hours)
	Difference Equations-Block diagram representation-Impulse response - Convolution sum- Discrete Fourier and Z Transform Analysis of			

	Recursive & Non-Recursive systems	
UNIT - VI	Real Life Application presentations	(06 Hours)
	Analysis of obstacle detection, Speech and hearing, applications of Fourier Transform, Neuro Electronics, Automation for Smart traffic controller, Image processing, CDMA, Speaker verification, Pattern recognition in forex rates, Use of signals in SETI, SAS in radio astronomy, SAS in economic analysis, SAS in meteorology, SAS in Fourier optics	
Term Work:		
1. Generation of Signals: continuous time and discrete time		
2. Convolution of Signals, Solution of Difference equations		
3. Fourier series representation of continuous time signals		
4. Fourier transform of continuous time signals.		
5. Discrete time Fourier analysis		
6. Introduction to SIMULINK and calculation of output of systems represented by block		
7. Sampling and reconstruction of continuous time signals		
Text Books:		
1) 'Signals and systems' by Rajiv Kapadia, Jaico Publishing		
2) 'Signals and systems' by Anand Kumar		
3) 'Linear Systems and signals' by B.P.Lathi		
4) Textbook on Signals and systems' by Harish Parthasarathy, I.K.International Publishing		
Reference Books:		
1. 'Signals and systems' by Allen Openheim and Wilsky, Prentice Hall Publication		
2. Schaum's outline series book on 'Signals and systems' by H.Hsu and R.Ranjan		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Assignments:

1. Solve the unsolved question from the books Unit wise.
2. Prepare report from NPTEL video lectures.
3. Prepare programming assignments from the syllabus topic.
4. Solve the University Question Papers Unit wise.
5. Group Discussions from syllabus topics from students and prepare report on the same.
6. Topics preparation from students on any topics and prepare PPT on the same.

Elective II: Introduction to JAVA and .NET

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral:25Marks	01Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Object Oriented Programming like C++ and Internet concepts	
Course Objectives:		
	To expose students to the programming in JAVA and .NET for basic level programming so that they can program static and dynamic web pages using JAVA and .NET platforms.	
Course Outcomes: After learning the subject students will be able to		
1.	Use basic JAVA programming using JDK	
2.	Construct JAVA programs and applications deployed on server with server components and communication	
3.	Develop JAVA platform applications with database connectivity for dynamic and static web pages	
4	Use basics of .NET platform programming using .NET technologies	
5	Construct web applications using .NET technologies involving server communication and front end	
6	Use .NET platform for building applications using web services	
UNIT - I	Introduction to JAVA	(06 Hours)
	Why Java, Java Virtual Machine (JVM), Features, Variables, Data Types, Operators, Control Statements, Object Oriented Concepts in Java, Libraries, Packages,	
UNIT – II	Server Programming Concepts in JAVA	(06 Hours)
	Java Development Kit (JDK), Exception Handling (try-catch, throws and finally), Java API, Compile and Runtime Environment, JAVA – J2EE, JAVA.awt - Applets, JAVA GUI Components, Java Scripting	
UNIT – III	Database and Application Programming Concepts in JAVA	(06 Hours)
	Java Beans, Web Servers, Servelets, HTTP Request and Response, JDBC, Accessing Database from JSP Page, Exploring JAVA Programs and Applications	
UNIT – IV	Introduction to .NET	(06 Hours)
	Introduction to .NET Framework, Evolution of .NET technologies - CTS, CLS, CLR, MSIL, Introduction to Base Class Library, Introduction to VB.NET - Working with Visual Studio IDÉE – IDE Components, VB.NET Fundamentals – Variables, Data Types, Control Flow Statements, Subroutines, Functions, Object Oriented Concepts in .NET	

UNIT - V	Building Applications with .NET	(06 Hours)
	.NET Class Library, Input and Output, Windows Forms, Building Forms, Responding to User Inputs/Events, Menu Design, Information Presentation, Dialog Control, Working with XML, GUI's	
UNIT - VI	Advanced .NET and Applications	(06 Hours)
	ADO.NET Architecture, Web Programming, Web Services, Database Controls, ADO .NET Programming, Exploring .NET Applications and Programs, Comparison Between J2EE and .NET	
Term Work :		
The term work / assignments shall consist of record of topics from the list given below.		
<ol style="list-style-type: none"> 1. Development of static pages using HTML of an online Departmental Store having home page, login page and items catalog page. 2. Add validations to above static pages of home page, login and items page using Java Script. 3. Creation of a XML document of 20 students. Add their roll numbers, marks obtained in 5 subjects, total and percentage and save this XML document at the server. Write a program that takes students' roll number as an input and returns the students' marks, total and percentage by taking the students' information from the XML document on server. 4. Creation of a JavaBeans which gives converted value of Temperature (in degree Celsius) into equivalent Fahrenheit. 5. Do the assignment using JSP by converting the static web pages of assignment 2 into dynamic web pages. Create database with User Information and Item information. The Item catalog should be dynamically loaded from the database. 6. Implementation of "Hello World!" program using JSP Struts Framework. 7. Repeat all / some of the above experiments using VB.NET. 		
Text Books:		
1. Achyut Godbole and Atul Kahate, " Web Technologies - TCP/IP Architecture and Java Programming"		
2. Matha "Core Java: A comprehensive Study" Publisher PHI		
3. Black, "Web Technologies – HTML, JavaScript, PHP, JAVA, JSP, ASP.NET, XML and AJAX", Wiley India		
4. Pro ADO.NET with VB.NET – Sahil Mailk and Paul Dickinson		
5. Programming with JAVA - E Balgurusamy		
6. N.P .Gopalan, J.Akileneshwari, "Web Technology-A developer's Perspective", PHI		
Reference Books:		
1. Complete Reference J2EE – Jim Keogh		
2. McDonald, "ASP .Net Complete Reference", TMH		
3. Online Java Developer Tutorials and Training: http://www.oracle.com/technetwork/java		
4. H.M. Deitel and P.J. Deitel, "Java™ How to Program", Prentice-Hall of India, Seventh edition		

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI
<u>Assignments:</u>	
<ol style="list-style-type: none">1. Solve the unsolved question from the books Unit wise.2. Prepare report from NPTEL video lectures.3. Prepare programming assignments from the syllabus topic.4. Industrial visit to software company for the learning the applications of JAVA and .NET.5. Solve the University Question Papers Unit wise.6. Group Discussions from syllabus topics from students and prepare report on the same.	

Elective II: Special Purpose Machines

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral:25Marks	01Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Electrical machines (AC and DC)	
Course Objectives:		
	To expose students to construction, principle of operation, performance and applications of special electrical machines as an extension to the study of basic electrical machines.	
Course Outcomes: After learning the subject students will be able to		
1.	Use the MMF and EMF equations for rotating machines	
2.	Analyze, perform basic experiments and can apply use of BLDC and PMSM motors for different applications	
3.	Analyze, perform basic experiments and can apply use of SRM and SYNREL motors for different applications	
4	Analyze, perform basic experiments and can apply use of Linear Induction Motors and Traction Motors for different applications	
5	Analyze, perform basic experiments and can apply use of Transverse Flux - Axial Flux machines and PMSG and DFIG Generators for different applications	
6	Analyze, perform basic experiments and can apply use of small control motors like servo motors, stepper motors, universal motors and PCB motors for different applications	
UNIT - I	Generalized Machine Theory	(06 Hours)
	Energy in singly excited magnetic field systems, Magnetic force and torque from energy, Magnetic force and torque from co-energy, Forces and torques in systems with permanent magnets, Magnetic field production of EMFs in rotating machines	
UNIT – II	Permanent Magnet Special Motors	(06 Hours)
	Types, Construction, Principle of Operation, Characteristics, Drives / Control and Applications of – 1. Brushless DC Motor (BLDC) 2. PM Synchronous Motor (PMSM)	
UNIT – III	Reluctance Type Special Motor	(06 Hours)
	Types, Construction, Principle of operation, Characteristics, Drives / Control and Applications of – Reluctance Motor – includes 1. Switched Reluctance Motors (SRM) 2. Synchronous Reluctance (SYNREL) Motors	

UNIT – IV	Linear and Traction Motors	(06 Hours)
	Types, Construction, Principle of Operation, Characteristics, Drives / Control and Applications of – 1. Linear Induction Motor (LIM) 2. Traction Motors	
UNIT - V	Transverse Flux & Axial Flux Machines and Special Generators	(06 Hours)
	Types, Construction, Principle of Operation, Characteristics, Drives / Control and Applications of – 1. Axial Flux Permanent Magnet (PM) Synchronous Generators 2. Doubly Fed Induction Generators (DFIG) 3. Transverse Flux Machines	
UNIT - VI	Control of Small Special Motors	(06 Hours)
	Types, Construction, Principle of Operation, Characteristics, Drives / Control and Applications of – 1. Stepper / Stepping Motors 2. Servo Motors 3. Printed Circuit Board (PCB) Motors 4. Universal Motors	

Term Work:

The term work / assignments shall consist of record of topics from the list given below.

1. Laboratory demonstration of PMSM motor and drive.
2. Laboratory demonstration of BLDC Drive.
3. Experimental analysis of Reluctance Motor Drive.
4. Laboratory demonstration of Stepper Motor Drive.
5. Laboratory demonstration of Linear Induction Motor.
6. Laboratory demonstration of AC / DC Servo motor.
7. Laboratory demonstration of Induction Generator.

Text Books:

7. P. S. Bimbhra “Generalized Theory of Electrical Machines” Khanna Publishers
8. K. Venkatratnam, ‘Special Electrical Machines’, University Press
9. A. E. Fitzgerald, Charles Kingsley, Stephen Umans, ‘Electric Machinery’, Tata McGraw Hill Publication
10. V. V. Athani, ‘Stepper Motors: Fundamentals, Applications and Design’, New Age International
11. T. J. E. Miller, ‘Brushless Permanent Magnet and Reluctance Motor Drives’, Clarendon Press, Oxford Publication
12. Ion Boldea, ‘Linear Electric Machines, Drives and Maglevs’, CRC Press

Reference Books:

5. M. G. Say “Alternating current Machines”, Pitman & Sons
6. T. Kenjo, ‘Stepping Motors and Their Microprocessor Controls’, Clarendon Press London
7. P. C. Sen, “Principles of Electrical Machines and Power Electronics”, John Willey & Sons

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Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Assignments:

1. Solve the unsolved question from the books Unit wise.
2. Prepare report from NPTEL video lectures.
3. Solve the University Question Papers Unit wise.
4. Group Discussions from syllabus topics from students and prepare report on the same.
5. Industrial visit to electrical machine manufacturing company and prepare report on the same.
6. Market survey for various electrical special machines and preparing report on the same.

Elective II: Illumination Engineering

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS</u>
				<u>ALLOTTED:</u>
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits
Practical: 02Hours / Week		Continuous Assessment: 40 Marks		
		Term Work: 25 Marks Oral:25Marks		01Credit
Course Pre-requisites:				
The Students should have knowledge of				
1. Fundamentals of Electrical Engineering & Color acknowledgement.				
Course Objectives:				
1. Basics of Illumination Engineering.				
2. Illumination Design				
3. Interior & Exterior Illumination				
Course Outcomes:				
1. To study working of various light sources.				
2. To design illumination systems as per illumination laws.				
3. To make students perform interior lighting design				
4 To make students perform Exterior lighting design				
5 To study various lighting systems such as solar, cold lighting				
6 To make students able to apply lighting design in green buildings.				
UNIT 1	Basic physics of Light			(06 Hours)
	Nature And Properties Of Light. Radiation, color, eye & vision; different entities of illuminating systems; Light sources: daylight, incandescent, electric discharge, fluorescent, arc lamps and lasers;			
UNIT 2	Illumination design			(06 Hours)
	Luminaries, wiring, switching & control circuits; Laws of illumination; illumination from point, line and surface sources. Photometry and spectrophotometry; photocells. Environment and glare. General illumination design.			
UNIT 3	Interior lighting			(06 Hours)
	Industrial, residential, office departmental stores, indoor stadium, theater and hospitals. Lighting For <i>Hazardous Areas</i>			
UNIT 4	Exterior lighting			(06 Hours)
	Flood, street, aviation and transport lighting, lighting for displays and signaling- neon signs, LED-LCD displays beacons and lighting for surveillance. <i>Sports lighting.</i>			

UNIT 5	Other lighting designs	(06 Hours)
	1) Solar Lighting 2) Day-lighting for building 3) Cold Lighting 4) Energy efficient lighting.	
UNIT 6	Lighting in sustainable buildings	(06 Hours)
	1) Reduction methods of Lighting pollution 2) Significance of Lighting in Green building design. 3) Comparison of conventional and new energy saving lighting appliances. 4) LEED certification	
TermWork:		
1. Study of commercial catalog for LEDs, CFLs and Tubes for understanding lumens output and wattages of each lamps.		
2. Study of Design and assemble various Illuminating lamps.		
3. Study of Design of illumination for Hotel.		
4. Study of Design of illumination for residential sector		
5. Study of Design of illumination for office departmental stores.		
6. Study of Design of illumination for Hospital.		
7. Study of Design of Solar Lighting for College.		
8. Study of Design of Energy efficient lighting		
Text Books:		
National Lighting Code- Published by Govt of India		
Reference Books:		
1) Lamps and Lighting – Edited by J.R.Coaton and A.M.Marsden, 4th Edition		
2) IES Lighting Handbook – IES North America		
3) Interior Lighting – Boer, Fischer, Pub – Philips Technical Library		
4) Website: http://lighting.sustainableources.com/		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Assignments:-

1. Define and explain Radiation, color, eye & vision
2. Discuss Different entities of illuminating systems
3. Write a short note on General illumination design
4. State and explain Laws of illumination
5. Design illumination for Industrial, residential, office departmental stores,
6. Design illumination for indoor stadium, theater and hospitals.
7. Design illumination for Flood, street, aviation and transport lighting
8. Design illumination for lighting for displays

9. Write in brief about Solar Lighting
10. What is Significance of Lighting in Green building design

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Biomedical) Sem – III (2014 Course)

Sr. No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)							Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW & PR	TW & OR	Theory		TW	Total Credits	
		L	P	T		Unit Test	Attendance	Assignments							
1	Engineering Mathematics-III	3	0	1	60	20	10	10	-	-	100	3	1	4	
2	Analog Electronics	4	2	0	60	20	10	10	50	-	150	4	1	5	
3	Signals & Systems	3	0	1	60	20	10	10	-	50	150	3	1	4	
4	Human Biology	3	2	0	60	20	10	10	50	-	150	3	1	4	
5	Circuit theory	3	2	0	60	20	10	10	50	-	150	3	1	4	
6	Professional Skill Development-III	4	0	0	100	0	00	0	-	-	100	4	0	4	
Total		20	6	2	400	100	50	50	150	50	800	20	05	25	

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

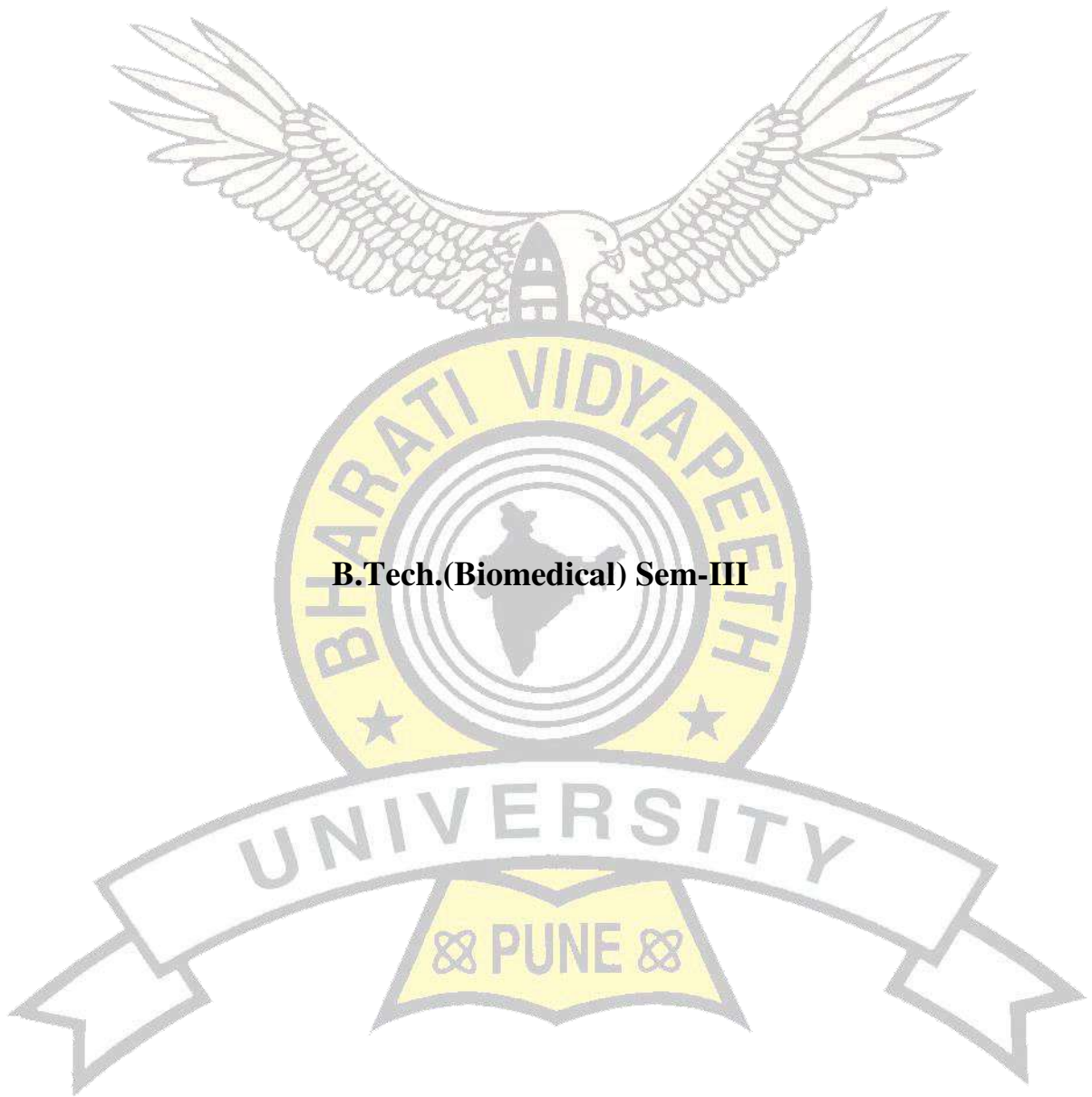
Programme : B.Tech (Biomedical) Sem – IV (2014 Course)

Sr. No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)							Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW & PR	TW & OR	Theory		TW	Total Credits	
		L	P	T		Unit Test	Attendance	Assignments							
7	Analog integrated circuits	3	2	0	60	20	10	10	50	-	150	3	1	4	
8	Electronic Circuits and Applications	4	2	0	60	20	10	10	50	-	150	4	1	5	
9	Electronic Instruments & Measurement System	3	2	1	60	20	10	10	-	-	100	3	2	5	
10	Digital Logic Circuits	3	2	0	60	20	10	10	-	50	150	3	1	4	
11	Rehabilitation Engineering	2	2	0	60	20	10	10	-	50	150	2	1	3	
12	Professional Skill Development-IV	4	0	0	100	-	-	-	-	-	50	4	0	4	
Total		19	10	1	400	100	50	50	100	100	800	19	6	25	

Total Credits Sem – III : 25

Total Credits Sem – IV : 25

Grant total : 50



B.Tech.(Biomedical) Sem-III



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Biomedical) Sem:- III

SUBJECT: - Engineering Mathematics-III

Lecture: 3 hours/week

Tutorial: 1 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

Course prerequisites:

Students should have basic knowledge of:

- Differential calculus
- Integral calculus
- Complex numbers
- Vector algebra

Course objective:

To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

Course Outcomes: On successful completion of this course, students will be able to

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

Contents:

Unit-I

Linear Differential Equations (LDE) (08Hours)

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

Unit-II

Complex Variables (08Hours)

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

Unit-III

Transforms (08Hours)

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit-IV

Laplace Transform (LT) (08Hours)

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit -V

Vector Differential Calculus (08Hours)

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

Unit-VI

Vector Integral Calculus

(08Hours)

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

Assignments:

1. Solve the problem based on Linear Differential Equations
2. Solve the problem based on Complex Variables
3. Solve the problem based on Fourier and Z -Transforms
4. Solve the problem based on Laplace Transform
5. Solve the problem based on Vector Differential Calculus
6. Solve the problem based on Vector Integral Calculus

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Biomedical) Sem:- III

SUBJECT: - Analog Electronics

Lecture: 4 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Practical.: 50 marks

Course prerequisites:

- Knowledge of Electronic Components
- Fundamentals of P-N diode.
- Knowledge of BJT and its configuration

Course objective:

1. To make student understand working of bipolar junction transistor and field effect transistor with different biasing techniques
2. To make student understand a practical approach of design and analysis of waveshaping circuits using diode and multivibrator using transistors
3. To make student understand working of FET and MOSFET and its applications
4. To make student understand working of optoelectronic devices and its applications.
5. To make student understand the fabrication process of PCB

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate knowledge of working and applications of diode.
2. Demonstrate knowledge of working of BJT with different biasing techniques.
3. Analyze applications of BJT as an amplifier and multivibrator.
4. Explain working of FET and MOSFET and its applications.
5. Demonstrate knowledge of working of optoelectronic devices.
6. Design, built and test any small electronic circuit on PCB.

Contents:

Unit-I

Transistor Biasing (08Hours)

Need of biasing, DC load line analysis, operating point, Thermal runaway. Requirements of a biasing circuit, Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for all biasing circuits, Design of biasing circuits, Transistor as an amplifier.

Unit-II

BJT Amplifiers (08Hours)

Two port device and Hybrid model, transistor Hybrid model, h- parameters, Simplified CE Hybrid Model, Analysis of amplifiers using Approximate Model(CE, CC, CB), BJT Single Stage Amplifiers, Small Signal Analysis of Single Stage BJT Amplifiers, Distortion in Amplifiers.

Unit-III

Field Effect Transistor (FET) (08Hours)

Types of FET viz. JFET, MOSFET, JFET -construction, VI characteristics, transfer characteristics, Characteristics Parameters of JFET, FET Biasing(Self Bias, Fixed Bias, Current Source Bias), JFET amplifiers-CS, CD and CG amplifiers, Application of FET.

Unit-IV

MOSFETs (08Hours)

Types of MOSFET viz. D-MOSFET, E-MOSFET, n-MOS, p-MOS and CMOS devices, DMOSFET and EMOSFET characteristics and parameters, non-ideal V-I characteristics viz. finite output resistance, body effect, subthreshold conduction, breakdown effects and temperature effects, MOSFET as VLSI device

Unit -V

Wave shaping and Multivibrator Circuits (08Hours)

Diode as clipper- series and parallel forms of clipper circuits, biased clipper, their operations, Diode as a clamper, voltage multiplier circuits-voltage doubler, tripler and quadrupler configuration, Multivibrator circuits-astable and monostable multivibrator circuit using BJT.

Unit-VI

Optoelectronic devices and PCB design

(08Hours)

Construction, V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optocoupler.

PCB: types of PCB, PCB design rules, layout design, artwork design, fabrication process of single sided PCB, different copper clad laminates, composition of solder metal.

List of Experiments:

1. Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias
2. To plot frequency response of single stage CE amplifier and find its bandwidth
3. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
4. To study different types of Clipper circuits
5. To study different types Clamper circuits
6. To plot transfer characteristics of Optocoupler
7. To plot V-I and optical characteristics of LED and LDR
8. To plot V-I and optical characteristics of Photodiode and phototransistor

Assignments:

1. Simulation of BJT amplifier using Multisim.
2. Define h-parameters for CE, CB, CC configuration and describe how these parameters are determined from BJT characteristics.
3. Describe fabrication process of MOSFET and any two real time applications of MOSFETs
4. Real time applications of optoelectronics devices such as LED, Optoisolator
5. To design, built and test given electronic circuits (Group activity)
6. Obtain industry exposure based on product design industry and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

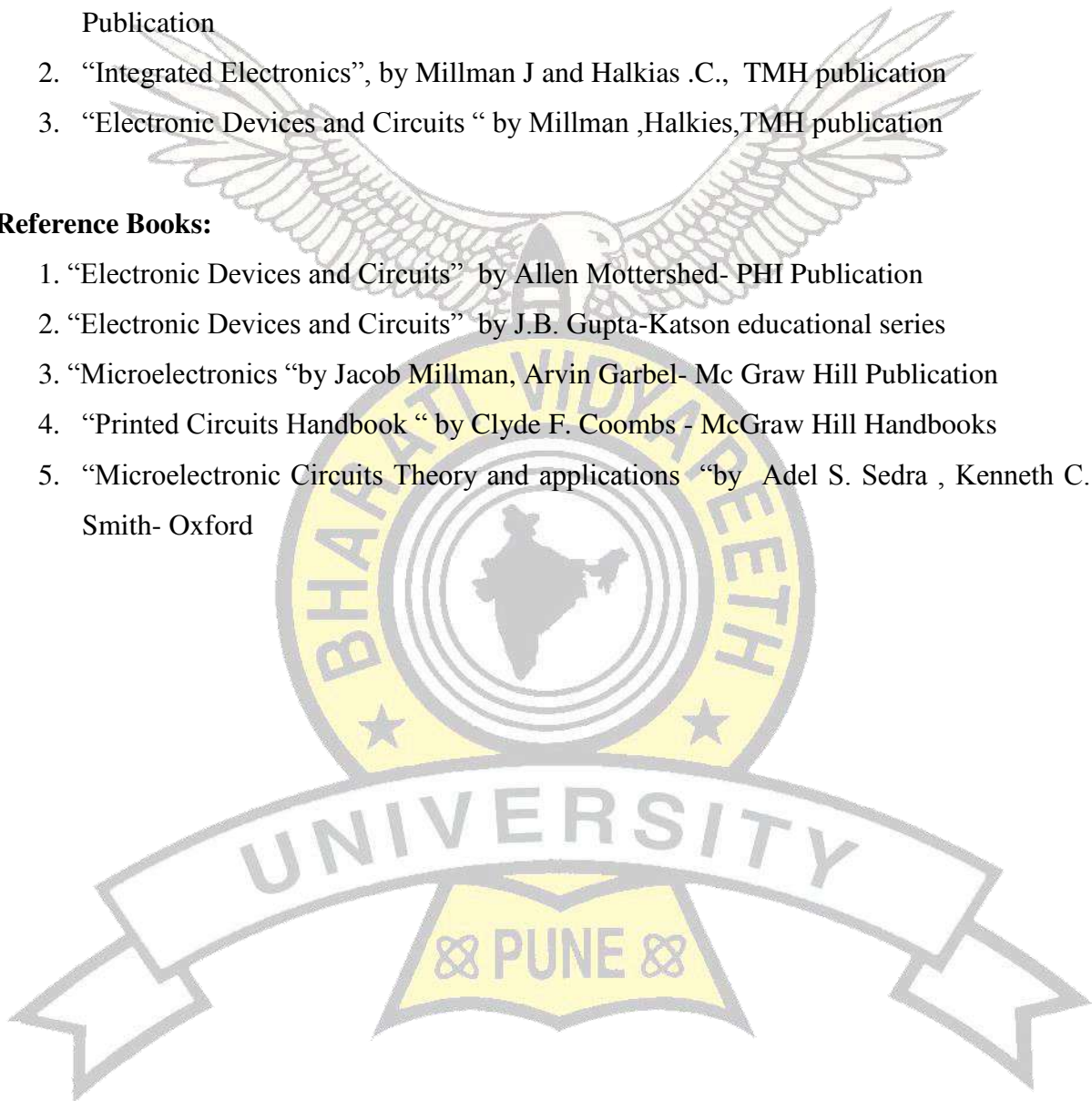
1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. “Electronic Devices and Circuits” by S. salivahanan,Suresh kumar- Mc Graw Hill Publication
2. “Integrated Electronics”, by Millman J and Halkias .C., TMH publication
3. “Electronic Devices and Circuits “ by Millman ,Halkies,TMH publication

Reference Books:

1. “Electronic Devices and Circuits” by Allen Mottershed- PHI Publication
2. “Electronic Devices and Circuits” by J.B. Gupta-Katson educational series
3. “Microelectronics “by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
4. “Printed Circuits Handbook “ by Clyde F. Coombs - McGraw Hill Handbooks
5. “Microelectronic Circuits Theory and applications “by Adel S. Sedra , Kenneth C. Smith- Oxford





**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Biomedical) Sem:- III

SUBJECT: - Signals and Systems

Lecture: 3 Hrs/week

Tutorial: 01 Hr/Week

Theory: 60 marks

Unit Test: 20 Marks

Attendance: 10Marks

Assignments: 10Marks

TW & Oral: 50 Marks

Course prerequisites:

Before proceeding with this tutorial, you must have a basic understanding of differential and integral calculus, limits and adequate knowledge of mathematics.

Course objective:

The course aims to develop good understanding about signals, systems and their classification and analysis tools in the time and frequency domain. It also provides knowledge of correlation function and sampling.

Course Outcomes: On successful completion of this course, students will be able to

1. Represent & classify signals, Systems & identify LTI systems
2. Analyze the systems in time domain using convolution.
3. Apply Fourier transform, Laplace transform and Z-Transform for analysis of LTI systems.
4. Conceptualize the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

Contents:

Unit-I

Introduction to signals

(06 Hours)

Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic,

energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.

Unit-II

Classification of Discrete time systems (06 Hours)

Definition, Classification of System, System Interconnections, state space analysis, Linear & non-linear, Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.

LTI system Analysis: Introduction to LTI systems. Block Diagram, Linear Convolution-Convolution Integral, Impulse response, Methods of Convolution. Properties of convolution

Unit-III

Continuous Time system Analysis: (06 Hours)

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, applications of Fourier series & Fourier transforms to the system analysis.

Unit-IV

System Analysis in Laplace Transform (06 Hours)

Laplace Transform: Definition and its properties, ROC and pole zero concept. Applications of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties.

Unit-V

System Analysis in Z-Transform (06 Hours)

Z-Transform: Definition and its properties, Region of Convergence for the Z-Transform, the Inverse z-Transform, Applications of Z-Transform to the LTI system analysis

Unit VI:

Correlation and Spectral Density (06 Hours)

Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.

Assignments:

Perform the following assignments using MATLAB (any three) and Virtual Lab (any three)

1. Generation of Signals
2. Linear convolution of any two signals
3. Fourier transform of given signal
4. Laplace Transform of given signal
5. Z-transform of given signal
6. Sampling Theorem & aliasing effect.

Content Delivery Methods: Chalk & talk, Power point presentation, Quiz

Assessment Methods:

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books:

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc,2004.

Reference Books:

1. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005
2. H. P Hsu, R. Ranjan, "Signals and Systems", Scham"s outlines, McGraw Hill,2006
3. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



**Class: B.Tech (Biomedical) SEM: - III
SUBJECT: - Circuit Theory**

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Practical: 50 marks

Course prerequisites:

- Knowledge of KCL and KVL Laws from Basic Electrical Engineering
- Knowledge of Linear Differential Equations and Systems of Linear Equations from Engineering Mathematics - I and II.

Course objective:

The objective of the course is to enable the student to perform any of the network analysis task required in the subsequent courses. The student is exposed to some concepts in graph theory for providing a good foundation for the methods of Mesh Analysis and Node Analysis. The transient analysis using Laplace Transforms is also included. The series and parallel resonance circuits which occur quite frequently in electronics are analyzed. The topic of constant K filter is included as it finds many applications in electronic design. The two port network parameters which are of fundamental importance in many courses on electronic devices are included in the last unit.

Course Outcomes: On successful completion of this course, students will be able to:

1. To find voltages and currents in a given network using Mesh Analysis or Node Analysis or Network Theorems.
2. To find voltages and currents in a given network by formulating network equilibrium equations from graph theory.
3. To find the transient response in a given network consisting of series or a parallel combination of resistance, capacitance and inductance.

4. To find all the parameters relating to a given series or a parallel resonant circuit.
5. To design a constant K prototype low pass, high pass, band pass or a band stop passive filter
6. To find any of the two port parameters of a given two port network.

Contents:

Unit I

Fundamentals Of Network

(6 Hours)

KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Mesh and Node Analysis in Sinusoidal Steady State
Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

Unit II

Application Of Graph Theory

(6 Hours)

Network Graph, tree, cotree & loops, Incidence Matrix, tie set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of Duality

Unit III

Transient Analysis

(6 Hours)

Initial Conditions in networks. A procedure for evaluating initial conditions. Solution of step response in RC, RL, RLC circuits using classical method, Analogous equivalence of mechanical system.

Unit IV

Resonance

(6 Hours)

Resonant condition, Definition of Quality factor. Finding resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. General case of resistance present in both branches of parallel resonant circuit. Comparison of series and parallel resonant circuits, Applications of resonant circuits

Unit V

Passive Filters

(6 Hours)

Filter Fundamentals, Image impedance, Characteristic impedance, Propagation constant. Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters

Unit VI

Two Port Networks

(6 Hours)

Network Functions, Two port network parameters, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Interconnections of two-ports, Reciprocity and Symmetry conditions

List of Experiments:

1. To verify Thevenin's and Norton's Theorem.
2. To verify Superposition and Reciprocity Theorem.
3. To find resonant frequencies of series and parallel circuit.
4. To plot frequency response of frequency selective network (Twin T or Wein Bridge).
5. To plot frequency response & cut-off frequency of constant-k LPF and HPF.
6. To plot frequency response & cut-off frequency of constant-k BPF and BSF.
7. To find Z and Y parameters of given two port network.
8. To find H and ABCD parameters of given two port network.

Assignments:

1. Analyze the circuit using mesh and node analysis.
2. Apply graph theory for circuit.
3. Describe any two real time applications of passive filters.
4. Simulation of series and parallel resonance circuit using Multisim.
5. Transient response of RC, RL and RLC circuit using Multisim.
6. Obtain industry exposure based on product design industry and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

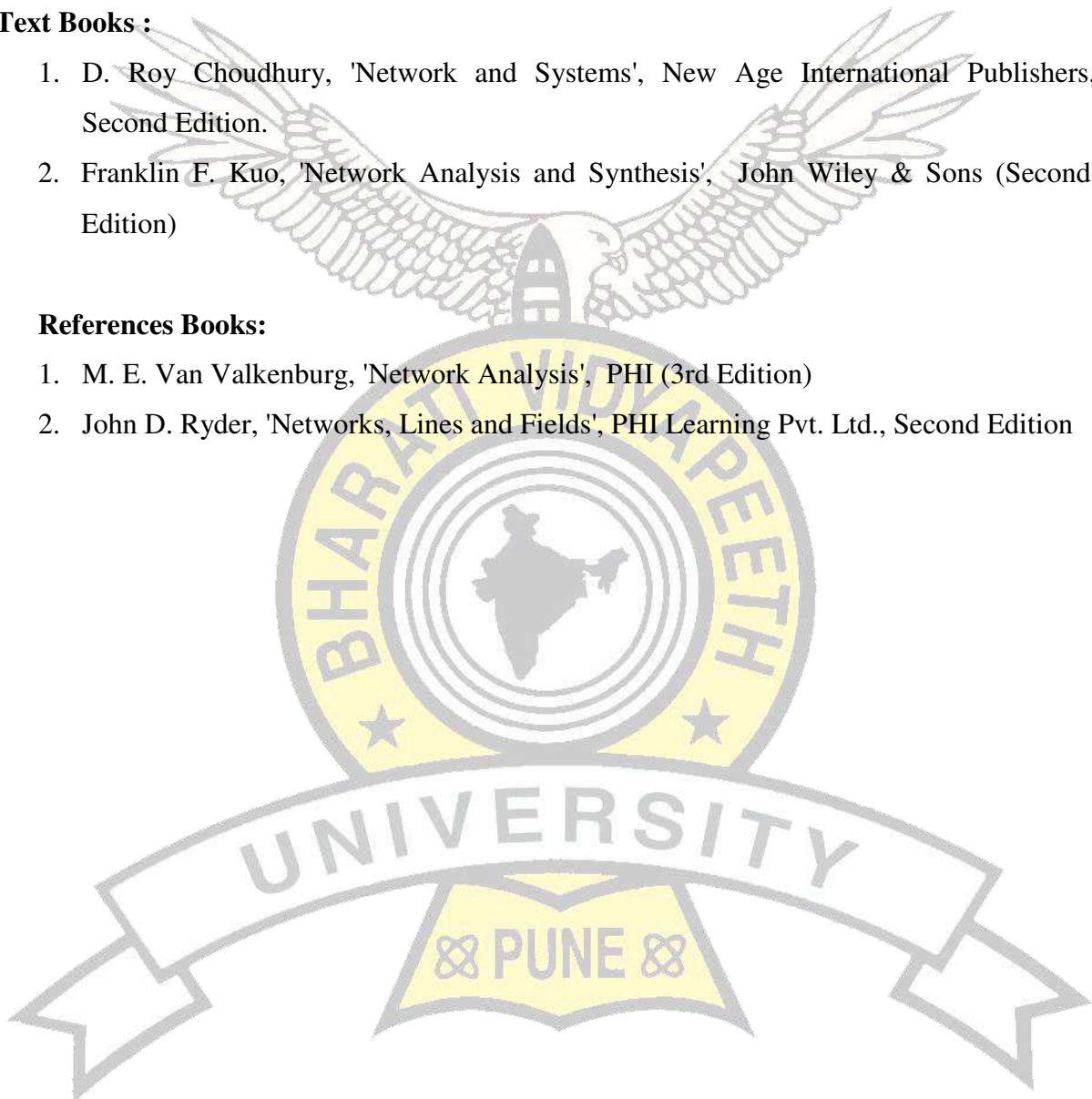
1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books :

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)

References Books:

1. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
2. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition





Bharati Vidyapeeth Deemed University,
College of Engineering, Pune



Class: B.Tech (Biomedical) Sem:- III

SUBJECT: - Human Biology

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Oral: 50 marks

Course prerequisites:

- Basic knowledge of Human body parts.

Course objective:

This course provides in depth knowledge on Anatomy of Physiology of Different systems exist in Human body.

Course Outcomes: On successful completion of this course, students will be able to

1. Classify types of Bones
2. Demonstrate anatomy of various systems such as cardiovascular Respiratory, Gastrointestinal & Excretory System, various special senses & Central nervous system.
3. Demonstrate Physiology of various systems such as cardiovascular Respiratory, Gastrointestinal, Excretory System & various special senses.

Contents:

Unit-I

General Anatomy

(06 hours)

Anatomy of Cell, Tissues & bones, Types of bones of Upper and Lower extremity.

Unit-II

Systemic Anatomy

(06 hours)

Structure & anatomy of Cardiovascular system, Respiratory system, Gastrointestinal system, Excretory system & reproductive system.

Unit-III

Anatomy of Special Senses & Central nervous system (06 hours)

Anatomy of special senses: Nose, Eye, Ear, Tongue, Skin & CNS: Cerebrum, Cerebellum, Brain Stem & Spinal Cord.

Unit-IV

Physiology of Cardio-respiratory System (06 hours)

Blood: composition, blood groups, blood vessels, blood pressure, blood transfusion, blood clotting, parts of heart, conduction system, ECG, Physiology of respiration

Unit-V

Physiology of Gastrointestinal & Excretory System (06 hours)

Blood, Blood Groups, Blood Transfusion, Blood Pressure, Blood Clotting Physiology of Gastrointestinal system, Excretory system: Physiology of Nephron, urine formation, Functions of Kidney, Physiology of Endocrine System

Unit-VI

Physiology of special Senses (06 hours)

Physiology of Nose, Eye, Ear, Tongue & Skin.

Content Delivery Methods: Chalk & talk, Charts & Models

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books/ References Books:

1. Arthur C. Guyton "Medical Physiology" Prismbook.
2. B.D. Chaurasia "General Anatomy", Third edition, CBS publication.
3. Tortora and Graabowski, "Principles of Anatomy and Physiology", Haper colin Publication



B.Tech.(Biomedical) Sem-IV



Bharati Vidyapeeth Deemed University,
College of Engineering, Pune



Class: B.Tech (Biomedical) Sem:- IV

SUBJECT: - Analog Integrated Circuits

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Oral: 50 marks

Course prerequisites:

- Knowledge of KCL and KVL Law
- Basic knowledge of Op-Amp and its configurations

Course objective:

This course provides in depth knowledge on the Op-Amp. Also it introduces the design of PLL, Waveform generators, Timer IC's and Converters.

Course Outcomes: On successful completion of this course, students will be able to

1. Design linear and nonlinear applications of Op-Amp.
2. Design of first and second order active filters.
3. Analyze and design Waveform Generators.
4. Demonstrate knowledge of Phase Locked Loop IC 565 and Converters.
5. Design of multivibrators using Timer IC 555

Contents:

Unit-I

Fundamentals of Operational Amplifier

(06 hours)

Block diagram representation of a typical op-amp, Schematic symbol for op-amp, Definition of integrated circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal & external offset voltage compensation, Frequency Response of an op-amp.

Unit-II

Operational Amplifier – Linear circuits

(06 hours)

Inverting amplifier, Non-inverting amplifier, Voltage Follower, Adder, Subtractor, Scaling averaging amplifier, Integrator, Differentiator, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge, Peaking amplifier

Unit-III

Operational Amplifier - Non-linear circuits

(06 hours)

Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.

Unit-IV

Active filters and waveform generators

(06 hours)

First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Sawtooth wave generator and study of function generator or IC 8038

Unit-V

Special function IC's

(06 hours)

IC 555- as Monostable and Astable Multivibrators and its applications.

IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector

Unit-VI

Interfacing circuits

(06 hours)

V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.

List of Experiments:

1. To design and build Integrator and draw frequency response
2. To design and build Differentiator and draw frequency response
3. To design and build precision rectifier

4. To design and build schmitt trigger and find threshold levels
5. To design and build first order Butterworth low pass filter
6. To design and build first order Butterworth high pass filter
7. To design and build triangular waveform generator using IC 741
8. To design and build Function generator using IC 8038
9. To design and build Astable multivibrator using timer IC 555.

Assignments:

1. Find out any three ICs of op-amp other than IC 741 and compare the characteristics with IC 741.
2. List out any two linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
3. List out any two non-linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
4. Design sinusoidal generators using op-amp for a given frequency.
5. Real time applications of IC555/ IC565.
6. Obtain industry exposure based on product design and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4th Edition, 2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10th edition, 2010

References Books:

1. David A. Bell, "Operational Amplifiers and Linear ICs", Oxford publication, 3rd edition, 2011
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill, 3rd edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 4th edition, 2010.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Biomedical) Sem:- IV

SUBJECT: - Electronic Circuits and applications

Lecture: 4 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Practical.: 50 marks

Course prerequisites:

- Knowledge of linear circuit theory
- Basic concept of BJT

Course objective:

1. To make student understand analysis of multistage transistor amplifier.
2. To make student understand a practical approach of design and analysis of feedback amplifiers ,power amplifiers and oscillators
3. To make student understand analysis and design of voltage regulators.
4. To make student understand the behavior of high frequency BJT amplifiers

Course Outcomes: On successful completion of this course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier and power amplifier and oscillators
3. Analyze and design voltage regulators.
4. Characterize behavior of high frequency BJT amplifiers.

Contents:

Unit-I

Multistage amplifiers

(08hours)

Need of Multistage amplifiers, Parameter evaluation such as R_i , R_o , A_v , A_i & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct

coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier

Unit-II

Feedback amplifiers (08 hours)

Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.

Unit-III

Power amplifiers (08 hours)

classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis

Unit-IV

Oscillators (08 hours)

Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator

Unit- V

Regulators (08 hours)

Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's :78XX,79XX,723,LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.

Unit-VI

High frequency amplifiers

(08hours)

High frequency T model. Common base short circuit current frequency response, alpha cut-off frequency, CE short circuit current frequency response, high frequency hybrid π CE model, Amplifier response taking into account source and load resistances.

List of Experiments:

1. Study of CE two-stage amplifier with capacitive coupling
2. Study of Voltage series and current series feedback amplifiers
3. Study of Voltage shunt and current shunt feedback amplifiers
4. Study of Class B/AB push – pull/ Complementary Symmetry power amplifier.
5. Study of RC Oscillators - phase shift and wien bridge oscillators
6. Study of LC oscillators – Hartley, Colpitt oscillators
7. Study of Linear voltage regulators – series regulator using series pass transistor, shunt regulator using zener diode
8. Study of Fold back current limiting using IC 723

Assignments:

1. Analyze given feedback amplifier.
2. Describe any two real time applications of power amplifier.
3. Simulation of oscillator using Multisim.
4. Describe any two real time applications of regulator.
5. To design, built and test given electronic circuits(Group activity)
6. Obtain industry exposure based on electronic product design and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

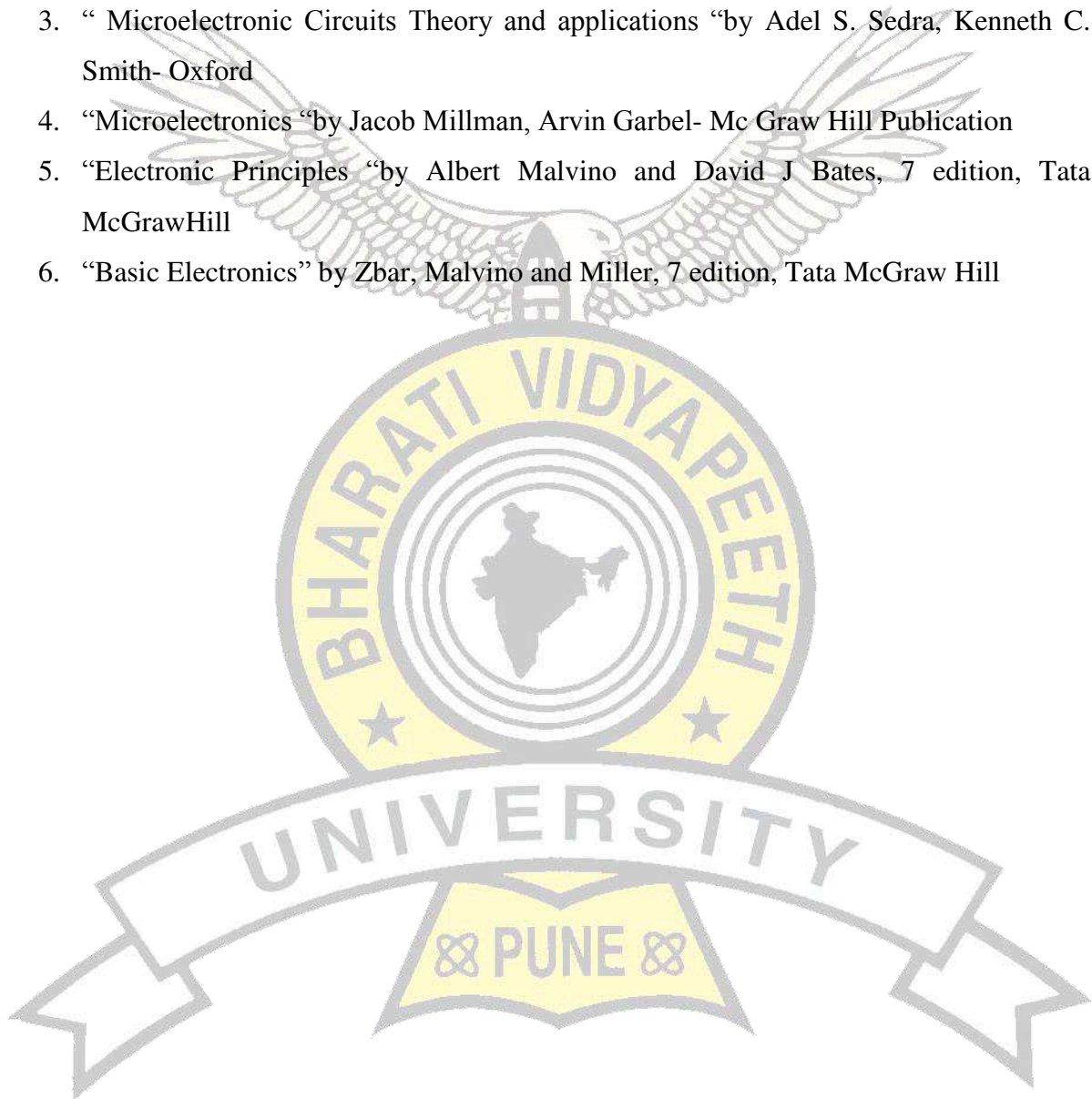
Text Books:

1. “Electronic devices and circuits” by S. Salivahanan, Suresh Kumar Vallavaraj, Mc Graw Hill Publication

2. "Electronic devices and circuits "by Millaman Halkies ,TMH publication
3. "Integrated Electronics", by Millman J and Halkias .C., TMH publication

Reference Books:

1. "Electronic Devices and Circuits "by Allen Mottershed- PHI Publication
2. "Electronic Devices and Circuits "by J.B. Gupta- KATSON educational series books
3. " Microelectronic Circuits Theory and applications "by Adel S. Sedra, Kenneth C. Smith- Oxford
4. "Microelectronics "by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
5. "Electronic Principles "by Albert Malvino and David J Bates, 7 edition, Tata McGrawHill
6. "Basic Electronics" by Zbar, Malvino and Miller, 7 edition, Tata McGraw Hill





**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B. Tech. (Biomedical) Sem:- IV

SUBJECT: - Electronic Instruments and Measurement Systems

Lecture: 4 hours/week

Theory: 60 marks

Practical: 2 hours/week

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Practical: 50 marks

Course prerequisites:

- Knowledge of process instrumentation.
- Knowledge of Integrated circuits.

Course objective:

The objective of the course is to introduce the fundamentals of Electronics Instruments and Measurement. Students learn the essential topics in Measurement systems. The course includes an in-depth understanding of oscilloscope, digital storage oscilloscope, analyzers, communication Measurements.

Course Outcomes: On successful completion of this course, students will be able to:

1. Explain the basic operation of measuring instruments.
2. Describe functioning, specifications, and applications of signal analyzing instruments.
3. Describe the basic features of oscilloscope and the internal structures of different types of oscilloscopes.

Contents:

Unit-I

Fundamentals of Instrumentation & Measurement:

(08 hours)

Necessity of Electronic Measurements, Block diagram of electronic measuring system, Concepts of Accuracy, Precision, Linearity, Sensitivity, Resolution, Hysteresis, Calibration

etc. Measurement Errors, Voltage, Current, Resistance measurement using DMM- 4 ½ & 6 ½, Auto zeroing, Auto ranging.

Unit-II

Measuring Instruments (08 hours)

Voltage , current and impedance measurement, VTVM, TVM, DVMs, AC voltmeters true RMS meters, vector voltmeter, vector impedance meter, direct current probes, alternating current probes ,LCR-Q meter.

Unit-III

Signal Generators & counters (08 Hours)

Sine-wave generator, standard signal generators, Frequency synthesized signal generator, swept frequency generator, random noise generator, Audio frequency signal generation, RF generator, Pulse generator (block diagram), Function generator Time, Frequency, Ratio, Time interval, Period & Multiple Period averaging using digital universal frequency counter.

Unit-IV

Signal Analyzers & computer aided measurements: (08 hours)

Harmonic and Wave analyzer, Distortion factor meter, Spectrum analyzer -FFT analyzer, tracking generator, Logic analyzer, logic timing analyzer, logic state analyzer, FFT analyzer, Mixed signal oscilloscope, IEEE 488, VXI based instruments, Introduction of Lab view software.

Unit-V

Communication Measurements: (08 hours)

Communication measurements, Measurements on transmitter and receiver: sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc. Network analyzer- system elements, measurement accuracy, scalar network analyzer, vector network analyzer, S-parameter measurement using network analyzer.

Unit-VI

Oscilloscopes: (08 hours)

Overview of analog CRO, dual/ Multi-trace CRO, Various CRO probes & its applications. Digital Storage Oscilloscope - Sampling speed & Memory depth of DSO, Design

considerations, Attachments to DSO for enhancing the functionality, Measurements such as FFT, Math Functions, Curve Tracer, and Power scope.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

List of Experiments:

Any 8 assignments should be conducted from the following list.

1. Peak ,average and r.m.s. measurement using rectifier circuit.
2. Calibration of DVM for any one range: e.g, 200 V dc, 200 V ac, 200mA dc, using Standard calibrator or standard 6½DMM.
3. Measurement using spectrum analyzer and tracking generator. Observing spectrum of AM and FM waveforms for different modulation indices
4. Measurements on DSO:
 - i) FFT analysis of LF signal
 - ii) Capturing transients
 - iii) Storing and retrieving number of different signals
 - iv) Study of various operations like add, subtract, integrate, differentiate.
5. Measurement and timing analysis of digital signals using Logic Analyzer.
6. Experiment with virtual instruments using software such as Lab view.
7. Measurement of Total harmonic distortion using distortion factor meter.
8. Measurements on L-C-R Q meter.
9. Measurements with Universal counter (Frequency, Period, frequency ratio, Period Averaging and Time interval).
10. Study of characteristics of Diode, Transistors using Curve Tracer.
11. Study of Power scope.

Text Books/ Reference Books:

1. Oliver-Cage, “Electronic measurements and instrumentation”, TMH edition.
2. M.M.S. Anand, “Electronics instruments and instrumentation technology”, PHI.

3. Coombs, Clide F. Jr., “Electronic instrument handbook”, McGraw –Hill.
4. Car Joseph, “elements of Electronics Instrumentation and Measurement”, PHI
5. A. J. Bouwens, “Digital Instrumentation”, TATA McGraw Hill.





**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



**Class: B.Tech (Electronics) SEM: - III
SUBJECT: - Digital Logic Circuits**

Lecture: 3 Hours/Week

Practical: 2 Hours/Week

Theory: 60 marks

Unit Test: 20 Marks

Attendance: 10Marks

Assignments: 10Marks

TW & Practical: 50 Marks

Course Prerequisite:

1. Fundamentals of Number Systems.

Course Objective:

1. To understand principles, characteristics & operations of combinational & sequential logic circuits.
2. To design combinational circuits by using logic gates, MSI circuits, PLDs.
3. To design, implement analyze, asynchronous & synchronous sequential circuits using flip flops.

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate the knowledge of Boolean algebra including simplification techniques.
2. Describe the characteristics of Logic families TTL, CMOS, ECL & explain the fundamentals of semiconductor memories.
3. Analyze & design digital combinational circuits such as of multiplexers, Demultiplexer, encoder, decoder and arithmetic circuits.
4. Demonstrate the knowledge of operations of basic types of flip-flops, registers, counters & the design of Finite State Machine.
5. Describe the characteristics of PLDs, Semiconductor memories and their applications.

Contents:

Unit –I

Number Systems, Codes & reduction techniques:

(6 Hours)

Review of Binary number system: Binary addition and subtraction using 1's, 2's complement method, sign magnitude representation. BCD codes, 8421, Excess –3, Grey code, codes with more than four bits, ASCII code.

Fundamental theorems of Boolean algebra, Canonical and standard forms (SOP and POS), minimization of logic functions, Karnaugh maps up to 4 variables, Don't care conditions, Quine Mc-Cluskey method.

Unit-II

Combinational Logic Modules and their Applications

(6 Hours)

Adder, subtractor, carry look ahead adder, BCD adder, magnitude comparator, Excess-3 Adder, series and parallel adder, ALU.

Code conversion, Multiplexer, Demultiplexer, Encoder, Decoder and their applications. Parity generator and checker.

Unit-III

Logic Families

(6 Hours)

Parameter definitions - Noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL, CMOS & ECL. Two input TTL NAND gate, TTL logic families standard, Totem – pole, open collector, tri-state (concept & application). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS ECL.

Unit-IV

Sequential Logic Modules

(7 Hours)

Basic sequential circuits-latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, MS J-K flip flop, T flip-flop.

Definition of state machines, Moore and Mealy machine, Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization.

Unit-V

Shift Registers & Counters

(5 Hours)

Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter.

Unit-VI

PLDs & Memories

(6 Hours)

Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.

Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.

List of Experiments:

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. 1 & 2 bit digital comparator and ALU verification
6. Function implementation using Multiplexer and Demultiplexer
7. Sequence generator using MSJK flip flop IC's
8. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
9. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
10. BCD Adder/Subtractor with Decoder driver and 7 segment display

Assignments:

1. Implement a multiplexer using Virtual laboratory
2. Design example based on combinational circuit
3. Design for e.g. digital clock, digital event counter, timers, and various multi-vibrator circuits, small processor ports or scrolling display
4. Implementation of combinational logic using PLAs
5. Design a pulse train generator using shift register
6. Design example based on state machine

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

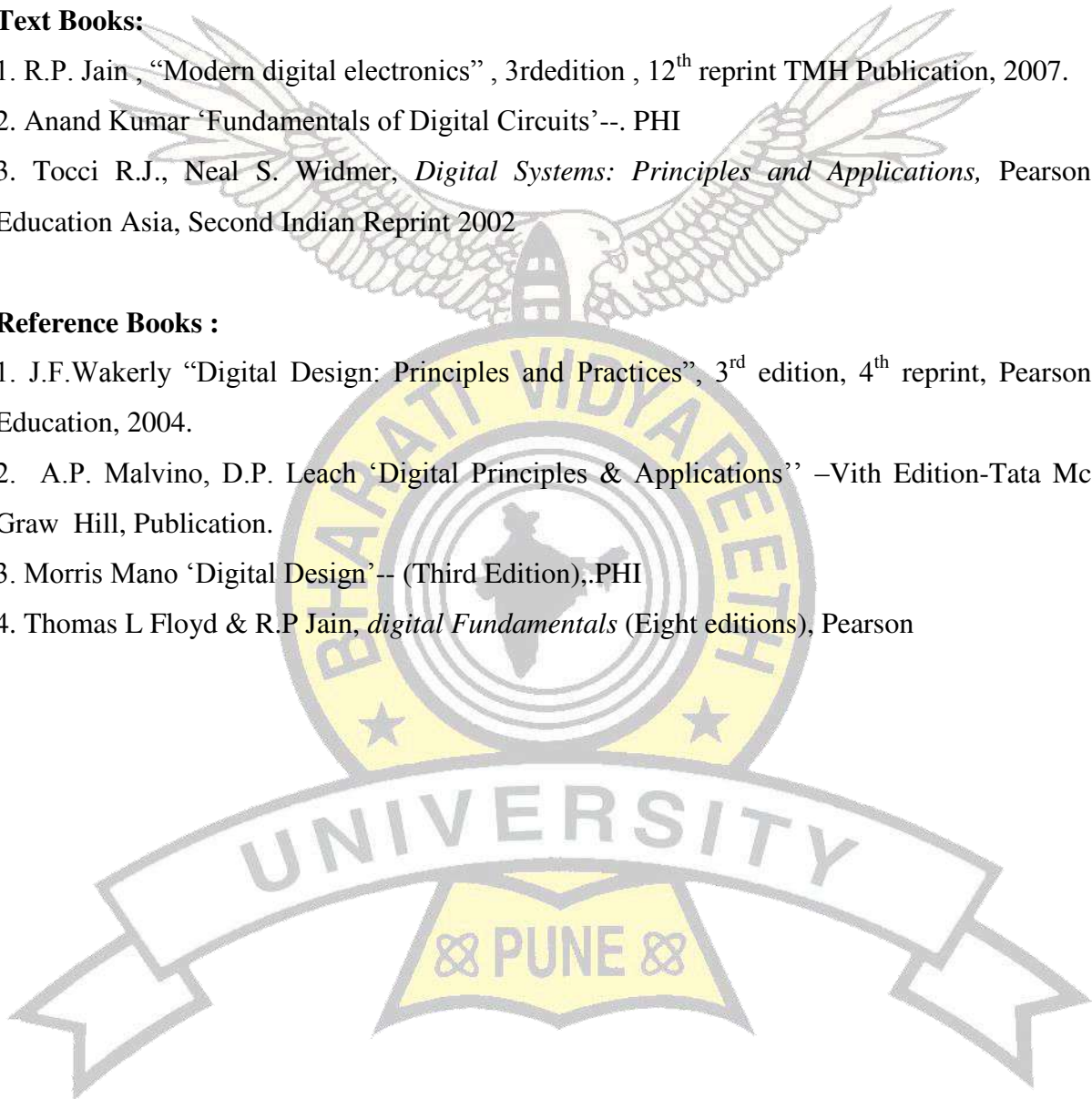
1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books:

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12th reprint TMH Publication, 2007.
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI
3. Tocci R.J., Neal S. Widmer, *Digital Systems: Principles and Applications*, Pearson Education Asia, Second Indian Reprint 2002

Reference Books :

1. J.F.Wakerly “Digital Design: Principles and Practices”, 3rd edition, 4th reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano ‘Digital Design’-- (Third Edition),.PHI
4. Thomas L Floyd & R.P Jain, *digital Fundamentals* (Eight editions), Pearson





**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Biomedical) Sem:- IV

SUBJECT: - Rehabilitation Engineering

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & oral: 50 marks

Course prerequisites:

- Basic Knowledge of Bones in Upper & lower Extremity
- Basic knowledge of Joints in Upper and Lower Extremity.

Course objective:

This course provides in depth knowledge on biomechanics of all soft tissues and also about prosthetic and orthotic devices introduces for upper and lower Extremity..

Course Outcomes:

On successful completion of this course, students will be able to:

1. Demonstrate Mechanical properties of soft tissues.
2. Classify various types of Orthosis and Prosthesis.
3. Demonstrate applications of orthosis and prosthesis.
4. Design of Prosthesis for upper extremity

Contents:

Unit-I

Tissue Biomechanics

(06 hours)

General Principles of Biomechanics, Biomechanics of Soft Tissues: Stress strain behaviour, creep stability, biomechanics of Skin, biomechanics of Muscles, Biomechanics of Ligaments, biomechanics of Tendon & Bones.

Unit-II

Movement Biomechanics

(06 hours)

Gait analysis, Forces transmitted by joints, Mass motion action, joint forces results in normal & disabled person, Biomechanical analysis of human motion using instrumentation

Unit-III

Classification of Orthosis

(06 hours)

Principles in designing orthosis, Principles of Three point pressure, International conventions for providing orthosis, upper extremity orthosis, lower extremity orthosis, Recent developments

Unit-IV

Classification of Prosthesis

(06 hours)

Principles in designing prosthesis, International Conventions for Providing Prosthesis, Upper extremity prosthesis, lower Extremity Prosthesis, Recent developments.

Unit-V

Design of upper Extremity Prosthesis

(06 hours)

Introduction to Rehabilitator, Design of Artificial arms, nature of problem, general design considerations, safety & control, biomaterials used for the same.

Unit-VI

Design of Lower Extremity prosthesis

(06 hours)

Design of Artificial limb for lower Extremity ,History of lower limb Prosthesis, Amputation surgery ,recent development.

List of Experiments:

- 1.study of Knee Ankle Foot Orthosis
- 2.Study of Hip Knee Ankle Foot Orthosis
- 3.Study of Below elbow Orthosis
- 4.Lamination of prosthesis
- 5.Study of Milwaukee brace

6.Study of Hand prosthesis and Orthosis

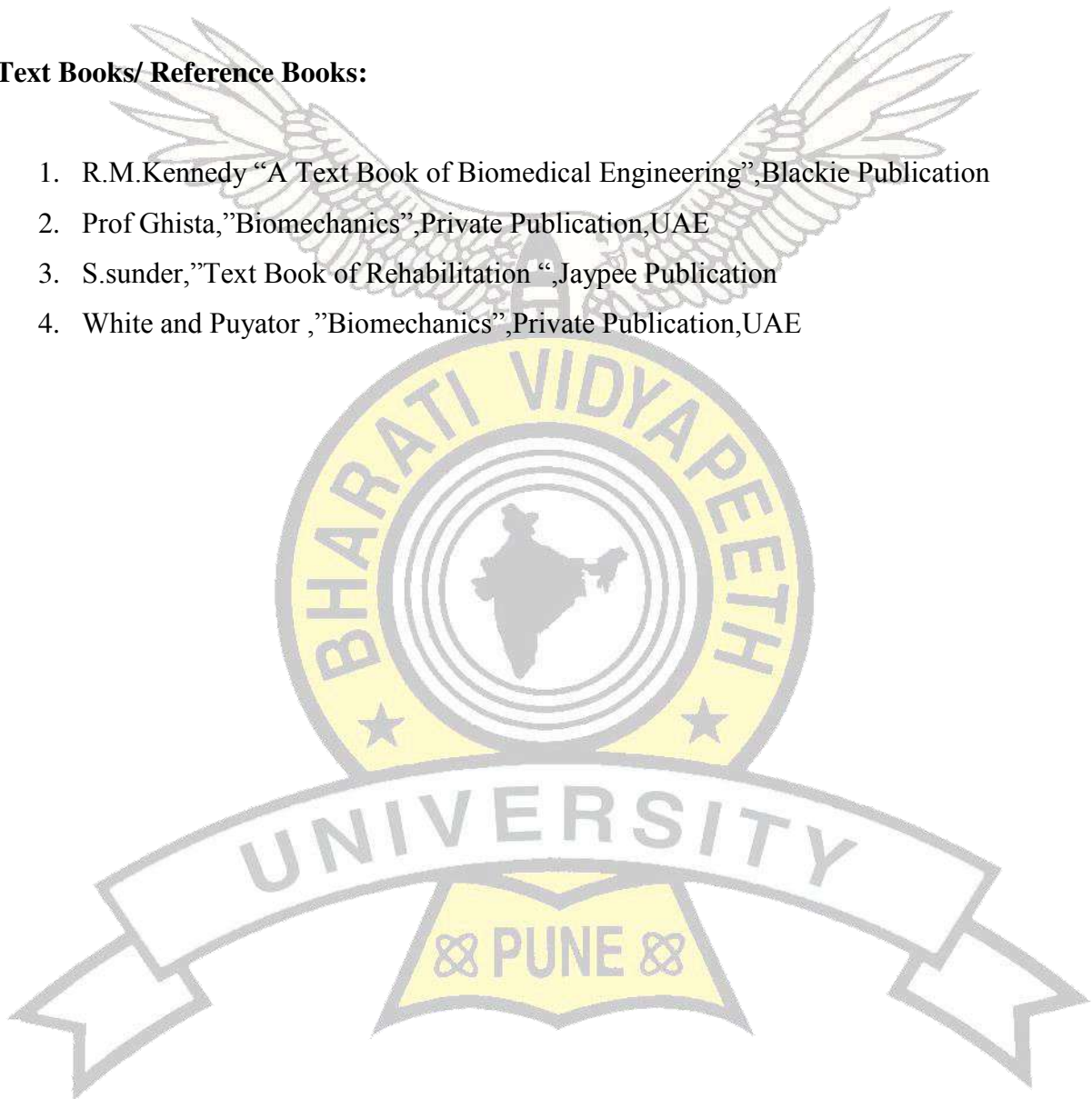
Content Delivery Methods: Chalk & talk, Models

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books/ Reference Books:

1. R.M.Kennedy “A Text Book of Biomedical Engineering”,Blackie Publication
2. Prof Ghista,”Biomechanics”,Private Publication,UAE
3. S.sunder,”Text Book of Rehabilitation “,Jaypee Publication
4. White and Puyator ,”Biomechanics”,Private Publication,UAE



Bharati Vidyapeeth
Deemed University, Pune
B. Tech. (Chemical) – 2014 Course
Sem. - I

Total Duration : 29 Hours/week Total Credits : 25 Total Marks : 700													
Sr. No.	Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)							Credit
		L	P/D	T	Total	End Semester Examination	Continuous Assessment			TW	Total		
							Unit Test	Assignments	Attendance				
1	Engineering Mathematics-I	3	-	1	4	60	20	10	10	-	100	4	
2	Fundamental of Civil Engineering	3	2	-	5	60	20	10	10	25	125	4	
3	Engineering Graphics	4	2	-	6	60	20	10	10	25	125	5	
4	Engineering Physics	4	2	-	6	60	20	10	10	25	125	5	
5	Chemical Engineering Materials	3	-	1	4	60	20	10	10	25	125	4	
6	Professional Skill Development-I	2	-	-	2	30	-	20	-	-	50	2	
7	Workshop Technology	-	2	-	2	-	-	-	-	50	50	1	
Total		19	8	2	29	330	100	70	50	150	700	25	

Bharati Vidyapeeth
Deemed University, Pune
B. Tech. (Chemical) – 2014 Course
Sem. – II

Total Duration : 30 Hours/week Total Credits : 25 Total Marks : 700													
Sr. No.	Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)							Credit
		L	P/D	T	Total	End Semester Examination	Continuous Assessment			TW	Total		
							Unit Test	Assignments	Attendance				
8	Engineering Mathematics-II	3	-	1	4	60	20	10	10	-	100	4	
9	Fundamental of Mechanical Engineering	3	2	-	5	60	20	10	10	25	125	4	
10	Engineering Mechanics	4	2	-	6	60	20	10	10	25	125	5	
11	Engineering Chemistry	4	2	-	6	60	20	10	10	25	125	5	
12	Fundamental of Electrical Engineering	3	2	-	5	60	20	10	10	25	125	4	
13	Professional Skill Development-II	2	-	-	2	30	-	20	-	-	50	2	
14	Analytical Techniques in Chemical Engineering	-	2	-	2	-	-	-	-	50	50	1	
Total		19	10	1	30	330	100	70	50	150	700	25	

Bharati Vidyapeeth
Deemed University, Pune
ENGINEERING MATHEMATICS-I

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

(08 Hours)

Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

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Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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Deemed University, Pune**

02: Fundamentals of Civil Engineering

02: Fundamentals of Civil Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Concepts of units and conversions of units.	
2.	Basic knowledge of Chemistry	
3.	Basic knowledge of geography, concept of latitude and longitude.	
Course Objectives:		
	To make student understand the scope and application of Civil Engineering	
Course Outcomes:		
Students will be able to understand		
1.	Different building components and material	
2.	Classification of surveying	
3.	Levelling of the ground	
4.	Planning of building	
5.	Methods of irrigation and water supply	
6.	Different methods of transportation	
UNIT - I		
	Civil Engineering Scope And Applications.	(06 Hours)
	Civil Engineering scope, importance and applications to other	

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	disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.	
UNIT - II	Surveying	(06 Hours)
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.	
UNIT - III	Building Planning And Bye Laws	(06 Hours)
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.	
UNIT - IV	Foundations and Earthquakes	(06 Hours)
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.	
UNIT - V	Irrigation And Water Supply	(06 Hours)
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
UNIT - VI	Infrastructure	(06 Hours)
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of	

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	<p>railway track, advantages.</p> <p>Bridges: Components - Foundation, Piers, Bearings, Deck.</p> <p>Airways- Components -Runway, Taxiway and Hangers.</p>	
Term Work:		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	

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Reference Books:	
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

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ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p>Lines and Dimensioning in Engineering Drawing</p> <p>Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p>Curves used in Engineering Practice</p> <p>Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p>Orthographic Projection</p> <p>Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p>Isometric Projections</p> <p>Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p>Projections of Points and Lines and planes</p> <p>Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p>Projection of Solids</p> <p>Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)

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Unit VI	Section of Solids Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.	(6)
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Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.
Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
	Term Work: 25marks	

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

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UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

(08 hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

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UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.

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5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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Chemical Engineering Materials

Teaching Scheme		Examination Scheme		Credits
Lectures	: 3Hrs/week	End semester examination:60 Marks		3
Tutorials	: 1 Hr/week	Continuous assessment	: 40 Marks	
		Term work	: 25 Marks	1
		Total	: 125Marks	4

Course Pre-requisite: Basic understanding of chemistry of bonds

Course Objectives: To get knowledge of selection of material for process industry

Course outcome: Understand material properties, metal and their alloys, polymers, plastics, paints, coatings adhesives, ceramic, cement, glass, material failures and prevention measures.

Unit –I **(06 Hours)**

Introduction

Materials and criteria for selection of material in process industries. Material properties: Mechanical, thermal, chemical, electrical, magnetic and technological properties, modification and control of material properties.

Unit- II **(06 Hours)**

Metal and their alloys

- A. Ferrous materials: Pure iron, cast iron, mild steel, stainless steels, special alloy steels-iron and iron carbide, phase diagram-heat treatment of plain-carbon steels.
- B. Nonferrous materials: Lead, Tin, aluminium, zinc, nickel, copper, Magnesium and their alloys. Properties and applications in process industries.

Unit –III **(06 Hours)**

Hydrocarbon materials

Natural & synthetic polymeric materials

Selection of polymeric materials for equipment linings, fiber reinforced plastic, application of special polymers like Nylon 66, Teflon in engineering. Polymer Composites and blends.

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Paints, coatings and adhesives

Unit-IV

(06 Hours)

Ceramic, glasses and cement

Definition of ceramics and glasses; interaction between structure, processing, and properties; Applications of ceramic and glass materials; Crystalline and non-crystalline ceramics, silicates, refractories, clays, glass, vitreous silica, and borosilicate

Cement and its properties- special cements, cement concrete, RCC- Pre stressed concrete.

Unit- V

(06 Hours)

Material failure analysis

Thermal and mechanical failures: Creep, stress, crystal structure and defects.

Chemical failure: acid base environment, water, Corrosion: Corrosion attack methods, Different types of corrosion: chemical, biochemical, and electrochemical; Internal and external factors affecting corrosion of chemical equipments; corrosion charts for process equipments.

Unit-VI

(06 Hours)

Material failure prevention

Property enhancement by electroplating, glass and ceramic linings, polymer lining, paints, coatings, alloy preparation, composite and blend formation.

Unit tests would follow as:

- | | | |
|-------------|---|-------------------|
| Unit test 1 | : | Unit 1 and unit 2 |
| Unit test 2 | : | Unit 3 and unit 4 |
| Unit test 3 | : | Unit 5 and unit 6 |

Term work includes assignments on

1. Basic criteria for material selection, material properties
2. Ferrous and non-ferrous material recent advanced material of actual application in industry
3. Polymeric advanced material presently applied in industry
4. Cement, ceramic and glass variety to be used in industry
5. Industrial example with analysis of thermal, mechanical and chemical failure.
6. Industrially applied case studies for prevention of material prevention

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Text Books

1. Kodgire V. D. "Material Science and Metallurgy for Engineers", Everest publication India
2. Gowarikar V. R., Vishwanath N V, JaydevShreedhar, "Polymer science", New age International publication, India

References books

1. Budinsky K G and Budinsky K M "Engineering materials- Properties and Selection", Prentice Hall of India.
2. Henry R Clauser, "Industrial and Engineering materials", McGraw Hill Book Co.
3. James F. Shackelford, Introduction to Material Science, Mc-Millan Publishing Company, New-York.
4. D.Z. Jestrzebaski, Properties of Engineering Materials, 3rd Ed. Toppers. Co. Ltd.
5. J.L. Lee and Evans, Selecting Engineering Materials for Chemical and Process Plants, Business Works.

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Workshop Technology**

TEACHING SCHEME:

Theory: -

Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -

Continuous Assessment: -

Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances

Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

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Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.

Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

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ENGINEERING MATHEMATICS-II

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

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Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

(08 Hours)

Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I, II, III

Unit Test II :- Unit IV, V, VI

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FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: -60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Thermodynamics-</p> <p>Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p>Introduction to I.C. Engines and turbines-</p> <p>Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines,</p> <p>Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p>Introduction to refrigeration, compressors & pumps-</p> <p>Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p>Energy Sources -</p> <p>Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p>Heat transfer-</p> <p>Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating</p>	(08)

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	materials and their properties, types of heat exchangers and their applications.	
UNIT-IV	<p>Properties of fluids-</p> <p>Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p>Properties of Materials and their Applications-</p> <p>Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p>Mechanical devices -</p> <p>Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p>Mechanisms-</p> <p>Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p>Machine Tools-</p> <p>Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p>Introduction to manufacturing processes and Their Applications-</p> <p>Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.

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4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

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10: Engineering Mechanics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have knowledge of

- | | |
|----|---|
| 1. | Scalar and Vector |
| 2. | Newton's law of motion |
| 3. | Law of friction |
| 4. | Concept of physical quantities, their units and conversion of units |
| 5. | Concept of differentiation and integration |

Course Objectives:

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

Course Outcomes:

The student should be able to

- | | |
|----|--|
| 1. | calculate resultant and apply conditions of equilibrium. |
| 2. | analyze the truss and calculate friction force. |
| 3. | calculate centroid and moment of inertia. |
| 4. | solve problem on rectilinear motion. |
| 5. | solve problems on curvilinear motion. |
| 6. | use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle. |

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UNIT - I	Resultant and Equilibrium	(06 Hours)
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
UNIT - II	Truss and Friction	(06 Hours)
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	Centroid and Moment of Inertia	(06 Hours)
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
UNIT - IV	Kinematics of Rectilinear motion of a Particle	(06 Hours)
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	Kinematics of Curvilinear motion of a Particle	(06 Hours)
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	Kinetics of a Particle	(06 Hours)
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	

Term Work:

A) The term-work shall consist of minimum **Five** experiments from list below.

1. Determination of reactions of Simple and Compound beam.
2. Study of equilibrium of concurrent force system in a plane.
3. Determination of coefficient of friction for Flat Belt.
4. Determination of coefficient of friction for Rope.
5. Study of Curvilinear motion.
6. Determination of Coefficient of Restitution.

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B) The term-work shall also consist of minimum **Five** graphical solutions of the problems on different topics.

Text Books:

1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.

2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.

3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.

Reference Books:

1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.

2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.

3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.

4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.

5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.

6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.

Syllabus for Unit Test:

Unit Test -1

UNIT – I to III

Unit Test -2

UNIT – IV to VI

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ENGINEERING CHEMISTRY

Teaching Scheme:
Lectures: 4Hrs/Week
Practical: 2Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory: 04
Practical: 01
Term Work: 25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming

Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning
Numerical based on the zeolite process **(08 Hours)**

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications. **(08 Hours)**

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV. **(08 Hours)**

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping. **(08 Hours)**

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles. **(08 Hours)**

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Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

1. Effect of hard water on boilers and heat exchangers
2. Hydraulic/ Non-hydraulic cementing materials
3. Analysis of coal a) Proximate b) ultimate analysis of coal
4. Wet corrosion-mechanism, Electroplating, Hot dipping
5. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
6. Fuel cells

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References / Text Books :

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
2. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
3. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
4. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
5. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
6. Engineering Chemistry by Dara S. S. S Chand Publications
7. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Electrical Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have

- | | |
|----|-------------|
| 1. | Mathematics |
| 2. | Physics |

Course Objectives:

The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.

Course Outcomes:

- | | |
|----|--|
| 1. | Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems |
| 2. | Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks |
| 3. | Describe construction, principle of operation, specifications and applications of capacitors and batteries |
| 4. | Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer |
| 5. | Define basic terms of single phase and three phase ac circuits and supply systems |
| 6. | Know and use electrical safety rules |

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UNIT - I	Basic concepts	(06 Hours)
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	Network Theorems	(06 Hours)
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	Electrostatics	(06 Hours)
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
UNIT - IV	Magnetic Circuit & Transformer	(06 Hours)
	Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.	
UNIT - V	AC Fundamentals & AC Circuits	(06 Hours)
	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	

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UNIT - VI	Electrical Wiring and Illumination system	(06 Hours)
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight exercises / experiments.		
<ol style="list-style-type: none"> 1. Determination of resistance temperature coefficient 2. Verification of Superposition Theorem 3. Verification of Thevenin's Theorem 4. Verification of Kirchoff's Laws 5. Verification of Maximum power transfer Theorem 6. Time response of RC circuit 7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$ 8. Verification of current relations in three phase balanced star and delta connected loads. 9. Direct loading test on Single phase transformer <ol style="list-style-type: none"> a) Voltage and current ratios. b) Efficiency and regulations . 10. Study of a Residential (L.T.) Bill 		
Text Books:		
1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi		
2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi		
3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd		
Reference Books:		
1. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication		
2. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications		
3. John Omalley Shawn – "Basic circuits analysis" Mc Graw Hill Publications		
4. Vincent Del Toro – "Principles of Electrical Engineering", PHI Publications		

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Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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Analytical Techniques in Chemical Engineering

Teaching Scheme:

Lectures: - -

Practical: 2 Hr/week

Examination Scheme:

Term work: 50 Marks

Credits:

01

Course pre-requisite: Fundamental knowledge of chemistry involved in analytical techniques.

Course objectives:

1. To develop students acquaintance with various basic analytical techniques available in Chemical Engineering.
2. To provide a base for effective understanding of the core subjects of Chemical Engineering such as Stoichiometry, Environmental Engineering etc.

Course outcome:

After successful completion of the course the student will be able:

1. To independently prepare standard solutions and solutions for given normality/ molarity/ molality
2. To carry out preliminary water and fuel analysis.

Minimum eight practicals should be conducted from the list given below:

I. Standardization

1. To prepare standard alkaline and acidic solutions.

II. Normality/ Molarity/ Molality Concepts

3. Find the strength of given alkaline solution using acidic solution or vice versa.
4. Preparation of solutions for given normality/ molarity/ molality

III. Water Analysis

1. To determine free CO₂ in the given water Sample.
2. Determination of Dissolved oxygen in the given water sample.
3. To determine Acidity of a given water sample.
4. To determine alkalinity of a given water sample.

IV. Fuel Analysis

1. Determination of octane/cetane number
2. Determination of kinematic viscosity
3. Determination of calorific value

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4. Determination of moisture content
5. Ultimate/proximate analysis of solid fuel

Text books/References:

1. Practical organic chemistry, Arthur I. Vogel, Longman publication
2. Experiments in applied chemistry, Sunita Rattan, S. K. Kataria & Sons

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College of Engineering
Department of Chemical Engineering

Semester III														Total Duration : 28Hours/week
														Total Credits :25
														Total Marks : 750
Sr. No.	Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)							Credit	
		L	P/D	T	Total	End Semester Examination	Continuous Assessment			TW/ O	TW/ P	Total		
							Unit Test	Assign-ments	Atten-dance					
1	Chemical Engineering Thermodynamics I	3	-	1	4	60	20	10	10	-	-	100	4	
2	Strength of Material	3	2	-	5	60	20	10	10	-	25	125	4	
3	Physical Chemistry	3	2	-	5	60	20	10	10	-	50	150	4	
4	Chemical Process Calculations	3	-	1	4	60	20	10	10	25	-	125	4	
5	Mechanical Operation	4	2	-	6	60	20	10	10	-	50	150	5	
6	Professional Skill Development-III	4	-	-	4	60	-	40	-	-	-	100	4	
Total		20	6	2	28	360	100	90	50	25	125	750	25	

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Semester IV														Total Duration : 28Hours/week
														Total Credits :25
														Total Marks : 750
Sr. No.	Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)								Credit
		L	P/D	T	Total	End Semester Examination	Continuous Assessment			TW/ O	TW/ P	Total		
							Unit Test	Assign-ments	Atten-dance					
7	Engineering Mathematics III	3	-	1	4	60	20	10	10	-	-	100	4	
8	Fluid Flow Operations	4	2	-	6	60	20	10	10	-	50	150	5	
9	Process Heat Transfer	4	2	-	6	60	20	10	10	-	50	150	5	
10	Chemical Engineering Thermodynamics II	3	-	1	4	60	20	10	10	25	-	125	4	
11	Chemical Process Industries	2	-	1	3	60	20	10	10	25	-	125	3	
12	Professional Skill Development-IV	4	-	-	4	60	-	40	-	-	-	100	4	
Total		21	6	1	27	360	100	90	50	50	100	750	25	

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DEEMED UNIVERSITY, PUNE
B.Tech (Chemical) - 2014 Course
Semester-III

CHEMICAL ENGINEERING THERMODYNAMICS-I		
Designation: Professional Core		
Course Pre-requisites:		
Students should have knowledge of		
1.	Mathematics	
2.	Physics	
3	Chemistry	
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
Tutorial : 1 Hour /Week	Unit Test : 20 marks	Tutorial : 01
Total : 4 Hours/Week	Continuous Assessment : 20 Marks	Total credits : 04
	Term Work/Oral : 25 Marks	
	Total : 125 Marks	
Course Outcomes:		
After completion of the course students will be able to		
1.	(a) Estimate energy requirement for a system	
2.	(a) Understand second law of thermodynamics and the concept of entropy (b) Calculate efficiency of heat engines and refrigerator, and calculate change in entropy for ideal gas.	
3.	(a) Understand P-T and P-V diagrams for pure fluids (b) Select appropriate equation of state for representing P-V-T behavior of gases and/or liquids.	
4.	(a) Calculate changes in internal energy, enthalpy, and entropy for ideal gases, and also for non-ideal gases through use of residual properties (b) Understand the criterion of phase equilibrium for a pure substance and use it to relate the enthalpy of phase change to the saturation pressure curve via Clausius- Clapeyron equation	
5.	(a) Understand refrigeration and liquefaction cycles.	
6.	(a) Estimate deviation from ideality for real gaseous mixtures and liquid solutions	
Topics covered		
UNIT - I	First Law of Thermodynamics Preliminary concepts of thermodynamics; Statement of first law of thermodynamics; Joules experiment and internal energy; Mathematical form of first law of thermodynamics; State function and path function; Intensive and extensive properties; Enthalpy; Steady state steady flow process; Equilibrium; Phase rule; Reversible and irreversible processes; Constant volume and constant pressure processes.	(08 Hours)

UNIT - II	Second Law of Thermodynamics: Necessity of second law of thermodynamics; Statements of second law of thermodynamics; Heat engine: Carnot approach; Kelvin-Planck statements; Thermodynamic temperature scale; Thermodynamic temperature and the ideal gas scale; Entropy: Clausius approach; Entropy change of ideal gas; Mathematical statement of second law of thermodynamics; Third law of thermodynamics and its mathematical statement	(08 Hours)
UNIT - III	Volumetric Properties of Pure Fluids PVT behavior of pure substance; Basic equation of state; Difference between Ideal gas and real gas; Equation governing PVT behavior of ideal gas; Development of thermodynamic relations for ideal gas for isochoric, isobaric, isothermal, adiabatic, and polytropic processes; Equations governing PVT behavior of real gas: (i) the virial equations, (ii) two parameter equations (van der Waal, and RedlichKwong equations), (iii) compressibility factor: two parameter theorem of corresponding state and three parameter theorem of corresponding state.	(08 Hours)
UNIT - IV	Thermodynamic properties of Fluids: Property relations for homogeneous phases: (i) Thermodynamic relations derived from laws of thermodynamics, Helmholtz energy, and Gibbs energy, (ii) Maxwell relationships; Two-phase systems: Clausius - Clapeyron equation and Antoine equation; Thermodynamic diagrams: (i) temperature-entropy, (ii) pressure-enthalpy, and (iii) enthalpy-entropy (the Mollier diagram).	(08 Hours)
UNIT - V	Refrigeration and Liquefaction The Carnot Cycle; The vapor- compression cycle; Comparison of refrigeration cycle; The Choice of refrigerant; Absorption refrigeration and power cycle; Organic Rankine cycle; Liquefaction processes	(08 Hours)
UNIT - VI	Solution Thermodynamics Fundamental property relation; Phase equilibrium using volumetric properties; Partial molal properties; Ideal gas mixtures and ideal solutions; Concept of fugacity and activity; Concept of residual and excess properties.	(08 Hours)
Tutorials:		
Tutorials will be based on the theoretical and/or numerical covered in six units		
1	Solving numerical in connection with the basic principles of thermodynamics	
2	Questions involving first law applied to pure component systems.	
3	Solving numerical in connection with entropy changes of ideal gas for various thermodynamic processes.	
4	Draw P-T and P-V diagrams for pure substances.	
5	Solving numerical based on application of thermodynamics to transient open and closed systems	
6	Numerical involving Pure Fluid Properties Coupled to 1st and 2nd Laws.	

7	Conducting surprise MCQ test for students
8	Solving numerical based on Refrigeration and Liquefaction.
9	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments.
10	Students have to study any five NPTEL videos related to Chemical Engineering Thermodynamics I and prepare/present power point presentation.
11	Group discussions on any of the following topics: a) Importance of Chemical Engineering Thermodynamics in chemical industries. b) Practical applications involving various thermodynamic processes. c) Ideal Gas, Real Gas, Ideal gas mixture, Ideal solution.
12	Preparation of a brief report on applicability of equations of states (EOS) in chemical engineering systems.
13	Solve question papers of CET I of previous THREE years.
14	Unsolved numerical from the reference books on various topics studied
Text Books/ References:	
1.	J. M. Smith and H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics", McGraw-Hill Publication
2.	T. E. Daubert, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
3.	B. F. Dodge, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
4.	S. I. Sandler, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
Syllabus for Unit Test:	
Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI

STRENGTH OF MATERIAL			
Designation: Breath			
Course Pre-requisites:			
Students should have			
1.	Basic knowledge of Engineering Mechanics		
TEACHING SCHEME:			
EXAMINATION SCHEME:			
CREDITS ALLOTTED:			
Lectures	: 3Hours/Week	End Semester Examination : 60 Marks	Theory : 03
Practical	: 2 Hour /Week	Unit Test : 20 Marks	Practical : 01
Total	: 5 Hours/Week	Continuous Assessment : 20 Marks	Total credits : 04
		Term Work/Practicalal : 25 Marks	
		Total : 125 Marks	
Course Outcomes:			
After completion of the course students will be able to			
1.	Calculate stresses due to axial force.		
2.	Calculate shear force and bending moment in the beam.		
3.	Calculate deflection and bending stress in the beam.		
4.	Calculate shear stress due to shear force and torsion.		
5.	Calculate critical load for column.		
6.	Calculate principal stresses.		
Topics covered			
UNIT-I	<p>Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law;</p> <p>Stresses due to Axial Load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section.</p>	(06 Hours)	
UNIT-II	<p>Shear Force and Bending Moment in Beams:</p> <p>Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments.</p>	(06 Hours)	
UNIT-III	<p>Deflection of Beams:</p> <p>Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve.</p> <p>Flexural Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section.</p>	(08 Hours)	
UNIT-IV	<p>Shear Stresses: Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section.</p> <p>Torsion of Circular Shafts: Theory, assumptions and derivation of torsional formula; Shear stress distribution across cross section; Twisting moment diagram; Shear</p>	(06 Hours)	

	stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity.	
UNIT-V	Combined Axial and Bending Stress: Concept; Resultant stress due to the axial load and uni-axial or biaxial bending; Core of section. Axially Loaded Long Columns: Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula.	(06 Hours)
UNIT-VI	Principal Stresses and Principal Planes: Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method. (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion.	(06 Hours)

Text Books/References:

1.	R. C. Hibbeler, "Mechanics of Materials", Pearson Prentice Hall,
2.	Rajput R. K., "Strength of Materials", S. Chand Publication
3.	Punmia B. C., Jain, Ashok Kr. Jain Arun Kr., "Mechanics of Materials", Laxmi Publication.
4.	Ramamrutham S. & Narayan R., "Strength of Materials", DhanpatRai Publishing Co.
5.	Beer F.P. and Johnston E.R., "Mechanics of Materials", McGraw Hill Publication
6.	Gere J.M. & Timoshenko S.P., "Mechanics of Materials", CBS Publishers & Distributors
7.	Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication
8.	Popov E. P., "Engineering Mechanics of Solids", Prentice Hall of India (P) Ltd.
9.	Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV ,V,VI

PHYSICAL CHEMISTRY

Designation: Basic science

Course Pre-requisites: Basic knowledge for chemistry

TEACHING SCHEME:

Lectures : 03 Hours/Week

Practical : 02 Hours /Week

Total : 05 Hours/Week

EXAMINATION SCHEME:

End Semester Examination : 60 Marks

Unit Test : 20 Marks

Continuous Assessment : 20 Marks

Term Work/Practical : 50 Marks

Total : 150 Marks

CREDITS ALLOTTED:

Theory : 03

Practical : 01

Total credits : 04

Course Outcomes:

After completion of the course students will be able to

1. Explain the basic concepts of bond forming and reactivity.
2. Describe the principles and applications of spectroscopic techniques such as infra-red UV/Visible absorption spectrometry.
3. Demonstrate the principles and functions of the UV and IR spectroscopy for chemical investigations.
4. Recognize the use of catalysts for industrially important processes.
5. Comprehend Structure-Property Relationship.
6. Interpret concept of Surface and Interfacial Chemistry.

Topics covered

UNIT-I	Bonding and reactivity: Aromaticity-conditions necessary for delocalization of electrons, resonance structures stability rules, resonance in phenol, aniline, benzaldehyde, nitrobenzene molecules, Effect of inductive effect and resonance on pKa and pKb values of acids and bases. Reaction intermediates –carbonations, carban ions, free radicals and their stability. Types of reagents, types of reactions.	(06 Hours)
UNIT-II	Reaction mechanisms: Substitution at saturated carbon (SN1, SN2)- mechanism, factors favoring. Electrophilic aromatic substitution in benzene and mono substituted benzenes, activating and deactivating groups , nitration, Friedal-Craft reactions, sulphonation, diazotization. Nucleophilic substitution on on carbonyl carbon. Addition of HX on C=C 1, 2-Eliminations- E1mechanism, E 2, (Saytzeff, Hoffman products), factors favoring. Rearrangements- Beckman, Claisen, Reformatsky.	(06Hours)
UNIT-III	Instrumental methods of chemical analysis: UV-Visible spectroscopy: Lambert-Beer law, λ max, calculation of λ max for olefinic and cyclic structures, instrumentation, interpretation of spectra, applications. IR Spectroscopy: Introduction, instrumentation (double beam spectrophotometer) characteristic absorption in functional and finger print regions, interpretation of spectra, applications.	(06 Hours)
UNIT-IV	Catalysis: Introduction, types of catalyst, criteria or Characteristics of catalyst, adsorption theory of catalysis, catalytic promoters or activators, catalytic poisons, Enzyme catalysis, Applications of catalysts for industrially important processes.	(06 Hours)
UNIT-V	Structure –Property Relationship: Molecular interactions and bonds weaker than covalent bonds, e.g. hydrogen bond,dipole interaction,VDW forces etc.and there effects on various properties	(06 Hours)

	such as refractive index ,viscosity, surface tension, density, thermal conductivity, specific heat, diffusivity, melting point, boiling point, vapor pressure, heat of formation, latent of diffusion and vaporization, non ideal behavior in solutions, group contribution methods for estimation of these properties(including those of polymers and polymeric solutions).	
UNIT-VI	Surface and Interfacial Chemistry: Concept of surface /interfacial energy and surface /interfacial tension, Thermodynamics of surfaces, Gibbs adsorption equation and isotherm, Curved surfaces-Young, Laplace, Kelvin and Thompson equations contact angle and wetting phenomena, adhesion, cohesion, surface active agents: types and applications, surfactant aggregates, emulsions and micro emulsions preparation, stability and application.	(06 Hours)
List of Experiments:		
Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.		
1.	Preparation of benzoic acid from benzamide.	
2.	Preparation of aspirin from salicylic acid.	
3.	Conductometric titration between strong acid and strong base.	
4.	Determination of percentage purity of sodium Bicarbonate by gravimetry.	
5.	Estimation of Cu ⁺⁺ ions by spectrophotometer/colorimeter.	
6.	Purification of organic compounds by crystallization and sublimation.	
7.	To determine the number of molecules of water of crystallization in BaCl ₂ .2H ₂ O by heating.	
8.	Volumetric estimation of aniline from the given solution.	
9.	Volumetric estimation of acetone from the given solution.	
10.	Determine viscosity of given liquids by Ostwald's viscometer.	
11.	To determine ΔH, ΔG,ΔS of the reaction, $Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$	
12	Preparation of tetramine copper (II) sulphate.	
13	Preparation of potassiumtrioxalato aluminate.	
14	Preparation of crystal of potash alum.	
15	To determine the equivalent weight of the given metal (Zn or Mg) eudiometrically.	
Assignments:		
1	What is resonance effect? Draw resonating structure of aniline, phenol, phenoxide ion.	
2	Nucleophilic substitution.	
3	Conductometric titrations.	
4	Industrial applications of catalysts.	
5	Adsorption theory of catalysis.	
6	Gibbs adsorption equation and isotherm	
Reference Books		
1	Instrumental methods of chemical analysis ----B.K.Sharma, Goel publ.)	
2	Instrumental methods of chemical analysis ----Chatwal –Anand	
3	Organic chemistry –I L Finar volume I and II	
4	Engineering Chemistry ---S.S.Dara	
5	Physical chemistry –P L Soni	

6	Atkins P.W. and Paula., Physical Chemistry, 8 th Edn., Oxford University Press.	
7	Inorganic chemistry ----Cotton, Wilkinson	
8	Spectroscopy ---Kalsi	
9	Vogels text book of quantitative chemical analysis. (5 th Edn.)	
Syllabus for Unit Test:		
Unit Test -I	UNIT – I ,II,III	
Unit Test -II	UNIT – IV,V,VI	

CHEMICAL PROCESS CALCULATIONS

Designation: Professional Core		
Course Pre-requisites:		
Students should have		
1.	Basic knowledge of chemistry	
TEACHING SCHEME:		
EXAMINATION SCHEME:		
CREDITS ALLOTTED:		
Lectures	: 3Hours/Week	End Semester Examination : 60 Marks
Tutorial	: 1 Hour /Week	Unit Test : 20 Marks
Total	: 4 Hours/Week	Continuous Assessment : 20 Marks.
		Term Work/Oral : 25 Marks
		Total : 125 Marks
		Theory : 03
		Tutorial : 01
		Total credits : 04
Course Outcomes:		
After completion of the course students will be able to		
1.	Explain the concept of units and dimensions and solve the problems on basic chemical calculations.	
2.	Describe the concept of material balance without chemical reactions and solve the problems involved in various unit operations.	
3.	Explain the concept of material balance involving chemical reactions and solve the problems on unit processes carried out in chemical industry.	
4.	Explain the concept of recycle, bypass, purge operations and solve problems based on humidification, recycle, bypass and purge operations.	
5.	Interpret the concepts of energy balance and solve numerical based on them.	
6.	Apply the knowledge of gross and net calorific values of fuel and solve the problems based on them.	
Topics covered		
UNIT-I	Basic Chemical Calculations: Units and dimensions for mass and energy calculation for solid, liquid and gas; Mole concept; Basic composition calculation for homogeneous, two phase and three phase systems,	(08 Hours)
UNIT-II	Material balances without Chemical Reactions: Generalized law of conservation of mass; Mass conservation without chemical reaction; Mass balance for unit operations encountered in chemical process industry : Distillation, extraction, evaporation, blending etc.	(08 Hours)
UNIT-III	Material balances involving Chemical Reactions: Generalization of law of conservation of mass involving chemical reaction and its simplification; Chemical equations and stoichiometry; Some basic concepts: conversion, yield, selectivity; Material balance for unit processes encountered in chemical process industry: nitration, esterification, acylation, sulfonation etc.	(08 Hours)
UNIT-IV	Recycle, bypass and purge operations: Necessity of recycle, bypass and purge streams; Basic calculations of recycle, bypass and purge streams for unit operations and unit processes. Industrial examples of recycling, bypassing and purging with complete mass balance viz. biofuel synthesis, food processing etc.; Humidification operation.	(08 Hours)
UNIT-V	Energy Balance: Basic concepts; heat capacity; Sensible heat and latent heat: Clausius-Clapeyron equation; standard heat of formation, combustion, reaction, Hess's law; General equation of energy balance; Energy balance approach and calculations for exothermic and endothermic reactions with industrial examples; Steam table and its utility; Utility	(08 Hours)

	energy balance calculations.	
UNIT-VI	Fuels and Combustion: Types of fuels: solid, liquid and gas; Calculations of energy content of fuel; Analysis of fuel; oxygen requirement and excessity; Adiabatic flame temperature calculations.	(08 Hours)
Term Work/ Tutorial:		
Term work includes numerical on the following topics.		
1.	Basic chemical calculations.	
2.	Material balances without chemical reactions.	
3.	Material balances involving chemical reactions.	
4.	Recycle, bypass, purge and humidification operation.	
5.	Energy balance.	
6.	Fuels and combustion.	
Assignment:		
1.	Mass and energy balance for any one of following unit operations for given system.	
	a) Distillation	
	b) Evaporation	
	c) Extraction	
	d) Crystallization	
	e) Drying. etc	
2.	Mass and energy balance for any one of following unit processes for given system. These assignment may include overall energy and/or mass balance or energy and/or mass balance over a given chemical process equipment.	
	a) Nitration	
	b) Esterification	
	c) Acylation	
	d) Fermentation	
	e) Sulfonation etc.	
3.	Students have to visit chemical industry and prepare a detailed report on various unit operations and unit processes used in industry.	
4.	Measurement of calorific values of any two types of fuel.	
5.	Group discussions on mass and energy balance for unit operations and unit processes carried out in chemical industry	
6.	Solve last five years GATE question papers with reference to chemical process calculations.	
7.	Students have to study any five NPTEL videos related to chemical process calculations and prepare/present power point presentation.	
8.	Numericals based on above six units.	
9.	Technical interview based on knowledge of chemical process calculations.	
10.	Prepare models for recycle, bypass and purge operations carried out in chemical industry.	
11.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.	
12.	Prepare a report on unit operations which are newly introduced in the current year.	
13.	Write a report on your visit to research and development laboratory of national/international repute.	
In addition to these above stated assignments concern faculty member may design his/her won.		
Text Books/References:		
1.	Bhatt, B. I. and Vora, S. M.; Stoichiometry (SI Units), Third Edition, Tata McGraw Hill Publishers, New Delhi.	
2.	Himmelblau, D. M.; Basic Principles and Calculations in Chemical Engineering, Prentice Hall Publications	

3.	Hougen, O. A.; Watson, K. M. and Ragatz, R A; Chemical Processes Principles, Part-I, Material and Energy Balances, Asia Publishing House, Bombay
4.	Felder, R.M. andRousseau, R.W.; Elementary Principles of Chemical Processes, 3 rd edition, WileyJohn& sons Publications
5.	Rudd, D.F.; Powers, G.J. and Sirola, J.F.; Process Synthesis, Prentice Hall Publications
6.	Shukla, S.D. and Pandey, G. N.; Chemical Engineering Calculations, Lion Press, Kanpur
7.	Ranz, W.E.; Describing Chemical Engineering Systems, McGraw Hill Publications.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

MECHANICAL OPERATION

Designation: Professional Core

Course Pre-requisites: None

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Lectures	: 4 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 04
Practical	: 2 Hours /Week	Unit Test	: 20 Marks	Practical	: 01
Total	: 6 Hours/Week	Continuous Assessment	: 20 Marks	Total credits	: 05
		Term Work/Practical	: 50 Marks		
		Total	: 150 Marks		

Course Outcomes:

After completion of the course students will be able to

1. Understand the concept of particle size measurement, distribution and analyze the performance of size reduction equipment.
2. Understand the concept of solid storage and solid conveying.
3. Understand the concept of mixing and Calculate the power requirement for agitator.
4. Understand the concept of particle mechanics and sedimentation
5. Understand the concepts of filtration.
6. Understand the concept of separation of solids from fluids.

Topics covered

UNIT-I	<p>Properties of Solid and Size Reduction Properties of solid:- Particle size and shape, Mixtures of particles, Cumulative and differential screen analysis, Determination of particle size, Screen effectiveness and capacity, Industrial screening equipments. Size Reduction:- Crushing efficiency, energy requirements calculations by using different crushing laws, Size reduction equipments: Primary crushers, secondary crushers, Intermediate & fine grinders, Ultra fine grinders, Cutting machines, open circuit & Closed circuit grinding.</p>	(08 Hours)
UNIT-II	<p>Handling and Transport of Solids Storage of Solids:- Bins, silos, hoppers, Janseen's equation, characteristics of Bulk solids. Transport of Solids:- Conveyors: Working principles, Construction, Advantages, Disadvantages and design calculation of Screw conveyors, Belt Conveyors, Chain & Flight conveyors, Bucket elevators, Pneumatic conveyors.</p>	(08Hours)
UNIT-III	<p>Mixing and Agitation Necessity of mixing & agitation in chemical industries, Mixers for pastes and plastic masses. Mixers for dry powders. Criteria for mixer effectiveness. Mixing index in blending granular solids. Rate of mixing. Types of equipment, Mixing characteristics, Power consumption, Mixing index calculations, Agitator selection.</p>	(08 Hours)
UNIT-IV	<p>Sedimentation Gravity settling method: Motion of particles in fluid, drag force, drag coefficients, effect of particle shape, Stock's law, hindered settling, Terminal velocity, sink and float method, differential settling. Batch sedimentation, equipments for sedimentation, Kynch theory of sedimentation, calculation of area and depth of batch thickeners and continuous thickeners.</p>	(08 Hours)
UNIT-V	<p>Filtration Filter media and filter aids, classification of filtration, pressure drop through filter cake, filter medium resistance, specific cake resistance, Continuous Filtration,</p>	(08 Hours)

	Washing and dewatering of filter cakes, Centrifugal filtration. Selection of filtration equipment.	
UNIT-VI	Separation of solids from fluids Froth flotation, magnetic separator, scrubbers, fiber and fabric filter, and electrostatic precipitators. Mineral jig, cyclone separator, hydro cyclone types and centrifuges, centrifugal clarifier.	(08 Hours)
List of Experiments:		
Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.		
1.	To determine effectiveness of given set of standard screen.	
2.	To determine energy consumption and crushing law constants for jaw crusher.	
3.	To determine Critical speed of Ball mill & Average particle size of the product obtained in ball mill.	
4.	To determine mixing Index of a mixture in Ribbon Blender. OR To determine mixing Index of mixture in Sigma Mixer.	
5.	To determine filter medium resistance and cake resistance by using Vacuum Leaf filter.	
6.	To determine filter medium resistance and cake resistance by using Plate & frame Filter Press OR by using centrifuge machine.	
7.	To determine area of batch thickener by conducting batch sedimentation test.	
8.	To determine separation efficiency by using froth flotation cell.	
9.	To determine separation efficiency by using magnetic separator.	
10.	To determine efficiency of Cyclone separator.	
Assignments:		
1	Pilot scale solid-liquid fluidization: Expansion characteristics of solids	
2	Estimate power consumption for homogeneous system	
3	Industry related unit operation (ANY ONE INDUSTRY) detailing of it.	
4	How does filtration fit into the water treatment process?	
5	How Does Filtration clean water?	
6	What types of filters are used for water treatment? Explain in brief	
7	Explain hand pump water filter	
8	How does sedimentation fit in to the waste water treatment process?	
9	What zones are present in sedimentation basin?	
10	How is sedimentation sludge disposed of?	
11	What is surface loading rate explain in brief. The flow into clarifier is 3.2 MGD in tank 80 feet long and 40 feet wide. what is surface loading rate?	
12	Recent trends in particle size technology.	
13	Watch the NPTEL video on this subject of any TWO modules and summarize it	
14	Solve numerical problems asked in previous THREE year question papers.	
15	Solve questions asked on filtration in previous THREE year question papers.	
16	If your particles are not spherical which equivalent particle size would be suitable to calculate for the purpose of filtration	
17	What media are used in filters? What factors affect filter efficiency?	
Text Books/References:		
1.	McCabe, W. L.; Smith, J. C. and Harriott, P.; Unit Operations of Chemical Engineering, 6 th edition, McGraw Hill Publications.	
2.	Coulson, J.M.; Richardson, J. F.; Backhurst, J. R.; Harker, J. H.; Chemical Engineering Volume 2, 6 th edition, Pergamon Press.	
3.	Badger W. L & Banchemo J.T. "Introduction to Chemical Engineering", McGraw Hill	

4.	Foust A. S “Principles of Unit Operation”.
5.	George G. Brown, “Unit operations”, CBS publishers and distributors.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
B.Tech (Chemical) - 2014 Course
SEMESTER-IV

ENGINEERING MATHEMATICS- III		
Designation: Professional Core		
Course Pre-requisites:		
Students should have		
Basic knowledge of Mathematics including derivative, integration etc.		
TEACHING SCHEME:		
EXAMINATION SCHEME:		
CREDITS ALLOTTED:		
Lectures : 3Hours/Week	End Semester Examination : 60 Marks	Theory : 04
Tutorial : 1 Hour /Week	Unit Test : 20 Marks	Total credits : 04
Total : 4 Hours/Week	Continuous Assessment : 20 Marks	
	Total : 100 Marks	
Course Outcomes:		
After completion of the course students will be able to		
1.	To develop an ability of mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient	
2.	To develop an ability to solve the Laplace, heat and wave equations for a variety of boundary conditions in domains of simple geometry and with simple boundary conditions; the techniques available will include, separation of variables	
3.	To develop an ability to solve problems on Fourier sine and cosine transform	
4.	To develop an ability to use theorems to compute the Laplace transform, inverse Laplace transforms	
5.	To develop an ability to calculate the gradients and directional derivatives of functions of several variables	
6.	To develop an ability to use Green's theorem to evaluate line integrals along simple closed contours on the plane	
Topics covered		
UNIT-I	Linear Differential Equations (LDE): Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE. Applications of LDE to chemical engineering problems and allied engineering.	(08 Hours)
UNIT-II	Partial Differential Equations (PDE): Solution of Partial Differential Equations 1) $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$, 2) $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$, 3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$	(08 Hours)

	By separating variables only. Applications of PDE to problems of Chemical and allied engineering.	
UNIT-III	Fourier Transform (FT): Fourier Integral theorem. Sine & Cosine Integrals. Fourier Transform, Fourier Cosine Transform, Fourier Sine Transforms and their inverses. Finite FT, Application of FT to problems on one and two dimensional heat flow problems.	(08 Hours)
UNIT-IV	Laplace Transform (LT): Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz. error, 1st order Bessel's, Periodic, Unit Step, Unit Impulse, ramp, jump, parabolic, Si(t) and Ei(t). Problems on finding LT & inverse LT. Applications of LT for solving ordinary differential equations, liquid level systems, consisting of single tank and two tanks in series (interacting and non-interacting systems), second order systems (damped vibrator).	(08 Hours)
UNIT-V	Vector Differentiation: Physical Interpretation of Vector Differentiation. Radial, Transverse, Tangential & Normal components of Velocity and Acceleration. Vector differential operator. Gradient, Divergence & Curl. Directional derivative. Vector identities. Irrotational & Solenoidal fields. Application of vector differentiation to chemical engineering.	(08 Hours)
UNIT-VI	Vector Integration: Line integral, Surface & Volume integrals. Work done, Green's Lemma, Gauss-Divergence and Stoke's Theorem, Applications of Vectors to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equation.	(08 Hours)

Assignments:

1	Linear differential equation with constants coefficients.
2	Application of LDE and partial differential equations.
3	Fourier transform and inverse fourier a function which is neither even nor odd ,for even and odd function
4	Laplace transform and invese laplace transform and its application to differential equation
5	Vector identities and application of vector differential in mechanics.
6	line integral, surface integral and volume integral.

Text Books/References:

1.	Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2.	Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)
3.	Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
4.	Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
5.	Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
6.	Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
7.	Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
8.	Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).

Syllabus for Unit Test:

Unit Test -I	UNIT – I, II, III
Unit Test -II	UNIT – IV, V, VI

FLUID FLOW OPERATIONS

Designation: Professional Core

Course Pre-requisites:

Students should have knowledge of

1. Physics, Engineering Science and Engineering Mechanics.
2. Elements of Civil Engineering

TEACHING SCHEME:

Lectures : 4 Hours/Week
 Practical : 2 Hour /Week
 Total : 6 Hours/Week

EXAMINATION SCHEME:

End Semester Examination : 60 Marks
 Unit Test : 20 Marks
 Continuous Assessment : 20 Marks.
 Term Work/Practical : 50 Marks
 Total : 150 Marks

CREDITS ALLOTTED:

Theory : 04
 Practical : 01
 Total credits : 05

Course Outcomes:

After completion of the course students will be able to

1. Describe the various properties of fluids and basic concept of fluid flow.
2. Apply the basic equations of fluid flow like Continuity and Bernoulli's equation for solving numerical in fluid flow operations.
3. Apply the basics of turbulent flow and flow measuring devices for solving numerical in fluid flow operations
4. Identify and explain the various types of energy losses for fluid flowing through a pipe.
5. Identify and select various types of fluid moving equipments for fluid flow
6. Explain the construction and working of fluidized bed reactor.

Topics covered

UNIT - I	Basic Concepts of Fluid Flow: Types of fluid: Newtonian and Non-Newtonian fluids; Properties of fluids; Concept of viscosity, calculation and measurement; Models for non-Newtonian fluids; Types of flow: laminar, transition and turbulent and their characteristics; Concept of fluid pressure, pressure measurement and calculation.	(08 Hours)
UNIT - II	Equations of Fluid Flow: Basic equations of fluid flow; Equation of continuity and motion (cartesian, cylindrical and spherical coordinates) in laminar flow and its applications for calculation of velocity profiles, shear stress distribution, volumetric flow rate, power etc. in engineering applications; Flow of incompressible fluids.	(08 Hours)
UNIT - III	Turbulent Flow: Basics of turbulent flow; Equations of continuity and motion for turbulent flows: Reynolds averaging, Boussinesq hypothesis, Prandtl mixing length theory, Turbulent models; Flow measurement: flow measuring devices; Velocity profile;	(08 Hours)
UNIT - IV	Pressure Drop Calculation and Measurement in Pipe Flow: Darcy-Weisbach equation; Bernoulli's equation; Friction factor: laminar, transition and turbulent flow; Models available to predict friction factor; Friction factor: valves, bends, fittings, sudden expansion and contraction, sudden obstruction etc.; Equivalent diameter concept for energy losses.	(08 Hours)

UNIT - V	Flow Moving Equipments: Pumps: Types; Selection and specifications; characteristic curves; cavitation phenomena; Net positive suction head (NPSH) calculations; System and operating parameters affecting pump performance; Calculation of power requirement. Blowers and compressor: Selection and specifications; Factors affecting performance; Power calculations for given duty.	(08 Hours)
UNIT - VI	Flow Through Solids: Expansion characteristics of solids: Drag and drag coefficient (C_D), terminal settling velocity, settling in presence of other particles; voidage-superficial fluid velocity relationship, C_D Vs N_{Re} ; Boundary layer separation; Pressure drop calculation and measurement: skin and form friction, effect of system, operating and geometrical parameters, Ergun equation, experimental methods of measuring pressure drop. Applications of fluidization: catalytic cracking, chromatographic separation etc.	(08 Hours)

Term Work:

Term work will consist of the experiments listed below, out of which at least eight experiments should be performed in laboratory by the students.

1.	To determine kinematic viscosity and to study the effect of temperature on kinematic viscosity of given oil.
2.	To study flow characteristics using Reynolds apparatus and determine Reynolds number.
3.	To determine the coefficient of discharge for venturimeter.
4.	To determine the coefficient of discharge for orificemeter.
5.	To determine Darcy Weisbach coefficient of friction of laminar and turbulent flow for given pipe.
6.	To determine friction and pressure drop for flow through helical/spiral coils.
7.	To find losses due to sudden expansion and contraction in pipe.
8.	To calculate minimum fluidization velocity using fluidized bed reactor.
9.	To verify Bernoulli's theorem.
10.	To study characteristics of centrifugal pump.
11.	To Study Darcy's law.
12.	To study pressure drop in packed bed for different fluid velocities.
13.	To determine the coefficient of discharge for different notches like rectangular notch, 45° V notch, 60° V notch and trapezoidal notch.
14.	To determine terminal velocity of particles in fluids of different viscosity and plot a graph of drag coefficient (C_D) as a function of N_{Re} .

Assignments:

1.	Numericals based on above six units.
2.	Visit to suppliers and prepare a report on detailed specifications of following fluid moving equipments.
	a) Pumps.
	b) Blowers.
	c) Compressors.
3.	Visit to suppliers and prepare a report on detailed specifications of following flow measuring devices.
	a) Venturimeter.
	b) Orificemeter.
	c) Pitot tube.
	d) Roatameters.
4.	Students have to study any five NPTEL videos related to fluid flow operations and prepare/present power point presentation.

5.	Students have to visit chemical industry and make a detailed report on overall fluid flow operations.
6.	Group discussions on any one of the following topics.
	a) Importance of fluid flow operations in chemical industries.
	b) Pumps, blowers and compressors.
	c) Flow measuring devices.
7.	Prepare models for various types of valves and write industrial applications.
8.	Prepare models for various types of bends and write industrial applications.
9.	Prepare models for various types of fittings and write industrial applications.
10.	Prepare a report on fluid flow operations which are newly introduced in the current year.
11.	Solve last five years GATE question papers with reference to fluid flow operations subject.
12.	Write a report on your visit to research and development laboratory of national/international repute.
13.	Technical interview based on knowledge of fluid flow operations.
14.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
In addition to these above stated assignments concern faculty member may design his/her won.	

Text Books/ References:

1.	McCabe, W. L.; Smith, J. C. and Harriott, P.; Unit Operations of Chemical Engineering, 5 th edition, McGraw Hill Publications.
2.	Coulson, J.M.; Richardson, J. F.; Backhurst, J. R.; Harker, J. H.; Chemical Engineering Volume 1, 6 th edition, Pergamon Press.
3.	Gupta, S.K.; Momentum transfer operations, Tata McGraw Hill Publishers.
4.	Bansal, R. K.; A text book of fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd, New Delhi.
5.	Bird, R.B.; Stewart, W.E.; Lightfoot, E.N.; Transport Phenomena, John Wiley & Sons, New York.
6.	Denn, M.M.; Process fluid mechanics, Prentice Hall Publications.

Syllabus for Unit Test:

Unit Test - I	UNIT– I, II, III
Unit Test - II	UNIT– IV, V, VI

PROCESS HEAT TRANSFER

Designation: Professional Core

Course Pre-requisites:

Students should have

Basic knowledge of units and dimensions, mathematical concepts like differential and integral etc, fluid flow concepts like continuity equation, momentum balance.

TEACHING SCHEME:

Lectures : 4 Hours/Week

Practical : 2 Hour /Week

Total : 6 Hours/Week

EXAMINATION SCHEME:

End Semester Examination : 60 Marks

Unit Test : 20 Marks

Continuous Assessment : 20 Marks

Termwork / practical :50 Marks

Total :150 Marks

CREDITS ALLOTTED:

Theory : 04

Practical : 01

Total credits : 05

Course Outcomes:

After completion of the course students would be able to

1. Evaluate heat loss through pipe insulation, critical and optimum thickness for insulation.
2. Identify the importance of dimensional analysis and derive the dimensionless numbers.
3. Calculate the heat transfer coefficient and heat transfer rate for vertical, horizontal plate in case of film-wise condensation.
4. Apply appropriate empirical correlations to estimate critical heat flux in boiling.
5. Explain the evaporation phenomena and estimate economy of the evaporator.
6. Compute heat transfer rates in case of conduction, convection and radiation.

Topics covered

UNIT-I	<p>Heat conduction Thermal conductivity: solids, liquids, and gases; Generalized equation for heat conduction; Steady state heat conduction through: plane slab, composite slab, hollow cylinder, composite cylinder and hollow sphere; Heat loss through pipe: maximum loss, critical and optimum thickness of insulation; its application for the calculation of temperature profile, maximum temperature rise or drop, heat flow at surface; Heat transfer through extended surfaces of uniform cross section.</p>	(08 Hours)
UNIT-II	<p>Convection without phase change Basic concepts of convection; Natural and forced convection; Dimensional analysis: dimensionless groups and their physical significance; Film coefficients; Factors affecting film coefficient; Fouling resistance; Empirical equations for convection heat transfer in turbulent flow through tubes, through annulus and over a flat plate; Steady state convection heat transfer equation to calculate temperature distribution in laminar and turbulent flows.</p>	(08 Hours)
UNIT-III	<p>Convection with phase change Condensation basic concepts; Dropwise and filmwise condensation; Condensation on surfaces-Nusselt's theory: vertical surface, horizontal surface, and inclined surface. Boiling types; Effect of physical properties; Pool boiling curve; Correlations used in boiling; Concept of critical heat flux.</p>	(08 Hours)
UNIT-IV	<p>Radiation Basic concepts; Thermal radiation; Black body radiation; Properties and laws of radiation; The radiation shape factor; Laws of shape factor; Various cases of radiation between two surfaces; Radiation shields; Radiant heat exchange in an enclosure having black surfaces.</p>	(08 Hours)
UNIT-V	<p>Evaporation</p>	(08 Hours)

	Introduction; Types of evaporators; Material and energy balance; Boiling point elevation; Capacity and economy; Multiple effect evaporators.	
UNIT-VI	Unsteady state processes Unsteady state heat conduction: infinite slab, infinite cylinder, sphere. Heat transfer in agitated vessels: calculation of film coefficient in coil, jacket; heating and cooling times; Application to batch reactor and processes.	(08 Hours)
Assignments		
1.	Write a report on the recent advances in heat transfer processes with reference to the current year.	
2.	Solve old (last five years) question papers with reference to particular topic.	
3.	Prepare a model for any of the heat transfer equipment.	
4.	Prepare a report on heat transfer equipments which are newly introduced in the current year.	
5.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.	
6.	Evaluate capacity and economy for any industrial evaporator.	
7.	Estimate how much heat transfer rate is decreased due to the scale formation on surface of industrial heat transfer equipment?	
8.	By determining optimum thickness of insulation give solution to an industrial problem to minimize the heat loss.	
9.	Design laboratory manuals better than existing ones with clearly shown specimen calculations.	
10.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.	
11.	Write a technical report on your visit to a process industry.	
12.	Solve old (last ten years) GATE question papers with reference to heat transfer subject.	
13.	Group discussion on the recent advances in heat transfer processes.	
14.	Write a report on your visit to research and development laboratory of national/international repute.	
15.	Technical interview based on the knowledge of heat transfer.	
In addition to these above stated assignments concerned faculty member may design his/her own assignments		
Term Work:		
Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.		
1.	To determine rate of heat flow and thermal conductivity of an insulating material.	
2.	To determine thermal conductivity of a metal bar.	
3.	To study Newton's law of cooling to find rate of heat flow.	
4.	To determine the local heat transfer coefficients using the various correlations in natural convection.	
5.	To determine heat transfer coefficient in forced convection.	
6.	To study film wise condensation.	
7.	To study drop wise condensation.	
8.	To determine the critical heat flux	
9.	To study Stefan-Boltzman law and find the value of its constant.	
10.	To study evaporators.	
11.	To determine emissivity of an aluminum plate.	
12.	To study unsteady state processes.	
Text Books/References:		
1.	McCabe, W. L., J. Smith, and Harriot: "Unit operations of chemical engineering," Tata McGraw Hill.	
2.	Kern, D. Q.: "Process Heat Transfer," 11 th ed., Tata McGraw Hill Publication, New Delhi.	
3.	Sukhatme, S. P.: "A Textbook on Heat Transfer," 4 th ed., Universities Press, India, 2005.	
4.	Richardson, J. F., and J. M. Coulson: "Chemical Engineering," Butterworth Heinemann, Volume 1.	
5.	Holman, J.P.: "Heat Transfer," 9 th ed., Tata McGraw Hill Publications, New Delhi, 2004.	

6.	Frank, K., M. Bohn: "Principles of Heat Transfer," 5 th edition, PWS Publishing company, Boston, 1997.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

CHEMICAL PROCESS INDUSTRIES

Designation: Professional Core

Course Pre-requisites: None

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Lectures	: 02 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 03
Tutorial	: 01 Hours /Week	Unit Test	: 20 Marks	Total credits	: 03
Total	: 03 Hours/Week	Continuous Assessment	: 20 Marks		
		Term Work/Oral	: 50Marks		
		Total	: 150 Marks		

Course Outcomes:

After completion of the course students will be able to

1. Understand the concept of Unit operation and Unit processes as well the significance of process flow diagram.
2. Understand the manufacturing processes for soda ash, caustic and chlorine and Indian scenario of chlor-alkali industries.
3. Understand manufacturing processes of sulfur and nitrogen industry
4. Understand nitration of hydrocarbons and typical industrial process for nitration
5. Understand sulfonation and sulfation process used in organic industry
6. Understand processes for various petrochemicals

Topics covered

UNIT-I	Concept of Unit Operation and Unit process: Unit operations and unit processes, Concept of block diagram, process flow diagram (ASME guidelines). Water for the chemical process industry and its treatment: Boiler feed-water, Cooling tower water, Process Plant water.	(08 Hours)
UNIT-II	Chlor -alkali industries: current status (Indian and global), Production and consumption pattern, Different processes for the manufacture of Soda ash, Caustic and chlorine	(08Hours)
UNIT-III	Sulfur Industry: Current status (Indian and global), Production and consumption pattern Sulfur and Manufacture of sulfuric acid, Different processes and comparison. Nitrogen Industry: Current status (Indian and global), Production and consumption pattern Ammonia, Nitric acid, Urea and other nitrogen fertilizers, Mixed fertilizers.	(08 Hours)
UNIT-IV	Nitration: Nitrating Agents, Kinetics and Mechanism of Aromatic Nitration, Nitration of Paraffinic hydrocarbons, Liquid phase nitration, Nitro compounds, and Commercial nitration process.	(08 Hours)
UNIT-V	Sulfonation and Sulfation: Sulfonating and sulfating agents and their principal applications, Sulfonation and Sulfation of aliphatic compounds, Sulfonation of aromatic compounds, Commercial sulfonation process.	(08 Hours)
UNIT-VI	Petrochemicals: Production of petrochemical precursors - olefins and aromatics, Production of ethylene, propylene, formaldehyde, methanol, ethylene oxide, ethanolamine, cumene, ethylene glycol, ethyl benzene	(08 Hours)

List of Practicals:

The practical shall include at least (6) assignments from the various units mentioned in the syllabus.

One industrial visit should be arranged to the process industry and students should prepare the report on the same as a part of the term work.

Expert Interaction:

Lecture(s) by eminent scholar(s) on the topic(s) mentioned in the syllabus.

Assignments:

1	One industrial visit should be arranged to the process industry and the students will prepare the report which includes the consumption pattern of the products produced, process flow diagram and process description, major engineering problems in the industry.
2	Students should prepare the plant-layout for the industry visited.
3	Students should visit one CETP (Central effluent Treatment Plant) nearby and prepare the report which includes different unit operations in CETP, Significance of each unit.
4	Students should visit one STP (Sewage treatment plant) and prepare the report which includes different unit operations in STP, block diagram.
5	Students should compile the list of vendors (manufacturers of pumps, contact, and address) along with the details like type, specifications, and costs and should prepare the comparative for the same.
6	Students should prepare the report on "Material of construction" for pumps for special applications using the data from assignment 4.
7	Students should make a report on "Indian scenario of inorganic industries" which will include the name of industries (from different chemical zones), products manufactured, and production capacity.
8	Students should make a report on "Fertilizer industries in Maharashtra and Gujarat" which will include the name of industries (from different chemical zones), products manufactured, and production capacity.
9	Model making of any one Unit operation used in chemical process industry.
10	Describe the different equipment used to run the process plant with different utilities.
11	Students should compile the list of Boiler manufacturers, contacts, and address along with their product range specifications.
12	Students should compile the list of vendors providing "water treatment plants" in chemical process industries along with their product specifications.
13	Give a presentation on "commercial aspects of petrochemical products".
14	AutoCAD drawing of process flow diagram for any one process from the syllabus

Text Books

1.	Dryden, C. E. "Outlines of Chemical Technology" (Edited and Revised by M.Gopal Rao and Sittig .M) East West Press. ,New Delhi,3 rd Edition(1997).
2.	Austin G. T » Shreve's Chemical Process Industries", 5th ed., McGraw Hill.(1984)
3.	Groggins, Unit process in organic synthesis, Tata McGraw-Hill Education

Reference Books

1	Faith, W. L., Keyes, D. B. and Clark, R. L., "Industrial Chemicals" John Wiley.(1975).
2	Kirk and Othmer, "Encyclopaedia of Chemical Technology" Wiley (2004).
3	Pandey G.N &Shukla.S.D, "Chemical Technology Vol - I" Vikas publication.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

CHEMICAL ENGINEERING THERMODYNAMICS-II

Designation: Professional Core

Course Pre-requisites:

Students should have knowledge of

- | | |
|----|---------------------------------------|
| 1. | Chemical Engineering Thermodynamics I |
| 2. | Mathematics |
| 3. | Chemistry, Physics |

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures	: 3 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 03
Tutorial	: 2 Hour /Week	Unit Test	: 20 Marks	Tutorial	: 01
		Continuous Assessment	: 20 Marks	Total credits	: 04
		Term Work/Oral	: 50 Marks		
		Total	: 150 Marks		

Course Outcomes:

After completion of the course students will be able to

- | | |
|----|---|
| 1. | a) Understand the concept of fugacity and its application to gaseous and liquid systems
b) Understand residual and excess properties to demarcate non- ideality in gaseous phase and liquid solution |
| 2. | a) Understand criteria of phase equilibrium and stability
b) Make typical phase equilibrium calculations pertaining to VLE, LLE, SLE, SVE, etc. |
| 3. | a) Perform bubble P, dew P, bubble T, and dew T calculations for VLE
b) Carry out thermodynamic consistency test for experimental VLE data |
| 4. | a) Understand the criterion for chemical reaction equilibrium
b) Establish relation of equilibrium constant to composition for gas phase and liquid phase reactions. |
| 5. | a) Calculate equilibrium constant for heterogeneous system
b) Understand phase rule for reacting system and its physical significance |
| 6. | Understand thermodynamics of liquid-liquid equilibrium. |

Topics covered

UNIT - I	<p>Solution Thermodynamics:</p> <p>Concept of chemical potential; chemical potential as a criterion of phase equilibria; Concept of non ideality in gaseous mixtures; Fugacity and fugacity coefficient for species in solution; Methods of determination of fugacity coefficient; Concept of non-ideality in liquid mixtures; Activity and</p>	(06 Hours)
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	activity coefficient for species in solution; Excess properties; Gibbs excess energy; Model for estimation of excess property; Property change of mixing and heat effects in mixing.	
UNIT - II	Phase Equilibria: Criteria of phase equilibrium; Criterion of stability; Phase equilibria in single and multi component system; Phase rule: Duhems theorem; LLE, VLLE, SLE, and SVE; Phase diagrams; Dilute solution laws: Nernst's law, osmotic equilibrium.	(06 Hours)
UNIT - III	Vapor-liquid equilibrium (VLE): Qualitative behavior of VLE; Basic equation for vapor- liquid equilibrium; Liquid phase properties from VLE data; VLE at low to moderate pressures: excess Gibbs free energy models; Azeotropic data; VLE at high pressures; Multicomponent vapor- liquid equilibria; Bubble point and dew point calculations; Thermodynamic consistency test for VLE data.	(06 Hours)
UNIT - IV	Chemical reaction equilibria: The reaction coordinate; Application of equilibrium criteria to chemical reactions; The standard Gibbs energy change and the equilibrium constant; Effect of temperature on the equilibrium constant; Evaluation of equilibrium constant; Relation of equilibrium constants to composition; Phase rule for reacting systems; Multi-reaction equilibria.	(06 Hours)
UNIT - V	Heterogeneous reaction equilibrium: Notable industrial heterogeneous systems and thermodynamic role; The Gibbs energy change and equilibrium constant; Estimation of equilibrium constant for heterogeneous system by defining standard state of the phases involved; Pressure of decomposition; Simultaneous reactions; Combined physical and chemical equilibria.	(06 Hours)
UNIT - VI	Liquid-liquid Equilibria (LLE):	(06 Hours)

	Quantitative behavior of LLE; Basic equation governing LLE; Distribution coefficient (Partition Coefficient); Activity coefficient and its determination; Selection of extractant; Solubility parameters and estimation.	
Tutorials/Assignments:		
1	Questions involving fugacity and activity for the species in solution.	
2	Solving numerical in connection with phase equilibria.	
3	Solving numerical based on application of Rault's law for the calculation of dew point and bubble point	
4	Conducting surprise MCQ test for students.	
5	Draw P-xy and T-xy diagrams.	
6	Solving numerical based on chemical reaction equilibrium.	
7	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments.	
8	Students have to study any five NPTEL videos related to Chemical Engineering Thermodynamics I and prepare/present power point presentation.	
9	Group discussions on any of the following topics: a) Importance of Phase equilibria in chemical industries. b) Thermodynamic properties for pure species and species in solution	
10	Preparation of a brief report on applicability of liquid-liquid equilibrium (LLE) in chemical engineering systems.	
11	Solve question papers of CET II of previous THREE years.	
12	Unsolved numerical from the reference books on various topics studied.	
Term Work:		
Term work includes minimum 08 assignments/problems on each unit covered		
Text Books/ References:		
1.	J. M. Smith and H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics", McGraw- Hill Publication	
2.	T. E. Daubert, "Chemical Engineering Thermodynamics", McGraw- Hill Publication	
3.	K.V. Narayanan, "Chemical Engineering Thermodynamics", PHI Learning Pvt. Ltd.	
4.	B. F. Dodge, "Chemical Engineering Thermodynamics", McGraw- Hill Publication	

5.	M. D. Koretsky, "Engineering and Chemical Thermodynamics", 2nd Edition, John Wiley & Sons
6.	S. I. Sandler, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
7.	S. Glasstone, "Thermodynamics for Chemists", Affiliated East West Press Pvt.Ltd.

Syllabus for Unit Test:

Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI

Bharati Vidyapeeth University
Faculty of Engineering and Technology
Programme: B. Tech. (Chemical) - Semester V - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hours/week)			Examination Scheme (Marks)							Credit		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW/O	TW/P	Total	Theory	P/D	Total
						Unit Test	Attendance	Assignments						
1	Elective-I	3	-	-	60	20	10	10	-	-	100	3	-	3
2	Mass Transfer Operation	4	2	-	60	20	10	10	-	50	150	4	1	5
3	Chemical Reaction Engineering- I	4	2	-	60	20	10	10	-	50	150	4	1	5
4	Chemical Engineering Mathematics	3	-	1	60	20	10	10	50	-	150	4	-	4
5	Computer Programming for Chemical Engineers –I	3	2	-	60	20	10	10	-	50	150	3	1	4
6	Professional Skill Development-V	4	-	-	100	-	-	-	-	-	100	4	-	4
Total		21	6	1	400	100	50	50	50	150	800	22	3	25

Bharati Vidyapeeth University
Faculty of Engineering and Technology
Programme: B. Tech. (Chemical) - Semester VI - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hours/week)			Examination Scheme (Marks)							Credit		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW/O	TW/P	Total	Theory	P/D	Total
						Unit Test	Attendance	Assignments						
7	Elective-II	3	-	-	60	20	10	10	-	-	100	3	-	3
8	Separation Techniques	4	2	-	60	20	10	10	-	50	150	4	1	5
9	Chemical Process Equipment Design- I	3	2	-	60	20	10	10	-	25	125	3	1	4
10	Chemical Reaction Engineering – II	3	2	-	60	20	10	10	-	50	150	3	1	4
11	Process Instrumentation and Instrumental Methods of Analysis	3	2	-	60	20	10	10	-	25	125	3	1	4
12	Professional Skill Development-VI	4	-	-	100	-	-	-	-	-	100	4	-	4
13	Computer Programming For Chemical Engineering-II	-	2	-	-	-	-	-	-	50	50	-	1	1
Total		20	10	-	400	100	50	50	-	200	800	20	5	25

Total Credits
Semester V : 25
Semester VI : 25
Grand Total : 50

Elective I: Advanced Material Science

Designation: Elective

Course Pre-requisites:

- | | |
|-----------|--|
| 1. | Basic chemistry, Basic physics, Chemical Engineering Materials, Physical chemistry, Chemical Reaction Engineering, Chemical Engineering Thermodynamics |
|-----------|--|

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures: 3 Hours/Week

End Semester Examination: 60 marks

Theory : 03

Continuous Assessment: 40 marks

Course Outcomes:

- | | |
|-----------|---|
| 1. | Explain basics of polymers and their classifications |
| 2. | Explain various polymer properties and the their effect on engineering properties |
| 3. | Determine suitable process for polymer synthesis and describe its mechanism |
| 4. | Understand the basics of polymer characterizations and discuss its effect on properties |
| 5. | Explain the formation of composites and blends in polymers |
| 6. | Explain the methods of polymer compounding and processing |

Topics covered

UNIT-I	Material composites Introduction to composite materials, factors influencing the properties of composite materials like fiber parameter, matrix, interface & molding methods. Phase selection criteria. Reinforcing mechanisms. Interfaces, advantages and disadvantages. Polymer composites. Reinforcing and matrix materials, prepregs, fiber winding techniques, fabrication techniques, laminates, mechanical behavior, etc.	(06 Hours)
UNIT-II	Composite and reinforcement Metal composites, types of reinforcement, chemical compatibility, fabrication processes, mechanical behavior and properties, ceramic composites. Matrices and reinforcement. Why to reinforce ceramics, fabrication methods, crack propagation and mechanical behavior.	(06 Hours)
UNIT-III	Carbon composites Carbon composites, their properties, fabrication methods and their applications, ablative polymers, their applications, air craft materials, introduction to nonmaterial, synthesis & characterization of nonmaterial, application of nonmaterial with special reference to chemical engineering.	(06 Hours)
UNIT-IV	Nuclear materials Atomic structure, atomic number, mass number, isotopes, nuclear energy and nuclear forces, binding energy, nuclear stability, radioactivity, nuclear reactions, nuclear fissions, nuclear fusion, Types of waste –disposal – radiation hazards and prevention	(06 Hours)
UNIT-V	Biomaterials	(06 Hours)

	Properties of biomaterials: Physical, thermal, electrical and optical properties of bio-materials and their application to processing. Novel Biomaterials and Uses in Engineering and Tissue Engineering: Hydrogels, self-assembling peptides, Implants materials: Metallic implant materials, hydroxyapatite glass ceramics carbons, Polymeric implant, medical applications.	Hours)
UNIT-VI	Nanomaterials Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrode position, chemical vapour deposition, laser ablation; Properties and applications	(06 Hours)

Assignments:

1. Prepare the report on any advanced material comprising its significance, preparation, characterization, processing, properties and application

References/Text Books:

1. L.C. Merrite, "Basic principles of Nuclear science and Reactors" Wiley Eastern 1977.
2. Polymers of high technology, electronics and photonics, Bowden M.J & Turner S.R., ACS Symp. Ser. 346, 1987.
3. Composite Materials , Chawala K.K., Springer Science & Business Media.
4. Buddy D. Ratner Allan S. HoffmanFrederick J. SchoenJack E. Lemons Biomaterials Science, Second Edition: Wiley Science 2004.
5. "An Introduction to Materials Engineering and Science for Chemical and Materials Engineers," by Brian S. Mitchell; Wiley-Interscience, 2003; ISBN 0471436232.
6. Carl C. Koch (ed.), "Nanostructured Materials", Processing, Properties and Potential Applications, Noyes Publications, Norwich, New York, U.S.A.
7. Bhusan, Bharat (Ed), "Springer Handbook of Nanotechnology", 2nd Edition, 2007.

Syllabus for Unit Test:

Unit Test –I	UNIT – I ,II,III
Unit Test –II	UNIT – IV,V,VI

ELECTIVE I COMBUSTION ENGINEERING

Designation: Elective		
Course Pre-requisites:		
Students should have		
1.	Basic knowledge of chemistry	
TEACHING SCHEME:		
EXAMINATION SCHEME:		
CREDITS ALLOTTED:		
Lectures: 3Hours/Week	End Semester Examination: 60 Marks	Theory : 03
	Unit Test: 20 Marks	Total credits: 03
	Continuous Assessment: 20 Marks.	
	Total : 100 Marks	
Course Outcomes:		
After completion of the course students will be able to		
1.	Identify the fundamental definitions, properties and various measurement techniques for fuels.	
2.	Describe the combustion techniques of solid fuel i.e. coal.	
3.	Explain the concept of exploration of crude petroleum and refinery equipments.	
4.	Explain about different important gaseous fuels	
5.	Emphasis is given to combustion of various fuels in the light of thermodynamics and applies the knowledge of gross and net calorific values of fuel and solves the problems based on them.	
6.	Describe the incineration technology.	
Topics covered		
UNIT-I	Introduction: History of Fuels : History of solid fuel, History of liquid fuels and gaseous fuels, Production, present scenario and consumption pattern of fuels, Fundamental definitions, properties and various measurements: Definitions and properties of solid fuels, Definitions and properties of liquid and gaseous fuels, Various measurement techniques.	(06 Hours)
UNIT-II	Solid Fossil Fuel (Coal): Coal classification, composition and basis, Coal mining, Coal preparation and washing, Combustion of coal and coke making (Action of heat on different coal samples, Different types of coal combustion techniques, Coal tar distillation), Coal liquefaction (Direct liquefaction, Indirect liquefaction), Coal gasification	(06 Hours)
UNIT-III	Liquid Fossil Fuel (Petroleum): Exploration of crude petroleum, Evaluation of crude, Distillation (Atmospheric distillation, Vacuum distillation), Secondary processing (Cracking, Thermal cracking, Visbreaking, Coking, Catalytic cracking, Reforming of naphtha, Hydrotreatment, dewaxing, deasphalting), Refinery equipments.	(06 Hours)
UNIT-IV	Gaseous Fuels: Natural gas and LPG, Producer gas, Water gas, Hydrogen, Acetylene, Other fuel gases	(06 Hours)
UNIT-V	Combustion Technology: Fundamentals of thermochemistry, Combustion air calculation, Calculation of calorific value of fuels, Adiabatic flame temperature calculation, Mechanism and kinetics of combustion, Flame properties, Combustion burners, Combustion furnaces, Internal combustion engines	(06 Hours)
UNIT-VI	Incineration Technology: Classification, Key Issues, Pretreatment of Waste, Sorting, Homogenization, Moving Grate Incineration, Rotary Kiln Incineration, Fluidized Bed Incineration, advantages, disadvantages and applications of incineration. Furnaces and Boilers.	(06 Hours)

Assignment:	
1.	Presentations on any topic of combustion engineering.
2.	Recent trends in combustion technology.
3.	Alternative fuel for engines.
4.	Measurement of calorific values of any two types of fuel.
5.	Detail study on solid fossil fuel.
6.	Solve last five years GATE question papers with reference to combustion engineering.
7.	Students have to study any five NPTEL videos related to combustion engineering and prepare/present power point presentation.
8.	Numerical based on above fifth unit.
9.	Detail study on liquid fossil fuel.
10.	Detail study on gaseous fuels.
11.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
12.	Prepare a report on combustion technology which is newly introduced in the current year.
13.	Write a report on incineration technology.
In addition to these above stated assignments concern faculty member may design his/her won.	
Text Books/References:	
1.	Richard A. Dave, "Modern Petroleum Technology", Vol 1 , Upstream, 6th ed., John Wiley & Sons. Ltd.2002.
2.	Alan G. Lucas, "Modern Petroleum Technology", Vol 2, Downstream, 6th ed., John Wiley & Sons. Ltd.2002.
3.	Irvin Glassman, "Combustion", 2nd ed., Academic Press.2009.
4.	B.K. Bhaskar Rao, "Modern Petroleum Refining Processes", 5th ed., Oxford & IBH Publishing Co. Pvt. Ltd.2007.
5.	John Griswold , "Fuels Combustion and Furnaces" , Mc-Graw Hill Book Company Inc.1988.
6.	Samir Sarkar, "Fuels and Combustion", 3rd. ed Universities Press.2009.
7.	W.L. Nelson, "Petroleum Refinery Engineering", 4th ed. Mc-Graw Hill Book Company.1958.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

ELECTIVE-I : MULTIPHASE FLOW

Designation: Elective

Course Pre-requisites:

Students should have basic knowledge of

1 | Fluid Flow Operations

2 | Process Heat Transfer

TEACHING SCHEME:

Lectures : 3 Hours/Week

EXAMINATION SCHEME:

End Semester Examination : 60 Marks

Continuous Assessment : 40 Marks

Total : 100 Marks

CREDITS ALLOTTED:

Theory : 03

Total credits : 03

Course Outcomes:

After completion of the course students will be able to

1. Explain the concept of two phase flow and describe the flow types, flow regimes in horizontal and vertical flow
2. Describe the two phase flow classifications.
3. Explain the mixing power correlations.
4. Identify and explain packed bed, fluidized bed, bubble column and its design aspects.
5. Explain the concept of multiphase flow and identify the flow regimes.
6. Explain cavitation and RTD in multiphase flow system.

Topics covered

UNIT-I	Gas/liquid and liquid/liquid Two phase flow: Scope and significance of multiphase flows, Dimensionless numbers in multiphase flows; Flow types and regimes in horizontal and vertical flow, Regime maps, Behaviour of non-Newtonian fluids in two phase flow.	(06 Hours)
UNIT-II	Flow Classification: Two-phase Co-current flow of Gas-Liquid, Gas-Solid and Liquid-Liquid, Upward and Downward Flow in Vertical pipes. Suspensions of Solid and their transport in Horizontal Pipes. Drag Reduction Phenomena, Laminar, Turbulent and Creeping Flow Regimes.	(06 Hours)
UNIT-III	Mixing Power Correlations: Theories of Intensity and Scale of Turbulence. Calculation of Circulation Velocities and Power Consumption in Agitated Vessels for Newtonian and Non-Newtonian Fluids. Blending and Mixing of Phases, flow patterns. Power requires for aeration to suspend to an Immiscible Liquid or Solids in Slurry Reactors, Prediction of optimum speed of Impeller Rotor. Mixing equipments.	(06 Hours)
UNIT-IV	Quantification of Flow System: Prediction of Holdup, Pressure Drop and bubble size in pipe flow, Lockhart – Martinelli Parameters, Bubble Column and its Design aspects; Flow through Packed Bed and Fluidized Bed, Minimum Carryover Velocity. Holdup Ratios, Pressure Drop and Transport Velocities and their prediction. Solid-Fluid Conveying and Settling.	(06 Hours)
UNIT-V	Flow in Three - Phase Systems:	(06 Hours)

	Introduction to three phase flow; Flow regime identification, pressure drop, void fraction and flow rate measurement, Prediction of Holdup, Pressure Drop and throughput velocities in three –phase system. phase separation and settling behaviour, analysis of stratified and bubble flow, formation of bubbles and drops and their size distribution and hold up in different flow system, momentum and energy relations.	
UNIT-VI	<p>RTD in multiphase flow system: Non-Ideal Flow: Residence time distribution of fluid in vessel, non-ideal flow patterns, E, F, C curve, Mean and variance, residence time, Models for non-ideal flow.</p> <p>Cavitation: Introduction, types of cavitation, mechanism of cavitation. Key features of bubble cavitation: cavitation inception, cavitation bubble collapse, shape distortion during bubble collapse, cavitation damage. Cavitation bubbles: observations of cavitating bubbles, cavitation noise and cavitation luminescence.</p>	(06 Hours)

Assignments

1	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
2	Students have to study any five NPTEL videos related to multiphase flow and prepare/present power point presentation.
3	Students have to visit chemical industry and make a detailed report on multiphase flow.
4	Write a report on the recent advances in multiphase flow with reference to the current year.
5	Prepare models for bubble column, packed bed and fluidized bed reactors.
6	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
7	Write a report on your visit to research and development laboratory of national/international repute.
8	Solve old (last five years) GATE question papers with reference to multiphase flow.
9	Group discussions on any one topic from above six units.
10	Technical interview based on the knowledge of multiphase flow.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Text Books/References:

1.	Wallis, G.B.; One Dimensional Two Phase Flow, McGraw Hill Book Co., New York, 1969.
2.	Hewitt, G.F.; Measurement of Two Phase Flow Parameters.
3.	Govier, G. W. and Aziz, K.; The Flow of Complex Mixture in Pipes, Richardson, Tex.: Society of Petroleum Engineers 2008.
4.	Butterworth and Hewitt, Two Phase Flow
5.	John, G. Collier and John, R.Thome,; Convective Boiling and Condensation, Oxford University Press, 3rd Edition, 2002.
6.	Levenspiel, O.; Chemical Reaction Engineering, 3 rd Ed , John Wiley & Sons, Singapore (1999).
7.	Doraiswamy, L.K., and Sharma, M.M.; Heterogeneous Reactions: Volume 2 Fluid-Fluid-Solid Reaction, John Wiley & Sons, 1984, Singapore
8.	Coulson, J.M. and Richardson, J.F.; Chemical Engineering, Vol I, 6 th edition, Oxford, 1999.
9.	D.G. Knudsan and D. L. Katz. Fluid Dynamics and Heat transfer. Mc-Graw Hill, 1958
10.	A.H. P. Skelland “Non Newtonian flow and Heat transfer” John Wiley 1867

11.	Brodkey, R. S.; The Phenomena of Fluid Motions”, Addison –Wesley, New York, 1967.
12.	Hestroni, G., (Ed.) ; Hand book of Multiphase systems, Hemisphere Publishing, Washington, 1982.
13.	Christopher, E. Brenner,; Fundamentals of multiphase flows, Cambridge University Press 2005.

Syllabus for Unit Test:	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

Elective I Rheology

Designation: Elective

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical : ---	Unit Test: 20 Marks	Practical: ---
Total: 3Hours/Week	Continuous Assessment: 20 Marks	Total credits: 03
	Total :100 Marks	

Course Outcomes:

After completion of the course students would be able to

1. Apply the rheological models to study the rheology of non-Newtonian fluids
2. Describe the operation of instruments used for measurements of rheological properties
3. Obtain the rheological behavior of non-Newtonian fluids
4. Explain the rheological models for rubber compounds
5. Describe the models to represent behavior of polymer liquids
6. Obtain the variable influencing the rheology of fluids

Topics covered

UNIT-I	Introduction Types of fluid flow, time dependant fluids, shear rate dependant fluids, Newtonian and Non Newtonian fluids, Definition of Rheology, Rheological Perspective, The importance of nonlinearity, Solids and liquids, Components of rheological research: Rheometry, Constitutive equations.	(08 Hours)
UNIT-II	Rheological Models Power law fluid Model, Eyring Model, Bingham Plastic fluid model, Ellis fluid model, Eyring-Powel model , Reiner-Phillipoff model , Meter model. Instruments used for measurements of Rheological properties capillary rheometer, melt flow index, cone and plate viscometer, Torque rheometer, Mooney viscometer	(08 Hours)
UNIT-III	Experimental Studies of Rheological Behavior : Steady Shear Flow: Elongation Flow, Oscillating Flow: Stress Relaxation, Temperature Dependence: Processability, Test & Dependence upon Polymer Structure, Shear Flow Boundary Conditions and Slippage, Flow induced Degradation & Mechanochemistry.	(08 Hours)
UNIT-IV	Rheology of Rubber Rheological Models and Approaches to Flow Analysis: One Dimensional Rheological Models for Rubber Compounds: Plastic Viscous Model, Plastic Viscoelastic Model, Thixotropic Model, Equation of Motion and Dimensional Analysis of Non-Newtonian Fluids: General, Viscoelastic Fluids, Plastic Fluids, Energy Equation & Non Isothermal Flow :Energy Equation, Dimensional Analysis, Classification of Flows :Internal & External Flow, Hydrodynamic Lubrication Theory.	(08 Hours)
UNIT-V	Rheology of polymers Introduction	(08 Hours)

	Elastic materials ,Viscous materials, Viscoelasticity, Effect of rate of strain, temperature and time on mechanical behavior of polymeric materials, creep, stress relaxation Models to represent behavior of Polymer Liquids Mechanical models, stress strain response of spring and dashpot Viscoelastic models, Maxwell element, Voigt Oelvin element, response to creep and stress relaxation, Four parameter model, dynamic mechanical properties, behavior of Maxwell element and relaxation spectra	
UNIT-VI	Variable influencing the Rheology of fluids Effect of Temperature, Effect of Pressure, Effect of Molecular weight & Molecular structure, effect of entanglement of molecules & molecular motions.	(08 Hours)

Assignments

1.	Group discussion on the recent advances in rheology.
2.	Presentation on a instruments used for measurements of rheological properties.
3.	Group discussion on importance of studying this elective.
4.	Technical interview based on the knowledge of rheology.
5.	Presentation on rheological models for rubber compounds.
6.	Write a report on your visit to research and development laboratory of national/international repute.
7.	Technical interview based on the knowledge of rheology.
8.	Preparation of report on recent trends in rheology of polymers.
9.	Group discussion on variable influencing the rheology of fluids

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Text Books/References:

1.	R. B. Bird, W. E. Stewart, E. N. Lightfoot, “ Transport Phenomena” Wiley- India, New Delhi
2.	Dr. B. R.Gupta, “Rheology of Elastomers”
3.	H.A. Barnes, J. F. Hutton and K. Walters, “An Introduction to Rheology”
4.	R. P. Chhabra & J. F. Richardson , “Non-Newtonian Flow and Applied Rheology”
5.	Chang Dae Han, “Rheology in Polymer Processing”, Academic Press, New York
6.	R.S. Lenk, “Polymer Rheology”, Applied Science, London

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

MASS TRANSFER OPERATION

Designation: Professional Core

Course Pre-requisites:

Students should have basic knowledge of

1 | Heat Transfer operation

2 | Unit Operations and stoichiometry

TEACHING SCHEME:

EXAMINATION SCHEME:

**CREDITS
ALLOTTED:**

Lectures : 4 Hours/Week

End Semester Examination : 60 Marks

Theory : 04

Practical : 2 Hour /Week

Unit Test : 20 Marks

Practical : 01

Total : 6Hours/Week

Continuous Assessment : 20 Marks

Total credits : 05

Term work / practical : 50 Marks

Total : 150 Marks

Course Outcomes:

After completion of the course students would be able to

1. Evaluate diffusivity and rate of diffusion.

2. Evaluate mass transfer coefficients and understand interphase mass transfer.

3. Calculate the height of transfer unit, number of transfer unit, in absorption column.

4. Calculate rate of mass transfer in humidification.

5. Estimate rate and time of drying.

6. Analyze type of crystallization and estimate yield of crystallization.

Topics covered

UNIT-I	<p>Diffusion Molecular diffusion in fluids: Steady state diffusion in fluids at rest and in laminar flow, Steady state diffusion of A through nondiffusing B , equimolar counter diffusion, steady state diffusion in multicomponent mixture , molecular diffusion in fluids, diffusivity of liquids and gases, effect of temperature and pressure on diffusivity, diffusion in solids. Laws of diffusion and empirical equations – Maxwell’s law, Stefan’s law, Winkle man’s method.</p>	(08 Hours)
UNIT-II	<p>Mass transfer Coefficient and Interphase Mass Transfer: a) Mass transfer coefficients: Mass transfer coefficient in laminar flow and in turbulent flow. Relation of individual and overall mass transfer coefficient. Theories of mass transfer. Mass, heat and momentum transfer analogies. b) Interphase mass transfer. Equilibrium in mass transfer, two resistance concept. diffusion between phases. Steady state co-current and counter current processes. continuous crosscurrent, counter-current, crosscurrent cascade operations and mass balances.</p>	(08 Hours)
UNIT-III	<p>Absorption: Introduction to absorption, types of tower packing’s, contact between liquid and gas, pressure drop and limiting flow rates, material balances for each flow , limiting gas-liquid ratio, rate of absorption, calculation of HTU, NTU and</p>	(08 Hours)

	HETP. Alternate forms of transfer coefficients and their relations. Tray Efficiencies, absorption in plate columns, absorption with chemical reaction. Equipments for absorption column.	
UNIT-IV	Humidification: Vapor-liquid equilibrium, enthalpy for pure substances, definitions of humidity terms, adiabatic saturation temperature, wet bulb and dry bulb temperatures, study of humidity charts, lewis relation. method of adiabatic humidification and dehumidification. Equipments for humidification, cooling tower design.	(08 Hours)
UNIT-V	Drying: Basic principles of drying. equilibrium in drying. definitions of terms in drying, types of moisture binding, rate of drying curve, mechanism of batch drying and continuous drying, time requirement for drying, mechanism of moisture movement in solids. Equipments used for drying: Classification of dryers, solids handling in dryers, equipments for batch and continuous drying processes: working principle of tray driers, tower driers, rotary driers, spray driers. Concept of freeze drying	(08 Hours)
UNIT-VI	Crystallisation: Introduction to the process, principal rate of crystallization, Mier's supersaturation theory, growth and properties of crystals, crystallisation rate, calculations of yield, mass and enthalpy balances. Equipments used in crystallization.	(08 Hours)

Assignments

1.	Write a report on the recent advances in mass transfer processes with reference to the current year.
2.	Solve old (last five years) question papers with reference to particular topic.
3.	Prepare a model for any of the Mass transfer equipment.
4.	Prepare a report on Mass transfer equipments which are newly introduced in the current year.
5.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
6.	Evaluate efficiencies of different Gas-liquid contact equipment. .
7.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
8.	Design laboratory manuals better than existing ones with clearly shown specimen calculations.
9.	Compare working and principles for different mass transfer operations.
10.	Solve numerical for any industrial data.
11.	Write a technical report on your visit to a process industry.
12.	Solve old (last ten years) GATE question papers with reference to Mass transfer-I subject.
13.	Group discussion on the recent advances in mass Transfer equipments.
14.	Write a report on your visit to research and development laboratory of national/international repute.
15.	Technical interview based on the knowledge of Mass transfer.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of the experiments listed below, out of which any eight experiments are to be

performed in laboratory by the students.	
1.	To calculate diffusion coefficient in Liquid-Liquid diffusion.
2.	To calculate diffusion coefficient in still air..
3.	To study characteristics of Wetted Wall Column.
4.	To calculate individual and overall interface mass transfer coefficient.
5.	To estimate efficiency of cooling Tower.
6.	To estimate rate of drying in tray drier/rotary drier
7.	To study the crystallization process by air, water cooling and seeding.
8.	Humidification and Dehumidification experiment.
9.	To study agitated batch crystallizer
10.	Study of Spray drier
Text Books/References:	
1.	McCabe, W. L., J. Smith, and Harriot: "Unit operations of chemical engineering," Tata McGraw Hill.
2.	Treybal R.E., Mass Transfer Operations, 3 rd Ed., McGrawHill, 1981.
3.	King C. J. "Separation Techniques," McGraw Hill Publications
4.	Richardson, J. F., and J. M. Coulson: "Chemical Engineering," Butterworth Heinemann, Volume 1.
5.	E. L. Cussler, "Diffusion Mass Transfer in fluid systems " 3 rd Ed. Cambridge Series in Chemical Engineering.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

CHEMICAL REACTION ENGINEERING-I

Designation: Professional Core		
Course Pre-requisites:		
Students should have basic knowledge of		
1	Analytical and physical Chemistry	
2	Process Calculation	
3	Mathematics including integration and derivation	
TEACHING SCHEME:		
EXAMINATION SCHEME:		
CREDITS ALLOTTED:		
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 6Hours/Week	Continuous Assessment: 20 Marks	Total credits: 05
	Termwork / practical:50 Marks	
	Total :150 Marks	
Course Outcomes:		
After completion of the course students would be able to		
1.	Define rates of homogeneous chemical reactions and express the temperature dependent term of a rate equation with Arrhenius' Law and other theories	
2.	Design experiments, analyze and interpret data, and apply the results to chemical systems and processes.	
3.	Design ideal batch reactors, ideal CSTR reactors and ideal plug flow reactors.	
4.	Analyze multiple reactor system, autocatalytic and recycle reactors.	
5.	Specify operating conditions to produce desired products from parallel and series chemical reactions.	
6.	Evaluate effect of temperature on reaction.	
Topics covered		
UNIT-I	Chemical Kinetics: Classification of reactions, rate laws and stoichiometry, relative rates of reaction, reaction order, rate limiting step, half life, concentration-dependent term of a rate equation, temperature-dependent term of a rate equation, Temperature dependency from Arrhenius law, Transition state theory, collision theory, rate equation using partial pressure and concentration, their interrelation, searching for a reaction mechanism.	(08 Hours)
UNIT-II	Interpretation of Batch reactor data: Interpretation of batch experimental kinetics data using integral and differential analysis, constant volume batch reactor system, design equation for zero, first, second and third order irreversible and reversible reactions, graphical interpretation of these equations and their limitations, variable volume batch reactors, design equation for zero, first and second order irreversible and reversible reactions, graphical interpretation of their limitations.	(08 Hours)
UNIT-III	Introduction to Reactor Design Single ideal reactors under steady state conditions, design equations for batch,	(08 Hours)

	mixed flow & plug flow reactor, development of rate expression for mean holding time for a plug flow reactor, space time and space velocity, Introduction to Semi-batch reactor.	
UNIT-IV	Isothermal flow reactors Size comparison of reactor performance, sequences of reactors, reactors with recycle. optimum size determination, reactors in series and parallel, performance of infinite number of back mix reactors in series, back mix and plug flow reactors of different sizes in series and their optimum way of staging, optimum recycle ratio for auto –catalytic (recycle) reactors.	(08 Hours)
UNIT-V	Design of reactors for Single and Multiple reactions Parallel and consecutive reactions in batch, CSTR and PFR, qualitative discussion about product distribution, quantitative treatment of product distribution and reactor size, factors affecting such as choice, optimum yield, conversion, selectivity, reactivity on consecutive and parallel reactions in reactors.	(08 Hours)
UNIT-VI	Non-Isothermal reactor for homogeneous reactor systems Energy balances in reactors, adiabatic operations, non-adiabatic operations, stability of reactors, non-isothermal homogeneous reactor systems, rates of heat exchanges for different reactors, adiabatic operations for batch and continuous reactors, optimum temperature progression, rate, temperature and conversion profiles for exothermic and endothermic reactions.	(08 Hours)

Assignments

1.	Write a report on the recent advances in chemical reaction engineering with reference to the current year.
2.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
3.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
4.	Derive the rate equations for various combinations of reactors.
5.	Suggest best suitable reactor arrangement for zero, first and second order reaction.
6.	Explain in detail use of kinetics in equipment/reactor design.
7.	Design laboratory manuals better than existing ones with clearly shown specimen calculations.
8.	Solve old (last five years) question papers with reference to particular topic.
9.	Prepare a model for any of the reactor.
10.	Solve old (last ten years) GATE question papers with reference to chemical reaction engineering subject.
11.	Group discussion on the recent advances in reaction engineering.
12.	Write a report on your visit to research and development laboratory of national/international repute.
13.	Technical interview based on the knowledge of chemical reaction engineering.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.

1.	Study of first order reaction.
2.	Study of PFR & CSTR combination in second order reaction.

3.	Rate constant of hydrolysis of methyl acetate by dilute HCl.
4	Energy of activation of a reaction between $K_2S_2O_8$ and KI
5.	Study of homogeneous catalytic reaction, decomposition of hydrogen peroxide, acid catalysed ester hydrolysis.
6.	Hydrolysis of ester (e.g. ethyl acetate) by alkali (NaOH).
7.	Study of CSTR combination in first order reactions.
8.	Determination of Arrhenius parameters.
9.	Rate constant for saponification of ethyl acetate with NaOH using CSTR.
10.	Rate constant for saponification of ethyl acetate with NaOH at ambient conditions using PFR.
11.	Rate constant for saponification of ethyl acetate with NaOH at ambient conditions using (i) Isothermal batch reactor (ii) Isothermal CSTR.
12.	Study and operation of an adiabatic batch reactor.
13.	Study of a reversible reaction in a batch reactor.
14.	To determine energy of activation of reaction of ethyl acetate with sodium hydroxide.
15.	Find out specific rate constant and activation energy of a reaction in a plug flow reactor.
16.	Use MATLAB software to simulate Batch / CSTR / Plug flow reactor data.

Text Books/References:

1.	Octave Levenspiel, "Chemical Reaction Engineering", 3rd Edition, John Wiley and sons, New Delhi, 2007. (ISBN 9788126510009).
2.	Scott Fogler H, "Elements of Chemical Reaction Engineering", 4th Edition, Prentice Hall of India, New Delhi, 2006. (ISBN : 9788120334168).
3.	Keith J. Laidler, "Chemical Kinetics", 3rd Edition, Pearson Education Inc. (ISBN: 9788131709726).
4.	Smith J.M., "Chemical Engineering kinetics", 3rd Edition, McGraw Hill, 1981. (ISBN: 0070665745).

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

CHEMICAL ENGINEERING MATHEMATICS

Designation: Professional Core		
Course Pre-requisites:		
Students should have		
Basic knowledge of Mathematics including derivative, integration etc.		
TEACHING SCHEME:		
EXAMINATION SCHEME:		
CREDITS ALLOTTED:		
Lectures: 3Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Tutorial : 1Hour/Week	Unit Test: 20 Marks	Tutorial : 01
	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / Oral:50 Marks	
	Total: 150	
Course Outcomes:		
After completion of the course students will be able to		
1.	Compute the roots of the equation using methods like Secant method, Bisection method, False position method etc.	
2.	Apply Numerical differentiation methods such Euler's method, Modified Euler's method, Runge-Kutta methods etc.	
3.	Apply Numerical integration methods such as Trapezoidal rule, Simpson method, Romberg method etc.	
4.	Evaluate the problems on special matrices using Matrix inversion method, LU decomposition etc.	
5.	Evaluate curve fitting problems.	
6.	Optimize Linear programming problems.	
Topics covered		
UNIT-I	Root of equation Solve Fluid flow, heat transfer problems using Picard method, Secant method, Bisection method, False position method, Newton-Rapson method, modified Newton-Rapson method, Muller method.	(06 Hours)
UNIT-II	Numerical Differentiation Solve mass transfer, chemical reaction engineering, heat transfer problems using Euler's method, Modified Euler's method, Runge-Kutta methods, Milne's predictor-corrector method, Richardson Extrapolation.	(06 Hours)
UNIT-III	Numerical Integration Trapezoidal rule, Simpson 1/3 and 3/8 rule, Multiple integrals, Romberg integration, Stirlings formula, LaGarange method, Cauchys integral formula.	(06 Hours)

UNIT-IV	Multiple algebraic equations using Matrix Matrix inversion method, Gauss elimination, Gauss Jordan method, LU decomposition method, Gauss Seidal method, Jacobian method.	(06 Hours)
UNIT-V	Curve fitting and Statistics Linear regression, multiple linear regressions, polynomial regression, general linear least squares, Non-linear regression. Introduction to Statistics, application of Statistics, histogram method, measuring centre values by median, mode methods.	(06 Hours)
UNIT-VI	Optimization Graphical method, Simplex method, Golden section search method, Linear programming case studies such as least cost design of tank, least cost treatment of wastewater, chemical Process e.g. reactors, heat exchangers, evaporators etc.	(06 Hours)

Assignments:

There will be six (6) assignments from various units mentioned in the syllabus. Each assignment will carry 10 marks.

List of assignments

1. Finding the roots of polymeric equations mentioned in the fluid mechanics. Equations such as buoyancy of ball, liquid level in manometer etc.
2. Solving the equations from mass transfer, Momentum transfer using Numerical differentiation methods.
3. Evaluating the integrals from heat transfer using Numerical integral methods.
4. Solving linear problems from process calculation using matrix methods.
5. Finding rate equation, equilibrium curve using experimental data.
6. Applying optimization method for equation of cost for various equipments, insulation thickness etc.
7. With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry
8. Solve old (last five years) question papers with reference to particular topic.
9. Solve old (last ten years) GATE question papers with reference to chemical engineering mathematics subject.

Tutorials / Term work

1. Solving problems on roots of equation.
2. Use numerical differential methods for problems on chemical reaction engineering, mass transfer, heat transfer etc.
3. Use numerical integration methods for problems on chemical reaction engineering, mass transfer, heat transfer etc.
4. Solve problems on multiple algebraic equations using Matrix.
5. Analyze and solve the problems on curve fitting.
6. Applying optimization method for industrial problems.

Text Books/References:	
1.	Chapra S. C., R.P. Canale, “Numerical Methods for Engineers”, Tata-McGraw Hill Publications.
2.	T. F. Edgar, D. M. Himmblblau. , “Optimization of Chemical Processes”, Tata-McGraw Hill Publications.
3.	M. K. Jain, S. R .K. Iyengar, R. K. Jain. , “Numerical methods for Scientific and Engineering Computational”, new age international Publishers.
4.	S. S. Sastri. , “Introductory methods of Numerical analysis”, Prentice-Hall India.
5.	S. Pushpavanam, “Mathematical Methods for Chemical Engineering”, Printice-Hall of India.
6.	E. Balagurusamy. , “Numerical Methods”, McGraw Hill Education (India) Private Limited.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I , II, III
Unit Test -II	UNIT – IV, V, VI

COMPUTER PROGRAMMING FOR CHEMICAL ENGINEERS - I

Designation: Computing

Course Pre-requisites:

Students should have basic knowledge of

Computer fundamentals

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Lectures	: 3 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 03
Practical	: 2 Hour /Week	Continuous Assessment	: 40 Marks	Practical	: 01
Total	: 5Hours/Week	Term work / practical	: 50 Marks	Total credits	: 04
		Total	:150 Marks		

Course Outcomes:

After completion of the course students will be able to

1. Apply the knowledge of constant, variables and data types used in visual basic and write programs.
2. Write coding in VB and prepare interface using various controls like option button, check box, list box, text box, command button etc.
3. Apply the knowledge of Visual Basic to various chemical engineering calculations.
4. Explain and apply the HTML tags for web page.
5. Design a web page and apply dynamic effects to the page using the knowledge of HTML.
6. Explain and apply the various DHTML tags and object models for web page.

Topics covered

UNIT-I	Visual Basic: Introduction to visual basic, object oriented programming and Graphics User Interface (GUI). Editions of visual basic. Variable: Types of variable declaration, scope of variable. Data Types, conversion of data types, array of controls. Control constructs and loop statements used in visual basic.	(06 Hours)
UNIT-II	Important Visual Basic controls like Text box, command button, option button, check box, list box, combo box, frame, label and Timer control. Events: mouse, key and focus events. Working with menus, toolbars, status bars. Scope of variables and procedures. Data controls. Creating MDI applications.	(06 Hours)
UNIT-III	Application of Visual Basic for Chemical Engineering: Various calculations and solutions in chemical engineering like calculation of LMTD for co-current and counter current heat exchangers, Design of distillation column, evaporator, dryer, mixed flow reactor etc.	(06 Hours)
UNIT-IV	HTML: Introduction to HTML, components of HTML, structure tags, block level tags, text level tags, horizontal rules, colours in web page. Design parameters. List: ordered, unordered and definition list, generating lists.	(06 Hours)
UNIT-V	Web page designing parameters. Adding graphics/images. Hyperlinks. Tables. Frames. Style sheets. Applying dynamic effects to the page. Working with forms in a web page	(06 Hours)
UNIT-VI	DHTML:	(06 Hours)

	Introduction to DHTML, DHTML Object Model. Events. Handling text attributes. Dynamically changing style. Dynamically changing content. Dynamically altering the placement of elements	
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Assignments

1.	Discuss the client-server applications with appropriate example
2.	Discuss web applications with appropriate example
3.	Explain e-commerce applications
4.	Design your own home page using various HTML tags
5.	Design your own blog for technical discussion.
6.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
7.	To create various animations using Timer control.
8.	Design various unit operations used in chemical industry using knowledge of visual basic.
9.	Students have to study any five NPTEL videos related to HTML, DHTML and visual basic and prepare/present power point presentation.
10.	Programs based on above six units.
11.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
12.	Group discussion on the recent advances in HTML, DHTML and visual basic.
13.	Technical interview based on the knowledge of HTML, DHTML and visual basic.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of the programs/practicals listed below, out of which any eight programs/practicals are to be performed in laboratory by the students.

1.	Development of visual basic interface and programs using click events.
2.	Development of visual basic interface and programs using option button.
3.	Development of visual basic interface and programs using list box control.
4.	Development of visual basic interface and programs using various control statements
5.	Development of visual basic interface and programs using various loop statements
6.	Development of visual basic interface and programs using Timer control.
7.	Application of visual basic to various chemical engineering calculations.
8.	To create table and use of table tags in HTML to design a web page.
9.	Web page design as per given output
10.	Design a web page using the image and hyperlink.
11.	Design a web page using ordered list, unordered list and definition list.
12.	HTML code to display given form.

Text Books/References:

1.	Holzschlag, M. E.; Using HTML – 4, Eastern Economy Publication
2.	Holzner, S. ; HTML Black Book, Dreamtech Press
3.	Thomas Powell; HTML& CSS: The Complete reference, 5 th edition, BPB Publications
4.	Gurewich; Learn VB In 21 Days, San's Publications
5.	Cornell; Visual Basic 6 from the ground, Tata McGraw Hill Publishers
6.	Hollis; Visual Basic 6 : Design, specification & Objects, Longman Publications

7.	Ivan Bayross; Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, PBP Publications.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,IV
Unit Test -II	UNIT – III,V,VI

ELECTIVE II BIOFUEL TECHNOLOGY

Designation: Elective

Course Pre-requisites:

Students should have basic knowledge of

- | | |
|---|--------------------------------|
| 1 | Biology |
| 2 | Basics of Chemical Engineering |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical : -	Unit Test: 20 Marks	
Total : 3 Hours/Week	Continuous Assessment: 20 Marks	Total credits: 03
	Total :100 Marks	

Course Outcomes:

After completion of the course students would be able to describe

- | | |
|----|---|
| 1. | How petroleum and bio-based fuels affect the global carbon cycle |
| 2. | The attributes of biofuels that make them suitable as a fuel for a specific application |
| 3. | Limitations of petroleum fuel and biofuel and importance of biodiesel |
| 4. | Global impacts of bioethanol and biobutanol on energy sector |
| 5. | Technological advances and challenges to be overcome for biohydrogen production |
| 6. | Importance and aspects of manufacturing processes of microbial fuel cells |

Topics covered

UNIT-I	<p>Introduction to Biofuels: Biofuels, energy use and efficiency, generations of biofuels, alternative energies, types of biofuels, advantages and disadvantages of different biofuels, economics, and policies.</p>	(06 Hours)
UNIT-II	<p>Renewable Feedstocks: Feedstocks: Biomass, starch, sugar, lignocellulosic, agro and industrial by-products, pretreatment of feedstock, biomass production for fuel – algal cultures, yeasts (lipid and carbohydrate), sources of oils – edible and non edible</p>	(06 Hours)
UNIT-III	<p>Production of biodiesel: Chemical, thermodynamic and reaction kinetic aspects of biodiesel production: esterification and transesterification, free fatty acids; saponification; single step and two step biodiesel production, catalysts for biodiesel production – homogeneous (alkali/acidic) and heterogeneous, general procedure of biodiesel production and purification. algal biodiesel production, quality control aspects, methods to improve the biodiesel yield, process flow diagrams</p>	(06 Hours)
UNIT-IV	<p>Production of bioethanol and biobutanol: Process technology for ABE using different feedstocks; by-products of biofuel industry as feedstock; selection of micro-organisms and feedstock – ethanol/butanol tolerance; determination of ABE yield; recovery of biofuels, process integration, advances in bioethanol and biobutanol production.</p>	(06 Hours)

UNIT-V	Production of Biohydrogen: Enzymes involved in H ₂ production; photobiological H ₂ production: biophotolysis and photo-fermentation; H ₂ production by fermentation: biochemical pathway, batch fermentation, factors affecting H ₂ production, carbon sources, process and culture parameters; detection and quantification of H ₂ , reactors for biohydrogen production. Biogas: Use of different feedstock to produce biogas, methods of biogas generation, equipment design to improve the yield, application of biogas as fuel	(06 Hours)
UNIT-VI	Microbial Fuel Cells (MFC): Biochemical basis; components of MFC fuel cell design, microbial cultures, MFC performance methods: substrate and biomass measurements, basic power calculations, MFC performance, single vs two-chamber designs, Applications of MFC	(06 Hours)

Text Books/References:

1.	C.M. Drapcho, N.P. Nhuan, T.H. Walker. Biofuels Engineering Process Technology, Mc Graw Hill Publishers, New York, 2008.
2.	R.M. Jonathan. Biofuels – Methods and Protocols (Methods in Molecular Biology Series), Humana Press, New York, 2009.
3.	L. Olsson (Ed.), Biofuels (Advances in Biochemical Engineering/Biotechnology Series, Springer-Verlag Publishers, Berlin, 2007.
4.	A.N. Glazer, H. Nikaido, Microbial Biotechnology – Fundamentals of Applied Microbiology, 2 Ed., Cambridge University Press, 2007.
5.	R. C. Brown, Biorenewable Resources: Engineering New Products from Agriculture, Wiley-Blackwell Publishing (2003)

Syllabus for Unit Test:

Unit Test -I	UNIT – I , II, III
Unit Test -II	UNIT – IV,V,VI

ELECTIVE II FOOD TECHNOLOGY

Designation: Elective

Course Pre-requisites:

Basic knowledge of microbiology and biochemistry

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Lectures	: 3 Hours/Week	End Semester Examination	: 60	Theory	: 03
		Marks			
Seminar	: -	Unit Test	: 20	Seminar	: -
		Marks			
Total	: 3 Hours/Week	Continuous Assessment	: 20	Total credits	: 03
		Marks			
		Total	: 100		
		Marks			

Course Outcomes:

After completion of the course students would be able to

1. Evaluate analysis of suitable chemical constitute and their significance in food products.
2. Identify the significance of fluid flow and rheological properties of food; develop the Process and equipment design aspect for food processing.
3. Draw basic flow sheet development for food processing, construction and plant layout.
4. Implement suitable equipment design and their design parameters for canning and retort processing.
5. Chose and apply suitable food preservation technique, give details of preservation, significance and estimate economy of the food preservation.
6. Select and do the packaging of fresh food and processed food, implement newer trends in packaging.

Topics covered

UNIT-I	Introduction to food technology : Introduction to food technology, different types of food products, Application of Engineering in Food industries. Analysis of chemical constituents in food products, their characterization and significance.	(06 Hours)
UNIT-II	Food Engineering: Principles of mass and energy balance in food processing operations. Transport phenomena with respect to foods. Fluid dynamics, Rheological properties of foods. Process design aspects. Concentration with thermal and membranes processes. Process and equipment design for food processing.	(06 Hours)
UNIT-III	Food Process Engineering: Important aspects of product and process development. Basic flow sheet development for food processing. Other food processing such as Bakery machines and equipment; Food processing plant layout, material of construction, corrosion, waste utilization.	(06 Hours)
UNIT-IV	Thermal processing: Canning and retort processing – process design and equipment. Equipment design aspects, dryers and their design parameters. Construction of cold	(06 Hours)

	storages, Types of freezers and their design parameters	
UNIT-V	Principles of food preservation: Aims and objectives of preservation and processing of foods. Preservation by high temperature, Preservation by low temperature, Preservation by water removal. Different preservation technique: chemical preservatives. Controlled and modified atmospheric storage.	(06 Hours)
UNIT-VI	Food Packaging Technology: Concept of packaging, Functions of a Food Package, Aseptic Packaging. Packaging as a method for conservation and protection of foods. Different packaging materials and their properties, Environmental friendly food packing material, Food product characteristics and package requirement, Evaluation of quality and safety of packaging materials.	(06 Hours)

Text Books/References:

1.	The Fundamentals of Food Engineering, Charm SE, 1963, The Avi Publishing Co.
2.	S. Saclarow and R.C. Griffin. Principles of Food Packaging
3.	RS Kirk and R. Sawyer.1991. Pearson's Chemical Analysis of Foods. 9th Ed. Harlow, UK, Longman Scientific and Technical.
4.	M. Mathlouthi. Food Packaging and Preservation : theory and practice, Springer Science
5.	R.T. Toledo. Fundamentals of Food Process Engineering, 2000, Chapman and Hall.
6.	N.W. Desrosier. The Technology of Food Preservation, 1977, The AVI Publishing Co. Inc.
7.	P.J. Fellows. Food Processing Technology: Principles and Practice, 2005, CBS Publishers.
8.	D.R. Heldman and R.P. Singh. Food Process Engineering, 1984, Chapman and Hall.
9.	J.M. Apple. Plant Layout and Material Handling, 1977, John Wiley & Sons.

Syllabus for Unit Test:

Unit Test -I	UNIT – I , II, III
Unit Test -II	UNIT – IV, V, VI

ELECTIVE-II NANOMATERIALS

Designation: Elective

Course Pre-requisites:

Students should have knowledge of

1. Chemistry, Physics

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures : 3 Hours/Week

End Semester Examination : 60 Marks

Theory : 03

Unit Test : 20 Marks

Total credits : 03

Continuous Assessment : 20 Marks

Total : 100 Marks

Course Outcomes:

After completion of the course students will be able to

1. Define the concept of nanomaterials and Nanotechnology
2. Express various types of nanomaterials and characterization techniques
3. Distinguish between the synthesis techniques for nanomaterials and apply the appropriate synthesis technique.
4. Recognize the properties of nanomaterials and effect on them due to nanoscale.
5. Express the Chemical and Catalytic Aspects of Nanomaterials
6. Recognize the various modes and methods for synthesis of polymer nanocomposite

Topics covered

UNIT - I	<p>Introduction to Nanomaterials Basic definitions: Nanoscience, Nanotechnology, Nanomaterial, Nanostructure, Nanomachine; Historical perspective on nanomaterials, Advantages of nanomaterials, Importance of nanomaterials, Top down and bottom up approaches to manufacture nanomaterials. Applications of Nanomaterials</p> <p>Types of nanomaterial/Nanostructures Classification of nanomaterial based on the number of dimensions: 0-D, 1-D, 2-D, and 3-D nanostructures; Quantum dots, Quantum wire, Core/Shell structures, Nanotubes, nanorodes, nanowires, nanofibers.</p>	(06 Hours)
UNIT - II	<p>Characterization Techniques: X-ray Diffraction, Scanning Electron Microscopy (SEM), Transmission Electron microscopy (TEM), Optical spectroscopy, Atomic Force Micrograph (AFM), Partical Size Analyzer.</p> <p>Synthesis of Nanomaterials: Classification of Nanoparticle Synthesis Techniques, Solid-State Synthesis of Nanoparticles, Vapor-Phase Synthesis of Nanoparticles, Inert Gas Condensation of Nanoparticles, Chemical Vapor Condensation (CVC),</p>	(06 Hours)
UNIT - III	<p>Technology of Nanoparticles Synthesis: Plasma-Based Synthesis of Nanoparticles, Flame-Based Synthesis of Nanoparticles, Spray Pyrolysis of Nanoparticles; Solution Processing of Nanoparticles, Sol-Gel Processing, Solution Precipitation, Water–Oil</p>	(06 Hours)

	Microemulsion (Reverse Micelle) Method.	
UNIT - IV	Nanomaterial properties Physical properties of nanostructured materials, Chemical properties, Mechanical properties, Magnetic and structural properties, Optical properties, Thermal properties; Influence of nano structuring on mechanical, optical, electronic, magnetic and chemical properties; Gramsize effects on strength of metals optical properties of quantum dots and quantum wires, carbon nano tubes: magnetic behavior.	(06 Hours)
UNIT - V	Chemical and Catalytic Aspects of Nanomaterials Nanomaterials in catalysis, Importance of surface to volume ratios, nanocrystal shapes and defects as they relate to heterogeneous catalysis, Controlled pore size materials, nanoparticles as chemical reagents; Examples of metal, metal oxide and metal sulfide nanoparticles in catalytic processes	(06 Hours)
UNIT - VI	Polymer Nanocomposites Generalities on polymer composites, From “Micro” to “Nano” composites: Effect of particle dimensions, Nanocomposites preparation pathways: Importance of the interfacial compatibilization, Current scientific and technical advances in polymer nanocomposites	(06 Hours)
Tutorials/Assignments:		
The internal assessment shall consist of minimum SIX assignments from the following list		
1.	Questions involving classification of nanomaterial	
2.	Prepare one assignment considering any one nanomaterial on: Influence of Nano structuring on Mechanical - Optical, electronic, magnetic and chemical properties	
3.	Conducting surprise MCQ test for students	
4.	Questions involving various techniques employed for nanomaterial characterization	
5.	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments	
6.	Students have to study any five research papers related to specific topic in nanomaterials and prepare/present power point presentation	
7.	Brief report on ‘Environmental, health and ethical concerns that are associated with nanomaterials	
8.	Group discussions on any of the following topics: a) Importance of Nanomaterials in chemical industries. b) Current scientific and technical advances in Nanomaterials c) Methods of synthesis for nanomaterials	
9.	Preparation of a brief report on applicability of nanomaterials in chemical engineering operations	
10.	Conducting open-book class test	
Text Books/ References:		
1.	Charles P. Poole, Frank J. Owens, “Introduction to Nanotechnology”, Wiley Interscience	
2.	B S Murty, P Shankar, Baldev Raj, B B Rath, James Murday, “Textbook of Nanoscience and Nanotechnology” Universities Press (India) Private Limited	
3.	Mark A. Ratner, Daniel Ratner, “Nanotechnology: A gentle introduction to the next Big Idea”, Prentice Hall, 1 st Edition	

4.	Yury Gogotsi, "Nanomaterials Handbook", CRC Press, Taylor & Francis Group
5.	Gu`nter Schmid, "Nanoparticles From Theory to Application", Wiley-VCH Verlag GmbH & Co
6.	C. Br´echignac P. Houdy M. Lahmani, "Nanomaterials and Nanochemistry", Springer Berlin Heidelberg New York
7.	Kenneth J. Klabunde, "Nanoscale Materials in Chemistry", John Wiley & Sons, Inc
8.	Alain Nouailhat, "An Introduction to Nanoscience and Nanotechnology", Wiley-ISTE; 1 st Edition
Syllabus for Unit Test:	
Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI

Elective I: Polymer Technology		
Designation: Elective		
Course Pre-requisites:		
1.	Basic chemistry, Physical chemistry, Chemical Reaction Engineering, Chemical Engineering Thermodynamics	
TEACHING SCHEME:		
EXAMINATION SCHEME:		
CREDITS ALLOTTED:		
Lectures: 3 Hours/Week	End Semester Examination: 60 marks	Theory : 03
	Continuous Assessment: 40 marks	
Course Outcomes:		
1.	Explain basics of polymers and their classifications	
2.	Explain various polymer properties and the their effect on engineering properties	
3.	Determine suitable process for polymer synthesis and describe its mechanism	
4.	Understand the basics of polymer characterizations and discuss its effect on properties	
5.	Explain the formation of composites and blends in polymers	
6.	Explain the methods of polymer compounding and processing	
Topics covered		
UNIT-I	Introduction to polymers Introduction, polymer microstructure, homopolymers-heteropolymers, monomers as building block of polymers, historical development, classifications of polymers and polymerization reactions, chain growth and step growth polymerization, mechanism of polymerization, polymer liquids and polymer solids	(06 Hours)
UNIT-II	Polymer properties Molecular weight of polymers (Mw, Mn, Mv), Molecular weight distribution, determination of molecular weights, polymer morphology, polymer structure – linear, branched and crosslinked, presence of functionality, chemical bonding in polymers, stereoisomerism, effect these factors on chemical, thermal and mechanical properties of polymers	(06 Hours)
UNIT-III	Synthesis of polymers Polymerization techniques: bulk, solution, suspension, emulsion polymerization with their merits and demerits, kinetics of polymerization; free radical chain polymerization, cationic polymerization, anionic polymerization, polycondensation, co-polymerization and its kinetics, Smith Ewarts kinetics for emulsion polymerization, continuous emulsion polymerization, Ziegler-Natta catalyst	(06 Hours)
UNIT-IV	Polymer structure and effect on properties Chemical and geometrical structure of polymer molecules, microstructure based on chemical structure, microstructure based on geometrical structure, Glass transition temperature, factors influencing glass transition – molecular	(06 Hours)

	weight, plasticisers, copolymer concentration, and their effect on polymer properties; crystallinity, effect of presence of crystallinity on polymer properties	
UNIT-V	Polymer composite and blends Difference between blends and composites, their significance, choice of polymers for blending, blend miscibility-miscible and immiscible blends, thermodynamics, phase morphology, polymer alloys, polymer eutectics, plastic-plastic, rubber-plastic and rubber-rubber blends, FRP, particulate, long and short fibre reinforced composites.	(06 Hours)
UNIT-VI	Polymer processing and compounding Polymer compounding-need and significance, different compounding ingredients for rubber and plastics, crosslinking and vulcanization. Methods of processing: Compression molding, transfer molding, injection molding, blow molding, reaction injection molding, extrusion, pultrusion, calendaring, rotational molding, thermoforming, rubber processing in two-roll mill, internal mixer.	(06 Hours)
Assignments:		
1.	Prepare the report on any one polymer comprising its significance, preparation, characterization, processing and properties	
References/Text Books:		
1.	Text book for polymer science; F. W. Billmeyer, Wiley Interscience Publications (John Wiley and Sons)	
2.	Polymer Science, V. R. Gowarikar, N. V. Viswanathan, J. Shreedhar; Wiley Estern Limited	
3.	Principles of Polymerizations; Odion G. G.; Mc-Graw Hill	
4.	Fundamentals of polymer Engineering, Arie Ram, Plenum Press	
5.	Polymer Physics, Michael Rubinstein, Ralph H. Colby, Wiley Interscience Publications (John Wiley and Sons)	
6.	Polymer data handbook, James E. Mark (Ed.), Oxford University Press	
Syllabus for Unit Test:		
Unit Test –I	UNIT – I ,II,III	
Unit Test –II	UNIT – IV,V,VI	

SEPARATION TECHNIQUES		
Designation: Professional Core		
Course Pre-requisites:		
Students should have basic knowledge of		
1	Fundamentals of mass transfer	
2	Fundamentals of heat transfer	
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 6Hours/Week	Continuous Assessment: 20 Marks	Total credits: 05
	Term work / practical:50 Marks	
	Total :150 Marks	
Course Outcomes:		
After completion of the course students would be able to		
1.	Apply the basics of distillation for the binary separation of ideal and nonideal mixture and determine the extent of separation obtained.	
2.	Describe the operation of continuous rectification and determine the number of stages required for distillation.	
3.	Determine the number of stages required for separation using liquid-liquid extraction and describe the extractors used industrially.	
4.	Obtain the requirement of solvent in leaching operation and obtain the extent of separation.	
5.	Plot the adsorption isotherms and estimate the amount of adsorption using single and multistage operations.	
6.	Explain the operation and applications of novel separation techniques	
Topics covered		
UNIT-I	Introduction: Review of various separation techniques, Selection of the technique of separation, pros and cons of various methods. Basics of Distillation: Equilibrium of vapor and liquid, relative volatility, Raoult's law, Ideal and Non-ideal behavior study, Azeotropes, positive and negative deviation from ideality, Methods of distillation - simple, flash distillation, Rayleigh's equation, Graphical and analytical method for determination of the compositions, Introduction to reactive distillation, Azeotropic distillation, Molecular or low pressure distillation, Extractive distillation.	(08 Hours)
UNIT-II	Rectification: Continuous rectification for binary systems, Tray towers, McCabe Thiele's method of calculation of number of trays, Method of Ponchon Savarit, Enthalpy concentration diagrams, Tray efficiencies, Concept of reflux, cold reflux, partial and total cold reflux, Effect of feed temperature and q-line equation derivation, Total reflux, Optimum reflux, Fenske Underwood equation, Condenser and reboilers used in distillation, Use of open steam for	(08 Hours)

	distillation, Rectification of Azeotropic mixtures. Distillation in packed towers: HETP concept, HTU and NTU calculations, Distillation column internals: Type of trays, Type of packing used.	
UNIT-III	Adsorption: Types of adsorption, Nature of adsorbents, Equilibria in adsorption- Single gases and vapors, adsorption hysteresis, Effect of temperature, Heat of adsorption, adsorption of liquids, Langmuir isotherms, Freundlich isotherms, Introduction to pressure swing and temperature swing adsorption, Equipment: Continuous contact, Steady state moving bed absorbers. Ion exchange process: Basic principles and chemical reactions, Techniques and applications, Equilibria and rate of ion exchange, Equipment studies.	(08 Hours)
UNIT-IV	Liquid- Liquid Extraction: Introduction, Choice of solvent, Ternary equilibrium, Binodal solubility curve, Single stage extraction, Multistage crosscurrent and countercurrent extraction, extraction calculations using triangular and rectangular coordinates, Solvent free basis calculations, Nxy diagrams, Material balances, Continuous countercurrent extraction with reflux, stage efficiency. Continuous countercurrent extraction in packed columns: HTU and NTU calculations. Types of extractors: Stage type and differential extractors.	(08 Hours)
UNIT-V	Leaching (Solid Liquid Extraction): Introduction: Classification of leaching processes, Factors affecting the leaching process, Solid –liquid equilibria. Methods of calculation: Single stage leaching, multistage cross-current leaching, Continuous countercurrent leaching. Leaching Equipments: Unsteady state and steady state equipment.	(08 Hours)
UNIT-VI	Novel separation techniques: Membrane separation techniques- Ultrafiltration, Nano-filtration, Reverse osmosis process, Electro dialysis, Rate based processes such as diffusion coefficient based inert gas generating from air by carbon molecular sieves.	(08 Hours)

Assignments

1.	Group discussion on the recent advances in mass transfer operations.
2.	Solve previous university question papers with reference to particular topic of this subject.
3.	Seminar presentation on a particular topic specified in the syllabus and submission of report based on it.
4.	Estimation of composition of vapor and liquid in flash distillation
5.	Compute the composition of residue and distillate in simple distillation.
6.	Evaluation of number of stages using McCabe Thiele and Ponchon Savarit method.
7.	HTU and NTU calculation for distillation in packed columns.
8.	Group discussion on equipments used for extraction.
9.	Estimate the number of stages required for single and multistage extraction operation.
10.	Estimate the number of stages required for single and multistage leaching operation.
11.	Group discussion on ion exchange technique and its application.
12.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.

13.	Presentation on novel separation techniques.
14.	Solve old GATE question papers with reference to this subject.
15.	Group discussion on the recent advances in separation techniques.
16.	Write a report on your visit to research and development laboratory of national/international repute.
17.	Technical interview based on the knowledge of separation techniques.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.

1.	Simple distillation
2.	Distillation with total reflux
3.	Steam distillation
4.	Equilibrium diagrams for liquid -liquid extraction
5.	Cross current multistage extraction
6.	York Schiebel column for extraction
7.	Bubble cap distillation column
8.	Sieve tray distillation column
9.	Vapour liquid equilibria
10.	Solid liquid extraction of oil
11.	Langmuir and Freundlich adsorption isotherm

Text Books/References:

1.	Treybal R. E., "Mass Transfer Operation", McGraw Hill publication.
2.	Coulson J. M. Richardson, "Chemical engineering", Vol, I and II, Pergamon Press.
3.	King C. J., "Separation Techniques", McGraw Hill publication.
4.	Smith B. D., "Design of Equilibrium stage process", McGraw Hill publication.

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV, V, VI

CHEMICAL PROCESS EQUIPMENT DESIGN-I

Designation: Professional Core

Course Pre-requisites:

Students should have basic knowledge of

- | | |
|---|--|
| 1 | Unit Operations involved in chemical engineering |
| 2 | Heat transfer and Mass transfer and Mechanical operation equipments. |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Drawing : 2 Hour /Week	Unit Test: 20 Marks	Drawing: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / practical:25 Marks	
	Total :125 Marks	

Course Outcomes:

After completion of the course students would be able to

- | | |
|----|--|
| 1. | Apply and understand different codes for equipment design. |
| 2. | Design different heads used for equipments |
| 3. | Identify and design different supports used for process equipments. |
| 4. | Study and design process and mechanical aspect of heat exchangers |
| 5. | Calculate various stresses acting on vessels |
| 6. | Design different equipments like cyclone separator, gravity thickener, decanter, fluid –fluid separator, electrostatic precipitator, cooling towers, evaporators, dryers, crystallizers. |

Topics covered

UNIT-I	<p>Introduction to Process Equipment Design: Introduction to various mechanical properties of materials to be used as material of construction, resistance of metals to corrosion under varying conditions of temperature and pressure etc. Theories of failures, application and use of various codes and standards in design. Representation of different utilities and symbols, General design procedure, equipment classification, study of design parameters such as maximum working pressure, design pressure, design temperature, design stress & factor of safety, design of wall thickness & minimum actual thickness, corrosion allowance, design loading, possions ratio.</p>	(06 Hours)
UNIT-II	<p>Design of pressure vessels and storage tank: Design of pressure vessels and storage tank: Vessels subjected to internal pressure and combined loading, cylindrical and spherical shell, resultant stresses induced in pressure vessel, stresses in high pressure vessels, optimum vessel size, design of various heads & closures such as flat head, torrispherical head, elliptical head, hemispherical head, and conical head. Design of storage tank, types of storage tank, types of roof for storage tank, types of losses in floating roof tank, estimation of nozzle diameter for drain in storage tank.</p>	(06 Hours)
UNIT-III	Introduction to various Supports :	(06 Hours)

	Introduction to various Supports, design of various supports such as skirt support, skirt bearing plate, leg support, bracket support, saddle support, design of tall vertical column, anchor bolts, base ring, ring stiffeners, wind girders, flanges & nozzles, detail design of number of bolts & nozzles. Stresses induced in supports like dead weight, wind load, seismic load.	
UNIT-IV	Design of Heat exchangers : Classification of heat exchangers, flow arrangements, types of heat exchanger, LMTD and effectiveness NTU method, Process design of shell and tube heat exchanger - heat transfer coefficient calculations, number of tube calculation, pressure drop calculation on tube side and shell side. Process design of double pipe heat exchanger, types of fouling, fouling resistance in heat exchangers. Mechanical design aspects of heat exchanger. Differential expansion and thermal stresses in heat exchanger. Introduction to fin type, plate type heat exchanger.	(06 Hours)
UNIT-V	Design of Agitators : Design of Agitators: types of agitators, selection criteria, design of blades, power calculation, flow patterns, calculation of bending moment, twisting moment, and combined effect.	(06 Hours)
UNIT-VI	Design of some separation equipments : Design of some separation equipment like cyclone separator, gravity thickener, decanter, fluid –fluid separator, electrostatic precipitator, evaporators.	(06 Hours)

Assignments

1.	Write a report on different codes and symbols used in design.
2.	Solve old (last five years) question papers with reference to particular topic.
3.	Prepare a model for any of the equipment
4.	Prepare a report on advance equipments which are newly introduced in the current year.
5.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
6.	Prepare model for different roofs used in storage vessels.
7.	Prepare a chart for different construction of materials in equipment design.
8.	Prepare a presentations on newly introduced equipments in current year
9.	Design laboratory manuals better than existing ones with clearly shown specimen calculations.
10.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in designing a economic plant layout for any industry.
11.	Write a technical report on your visit to a process industry.
12.	Solve old (last ten years) GATE question papers with reference to design subject.
13.	Group discussion on the recent advances in equipment design
14.	Write a report on your visit to research and development laboratory of national/international repute.
15.	Technical interview based on the knowledge of design

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of the Practicals and drawings listed below, out of which any eight are to be done by students. Any one drawing in Autocad.

1.	Detailed design and drawing of enclosures and supports
2.	Design of pressure vessels.
3.	Calculation of heat transfer coefficient, No of tubes and rate of heat flow in shell and tube heat exchanger
4	Calculate pressure drop for tube and shell side heat exchanger.
5.	Detailed design and drawing of agitated vessel.
6.	Detailed design and drawing of cyclone separator.
7.	Detailed design and drawing of cooling towers
8.	Detailed design and drawing of crystallizer
9.	Detailed design and drawing of gravity thickener.
10.	Design of storage tanks.
11.	Design of Supports.
12	Calculation of heat transfer coefficient,rate of heat flow and effectiveness in Double pipe heat exchanger.
13	Calculation of heat transfer coefficient,rate of heat flow and effectiveness in fin type heat exchanger.

Text Books/References:

1.	Joshi. M.V, and Mahajani. V.V, "Process Equipment Design," 3rd Edn. Macmillan India Limited, New Delhi, 1996
2.	Bownell, L.E., and Young, E.M., " <i>Process Equipment Design</i> ", Wiley Eastern, 1968.
3.	Sinnott. R.K, Coulson & Richardson's, "Chemical Engineering", Volume 6, 3rd Edn., Butterworth Heinemann, New Delhi, 1999.
4.	Bhattacharya B C, Chemical Equipment Design , CBS publishers.
5.	Dawande S D, " Process Equipment Design" DENETT publishers

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

CHEMICAL REACTION ENGINEERING-II		
Designation: Professional Core		
Course Pre-requisites:		
Students should have basic knowledge of		
1	Chemical reaction engineering-I	
2	Stoichiometry	
3.	Mass transfer	
TEACHING SCHEME:		
EXAMINATION SCHEME:		
CREDITS ALLOTTED:		
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / Oral :50 Marks	
	Total :150 Marks	
Course Outcomes:		
After completion of the course students would be able to		
1.	a) Write the overall rate equation for heterogeneous reactions. b) Study kinetics and design of fluid solid non catalytic reactions.	
2.	Define the mechanism of catalytic reactions.	
3.	Calculate the height of fluid fluid non catalytic reactions.	
4.	Learn the kinetics and design of solid catalyzed reactions.	
5.	Learn the diffusion and reaction kinetics for porous catalyst.	
6.	Develop the kinetics of nonideal flow.	
Topics covered		
UNIT-I	Introduction to heterogeneous reaction systems: Fluid-solid non catalytic reactions: Types of heterogeneous reactions. Steps involved in developing overall rate equation. Linearizing a nonlinear rate equation and contacting patterns for heterogeneous reaction systems. Proposed models i.e. progressive conversion model and unreacted core model. Steps/resistance involved in these models. Individual and overall/global rate equation. Determination of rate controlling step. Application to design of fluid solid reactor by identifying the type of flow of phases.	(06 Hours)
UNIT-II	Fluid-fluid non catalytic reactions: Kinetic regimes for mass transfer and reaction. Rate equation for different cases/regimes. Clues to kinetic regimes using different methods. Application to design of packed bed reactor.	(06Hours)
UNIT-III	Catalysis (fluid-solid catalytic reactions): The nature of catalytic reactions. The mechanism of catalytic reactions. Steps involved in catalytic reactions. Types of adsorption, Langmuir adsorption isotherm. Synthesizing a rate law rate limiting step, preparation of catalyst and its deactivation, poisoning and regeneration. Nature and mechanism of catalyst reactions.	(06 Hours)
UNIT-IV	Solid catalyzed reactions:	(06Hours)

	Introduction, Rate equation, Film resistance controlling, surface flow controlling, Pore diffusion controlling, Experimental methods for finding rates, construction, operation and design of Catalytic reactors : Fixed bed reactor, Fluidized bed reactor.	
UNIT-V	Diffusion and reaction in porous catalysts: Diffusion and reaction in spherical catalyst pellets. Internal effectiveness factor. Overall effectiveness factor. Estimation of diffusion- and reaction-limited regimes. Mass transfer and reaction in a packed-bed. Chemical vapor decomposition (CVD) reactors.	(06Hours)
UNIT-VI	Basics of Non-ideal Flow: The Residence Time Distribution Functions and their Relationships Role of RTD in determining reactor behavior Experimental methods for finding E, the pulse experiment, the step experiment, relationship between E, F & C curve. Introduction to Dispersion Model, Tank in series model.	(06Hours)

Assignments

1.	List different types of heterogeneous reactions in chemical industry.
2.	Write a report on “ Importance of heterogeneous reactions in Chemical Industry”
3.	Select any five industrial heterogeneous reactions and write rate equations for the reactions.
4.	Give power point presentation on models for heterogeneous reactions.
5.	Design a reactor for fluid solid non catalytic reactions.
6.	Do the experiments on Reactor lab software.
7.	Give power point presentation on different types of adsorption isotherms.
8.	Solve any five old question papers.
9.	Solve ten problems on kinetics and design of fluid fluid non catalytic reactions.
10.	List out different types of industrial catalyst with characteristics.
11.	Draw different types of contacting patterns for heterogeneous reactions used in industry.
12.	Give a presentation on any reactor used for heterogeneous reactions in industry
13.	Write a report on research (review) paper on reactors used for heterogeneous reactions.
14.	Industrial visit to a chemical industry.
15.	Write a report on industrial visit. Give emphasis on details of reactor.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.

1.	To study residence time distribution in packed bed reactor.
2.	To study residence time distribution in plug flow reactor.
3.	To study residence time distribution in continuous stirred tank reactor.
4.	To study CSTR PFR in series.
5.	To study CSTR in series.
6.	Determination Surface area of catalysts.
7.	Determination of bulk density, apparent density, and true density of catalyst.
8.	Determination Pore volume of catalysts.

Text Books/References:	
1.	Levenspiel Octave. "Chemical Reaction Engineering," Wiley Eastern Publications
2.	Smith J.M. "Chemical Engineering Kinetics," McGraw-Hill Publications
3.	Fogler H.S. "Elements of Chemical Reaction Engineering," Eastern Economy Publications
4.	Carberry & Verma "Chemical and Catalytic Reaction Engineering"
5.	H. Scott Fogler "Elements of Chemical Reaction Engineering"
6.	Doraiswamy L.K. and Sharma M.M. "Heterogeneous Reactions: Analysis Examples and reactor design." Vol.1 & 2.
7.	C.G. Hill. "An Introduction to Chemical Reaction Kinetics & Reactor Design."
8.	Dawande, "Principles of Reaction Engineering." Denett publications
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

PROCESS INSTRUMENTATION AND INSTRUMENTAL METHODS OF ANALYSIS		
Designation: Professional Core		
Course Pre-requisites:		
Students should have		
	Basic knowledge of Mathematics.	
TEACHING SCHEME:		
EXAMINATION SCHEME:		
CREDITS ALLOTTED:		
Lectures: 3 Hour/Week	End Semester Examination: 60 Marks	Theory : 03
Tutorial : 2 Hour /Week	Unit Test: 20 Marks	Practical : 01
Total: 5 Hour /Week	Continuous Assessment: 20 Marks	Total credits: 04
	TW/Practical: 25 marks	
	Total : 125 Marks	
Course Outcomes:		
After completion of the course students will be able to		
1.	To explain the need of process instrumentation and process control in chemical industries.	
2.	To describe various chemical analysis instruments.	
3.	To explain conductometry, turbidimetry and refractometry.	
4.	To describe chromatography methods.	
5.	To develop an ability to use theorems to compute the Laplace transform, inverse Laplace transforms. To calculate the transfer functions for first order and second order systems.	
6.	To explain various control action for first order and second order system.	
Topics covered		
UNIT-I	Introduction: Basic Concepts and characteristics of measurement system, various elements of instrument, performance characteristics. Temperature measurement: Introduction, methods of temperature measurement by expansion thermometers, filled system thermometers, electrical temperature instruments, pyrometers. Calibration of Thermometers Level measurement: Displacers, ultrasonic, microwaves, laser light.	(06 Hours)
UNIT-II	Introduction to instrumental methods of analysis: General Introduction, classification of instrumental methods, spectroscopy, properties of electromagnetic radiation, pH metry, Karl Fischer Titration. Visible Spectrophotometry & Colorimetry: Deviation from Beer's law, instrumentation applications. Molar compositions of complexes, examples.	(06 Hours)
UNIT-III	Conductometry: Introduction, laws, conductance, measurements, types of conductometric titrations, applications, advantages and disadvantages. Nephelometry and Turbidimetry: Introduction, theory, comparison with spectrophotometry, instrumentation, applications. Refractometry: Introduction, Abbe refractometer, instrumentation, applications.	(06 Hours)

UNIT-IV	<p>Chromatography: Introduction, types, theoretical principles, theories of chromatography, development of chromatography, qualitative and quantitative analysis, applications and numerical.</p> <p>Gas Chromatography: Introduction, principles of gas chromatography, gas liquid chromatography, instrumentation, evaluation, retention volume, resolution. Branches of gas chromatography, applications and numerical.</p> <p>High Performance (Pressure) Liquid Chromatography: Introduction, principles, instrumentation, apparatus & materials, column efficiency and selectivity, applications.</p> <p>GC-MS, LC-MS.</p>	(06 Hours)
UNIT-V	<p>Process dynamics: Introduction, tools of dynamics analysis, ideal forcing function, input output model, transfer function models, proportion of transfer function, poles & zeros of transfer function with qualitative response, dynamic behavior of pure integrator, pure gain, first order & second order systems (with or without dead time), physical example of these systems.</p>	(06 Hours)
UNIT-VI	<p>Introduction to feedback control: Final Control Elements - Valve characteristics. Instrumentation symbols. Introduction to Process Flow Diagram (PFD) and Piping & Instrumentation Diagram (P&ID).</p> <p>Control theory basics: The control loops, process control terms, components of control loops, basic control action i.e. on-off, P, I, D, PI, PD, PID for 1st order process control loops and 2nd order response.</p>	(06 Hours)

List of Experiments:

Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.

1.	To Study the characteristics of On-Off Controller.
2.	Calibration of Bimetallic thermometer.
3.	Gas Chromatography.
4.	High Performance Liquid Chromatography.
5.	UV Spectrophotometer.
6.	Dynamic behavior of non interacting system.
7.	Dynamic behavior of interacting system.
8.	Mercury Thermometer With well and Without Well.
9.	Conductivity meter.
10.	PH meter analysis.
11.	Manometer Tuning.
12.	To Study the Thermocouple.
13.	Calibration of RTD.

Assignments:

1.	Students have to visit chemical industry and prepare a detailed report on various instruments used for process variable measurement.
2.	Students have to visit chemical industry and prepare a detailed report on various instruments used

	for chemical analysis.
3.	Watch NPTEL video and make report on various instruments used for process variable measurement.
4.	Presentation on instruments used for process variable measurement.
5.	Group discussions on instruments used for process variable measurement.
6.	To find Transfer Function for 1 st order and 2 nd order Instrument or process.
7.	Draw the Control Loop for HE for different process variable control.
8.	Draw the Control Loop for Batch Reactor for different process variable control.
9.	Draw the Control Loop for CSTR for different process variable control.

Text Books/References:

1	S.K.Singh, "Industrial Instrumentation & Control", Tata McGraw Hill publishing company ltd, New Delhi, 2000
2	D. Pastranabis, "Principals of industrial instrumentation", 2nd edition, Tata McGraw 4 Hill publishing company ltd, New Delhi, 2003
3	Eckman D.P. "Industrial Instrumentation", Willey Eastern Ltd, New Delhi, 1984.
4	A.C. Shrivastav "Techniques in Instrumentation", New Delhi, 1984.
5	W.Boltan, "Instrumentation and Process Measurement", Orient Longman Ltd, Hyderabad, 1st Edition, 1993.
6	Willard H.H, "Instrumental methods of analysis", 6th Edition, CBS Publication New Delhi 1986
7	Galen W. Ewing, "Instrumental Methods of Chemical Analysis", 5th Edition, McGraw Hill Book Company, Singapore, 1990
8	D. A. Skoog, "Principal of Instrumental Analysis", Southern Collage Publication, Japan 1984
9	G. R. Chatwal, S.K. Anand, "Instrumental method of chemical analysis", 5th Edition, Himalaya Publishing House, Mumbai 2002.
10	Ray Choudhuri and Ray Choudhuri "Process Instrumentation, Dynamics and control for Engineers", 1st Edition, Asian Books Pvt Ltd, New Delhi, 2003.
11	B.G. Liptak, "Instrument Engineers Handbook" , 4 th Edition , CRC Press, 2005.

Syllabus for Unit Test:

Unit Test -I	UNIT – I, II, III
Unit Test -II	UNIT – IV, V, VI

COMPUTER PROGRAMMING FOR CHEMICAL ENGINEERING - II

Designation: Computing

Course Pre-requisites:

Students should have basic knowledge of

- | | |
|---|---|
| 1 | Computer fundamentals |
| 2 | Computer Programming for Chemical Engineering-I |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical : 2 Hour /Week	Term work / practical : 50 Marks	Practical : 01
		Total credits : 01

Course Outcomes:

After completion of the course students will be able to

- | | |
|----|--|
| 1. | Apply the knowledge of constant, variables, data types and various standard input output functions to write C-programs. |
| 2. | Prepare a flow chart and write C-programs using control constructs and looping statements. |
| 3. | Explain the concept of single dimensional and multidimensional arrays and write C-programs for single dimensional arrays, multidimensional arrays. |
| 4. | Write C-programs using string. |
| 5. | Explain the concept of pointer and write C-programs using pointers. |
| 6. | Apply the knowledge of C-programming language, CHEMCAD, MATLAB for chemical engineering calculations. |

Term Work:

Term work will consist of the programs/practicals listed below, out of which any eight programs/practicals are to be performed in laboratory by the students.

- | | |
|---|---|
| ➤ | <p>C-Programming Language: Introduction, Character sets, constant, variables and <u>Data Types</u>: integer, float, double, char, string. <u>Operators</u>: arithmetic, relational, logical, increment and decrement, assignment, conditional. Standard input-output functions: printf (), scanf (), getch () or getchar().</p> <p>1. Programs based on standard input-output functions used in C-Programming.</p> |
| ➤ | <p><u>Control statements</u>: programs using if statement, if-else statement, goto statement and switch-case statement.</p> <p>2. Programs based on if-else statements.
3. Programs based on goto statements.
4. Programs based on switch-case statements.</p> |
| ➤ | <p><u>Loop statements</u>: programs using while loop, do-while loop and for loop.</p> <p>5. Programs based on while loop.
6. Programs based on do-while loop.
7. Programs based on for loop.
8. Programs to solve chemical engineering problems.</p> |
| ➤ | <p><u>Arrays</u>: single dimensional and multi-dimensional arrays.</p> |

	9. Programs based on single dimensional arrays. 10. Programs based on multi-dimensional arrays.
➤	<u>String:</u> programs using string. String functions: strlen()/ strcpy()/ strrev()/ strcat ()/strlwr ()/strupr ()/ strcmp (). 11. Programs based on strings and string functions. 12. Programs based on string functions.
➤	<u>Pointers:</u> programs using pointers. Use of * and & operators. Pointer arithmetic's. Use of pointers <u>Pointer and function:</u> parameter passing to function by reference and by value. File handling, Linked list 13. Programs based on pointers and function
➤	<u>Application of C-programming language, CHEMCAD and MATLAB for Chemical Engineering:</u> various calculations and solutions in Chemical Engineering. Term work includes programs based on following unit operations 13. Design of co-current and counter current heat exchanger 14. Design of Distillation column 15. Design of Mixed Flow Reactor 16. Design of Evaporator etc.
In addition to these above stated programs / practicals concern faculty member may design his/her own programs / practicals.	
Text Books/References:	
1.	Kanetkar, Y.C.; Let Us C, 4 th revised edition, BPB Publications
2.	Cooper, M.; The Spirit of 'C' – An introduction to modern programming, Jaico Publisher
3.	Rajaraman, V.; Fundamentals of Computers, Prentice Hall of India
4.	Balagurusamy, E.; Programming in ANSY C, 2 nd Edition, McGraw Hill Publication
5.	Sanders, D. H.; Computers Today, McGraw Hill Publications

Bharati Vidyapeeth University
College of Engineering
Department of Chemical Engineering
CBCS Structure: 2014- 2015
Sem VII and Sem VIII

Bharati Vidyapeeth University
Faculty of Engineering and Technology
Programme: B. Tech. (Chemical) - Semester VII - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hours/week)			Examination Scheme (Marks)							Credit		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW/O	TW/P	Total	Theory	P/D	Total
						Unit Test	Attendance	Assignments						
1	Elective-III	3	2	-	60	20	10	10	50	-	150	3	1	4
2	Chemical Process Equipment Design- II	3	2	-	60	20	10	10	50	-	150	3	1	4
3	Plant Utilities and Process Safety	3	-	-	60	20	10	10	-	-	100	3	-	3
4	Process Dynamics and Control	3	2	-	60	20	10	10	-	50	150	3	1	4
5	Multiphase Reaction Engineering	3	-	-	60	20	10	10	-	-	100	3	-	3
6	Industrial Training	-	-	-	-	-	-	-	50	-	50	-	3	3
7	Project [Stage I]	-	4	-	-	-	-	-	100	-	100	-	4	4
Total		15	10	-	300	100	50	50	250	50	800	15	10	25

Bharati Vidyapeeth University
Faculty of Engineering and Technology
Programme: B. Tech. (Chemical) - Semester VIII - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hours/week)			Examination Scheme (Marks)							Credit		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW/O	TW/P	Total	Theory	P/D	Total
						Unit Test	Attendance	Assignments						
8	Elective-IV	3	2	-	60	20	10	10	50	-	150	3	1	4
9	Plant Design, Project Engineering and Costing	3	2	-	60	20	10	10	50	-	150	3	1	4
10	Industrial Management	3	-	-	60	20	10	10	-	-	100	3	-	3
11	Chemical Process Modeling and Simulation	3	2	-	60	20	10	10	-	50	150	3	1	4
12	Seminar	-	-	2	-	-	-	-	50	-	50	2	-	2
13	Project [Stage II]	-	6	-	-	-	-	-	200	-	200	-	8	8
Total		15	6	8	240	80	40	40	350	50	800	14	11	25

Total Credits

Semester VII : 25

Semester VIII : 25

Grand Total : 50

Elective-I	Elective-II
1. Combustion Engineering 2. Advanced Material Science 3. Multiphase Flow 4. Rheology	1. Biofuel Technology 2. Polymer Technology 3. Food Technology 4. Nanomaterials
Elective-III	Elective-VI
1. Petroleum Refinery Engineering 2. Membrane Separation 3. Fuel Cell Technology 4. Advanced Oxidation Processes	1. Hazardous Waste Management 2. Bio-separations 3. Energy Engineering 4. Green Technology

Bharati Vidyapeeth University
College of Engineering
Department of Chemical Engineering
CBCS Syllabus: 2014-2015
Sem VII and Sem VIII

CHEMICAL PROCESS EQUIPMENT DESIGN-II

Designation: Professional Core

Course Pre-requisites:

Students should have basic knowledge of

- | | |
|---|--|
| 1 | Unit Operations involved in chemical engineering |
| 2 | Heat transfer and Mass transfer and Mechanical operation equipments. |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Drawing : 2 Hour /Week	Unit Test: 20 Marks	Drawing: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / practical:50 Marks	
	Total :150 Marks	

Course Outcomes:

After completion of the course, students would be able to

- | | |
|----|---|
| 1. | Design evaporator and crystallizers. |
| 2. | Design Dryers and Filters. |
| 3. | Design different columns used in distillation/Absorption. |
| 4. | Identify and design different packings used in packed columns. |
| 5. | Calculate height of packing, column diameter in packed columns. |
| 6. | Understand importance of process safety and Hazard Analysis. |

Topics covered

UNIT-I	<p>Evaporators & Crystallizers</p> <p>Classification of vaporizing equipment, evaporators such as kettle, thermosiphon, vertical, horizontal etc., Chemical evaporators, natural circulation & forced circulation evaporators, the calculation of chemical evaporators, crystallizers, types of crystallizers, design considerations. Case studies on evaporators.</p>	(06 Hours)
UNIT-II	<p>Filters & Dryers:</p>	(06 Hours)

	Various types of filters like vacuum filters, pressure filters, centrifuges and rotary drum filters, design of rotary drum filters, including design of drum, shaft, bearing and drive system. Types of dryers, batch type dryers, continuous dryers.	
UNIT-III	Tray Column Design Design of plate column- distillation columns, design variables in distillation, design methods for binary systems, plate efficiency, approximate column sizing, plate Contactors, plate hydraulic design.	(06 Hours)
UNIT-IV	Packed Column Design Choices of packing, types of packing, packed bed height (distillation and absorption), HETP, HTU, NTU, Cornell's method, Onda's method, column diameter, column internals, column auxiliaries.	(06 Hours)
UNIT-V	Piping Design I Definition and Application of Piping, Classification of pipe, Piping Material Specifications, Manufacturing Method, Weight and Size Standards STD , Extra Strong XS , Double Extra Strong XXS etc. Pressure Temperature Rating System, Pipe Fittings, Types of Flanges, Types of Valves,	(06 Hours)
UNIT-VI	Piping Design II Codes and Standards, Piping elements, Pipe Hydraulics and Sizing, Mechanical Design, Fundamentals Piping Drawing, Basics Development of Plot Plan, Equipment and Piping Layout, Stress Analysis Static and Dynamic, Selection and Design of Supports and Expansion Joints, Transient Fluid flow Analysis. Friction Factor, Moody Diagram, Minor Losses in Piping ,Equivalent Length Method & Loss Coefficient Method,	(06 Hours)

Assignments	
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1.	Write a report on different evaporators and crystallizer
2.	Types of Dryers and filters.
3.	Designing of Distillation column.
4.	Designing of Absorption column.
5.	Importance of piping design.

6.	Pipe sizing and supports
7.	Report on Equivalent Length Method & Loss Coefficient Method,
8.	Solve old (last five years) question papers with reference to particular topic.
9.	Prepare a model for any of the equipment
10.	Prepare a report on advance equipments which are newly introduced in the current year.
11.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
12.	Solve old (last ten years) GATE question papers with reference to design subject.
13.	Group discussion on the recent advances in equipment design
14.	Write a report on your visit to research and development laboratory of national/international repute.
15.	Technical interview based on the knowledge of design

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of the Practicals and drawings listed below, out of which any eight are to be done by students. Any one drawing in Autocad.

1.	Design and drawing of evaporator.
2.	Design and drawing of crystallizer.
3.	Design and drawing of rotary filter.
4.	Detailed design and drawing of piping layout.
5.	Detailed design and drawing of spray dryer..
6.	Detailed design and drawing of distillation column.
7.	Detailed design and drawing of absorption column..
8.	Study various packings.
9.	Design and calculations of packed column.
10.	Study the contains of stress analysis of pipes.
11.	Detailed design and drawing of piping supports.

Text Books/References:

1.	Joshi. M.V, and Mahajani. V.V, "Process Equipment Design," 3rd Edn. Macmillan India Limited, New Delhi, 1996
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2.	Bownell, L.E., and Young, E.M., " <i>Process Equipment Design</i> ", Wiley Eastern, 1968.
3.	Sinnott. R.K, Coulson & Richardson's, "Chemical Engineering", Volume 6, 3rd Edn., Butterworth Heinemann, New Delhi, 1999.
4.	Bhattacharya B C, Chemical Equipment Design , CBS publishers.
5.	Dawande S D, " Process Equipment Design" DENETT publishers

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

MULTIPHASE REACTION ENGINEERING		
Designation: Professional Core		
Course Pre-requisites:		
Students should have basic knowledge of		
1	Thermodynamics	
2	Transport Processes	
<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS ALLOTTED</u>
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
	Unit Test : 20 Marks	Practical: 01
	Continuous Assessment : 20 Marks	Total credits: 04
	Total :100 Marks	
Course Outcomes:		
After completion of the course students would be able to		
1	Recognize the importance of multiphase reactors.	
2	Determine chemical reaction equilibrium constant and rate controlling step for heterogeneous system.	
3	Recognize the effect of system and operating parameters on the hydrodynamics of multiphase reactors.	
4	Recognize the significance of mixing and determine extent of mixing in multiphase system	
5	Determine the effect of system, geometric, and operating parameters on heat and mass transfer coefficients.	
6	Enumerate the effect of hold up in the design of multiphase reactors	
Topics covered		
UNIT-I	Introduction to Multiphase Reactor Engineering Types, Classification, Application of Industrial Importance. Two case studies	(06 Hours)
UNIT-II	Thermodynamics and kinetics Notable industrial heterogeneous systems and thermodynamic role. Application of equilibrium criteria to chemical reactions. The Gibbs energy change and equilibrium constant. Estimation of equilibrium constant for heterogeneous system by defining standard state of the phases involved. Determination of rate controlling step: intrinsic kinetics for heterogeneous systems	(06 Hours)
UNIT-III	Hydrodynamic Characteristics Hydrodynamic characteristics of different multiphase reactors: Mechanically	(06 Hours)

	Agitated Contactors (MAC), Bubble Columns, Slurry Reactors, Fluidized Beds, Loop Reactors and Modified Versions	
UNIT-IV	Mixing Studies Effect of geometrical, system, and operating parameters on phase mixing in multiphase reactors. Quantification of phase mixing. Development of a mathematical model.	(06 Hours)
UNIT-V	Heat Transfer and Mass Transfer Studies Effect of geometrical, system, and operating parameters on heat transfer coefficient in multiphase reactors. Quantification of heat transfer coefficient. Application of correlations available to different multiphase reactors. Experimental techniques used for estimation of mass transfer coefficient and selection of suitable technique for a multiphase reactor. Effect of geometrical, system, and operating parameters on mass transfer coefficient in multiphase reactors. Quantification of mass transfer coefficient. Application of correlations available to different multiphase reactors.	(06 Hours)
UNIT-VI	Design Aspects of Multiphase Reactors Pressure drop, Fractional phase hold- up, mass and heat transfer coefficient, extent of mixing, etc.	(06 Hours)

Assignments:

1.	Enumerate any one industrial relevant multiphase system
2.	Refer any one recently published article related to multiphase system and make presentation
3.	Estimate the power requirement for a given impeller
4.	Visit to any chemical process industry to study atleast one multiphase system
5.	List the pressure measurement tools available in the market
6.	List and enumerate physical significance of the empirical correlations available in the literature to estimate liquid dispersion coefficient.
7.	List and enumerate physical significance the empirical correlations available in the literature to estimate mass transfer coefficient.
8.	Refer any review article perati
9.	Technical interview based on the knowledge of analytical techniques.
10.	List out all the principles of the analytical techniques.
11.	Perform any one chromatographic technique.
12.	Find out different types of proteins with structure.
13.	Prepare a report on downstream processing.

In addition to these above stated assignments concerned faculty member may design his/her own

assignments.

Text Books/References:

1	L. K. Doraiswamy and M. M. Sharma, "Heterogeneous Reactions", 2 nd Edition, Volume I and II.
2	G. B. Tatterson, "Fluid Mixing and Gas Dispersion in Stirred Reactors", 10 th Edition, Academic Press, London, 1994
3	W. D. Deckwer, "Bubble Column Reactors", Cambridge University Press, New York, 2000
4	DiazoKunji and O. Levenspiel, "Fluidization Engineering", 2 nd Edition, Butterworth Heinemann, 1991.
5	J. F. Devidson and Harrison, "Fluidization", 10 th Edition, Academic Press, London, 1994

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

PLANT UTILITIES AND PROCESS SAFETY

Designation: Professional Core

Course Pre-requisites:

Students should have knowledge of

1. Chemical Technology, Chemical Process Industries

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
	Unit Test : 20 Marks	Total credits : 03
	Continuous Assessment : 20 Marks	
	Total : 100 Marks	

Course Outcomes:

After completion of the course students will be able to

1. Identify the common utilities required for Chemical Plant.
2. Express various types of boilers and their selection.
3. Analyze the importance of insulation and air pressure in process.
4. Identify and analyze the hazards.
5. Integrate the theoretical and practice knowledge to understand hazards activities.
6. Implement the safety designs and procedures.

Topics covered

UNIT - I	<p>Identification of common plant utilities</p> <p>Role and importance of plant utilities in chemical plants, Water, compressed air, steam, vacuum, refrigeration, venting, flaring and pollution abating. Water and its quality, storage and distribution for cooling and fire fighting, Water resource management.</p>	(06 Hours)
UNIT - II	<p>Steam Generation and Utilization</p> <p>Steam generation and its application in chemical process plants, distribution and utilization; Types of boilers and their operation; steam economy, Steam condensers and condensate utilization, Steam generation by utilizing process waste heat using thermic fluids, Selection and sizing of boilers; waste heat</p>	(06 Hours)

	boilers.	
UNIT - III	<p>Compressors, blowers and Vacuum Pumps</p> <p>Compressors, blowers and vacuum pumps and their performance characteristics; Methods of developing vacuum and their limitations, material handling under vacuum, Creation of low pressure/vacuum by pumps and ejectors.</p> <p>Refrigeration and HVAC</p> <p>fundamentals of refrigeration, refrigerant management and safety, Selection of refrigerants; Processes of HVAC, Psychometric Chart and Air-Conditioning System, Ventilation and Indoor Air Quality.</p>	(06 Hours)
UNIT - IV	<p>Elements of Safety</p> <p>Elements of safety, safety and site selection; Plant layout and unit plot planning; Definition of risk and hazard, Identification and assessment of the hazards, distinction between hazards and risk, Industrial hygiene, toxicological studies, Hazard operability (HAZOP) hazard analysis (HAZAN); Safety Integrity Level (SIL) Studies; Technology selection and transfer, choosing the right process.</p>	(06 Hours)
UNIT - V	<p>Safety in Chemical Processes</p> <p>Introduction, Chemical Process classification, Process design and safety parameters. Safety parameters in the process design of phenol from cumene, safety in polyvinyl chloride plant.</p> <p>Chemicals and their Hazards</p> <p>Acetonitrile, acetyl chloride, butyl amine, acrylamide, acrylonitrile, allyl alcohol, benzene, bromine, isopropyl alcohol, acetaldehyde, ethylene oxide, butane, n-hexane, anhydrous ammonia, acetone, toluene, p-xylene, acetic acid, monochloro benzene, oleum, carbon monoxide.</p>	(06 Hours)
UNIT - VI	<p>Safety Procedures and Designs</p> <p>Process Safety Hierarchy, Process Safety Strategies, Managing Safety, Safety Reviews and Accident Investigations, Designs for Process Safety, Inherently Safer Designs, Controls: Double Block and Bleed, Safeguards or Redundancy, Block Valves, Explosion Suppression, Designs for Runaway Reactions.</p>	(06 Hours)

Tutorials/Assignments:	
The internal assessment shall consist of minimum SIX assignments from the following list	
1.	Prepare a report on safety issues of any one particular industry.
2.	Prepare Utility Line Diagram (ULD) for typical process.
3.	Write a report on HAZOP study of one particular hazard.
4.	Prepare a report on the color codes for utility pipelines in chemical plants.
5.	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments
6.	Write a report on “ Importance of Industrial Hygiene in Chemical Industry”
7.	Group discussions on any of the following topics: a) Importance of various utilities in chemical industries. b) Process safety in petroleum industry c) HAZOP Vs HAZAN
8.	Design a manual for application of utilities for various plants.
9.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
10.	Write a technical report on HAZAN study of any one particular threat.
11.	Elaborate the role of safety engineer in Chemical industry.
12.	Organizing a industrial visit to nearby industry to understand the plant utilities and safety measures.
13.	Write a report on your visit to research and development laboratory of national/international repute.
Text Books/ References:	
1.	Chemical Process Plants-Managing Plant Utilities, Volume One
2.	Chemical Process Plants-Managing Plant Utilities, Volume Two
3.	Robert McDowall, “Fundamentals of HVAC Systems”, Butterworth-Heinemann Elsevier, First edition 2006
4.	John J. McKetta, “Encyclopedia of Chemical Processing and Design“, Volume 44 CRC Press, 1993

5.	Daniel A. Crowl, Joseph F. Louvar, “Chemical Process Safety Fundamentals with Applications”, Prentice Hall, Third Edition, 2011
6.	Trevor A. Kletz, “Hazop & Hazan: Identifying and Assessing Process Industry Hazards”, Fourth Edition, CRC Press, 1999.
Syllabus for Unit Test:	
Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI

PROCESS DYNAMICS AND CONTROL

Designation: Professional Core

Course Pre-requisites:

Students should have

1. Basic knowledge of Mathematics.
2. Process Instrumentation and Instrumental Methods of Analysis

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Tutorial : 2 Hour /Week	Unit Test: 20 Marks	Practical : 01
Total: 5 Hour /Week	Continuous Assessment: 20 Marks	Total credits: 04
	TW/Practical: 50 marks	
	Total : 150 Marks	

Course Outcomes:

After completion of the course students will be able to

1. To give details of basic control action and develop mathematical models for control purpose.
2. To illustrate behavior of chemical processes.
3. To elucidate transient response of system.
4. To describe stability of the system.
5. To analyze frequency response of process.
6. To apply knowledge for controller selection and tuning.

Topics covered

UNIT-I	<p>Introduction: Block diagrams, closed loop and open loop control systems, Basic control actions.</p> <p>Open Loop Response of Simple Systems: Dynamics of first order systems using transfer functions; Various first order responses such as, a thermometer bulb. General response to step, ramp, impulse, and sinusoidal inputs; Concentration and temperature responses of a stirred tank</p>	(06 Hours)
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UNIT-II	Dynamic Behavior of Chemical Processes: Linearization of liquid level systems; Response of a pressure system, second order systems, the manometer; Response of interacting and non interacting systems. Transfer functions and the input-output models. Dynamics and analysis of first, second and higher order systems.	(06 Hours)
UNIT-III	Transient Response of Control Systems: Servo and regulated operation, General equations for the transient response, proportional control of a signal capacity process; Integral control, Proportional-integral control and derivative action.	(06 Hours)
UNIT-IV	Stability: Concept of stability, Stability criterion, Routh test for stability. Root Locus Analysis: Concept of root locus, Locus diagram.	(06 Hours)
UNIT-V	Frequency Response Analysis: First order systems, Bode diagram, and Complex numbers to get frequency response. Nyquist plot.	(06 Hours)
UNIT-VI	Advanced Control Schemes: Controller selection and tuning, Control valve characteristics and sizing, cascade control, Feed forward and ratio control. Introduction of digital control system.	(06 Hours)

List of Experiments:

Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.

1.	To study the closed loop pressure control for P control action and calculate offset.
2.	To study the closed loop pressure control for PI action PID action.
3.	To study optimizing performance for pressure control trainer by using tuning technique with help of PID action.
4.	To study closed loop system for servo problem having PI action consideration.
5.	To study the closed loop flow controller
6.	To study the closed loop level controller

7.	To study the ratio controller
8.	To study the cascade controller
9.	Root locus analysis on software (Ex. MATLAB)
10.	Bode plot on software (Ex. MATLAB)
11.	Nyquist plot on software (Ex. MATLAB)
12.	PID control loop simulation for a first order process (Ex. SIMULINK)

Assignments:

1.	Students have to visit chemical industry and prepare a detailed report on various controllers used in industry.
2.	Watch NPTEL video and make report on various topics in process dynamics and control
3.	Group discussions on controllers used for chemical processes.
4.	To find Transfer Function for 1 st order and 2 nd order process.
5.	Draw the Control Loop and Block Diagram for different chemical processes.
6.	Solve numerical questions in last three year question papers.
7.	Write note on Advance Controllers.
8.	Explain Digital Controllers.
9.	Explain IMC Controller in Detail.
10.	Explain MPC Controller in Detail.
11.	Explain process Identification of any Chemical Process in detail
12.	Explain Optimal control of any one Chemical Process.

Text Books/References:

1	G. Stephanopoulos, <i>Chemical Process Control: An introduction to theory and practice</i> , Prentice Hall, New Jersey, 1984.
2	P. Harriott, <i>Process Control, Reprint of text</i> , ed. Tata McGraw Hill, 1983.
3	D. R. Coughanowr, <i>Process system analysis and control</i> , 2nded, McGraw Hill, 1991.
4	Seborg, D.E., Edgar, T.F. and Mellichamp, "Process dynamics and control," Wiley, New York, D.A. 2003.

Syllabus for Unit Test:

Unit Test -I	UNIT – I , II, III
Unit Test -II	UNIT – IV, V, VI

CHEMICAL PROCESS MODELING AND SIMULATION

Designation: Professional Core

Course Pre-requisites:

Students should have basic knowledge of

1	Heat transfer, Mass transfer, Chemical reaction engineering, Process Dynamics and Control
2	Process Calculation
3	Mathematics including integration and derivation

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / practical:50 Marks	
	Total :150 Marks	

Course Outcomes:

After completion of the course students would be able to

1	Express mass balance, energy balance and momentum balance equation for various chemical process systems.
2	Express models for heat transfer equipment such as double pipe heat exchangers, shell and tube heat exchanger, etc.
3	Develop models for distillation columns, etc.
4	Develop models for reaction equipment such as batch reactor, CSTR, etc.
5	Recognize simulation approaches.
6	Simulate model equations using numerical methods.

Topics covered

UNIT-I	<p>Introduction to modeling: Introduction, definition of modeling, different types of models, applications of mathematical modeling, principles of formation, lumped model, distributed parameter model, Fundamental laws: continuity equation, energy equation,</p>	(06 Hours)
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	equations of motions, transport equations, equations of state, chemical kinetics.	
UNIT-II	Modeling of Heat transfer equipment: Double pipe heat exchanger, shell and tube heat exchanger, two heated tanks, single component vaporizer, steady-state heat Conduction through a hollow cylindrical pipe, heat transfer with coil	(06 Hours)
UNIT-III	Modeling of distillation columns: Ideal binary distillation column, multi component non-ideal distillation column, batch distillation with holdup, flash distillation, packed column design	(06 Hours)
UNIT-IV	Modeling of reactors: Two phase CSTR with heat removal, series of isothermal constant holdup CSTRs, CSTRs with variable holdups, Gas phase-pressurized CSTR, Non-Isothermal CSTR, Batch reactor, gas liquid bubble reactor, semi-batch reactor.	(06 Hours)
UNIT-V	Introduction to simulation: Introduction to simulation, definition of simulation, approaches of simulation: modular approaches, equation-solving approach, decomposition of networks: tearing algorithms, algorithms based on the signal flow graph, algorithms based on reduced digraph.	(06 Hours)
UNIT-VI	Simulations using numerical methods: Use of numerical methods to solve mathematical model equations of Gravity flow tank, Three CSTRs in series, Non-isothermal CSTR, Binary distillation column, Multi-component distillation column, Batch reactor.	(06 Hours)

Assignments

1	Write a report on the importance of modeling with reference to the process industries.
2	Solve old (last five years) question papers with reference to particular topic.
3	Discuss the importance of modeling and simulation w. r. t. science and engineering
4	Prepare a report on application of modeling and simulation.
5	Give fifteen minute presentation (seminar) on particular topic and prepare a report.
6	Obtain any industrial data for modeling and simulation.
7	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.

8	Discuss different software available for modeling and simulation.
9	Write a technical report on your visit to a process industry with respect to modeling.
10	Group discussion on the recent advances in simulation software.
11	Prepare a report on modeling and simulation of all different chemicals reactors.
12	Technical interview based on the knowledge of Modeling simulation.
13	Students may take any industrial case e.g. manufacturing of Maleic anhydride and solve this case using standard simulation software like Aspen Plus, HYSIS
In addition to these above stated assignments concerned faculty member may design his/her own assignments.	
Term Work:	
Term work will consist of the practicals listed below, out of which any eight practicals are to be performed in laboratory by the students.	
1	Study of gravity flow tank.
2	Study of Batch reactor
3	Simulation of CSTR
4	Simulation of bubble point temperature
5	Simulation of distillation column.
6	Simulation of heat exchanger
7	Simulation of first order reaction system in batch reactor.
8	Simulation of first order reaction system in CSTR
9	Study of a reversible reaction in a batch reactor.
10	Simulation of any model equation.
11	Study of CSTR combination in first order reactions.
For simulation, faculty member may use any suitable simulation software like MATLAB, ASPEN, CHEMCAD, etc. In addition to these above stated practicals concerned faculty member may design his/her own practicals.	
Text Books/References:	
1	W. L. Luyben, Process Modeling Simulation and Control for Chemical Engineers, McGraw Hill, 1990.

2	S.C. Chapra, R.P. Canale, Numerical Methods for Engineers, 6th Edition, Tata-McGraw Hill Publications, 2012.
3	R.E.G. Franks, Modeling and Simulation in Chemical Engineering, Wiley-Interscience, NY, 1972.
4	B.V. Babu, Process Plant Simulation, Oxford University Press, NY 2004.
5	D. Himmelblau, K.B. Bischoff, Process Analysis and Simulation, John Wiley & Sons, 1968

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Syllabus for Unit Test:	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

INDUSTRIAL MANAGEMENT

Designation: Professional Core

Course Pre-requisites:

Students should have basic knowledge of

1	Concept of Management.
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TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Unit Test: 20 Marks

Drawing: 00

Total:3 Hours/Week

Continuous Assessment: 20 Marks

Total credits: 03

Total :100Marks

Course Outcomes:

After completion of the course, students would be able to

- | | |
|----|---|
| 1. | Know the types of business. |
| 2. | Understand the types of organization |
| 3. | Understand the forms of ownership. |
| 4. | Know the concepts of material management. |
| 5. | Know the concepts quality management. |
| 6. | Know the various acts. |

Topics covered

	Outline of Business	
UNIT-I	Types of Business, Industrial sectors Globalization Management Process, Principles of Management, Functions of Management	(06 Hours)
UNIT-II	Organizational Management Organization, Types of organization, Departmentation, Principles of Organization, Forms of ownership	(06 Hours)
UNIT-III	Financial Management Financial Management- Objectives & Functions, Capital Generation &	(06 Hours)

	Management, Budgets and accounts, Taxation (Excise Tax, Service Tax, Income Tax, Value Added Tax and Custom Duty)	
UNIT-IV	Materials Management Inventory Concept, its classification, functions of inventory, ABC Analysis, Economic Order Quantity Concept, graphical representation, determination of EOQ, Standard steps in Purchasing, Modern Techniques of Material Management, Material Resource Planning (MRP), Enterprise Resource Planning (ERP)	(06 Hours)
UNIT-V	Quality Management Quality Management System, Quality Control, Quality Circle, Quality Assurance, Total Quality and TQM, Kaizen, 5'S', 6 Sigma	(06 Hours)
UNIT-VI	Industrial Legislation and Industrial Safety Safety Management, Causes of accidents, Types of Industrial Accidents, Preventive measures, Safety procedures Factory Act, Air (Prevention and Control of Pollution) Act, Minimum Wages Act, Workman Compensation Act.	(06 Hours)
Assignments		
1.	Types of business.	
2.	Globalization in India	
3.	Different principals of management.	
4.	Various types of organization	
5.	Various forms of ownership	
6.	Capital Generation for an organization.	
7.	ABC Analysis.	
8.	Standard purchase	
9.	Material Resource Planning (MRP), Enterprise Resource Planning (ERP)	
10.	Concepts of quality management.	
11.	Total Quality Management (TQM)	
12.	Kaizen approach in Quality management.	
13.	5'S', 6 Sigma	

14.	Factory Act
15.	Minimum Wages Act, Workman Compensation Act
In addition to these above stated assignments concerned faculty member may design his/her own assignments	
Text Books/References:	
1.	Khanna. O.P., “Industrial Engineering & Management” Dhanpat Rai & Sons New Delhi.
2.	Banga T. R. and Sharma S.C. “Industrial Engineering & Management” Khanna Publication
3.	<i>Saxena, S.C.</i> ” Business Administration & Management” SahityaBhavan Agra
4.	Newman W.H., Warren E. K. and McGil A. R., “The process of Management” Prentice- Hall
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

PLANT DESIGN PROJECT ENGINEERING AND COSTING

Designation: Professional Core

Course Pre-requisites:

Students should have basic knowledge of

1 | Chemical Process Industry

2 | Chemical design

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Practical : 2 Hour /Week

Unit Test: 20 Marks

Practical: 01

Total : 5Hours/Week

Continuous Assessment: 20 Marks

Total credits: 04

Termwork / Oral :50 Marks

Total :150 Marks

Course Outcomes:

After completion of the course students would be able to

1. | Select appropriate process for a project.
2. | Differentiate the equipment and able to prepare specification sheet.
3. | Learn basic economic concept, to understand and apply this concepts in the project works undertaken and to chemical engineering situation by solving problem.
4. | Evaluate the project cost including capital investment, product cost and the total project cost.
5. | Solve problem on profitability and breakeven analysis.
6. | Control and schedule of the project using CPME/PERT technique, calculations.

Topics covered

UNIT-I	<p>Introduction: Plant design : Design basis, process selection, material of construction, plant location ,plant layout and installation, safety ,start up ,shut down and operating guidelines ,Preliminary techno economic feasibility report .Complete engineering flowsheet drawing.</p>	(06Hours)
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UNIT-II	Optimization and feasibility of plant design, selection of process equipments: Standard versus special equipment selection criteria, and specification sheets. Importance of Laboratory development pilot plant, Indian boiler regulations, factories act.	(06Hours)
UNIT-III	Cost estimation: Cash flow and cumulative cash position for industrial operations, factors affecting estimation of investment and production cost, total capital investment, fixed and working capital investment & their estimations, type of estimates, cost indexes, method for estimating capital investment. Insurance.	(06 Hours)
UNIT-IV	Estimation of total product cost, Estimation of total product cost: manufacturing cost, general expenses, Manufacturing cost: direct production cost, fixed charges, plant overhead cost. Types of depreciation, Method for determining depreciation: straight line method, decline balance method, sum of the year digit method, shrinking fund method etc, payout period.	(06 Hours)
UNIT-V	Profitability, alternative investments and replacement: Methods for profitability evaluation, Evaluation of Break Even Point and its significance, % rate of return, Practical factors in alternative investment and replacement Studies	(06 Hours)
UNIT-VI	Scheduling and Networking of Project Planning of project schedule by BAR CHART, Inventory control scheduling project using CPM/PERT methods. Network diagramming, earliest start time and earliest finish time, Advantages of CPM, Cost to finish the project earlier than normal cost.	(06 Hours)

Assignments

1.	Write a report on plant design for any company for current year.
2.	Write preliminary feasibility report for any industry.
3.	Draw complete engineering drawing for any process industry.
4.	Prepare specification sheet for equipments for any particular industry.
5.	Give power point presentation of different types of cost for industry.
6.	Draw a chart of how cash flow takes place in chemical industry.

7.	Analyze cost index for last ten years and how it changes.
8.	Understand basic concept of depreciation and apply to any chemical industry and calculate the values.
9.	Apply a critical-thinking and problem-solving approach towards factories act.
10.	Specify materials for construction and estimate the cost of investments for chemical industry.
11.	Write complete report for a chemical industry which should include all the factors related to cost estimation.
12.	Give power point presentation on knowledge of safety in chemical industry.
13.	Give power point presentation on importance of break even analysis.
14.	Prepare one network diagramming by using CPM method.
15.	Gove a power point presentation on CPM and PERT for any particular industry.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of drawing of sheets

	Standard symbols as per IS code
1	Process flow diagram
2	Piping and Instrumentation diagram
3	Plant layout and elevations
4	Utility diagram
5	Piping GA drawing
6	Piping isometrics
7.	Draw any sheet by using Autocad.

Text Books/References:

1.	M.S.Peters and Timmerhaus, "Plant design and Economics for Chemical Engineers", McGraw Hill 3rd Edition.
2.	F.C. Vibrandt and C.E. Dryden, "Chemical Engineering Plant Design", McGraw Hill Fifth Edition..
3.	Coulson & Richardson's Chemical Engineering Volume 6, Butterworth-Heinemann, 1999, 3rd Edition.

4.	Industrial Engineering and Management by O. P. Khanna Dhanpat Rai & Sons, 1985 7 th Edition
5.	Project Engineering: Suhas Mokashi ,Mcmillan Publisher .
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

Bharati Vidyapeeth University
College of Engineering
Elective

Elective III: Advanced Oxidation Processes

Designation: Elective

Course Pre-requisites:

Students should have basic knowledge of

1 | Waste water treatment

2 | Engineering Chemistry

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Practical : 2 Hour /Week

Unit Test: 20 Marks

Practical: 01

Total : 5Hours/Week

Continuous Assessment: 20 Marks

Total credits: 04

Term work / Oral :50 Marks

Total :150 Marks

Course Outcomes:

After completion of the course students would be able to

1. | Demonstrate the mechanism of various advanced oxidation processes (AOPs)

2. | Understand the method of ozonation and photon induced AOPs

3. | Learn the method of heterogeneous photocatalysis and its mechanism

4. | Know the method of homogeneous and heterogeneous Fenton processes and its mechanism

5. | Analyze emerging AOPs and their mechanism

6. | Demonstrate the industrial applications of AOPs

Topics covered

UNIT-I	<p>Introduction to advanced oxidation processes (AOPs) Conventional waste water treatment processes, Fundamentals and background of AOPs for water and wastewater treatment, basic reaction mechanism of AOPs, Role of hydroxyl radicals and their generation, Reaction kinetics and degradation mechanisms of organic pollutants by hydroxyl radicals, Effects of</p>	(06 Hours)
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	process parameters and scavenging media on degradation efficiency, oxidation potential of AOPs, merits and demerits of various AOPs	
UNIT-II	<p>Ozonation and Photo induced AOPs:</p> <p>Ozonation: background and fundamentals, reaction kinetics and mechanisms, Application of homogeneous and heterogeneous catalytic ozonation in water treatment</p> <p>Fundamentals of UV irradiation, Absorption and bond dissociation energy, UV sources and their characteristics, choice of photo source–used in AOPs and their spectral distributions, mechanism of photo induced AOPs.</p> <p>Photo induced AOPs: Oxidation using ultraviolet irradiation and hydrogen peroxide (UV/H₂O₂), oxidation using ultraviolet irradiation and ozone (UV/Ozone), oxidation using combination of ultraviolet irradiation, hydrogen peroxide and ozone (UV/ H₂O₂ /Ozone).</p>	(06 Hours)
UNIT-III	<p>Heterogeneous photo-catalysis</p> <p>Fundamentals of semiconductor photo-catalysis, various semiconductor particles used in photocatalytic applications, visible light driven photo-catalysts, photocatalytic reactions and kinetic studies and introduction to nano photo-catalysis.</p> <p>Photocatalytic reactors, solar energy driven or artificial light photo reactors, solar collectors, design of slurry or supported catalyst reactors, comparing reactor efficiencies and reuse of catalyst.</p>	(06 Hours)
UNIT-IV	<p>Homogeneous and heterogeneous Fenton processes</p> <p>Fenton process, photo-fenton process, advanced fenton process, the mechanism of fenton based processes, merits and demerits of homogeneous and heterogeneous Fenton processes.</p>	(06Hours)
UNIT-V	<p>Emerging AOPs</p> <p>Electrochemical oxidation, Ultrasound processes; principles of sonochemistry and acoustic cavitation, ultrasound cavitation and its combination with other AOPs, synergistic and antagonistic effects, hydrodynamic cavitation and its combination with other AOPs.</p>	(06 Hours)

UNIT-VI	Industrial applications of AOPs Application of AOPs for industries such as textile, petroleum, pharmaceutical, petrochemical industry etc., decontamination of ground water, cost or economic analysis of various AOPs	(06 Hours)
Assignments		
1.	Write a report on current scenario of advanced oxidation processes.	
2.	Evaluate the use of solar or visible light driven photocatalysts.	
3.	Estimate synergistic effect of combining AOPs with cavitation based processes	
4.	Give power point presentation on semiconductor photocatalysis	
5.	Analyze the industrial applications of AOPs.	
6.	Understand the reaction mechanism of AOPs	
7.	Apply a critical-thinking towards scale-up aspects of AOPs.	
8.	Analyze recent advances in synthesis of mixed oxide photocatalysts.	
9.	Write a technical report on your visit to a waste water treatment plant.	
10.	Give power point presentation on the applications of emerging AOPs	
11.	Group discussion on the recent advances in advanced oxidation processes.	
12.	Make a complete chart of various operations involved in waste water treatment.	
13.	Assess the environmental or safety norms for disposal of waste water.	
In addition to these above stated assignments concerned faculty member may design his/her own assignments		
Term Work:		
Term work will consist of the Seminar :		
	Seminar should be based on recent advances in AOPs. Students may undertake studies in water and waste water treatment using AOPs. Design and scale-up aspects can be studied in detail. Termwork should be based on the technical report on these studies carried out by individual or small group of students.	
Text Books/References:		
1.	Simon Parsons, Advanced oxidation processes for water and wastewater treatment, IWA Publishing,	

	2004.
2.	Thomas Oppenlander, Photochemical Purification of Water and Air: Advanced Oxidation Processes (AOPs): Principles, Reaction Mechanisms, Reactor Concepts, Wiley-VCH Publishing, 2003.
3.	Vincenzo Belgiorno, Vincenzo Naddeo and Luigi Rizzo, Water, wastewater and soil treatment by Advanced Oxidation Processes (AOP), Lulu Enterprises, 2011.
4.	Jean-Pierre Franc, Jean-Marie Michel, "Fundamentals of Cavitation", Kluwer Academic Publishers, Dordrecht.
5.	T. J. Mason and J. P. Lorimer, "Applied sonochemistry: Uses of power ultrasound in chemistry and processing", Wiley-VCH publishers.

Syllabus for Unit Test:	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

ELECTIVE III: FUEL CELL TECHNOLOGY

Designation: Elective

Course Pre-requisites:

Students should have knowledge of

1. Chemistry, Physics, Thermodynamics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 2 Hour /Week	Continuous Assessment : 40 Marks	Practical : 01
	Term Work/Oral : 50 Marks	Total credits : 04
	Total : 150 Marks	

Course Outcomes:

After completion of the course students will be able to

1. Define the concept of fuel cell.
2. Express various types of fuel cell.
3. Distinguish between the fuel cell and electrochemical cell.
4. Express the thermodynamics of fuel cell system.
5. Learn the process of fuel processing
6. Develop enough skills to design systems or components of fuel cells.

Topics covered

UNIT - I	<p>Introduction to Fuel Cell Technology</p> <p>Fuel cell definitions, Need of fuel Cell, Principal of fuel cell technology, Basics Electrochemistry of fuel cell, Calculation of cell potential: activities or concentrations, electrochemical potential; The movement of ions in solution: diffusion and migration, Conductivity and mobility, Liquid junction potentials, ion-selective electrodes.</p>	(06 Hours)
UNIT - II	<p>Classification of Fuel Cells</p> <p>Alkaline Fuel Cells, Phosphoric Acid Fuel Cells, Solid Oxide Fuel Cells, Molten Carbonate Fuel Cells, Direct Methanol Fuel Cells, Proton Exchange</p>	(06 Hours)

	Membrane Fuel Cells	
UNIT - III	<p>Fuel Cell Components Electrolytes, Catalysts, Current collector/ bipolar plate.</p> <p>Fuel cell characterization Possible ways of characterization, In-situ characterization especially I-V characteristics and electrochemical impedance spectroscopy; Cyclic voltammetry; Current interruption technique, Ex-situ characterization especially electrolyte and bipolar plate</p>	(06 Hours)
UNIT - IV	<p>Fuel Cells Thermodynamics Gibb's free energy; reversible and irreversible losses; Fuel cell efficiency, Nernst equation, Effect of temperature, pressure, concentration on Nernst potential, Calculations of electrochemical potential.</p>	(06 Hours)
UNIT - V	<p>Fuel Processing Processing Hydrogen from Alcohols, Producing Hydrogen from Hydrocarbons, Hydrogen from Other Sources, Gas Clean-up, Challenges and Opportunities for Research in Fuel Processing</p>	(06 Hours)
UNIT - VI	<p>Fuel Cell System and system integration Hydrogen Production, Hydrogen Storage, Methods of Hydrogen Storage, Prediction of Hydrogen Uptake in Carbon Materials, Balance of plant and Power electronic and system integration</p>	(06 Hours)

Tutorials/Assignments:

The internal assessment shall consist of minimum SIX assignments.

1.	Questions involving classification of Fuel Cells.
2.	Prepare one assignment considering any one type of fuel cell.
3.	Conducting surprise MCQ test for students
4.	Apply a critical-thinking and problem-solving approach towards the principles of fuel cell.
5.	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments
6.	Students have to study any five research papers related to specific topic and prepare/present power point presentation
7.	Brief report on 'Environmental, health and ethical concerns that are associated with Fuel Cell

	Technology.
8.	Group discussions on any/all of the following topics: d) Classification of Fuel Cells. e) Current scientific and technical advances f) Electrochemical Cell Vs Fuel Cell
9.	Preparation of a brief report on applicability of fuel cells in chemical engineering operations
10.	Write a report on innovations in fuel cell technology in current year.
11.	Learning on performance characteristics of fuel cell power plant and its components.
12.	Identify the operational issues and challenges for all major types of fuel cells and give the presentation on it.
13.	Conducting open-book class test.
In addition to these above stated assignments concerned faculty member may design his/her own assignments	
Term Work:	
Term work will consist of the Seminar :	
	Seminar should be based on theory. Students may undertake studies in design and development, analysis, synthesis, construction and fabrication of equipment, treatment plants. Critical review on product and system generation of new concept, idea and improvement in existing process related to subject. Term work should be based on the technical report on these studies carried out by individual or small group of students.
Text Books/ References:	
1.	B. Viswanathan, M. Aulice Scibioh, "Fuel Cells: Principles and Applications", CRC Press, 1 edition, 2008.
2.	James Larminie, Andrew Dicks, "Fuel Cell Systems Explained", 2nd Edition, John Wiley & Sons Ltd, New York, 2003
3.	O'Hayre, R. P., S. Cha, W. Colella, F. B. Prinz, "Fuel Cell Fundamentals", Wiley, NY, 2006
4.	"Fuel cell: a handbook", U S Department of energy.
5.	Bokris John O'm, Srinivasan S., "Fuel cells-their electrochemistry", McGraw Hill 1969.
6.	Appleby A.J. Fralkes F. R., "Fuel cell handbook", Van Nostrand Reinhold, 1989

7.	Basu, S. (Ed) "Fuel Cell Science and Technology", Springer, N.Y. 2007
8.	Liu, H., "Principles of fuel cells", Taylor & Francis, N.Y. 2006
Syllabus for Unit Test:	
Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI

Elective III: Membrane Separation

Designation: Elective

Course Pre-requisites:

1.

Basic chemistry, Physical chemistry, Mass transfer, Fluid flow operations, Chemical Engineering Thermodynamics

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures: 3Hours/Week

End Semester Examination: 60 marks

Theory : 03

Term work: 2 Hour/Week

Continuous Assessment: 40 marks

Tutorial : 01

Term Work: 50 marks

Total Marks: 150 marks

Course Outcomes:

1.

Explain basics of membrane and select proper material depending upon application

2.

Explain the methods of membrane preparation and characterization

3.

Determine suitable process for size based separation and explain its transport mechanism

4.

Understand the transport through non-porous membranes and define membranes for desired application

5.

Explain basics and preparation of membrane for other specialized membrane processes

6.

Design suitable module and parameters for the desired application

Topics covered

UNIT-I

Introduction and Membrane Materials

Introduction, historical development of membrane processes, definition of membrane, permeation, retention and selectivity, membrane processes, their categorization, material for membrane preparation, polymeric material, inorganic materials, mechanical, thermal and chemical stability of membrane based on material, choice of polymer for membrane preparation based on application

(06 Hours)

UNIT-II	<p>Membrane Preparation and Characterizations</p> <p>Preparation of synthetic membranes: phase inversion membranes, preparation of composite membranes, preparation of inorganic membranes</p> <p>Characterization: Porous membranes – electron microscopy, atomic force microscopy, mercury intrusion, bubble point method, permeability method, solute rejection characteristic; non-porous membranes – permeability, surface analysis, wide angle X-ray, DCS/DTA, density measurement</p>	(06 Hours)
UNIT-III	<p>Processes using porous membranes</p> <p>Transport mechanism in porous membranes – Knudsen flow, friction model, sieving mechanism</p> <p>Processes: Microfiltration – membranes details, characteristics, industrial applications; Ultrafiltration - membranes details, characteristics, industrial applications; Nano-filtration - membranes details, characteristics, industrial applications.</p>	(06 Hours)
UNIT-IV	<p>Solution-diffusion based membrane processes</p> <p>Transport mechanism – Solution-diffusion mechanism, solubility, diffusivity, effect of temperature, interaction polymer crystallinity of solubility and diffusivity; Free volume theory</p> <p>Processes: Reverse osmosis - membranes details, characteristics, industrial applications; Gas separation - membranes details, characteristics, industrial applications; Pervaporation - membranes details, characteristics, industrial applications</p>	(06 Hours)
UNIT-V	<p>Other membrane processes</p> <p>Dialysis - membranes details, their preparation, characteristics, transport mechanism, industrial applications; Electrodialysis - membranes details, their preparation, characteristics, industrial applications; Membrane distillation - membranes details, their preparation, characteristics, industrial applications; Membrane bioreactor - membranes details, their preparation, characteristics, industrial applications; Liquid membranes - membranes details, ionic liquids, their preparation, characteristics, industrial applications; ion exchange - membranes details, their preparation, characteristics, industrial applications</p>	(06 Hours)
UNIT-VI	<p>Membrane modules and process design</p>	(06 Hours)

	Selection of process depending upon applications, plate and frame module, spiral wound module, tubular module, capillary module, hollow fiber module, comparison between module configuration, system design, cross flow operations, hybrid dead end/cross flow operations, cascade operations, Process parameters, Energy requirements	
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Term work/Practical:

1.	Preparation of microfiltration membranes by phase inversion and their transport analysis.
2.	Preparation of UF membranes and their transport analysis
3.	Study of prepared porous membranes for bubble point analysis
4.	Study of porous membranes for rejection analysis
5.	Surface characterization of membrane by instrumental methods
6.	Preparation of asymmetrically skinned membrane and analyze it for pervaporation
7.	Preparation of thin film composite membranes and analyze its transport properties
8.	Preparation of symmetric membrane and analyze its transport and rejection properties
9.	Study variation in fouling characteristics between dead end and cross flow method
10.	Study separation characteristics of reverse osmosis membranes
11.	Preparation of hollow fiber membranes and study its permeation characteristics
12.	Study dialysis /electrodialysis membrane transport characteristics
13.	Study preparation of membrane bio-reactor and its effect of fermentation system

In addition to these above stated term-work concern faculty member may design his/her own term-work or practicals.

Assignments:

1.	Detail of membrane material, preparation, characterization, module and process design for anyone application
2.	Technical interview based on knowledge of membrane technology.
3.	Students have to study any five NPTEL/you-tube videos related to membrane technology and prepare/present power point presentation.
4.	Group discussions on membrane science and technology related topics.
5.	Prepare a report on innovations in membrane technology and their practical importance.

6.	Conducting open-book class test.
7.	Conducting surprise Multiple choice questions (MCQs) test for students
8.	Students have to study any five research papers related to specific topic and prepare/present power point presentation
9.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
10.	Case study on emerging trends in process/product innovation considering membrane technology.
11.	Students have to visit chemical industry and make a detailed report on membrane technologies used in the process.
12.	Write a report on your visit to research and development laboratory of national/international repute.
13.	Write a report on membrane technologies for addressing the problems of Water and Energy.
In addition to these above stated assignments concern faculty member may design his/her own assignments.	
References/Text Books:	
1.	Basic principle of membrane technology Marcel Mulder, Kluwer Academic Press
2.	Membrane technology and applications, Richard W. Baker, John Wiley and Sons, Ltd.
3.	Handbook of industrial membrane technology, Mark C. Porter (Ed.), Noyes Publications.
4.	Membrane separation systems – recent developments and future directions, R. W. Baker, E. L. Cussler, W. Eykamp, W. J. Koros, R. L. Riley, H. Strathman, Noyes Data Corporation
5.	Membrane technology in the chemical industry, S. P. Nunes, K.-V. Peinemann (Eds.), Wiley-VCH Verlag GMBH
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

ELECTIVE III: PETROLEUM REFINERY ENGINEERING

Designation: Elective

Course Pre-requisites:

Students should have basic knowledge of

1 | Chemical Process Industry

2 | Mass Transfer

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Practical : 2 Hour /Week

Unit Test: 20 Marks

Practical: 01

Total : 5Hours/Week

Continuous Assessment: 20 Marks

Total credits: 04

Termwork / Oral :50 Marks

Total :150 Marks

Course Outcomes:

After completion of the course students would be able to

1. Know the composition of crude oil and its products, along with its properties and characterization methods.
2. Demonstrate knowledge of petroleum products, quality control and understand processing of crude oil.
3. Understand the thermal and catalytic cracking process.
4. Learn the process of catalytic reforming, Hydrotreating and Hydrocracking.
5. Get conversant with the process of purification and fractionation of crude oil.
6. Analyze theoretical and practice skills in environmental issues of petroleum refinery.

Topics covered

UNIT-I

Introduction:

Introduction to petroleum refinery, Classification of Crude oil, Characterization of crude oil, Composition of crude Physical properties L6: Crude oil; analysis and distillation, Introduction to refinery "feedstock/s" and refinery products. ASTM nomenclature (ASTM test numbers and their meaning)Introduction to various codes required for petroleum industry

(06 Hours)

UNIT-II	Evaluation of crude oil properties and Design of crude oil distillation column: Dehydration and desalting of crude. Crude Assay ASTM TBP distillations evaluation of crude oil properties.API gravity various average boiling points and mid percent curves Evaluation of properties of crude oil and its fractions. Design concept of crude oil distillation column design.	(06 Hours)
UNIT-III	Thermal and Catalytic cracking: Coking and thermal process, delayed coking, Catalytic cracking, cracking reactions, cracking feedstock, Effect of process, FCC cracking, catalyst ,New designs for fluidized bed catalytic cracking	(06 Hours)
UNIT-IV	Catalytic Reforming : Objective and application of catalytic reforming, process reforming Catalysts, Reformer feed reforming reactor design continuous and semi regenerative process. Hydrotreating and Hydrocracking reactions.	(06Hours)
UNIT-V	Iso merization, Alkylation and Polymerization: Isomerization process, Reactions, Effects of process variables. Alkylation process, Feedstock, reactions, products, catalysts and effect of process variables. Polymerization: Objectives, process, Reactions, catalysts and effect of process variables. Visbreaking	(06 Hours)
UNIT-VI	Environmental issues and New Trends in petroleum refinery operations: Ecological consideration in petroleum refinery, Waste water treatment, control of air pollution, New trends in refinery, Alternative energy sources. Safety aspects in petroleum industry	(06 Hours)

Assignments

1.	Write a report on petroleum refining and energy demand in current year.
2.	Discover the methods used to create clean and reformulated fuels
3.	Evaluate the use of catalysts in petroleum refining..
4.	Estimate refinery CAPEX and OPEX
5.	Give power point presentation on vertical integration in petroleum industry
6.	Learning on different areas of study in upstream, midstream and downstream industry.
7.	Analyze worldwide distribution of oil and gas reserves in current year.

8.	Understand basic procedures and role of all fundamental systems used in petroleum drilling..
9.	Apply a critical-thinking and problem-solving approach towards the principles of petroleum engineering.
10.	Specify materials for construction and estimate the cost of investments for crude oil distillation column.
11.	Write a technical report on your visit to a petroleum refinery.
12.	Give power point presentation on knowledge of safety and pollution control in the refining industries.
13.	Group discussion on the recent advances in petroleum refinery processes.
14.	Make a complete chart of operations involved in petroleum industry.
15.	Assess the economic environment of the petroleum industry.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

Term Work:

Term work will consist of the Seminar :

Seminar should be based on theory. Students may undertake studies in design and development, analysis, synthesis, construction and fabrication of equipment, treatment plants. Critical review on product and system generation of new concept, idea and improvement in existing process related to subject. Termwork should be based on the technical report on these studies carried out by individual or small group of students.

Text Books/References:

1.	B.K.Bhaskar Rao., “Modern Petroleum Refining Processes”, 2ndEd., Oxford and IBH publishing Co. Pvt. Ltd., New Delhi 1990.
2.	W.C. Edmister “Applied Hydrocarbon Thermodynamics”, Gulf Publishing, Houston, Texas, 1961.
3.	Gas Production Engineering” S.Kumar Gulf publishing Co., 1987.
4.	Petroleum Exploration Hand Book by Moody, G.B.
5.	standard Handbook of petroleum and Natural Gas Engineering. 2 nd Edition. William C Lyons, Gary C Plisga. Gulf Profession.
6.	W.L. Nelson, “Petroleum Refinery Engineering”, McGraw Hill, 1964.

Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

Elective IV: BIO-SEPARATION		
Designation: Elective		
Course Pre-requisites:		
Students should have basic knowledge of		
1	Basic biology	
2	Analytical chemistry and techniques.	
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / Oral :50 Marks	
	Total :150 Marks	
Course Outcomes:		
After completion of the course students would be able to		
1	Define concept of bio-separation, physico-chemical basis of bio-separation.	
2	Explain low resolution bio-separation techniques.	
3	Describe high resolution bio-separation techniques.	
4	Discuss separation techniques like precipitation, crystallization, etc.	
5	Recognize the emerging bio-separation techniques like expanded-bed chromatography, hybrid bio-separations, etc.	
6	Apply bio-separation knowledge for purification of β amylase, aspartic acid, etc.	
Topics covered		
UNIT-I	INTRODUCTION TO BIOSEPARATION: An overview of bio-separation, Separation of cells and other insolubles from fermented broth. bioproduct purification, characteristics of biological mixtures, physico-chemical basis of bio-separation.	(06 Hours)
UNIT-II	LOW RESOLUTION BIO-SEPARATION TECHNIQUES: Cell disruption, Centrifugation, Liquid-liquid extraction, Leaching, Filtration, Supercritical fluid extraction, Micro-filtration, Ultra-filtration, Adsorption,	(06 Hours)

	Sedimentation	
UNIT-III	HIGH RESOLUTION BIO-SEPARATION TECHNIQUES: Ultra-centrifugation, Different electrophoresis techniques viz. Isoelectric focusing, Affinity separation, Chromatographic techniques viz. Paper, Gel; Ion exchange, Affinity, GLC, HPLC. Dialysis.	(06 Hours)
UNIT-IV	OTHER SEPARATION TECHNIQUES: Zone refining, Molecular sieves, Adductive crystallization, Reactive extraction, Precipitation method using ammonium sulfate, organic solvents, high molecular weight polymers, Reverse osmosis, Foam separation., Aqueous two phase systems,	(06 Hours)
UNIT-V	EMERGING BIO-SEPARATION TECHNIQUES: Membrane and monolith chromatography, Expanded-bed chromatography, High-resolution ultrafiltration, Hybrid bio-separations, Introduction to SEP box and Hyphenated techniques.	(06 Hours)
UNIT-VI	APPLICATIONS OF BIO-SEPARATIONS -CASE STUDIES: Purification of β amylase, aspartic acid, insulin; Food and Beverages: Beer, Citric acid; Bio-chemicals: Butanol.	(06 Hours)

Assignments:

1.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
2.	Prepare a mini report of any topic given above.
3.	Write a report on the recent advances in chromatographic processes with reference to the current year.
4.	Prepare a model for any of the topic given above.
5.	Evaluate efficiencies of different chromatographic techniques.
6.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
7.	Search out some industries related to bio-separation.
8.	Write a technical report on your visit to a process industry.

9.	Technical interview based on the knowledge of analytical techniques.
10.	List out all the principles of the analytical techniques.
11.	Perform any one chromatographic technique.
12.	Find out different types of proteins with structure.
13.	Prepare a report on downstream processing.

In addition to these above stated assignments concerned faculty member may design his/her own assignments.

Term Work:

Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.

1.	Gas chromatography.
2.	Study of membrane separation and its application in industry.
3.	Study of sedimentation and its application in industry.
4	Study of reactive extraction.
5.	Material analysis using paper chromatography
6.	Study of high-resolution ultrafiltration.
7.	Study of gel electrophoresis.
8.	To study molecular sieves.
9.	To estimate efficiency of Centrifugation.
10.	Study of adductive crystallization.

In addition to these above stated experiments concerned faculty member may design his/her own experiments related to course.

Text Books/References:

1	Belter P A, Cussler E L, and Wei Shou Hu, “Bio-separation–Downstream Processing for Biotechnology”, Wiley India Pvt. Ltd., 2011.
2	Prasad N K, “Downstream Process Technology-A New Horizon in Biotechnology”, Prentice Hall of India, New Delhi, 2012.
3	Pauline M Doran “Bioprocess Engineering Principles”, Academic Press, London, USA, 2012.
4	B Sivasankar, “Bio-separations: Principles and Techniques”, Phi Learning Pvt. Ltd., 2009.

5	Ajay Kumar, Abishek Awasthi “Bio-separation Engineering: Comprehensive DSP Volumen” I.K International Publishing House Pvt. Ltd., New Delhi, 2009.
Syllabus for Unit Test:	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

ELECTIVE IV: ENERGY ENGINEERING

Designation: Elective

Course Pre-requisites:

Students should have basic knowledge of

1 | Unit operations, Heat Transfer, Mass Transfer

2 | Basic Mathematics and Numerical Techniques.

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Unit Test: 20 Marks

Total : 3Hours/Week

Continuous Assessment: 20 Marks

Total credits: 03

Total :100 Marks

Course Outcomes:

After completion of the course students would be able to

1. Know the basic energy sources *viz* conventional and non conventional.
2. Evaluate Energy balance and efficiency of any thermal system.
3. Understand the basic need for pinch analysis and HEN.
4. Formulate the problem for given energy system.
5. Model the given energy system and optimize it.
6. Understand different applications of non conventional energy systems.

Topics covered

UNIT-I	<p>Basic Energy Sources : Fossil fuels, Nuclear fuels. Conventional & Renewable Energy Energy Sources: prospecting, extraction and resource assessment and their peculiar characteristics. Direct use of primary energy sources, Conversion of primary into secondary energy sources such as Electricity, Hydrogen, And Nuclear energy etc. Energy Conversion through fission and fusion, Nuclear power generation etc.</p>	(06Hours)
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UNIT-II	Energy Management part I: Importance of energy management. Energy auditing: methodology, analysis of past trends (plant data), closing the energy balance, laws of thermodynamics, measurements, portable and on line instruments. Steam Systems: Boiler -efficiency testing, excess air control, Steam distribution & use- steam traps, condensate recovery, flash steam utilization. Thermal Insulation.	(06 Hours)
UNIT-III	Energy Management part II Energy conservation in Pumps, Fans (flow control), Compressed Air Systems, Refrigeration& air conditioning systems. Heatexchanger networking- concept of pinch, target setting, problem table approach, composite curves.	(06 Hours)
UNIT-IV	Energy Systems Analysis: Case studies of optimization in Energy systems problems. Dealing with uncertainty- probabilistic techniques. Trade-offs between capital & energy using Pinch Analysis. Case studies	(06 Hours)
UNIT-V	Application of Non-conventional energy systems in Industry: Solar energy Applications, Wave Energy and Ocean Thermal Energy, Wind Energy, Biomass Energy, Energy from Waste.	(06 Hours)
UNIT-VI	Economic Analysis: Initial and annual cost, basic definitions, present worth calculations, economic analysis of add on solar system, Energy audit	(06 Hours)

Assignments

1.	Write a report on the recent advances in Energy Efficiency.
2.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
3.	Compare the industrial data for energy utilization used in 5 different industries.
4.	Write a report on your heat transfer equipments to minimize energy loss.
5.	Present a seminar on Pinch Technology and HEN.
6.	Present a seminar on thermal equipments involved in industry.
7.	Prepare a model on non conventional energy sources and applications.
8.	Write a energy audit for any single industry.

Text Books/References:

1.	J. Twidell and T. Weir, Renewable Energy Resources, E & F N Spon Ltd, London, 1986.
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2.	D. Y. Goswami, F. Kreith and J. F. Kreider, Principles of Solar Engineering, Taylor and Francis, Philadelphia, 2000
3.	L.C.Witte, P.S.Schmidt, D.R.Brown , Industrial Energy Management and Utilisation, Hemisphere Publ, Washington,1988.
4.	I.G.C.Dryden, Butterworths, The Efficient Use of Energy, London, 1982
5.	Freris L.L., Wind Energy Conversion Systems, Prentice Hall 1990.
6.	S.S.RaoOptimisation theory and applications, Wiley Eastern, 1990
7.	Beveridge and Schechter,Optimisation Theory and Practice,Mcgraw Hill, 1970
8.	Shenoy U. V., Heat Exchanger Network Synthesis: Processes Optimization by Energy
9.	Fowler, J.M., Energy and the environment, 2nd Edn., McGraw Hill, New York, 1984

Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

ELECTIVE - IV: GREEN TECHNOLOGY

Designation: Elective

Course Pre-requisites:

Students should have basic knowledge of chemistry and pollution control.

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Lectures : 3 Hours/Week

End Semester Examination : 60 Marks

Theory : 03

Practical : 2 Hour /Week

Unit Test : 20 Marks

Practical : 01

Total : 5 Hours/Week

Continuous Assessment : 20 Marks

Total credits : 04

Term Work/Oral : 50 Marks

Total : 150Marks

Course Outcomes:

After completion of the course students will be able to:

1. Identify the major environmental issues and describe the need for green technology.
2. Explain green technology principles and protocols.
3. Identify and explain the green synthetic methods.
4. Explain biochemical conversion and bio-photolysis.
5. Explain criteria for choosing appropriate green energy technologies, Green innovation & sustainability.
6. Explain the green house effects, global warming, carbon footprint and ways to overcome them using green technology.

Topics covered

UNIT - I

Introduction and need for green technology:

Overview of Major Environmental Issues, Global Environmental Issues. Air Quality Issues. Water Quality Issues, Ecology, Natural Resources, Waste: Production, Prevention, Problems and Source of waste, cost of Waste, Waste minimization technique, waste treatment and recycling. Description of Risk. Value of Risk Assessment in the Engineering Profession. Risk-Based Environmental Law. Risk Assessment Concepts. Hazard Assessment, Risk Characterization. Role of Industry, Government and Institutions in green

(06 Hours)

	technology.	
UNIT - II	<p>Green technology principals and protocols:</p> <p>Importance, advantages and disadvantages of green technologies, factors affecting green technologies, the twelve basic principles of green chemistry. Sustainable development, atom economy, reduction of toxicity. Use of Renewable Feedstock, Reduction of Derivatives, Catalysis, Design for Degradation, Real-time Analysis for Pollution Prevention, Inherently Safer Chemistry for Accident Prevention.</p>	(06 Hours)
UNIT - III	<p>Green synthetic methods:</p> <p>Microwave synthesis, electro-organic synthesis, Design and development of environmentally friendly chemical pathways: challenges and opportunities. Materials for green chemistry and technology: Catalysis, environmental friendly catalysts, Bio-catalysis, biodegradable polymers, alternative solvents,</p>	(06 Hours)
UNIT - IV	<p>Biochemical conversion:</p> <p>Anaerobic digestion, alcohol production from biomass; Chemical conversion process: hydrolysis and hydrogenation; Biophotolysis: Hydrogen generation from algae biological pathways; Storage and transportation; Applications</p>	(06 Hours)
UNIT - V	<p>Green innovation & sustainability:</p> <p>Criteria for choosing appropriate green energy technologies, life cycle cost; the emerging trends – process/product innovation, Eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity- WEHAB (eco-restoration/ phyto-remediation, ecological sanitation, renewable energy technologies).</p>	(06 Hours)
UNIT - VI	<p>Green house effect and Global warming:</p> <p>Greenhouse gas emissions, impacts, mitigation and adaptation, carbon credit, carbon footprint ; future energy Systems- clean/green energy technologies; International agreements/conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCCC), Kyoto protocol; sustainable development, Environmental reporting and ISO 14001; climate change business and ISO 14064; green financing; financial initiative by UNEP</p>	(06 Hours)

Term Work:	
Term work will consist of the seminars on the following topics.	
1	Major Environmental Issues and need for green technology
2	Green technology principals and protocols
3	Green synthetic methods
4	Biochemical conversion and Biophotolysis
5	Green innovation & sustainability
6	Green house effect and Global warming
Assignments:	
1.	Technical interview based on knowledge of green technology.
2.	Students have to study any five NPTEL videos related to green technology and prepare/present power point presentation.
3.	Group discussions on any one of the following topics.
	a) Major Environmental Issues.
	b) Green innovation & sustainability.
	c) Global warming
4	Prepare a report on innovations in green technology and their practical importance.
5	Conducting open-book class test.
6	Conducting surprise Multiple choice questions (MCQs) test for students
7	Students have to study any five research papers related to specific topic and prepare/present power point presentation
8	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
9	Case study on emerging trends in process/product innovation considering green technology.
10	Students have to visit chemical industry and make a detailed report on green technologies used in the process.
11	Write a report on your visit to research and development laboratory of national/international repute.
12	Write a report on eco/green technologies for addressing the problems of Water and Energy.
13	Write a report on eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity (WEHAB).

In addition to these above stated assignments concern faculty member may design his/her own assignments.

Text Books/ References:

1	Paul Anastas, John C. Warner, John Warner Joint; Green Chemistry: Theory & Practice New Edition; Oxford University press, USA, 2000.
2	Mukesh Doble and Anil Kumar Kruthiventi, Green Chemistry and Engineering, Elsevier, Burlington, USA, 2007.
3	Allen, D.T., Shonnard, D.R, Green Engineering: Environmentally Conscious Design of Chemical Processes. Prentice Hall PTR 2002.
4	Baird, C. and Cann, M., Environmental Chemistry , 4 th Edition, W.H. Freeman and Company, New York, 2008.
5	Paul T. Anastas, Walter Leitner, Phillip G. Jessop, Chao-Jan Li, Peter Wasserscheid, Annegret Stark; Handbook of Green Chemistry, 3 Volume set, Green solvents; Wiley-VCH.
6	Paul T. Anastas, Istvan T. Horvath ; Green Chemistry for a sustainable future; Wiley-Blackwell publishers, 2010.
7	V.K. Ahluwalia, M. Kidwai; New Trends in Green Chemistry; Kluwer Academic Publishers.

Syllabus for Unit Test:

Unit Test - I	UNIT– I, II, III
Unit Test - II	UNIT– IV, V, VI

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
B.Tech. (Civil) (Sem - I) -2014 Course

Sr. No.	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Sem. Exam	Continuous Assessment			T W	Total	Theory	T W
						Unit Test	Attendance	Assignments				
1.	Engineering Mathematics- I	3	--	1	60	20	10	10	--	100	4	-
2.	Fundamentals of Civil Engineering	3	2	--	60	20	10	10	25	125	3	1
3.	Engineering Graphics*	4	2	--	60	20	10	10	25	125	4	1
4.	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1
5.	Fundamentals of Electrical Engineering	3	2	--	60	20	10	10	25	125	3	1
6.	Professional Skill Development-I	2	--	--	30	--	--	20	--	50	2	-
7.	Computer Applications in Civil Engineering-I	-	2	--	--	---	--	--	50	50	-	1
	Total	19	10	1	330	100	50	70	150	700	20	5

*End Semester Exam of increased duration by 1 hour.

Choice Based Credit System Structure for Undergraduate Course

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
B. Tech. (Civil) (Sem - II) - 2014 Course

Sr.No.	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
8.	Engineering Mathematics- II	3	--	1	60	20	10	10	--	100	4	-
9.	Fundamentals of Mechanical Engineering	3	2	-	60	20	10	10	25	125	3	1
10.	Engineering Mechanics	4	2	-	60	20	10	10	25	125	4	1
11.	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1
12.	Building Construction	3	2	-	60	20	10	10	25	125	3	1
13.	Professional Skill Development-II	2	--	-	30	--	--	20	--	50	2	-
14.	Workshop Technology	--	2	-	--	---	--	--	50	50	-	1
	Total	19	10	1	330	100	50	70	150	700	20	5

Total Marks of Sem-I and Sem-II = 1400

Total Credits of Sem-I and Sem-II = 50

**BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
ENGINEERING MATHEMATICS-I**

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
Semester Examination: 60 marks
Continuous Assessment:40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

(08 Hours)

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Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank, System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

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Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :-Unit IV,V,VI

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02: Fundamentals of Civil Engineering

02: Fundamentals of Civil Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Concepts of units and conversions of units.	
2.	Basic knowledge of Chemistry	
3.	Basic knowledge of geography, concept of latitude and longitude.	
Course Objectives:		
	To make student understand the scope and application of Civil Engineering	
Course Outcomes:		
Students will be able to understand		
1.	Different building components and material	
2.	Classification of surveying	
3.	Levelling of the ground	
4.	Planning of building	
5.	Methods of irrigation and water supply	
6.	Different methods of transportation	
UNIT - I	Civil Engineering Scope And Applications.	(06 Hours)

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	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.	
UNIT - II	Surveying	(06 Hours)
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.	
UNIT - III	Building Planning And Bye Laws	(06 Hours)
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.	
UNIT - IV	Foundations and Earthquakes	(06 Hours)
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.	
UNIT - V	Irrigation And Water Supply	(06 Hours)
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
UNIT - VI	Infrastructure	(06 Hours)

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	<p>Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.</p> <p>Railways- Types of gauges, section of railway track, components of railway track, advantages.</p> <p>Bridges: Components - Foundation, Piers, Bearings, Deck.</p> <p>Airways- Components -Runway, Taxiway and Hangers.</p>	
<u>Term Work:</u>		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers	

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	,New Delhi
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication
Reference Books:	
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

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ENGINEERING GRAPHICS**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: - 40Marks	
	Term Work: 25 Marks	

Unit I	<p>Lines and Dimensioning in Engineering Drawing</p> <p>Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p>Curves used in Engineering Practice</p> <p>Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p>Orthographic Projection</p> <p>Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p>Isometric Projections</p> <p>Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p>Projections of Points and Lines and planes</p> <p>Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p>Projection of Solids</p>	(6)

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	Projection of prism, pyramid, cone and cylinder by rotation method.	
Unit VI	Section of Solids Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.
Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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ENGINEERING PHYSICS**

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
	Term Work: 25marks	

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second

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law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

(08 hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption

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coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

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Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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02: Fundamentals of Electrical Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Mathematics	
2.	Physics	
Course Objectives:		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
Course Outcomes:		
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
5.	Define basic terms of single phase and three phase ac circuits and supply systems	
6.	Know and use electrical safety rules	

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UNIT - I	Basic concepts	(06 Hours)
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	Network Theorems	(06 Hours)
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	Electrostatics	(06 Hours)
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
UNIT - IV	Magnetic Circuit & Transformer	(06 Hours)
	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling,</p> <p>Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.</p>	
UNIT - V	AC Fundamentals & AC Circuits	(06 Hours)

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	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
UNIT - VI	Electrical Wiring and Illumination system	(06 Hours)
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	
<u>Term Work:</u>		
The term work shall consist of record of minimum eight exercises / experiments.		
<ol style="list-style-type: none"> 1. Determination of resistance temperature coefficient 2. Verification of Superposition Theorem 3. Verification of Thevenin's Theorem 4. Verification of Kirchoff's Laws 5. Verification of Maximum power transfer Theorem 6. Time response of RC circuit 7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$ 8. Verification of current relations in three phase balanced star and delta connected loads. 9. Direct loading test on Single phase transformer <ol style="list-style-type: none"> a) Voltage and current ratios. b) Efficiency and regulations . 10. Study of a Residential (L.T.) Bill 		
Text Books:		
1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi		
2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi		
3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd		
Reference Books:		

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1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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07: Computer Applications in Civil Engineering-I

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: --	End Semester Examination: ---	-----
Practical: 02 Hours / Week	Continuous Assessment:	
	Term Work: 50 Marks	01 Credit

Course Pre-requisites:

The students should have

1. Basic knowledge of computer components, systems and operating of computer
2. Basic mathematical ability

Course Objectives:

To develop an ability to use MS- Excel and MS- Power Point

Course Outcomes:

1. To solve different problems using M S- Excel
2. To generate various graphs and charts by analyzing the given data in Excel
3. To present different problems in various slides using M S – Power Point

Use of computers in Civil Engineering is increasing day by day. Various analysis and design problems can be solved by preparing the programs in Microsoft Office Excel. Also to present any problem properly, knowledge Microsoft PowerPoint is required. Use of Microsoft Office Excel and PowerPoint will make the candidate to analyze and present different problems, the details of which are as listed below:

Learning Microsoft Excel:

- Introduction
- Getting Started
- Data analysis and Calculations using relevant formulae.
- Generate graphs and charts.

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Learning Microsoft PowerPoint:

- Introduction
- Getting Started
- Preparation of various slides
- Preparing presentation by giving different effects to the data entered.

Term Work:

Term work shall consist of **8 assignments** as follows:

- 1) Introduction to Microsoft Excel
- 2) Preparation of Excel Sheets with various solved equations.
- 3) Graphical representation of different data.
- 4) A mini project with Microsoft Excel
- 5) Introduction to Microsoft PowerPoint.
- 6) Preparation of slides.
- 7) Insertion of clipart, word-art, histograms, different shapes and various charts.
- 8) A mini project with Microsoft PowerPoint.

Reference Books:

1) "Excel 2013 Bible" by John Walkenbach

2) "Excel 2010 All-in-one For Dummies" by Greg Harvey

3) "Microsoft PowerPoint 2013 Introduction Quick Reference Guide" by Beezix Inc.

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ENGINEERING MATHEMATICS-II**

Teaching Scheme:

Lectures: 3Hrs/Week

Tutorials: 1Hr/Week

Examination scheme:

End Semester Examination: 60 marks

Continuous Assessment: 40 marks

Credits Allotted:

Theory : 03

Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

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Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

(08 Hours)

Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I, II, III

Unit Test II :- Unit IV, V, VI

BHARATI VIDYAPEETH
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FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Thermodynamics-</p> <p>Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p>Introduction to I.C. Engines and turbines-</p> <p>Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines,</p> <p>Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p>Introduction to refrigeration, compressors & pumps-</p> <p>Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)

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UNIT-III	<p>Energy Sources -</p> <p>Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p>Heat transfer-</p> <p>Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

UNIT-IV	<p>Properties of fluids-</p> <p>Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p>Properties of Materials and their Applications-</p> <p>Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p>Mechanical devices -</p> <p>Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p>	(08)

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	<p>Mechanisms-</p> <p>Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	
UNIT-VI	<p>Machine Tools-</p> <p>Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p>Introduction to manufacturing processes and Their Applications-</p> <p>Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

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List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.

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8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.

9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication,
New Delhi, 2nd edition.

10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House,
Ludhiana. 8th edition

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10: Engineering Mechanics

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks		
		Term Work: 25 Marks		01 Credit
Course Pre-requisites:				
The Students should have knowledge of				
1.	Scalar and Vector			
2.	Newton's law of motion			
3.	Law of friction			
4.	Concept of physical quantities, their units and conversion of units			
5.	Concept of differentiation and integration			
Course Objectives:				
	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.			
Course Outcomes:				
The student should be able to				
1.	calculate resultant and apply conditions of equilibrium.			
2.	analyze the truss and calculate friction force.			
3.	calculate centroid and moment of inertia.			
4.	solve problem on rectilinear motion.			
5.	solve problems on curvilinear motion.			
6.	use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.			

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UNIT - I	Resultant and Equilibrium	(06 Hours)
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
UNIT - II	Truss and Friction	(06 Hours)
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	Centroid and Moment of Inertia	(06 Hours)
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
UNIT - IV	Kinematics of Rectilinear motion of a Particle	(06 Hours)
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	Kinematics of Curvilinear motion of a Particle	(06 Hours)
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	Kinetics of a Particle	(06 Hours)
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum	

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	Principle, Coefficient of Restitution, Direct Central Impact.	
Term Work:		
A) The term-work shall consist of minimum Five experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
B) The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.		
Text Books:		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
Reference Books:		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	

**BHARATI VIDYAPEETH
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ENGINEERING CHEMISTRY**

Teaching Scheme:
Lectures: 4Hrs/Week
Practical: 2Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory: 04
Practical: 01

Term Work:

25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming

Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning

Numerical based on the zeolite process

(08 Hours)

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

(08 Hours)

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

(08 Hours)

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

(08 Hours)

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

(08 Hours)

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Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

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Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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12: Building Construction

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
Course Pre-requisites:					
The Students should have basic knowledge of					
1.	Fundamentals of civil Engineering				
2.	Concept of Engineering Graphics				
Course Objectives:					
	To develop the knowledge of building components, materials and construction practices				
Course Outcomes:					
The student should able to					
1.	understand different types of foundation and masonry.				
2.	design staircase .				
3.	understand types of Arches and flooring.				
4.	understand different methods of building finishes.				
5.	know different types of formworks.				
6.	understand different properties of construction materials.				
UNIT - I Building Foundations And Masonry (06 Hours)					
	Building foundations: Necessity,Types, Building and its components,				

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	Masonry : Stone, Brick ,Types of bonds in brick masonry, Composite masonry, Hollow and Solid block masonry, Mortars used in construction.	
UNIT - II	Doors , Windows And Stairs	(06 Hours)
	Doors: Classification, Terminology used, Frames, Sizes . Windows :Types , Sizes. Stairs : Classification , Terminology used ,Design of stairs. Lifts,, Escalators, Ramps.	
UNIT - III	Arches, Lintels And Floors	(06 Hours)
	Arches: Classification, Terminology used,, Stability Lintels :Types, Details of R.C.C. lintels and chhajja. Flooring: I.S. Specifications, Types , Factors for selection of flooring.	
UNIT - IV	Roof Construction	(06 Hours)
	Roofs :Types, Suitability, Roof structures, Selection of roof covering material, Methods of water proofing of roofs, Types of trusses, Fixtures & fastenings	
UNIT - V	Building Finishes	(06 Hours)
	Plastering : Methods, tools used, Mortars, Defects ,Plaster of Paris. Pointing: Types, Methods of pointing Paints : Types , Textures, Apex, Plastic emulsion , Wall cladding and its Materials	
UNIT - VI	Formwork , Scaffolding And Smart Materials	(06 Hours)
	Formwork : Necessity , Materials , Factors for selection , Types. Scaffolding : Necessity , Materials ,Factors for selection . Precast concrete , Ferrocurete , Nanoconcrete , Green construction materials, Tremix	

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Term Work:	
Plates-(1/4 imperial size)	
a. Symbols of Material & structures	
b. Section of wall	
c. Brick bonds - English bond, Flemish bond	
d. Types of stone masonry	
e. Arches - any three	
f. Types of steel trusses - any three	
g. Paneled Door & Flush doors.	
h. M.S. Window, Aluminum Window, Louvers Windows	
Collection of information brochures related to Construction Material.	
Assignment :One from each Unit.	
Text Books:	
1) "Building Construction"-Rangwala,Charotar Publication	
2) "The Text Book of Building Construction"-S.P.Arora& S.P.Bindra-DhanpatRai Publication	
3) " Building Technology and Valuation"- TTTI Madras,-- Tata McGraw Hill Publication	
Reference Books:	
1) " My Construction Practices "R.B.Chaphalkar	
2)"A to Z" Building Construction" Mantri Publications	
3) "Materials of Construction" – Ghose- Tata McGraw Hill Publications	
4) " Civil engineering Material'- TTTI Chandigarh- Tata McGraw Hill Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VII

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Workshop Technology**

TEACHING SCHEME:

Theory: -

Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -

Continuous Assessment: -

Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances

Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

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Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.

Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B. Tech. (Civil) – Sem III - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
1.	Building Planning, Design and Byelaws*	3	2	--	60	20	10	10	50	--	150	3	1	4
2.	Applied Geology	3	2	--	60	20	10	10	--	50	150	3	1	4
3.	Engineering Economics & Financial Accounting	3	-	-	60	20	10	10	--	---	100	3	--	3
4.	Mechanics of Solids	4	--	1	60	20	10	10	---	---	100	5	-	5
5.	Concrete Technology	3	--	--	60	20	10	10	--	----	100	3	-	3
6.	Professional Skill Development-III	4	--	--	100	---	----	--	--	----	100	4	-	4
7.	Computer Applications in Civil Engineering-II	---	2	--	---	--	---	---	---	50	50	---	1	1
8.	Testing of Materials	--	2	--	--	--	--	--	50	---	50	--	1	1
	Total	20	08	01	400	100	50	50	100	100	800	21	4	25

*End Semester Exam of duration 4 hours.

Programme: B. Tech. (Civil) – Sem IV - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
9.	Engineering Mathematics-III	3	--	1	60	20	10	10	--	---	100	4	-	4
10.	Surveying	3	4	--	60	20	10	10	--	50	150	3	2	5
11.	Mechanics of Fluids	3	2	--	60	20	10	10	50	----	150	3	1	4
12.	Construction Techniques and Machinery	3	--	--	60	20	10	10	---	----	100	3	-	3
13.	Structural Analysis- I	3	--	--	60	20	10	10	---		100	3	-	3
14.	Professional Skill Development-IV	4	--	--	100	--	--	--	--	---	100	4	--	4
15.	Computer Applications in Civil Engineering-III	---	2	--	---	--	---	---	---	50	50	---	1	1
16.	Civil Engineering Construction Practice	--	2	--	--	--	--	--	50	----	50	--	1	1
	Total	19	10	01	400	100	50	70	100	100	800	20	5	25

Total Credits

Semester III = 25

semester IV = 25

Grand Total = 50

01: BUILDING PLANNING , DESIGN AND BYELAWS

01: BUILDING PLANNING , DESIGN AND BYELAWS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory : 3 Hours/ Week	End Semester Exam: 60Marks	03 Credits
Practical : 1 Hour/ Week	Continuous Assessment : 40Marks	
	Term Work & Oral Exam: 50 Marks	01 Credit
Course Pre-requisites:		
The Student Should have		
1	Fundamentals of Civil Engineering	
2	Building Construction Practices	
Course Objective:		
	To make the student understand the process of building planning and building byelaws	
Course Outcomes:		
Student will be able to		
1	describe various types of buildings, their planning and building byelaws.	
2	apply design considerations for climate, ventilation and lighting in building planning.	
3	apply design considerations for Noise & acoustics, fire protection, Electrical & telecommunication and circulation in building planning.	
4	apply design considerations for plumbing services in building planning.	
5	explain the legal aspects of plan sanctioning.	
6	explain the role of town planning authority and various presentation drawings.	
Unit -I	Buildings, Types, Planning and Regulations :	(06 Hours)
	Types of Residential Building units – Bungalows, Twin bungalows, Row houses, Apartments; Requirements of Public buildings - Educational buildings, buildings for health care, industrial buildings and commercial buildings; Principles of planning for building, Integrated approach necessity. Building Rules Regulations and Byelaws necessity, plot size, open space around the building. FSI, Building line, control line. Height, room size, Built up area, floor area, carpet area. Rules of lighting ventilation, Drainage and Sanitation; Types of drawings - Submission drawings, working drawings and Architectural drawing.	

Unit II	Building Services I	(06 Hours)
	<p>(a) Climate - elements of climate, global climate, thermal design Principles, comfort sectors, Heat exchange of building. Thermal insulation of roof and wall.</p> <p>(b) Ventilation and lighting - comfort factors, function of ventilation, stack effect wind effect. Mechanical ventilation, ventilation rate, Air conditioning-design data, cooling load, Air conditioning systems.</p> <p>(c) Noise and acoustics –Effect of noise, comfort standards, Noise control sound insulation, Acoustics reverberation Sabines formula acoustical defects conditions of good acoustics.</p>	
Unit III	Building Services II	(06 Hours)
	<p>(a) Plumbing services, fixtures and fastenings, Layout of water supply & drainage system, Rate of water supply, storage and distribution arrangement, Plumbing systems,</p> <p>(b) Fire Protection – Fire safety, fire load, grading of occupancies by fire load, fire escape elements.</p> <p>(c) Constructional requirements for different building services like Electrical, Telecommunication services, Circulation-Lift escalators, Entertainment services.</p>	
Unit IV	New Planning Concepts of Buildings	(06 Hours)
	Layout plans of different types of buildings, Design and planning of ECO Friendly building, Intelligent building, Low Cost Housing, Planning considerations in High rise buildings.	
Unit V	Legal Aspects of Plan Sanctioning	(06 Hours)
	Role of Plan Sanctioning Authority for layout, co-op Housing societies and apartments. Ownership of land, plot, 7/12 abstract, meanings of different terms of 7/12 abstract, 6-D form, list of documents to be submitted along with building Plan for sanction from the authority. TDR, certificate of commencement and completion, various no objection certificates to be produced, format of permissions from pollution control board, MSEB, Water Supply and Drainage Department, State or National Highway Department.	
Unit VI	Town Planning and Presentation drawings	(06 Hours)
	<p>(a) Necessity of town planning in India. Importance of safety, amenities and services, Development plan, Land use- zoning: Introduction to different zones of land in town planning, Requirements of residential zone, commercial industrial and agricultural zone, open areas, green belts and parks.</p> <p>(b) Axonometric, Perceptive-One point and Two point.</p>	

Term work : It shall consist of :

1.	Preparation of working drawings of any one of the buildings listed below: a) Residential Building b) Commercial Building c) Educational Building d) Industrial Building e) Recreational Building f) Health Club
2.	Sheets to be drawn a) Plan/Typical floor plan to a suitable scale. b) Elevation and section to a suitable scale. c) Site plan showing water supply and Drainage d) Foundation Plan to a suitable scale.
3.	Line plan of remaining five buildings.
4.	Perspective Drawing of different objects.

Assignments:	
1	Study of building bye laws and D.C. rules of local authority
2	Study of different types of drawings.
3	Data collection with respect to climate , ventilation and lighting in building planning.
4	Study of various components of water supply and drainage system of buildings.
5	Case studies with respect to fire fighting of high rise building.
6	Case studies with respect to lift and escalators.
7	Study of constructional requirements with respect to electrical services in buildings.
8	Case studies of Ecofriendly and intelligent buildings.
9	Collecting information about legal aspects of building planning.
10	Writing report on development plan.
Text Books :	
1.	Bindra Arora, “Building Construction”, Laxmi Publication
2.	M. L. Shah, C. M. Kale, S. Y. Patki, “Building Drawing with integrated approach to Built Environment”, Tata McGraw Hill Publishers
3.	Rangwala, “Town Planning” , Charaotar Publications
References :	
3.	IS provisions “National Building Code”
4.	“Development Control Rules” of local plan sanctioning authority
5.	Calendar, “Time Saver Standards for Architectural Design”, Tata McGraw Hill Publishers
6.	Merit, “Building Design and Construction”, Tata McGraw Hill Publishers
Syllabus for Unit Test:	
Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI

02: APPLIED GEOLOGY

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Unit Test: 20Marks	
	Assignment : 10 Marks	
	Attendance: 10 Marks	
	TW & Practical : 50 Marks	01 Credits
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of engineering science	
Course Objectives:		
	To make students understand physical geology, mineralogy, petrology, structural & Indian geology, surface & sub surface water, geological investigation for tunnel, dam, reservoir & bridge	
Course Outcomes:		
1.	Students should be able to identify different rocks & minerals.	
2.	Students should be able to explain Geology of River, Mountain earthquakes & volcanism to decide the location ,type of foundation and type of civil engineering structure	
3.	Students should be able to identify different Geological structures to decide location and type of civil engineering structure.	
4	Students should be able to determine influence of texture & structures of rocks on occurrence of Ground water.	
5	Students should be able to prepare Geological maps and Geological sections for subsurface investigations.	
6	Student should be able to explain different methods of core drilling and core preservation	
UNIT - I	Physical Geology & Introduction to Engineering Geology:	(06 Hours)
	Origin of Earth, Surface Relief of the earth, Earth Movement, Earthquake, Interior of the Earth, Volcanicity: Product of Volcanoes, types of mountains, Different Branches of Geology, Engineering Geology as a Subject.	
UNIT - II	Mineralogy and Petrology:	(06 Hours)
	Mineralogy: Formation Process of Minerals, Types of Minerals, Classification of Minerals. Petrology- Rocks & minerals, Igneous rocks- mineral composition, texture, classification of igneous rock, study of common rock types, secondary rocks- weathering, texture & structure of sedimentary rocks & its classification, metamorphic rocks, agents & types of metamorphism,	

	metamorphic textures Building stones.	
UNIT - III	Structural Geology & Indian Geology:	(06 Hours)
	Structural Geology- Outcrop, dip & strike, conformable series, unconformity & overlap, faults & folds in rocks, mode of occurrence of igneous rocks, joints & fractures. Indian Geology- General Principles of stratigraphy, age of the earth & divisions of geological time, physiographic divisions of India & their characteristics, geological history of peninsula, study of formation in peninsula.	
UNIT - IV	Water: Surface & Sub Surface	(06 Hours)
	Surface Water: Geological action of running water, river valley development, normal & regional cycle of river erosion, waterfalls, ox-bow lakes, flood plane deposits, deltas, rejuvenation & resulting features., Sub - Surface Water: Types of Groundwater, depth zones of groundwater, perched water table, pervious & impervious rocks, geological work done by groundwater, natural springs & seepages, effect of pumping, cone of depression, circle of influence, conservation of groundwater, artesian wells, water bearing capacity of common rocks.	
UNIT - V	Geological Investigations	(06 Hours)
	Preliminary geological investigations- use of geological maps & sections, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts etc., limitation of drilling, engineering significance of geological structures, Tunneling- Influence of geological condition on design & construction method, preliminary geological investigations for tunnels, important geological considerations while choosing alignment, difficulties during tunneling, as related with lithology, nature & structure of materials to be excavated, role of groundwater, geological conditions likely to be troublesome, suitability of common rock types for tunneling, case studies.	
UNIT - VI	Geological Aspects at Dams, Reservoirs & Bridges	(06 Hours)
	Geology of dam site- preliminary geological work at dam site, influence of geological condition on the choice of types & design of dam, favorable & unsuitable geological conditions for locating a dam i.e. landslide, treatment of leaky rocks & geological structures, case studies. Geology of reservoir sites- Dependence of water tightness on physical properties & structures of rocks, geological conditions suitable & unsuitable	

	<p>for reservoir sites, conditions likely to cause leakage through reservoir rim, importance of groundwater studies & effect of rising of water table, case studies.</p> <p>Geology of Bridge Sites- Preliminary geological exploration for bridge piers & bridge abutments, scouring & erosion around bridge piers, influence of nature & structure of rocks on bridge foundation, case studies.</p>	
<p><u>List of Practicals / Term work:</u></p> <ol style="list-style-type: none"> 1) Identification of the Minerals (Two Practical) 2) Identification of Igneous rocks (Two Practical) 3) Identification of Secondary rocks (Two Practical) 4) Identification of Metamorphic rocks (Two Practical) 5) Study of Contoured Geological Maps & drawing the sections (Six Practical) 6) Visit to site of Dam / Tunnel for understanding the geological features. 		
<p><u>Assignments</u></p> <ol style="list-style-type: none"> 1) Collect and describe rock forming minerals & ore forming minerals 2) Collect and describe igneous rocks 3) Collect and describe secondary rocks 4) Collect and describe metamorphic rocks 5) Collect information and photographs of volcanoes 6) Collection of information about waterfalls & ox-bow lakes in India 7) Collection of data about different geological structures like folds, faults & unconformities 8) Conduct survey of ground water in India\ 9) Conduct survey of geological conditions suitable for tunneling. 10) Conduct survey of geological conditions suitable for dam . 		
<p><u>References.</u></p> <ol style="list-style-type: none"> 1) Gupte R. B., “A Text Book of Engineering Geology”, P. V. G. Publications, Pune 2) Legget R., “Geology and Engineering”, McGraw Hill Book Co., London 3) Trefethen J. M., “Geology for Engineers”, D Van Nostrand Co. Inc. 4) Schultz J. R. and A. B. Cleaves, “Geology in Engineering”, John Wiley Inc. 5) Engineering Geology & General Geology by Parbin Singh. 6) General Geology & Engineering Geology by Dr. P. T. Sawant, New Delhi Publication. 		
<p>Syllabus for Unit Test:</p>		
<p>Unit Test -1</p>	<p>UNIT – I, UNIT – II, UNIT - III</p>	
<p>Unit Test -2</p>	<p>UNIT – IV, UNIT – V, UNIT - VI</p>	

03.ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS ALLOTTED</u>
Theory: 03 Hours / Week	Continuous Assessment 40 Marks	03 Credits
Course Pre-requisites:		
The Students should have knowledge of		
1.	Civil Engineering	
2.	Mathematics	
Course Objectives:		
	To make students understand engineering economics and financial management	
Course Outcomes: The Student will be able to		
1.	The Student will be able to draw organization chart.	
2.	The Student will be able find out time value of money.	
3.	The Student will be able select best project.	
4.	The Student will be able find out depreciation cost.	
5.	The Student will be able prepare balance sheet.	
6.	The Student will be able generate finance for his organization.	
UNIT - I	Elementary Economics	(06 Hours)
	Definition of Economics, nature, scope and importance of Engineering economics, basic economics concept-Human wants. Utility, value, cost, price, profit, capital, wealth, equilibrium etc. law of demand, elasticity of demand. The law of supply. Factors influencing production: land, labor, capital and organization.	
UNIT - II	Engineering Economics	(06 Hours)
	Basic principles, time value of money, cash flow diagram. Equivalence-single payment in the future, present payment compare to uniform series payment. Future payment compare to uniform series payment.	
UNIT - III	Project Economics Analysis	(06 Hours)
	Comparison of alternatives, net present value present, future and annual worth method of comparing alternatives, internal rate of return. Break even analysis. Benefit cost ratio	

UNIT - IV	Depreciation and Value Engineering	(06 Hours)
	Depreciation and methods of depreciations. Inflation, value engineering and value analysis.	
UNIT - V	Financial Management	(06 Hours)
	Financial management, construction accountancy charts of accounts, financial statement, profit and loss account, balance sheet, insurance audits and financial risk aspects	
UNIT - VI	Project Budgeting	(06 Hours)
	Types of capitals, fix and working capital, debentures, shares, public deposits. Forms of foreign capital, money and capital market in India. New economical policy. Role of financial institutions in economical development, RBI government of India guidelines for foreign funding in construction projects.	

Assignments

- 1) Preparation of organization chart for small construction project
- 2) Preparation of organization chart for large construction project
- 3) Preparation of cash flow diagrams and finding out time value of money
- 4) Comparison of different projects by different methods
- 5) Benefit cost analysis of project
- 6) Determination depreciation value of equipments
- 7) Preparation of balance sheet for project
- 8) Assignment on value analysis
- 9) Collection of data regarding RBI government of India guide lines for foreign funding in construction project.
- 10) Numericals on engineering economics

References Books

- 1 Blank, L. T. and Tarquin, A. J., "Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998.
- 2 Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2010.
- 3 Boyer, C. B. and Merzbach, U. C., "A History of Mathematics", 2nd ed., John Wiley & Sons, New York, 1989.
- 4 Gould, F. E., "Managing the Construction Process", 2nd ed., Prentice Hall, Upper Saddle River, New Jersey, 2002.
- 5 Gransberg, D. G., Popescu, C. M. and Ryan, R. C., "Construction Equipment Management for Engineers, Estimators, and Owners, CRC/Taylor & Francis, Boca Raton, 2006.
- 6 Harris, F. , McCaffer, R. and Edum-Fotwe, F., "Modern Construction Management", 6th ed., Blackwell Publishing, 2006.
- 7 Jha, K. N., "Construction Project Management, Theory and Practice", Pearson, New Delhi, 2011.
- 8 Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P., "Engineering Economic Analysis", Indian Edition, Oxford University Press, 2010.

- 9 Ostwald, P. F., “Construction Cost Analysis and Estimating”, Prentice Hall, Upper Saddle River, New Jersey, 2001.
- 10 Peterson, S. J., “Construction Accounting and Financial Management”, Pearson Education, Upper Saddle River, New Jersey, 2005.
- 11 Peurifoy, R. L., Schexnayder, C. J. and Shapira, A., “Construction Planning, Equipment, and Methods, 7th ed., Tata McGraw-Hill, New Delhi, 2010.
- 12 Peurifoy, R. L. and Oberlender, G. D., “Estimating Construction Costs”, 5th ed., McGraw-Hill, New Delhi, 2004.
- 13 Schexnayder, C. J. and Mayo, R. E., “Construction Management Fundamentals”, International Edition, McGraw-Hill, 2003.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

04 : MECHANICS OF SOLIDS

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
		Continuous Assessment: 40 Marks			
Course Pre-requisites: The students should have knowledge of-					
1.	Engineering Mechanics				
Course Objectives:					
The student should be able to calculate stresses developed in the material.					
Course Outcomes: The student will be able to					
1.	calculate stresses due to axial force.				
2.	calculate shear force and bending moment in the beam.				
3.	calculate bending stress and deflection in the beam.				
4	calculate shear stress due to shear force and torsion.				
5	calculate critical load for column.				
6	calculate principal stresses.				
UNIT - I Simple Stresses and Strains: (08 Hours)					
	Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law; Stresses due to Axial Load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section.				
UNIT - II Shear Force and Bending Moment in Beams: (08 Hours)					
	Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments;				
UNIT - III Bending Stresses and Deflection of Beam: (08 Hours)					
	Bending Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section. Deflection of Beams: Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve.				
UNIT - IV Shear Stresses: (08 Hours)					
	Shear Stresses: Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section. Torsion of Circular Shafts: Theory, assumptions and derivation of torsional				

	formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity.	
UNIT - V	Combined Stresses and Axially Loaded Column:	(08 Hours)
	Combined Axial and Bending Stress: Concept; Resultant stress due to the axial load and uni-axial or biaxial bending; Core of section. Axially Loaded Long Columns: Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula, Determination of critical load.	
UNIT - VI	Principal Stresses and Principal Planes:	(08 Hours)
	Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion.	
Assignments:		
1	Explain different types of stresses with practical example.	
2	Write physical properties of different metals.	
3	Draw shape of SFD and BMD for different types of loading.	
4	Draw SFD and BMD for beams.	
5	Draw bending stress distribution diagram across section	
6	Calculate bending stress at particular point.	
7	Draw deflected shape of beam for different support conditions.	
8	Calculate slope and deflection at particular point.	
9	Draw shear stress distribution diagram across section	
10	Calculate shear stress at particular point.	
11	Explain application of shafts in series and in parallel.	
12	Calculate twist/torque/stresses in shaft.	
13	Draw effect of combined axial and flexure stress.	
14	Draw deflected shape of column under different support conditions.	
15	Calculate critical load for column.	
16	Explain principal stresses and strains.	
17	Draw Mohr's circle for different stresses.	
Text Books:		
1) R. C. Hibbeler, "Mechanics of Materials", Pearson Prentice Hall,		
2) Rajput R. K., "Strength of Materials", S. Chand Publication		
3) Punmia B. C., Jain, Ashok Kr. Jain Arun Kr., "Mechanics of Materials", Laxmi Publication.		
4) Ramamrutham S. & Narayan R., "Strength of Materials", Dhanpat Rai Publishing Co.		
Reference Books:		
1) Beer F..P. and Johnston E.R., "Mechanics of Materials", McGraw Hill Publication		
2) Gere J.M. & Timoshenko S.P., "Mechanics of Materials", CBS Publishers & Distributors		
3) Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication		

4) Popov E. P., “Engineering Mechanics of Solids”, Prentice Hall of India (P) Ltd.	
5) Singer F. L. & Pytel A., “Strength of Materials”, Harper and Row Publication	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

05: CONCRETE TECHNOLOGY

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
		Continuous Assessment: 40 Marks			
Course Pre-requisites:					
The Students should have knowledge of					
1.	Fundamentals of Civil Engineering				
2.	Engineering Chemistry				
Course Objectives:					
	The student should know qualities & properties of concrete.				
Course Outcomes:					
The student will be able to					
1.	test Ingredients of concrete.				
2.	measure Workability of concrete.				
3.	measure strength of Hardened concrete.				
4.	design of Concrete Mix.				
5.	describe Durability of concrete.				
6.	explain the use of Admixtures.				
UNIT - I	Ingredients of Concrete:				(06 Hours)
	Cement: Manufacture of Portland cement, Chemical Composition, Bogues compounds, Hydration of cement, Structure of Hydrated cement, ASTM classification and types of cement, Tests of cement and I.S. requirements for ordinary Portland cement. Aggregates: Classification, Properties of aggregates, Deleterious materials, Soundness, Alkali-Aggregate Reaction, Grading of aggregates, Standard Grading curves, Testing of aggregates, Artificial & recycled aggregates. Water: Quality of water IS requirements, Use of sea water.				
UNIT - II	Fresh Concrete:				(06 Hours)
	Workability: Factors affecting workability, Measurements of workability, Suitability of concrete based on degree of workability, Segregation, bleeding. Concreting Process: batching, mixing, transporting, placing and compaction. Curing of Concrete: Methods of curing (study of machinery not expected), Effect of temperature on curing, Steam curing, curing compounds, period for curing, stripping time.				
UNIT - III	Hardened Concrete:				(06 Hours)
	Properties of Hardened concrete Strength of Concrete: General, Compressive strength, Factors affecting strength, Maturity Concept, Tensile strength, Relation between compressive and tensile				

	strength, Flexural strength, Testing under central and third point loading, Shear strength, Bond strength, Elasticity, Creep and Shrinkage: Stress-Strain relation, Modulus of Elasticity, Creep-time curve. Non Destructive Testing: Schmidt's Rebound hammer, Ultrasonic Pulse velocity method.	
UNIT - IV	Concrete Mix Design:	(06 Hours)
	Concept of mix design, Variables in mix design, Statistical Quality Control, Various methods of mix design, Design of mix by Indian Standard recommended method (IS: 10262 & IS: 456), Acceptance criteria.	
UNIT - V	Admixtures in Concrete:	(06 Hours)
	Purpose and functions, Classification Chemical Admixtures: Plasticizers, Super-Plasticizer, Retarders, Air entraining agents, Compatibility of admixtures and cement, Marsh Cone Test. Mineral Pozzolanic/Admixtures:- Fly ash, Silica flume. Self Compacting Concrete, Roller Compacted Concrete, Ready mix concrete; High Performance Concrete.	
UNIT - VI	Special Concrete and Durability of Concrete:	(06 Hours)
	Special Concrete: Light weight concrete, Polymer Concrete, Fiber reinforced concrete, Ferro-cement. Special Concreting: Under water concreting, Cold weather concreting. Durability of Concrete: Definition, Significance, Strength and durability relationship; Permeability, Chemical attack; Sulphate attack; Chloride attack, attack by sea water, Carbonation and measurement of depth of carbonation, Requirement for durability as per IS 456.	

ASSIGNMENTS:

- 1) To find the types of cement from market.
- 2) To find the different types, sizes, shapes of aggregate from market.
- 3) Measurement of workability of fresh concrete by different methods.
- 4) Describe the concreting process from any nearby site.
- 5) Describe the curing of concrete.
- 6) Design the concrete mix by different method.
- 7) Measurement of strength of hardened concrete.
- 8) Measurement of strength of hardened concrete by nondestructive testing.
- 9) Describe the concept of durability of concrete.
- 10) Explain the use of Admixtures in concrete.

Text Books:

- 1) Gambhir M. L., "Concrete Technology", Tata McGraw Hill Publication
- 2) Shetty M. S., "Concrete Technology", S. Chand & Company Ltd.

Reference Books:

- 1) Neville A. M. & Brooks J. J., "Concrete Technology", Pearson Education Publication

2) Neville A. M., "Properties of Concrete", ELBS & Longman Publication

Syllabus for Unit Test:	
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Unit Test -1	UNIT – I, UNIT – II, UNIT - III
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Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI
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07: COMPUTER APPLICATIONS IN CIVIL ENGINEERING - II

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: --	End Semester Examination: --	--
Practical: 02 Hours / Week	Continuous Assessment: --	
	Term Work: 50 Marks	01 Credit

Course Pre-requisites:

The Students should have

1. Knowledge of basic building aspects.
2. Knowledge of various building components.
3. Knowledge of various building symbols.

Course Objectives:

To make student capable of drawing any kind of Engineering drawing using AutoCAD.

Course Outcomes:

The students will be able to

1. draw various Engineering drawing using AutoCAD.
2. draw various elements of a building.
3. draw various elevation and sections of the building.

CIVIL ENGINEERING SCOPE AND APPLICATIONS II

- Introduction.
- Getting Started.
- Learning commands: Draw and Modify Menu.
- Learning commands through drawings.
- Centerline drawings
- Layers / Filters
- Blocks
- Area Command
- Drawing Presentation :Sheet size and Text Format

Term Work:

- 1) Introduction to the software: Tool bars, Symbols and Various Commands.
- 2) Drawing Plates (minimum 10 in number)
- 3) Drawing Plan, Elevation and Section of G+1 Building.

Text Books:

AutoCAD users Guide

08: TESTING OF MATERIALS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 02 Hours / Week	TW&Oral:50Marks	01 Credit

Course Pre-requisites:

The Students should have

1. knowledge of Engineering Mechanics, Solid Mechanics & Concrete Technology.

Course Objectives:

the student should be able to test qualities & strength of the material.

Course Outcomes:

The student will be able to test

1. Metals

2. Cement

3. Aggregates

4. Concrete

Course Contents:

The term work shall consist of minimum **TWELVE** experiments from list below.

	Metal: (min Four)
1	Tension Test – Mild steel, Tor steel
2	Torsion test- Mild Steel
3	Direct Shear test- Mild Steel
4	Izod & Charpy Impact tests- Mild Steel, Aluminum, Brass, Copper
5	Rockwell Hardness test- Mild Steel, Aluminum, Brass, Copper
	Cement: (min Two)
6	Standard consistency and Setting time test on cement
7	Fineness test on Cement
8	Compressive strength of Cement
9	Soundness test on Cement
	Aggregate: (min Two)
10	Specific gravity of Aggregates
11	Fineness Modulus of Aggregate
12	Aggregate Impact Value
13	Aggregate Crushing Value
	Concrete (min Four)
14	Workability of Concrete & effect of admixture.
15	Compressive strength of Concrete
16	Flexural Test of Concrete
17	Split Tensile strength of Concrete
18	Non Destructive Test on concrete –Schmidth's Rebound hammer test
19	Bending test – Timber
20	Compressive Strength test- Bricks

Reference Books:

01) Neville A. M. & Brooks J. J., “Concrete Technology”, Pearson Education Publication

02) Neville A. M., “Properties of Concrete”, ELBS & Longman Publication

03) IS Codes

- IS-4926
- IS-516
- IS-2386
- IS-1199
- IS-383
- IS-13360
- IS-5242

Programme: B. Tech. (Civil) – Sem IV - 2014 Course

09: ENGINEERING MATHEMATICS-III		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Tutorial: 01 Hours / Week	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The Students should have		
1.	basic knowledge of differentiation, integration and differential equation	
2.	basic knowledge of vector algebra	
Course Objectives:		
	To form mathematical model and solve mathematical problem in Civil Engineering	
Course Outcomes:		
The student should be able to		
1.	form mathematical modeling of systems using differential equations and solve the differential equations	
2.	apply Vector differentiation and integration that finds applications in solid mechanics, fluid flow, heat problems and potential theory etc	
3.	analyze the numerical data by applying statistical methods	
4.	solve system of linear equation and ordinary differential equation by numerical methods	
5.	apply mathematical modeling of systems using partial differential equations and solve the partial differential equations.	
6.	apply vector integral calculus to solve various problems in Civil Engineering.	
Unit - I	Unit I: Linear Differential Equations (LDE)	(06 Hours)
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE.	
Unit - II	Unit II: Applications of DE	(06 Hours)
	Modeling of problems on bending of beams, whirling of shafts and mass spring systems. Solution of Partial Differential Equations (PDE): 1) $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$, 2) $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$, 3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ by using Separation of variables Applications of PDE to problems of Civil and allied engineering.	

Programme: B. Tech. (Civil) – Sem IV - 2014 Course

Unit - III	Unit III: Numerical Methods	(06 Hours)
	Numerical solutions of (i) System of Linear Equations by Gauss Elimination, Cholesky and Gauss-Seidel methods (ii) Ordinary Differential Equations by Euler's, Modified Euler's, Runge-Kutta 4 th order and Predictor-Corrector methods.	
Unit - IV	Unit IV: Statistics and Probability	(06 Hours)
	Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates. Theorems and Properties of Probability, Probability Density Function, Probability Distributions: Binomial, Poisson, Normal and Hypergeometric; Test of Hypothesis: Chi-Square test	
Unit - V	Unit V: Vector Differential Calculus	(06 Hours)
	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities	
Unit - VI	Unit VI: Vector Integral Calculus	(06 Hours)
	Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem. Applications to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equations.	

ASSIGNMENTS:

1. Problems on Linear differential equation with constants coefficients.
2. Problems on Application of LDE and partial differential equations.
3. Problems on Numerical methods to solve system of algebraic equation and ordinary differential equation.
4. Problems on Statistical methods and probability distribution.
5. Problems on Vector identities and application of vector differential in mechanics.
6. Problems on Line integral, surface integral and volume integral .

Text Books:

- 1) Peter V. O'Neil Advanced Engineering Mathematics by (Cengage Learning).
- 2) Erwin Kreyszig Advanced Engineering Mathematics by (Wiley Eastern Ltd.).

Reference Books:

- 1) B. V. Raman Engineering Mathematics by Tata McGraw-Hill.
- 2) M. D. Greenberg Advanced Engineering Mathematics, 2E, by Pearson Education.
- 3) Wylie C.R. & Barrett L.C. Advanced Engineering Mathematics, McGraw-Hill, Inc.
- 4) B. S. Grewal Higher Engineering Mathematics by Khanna Publication, Delhi.
- 5) P. N. Wartikar & J. N. Wartikar Applied Mathematics Volumes I and II Pune Vidyanthi Griha Prakashan, Pune.

Syllabus for Unit Test:

Unit Test I	Unit - I, II, III
Unit Test II	Unit - IV, V, VI

10: SURVEYING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory : 3 Hrs/ Week	End Semester Exam: 60Marks	03 Credits
Practical : 4 Hrs/ Week	Continuous Assessment : 40Marks	
	Term Work & Practical Exam: 50 Marks	01 Credit
Course Pre-requisites:		
The Student Should have		
1.	Basic concept of civil engineering.	
2.	Basics of mathematics and Geometry.	
Course Objective		
1.	To make students understand use of various instruments and process of surveying and levelling.	
Course Outcomes		
The student should be able to		
1.	Explain the use of linear measurements and prismatic compass in surveying.	
2.	Describe the process of vertical measurements and contouring and calculate reduced levels.	
3.	Describe the use of vernier theodolite for angular measurements and calculate coordinates of traverse stations.	
4.	Calculate omitted measurements in traverse survey and describe permanent adjustments of theodolite.	
5.	Explain various methods of setting out curves and describe field procedure of curve setting.	
6.	Explain use of plane table and minor instruments in surveying.	
UNIT - I	Linear measurement and Compass survey	(06 Hours)
	Introduction to land surveying, linear measurements, Tapes and EDM- Construction, working and principle, Direct and Indirect methods of linear measurement and ranging, types of tapes, , locating details with offsets by swinging tape, open cross staff and laser square method, concept of scale, R.F. maps and plan. Study and use of topo sheets. Compass survey: Types of bearing and meridian other than magnetic meridian, local attraction and correction of local attraction, dip, declination, reduction of true bearings, adjustment of closing error.	
UNIT - II	Vertical measurements and contouring.	(06 Hours)
	Instruments for vertical measurement-dumpy level, auto level, laser level and digital level. Principle axes of dumpy level, temporary and permanent adjustment, simple, compound and reciprocal levelling, curvature and refraction corrections, distance to the visible horizon. Contouring: Direct and indirect methods of contouring, uses of contour maps, profile levelling and cross sectioning and their applications, reduction of volume from contour map and tracing grade contour.	
UNIT - III	Measurement of direction by Vernier Theodolite.	(06

		Hours)
	Study of Vernier transit 20” Theodolite, introduction to digital Theodolite use of Theodolite for measurement of horizontal angles by repetition and reiteration, vertical angles and magnetic bearing, prolonging a line, lining in and setting out and angle with a Theodolite, plane trigonometrical levelling. Theodolite traversing: computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch’s rule, Gales traverse table.	
UNIT - IV	Omitted measurements, permanent adjustments of transit Theodolite and Tachometry.	(06 Hours)
	Omitted measurements, area calculation by independent co-ordinates, open traverse and its uses, measurement of deflection angles using transit Theodolite, open traverse survey and checks in open traverse. Fundamental axes of Theodolite: testing and permanent adjustment of Theodolite Tachometry: applications and limitations, principle of stadia tachometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points.	
UNIT - V	Curves	(06 Hours)
	Introduction to horizontal and vertical curves, different types and their applications, simple circular curves, elements and setting out by linear methods, offsets from long chord and offsets from chord produced, angular method, Rankin’s method of deflection angle. Transition curves: necessity, types and requirements.	
UNIT - VI	Plane table survey and construction survey.	(06 Hours)
	Equipments required for plane table survey and their uses, methods of plane table survey: radiation, intersection, traversing, and simple resection, errors and precisions in plane table surveying, construction survey- survey for tunnels, drainage line buildings, and roads. Use of laser based electronic range finder.	
	Term work:	
	The term work shall consist of	
	Field book containing record of all exercises and project listed below.	
a)	Road project showing L-section plan Of road with contours and typical cross section	2-sheets
b)	Theodolite traverse survey project.	1-sheets
	List of Practicals:	
	Details of practicals to be performed, Exercise projects and assignments	
1.	Linear measurements with tape and accessories.	
2.	Study and use of auto level and double check leveling	
3.	Compound leveling and fly leveling, calculation by rise and fall method.	
4.	Two peg test for level.	
5.	Study and use of 20” Vernier Theodolite.	

6.	Measurement of horizontal angle of triangle by repetition method and applying check.	
7.	Measurement of vertical angle by transit Theodolite	
8.	Trigonometrical levelling by transit Theodolite.	
Project I	Road project of minimum length of 250 M including fixing of alignment, profile leveling and cross sectioning.	
Project II	Theodolite traverse survey of closed traverse for minimum 0.5 hectares area including building roads etc.	
9.	Computation of horizontal distance and elevation of points by tachometry for horizontal and inclined sights.	
10.	Introduction and study of outfit of plane table and method of radiation.	
11.	Intersection method of plane table survey.	
12.	Closed plane table traverse survey around a small four sided building.	
13.	Setting out simple circular curve by Rankin's method of deflection angle	
14.	Use of laser based electronic range finder.	
	ASSIGNMENTS:	
1	Computation of corrected bearings of the traverse by different methods.	
2	Solving problems on calculation of reduced levels by different methods.	
3	Preparing contour map of the area from the given spot levels.	
4	Study of topographical sheets to record various details shown.	
5	Solving problems on trigonometrical leveling.	
6	Computations of independent coordinates of a closed traverse.	
7	Solving problems on omitted measurements.	
8	Calculation of reduced level and distance of a point by tacheometry.	
9	Computation of data required to set out the simple circular curve by Rankine's method .	
10	Write details of survey for drainage line with proper sketches.	
	Text Book:	
1	Surveying and Levelling by Vol.II-T.P. Kanetkar and S.V. Kulkarni.	
2	Surveying Vol. I & II by Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain.	
3	Surveying for Engineers- John Uren & Bill Price- Palgrave Macmillan	
4	Plane Surveying-----A.M. Chandra----- New age International Publishers	
5	Surveying and Levelling----N. N. Basak, Tata Mc-Graw hill	
6	Surveying Vol. I & II-----Dr. K. R. Arora.	
	Reference Books:	
1	Surveying: Theory and practice---James M. Anderson, Edward M. Mikhail	
2	Surveying theory and practices---Devise R. E., Foot F.S.	
3	Plane and Geodetic Surveying for Engineers. Vol. I—David clark.	
4	Principles of Surveying. Vol. I by J.G. Olliver, J.Clenning	

5	Surveying Vol. I & II by S.K.Duggal, Tata Mc-Graw Hill.	
6	Surveying and Levelling by Subramanian, oxford University Press.	

Syllabus for Unit Test.

Unit Test I	Units I, II, III
Unit Test II	Units IV, V, VI

11. MECHANICS OF FLUID

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory : 3 Hours / Week	End Semester Exam: 60Marks	03 Credits
Practical : 2 Hours / Week	Continuous Assessment : 40Marks	
	Term Work & Oral Exam: 50 Marks	01 Credit
Course Pre-requisites:		
The Student Should have		
1	Basic Knowledge of units and conversion of units	
2	Basic Knowledge of Engineering Mathematics	
3	Basic Knowledge of Engineering Physics	
Course Objective:		
	To make the student understand the scope and application of Fluid Mechanics	
Course Outcomes:		
Student should be able to		
1.	describe basic properties of fluids and measure its properties in static conditions.	
2.	apply knowledge of fluid kinematics and dynamics conditions.	
3.	analyse physical phenomenon dimensionally.	
4.	explain laminar flow and flow through pipes	
5.	explain of boundary layer theory.	
6.	describe turbulent flow.	
Unit -I	Properties of Fluids & Statics:	(06 Hours)
	Scope and application of fluid mechanics, Physical properties of fluids, Newton's Law of Viscosity, Dynamic & Kinematic Viscosity, Classification of fluids. Statics: Pressure density height relationship & Measurement, Hydrostatic pressure on a plane, Centre of pressure, Buoyancy, Stability of floating bodies, Metacentre and Metacentric height.	
Unit II	Kinematics	(06 Hours)
	Types of flow, path lines and streak lines, stream lines, Stream Tube, Continuity Equation in 1-D and 3-D, Velocity potential, Stream functions, Circulation and Vorticity, Concept and Application of Flow Net.	

Unit III	Kinetics	(06 Hours)
	Derivation of Bernoulli's Equation from Newton's 2nd Law , Limitations, Modified form of Bernoulli's Equation, Total energy and Hydraulic Grade line, , Impulse momentum equation.	
Unit IV	Dimensional Analysis and Model Studies	(06 Hours)
	Dimensional homogeneity, Important dimensionless parameters, Dimensional analysis using Buckingham's π theorem, Model studies, Similitude, Model laws, Types of models.	
Unit V	Fundamental of Pipe Flow & Boundary layer theory	(06 Hours)
	Reynolds experiment, Classification of Flows based on Reynolds Number, Moody's Diagram, Laminar flow in circular pipe ,Hagen Poisullies Equation, Introduction to Boundary Layer Theory, Concept of boundary layer, Development of Boundary layer over a flat plate, Laminar and transitional boundary layer, laminar sub layer, General characteristic of boundary layer, Boundary layer thickness, Velocity distributions within boundary layer	
Unit VI	Turbulent flow & Pipe Flow Problems	(06 Hours)
	Characteristics of turbulent flow- Instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, Darcy- Weisbach equation, Flow through pipes: Energy losses in pipe flow, parallel and series pipes, Equivalent Pipe Concept, Pipe network Analysis, Siphons, Hydraulic transmission through pipes, three reservoir problems.	
Term work shall consist of any Eight Exercises		
1.	Determination of Viscosity	
2.	Study of Pressure Measuring Devices	
3.	Study of Stability of Floating Bodies	
4.	Verification of Bernoulli's Theorem	
5.	Determination of C_d of Venturimeter	
6.	Determination of C_d of Orifice	
7.	Determination of C_d of Notch	
8.	Study of Laminar flow Using Heleshaw's /	
9.	Study of Laminar flow Using Reynold's Apparatus	
T.W and Oral Examination shall be based on above termwork		
ASSIGNMENTS : Assignments will consist of		
1. Solution of numerical problems asked in recent three years of BVU question papers.		
2. Solution of questions asked in recent three years BVU question papers.		
3. Report of new topic being discussed in reputed research journals related to fluid mechanics.		

4. Mini projects such as collection of information, Brochure, Data, on a topic related to fluid mechanics.
5. Writing of industrial applications of various topics of syllabus.
6. Design of new experiments related to fluid mechanics.
7. Collection of two fluid mechanics NPTEL videos and demonstration of it.
8. Collection of information about fluid mechanics equipment's /machinery/materials related to fluid mechanics.
9. Collection of information about fluid mechanics phenomenon and its explanation.
10. Collection of data of different fluids with reference to their properties.

Text Books:	
1.	Garde R. J. and Mirajgaonkar "Engineering Fluid Mechanics" Scitech Pulication C.P.Konthadraman "Fluid Mechanics And Machinery" New Age Publications
2.	S. Ramamurtham "Hydraulics and Fluid Mechanics and Fluid Machines" Dhanpat Rai Publishing Company
3.	R. K. Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publications
4.	R.K. Rajput "Fluid Mechanics" S Chand Publications
5.	Garde R. J. and Mirajgaonkar "Fluid Mechanics Through Problems" , New Age International New Delhi
6.	Modi P.N. and Seth S.M. " Fluid Mechanics" Standard Book House
Reference Books:	
1.	Streeter- Wylie,"Fluid Mechanics", TataMcGrow Hill Publication
2.	Dr. R. J. Garde "Turbulent Flow" New Age Publications
3.	N. Narayana Pillai "Principles of Fluid Mechanics and Fluid Machines" University Press
4.	Edward J. Shaughnessy "Introduction to Fluid Mechanics" Oxford University Press
5.	Baljeet S. Kapoor "Fluid Mechanics" New Age International Publishers
6.	Vijay Gupta "Fluid Mechanics And Its Applications" New Age International Publishers
7.	Robert W. Fox "Introduction to Fluid Mechanics" Willey Student Edition
8.	John F. Douglas "Fluid Mechanics" Perason Publication
9.	James A. Fay "Introduction to Fluid Mechanics" PHI Learning Private Limited
Syllabus for Unit Test	
Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI

12: CONSTRUCTION TECHNIQUES & MACHINERIES

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination : 60 Marks	03 Credits
	Unit Test : 20 Marks	
	Assignment : 10 Marks	
	Attendance : 10 Marks	

Course Pre-requisites:

The Students should have

1. knowledge of Building Construction Practices, Building Planning & Design.
2. knowledge of Engineering Economics.
3. knowledge of Concrete Technology.

Course Objectives:

Students should get knowledge of Construction Operation Equipments & different methods of advanced construction techniques, tunneling, concreting & dewatering.

Course Outcomes:

1. Student will be able to explain erection techniques for high rise structures.
2. Student will be able to Apply different construction techniques in underwater construction.
3. Student will be able to apply grouting techniques.
4. Student will be able to find output of earth moving equipment.
5. Student will be able to explain soil stabilization techniques.
6. Student will be able to describe safety of equipment

UNIT - I	CONSTRUCTION MECHANISATION & HIGH RISE CONSTRUCTIONS	(06 Hours)
	Role of Construction activity in the National (including Urban & Rural) & Global development. Necessity of mechanization in construction industry. Types of construction such as Light, Medium & Heavy duty. Erection techniques for high rise structures, advantages & disadvantages of high rise structures. Scope of infrastructure in India and provisions made.	
UNIT - II	UNDER WATER CONSTRUCTION	(06 Hours)
	Cofferdams Dams & Caissons – Definition, Classification & its use. Dredging Techniques. Construction under deep water (Tremie Method). Classification & different types of Piles, Sheet Piles, Pile driving techniques, Negative skin friction. Use of special types of Formwork. Jetties.	
UNIT - III	ADVANCED CONSTRUCTION TECHNIQUES	(06 Hours)

	Launching of Girders, Precast Techniques, Tunnel Driving techniques, Tunnel boring machines (Open & Shield), Road Headers & Boomers, Placing of concrete in Hot & Cold weather conditions. Shotcreting & Guniting. Trenchless Technology, Micro Tunneling. Pneumatic Drilling equipments. Drill & Blast method.	
UNIT - IV	EARTH WORK MACHINERIES	(06 Hours)
	Classification of Earth Moving machines (rippers, dragline, scrappers, pavers, backhoe) & factors affecting in selection. Group behavior of equipments. Manpower requirement for the equipments. Rollers, Tractors, Bull Dozers, Rippers, Draglines & Clamp Shells, Scrappers, Dumpers, Pavers, Power Shovels, Backhoe -: detailed study of these equipment with classification, uses, output, & economics. Excavating, Transporting & compaction equipments. Importance of record keeping of machineries & mode of payment for them.	
UNIT - V	HOISTING & CONVEYING EQUIPMENTS	(06 Hours)
	Hoisting & Transporting equipment; types (Derrick, Tower & Mobile), factors affecting for selection. Conveying equipments-: belt, apron, vibrating, pneumatic, flight & spiral or screw conveyors. Hauling equipments. Crushers & its types.	
UNIT - VI	DEWATERING, PAVING EQUIPMENTS & CONCRETE PUMPS	(06 Hours)
	Dewatering Techniques; Electro-osmosis method, Well Point System. Paving Equipments; Types, Uses. Asphalt Pavers, Slip Form Pavers, Concrete Pavers. Pumps; Types & Uses. Pumps for concreting.	
ASSIGNMENTS :		
1) Enlist & explain role of construction activity in National & Global development. Explain scope of infrastructure in India & provisions made.		
2) Define with examples; Light, Medium & Heavy construction.		
3) Define & differentiate between Cofferdams & Caissons & briefly explain piles & its classification.		
4) In context of tunneling, enlist different tunnel driving techniques & tunnel boring machines.		
5) Write short notes on -: <ul style="list-style-type: none"> i. Shotcreting ii. Guniting iii. Trenchless technology iv. Drill & Blast method v. Pneumatic drilling equipments 		
6) Classify, discuss briefly various earth work machineries (any five) & factors affecting in		

selection including their economics.	
7) Classify & explain various hoisting & conveying equipment. Discuss in detail about factors affecting in selection of them & its economics.	
8) Explain crushers & its types in detail.	
9) Enlist & explain with neat diagrams, different dewatering techniques (electro-osmosis method, well point system).	
10) Write a brief note on Pumps & its types. Discuss in detail about various pumps used for concreting.	
11) Prepare a Power Point presentation (P.P.T.) on any of the topic of your choice from the entire syllabus after getting approval of topic from your subject teacher.	
Textbooks / Reference Books:	
1) Mahesh Verma, "Construction Equipment & Planning & Application", Metropolitan Book Company Private Ltd., New Delhi.	
2) Peurifoy Robert L., William B. Ledbetter, "Construction Planning Equipment Methods", Mc Graw Hill Book Company.	
3) Russel James E., "Construction Equipment", Reston Publishing Company.	
4) Shetty M.S., "Concrete Technology – Theory & Practice", S. Chand & Company Private Limited.	
5) S.C. Sharma & Khanna, "Construction Equipments & its Management",	
6) V.R. Phadke "Construction Machinery & Works Management".	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

13: STRUCTURAL ANALYSIS - I

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week		End Semester Examination: 60 Marks	04 Credits
Tutorial: 01 Hours / Week		Continuous Assessment: 40 Marks	
Course Pre-requisites: The students should have knowledge of			
1.	Solid Mechanics		
Course Objectives:			
	The student should be able to analyse the structure.		
Course Outcomes: The student will be able to			
1.	calculate degree of indeterminacy of the structure.		
2.	calculate deflection of truss.		
3.	analyse Indeterminate truss using strain energy method.		
4.	calculate fixed end moments.		
5.	analyse plane structure using slope deflection method.		
6.	analyse plane structure using moment distribution method.		
UNIT - I	Basic Concepts:		(06 Hours)
	Types and classification of skeletal structures, members, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Deflected shape of beam and frame. Strain Energy: Concept of strain energy; Modulus of Resilience; Strain energy due to axially force, shear force, bending moment and torsional moment.		
UNIT- II	Deflection of Beam and Truss:		(06 Hours)
	Deflection of determinate beam using conjugate beam method, Deflection of joints of determinate truss using Castigliano's first theorem		
UNIT- III	Analysis of Indeterminate Plane Trusses using Castigliano's theorem:		(06 Hours)
	Analysis of indeterminate trusses by application of Castigliano's second theorem; Effect of Lack of fit, temperature changes and Sinking of support.		
UNIT - IV	Fixed Beam and Clapeyron's Three Moment Theorem:		(06 Hours)
	Fixed Beam: Calculation of fixed end moments due to different types of loads; Effect of sinking of support. Clapeyron's Three moment theorem: Analysis indeterminate beams using three moment theorem for different support conditions; Effect of sinking of support.		
UNIT - V	Slope Deflection Method:		(08 Hours)

	Analysis of continuous beams using slope deflection method-sinking and rotation at support; Deflected shape of beam; Analysis of non- sway and sway rectangular portal frames (with indeterminacy up to 3 degrees);	
UNIT - VI	Moment Distribution Method:	(08 Hours)
	Analysis of continuous beams using moment distribution method-sinking and rotation at support; Analysis of non-sway and sway rectangular portal frames (with indeterminacy up to 3 degrees).	
Assignments:		
1	Draw different types of structures- space, plane, trusses, beams and frames.	
2	Draw deflected shapes of different types of structures	
3	Calculate degree of static indeterminacy.	
4	Calculate degree of kinematic indeterminacy.	
5	Calculate deflection of beam using conjugate beam method.	
6	Calculate deflection of truss using Castigliano's first theorem.	
7	Analysis of indeterminate trusses using Castigliano's second theorem	
8	Write fixed end moments for different loading cases.	
9	Explain three moment theorem	
10	Analysis beam/frame using slope deflection method	
11	Calculate distribution factor at joint.	
12	Analysis non-sway beam/frame using moment distribution method	
13	Analysis sway frame using moment distribution method	
Text Books:		
1) Hibbeler R. C., "Structural Analysis", Prentice Hall Publication		
2) Pandit G. S. & Gupta S. P., "Theory of Structures Vol-I", Tata McGraw Hill Publication		
3) Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company		
Reference Books:		
1) Prakash Rao D. S., "Structural Analysis", Universities Press Publication		
2) Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication		
3) Aslam Kassimali, "Structural Analysis", Cengage Learning.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

15: COMPUTER APPLICATION IN CIVIL ENGINEERING - III

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 02 Hours / Week	Term work and Practical: 50 Marks	01 Credits
Course Pre-requisites: The students should have knowledge of		
1.	Engineering Mechanics	
2.	Solid Mechanics	
3.	Structural Analysis-I	
Course Objectives:		
	The student should be able to analyse the structure using STAAD.Pro	
Course Outcomes: The student will be able to		
1.	analyse the beams	
2.	analyse the plane frames.	
3.	analyse the plane truss.	
4.	Analyse the structure space.	
	Introduction to STAAD.Pro: Application of software, Getting started, Introduction to Tool bars, Menu bar, working window, setting units, , Local and Global Co-ordinate system etc.	
	Generation of Model: Generation of skeletal model, Defining cross section and section properties, Generate and assign different types of supports, assign different types of nodal and member loads, Define load combination, analysis, static check, load list, post analysis, run analysis, read input file etc	
	Results and Interpretation: Post analysis, extract output/result of axial force, shear force, bending moment, torsional moment, deflection and stresses-their values and graphs. Results from output file, read output file and Interpret the results.	
Term work: Term work consist of assignments on		
	1) Analysis of beams	
	2) Analysis of plane frames	
	3) Analysis of plane trusses	
Practical: The practical examination is based on above syllabus and term work.		
Reference Books:		
	1) T.S. Sharma, “Staad.Pro v8i for beginners” , Notion Press	
	2) Sivakumar Naganathan, “Learn Yourself STAAD.Pro V8i”,Lap Lambert	
	3) Bentley Structures, “Staad.Pro Technical reference manual”, Bentley Community e-book	

16: CIVIL ENGINEERING CONSTRUCTION PRACTICE

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDITS ALLOTTED</u>
Practical: 02Hrs/Week		TW & Oral Exam: 50 marks	01Credits
Course Pre-requisites:			
The Student Should have knowledge of			
1.	Fundamental of Civil engineering.		
2.	Building Construction		
3.	Engineering mathematics.		
4.	Concrete Technology		
5.	Building Planning, Designing and Bylaws		
Course Objective			
1.	To make students understand Civil Engineering Practices.		
Course Outcomes			
The students will be able to			
1.	setout of foundation for buildings.		
2.	carry out testing of construction materials		
3.	manage inventory on site.		
4.	maintain quality control on site.		
5.	work as a site engineer		
List of Practicals (Any 10)			
1.	Setting out and layout of building foundation.		
2.	Study of various types of drawings required on construction sites		
3.	Study of reinforcement and its bending for different structural members.		
4.	Slump test on concrete and effect of plasticizers.		
5.	Study of formwork& scaffolding.		
6.	Construction of different types of brick masonry bonds, study of recent types of bricks and blocks		
7.	Study of plastering & pointing.		
8.	Study of different types of tiles.		
9.	Introduction to water supply & sanitary fittings and appliances.		
10.	Consealed construction practices.		
11.	Types of paints.		
12.	Methods of Waterproofing of toilets & roofs.		
13.	Testing of concrete cubes of of different grades.		
14.	Study of stock register format and daily report.		
15.	Study of construction of concrete walls		
16.	Study of precast techniques		
17.	Study of Deck Slab		
18.	Study of Advance Water proofing Techniques		
Reference Books:			
1.	A to Z Building Construction by Mantri publication.		
2.	My Construction Practices by R.B. Chaphalkar.		

Programme: B. Tech. (Civil) – Sem V - 2014 Course

Sr · No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/ D	T	End Sem · Exa m	Un it Te st	Attenda nce	Assignme nts	T W & Or al	TW & Practic al	Tot al	Theo ry	T W	Tot al
31	Structural Design-I*	4	2	1	60	20	10	10	50	--	150	5	1	6
32	Advanced Surveying	3	2	-	60	20	10	10	50	--	150	3	1	4
33	Engineering Project Management	3	2	-	60	20	10	10	50	---	150	3	1	4
34	Structural Analysis-II	3	--	-	60	20	10	10	---	---	100	3	--	3
35	Advanced Mechanics of Fluid	3	2	-	60	20	10	10	50	----	150	3	1	4
36	Professional Skill Development-V	4	--	-	100	--	--	--	--	---	100	4	--	4
	Total	20	08	1	400	100	50	50	200	--	800	21	4	25

*End Sem Exam of duration 4 hours.

Optional Subject

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
	Engineering Mathematics IV	4	--	-	60	20	10	10	--	--	100	4	--	4

Programme: B. Tech. (Civil) – Sem VI - 2014 Course

Sr · No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
37	Structural Design-II*	3	2	1	60	20	10	10	50	--	150	4	1	5
38	Environmental Engineering-I	3	2	-	60	20	10	10	--	50	150	3	1	4
39	Estimation, Costing and Valuation*	3	2	1	60	20	10	10	50	---	150	4	1	5
40	Geotechnical Engineering	3	2	-	60	20	10	10	50	---	150	3	1	4
41	Elective-I	3	--	-	60	20	10	10	--	----	100	3	--	3
42	Professional Skill Development-VI	4	-	-	100	--	--	--	--	---	100	4	-	4
	Total	19	08	2	400	100	50	50	150	50	800	21	4	25

*End Sem Exam of duration 4 hours.

Total Credits

Semester V = 25

Semester VI = 25

Grand Total = 50

31 Structural Design-I*

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week	End Semester Examination: 60 Marks	Theory :5
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial : 1 Hours / Week	Term Work & Oral : 50 Marks	Termwork: 1
Course Pre-requisites:		
The Students should have knowledge of		
1.	Structural Analysis- I	
2.	Mechanics of Solids	
Course Objectives:		
	To make student capable to design different structural elements using steel.	
Course Outcomes:		
The student will be able to		
1.	estimate design load	
2.	design a connection for axial load	
3.	design a members for axial tension	
4.	design a members for axial compression	
5.	design a built up column	
6.	design a beam	
UNIT - I	Design Philosophy	(06 Hours)

	Types of structural elements and their behavior, Introduction to IS:875, Types of Loads, Estimation of Loads, Wind Load on Roof Truss. Load combinations, Design Load, Steel as a structural material, Type of structural steel, Mechanical Properties, Rolled steel sections and engineering properties, Introduction to SP6(1), Strength of Section, Design strength, Partial safety factors, Concept of Limit state design, Introduction to IS:800.	
UNIT - II	Design of Connections for Axial Load	(06 Hours)
	Types of fasteners, advantages and disadvantages, Types of bolts, Design strength of bolts, Design of bolted connection and detailing, Strength of weld, Design of weld and detailing.	
UNIT - III	Design of Axially Loaded Tension Members	(06 Hours)
	Behavior of member in tension, Axial tension capacity of plates, single and double angles and channel section, Design of axially loaded Tension members.	
UNIT - IV	Design of Axially Loaded Compression Members	(06 Hours)
	Behavior of member in compression, Concept of Effective Lengths, Axial compression capacity of single and double angle section, Design of axially loaded compression members	
UNIT - V	Design of Built up Column and Column Base.	(06 Hours)
	Axial compression capacity of Built up Column, Design of built up column, Design of Lacing system, Design of battening system, Design of slab base, Design of gusseted base.	
UNIT - VI	Design of Beams	(06 Hours)
	Behavior of beams, Shear and moment capacity of Laterally supported and laterally unsupported beam. Design of beam, Design of built up section, Curtailment of plates, Design of bolted connections for shear and moment.	
<u>Term Work:</u> The term work shall consist of minimum any ONE projects with 2 numbers of half imperial sheets based on following topics:		

1) Design of roof truss: Load estimation, Analysis of truss, Design force for member, Design of Members, Design of connection, Design of Purlin, Drawing.	
2) Design of Building: Load estimation, Analysis of frame, Design of Secondary beams, main beams, Columns, Beam to Beam, Beam to Column connections, column bases, etc.	
Assignments:	
1) Calculation of Wind load acting on the roof truss.	
2) Design of bolted or welded connection for axial load.	
3) Design of member for axial tensile load.	
4) Calculate axial capacity of member in compression.	
5) Design of lacing or battening connection for built up column	
6) Calculation of moment and shear capacity of rolled / built up section.	
Reference Books:	
1) N. Subhramanian, “ Design of Steel Structures”, Oxford University Press	
2) S. K Duggal, “Limit State Design of Steel Structures”, Tata McGraw-Hill Education	
3) S.S.Bhavikatti, “Design of Steel Structures: By Limit State Method”, I K International Pub	
4) Dr. Ramchandra, “Limit State Design of Steel Structures”, Scientific Publishers	
5) M. R. Shiyekar, “Limit State Design in Structural Steel”, Prentice-Hall of India	
6) IS:800-2007, General Construction in Steel - Code of Practice”	
7) IS:875-1987, “Code of Practice for Design Loads for Buildings and Structures Part (1 to 5)”	
8) IS:808-1989, “Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections”	
9) SP-6(6)- 1972, “Handbook for Structural Engineers”	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

32: ADVANCED SURVEYING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Oral: 50 Marks	Termwork: 1
Course Pre-requisites:		
The Students should have knowledge of		
1.	Fundamentals of Civil Engineering	
2.	Surveying	
Course Objectives:		
	To make student capable to use advanced surveying techniques for mapping	
Course Outcomes:		
The student will be able to		
1.	explain Geodetic control survey and theory of errors.	
2.	explain various features of modern Total Station for survey .	
3.	describe principles and components of Space Based Positioning System and its applications .	
4.	describe technique of Hydrographic Survey.	
5.	explain basics of Remote sensing and Geographical information System and its applications	
6.	describe the process of Aerial survey and its use in Surveying.	
UNIT - I	Geodetic Control Survey:	(6 Hours)

	Introduction to geodetic control survey, System- Triangulation and Trilateration, Triangulation stations and figures, concept of base line. Types of errors, Probable error and its determination, Laws of weights, Method of least squares, Normal equation, Adjustment of triangulation figure.	
UNIT - II	Total Station Survey:	(6 Hours)
	Concept and necessity of an electronic total station instrument. Types of total station as per EDM , range and angle resolution system. Principle features of an ETS, temporary adjustments, On board programmes such as REM, RDM, Free stationing, resectioning etc. ,traverse survey with ETS. Concept of data down loading and post processing software, Errors in ETS survey.	
UNIT - III	Space Based Positioning Techniques:	(6 Hours)
	Introduction and concept, segments of SBPS- space, control and user. GNSS type SBPS in action-GPS, GLONASS, Compass. RNSS type SBPS in action-Quasi zenith, IRNSS. GPS signals, GPS receivers-navigation and surveying. SBPS positioning systems-absolute and differential. Access denial techniques and ephemeris. SBPS coordinates and heights. Surveying with SBPS. Errors in positioning with SBPS. Applications of SBPS	
UNIT - IV	Hydrographic Survey	(6 Hours)
	Concept, objects, Soundings and instruments and personnel required for sounding, methods of locating soundings. Three point problem and its solution by mechanical, analytical and graphical method. Tides and tidal gauges and establishment of MSL	
UNIT - V	Photogrammetry	(6 Hours)
	Elements of photogrammetry, types of photogrammetry. Aerial photographs their types and scale. Concept of relief displacement, Stereoscopy, parallax and mirror stereoscope, parallax equation and difference in elevation from differential parallax. Ground control. Procedure of aerial survey and flight planning.	
UNIT - VI	Remote Sensing and Geographic Information System :	(6 Hours)
	Remote sensing-concept, types –active and passive, components of remote sensing system, electromagnetic energy and spectrum,	

	<p>atmospheric windows and spectral signature. Remote sensing platforms and sensors. Remote sensing data products, interpretation of remotely sensed images visual and digital. Limitations and applications of remote sensing.</p> <p>Concept and need of GIS, Components- people, procedure, hardware, software and data .Functions- Input, manipulation, management, Query analysis and Visualization. Application and limitations of GIS.</p>	
Assignments:		
1. Solution of problems on Laws of weights and normal equations.		
2. Collection of information for various types of ETS used and available in the market and their salient features		
3. Collection of information of SBPS of various countries and applications of SBPS.		
4. Write a report on Instruments used for measurement of soundings.		
5. Case studies on applications of Remote sensing and GIS.		
6. Case studies on applications of Aerial survey.		
Term Work: Any Ten Experiments		
1. Study and use of one second theodolite and measurement of horizontal angle		
2. Measurement of horizontal angles by reiteration method and Measurement of vertical angle.		
3. Study and use of total station.		
4. Study and use of total station for traverse survey.		
5. Applications of Total Station for REM, RDM.		
6. Study and Use of Nautical Sextant for measurement of horizontal angles.		
7. Study and Use of Mirror stereoscope to find air base distance. parallax bar and determination of difference in elevation by differential parallax		
8. Study and use of parallax bar and determination of difference in elevation by differential parallax.		

9. Adjustment of braced Geodetic quadrilateral	
10. Study and use of Handheld GPS for traverse survey	
11. Solution of three point problem in hydrographic surveying	
12. Study of GIS software.	
Text Books:	
1.Duggal S. K., “Surveying Vol-1, Vol-2”, Tata Mac Graw Hill pub. co., New Delhi	
2.Punmia B. C., “Higher Surveying”, Laxmi Publications, New Delhi	
3. Chandra A.M. ,”Higher Surveying “ ,New Age International Publishers,	
4. Bannister A. and Raymond Baker , “Surveying” , Pearson Education	
5 Anji M. Reddy, “ Text book of Remote Sensing and GIS “ , BSP BS Publications	
Reference Books:	
1.Uren J., W. F. Price, “Surveying for Engineers”, Macmillan Pub	
2.Wolf P. R., “Elements of Photogrammetry”, Mc Graw Hill	
3.Agarwal C. S., Garg P. K., “Remote Sensing in Natural Resources”, Wheeler Publishing	
4. Lo C.P., Albert Yeung , “ Concepts and techniques of GIS “ , Printice Hall of India	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V ,VI

33: Engineering Project Management

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory -3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & oral: 50 Marks	Termwork -1
Course Pre-requisites:		
The Students should have knowledge of		
1.	Building construction.	
2.	Building planning and design.	
Course Objectives:		
	To prepare the student to analyze the network and monitor and control the civil engineering projects.	
Course Outcomes:		
The student will be able to		
1.	prepare organization chart.	
2.	prepare a network and analyze by CPM and PERT methods.	
3.	update network and carryout resource allocation	
4.	carry out material management	
5.	solve linear programming problem by graphical and simplex methods	
6.	check quality parameters in construction process.	
UNIT - I	Introduction to Project Management	(06 Hours)
	Importance, Objectives and functions of Management, Categories of Project, Project Life Cycle Concept, Importance of organizational	

	structures, types of organization, Project Manager education, experience, authority & responsibility.	
UNIT - II	Project Planning & Scheduling	(6 Hours)
	Gantt /Bar Charts and its limitations, Network planning, network analysis, C.P.M., P.E.R.T., Types of floats, Slack. Ladder network ,	
UNIT - III	Project Monitoring & Control	(6 Hours)
	Resource allocation, resource smoothening and leveling, crashing of network, direct cost and indirect cost, cost slope, updating of network,	
UNIT - IV	Material Management	(6 Hours)
	Objectives of material management, material requirement, scheduling, monitoring, inventory control, inventory classification, inventory management, economic order quantity, inventory models, ABC analysis	
UNIT - V	Linear Programming	(6 Hours)
	Identification & formulation of L.P. problem, requirements and assumptions of linear programming model, graphical method and simplex method	
UNIT - VI	Total Quality Management	(6 Hours)
	Importance of total quality management in construction process and steps involved, concept of quality control, quality assurance, quality management and TQM, study of various quality standards in construction, six sigma concept, designing of quality manual, checklist and inspection reports, necessity of MIS in management	
Assignments -:		
1) Project Manager Education, experience, authority & responsibility.		
2) Draw a bar chart for a building project.		
3) Ladder network analysis.		
4) ABC analysis of small building project.		
5) Problems on linear programming, graphical and simplex method.		
6) Total quality management.		

<u>Term Work :</u>	
1.	Assignment on different types of organization and their flowcharts.
2.	Assignment on bar chart.
3.	Assignments on C.P.M. and P.E.R.T.`
4.	Assignment on resource leveling.
5.	Assignment on crashing of network.
6.	Assignment on updating of network.
7.	Assignment on ABC and EOQ analysis.
8.	Assignment on linear programming, graphical and simplex method.
9.	Study of quality control system of a construction project.
10.	Prepare a network for any construction project containing minimum 25 activities and find out total float and free float.
Text Books:	
1.	Construction Engineering and Management by S. Seetharaman, Umesh Publications, New Delhi.
2.	PERT & CPM principles & applications by L.S. Srinath, affiliated East West press Pvt. Ltd., New Delhi.
3.	Project Planning & control with PERT & CPM by Dr. B.C. Punmia, K.K. Khandelwal, Laxmi Publications (P) Ltd, New Delhi.
Reference Books:	
1.	Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi.
2.	Construction Project Management Planning, Scheduling and controlling by K.K. Chitkara TMH Publishing Company, New Delhi
3.	Inventory Control by L.C. Zhamb, Everest Publishing House
4.	Project Management by Khatua, Oxford University Press
5.	Project Planning, Analysis selection, Implementation & Review by Prasanna Chandra, Tata McGraw Hill, New Delhi
6.	Civil Engineering Project Management by Alan C. Twort & J. Gordon Rees, Elsevier
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II & III
Unit Test -2	UNIT – IV, V & VI

34 Structural Analysis-II

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory : 3
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Structural Analysis- I	
2.	Mechanics of Solids	
Course Objectives:		
	The student should able to analyse the structure.	
Course Outcomes:		
The student should be able to		
1.	calculate plastic moment capacity of section.	
2.	draw Influence Line Diagrams (ILD) for reaction, Shear Force and Bending Moment	
3.	draw Influence Line Diagrams (ILD) for force in members of truss	
4.	analyse three hinge arch	
5.	analyse two hinge arch	
6.	analyse frame using approximate method.	
UNIT - I	Plastic Analysis of Structure	(06 Hours)

	Elastic and Plastic moment capacity, Plastic hinge, Shape factor, Collapse mechanism, Applications to continuous beams, Fixed beams, Single bay single storied rectangular frames.	
UNIT - II	Influence Line Diagrams and rolling loads for beams:	(06 Hours)
	Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams. Muller-Breslau's principle and its application to above beams. Rolling loads - Use of influence line diagram for determination of SF and BM in beams due to UDL shorter than span, UDL longer than span, Series of concentrated loads. Conditions for maximum SF and maximum BM values.	
UNIT - III	Influence Line Diagrams and rolling loads for truss:	(06 Hours)
	Influence line diagram for axial forces in members of plane determinate trusses. Use of influence line diagram for determination of member forces of plane determinate trusses under dead load and live load.	
UNIT - IV	Analysis of Three Hinged Arch	(06 Hours)
	Concept and types of arches, Three hinged arches – analysis, Calculation of horizontal Thrust, Radial Shear, Normal Thrust and BM at a cross section.	
UNIT - V	Analysis of Two Hinged Arch	(06 Hours)
	Two hinged arches – Horizontal Thrust at support, Radial Shear, Normal Thrust and BM at a cross section. BM diagram for concentrated load and UDL.	
UNIT - VI	Approximate Methods of the Analysis:	(06 Hours)
	Approximate methods of analysis of multistoried, multibay, 2-D rigid jointed frames by i) Portal method ii) Cantilever method iii) Substitute Frame Method	

Assignments:	
1) Calculate Plastic moment capacity of the cross section	
2) Draw ILD for beams for reaction, SF and BM	
3) Draw ILDs for members of the Truss	
4) Analyse three hinged arch	
5) Calculate support reactions for two hinged arch.	
6) Analyse frame using any approximate method	
Reference Books:	
1) Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication	
2) Pandit G. S. & Gupta S. P., “Theory of Structures- Vol-II”, Tata McGraw Hill Publication	
3) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
4) Junnarkar S. B. & Adavi, “Mechanic of Structures”, Charotar Publishing House	
5) Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

35 Advanced Mechanics of Fluids

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 3
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Oral : 50 Marks	Termwork : 01

Course Pre-requisites:

The Students should have knowledge of

1. Fluid Mechanics basics, Types of flows, friction.
2. Basic knowledge of Water retaining structure like dam, weir etc. irrigation channel.
3. Basic knowledge of Drag & lift, unsteady flow.
4. Basic knowledge of Hydro power plant.
5. Basic knowledge of pumps.

Course Objectives:

To impart knowledge of open channel flows and hydraulic machinery to students.

Course Outcomes:

The student will be able to

1. Design most efficient channel section, find critical depth of a flow.
2. Understand and apply knowledge of various flow profile and their characteristics.
3. Find energy dissipated in a hydraulic jump.

4.	Calculate forces on vanes for different conditions.	
5.	Understand and apply knowledge of turbines.	
6.	Understand and apply knowledge of pumps.	
UNIT - I	Uniform Flow in Open Channels:	(06 Hours)
	Basic Equations: Continuity Equation, Bernoulli's Equation, & Momentum Equation as applied to open channel one dimensional flow, Velocity distribution in open channel, Chezy's & Manning's formulae, factors affecting Manning's roughness coefficient, Normal depth, Conveyance Section factor, Most efficient channel section, Specific Energy, Specific Energy diagram, Depth-Discharge diagrams, alternate depths, Critical depth, Critical slopes, Froude number, Specific Force, Specific force diagrams, Conjugate depths, Depth-Discharge diagrams with respect to specific force.	
UNIT - II	Gradually Varied Flow in Open Channels:	(06 Hours)
	Gradually and rapidly varied flows, their examples, Basic assumptions in the derivation of GVF, Differential equations of GVF, Various GVF profiles, and their characteristics.	
UNIT - III	Rapidly Varied Flow:	(06 Hours)
	Hydraulic Jump in Rectangular and Trapezoidal channels, Classification & Practical uses of Jump, Examples of occurrence of Hydraulic Jump, Conjugate Depths, Energy Dissipation in Hydraulic Jump, Location of Jump, Devices for measurement of velocity and discharge in open Channels, Stream gauging.	
UNIT - IV	Unsteady Flow:	(06 Hours)
	Types, Flow through openings under varying head, Flow Compressibility, Celerity of Elastic Pressure Waves, Water Hammer Phenomenon, Rigid & Elastic water Columns Theories, Simple cases neglecting Friction, rapid	

	acceleration of flow due to sudden opening of valve, surge tanks and their functions, Location and Classification.	
UNIT - V	Fluid Flow Around Submerged Bodies:	(06 Hours)
	Fluid Flow Around Submerged Bodies: Practical problems involving fluid flow around submerged bodies, Definition & Expression for Drag, lift, drag coefficient, Types of Drag.	
UNIT - VI	Hydraulic Machines :	(06 Hours)
	Impact of Jet: Force Exerted due to impact of jet on stationary and moving flat and curved plates using linear momentum Principle, Principle of angular momentum, Euler's Momentum Equation for Turbines. Element of Hydropower plant, Hydraulic turbines, Heads & efficiencies, Governing of turbines, Cavitation in turbines, Performance of turbines, Prediction of performance in terms of unit quantities and specific quantities, specific speed. Theory of centrifugal pump, Centrifugal head due to rotation, Heads & efficiencies, Cavitation, Prediction of performance in terms of specific quantities, specific speed, characteristic curves.	
Assignments (Any Six)		
1. Solve Four Numericals to find out Critical Depth.		
2. Solve Numerical on GVF to find out flow profiles		
3. Solve Numericals on Hydraulic Jump to find out dissipation of energy.		
4. Solve Numericals to find out forces on different types of vanes.		
5. Solve Numericals on design of Turbines.		
6. Solve Numericals on design of Pumps.		
7. Collection & Study of Information Brochure about different Hydraulic Machineries.		
8. Collection & Study of Information Brochure about Hydraulic Lab Supply Companies.		

<u>Term Work: (Any Eight)</u>	
1. Flow around aerofoil.	
2. Flow around a Circular Cylinder.	
3. Impact of jet around flat / curved plate.	
4. Performance Curves of Hydraulic Turbine. Constant Head Characteristic Curve	
5. Characteristics of Centrifugal Pump.	
6. Uniform flow formulae of open channel.	
7. Velocity distribution in open channel flow.	
8. Hydraulic jump as energy dissipater.	
9. Characteristics of various GVF profiles.	
10. Design of Hydraulic Centrifugal Pump.	
11. Design of Hydraulic Turbine.	
12. GVF Computations by Direct Step Method.	
Text Books:	
1. Garde R. J., Mirajgaonkar A. G., “Engineering Fluid Mechanics”, Scitech Publication, Chennai	
2. Rangaraju K. G., “Open Channel Flow”, Tata McGraw Publication	
3. Streeter Wylie, “Fluid Mechanics”, Tata McGraw Publication	
4. Subramanyam K., “Open Channel Flow”, Tata McGraw Publication	
5. Ven Te Chow, “Open Channel Hydraulics”, Tata McGraw Publication	
6. Zueb Husain, Zaniel Alimuddin , “ Basic Fluid Mechanics and Hydraulic Machines” BSP Books Pvt. Ltd. Hyderabad	
Reference Books:	
7. Fox, McDonald, Pritchard, “Fluid Mechanics SI Version” Willey Student Edition	
8. Frank M. White, “Fluid Mechanics”, McGraw Hills Series	
9. C P Konthadraman, R Roodramoorthy, “Fluid Mechanics & Machinery” New Academic Science	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

36: Professional Skills Development V

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week	End Semester Examination: 100 Marks	4
Course Pre-requisites		
The Students should have knowledge of		
1.	Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.	
2.	An overall idea about vocabulary, Public speaking skills taught in the last semester	
3.	Knowledge of writing skills, importance of professionalism in emails and letters.	
4.	Knowledge on handling criticism and the concept of conflicts.	
5.	Awareness of the interpersonal skills like team work and its importance in the corporate sector.	
Course Objectives		
	The Professional Skills Development 5 is an extension of PSD- 4 with focus on the remaining topics of Aptitude, Reasoning and Grammar. The further complex concepts of Aptitude and Grammar aims to acquaint them with the topics and also provide them techniques to solve the question with tricks/methods in a very short period. The English communication and soft skills section of PSD-5 focuses on the higher aspects of soft skills training students on how to handle Group Discussions during placement process and other topics such as grooming them on how to handle conflicts effectively in the corporate scenario and also the correct attitude/approach to solve problems collectively from a team's perspective and also individually.	
Course Outcomes		
The student should be able to		
1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics of tenses and Sub- verb agreement relevant from the recruitment point of view.	

2.	Use Mnemonics, and learn appropriate strategies to handle complex topics in GDs and ways to handle them. Students would learn the appropriate ways of stating opinions, disagreeing or communicating during the Group Discussion Process.
3.	Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
5.	Students would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life. It would be a continuation of the topic covered during the previous semester PSD-4
6.	Learn to handle Case studies effectively and incorporate the right approach towards Case Studies asked during the recruitment process.
Unit I	Aptitude (Maths, Logical Reasoning, English) (24Hours)
	<ul style="list-style-type: none"> • Maths <ul style="list-style-type: none"> ▪ Time, Speed & Distance ▪ Time & Work ▪ Simple Interest & Compound Interest in continuation ▪ Maths Revision • Logical Reasoning <ul style="list-style-type: none"> ▪ Data Interpretation ▪ Data Sufficiency ▪ Set Theory & Syllogisms ▪ Reasoning Revision • English <ul style="list-style-type: none"> ▪ Grammar – II – (Adjective, Verb, Sub- Verb Agreement) ▪ Grammar- (Tenses) ▪ Vocabulary ▪ Verbal Ability- Revision
Unit II	Soft Skills & English Communication (24Hours)
	(6 Hours)
	<ul style="list-style-type: none"> • Situational Conversation • Situational Writing • GD Orientation • Mock GD-1 • Mock GD-2 • Mock GD-3

	<ul style="list-style-type: none">• Conflict Resolution• Problem Solving Skills• Time- Management Skills• Handling Case Studies• Management Games• Business Meeting Etiquettes	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		

37 Structural Design-II

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 4
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial: 1 Hour/Week	Term Work: 25 Marks	Termwork:1
Course Pre-requisites:		
The Students should have knowledge of		
1.	conditions of equilibrium, plotting Shear force and bending moment diagram of beams with various support conditions and various load combinations.	
2.	Determination of bending stress and shear stress in beams.	
3.	Concept of short, long columns, direct and bending stress, principal stress and strains.	
4.	Concrete, concreting techniques and properties of concrete.	
5.	Plastic theory, concepts of planning of staircase, planning of a building.	
Course Objectives:		
	The student should be able to complete the design and detailing of a G+2 storied R.C.C. building.	
Course Outcomes:		
The student will be able to		
1.	differentiate between various design philosophies of R.C.C. and know the properties of materials used in R.C.C. and the partial safety factors in Limit State Method .	
2.	differentiate between under-reinforced, over-reinforced and balanced section , analyse and design a singly reinforced, doubly reinforced and flanged beam by Limit State Method.	
3.	design beams for flexure, shear, bond for various supporting conditions	

4.	design different types of slabs and a staircase.	
5.	design short columns for axial load, uniaxial and biaxial bending by using SP-16.	
6.	design isolated column footings.	
UNIT - I	Materials and Design Approach:	(6 Hours)
	Introduction of R.C.C: Materials: Types of reinforcements, Study of properties of concrete and properties of steel. Introduction to design philosophies of R.C. Structures: Working Stress Method, Ultimate Load method, Limit State Method. Various limit states, semi-probabilistic approach, partial safety factors for materials and loads, various structural elements and loads on the elements, Load combinations.	
UNIT - II	R.C. Sections in Flexure:	(6 Hours)
	R.C. Sections in Flexure: Limit State Method: Assumptions, Strain variation diagram, Stress variation diagram; Concept of under reinforced, balanced, over reinforced section; Design parameters of a singly reinforced rectangular section, Moment of resistance of singly reinforced, doubly reinforced, rectangular, flanged section.	
UNIT – III	Beams:	(6 Hours)
	Design of Beams for Flexure, Shear, Bond : Behaviour of R.C .beam in shear, Shear failure, Shear strength of beam Without shear reinforcement, Design of shear reinforcement. Bond –Introduction, types of bonds, Code provision. Design of beams- Simply supported, cantilever, Continuous – Singly reinforced, doubly reinforced and flanged beam. Introduction to Redistribution of moments in beams: Assumption, Requirements of I.S.456-2000. Various load combinations in continuous beams.	
UNIT – IV	Slabs:	(6 Hours)
	Design of Slabs: One Way Slabs: Simply Supported, Cantilever, Continuous	

	Two Way Slabs: Various support conditions Design of Staircase: Dog legged, Open well	
UNIT – V	Columns:	(6 Hours)
	Design of Columns: Columns- Axially loaded short columns, requirements of minimum eccentricity; Design of short columns for axial load, uniaxial, biaxial bending (use of SP 16); Checking safety of column for biaxial bending	
UNIT-VI	Footings:	(6Hours)
	Design of Footings: Footings- Design of isolated column footing for axial load, uniaxial Bending.	
<u>Term Work:</u>		
<ol style="list-style-type: none"> 1. Design of G+2 storied building for gravity loads only. The design should include all types of slabs, beams, columns, footings and staircase (two flights) (Maximum three students in a group) 2. Report of a site visit related to building structure under construction. 3. Four half imperial drawing sheets . 		
Assignments : Any Six		
<ol style="list-style-type: none"> 1. Assignment based on various methods of design. 2. Assignment based on basic parameters in design-Limit State Method and Working Stress Method. 3. Assignment based on moment of resistance of a singly reinforced beam, doubly reinforced beam, flanged beam. 4. Assignment based on design of various types of slabs. 5. Assignment based on design of various types of beams. 6. Assignment based on staircase design. 7. Assignment based on design of various types of columns. 8. Assignment based on design of isolated footing. 		

9. Making the models of reinforcement in various types of slabs.
10. Making the models of reinforcement in various types of beams.
11. Making the models of reinforcement in columns.
12. Making the models of reinforcement in staircase.
13. Making the models of reinforcement in footing.

Text Books:

1. Dr. V. L. Shah and Dr. S. R. Karve- "Limit State Theory and Design", Pune Vidyarthi Griha Publications

2. Punmia, Jain and Jain, "Comprehensive Design of R. C. Structures", Standard Book House

3. S. S. Bhavikatti, "Design of R.C.C. structural elements", New Age International Ltd.

4. P. Dayaratnam, "Limit State Analysis and Design", Wheeler Publishing Company, New Delhi

5. P. C. Vergese, "Limit State Design", Prentice Hall India Publications, New Delhi

6. Sinha R.C. "RCC Analysis and Design- Vol. I, II", Chand and Co, New Delhi

I.S.Codes :

1. I.S.456-2000, "Plain and Reinforced Concrete-Code of Practice"

2. I.S.875-1987 (Part I to V), "Code of Practice for Design Loads"

3. SP-16-1980, "Design Aids for Reinforced Concrete"

Reference Books:

1. N. Subramanian "Design of Reinforced Concrete Structures" Oxford University Press

2. M. Fergusson "R.C. Fundamentals" - Tata Mcgraw Hill

3. S. Unnikrishnan Pillai, Devidas Menon "Reinforced Concrete Design"-Tata Mcgraw Hill Companies

4. Dr. H. J. Shah "Reinforced Concrete -Vol.1 (Elementary Reinforced Concrete)" -Charotar Publications

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

38: Environmental Engineering I

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Practical : 50 Marks	Termwork : 1
Course Pre-requisites:		
The Students should have knowledge of		
1.	Engineering chemistry.	
2.	Engineering mathematics.	
Course Objectives:		
	To make student aware of water treatment, air pollution, solid waste management and environmental management	
Course Outcomes:		
The student will be able to		
1.	Explain the water quality criteria and drinking water quality standards.	
2.	Explain aeration and sedimentation process of water treatment.	
3.	Describe filtration, disinfection and advanced water treatment processes.	
4.	Enumerate the various aspects of air pollution.	
5.	Describe the solid and hazardous waste management.	
6.	Explain the aspects of environmental management.	

UNIT - I	Water-Quantity, Quality and Standard	(06 Hours)
	<p>Water: Surface water sources, Ground water Sources, Water demand and quantity, various demands, Conveyance of water, Factors affecting demand, Design period, population forecasting,</p> <p>Quality of Water: Various Sources, Common impurities and their effects, Physical, Chemical, Biological, radiological characteristics of water, Drinking water quality standards,</p> <p>Flow sheets: Water Treatment Plant (WTP) based on sources of Raw water for Rural and Urban</p>	
UNIT - II	Treatment-Aeration and Sedimentation	(06 Hours)
	<p>Aeration: Types of aerators, gravity aerator and fixed spray aerator.</p> <p>Sedimentation: Plain Sedimentation, Principles and types of plain Sedimentation, details of Sedimentation tank, types of tanks, inlet and outlet arrangements; Design criteria like surface overflow rate, detention time, weir loading, depth of tank. Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clari-flocculator;</p> <p>Tube settlers: Introduction, Design of Tube settler</p>	
UNIT - III	Treatment- Filtration, Disinfection and Advance Technology	(06 Hours)
	<p>Filtration: Necessity, mechanisms, Theory of filtration, types of filters, pressure filters, dual and multimedia filters, Different media, details of filter, Rapid sand filter and slow sand filter, design criteria, working and washing of rapid sand filter, design of rapid sand filter.</p> <p>Disinfection: Necessity, Different methods, chlorination, reactions involved, Free And combined residual chlorine, Break point chlorination. UV disinfection, Ozonation</p> <p>Advance Treatment Methods: Water Softening- Chemical and ion exchange methods, Fluoridation and defluoridation, desalination, membrane technologies.</p>	
UNIT - IV	Air Pollution and Control	(06 Hours)

	<p>Air Pollution: History of Air pollutants, Sources and classification of pollutants and their effects on human health, vegetation and property. Ambient air quality and emission standards,</p> <p>Air Pollution Control: Principles, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods, Particulate Matter Control: settling chambers, cyclone separation, Wet collectors, fabric filters, and electrostatic precipitators.</p>	
UNIT - V	Solid and Hazardous Waste Management	(06 Hours)
	<p>Solid and Hazardous Waste Management: Introduction, Sources, Legislations, Waste Generation, Composition, Source reduction of wastes,</p> <p>Handling and segregation of wastes at source, storage and collection, Transport, Labeling and Handling of Hazardous Wastes, Waste processing, Composting,</p> <p>Solid Wastes Disposal in Landfills, secure landfills and landfill bioreactors, landfill remediation,</p> <p>Integrated Solid waste management: Principles and Elements of Integrated Solid waste management.</p>	
UNIT - VI	Environmental Management	(06 Hours)
	<p>Environmental Management: Introduction, Principle, Fundamentals</p> <p>Environmental Management Systems- Introduction, ISO 14000 series, Environmental Management Plan, Eco – labeling,</p> <p>Environmental Management Tools: Life Cycle Assessment (LCA): Environmental Impact Assessment (EIA) and Environmental Audits</p> <p>Environmental Legislation: Rules and Regulations of Environmental laws in India (Water and Air),</p>	
Assignments:		
1. Draw and explain flow sheets of water treatment plant for different types of water sources		
2. Numericals on design of flocculator, sedimentation tank and tube settler.		
3. Information about various types of filtration units		
4. National ambient air quality standards and control methods of air pollutants		
5. Experiences of solid waste management.		

6. EIA studies	
<u>Term Work: (Any Eight experiments)</u>	
11.	Determination of pH and alkalinity of water samples
12.	Determination of Total Hardness and its components of water samples
13.	Determination of Chlorides of water samples
14.	Determination of Turbidity and optimum dose of alum for raw water samples.
15.	Determination of Optimum dose of chlorine and residual chlorine for water samples.
16.	Determination of calorific value and/or energy content of the solid waste.
17.	Determination of concentration of trace metals (Al, Mn, Cu, Ni, Zn, Pb, Cd, Fe, N, P, K) from water, solid waste, air and soil samples.
18.	Determination of PM 2.5 in ambient air samples.
19.	Determination of concentration of Particulate matter and gaseous pollutants in industrial stack.
20.	Determination of concentration of carbon di-oxide from ambient air/industry/automobile
21.	Site visit
22.	Study of EIA report of infrastructure project.
Text Books:	
4.	Wark Kenneth and Warner C.F, Air pollution its origin and control. Harper and Row Publishers, New York, 1981.
5.	Rao C.S., Environmental pollution control Engineering, New age international Ltd, New Delhi, 1995.
6.	Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.
7.	George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, Integrated Solid Waste Management, McGraw- Hill, New York, 1993

8.	CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.
9.	Dr. M. N. Rao and Dr. Razia Sultana, 'Solid and Hazardous Waste management' BSP Books Pvt. Ltd. 2012
10.	I. V. Murali Krishna and Valli Manickam, 'Environmental Management', BSP, Books Pvt. Ltd. 2014
Reference Books:	
1.	S.K. Friedlander: Smoke Dust and Haze: Fundamentals of Aerosol Behavior, Wiley 1977.
2.	Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997.
3.	J.L. Schnoor, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
4.	Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I, Academic Press, 2006.
5.	Solid Waste Management, Van Nostrand Reinhold Co. 1975
6.	C.L. ell, Solid Waste Management, John Wiley, 1975
7.	P.W. Powers. How to dispose of toxic substances and industrial Waste, Noyes Data Corporation, England, 1976.
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

39 Estimating, Costing and Valuation

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory -4
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	Termwork -1
Tutorial : 1 Hour/ week	Term Work & Oral : 50 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Building Construction and Building planning and Design.	
2.	Structural Design I and Structural Design II.	
3.	Surveying and leveling	
4.	Environmental Engineering I	
5	Infrastructure Engineering	
Course Objectives:		
	To prepare the students to make estimate of building, road, and other civil engineering structures	
Course Outcomes:		
The student will be able to		
1.	explain the specifications for different construction works and materials..	
2.	prepare estimate of the buildings, and other civil engineering structures.	
3.	.carryout rate analysis of different items of construction work	
4.	Carry out valuation of civil engineering structures.	

5.	fill the tender documents.
6.	compare different types of contracts

UNIT - I		(6 Hours)
	<p>Estimating: Definition, importance of quantity surveying, types of estimates, data required for estimates, units of measurement & principles deciding the units, mode of measurement of building works. Abstracting, bill of quantities. Provisional & prime cost items, contingencies, establishment charges, centage charges, Schedule of rates (D. S. R.)</p> <p>Approximate Estimate: Definition, purpose, methods of approximate estimation of building & other civil engineering projects like roads, irrigation & water supply & sanitary engineering, electrical works.</p>	
UNIT - II		(6 Hours)
	<p>Methods of Taking out quantities: long wall, short wall method and centre line method of taking out quantities for different items of building. Estimate of RCC members. IS Codes used for estimating.</p> <p>Specifications: Definition & purpose, types, standard specifications. Drafting detailed specifications with reference to materials, quality, workmanship, method of execution, mode of measurement and payment, for major items such as earthwork, stone/brick masonry, plastering, ceramic tile flooring, R.C.C. work.</p>	
UNIT - III		(6 Hours)
	<p>Analysis of rates: Factors affecting cost of an item of work, materials, sundries, lab our, Tools & plant, overheads & profit. Task work - definition & factors affecting task work. Analysis of rates of any five items.</p> <p>Estimate of Road: Methods of estimate of earthwork for road, canal. Estimate of different types of roads.</p>	
UNIT - IV		(6 Hours)

	<p>Valuation of Properties: Purpose, nature of value, price, cost and value, types of value. Factors affecting value of property. Concept of free hold and lease hold property.</p> <p>Depreciation & methods of working out depreciation, sinking fund, Years purchase, out goings. Methods of Valuation of Building: Land & building basis, Rental basis, Reproduction & replacement cost basis. O₁ form.</p>	
UNIT - V		(6 Hours)
	<p>Tenders: Definition. Methods of inviting tenders, tender notice, Pre- qualifications of contractor, tender documents, preparation of tenders. Submission in 3 bid/ 2 bid or single bid system. Qualitative and quantitative evaluation of tenders, E tendering. Comparative statement, pre- bid conference, acceptance of tenders, various forms of BOT tenders, global tendering. (A mockup exercise of preparation, submission, opening of tender documents is suggested). PPP contracts.</p>	
UNIT - VI		(6 Hours)
	<p>Contracts: General idea, types of contracts viz: lump sum, item rate, cost plus, Conditions of contracts. FIDIC document, standard contract conditions published by MOS and PI, Law of contract. Definition, objective & essentials of valid contract.</p> <p>Conditions of contract: General and Specific conditions. Condition regarding EM, SD, time as an essence of contract. Important conditions regarding addition, alteration, extra items, testing of materials, defective work, subletting, powers delegated to Engineer incharge regarding the above aspect, defect liability period, retention money, interim payment or running account bills, advance payment, secured advance, final bill.</p> <p>Settlement of disputes viz. dispute resolving board, arbitration, concept of partnering. Indian Contract Act. Liquidated damages, termination of contract.</p>	
Assignments		
1. Approximate estimate of different types of buildings		
2. To determine quantities of different items of building and preparation of specifications for construction materials (Any five)		

3. Rate analysis.
4. To carryout the valuation of existing building.
5. Mock up exercise of submission of tender.
6. Types of contracts.
<u>Term Work:</u>
1.Estimate of different structures using long wall short wall method and centre line method
2.Detailed estimate of a single storied R. C. C. framed building using D.S.R. rates
3.Working out quantities of steel reinforcement for a slab, a beam, column footing and preparing bar bending schedule.
4. a)Detailed estimate of roadwork . b) Assignment on road earthwork calculations.
5.Estimating quantities for any two of the following a) House drainage & water supply arrangement. b) Pipe culvert or slab culvert c) Septic tank.
6.Drafting detailed specifications of any five items .
7. Assignment on valuation of building. (O ₁ form)
8.Preparation of draft tender notice.
9. Rate analysis for any five items.
Text Books:
1. Estimating and Costing By: Rangwala Published By: Charotar Publishing House, Anand
2.Estimating, Costing Specifications & valuation in Civil Engineering By: M.Chakraborty
Reference Books:
1.Estimating and Costing in Civil Engineering: Theory and Practice, By: B.N Dutta. Published By: S. Dutta & Company, Lucknow.
2.Civil Engineering Contracts & Estimates By: B.S.Patil Published, Orient Longman Ltd. Mumbai.
3.I.S.1200 (Part 01 to 25): Methods of Measurement of Building and Civil Engineering Works.
4. D.S.R: District Schedule of Rates

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

40: Geotechnical Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Termwork : 01
	Term Work & Oral : 50 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Engineering Mathematics	
2.	Engineering Mechanics	
3.	Fluid Mechanics	
Course Objectives:		
	To make student capable to determine the properties of soil and use of soil as a construction material.	
Course Outcomes:		
The student will be able to		
1.	determine weight - volume relation in soil as a three phase system	
2.	determine index properties of soil.	
3.	explain the compaction and consolidation process.	
4.	calculate the geostatic stresses and coefficient of permeability.	
5.	measure the shear strength of soil by various methods.	
6.	calculate the active and passive earth pressure by various methods.	

UNIT - I	Introduction to soil mechanics	(6 Hours)
	Soil, Soil formation, soil types its composition, soil structures, clay mineral, soil mechanics, history and development of soil mechanics, basic definitions, weight volume relations in soil as three phase system, soil classification systems – USCS, IS, HRB, Textural classification, Activity of clay, Sensitivity of clay, Thixotrophy of clay	
UNIT - II	Index Properties of Soil	(6 Hours)
	Index properties of soil – Water content, specific gravity, particle size distribution, Consistency limits, density, relative density	
UNIT - III	Permeability and Seepage Analysis	(6 Hours)
	Stresses within a soil, effective stress principle, stress point and stress path, Soil - water systems- capillarity, flow, Darcy’s law, permeability, and tests for its determination, head gradient and potential, seepage pressure, Upward flow condition, 2 D flow, Laplace equation, flow net and applications	
UNIT - IV	Compaction and Stress Distribution	(6 Hours)
	Compaction: - Laboratory compaction tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Field compaction; compaction specifications and field control. Stresses in soil: Geostatic Stresses, stress distribution, Bossinsque’s Theory for point load, Westergaard’s theory	
UNIT - V	Shear Strength	(6 Hours)
	a) Introduction- Shear strength an Engineering Property. Mohr’s stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure. Peak and Residual shear strength, factors affecting shear strength. Stress-strain behavior of sands and clays. b) Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests.	
UNIT - VI	Earth Pressure Theories	(6 Hours)

	<p>a) Earth Pressure- Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory- Earth pressure on Retaining wall due to submerged backfill,</p> <p>b) Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory. Rebhann's graphical method of determination of earth pressure.</p>	
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Term Work:

Term work shall consist of the following experiments (Any Ten)

1.	Determination of water content by oven drying method
2.	Determination of specific gravity of coarse and fine grained soil
3.	Classification of soil by sieve analysis
4.	Determination of consistency limits – Liquid, plastic and shrinkage limit
5.	Determination of in situ density test – Core cutter and sand replacement method
6.	Determination of coefficient of permeability by – a) Constant Head Method b) Falling Head Method
7.	Determination of OMC and MDD by Standard Proctor Test and Modified Proctor Test
8.	Determination of shear parameters by Direct Shear Test.
9.	Determination of Unconfined Compression Strength of soil
10.	Determination of shear parameters Triaxial Shear Test
11.	Determination of shear parameters Vane Shear Test

Assignments:

1.	Study of various relationships between weight and volume, numerical based on it and classification of soil.
2.	Classification of soil based on the index properties of soil.
3.	Study of permeability and numerical based on it.
4.	Study of Proctor tests, different field compaction equipments.
5.	Determination of shear strength, numerical problems based on it.
6.	Numerical problems based on earth pressure.

Text Books:

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1. Murthy, V.N.S., “Text Book of Soil Mechanics and Foundation Engineering”, CBS Publishers.	
2. Ranjan, G. and Rao, A.S.R., “Basic and Applied Soil Mechanics”, New Age International Publishers.	
3. K. R. Arora, “ Soil Mechanics & Foundation Engineering,	
4. Punmia B.C., “Soil Mechanics and Foundation Engineering” Laxmi Publications	
5. C. Venkatramaiah, “Geotechnical Engineering”, New Age International Publishers	
6. Gulati, Manoj Dutta, “Geotechnical Engineering”, Tata McGraw Hill Publications	
Reference Books:	
10. Terzaghi Karl, Ralph B. Pech, “Soil Mechanics in Engineering Practice”, A Wiley International Edition.	
11. Holtz, R.D. and Kovacs, W.D., “An Introduction to Geotechnical Engineering”, Prentice Hall.	
12. Lambe, T.W. and Whitman, R.V., “Soil Mechanics”, John Wiley and Sons.	
13. Couduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India.	
14. Das, B.M., “Principles of Geotechnical Engineering”, Thomson Asia.	
15. Korner Robert M. “ Construction and Geotechnical Engineering” Tata McGraw Hill Publications Company, New Delhi	
16. Joseph E. Bowels, “Soil mechanics and Foundation Engineering”, Tata McGraw Hill Publications Company, New Delhi	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 A: Elective-I: Financial Management

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory - 03
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Project Management	
2.	Economics and Management	
3.	Construction Techniques and machinery.	
Course Objectives:		
	Students are expected to prepare company's financial position for decision making.	
Course Outcomes:		
The student will be able to		
1.	manage financial planning of a construction project.	
2.	forecast financial requirement of a construction firm.	
3.	analyze Time-Value of Money.	
4.	determine working capital for construction Project.	
5.	apply theories of capital structures.	
6.	carry out risk analysis of budget.	
UNIT - I	Introduction to Financial Management	(6 Hours)

	Scope and Functions of Financial Management, Role of Finance Manager, Organization of the Finance function, Financial Planning, Financial Statement Analysis	
UNIT - II	Financial Planning	(6 Hours)
	Introduction, Objectives and steps in Financial planning, Factors affecting financial planning, estimation of financial requirement of a construction firm, Capitalization, Sources of Financing	
UNIT - III	Capital Budgeting	(6 Hours)
	Time Value of money – Future value of a single cash flow, annuity, Present value of Single Cash flow, Present Value of Uneven Cash flow, Discounting and Non-discounting techniques – NPV, IRR, BCR and Payback period.	
UNIT - IV	Working Capital Management	(6 Hours)
	Importance and Objectives, factors affecting working Capital, Determination of Working Capital, Working capital financing policy	
UNIT - V	Capital Structure	(6 Hours)
	Introduction, Salient features of Capital Structure, Factors influencing capital structure, Theories of Capital structures – EBIT and MM approach, Financial Management in India	
UNIT - VI	Risk Analysis in Capital Budgeting	(6 Hours)
	Introduction, Types and Sources of Risk in Capital Budgeting, Risk Adjusted Discount Rate, Certainty Equivalent Approach, Probability Distribution Approach, Sensitivity Analysis, Simulation Analysis	
<u>Assignments: (Any Six)</u>		
12.	Assignment on Financial Management.	
13.	Assignment on Financial Planning.	
14.	Assignment on Balance Sheet & Profit-Loss statement.	
15.	Assignment on Cash flows.	
16.	Assignment on NPV, BCR and IRR	
17.	Assignment on working Capital Management with reference to case study.	

18.	Assignment on EBIT approach.
19.	Assignment on MM approach.
20.	Assignment on sensitivity analysis.
21.	Assignment on simulation.
Text Books:	
11.	Financial Management, I.M. Pande, Vikas Publication
12.	Financial Management, C. Paramasivam & T. Subramaniam, New Age International (P) Limited, Publishers.
Reference Books:	
17.	Financial Management, An Introduction, Jim Mc Menamin, Taylor and Francis
18.	Financial Management, M.Y. Khan, P.K. Jain, Tata McGraw Hill Publication
19.	Financial Management, Prasanna Chandra, Tata McGraw Hill Publication
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II & III
Unit Test -2	UNIT – IV, V & VI

41 B: Elective-I - Advanced Structural Analysis

<u>TEACHING SCHEME:</u>			<u>EXAMINATION SCHEME:</u>			<u>CREDITS ALLOTTED:</u>		
Theory: 3 Hours / Week			End Semester Examination: 60 Marks			Theory: 3		
			Continuous Assessment: 40 Marks					
Course Pre-requisites:								
The Students should have knowledge of								
1.	Structural Analysis- I							
2.	Structural Analysis- II							
Course Objectives:								
	The student should able to analyse the structure.							
Course Outcomes:								
The student will be able to								
1.	calculate deflection of beams and frames using Castigliano's first theorem.							
2.	analyze deflection of beams and frames using Castigliano's second theorem,							
3.	analyze indeterminate beams using Stiffness matrix method.							
4.	analyze indeterminate frames using Stiffness matrix method.							
5.	analyze indeterminate beams using Flexibility matrix method.							
6.	analyze indeterminate frames using Flexibility matrix method.							
UNIT - I		Deflection of Beams and Plane Frames using Strain Energy Method:					(06 Hours)	

	Deflection of determinate beams and rectangular portals by application of Castigliano's first theorem;	
UNIT - II	Analysis of Beams and Plane Frames using Strain Energy Method:	(06 Hours)
	Analysis of indeterminate beams and rectangular portals by application of Castigliano's second theorem with indeterminacy up to two degrees;	
UNIT - III	Analysis of Beams using Stiffness Matrix Method:	(06 Hours)
	Stiffness matrix method of analysis, Formulation of stiffness matrices, Applications to indeterminate beams. (Involving not more than three unknowns).	
UNIT - IV	Analysis of Plane Frames using Stiffness Matrix Method:	(06 Hours)
	Formulation of stiffness matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).	
UNIT - V	Analysis of Beams using Flexibility Matrix Method:	(06 Hours)
	Flexibility matrix method of analysis, Formulation of flexibility matrices, Applications to indeterminate beams. (Involving not more than three unknowns).	
UNIT - VI	Analysis of Plane Frames using Flexibility Matrix Method:	(06 Hours)
	Formulation of flexibility matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).	
Assignments:		
1) Calculate deflection of beams using Castigliano's first theorem		
2) Analyse indeterminate beams or rectangular portals by application of Castigliano's second theorem		
3) Calculate stiffness matrix for beams		
4) Calculate stiffness matrix for frames		
5) Calculate flexibility matrix for beams		
6) Calculate flexibility matrix for frames		

Reference Books:	
1) Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication	
2) Pandit G. S. & Gupta S. P., “Matrix Methods of Structural Analysis”, Tata McGraw Hill Publication	
3) Asslam Kassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co.	
4) Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall.	
5) Wilbur & Norris, “Basic Structural Analysis” Tata McGraw Hill Publication	
6) Reddy C. S., “Basic Structural Analysis”, Tata McGraw Hill Publication	
7) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
8) Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company	
9) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
10) Junnarkar S. B. & Adavi, “Mechanic of Structures”, Charotar Publishing House	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 C: ELECTIVE I: URBAN WATER MANAGEMENT

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 03 Hours / Week		End Semester Examination : 60 Marks		Theory :03	
		Continuous Assessment : 40 Marks			
Course Pre-requisites:					
The Students should have knowledge of					
1.	Physics, Chemistry, Mathematics and Statistics				
2.	Ecology, Hydrology, Environment and Climate Change				
3.	Water Engineering and Management				
Course Objectives:					
To learn Urban Water Management (UWM) which promises a better approach than the current system, in which water supply, sanitation, storm water and wastewater are managed by isolated entities, and all four are separated from land-use planning and economic development and adopt UWM and its adaptive, iterative processes will help cities significantly reduce the number of people without access to water and sanitation by providing water services of appropriate quantity and quality, thereby improving the health and productivity of urban residents.					
Course Outcomes:					
The student will be able to					
1.	Understand how cities are growing and changing which is leading to describing the promise of IUWM and how some city case studies that explore the ways in which aspects of IUWM have been put into practice, since every city faces a different challenge and requires context-appropriate solutions.				
2.	Focus on the implications of these changes for urban water resources: in the past, water security efforts focused on water quantity and understand how new concerns about water quality are now emerging.				

3.	Understand and design the new tools and strategies to shift from urban water management to IUWM, and develop flexible and adaptable urban water systems.	
4.	Gain insight that how UWM can contribute to cities' resilience in the face of climate change and analyze changing climate demanding water management be approached in a different way.	
5.	Understand, apply and develop an enabling environment for the change toward a framework for integrated urban water management.	
6.	Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities that are inclusive, productive, well governed, and sustainable which leads to foster a new culture of urban water management.	
UNIT - I	Introduction to Urban Water Management	(6 Hours)
	Introduction to Urban Water Management (UWM): Concept, Need, The changing urban context, Expanding city limits, Consequences of globalization and Urbanization, Urban-Rural Conflicts, Special challenges for some cities	
UNIT - II	Water resources and urbanization	(6 Hours)
	Water: Sources, Quantity and Quality, Wastewater: Sources, Quality and Reuse , Effects on Water Demand due to Urbanization, Water Cess Act, Water(Prevention and Control) Act 1974	
UNIT - III	UWM tools and management strategies	(6 Hours)
	Storm water management, Water reclamation and reuse, Water audits and efficient use, Flexible and adaptable urban water systems, Tariffs, payments and other economic tools, Benefit Cost Ratio for Urban Water Management	
UNIT - IV	Climate Change Challenge	(6 Hours)
	Climate Change: Introduction, Cause and Consequences, Climatic Variations in India in recent years, Effect of Climate change on Water Resources and Sanitation, Urban contributions to climate change, Response options , Resilience to climate change	
UNIT - V	Conventional and Integrated Urban Water Management	(6 Hours)
	Conventional Urban Water Management: Introduction, Present Scenario, Advantages and Disadvantages, Integrated Urban Water Management (IUWM): Introduction, Need, Advantages, Urban water governance, Application of IUWM for SMART CITY	

UNIT - VI	Framework for integrated urban water management	(6 Hours)
	Role of Central and Local governments, Involvement of Private sector, Business opportunities and Employment Enhancement, Participation of NGO's and Stakeholder, Sustainable Development and Practices	
Assignments:		
1. Collection of data how cities are growing and changing describing the promise of IUWM		
2. Study of urban water resources: in the past and how new concerns about water quality are now emerging.		
3. Design new tools and strategies to shift from Conventional urban water management to IUWM		
4. Study and data collection of climate change and analyze changing climate demanding water management be approached in a different way.		
5. Design framework for integrated urban water management for Existing and Futuristic SMART Cities		
6. Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities to foster a new culture of urban water management.		
7. Field Visit and Report on SMART City and/or Township in India and/or abroad		
Text Books:		
1. Urban Water Engineering and Management by Mohammad Karamouz, Ali Moridi, Sara Nazif, January 20, 2010 by CRC Press Textbook, ISBN 9781439813102 - CAT# K10665		
2. Municipal Stormwater Management, Second Edition by Thomas N. Debo, Andrew Reese, November 25, 2002 by CRC Press, Reference – 1176, ISBN 9781566705844 - CAT# L1584		
3. Urban Storm Water Management by Hormoz Pazwash, April 28, 2011 by CRC Press, Reference – 550, ISBN 9781439810354 - CAT# K10518		
4. Integrated Urban Water Management: Humid Tropics: UNESCO-IHP by Jonathan N. Parkinson, Joel Avruch Goldenfum, Carlos Tucci, March 26, 2010 by CRC Press, Reference – 180, ISBN 9780415453523 - CAT# K10165, Series: Urban Water Series		
5. Water in Central Asia: Past, Present, Future by Victor A. Dukhovny, Joop de Schutter, January 25, 2011 by CRC Press, Reference – 432, ISBN 9780415459624 - CAT# K00021		
6. The Economics of Sustainable Urban Water Management: the Case of Beijing: UNESCO-IHE PhD Thesis by Xiao Liang, September 28, 2011 by CRC Press, Reference – 200, ISBN 9780415691734 - CAT# K13927		
7. Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations by Holger Treidel, Jose Luis Martin-Bordes, Jason J. Gurdak, December 2, 2011 by CRC Press, Reference – 414, ISBN 9780415689366 - CAT# K13833, Series: IAH - International Contributions to Hydrogeology		
8. Metropolitan Sustainability: Understanding and Improving the Urban Environment Edited by F Zeman, Royal Military College of Canada, Canada, September 2012, Woodhead Publishing, ISBN: 978-0-85709-046-1		
9. Designing the Urban Future: Smart Cities Kindle Edition by Scientific American Editors, Kindle Edition, Kindle eBook, 31 Mar 2014		

10. Urban Water Supply and Sanitation in Southeast Asia: A Guide to Good Practice by Arthur C. McIntosh, ASIAN DEVELOPMENT BANK, ISBN 978-92-9254-554-3 (Print), 978-92-9254-555-0 (PDF), Publication Stock No. TIM135915-2
11. Water Resources and Economics In association with International Water Association (IWA), Editor-in-Chief: [Prof. Dr. Roy Brouwer](#), ISSN: 2212-4284, ELSEVEIR
12. Water and Cities: Ensuring Sustainable Futures, Apr 2015, ISBN : 9789264230149 (PDF) ; 9789264230101 (print)
13. Water Management: Performance and Challenges in OECD Countries, Mar 1998, ISBN : 9789264162600 (PDF) ; 9789264160781 (print)
14. Good Practices in Urban Water Management: Decoding Good Practices for a Successful Future Edited by Anand Chiplunkar, Kallidaikurichi Seetharam, Cheon Kheong Tan, 2012, Asian Development Bank, National University of Singapore, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF), Publication Stock No. BKK102333
15. Strategic Planning of Sustainable Urban Water Management, P-A Malmqvist, G Heinicke, E Korrman, TA Stenstrom, G Svensson, 2006, IWA Publishing, ISBN13: 9781843391050, eISBN: 9781780402413, Categories: Utility / network management, Urban water
17. Climate Change and Water: International Perspectives on Mitigation and Adaptation edited by Carol Howe, Joel B. Smith, MS. Jim Henderson, American Water Works Association and IWA Publishing, ISBN: 978-1-58321-730-6
18. Climate Change and Water Resources by Younos, Tamim, Grady, Caitlin A (Eds.) , ISBN 978-3-642-37586-6, Springer, USA
19. Climate Change, Water Supply and Sanitation: Risk Assessment, Management, Mitigation and Reduction by Adriana Hulsmann, Gesche Grützmacher, Gerard van den Berg, Wolfgang Rauch, Anders Lynggaard Jensen, Victor Popovych, Mario Rosario, Lydia S. Vamvakeridou-Lyroudia, Dragan A. Savic, 2015, ISBN13: 9781780404998, eISBN: 9781780405001, Categories: Developing Countries, Water resources / environment, Water supply & treatment

Reference Books:

1. Integrated Urban Water Management By Akiça Bahri, Global Water Partnership Technical Committee (TEC), TEC BACKGROUND PAPERS, NO. 16, ISBN: 978-91-85321-87-2
2. Good Practices in urban water management: Decoding good practices for a successful future edited by Chiplunkar, Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan, Mandaluyong City, Philippines: Asian Development Bank, 2012, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF)
3. Integrated Urban Water Management for Planners By John Y. Whitler and Jennifer Warner, Water Research Foundation, PAS Memo — September/October 2014, American Planning Association, 205 N. Michigan Ave., Ste. 1200, Chicago, IL 6060

Syllabus for Unit Test:

Unit Test -1

UNIT – I, II, III

Unit Test -2	UNIT – IV, V, VI
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41 D: Elective-I: Docks, Ports and Harbours

<u>TEACHING SCHEME:</u>			<u>EXAMINATION SCHEME:</u>			<u>CREDITS ALLOTTED:</u>		
Theory: 03 Hours / Week			End Semester Examination: 60 Marks			Theory: 03		
			Continuous Assessment: 40 Marks					
Course Pre-requisites:								
The Students should have knowledge of								
1.	Fluid Mechanics							
2.	Advanced Surveying (Hydrographic Survey)							
Course Objectives:								
	To study different marine structures and their design considerations.							
Course Outcomes:								
The student will be able to								
1.	describe development of port.							
2.	describe the wave, tide and the phenomenon related to the same.							
3.	explain different harbour and port facilities.							
4.	design the breakwaters.							
5.	explain the port planning.							
6.	explain marine pollution.							
UNIT - I	Introduction to Ports and Harbours						(6 Hours)	

	History, development of port and ship construction technology along with International trade, Port Development – Indian Scenario	
UNIT - II	Waves and Tides	(6 Hours)
	Concept of generation, propagation and form of wave in coastal zone, global tide phenomenon, types of tides concept of wave tranquility, resonance, coastal sediment transport	
UNIT - III	Ports and Harbours	(6 Hours)
	Harbour : classification, facilities and structures, Approach channel, Marker Buoys, Breakwater layout, Berth and Jetties, Bulk oil container Ports: Loading unloading, storage, Customs and relevant facilities, security, hospital colony, Associated Services, Maintenance facilities, Dry docks, Slipway, locks.	
UNIT - IV	Marine Structures	(6 Hours)
	General design aspects, breakwaters - function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories- function, types, suitability, design and construction features.	
UNIT - V	Port Planning	(6 Hours)
	Modernization of port, Lifting and loading unloading (RORO) facilities, Computerization, Automation, berth occupancy, Port Cost Analysis, Dredging and disposal technology	
UNIT - VI	Port Development	(6 Hours)
	Role of port development and national policy, Public and private sector, Marine pollution and environmental aspects.	
<u>Assignments:</u>		
1. Explain history and development of port in India.		
2. Write the concept of wave generation and propagation in coastal zone		
3. Explain the facilities provided at ports and harbours.		

4. Design a breakwater with the data given.	
5. Write different aspect of port planning.	
6. National policy for port development and environmental aspect of it.	
7. Site visit to CW & PRS	
Text Books:	
1. Basic Coastal Engineering, R.M.Sorenson, J.Wiley & Sons, 1978	
2. Docks and Harbour Engineering,H.P.Oza and G.H.Oza, Charotar Publishing 2013	
3. A Course in Docks and Horbour Engineering, S.P.Bindra, Dhanpatrai Publications	
4. Harbour, Dock and Tunnel Engineering,R.Shrinivasan, Charotar Publishing House Pvt.Ltd (2013)	
Reference Books:	
1.Oceanographical Engineering, R.L.Wiegel, Prentice –Hall 1964	
2.Coastal Engineering, Vols. 1 and 2 , R. Silvester Elsevier Scientific Publishing Co., 1974	
3.N I O Design Manual	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 E: Elective-I: HUMAN RESOURCE MANAGEMENT

<u>TEACHING SCHEME:</u>			<u>EXAMINATION SCHEME:</u>			<u>CREDITS ALLOTTED:</u>		
Theory: 3 Hours / Week			End Semester Examination: 60 Marks			Theory: 03		
			Continuous Assessment: 40 Marks					
Course Pre-requisites:								
The Students should have knowledge of								
1.	Engineering Economics Management							
2.	Project Management							
Course Objectives:								
	To develop the skill of human resource management in construction industry.							
Course Outcomes:								
The student will be able to								
1.	discuss the significance of human resources in construction industry.							
2.	plan human resources.							
3.	describe the recruitment and selection process.							
4.	discuss the significance of training and development of employees.							
5.	analyze the employee benefits and incentives.							
6.	describe employee management relations.							
UNIT - I		Introduction					(6 Hours)	
		History of HRD, Objectives, Functions, HRD in Construction industry, status of construction labour.						
UNIT - II		Human Resource Planning					(6 Hours)	

	Formulating human resource plans, various methods, job analysis, job specifications and job design in construction projects, forecasting personal needs and supply in construction sector.	
UNIT - III	Recruitment & selection	(6 Hours)
	Selecting project manager & project team, external & internal recruitment. Data gathering methods, skill requirement of construction personnel.	
UNIT - IV	Training & Development	(6 Hours)
	The training Process, Individual and organizational development, change management, performance appraisal, use of performance appraisal information establishing the evaluation system, Performance Management / Encouragement, Rewarding Employees	
UNIT - V	Employee Benefits	(6 Hours)
	Employee health and safety, wage and salary administration, incentive system, wages of construction industry, retirement and pensions.	
UNIT - VI	Employee Management Relations	(6 Hours)
	Collective Bargaining, Effective ways of working, trade unions act, labour welfare act, payment of wages act ,workers compensation act ,contract labour act, management of conflicts.	
<u>Assignments:</u>		
1. Case study of HRD in construction industry		
2. Formulating human resource plan		
3. Case study of external and internal recruitment		
4. Report on establishing evaluation system for performance appraisal		
5. Importance on Employee benefits		
6. Report on conversation with HR of any construction industry		
Text Books:		
13.	“Human Resource Development and Management” by “Biswanath Ghosh”, Vikas Publishing House Pvt. Ltd.	
14.	“Human Resource Management” by “S.C. Agarwal”, Dhanpat Rai Publications	
15.	Personnel & Human resource Management – C.B. Mamoria, Himalaya Publishing House	
Reference Books:		

20.	Human resource management – Subbarao, Himalaya Publishing House
21.	Human Resource Management— K. Aswathappa, TMH Pvt. Ltd
22.	“Human Resource Management” by “John Stredwick”
23.	International Human Resource Management--- Gary Diesler
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 F: Elective-I - Green Construction Practices.

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The Students should have		
	basic knowledge of conventional construction practices, green materials and immerging trends in the green building industry.	
Course Objectives:		
1.	To understand the concept of sustainability and sustainable development	
2.	To familiarize students with various environmental issues	
3.	To familiarize students with various Green Building Rating Systems	
4.	To understand selection criteria and implementation options for various green material	
5.	To inform the various alternatives materials and construction practices.	
6.	To inform the various recycled and innovative materials and construction techniques through case studies.	
Course Outcomes:		
The student will be able to		
1.	evaluate the immerging trends in the fields of sustainable development and environment.	
2.	evaluate the effects of construction industry on environment.	
3.	understand the various evaluation systems for green buildings.	

4.	implement various green material selection and construction techniques.	
5.	determine immerging trends in alternative materials and construction techniques.	
6.	determine immerging trends in the field of recycled and innovative materials	
UNIT - I	Introduction to Sustainable Development	(06 Hours)
	Basic Concepts of Sustainable Development - History of sustainable development in India and around the world – Sustainable Development an overview Bruntland Commission, UNFCCC – Goals of sustainable development – Energy, Environment and Financial sustainability	
UNIT - II	Environment Management and Impact Assessment	(06 Hours)
	Environment Management Basic: Introduction to biodiversity, Ecosystem and impacts of climate change on environment Environment Laws and Policies: EP Act (Environment Protection Act) Acts related to pollution and climate change	
UNIT - III	Sustainable Architecture and Green Buildings	(06 Hours)
	Green Ratings System: in India and around the world- an introduction Green Rating Systems in India : LEED (IGBC), Griha – Ecohousing,	
UNIT - IV	Green Building Materials and Construction Techniques	(06 Hours)
	Introduction to Green materials – Life Cycle Analysis – Life Cycle Cost Analysis – Selection criteria of Materials and Construction Techniques Green Buildings.	
UNIT - V	Alternative Material and Construction Techniques:	(06 Hours)
	Bamboo, ferrocete, cob-adobe, etc and their construction techniques.	
UNIT - VI	Recycled and Innovative Materials and Construction Techniques	(06 Hours)
	Recycled glass, plastic, recycled debris block. Process of manufacture and construction.	
Assignments:		

22.	Assignment on various building practices carried out conventionally and the consequences.
23.	Assignment on Eco system and food chain,
24.	Assignment on Environmental Impact.
25.	Report writing on Green Material.
26.	Report writing on Indoor Environmental Quality Enhancement facilities.
27.	Case Studies
Text Books:	
16.	Dominique Gauzin – Muller “Sustainable Architecture and Urbanism: Concepts,
17.	Slessor, Eco-Tech : “Sustainable Architecture and High Technology”, Thames and Hudson
18.	Ken Yeang, “Ecodesign : A manual for Ecological Design”, Wiley Academy, 2006.
Reference Books:	
1.	Francis D.K. Ching, Ian M. Shapiro : “Green building Illustrated”
2.	Kumar , Surender, Managi , Shunsuke: “The Economics of Sustainable Development The Case of India “
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 G: Elective-I: Numerical Methods in Civil Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Engineering Mathematics	
2.	Concept of differentiation and integration	
3.	Partial differential equations.	
Course Objectives:		
	To give a broad background to numerical methods common to various branches of civil engineering to the student.	
Course Outcomes:		
The student will be able to		
1.	find out core concepts of error estimate and accuracy of numerical solutions.	
2.	use direct solutions of linear systems.	
3.	use iterative solutions of linear systems.	
4.	use direct solutions of non-linear systems.	
5.	use numerical solutions to solve partial differential equations.	
6.	use numerical integration methods to solve partial differential equations.	
UNIT - I	Introduction to Numerical Methods.	(6 Hours)

	Introduction, need of studying numerical methods, Sources of error in numerical solutions: truncation error, round off error. Order of accuracy - Taylor series expansion.	
UNIT - II	Direct Solutions of Linear Systems	(6 Hours)
	Gauss elimination, Gauss Jordan elimination. Pivoting, inaccuracies due to pivoting. Factorization, Cholesky decomposition.	
UNIT - III	Iterative Solutions of Linear Systems	(6 Hours)
	Jacobi iteration. Gauss Seidel iteration. Convergence criteria.	
UNIT - IV	Direct Solutions of Nonlinear Systems	(6 Hours)
	Newton Raphson iterations to find roots of a 1D nonlinear equation. Generalization to multiple dimensions. Newton Iterations, Quasi Newton iterations. Local and global minimum, rates of convergence, convergence criteria.	
UNIT - V	Numerical Methods to solve partial differential equations.	(6 Hours)
	Difference operators (forward, backward and central difference), Stability and accuracy of solutions, Application of finite difference operators to solve initial and boundary value problems. Numerical quadrature: Trapezoidal rule, simpsons rule, Gauss quadrature.	
UNIT-VI	Numerical integration of time dependent partial differential equations	(6Hours)
	Parabolic equations: algorithms - stability, consistency and convergence, Lax equivalence theorem. Hyperbolic equations: algorithms - Newmark's method, stability and accuracy, convergence, multi-step methods.	
<p>Assignments: Any Six</p> <ol style="list-style-type: none"> 1. Assignment problem based on ‘Gauss -Jordan Method’. 2. Assignment problem based on ‘Gauss -Elimination Method’. 3. Assignment problem based on ‘Gauss –Seidel Iteration Method’. 4. Assignment problem based on ‘Newton-Raphson Method’-1D solution. 5. Assignment problem based on ‘Newton –Raphson Method’-multidimensional solution. 6. Solution of Partial Differential Equation using ‘Trapezoidal Rule’. 		

7. Solution of Partial Differential Equation using ‘Simposon’s Rule’.	
8. Solution of Partial Differential Equation using ‘Gauss Quadrature Rule’.	
9. Solution of Time Dependent Partial Differential Equation .	
Text Books:	
1. Balaguruswamy “ Numerical Methods” Tata Mcgraw Hill Publications	
2. Dr.V.M.Domkundwar “Numerical Methods”	
3. S. S. Sastry “Introductory Methods of Numerical Analysis”, Prentice Hall India	
Reference Books:	
1.T.J.R.Hughes"The Finite Element Method", Prentice Hall, Englewood Cliffs, NJ, 1987.	
2. I.Stakgold , “Green's functions and Boundary Value Problems", Wiley, 1998.	
3.D.Dahlquist and A. Bork "Numerical Methods", Dan Prentice-Hall, Englewood Cliffs, NJ,. 1974.	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

ENGINEERING MATHEMATICS-IV (OPTIONAL SUBJECT)

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Determinants	
2.	Matrices	
3.	Differentiation	
4.	Integration of functions	
5.	Differential equation	
Course Objectives:		
	The course aims at making the students familiar about the most basic numerical methods and concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.	
Course Outcomes:		
The student should be able to		
1.	derive appropriate numerical methods to solve algebraic and transcendental equations	
2.	evaluate the accuracy of common numerical methods.	

3.	develop appropriate numerical methods to solve a difference equation	
4.	be familiar with numerical interpolation and approximation of functions , numerical integration and differentiation.	
5.	be familiar with numerical solution of ordinary differential equations.	
6.	To compute Numerical Solution of Partial Differential Equations.	
UNIT - I	Numerical solutions of algebraic and transcendental equations	(08 Hours)
	Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.	
UNIT - II	Solution of system of linear algebraic equation	(08 Hours)
	Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.	
UNIT - III	Difference equation and Solution of difference equations	(08 Hours)
	Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.	
UNIT - IV	Interpolation and Numerical differentiation and integration	(08 Hours)
	Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting : Method of least squares. Straight line, Second degree, parabola, Exponential curve.	

	Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.	
UNIT - V	Numerical solution of I order ordinary differential equation	(08 Hours)
	solution by Euler's, method Euler' Modified method Taylor's series. Runga-kutta method. Milne's Predictors and Correctors method.	
UNIT - VI	Numerical Solution of Partial Differential Equations	(08 Hours)
	Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.	
Text Books:		
1. Gupta P.P.& Malik G.S., <i>Calculus of Finite Differences and Numerical Analysis</i> , Krishna Prakashan Mandir, Meerut, 21/e, 2006.		
2. B.S.Grewal, <i>Engineering Mathematics</i> , Khanna Publishers, 12/e, 2006.		
Reference Books:		
24. Francis J. Scheid, Schaum's <i>Outline of Numerical Analysis</i> , McGraw-Hill, New York, 1989.		
25. S. S. Sastry, <i>Engineering Mathematics</i> , Vol I, II Prentice Hall Publication, 3/e, 2004.		
26. C.Ray Wylie & Louis C. Barretle, <i>Advanced Engineering Mathematics</i> , Tata McGraw Hill Publishing Co Ltd., 6/e, 2003.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I,II,III	
Unit Test -2	UNIT – IV,V,VI	

42 Professional Skills Development VI

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week		End Semester Examination: 100 Marks	4
Course Pre-requisites			
The Students should have knowledge of			
1.	Concepts of Maths, Logical reasoning and English Grammar taught in the last semester.		
2.	A basic knowledge of Group Discussion, DO's and Don'ts done in the previous sem.		
3.	Basic knowledge of writing skills, importance of professionalism in emails and letters.		
4.	Knowledge on the concepts of criticism, feedback and conflicts.		
5.	Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.		
6.	Brief idea about professional and business meeting etiquettes.		
Course Objectives			
	The Professional Skills Development 6 is an extension of PSD- 5 with focus on the remaining topics of Aptitude and Grammar. The further complex concepts of Permutation and Combination, Probability and grammatical topics such as prepositions etc would be dealt with. The objective here is to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-6 focuses on the other important aspects of soft skills training students such as techniques of effectively handling Personal Interviews during placement process and understand the dynamics of structured Resume and PIs		
Course Outcomes			
The student should be able to			

1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics such as prepositions, conjunctions etc relevant from the recruitment point of view.
2.	Learn to handle vocabulary questions such as synonyms and analogies in recruitment test and other competitive exams
3.	Understand and Learn techniques/Strategies of how to handle Personal interviews during recruitment process. Through Mock PIs students would be taught the appropriate ways of answering tricky questions in Interview and would learn the correct body language etc to be demonstrated in an interview process.
4.	They would be acquainted with the differences between CV, Bio- Data and Resume and they would learn the correct format of a Résumé along with methods and styles to make their Resumes interesting.
5.	Students would learn to incorporate various rules of written communication in business writing scenario with the appropriate tone and words.
6.	Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector.
Unit I	Aptitude (Maths, Logical Reasoning, English)
	(24Hours)
	<ul style="list-style-type: none"> • Maths <ul style="list-style-type: none"> ▪ Permutation & Combinatiom ▪ Probability ▪ Maths Revision -1 ▪ Maths Revision - 2 • Logical Reasoning <ul style="list-style-type: none"> ▪ Matching, Selection & Arrangement ▪ Clocks & Calendars, Visual Reasoning ▪ Input , Output & Flow Chart. ▪ Reasoning Revision- 1 ▪ Reasoning Revision-2 • English <ul style="list-style-type: none"> ▪ Grammar – III– (Prepositions& Conjunctions) ▪ Grammar- (Articles & Parallelism) ▪ Verbal Ability Revision- I
Unit II	Soft Skills & English Communication
	(24Hours)

	<ul style="list-style-type: none"> • Resume-I • Resume- II • Mock GD • Mock GD • Personal Interviews-I • Personal Interviews-II • Mock PI • Mock PI • Extempore Speeches, Group Interviews • Written Skills- Revision • Stress Management • Business Writing Tones. 	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		

BHARATI VIDYAPEETH UNIVERSITY, PUNE
FACULTY OF ENGINEERING and TECHNOLOGY

Programme: B. Tech. (Civil) – Sem I - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)						Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment			TW	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments					
1.	Engineering Mathematics- I	3	--	1	60	20	10	10	--	100	4	-	4
2.	Fundamentals of Civil Engineering	3	2	--	60	20	10	10	25	125	3	1	4
3.	Engineering Graphics*	4	2	--	60	20	10	10	25	125	4	1	5
4.	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1	5
5.	Fundamentals of Electrical Engineering	3	2	--	60	20	10	10	25	125	3	1	4
6.	Professional Skill Development-I	2	--	--	50	--	--	--	--	50	2	-	2
7.	Computer Applications in Civil Engineering-I	-	2	--	--	---	--	--	50	50	-	1	1
	Total	19	10	1	350	100	50	50	150	700	20	5	25

*End Semester Exam of duration 4 hours.

BHARATI VIDYAPEETH UNIVERSITY, PUNE
FACULTY OF ENGINEERING and TECHNOLOGY

Programme: B. Tech. (Civil) – Sem II - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)						Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW	Total	Theory	TW	Total
8.	Engineering Mathematics- II	3	--	1	60	20	10	10	--	100	4	-	4
9.	Fundamentals of Mechanical Engineering	3	2	--	60	20	10	10	25	125	3	1	4
10.	Engineering Mechanics	4	2	--	60	20	10	10	25	125	4	1	5
11.	Engineering Chemistry	4	2	--	60	20	10	10	25	125	4	1	5
12.	Building Construction	3	2	--	60	20	10	10	25	125	3	1	4
13.	Professional Skill Development-II	2	--	--	50	--	--	--	--	50	2	-	2
14.	Workshop Technology	--	2	--	--	---	--	--	50	50	-	1	1
	Total	19	10	1	350	100	50	50	150	700	20	5	25

Total Credits

Semester I = 25

Semester II = 25

Grand Total = 50

BHARATI VIDYAPEETH UNIVERSITY, PUNE
FACULTY OF ENGINEERING and TECHNOLOGY

Programme: B. Tech. (Civil) – Sem III - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
15	Building Planning, Design and Byelaws*	3	2	--	60	20	10	10	50	--	150	3	1	4
16	Applied Geology	3	2	--	60	20	10	10	--	50	150	3	1	4
17	Engineering Economics & Financial Accounting	3	-	-	60	20	10	10	--	---	100	3	--	3
18	Mechanics of Solids	4	--	1	60	20	10	10	---	---	100	5	-	5
19	Concrete Technology	3	--	--	60	20	10	10	--	----	100	3	-	3
20	Professional Skill Development-III	4	--	--	100	---	----	--	--	----	100	4	-	4
21	Computer Applications in Civil Engineering-II	---	2	--	---	--	---	---	---	50	50	---	1	1
22	Testing of Materials	--	2	--	--	--	--	--	50	---	50	--	1	1
	Total	20	08	01	400	100	50	50	100	100	800	21	4	25

*End Semester Exam of duration 4 hours.

BHARATI VIDYAPEETH UNIVERSITY, PUNE
FACULTY OF ENGINEERING and TECHNOLOGY

Programme: B. Tech. (Civil) – Sem IV - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
23	Engineering Mathematics-III	3	--	1	60	20	10	10	--	---	100	4	-	4
24	Surveying	3	4	--	60	20	10	10	--	50	150	3	2	5
25	Mechanics of Fluids	3	2	--	60	20	10	10	50	----	150	3	1	4
26	Construction Techniques and Machinery	3	--	--	60	20	10	10	---	----	100	3	-	3
27	Structural Analysis- I	3	--	--	60	20	10	10	---		100	3	-	3
28	Professional Skill Development-IV	4	--	--	100	--	--	--	--	---	100	4	--	4
29	Computer Applications in Civil Engineering-III	---	2	--	---	--	---	---	---	50	50	---	1	1
30	Civil Engineering Construction Practice	--	2	--	--	--	--	--	50	----	50	--	1	1
	Total	19	10	01	400	100	50	70	100	100	800	20	5	25

Total Credits

Semester III = 25

Semester IV = 25

Grand Total = 50

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Programme: B. Tech. (Civil) – Sem V - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
31.	Structural Design-I*	4	2	1	60	20	10	10	50	--	150	5	1	6
32.	Advanced Surveying	3	2	--	60	20	10	10	50	--	150	3	1	4
33.	Engineering Project Management	3	2	--	60	20	10	10	50	---	150	3	1	4
34.	Structural Analysis-II	3	--	-	60	20	10	10	---	---	100	3	--	3
35.	Advanced Mechanics of Fluid	3	2	--	60	20	10	10	50	----	150	3	1	4
36.	Professional Skill Development-V	4	--	--	100	--	--	--	--	---	100	4	--	4
	Total	20	08	1	400	100	50	50	200	--	800	21	4	25

*End Sem Exam of duration 4 hours.

Optional Subject

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

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Programme: B. Tech. (Civil) – Sem VI - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
37.	Structural Design-II*	3	2	1	60	20	10	10	50	--	150	4	1	5
38.	Environmental Engineering-I	3	2	--	60	20	10	10	--	50	150	3	1	4
39.	Estimation, Costing and Valuation*	3	2	1	60	20	10	10	50	---	150	4	1	5
40.	Geotechnical Engineering	3	2	--	60	20	10	10	50	---	150	3	1	4
41.	Elective-I	3	--	--	60	20	10	10	--	----	100	3	--	3
42.	Professional Skill Development-VI	4	-	--	100	--	--	--	--	---	100	4	-	4
	Total	19	08	2	400	100	50	50	150	50	800	21	4	25
MD	Environmental Studies	3	-	-	100	-	-	25	-	-	125	-	-	--

*End Sem Exam of duration 4 hours.

Total Credits

Semester V = 25

Semester VI = 25 Grand Total = 50

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Programme: B. Tech. (Civil) – Sem VII - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
43	Structural Design-III*	3	2	-	60	20	10	10	50	--	150	3	1	4
44	Environmental Engineering-II	3	2	--	60	20	10	10	50	--	150	3	1	4
45	Foundation Engineering	3	-	--	60	20	10	10	--	---	100	3	-	3
46	Urban Planning	3	-	--	60	20	10	10	--	---	100	3	-	3
47	Elective-II	3	--	--	60	20	10	10	---	---	100	3	--	3
48	Computer Applications in Civil Engineering-IV	--	2	-	--	--	-	---	50	--	50	--	1	1
49	Project Stage- I	--	2	--	-	-	-	-	50	---	50	--	4	4
50	In plant Training for 45 days	--	--	--	--	--	--	--	50	---	50	--	3	3
	Total	15	12	-	300	100	50	50	250	00	750	15	10	25

*End Sem Exam of duration 4 hours.

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Programme: B. Tech. (Civil) – Sem VIII - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW& Practical	Total	Theory	TW	Total
51	Earthquake Resistant Design of Structures	3	2	--	60	20	10	10	50	--	150	3	1	4
52	Water Resources Engineering	3	2	1	60	20	10	10	--	50	150	4	1	5
53	Infrastructure Engineering	3	2	-	60	20	10	10	50	---	150	3	1	4
54	Elective-III	3	2	--	60	20	10	10	50	---	150	3	1	4
55	Project Stage- II	--	6	--	--	-	--	--	150	----	150	--	8	8
	Total	12	14	1	240	80	40	40	300	50	750	13	12	25

Total Credits

Semester -VII = 25

Semester -VIII = 25

Grand Total = 50

Total Credits from Sem - I to Sem-VIII= 200

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Programme: B. Tech. (Civil)

Sr. No.	41 Elective –I (Sem VI)		Sr. No.	47 Elective II (Sem VII)
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41 A	Financial Management		47A	Construction Management
41 B	Advanced Structural Analysis		47B	Maintenance & Rehabilitation of the Structures
41 C	Urban Water Management		47C	Environmental Impact Assessment
41 D	Docks, Ports and Harbours		47D	Bridge and Tunnel Engineering
41 E	Human Resource Management		47E	Ground Water Hydrology
41 F	Green Construction Practices		47F	Geo informatics
41 G	Numerical Methods in Civil Engineering		47G	Advances in Concrete technology & Composites
Sr. No.	54 Elective-III (Sem VIII)			
54A	Disaster Management			
54B	Advanced Steel Design			
54C	Solid Waste Management			
54D	Entrepreneurship Development			
54E	Hydraulic Structures			
54F	Social and Legal Aspects in Civil Engineering			
54G	Advanced Engineering Geology with Rock Mechanics			
54 H	Development Engineering			

Revised Structure

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Programme: B. Tech. Civil

Reasons for Revision:

- 1. Letter from Secretary, University Grants Commission, New Delhi (D. O. No. F 14-12/2016(CPP II) dated 13th June 2016)**

Action:

- a. Addition of new course Urban Planning at B. Tech. Civil Sem VII
 - b. Subsequent removal of Elective II of B. Tech. Civil Sem VII
 - c. Adjustment of the courses of Elective II in Elective III (Sem VII) and Elective IV (Sem VIII).
 - d. Renaming of Elective III and Elective IV as Elective II (Sem VII) and Elective III (Sem VIII) respectively.
2. Subject Environmental Studies shifted from Sem VIII to Sem VI.

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**B. Tech. (Computer) - 2014 Course
Semester –I**

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Semester Examination	Continuous Assessment			TW	Total	Th	TW
						Unit Test	Attendance	Assignments				
1	Engineering Mathematics - I	3	--	1	60	20	10	10	--	100	4	--
2	Fundamentals of Civil Engineering	3	2	-	60	20	10	10	25	125	3	1
3	Engineering Graphics	4	2	-	60	20	10	10	25	125	4	1
4	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1
5	Fundamentals of Electrical Engineering	3	2	-	60	20	10	10	25	125	3	1
6	Professional Skill Development - I	2	--	-	30	--	--	20	--	50	2	--
7	Programming Principles and Paradigms	--	2	-	--	--	--	--	50	50	--	1
Total		19	10	1	330	100	50	70	150	700	20	5

Teaching Scheme			Examination Scheme-Marks						Credits	
Lectures	Practical	Tutorials	End Semester Examination	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
19	10	1	330	100	50	70	150	700	20	5

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**B. Tech. (Computer) - 2014 Course
Semester –II**

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks							Credits	
					End Semester Exam.	Continuous Assessment			TW	Total			
		L	P/D	T		Unit Test	Attendance	Assignments			Th	TW	
8	Engineering Mathematics-II	3	--	1	60	20	10	10	--	100	4	--	
9	Fundamentals of Mechanical Engineering	3	2	--	60	20	10	10	25	125	3	1	
10	Engineering Mechanics	4	2	--	60	20	10	10	25	125	4	1	
11	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1	
12	Object Oriented Programming	3	2	--	60	20	10	10	25	125	3	1	
13	Professional Skill Development - II	2	--	--	30	--	--	20	--	50	2	--	
14	Workshop Technology	--	2	--	--	--	--	--	50	50	--	1	
	Total	19	10	1	330	100	50	70	150	700	20	5	

Teaching Scheme			Examination Scheme-Marks							Credits	
Lecture	Practical	Tutorial	End Semester Examination	Unit Test	Attendance	Assignments	TW	Total	Theory	TW	
19	10	1	330	100	50	70	150	700	20	5	

Total Marks of Semester –I and Semester-II = 1400

Total Credits of Semester –I and Semester-II = 50

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ENGINEERING MATHEMATICS-I

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

(08 Hours)

Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

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MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Civil Engineering

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
Course Pre-requisites:					
The Students should have					
1.	Concepts of units and conversions of units.				
2.	Basic knowledge of Chemistry				
3.	Basic knowledge of geography, concept of latitude and longitude.				
Course Objectives:					
	To make student understand the scope and application of Civil Engineering				
Course Outcomes:					
Students will be able to understand					
1.	Different building components and material				
2.	Classification of surveying				
3.	Levelling of the ground				
4.	Planning of building				
5.	Methods of irrigation and water supply				
6.	Different methods of transportation				
UNIT - I	Civil Engineering Scope And Applications.				(06 Hours)
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.				
UNIT - II	Surveying				(06 Hours)
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.				
UNIT - III	Building Planning And Bye Laws				(06 Hours)
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.				
UNIT - IV	Foundations and Earthquakes				(06 Hours)
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.				
UNIT - V	Irrigation And Water Supply				(06 Hours)
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures; Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.				
UNIT - VI	Infrastructure				(06 Hours)
	Roads- types of roads and their suitability, cross section of roads, meaning of				

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	<p>terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.</p> <p>Railways- Types of gauges, section of railway track, components of railway track, advantages.</p> <p>Bridges: Components - Foundation, Piers, Bearings, Deck.</p> <p>Airways- Components -Runway, Taxiway and Hangers.</p>	
Term Work:		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
Reference Books:		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p>Lines and Dimensioning in Engineering Drawing Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p>Curves used in Engineering Practice Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p>Orthographic Projection Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p>Isometric Projections Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p>Projections of Points and Lines and planes Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p>Projection of Solids Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p>Section of Solids Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views

6. Projection of Solids

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India,
New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International
Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria
and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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ENGINEERING CHEMISTRY

Teaching Scheme:
Lectures: 4Hrs/Week
Practical: 2Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory: 04
Practical: 01
Term Work: 25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process
(08 Hours)

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.
Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.
(08 Hours)

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.
(08 Hours)

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.
Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.
(08 Hours)

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.
Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.
(08 Hours)

Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers
Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,
Conformations :- conformations of ethane, conformations of n-butane
(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Electrical Engineering		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Mathematics	
2.	Physics	
Course Objectives:		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
Course Outcomes:		
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
5.	Define basic terms of single phase and three phase ac circuits and supply systems	
6.	Know and use electrical safety rules	
UNIT - I	Basic concepts	(06 Hours)
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	Network Theorems	(06 Hours)
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	Electrostatics	(06 Hours)
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
UNIT - IV	Magnetic Circuit & Transformer	(06 Hours)

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	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.</p>	
UNIT - V	AC Fundamentals & AC Circuits	(06 Hours)
	<p>AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.</p>	
UNIT - VI	Electrical Wiring and Illumination system	(06 Hours)
	<p>Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.</p>	

Term Work:

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
 - a) Voltage and current ratios.
 - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books:

- 1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi
- 2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi
- 3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd

Reference Books:

1. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication
2. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications
3. John Omalley Shawn – "Basic circuits analysis" Mc Graw Hill Publications

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4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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ENGINEERING MATHEMATICS-II

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

(08 Hours)

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Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition(1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Thermodynamics- Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p>Introduction to I.C. Engines and turbines- Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p>Introduction to refrigeration, compressors & pumps- Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p>Energy Sources - Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p>Heat transfer- Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)
UNIT-IV	<p>Properties of fluids- Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p>Properties of Materials and their Applications- Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p>Mechanical devices - Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p>	(08)

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	<p>Mechanisms- Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	
UNIT-VI	<p>Machine Tools- Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p>Introduction to manufacturing processes and Their Applications- Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

- 1 “Thermodynamics An Engineering Approach” Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. “Applied Thermodynamics for Engineering Technologists” T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. “I.C. Engines Fundamentals” J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. “Internal Combustion Engine “: V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 “Strength of Materials” H. Ryder, Macmillians, London, 1969, 3rd edition.
6. “Mechanics of Materials” Johston and Beer TMH, 5th edition
- 7 “Mechanisms and Machine Theory” Ambekar A.G., Prentice-Hall of India, 2007.
8. “Theory of Machines” S.S. Rattan, Tata McGraw- Hill, 2nd edition.

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9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication,
New Delhi, 2nd edition.

10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th
edition

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10: Engineering Mechanics

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Scalar and Vector
2. Newton's law of motion
3. Law of friction
4. Concept of physical quantities, their units and conversion of units
5. Concept of differentiation and integration

Course Objectives:

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

Course Outcomes:

The student should be able to

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

UNIT - I	Resultant and Equilibrium	(06 Hours)
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
UNIT - II	Truss and Friction	(06 Hours)
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	Centroid and Moment of Inertia	(06 Hours)
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
UNIT - IV	Kinematics of Rectilinear motion of a Particle	(06 Hours)
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	Kinematics of Curvilinear motion of a Particle	(06 Hours)
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	Kinetics of a Particle	(06 Hours)
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum	

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Principle, Coefficient of Restitution, Direct Central Impact.	
Term Work:	
A) The term-work shall consist of minimum Five experiments from list below.	
1. Determination of reactions of Simple and Compound beam.	
2. Study of equilibrium of concurrent force system in a plane.	
3. Determination of coefficient of friction for Flat Belt.	
4. Determination of coefficient of friction for Rope.	
5. Study of Curvilinear motion.	
6. Determination of Coefficient of Restitution.	
B) The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.	
Text Books:	
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.	
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.	
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.	
Reference Books:	
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.	
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.	
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.	
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.	
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.	
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VI

ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
	Term Work: 25marks	

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

(08hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

Object-Oriented Programming in 'C++'

TEACHING SCHEME

Lectures : 2 Hrs/week

Practicals : 2 Hrs/week

EXAMINATION SCHEME

ESE (End Semester Examination) : 60 Marks

Continuous Assessment: 40 Marks

Term Work : 25 Marks

Credits : 3 Credits

Course Pre-requisite:

Programming Principles and Paradigms, "C" programming language.

Course Objectives:

- To familiarize with the universal concepts of computer programming.
- To present the syntax and semantics of the "C++" language as well as basic data types offered by the language
- To discuss the principles of the object-oriented model and its implementation in the "C++" language
- To demonstrate the means useful in resolving typical implementation problems with the help of standard "C++" language libraries

Course Outcomes:

At the end of this course students will able to :

- Understand basic concepts of Object Oriented Programming and applications of OOP.
- Use basic, user-defined and derived data types, Operator precedence.
- Apply Decision Structure, Loops and Functions
- Write, Debug and Compile Programs of C++
- Implement OOP concepts like – Inheritance using C++ programming.

UNIT I

(3 Hours)

Principles of Object Oriented Programming:

Object Oriented Programming Paradigm, Basic concepts of Object Oriented Programming, Benefits of OOP, Object Oriented Languages, Applications of OOP.

UNIT II

(5 Hours)

Beginning with C++:

Overview of C++, Sample C++ Program, C++ statements, Structure of C++ program, Creating source file, compiling and Linking, Tokens, Keywords, Identifiers and Constants, Basic data types, User-defined data types, Derived data types, Declaration of variables, Dynamic initialization of variables, Scope Resolution Operator, Operator Overloading, Operator precedence, Control Structures.

UNIT III

(5Hours)

Functions in C++:

The Main Function, Function Prototyping, Call by Reference, Inline functions, Default arguments, Function Overloading, Friend and Virtual Functions.

Classes and Objects:

Class specification, Class Objects, Scope resolution operator, Access specifiers- Public, Private, Protected, Defining member Functions, Nesting of Member Functions, Private Member Functions, Static Data Members, Static Member Functions, Data hiding.

UNIT IV

(6 Hours)

Inheritance: Extending Classes:

Defining Derived Classes, Single Inheritance, Making a Private member inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Class, Abstract class. Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes, Constructors, Destructors, Passing parameters to base class constructors, virtual base classes. STL: An overview, containers, vectors, lists, maps.

UNIT V

(6 Hours)

Constructors and Destructors:

Constructors, Parameterized constructors, Default Constructors, Copy constructor, Dynamic Initialization of Objects, Destructors.

Polymorphism:

Base class, Virtual Functions, Pure Virtual Functions, Calling a virtual function through a base class reference, Early and Late Binding.

UNIT VI

(3 Hours)

Managing Console I/O operations:

C++ Stream Classes, Unformatted I/O Operations, Working with Files, Opening and Closing a file, Formatted I/O.

Text Books/References:

- *Herbert Schildt, "The Complete Reference C++", 4th Edition, Mc Graw Hill, 2003.*
- *Stanley.B.Lippmann, Josee Lajoie, Barbara.E.Moo, "C++ Primer", 5th Edition, Pearson Education, 2013.*
- *Scott Meyers: "Effective C++", Third Edition, Addison-Wesley, 2005.*

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- *E. Balaguruswamy, "Object Oriented Programming using C++", 4th Edition, Mc Graw Hill, 2010.*

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI

Workshop Technology

TEACHING SCHEME:

Theory: -
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -
Continuous Assessment: -
Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

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FACULTY OF ENGINEERING AND TECHNOLOGY

Programme: B. Tech. (Computer) – SEM III – 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments						
1	Fundamentals of Data Communication	3	--	1	60	20	10	10	--	--	100	4	-	4
2	Principles of Data Structures	3	2	--	60	20	10	10	50	--	150	3	1	4
3	Digital Techniques and Logic Design	3	2	--	60	20	10	10	--	50	150	3	1	4
4	Discrete Mathematics and Graph Theory	3	2	--	60	20	10	10	--	50	150	3	1	4
5	Engineering Economics and Management	3	--	--	60	20	10	10	--	--	100	3	--	3
6	Professional Skill Development- III	4	--	--	100	--	--	-	--	--	100	4	--	4
7	Programming Lab-I	--	4	--	--	--	--	--	50	--	50	--	2	2
	TOTAL	19	10	1	400	100	50	50	100	100	800	20	05	25

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FACULTY OF ENGINEERING AND TECHNOLOGY

Programme: B. Tech. (Computer) – SEM IV – 2014 Course

Sr.no	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments						
8	Engineering Mathematics- III	3	--	1	60	20	10	10	--	--	100	4	--	4
9	Computer Graphics and Visualization	3	2	--	60	20	10	10	50	--	150	3	1	4
10	Systems Programming	3	2	--	60	20	10	10	--	50	150	3	1	4
11	Fundamentals of Software Engineering	3	--	--	60	20	10	10	--	--	100	3	--	3
12	Microprocessors and Micro-controllers	3	2	--	60	20	10	10	50		150	3	1	4
13	Professional Skill Development- IV	4	--	--	100	--	--	-	--	--	100	4	--	4
14	Programming Lab-II	--	4	--	--	--	--	--	50	--	50	--	2	2
	TOTAL	19	10	1	400	100	50	50	150	50	800	20	05	25

Total Credits

Semester - III = 25

Semester - IV = 25

Grand Total = 50

01: FUNDAMENTALS OF DATA COMMUNICATION

TEACHING SCHEME:

Theory: 03 Hours / Week

Tutorial: 01 Hrs/Week

EXAMINATION SCHEME:

End Semester Exam: 60 Marks

Unit Test: 20 Marks

Assignment :10 Marks

Attendance: 10 Marks

CREDITS ALLOTTED:

04 Credits

Course Pre-requisites:

The Students should have

1. Knowledge of basic Engineering Mathematics

Course Objectives:

1. Create awareness among the students about theoretical aspects of data communication system
2. To make students aware of various modulation techniques, networking concepts, and error detection and analysis methods.

Course Outcomes:

1. Understand basic concepts and principles of data communications.
2. Differentiate between various Modulation Techniques and their applications.
3. Analyze codes used for Error Detection and Correction
4. Compare the switching techniques in data communication.
5. Comprehend various issues pertaining to Satellite Communications.
6. Gain substantial knowledge of evolution of Cellular communication systems.

UNIT - I Fundamentals of data communications :

(08 Hours)

Simplified data communications model. Frequency Spectrum and Bandwidth. Analog and Digital data transmission - data and signals, analog and digital transmission, their comparison, Digital data rate and bandwidth. Transmission impairments - Attenuation, Delay distortion, Noise, Channel Capacity.

Transmission Media: Guided Transmission Media - Twisted pair wires, Coaxial, Optical fiber. Wireless Transmission - Terrestrial microwave, satellite microwave, broadcast Radio, Infrared.

UNIT - II Digital and Analog Transmission (08 Hours)

Digital Data, Digital Signal, Line coding- characteristics, Line coding schemes- Unipolar encoding: NRZ, RZ, Manchester, Differential Manchester. Bipolar encoding:- AMI, Block coding Analog Data, Digital Signal: Sampling, Sampling theorem, Nyquist rate, Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM). PCM Encoder and Decoder, DPCM, ADPCM, Delta modulation. Analog Transmission: Modulation of Analog signals :AM, FM, and Phase Modulation. Digital Modulation Techniques –ASK, FSK, PSK, QAM. Modems. Multiplexing: FDM, TDM, statistical TDM, WDM, OFDM. Multiple Access Techniques: FDMA, TDMA, CDMA.

UNIT - III Information theory and Coding (08 Hours)

Information Rate, Shannon's theorem, Optimum Codes, Huffman Code, Code Efficiency, Error Control Coding, Methods of Controlling Errors, Types of Errors, Types of Codes, Error detection and correction capabilities, Hamming Distance, Hamming Bound, Hamming Codes, CRC Block Codes, Error Detection and Correction, Handshaking Techniques, FEC, ARQ - Stop and Wait, Go Back N, Selective Repeat, Channel Throughput and Efficiency.

UNIT - IV Transmission Modes and Telecommunication (08 Hours)

Parallel transmission, Serial transmission, Asynchronous transmission, synchronous transmission. Line Configurations, full duplex and half duplex transmission. Packet switching: Datagram, virtual circuit. Circuit switching and packet switching, (ISO-OSI) Seven layer model, Physical layer protocol, RS232, etc. Data link level Protocol HDLC, SDLC, X-25, LAN, WAN, ISDN. **Telephone Network:** Wire telephony, Subscriber loop, Trunk circuits. Four wire terminating set. PSTN, Frame Relay.

UNIT - V Satellite and Fiber Optic Communication (08 Hours)

Orbital aspects. Geostationary satellite, Station keeping, Frequency plans and polarization, Transponders, Multiple access methods. Line-of-Sight (LOS) issues in Satellite Communications. Fiber optic communication: Principle of light transmission in Fiber, types and modes of fiber, losses in Fiber. Dispersion, light sources and detectors, fiber optic communication link, Physical Layer of Wireless Media. Case Studies on recent communication technologies.

UNIT - VI Cellular Communication System (08 Hours)

Cell structure, Frequency reuse, Roaming, transmitter, Receiver, Special services provided by cellular phone, IEEE 802.11, WIFI, Bluetooth, GSM, GPRS. High-Speed Digital Access:- DSL Technology-ADSL, xDSL, Spread Spectrum-Concept, Frequency Hopping, Direct Sequence Cellular Telephony:- Basic concepts, Frequency-Reuse Principle, Transmitting, Receiving, Handoff, Roaming. First Generation, Second Generation-GSM, 3G Generation, 4G Networks. Case Studies on recent communication technologies.

Assignments:

1. Outline a comparison of all the various analog modulation techniques.
2. Solve Problems on Signal to Noise Ratio , Channel Bandwidth
3. Solve Problems on Sampling Theorem
4. Outline a comparison of all the various digital modulation techniques.
5. Solve Problems on Line Coding Techniques
6. Solve Problems on Information Rate
7. Solve Problems on Shannon’s Channel Capacity Theorem
8. Solve Problems on Hamming Code
9. Solve Problems on CRC and FEC
10. Discuss LOS issues in Satellite Communication
11. Case Study on current generations of Cellular Mobile Communication System

Text Books:

1. William Stallings -Data and Computer communications - Prentice Hall of India,7th Edition.
2. Behrouz. A Forouzan, Data Communications and Networking, McGraw Hill ,4th edition .
3. Understanding Data Communications, John Wiley & Sons, Ltd7th Edition

Reference Books:

1. Andrews S. Tanenbaum -Computer Networks, Prentice Hall of India, 4th Edition.
2. Dennis Roddy, Satellite Communications Systems, John Wiley & Sons, Ltd 5th Edition
3. Richard Van Nee & Ramjee Prasad., “OFDM for Multimedia Communications”, Artech House Publication, 2001.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

02: PRINCIPLES OF DATA STRUCTURES

TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Tests: 20 Marks

Assignment :10 Marks

Attendance: 10 Marks

Practical + Term Work: 50Marks

CREDITS ALLOTTED:

04 Credits

Course Pre-requisites:

The Students should have

1. Knowledge of programming language C++

Course Objectives:

1. To develop skills to use appropriate data structures and selection of appropriate algorithm in computer engineering applications.

Course Outcomes:

1. Gain knowledge of basic concepts of data structures & Realization of ADT.
2. Apply the implementation of stack for evaluation of POLISH expressions, and other problems using C ++ compiler.
3. Differentiate between linear and nonlinear data structures and implement tree traversal techniques using recursive and non recursive methods.
4. Develop different algorithms for operations on Graphs. Implement programs using different sorting algorithms and Analyze for best, worst and average case.
5. Describe the characteristics of an algorithm, Gain knowledge of time and space complexity. Analyze for the searching algorithms.
6. Gain knowledge of decision problems.

UNIT - I

Introduction to Algorithm and Data Structures:

(06 Hours)

Definition, ADT, Complexity of Algorithms, Asymptotic Notations, Big 'O' Notations, Types of Data Structures, Linear Arrays, Arrays as ADT, Representation of Linear Array, Traversing Linear Array, Searching in Linear Array, Representation of Polynomials using Arrays, Introduction to Stack, Stack as ADT, Array representation of Stacks, Introduction to Queue, Queue as ADT, Array Representation of Queue.

UNIT- II Linked List:

(06 Hours)

Introduction, Singly Linked List ,Traversing, Searching , Insertion and Deletion from a Singly Linked List, Doubly Linked List, Circular Linked List, Stack using Linked List, Linked Representation of Queue, Circular Queue, Application of Stacks and queues.

UNIT III Trees:

(06 Hours)

Introduction, Binary Trees, Binary Tree representation ,Recursive and Non recursive tree traversal algorithms, Threaded Binary Tree, Binary Search Tree, Huffman's Algorithm, AVL Trees, m-way Search Trees, general trees,B Trees, B+ Trees, Red Black Tree, Applications of Trees.

UNIT IV Graphs and Sorting techniques:

(06 Hours)

Introduction, sequential and Linked representation of graph, Dijkstra's Algorithm , ADT for Graph, Traversing a Graph, minimum spanning Trees.

Sorting: Introduction, Bubble sort, Insertion sort, Selection Sort, Merge Sort, shell Sort, Radix Sort, Quick Sort, Hashing, Heap sort. Complexity Analysis of Algorithms.

UNIT V Design and Analysis of Algorithms I :

(06 Hours)

Divide and Conquer The General Method, Greedy Method, Dynamic Programming, Basic Search and Traversal Techniques: Code Optimization, AND/OR Graphs.

UNIT VI Design and Analysis of Algorithms II :

(06 Hours)

Game Trees, Backtracking: The 8-Queens Problem, Graph Coloring, Knapsack Problem, Branch and Bound Method, Introduction to NP- Hard, NP- Complete Problems, Polynomial Complexity .

List of Practical Assignments:

1. Analyze the Complexity of given algorithms and build program for it using c++.
2. Build a program for creation of Stack and Queue using arrays and perform all the operations on it.
3. Construct Linked List, Doubly Linked List, and Circular Linked List and perform all the operations on it.

4. Write a program for application of Stack and Queues.
5. Write a program for Recursive and Non-Recursive traversal on trees.
6. Explain a Huffman's algorithm and build a program in C++ for it.
7. Represent a graph in memory and Implement Dijkstra's algorithm.
8. Write an algorithm for illustrating Bubble Sort, and Quick Sort (any other sorting method may be implemented).
9. Discuss about Threaded Binary Tree, design algorithm for its illustration.
10. Write a program to Implement Minimum Spanning Tree.

Internal Assignment:

Implement mini project with suitable data structures studied in syllabus.

Reference Books:

- 1) Ellis Horowitz, Sartaj Sahani, "Fundamentals of Computer Algorithms", Galgotia Publications.
- 2) GA V Pai, "Data Structures and Algorithms, Concepts, Techniques and Applications, The McGraw Hill Publications.
- 3) Data structures using C and C++ by Langsam, Augenstein, Tenenbaum, PHI publication.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

03: DIGITAL TECHNIQUES AND LOGIC DESIGN

TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test Tests: 20 Marks

Oral + Term Work: 50Marks

CREDITS ALLOTTED:

04 Credits

Course Pre-requisites:

The Students should have

1. Knowledge of number system and codes
2. Basic Mathematics

Course Objectives:

1. To develop an ability to design system with combinational and sequential circuits elements
2. To introduce digital logic design software.

Course Outcomes:

1. Comprehend different number systems and Boolean algebraic principles.
2. Apply Boolean algebra to simplify and apply design logic.
3. Analyze a given digital system involving combinational circuit elements.
4. Design and Synthesize a system with sequential circuit elements.
5. Understand structure and characteristics of Memory.
6. Validate and implement the PLD based designs using both schematic capture and VHDL

UNIT - I Number Systems and codes:

(06 Hours)

Binary, Octal, Decimal and Hexadecimal number Systems and their conversion, Binary Addition and Subtraction.

Boolean algebra and logic gates:- NAND-NOR Realization. De Morgan's theorems. Theorems and Properties of Boolean Algebra, Standard SOP and POS form,

	Reduction of Boolean functions using Algebraic method, Karnaugh maps. Quine McCluskey Method.	
UNIT - II	Combinational logic design:	(06 Hours)
	Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder and Subtractor, BCD Adder, code conversion, Multiplexers and Demultiplexer(IC 74153 & 74154), Decoders (IC 74138), Parity generator and checker.	
UNIT - III	Sequential Logic Design:	(06 Hours)
	Flip Flops: SR, D, JK, JK Master Slave and T Flip Flop, Truth Tables and Excitation Tables, Flip-flop conversion. Sequential circuit analysis, construction of state diagrams. Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters, UP- DOWN counter. Shift Registers: SISO, SIPO, PIPO, PISO, Bidirectional Shift Register, Universal Shift Register.	
UNIT - IV	Memory :	(06 Hours)
	Random Access Memory, TTL RAM Cell, Parameters, Read/Write Cycles, ROM Types, EPROM Structure and Programming, MOS Static RAM Cell, Dynamic Cell, Refreshing, Memory Cycles.	
UNIT - V	Algorithmic State Machines:	(06 Hours)
	ASM state blocks, ASM Charts, Notations, ASM modeling styles, Design of Simple Controller, Multiplexed Controller Method, RTL Notations and Implementation.	
UNIT - VI	PLD and PLA, Introduction to CPLD and FPGA Computer Aided Design of digital systems:-	(06 Hours)
	Functional Simulation, Timing Simulation, Logic synthesis and optimization, Introduction to VHDL, Introduction to HDL, Framework of VHDL program VHDL-Library, Entity, Architecture, Modeling Styles, Data Objects & Data Types, and Attributes.	

Term Work: The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. To Describe and illustrate Boolean Functions Using Logic Gates
2. To describe and investigate Half adder, Full Adder, Half Subtractor and Full Subtractor Using Gates And IC's.
3. Illustrate and Investigate Bit Digital Comparator And ALU Verification
4. To describe and devise Up-Down Counter Using JK Flip-Flop.
5. To design and construct Modulo N Counter Using 7490 & 74190 (N>10).
6. To Examine and formulate how to realize Boolean Expression Using Multiplexer.

7. To describe Shift Registers: Shift Left, Shift Right, Parallel Loading And Pulse train Generator.
8. To Discuss on FPGA Devices.
9. To discuss about Typical RAM IC.
10. To Build Combinational Logic Using PLA

Text Books:

- 1)R. P. Jain, “Modern Digital Electronics”, Tata McGraw Hill
- 2) Malvino- Brown, “Digital Computer Electronics” Tata McGraw Hill.
- 3) Douglas L. Perry, “VHDL Programming by Example”, Tata McGraw Hill

Reference Books:

- 1) Donald p Leach, Albert Paul Malvino,“Digital principles and Applications”,Tata McGraw Hill.
- 2) Yarbrough John M. , “Digital Logic Applications and Design “, engage Learning
- 3) M. Morris Mano, “Digital Logic and computer Design”, PHI.

Syllabus for Unit Test:

- | | |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

04: DISCRETE MATHEMATICS AND GRAPH THEORY

TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test Tests: 20 Marks

Assignment :10 Marks

Attendance: 10 Marks

Oral: 50 Marks

Total : 150 Marks

CREDITS ALLOTTED:

Theory:03 Credits

TW/Oral:01 Credit

Course Pre-requisites:

1. Knowledge of basic mathematics.

Course Objectives:

1. To create ability among the students to understand the difference between continuous mathematics and discrete mathematics.
2. To develop the skills to mathematically analyze the characteristics of various discrete structures
3. To develop the skills among the students to apply the discrete mathematical concepts in computer engineering applications

Course Outcomes:

1. Apply knowledge of mathematical and logical notation to define and formally reason about mathematical concepts.
2. Interpret and apply the operations and terminologies associated with relations and functions.
3. Gain knowledge of discrete mathematics techniques for constructing mathematical proofs.
4. Demonstrate and implement the basic concepts in graph theory.
5. Understand various concepts of algebraic systems.
6. Develop fundamental understanding of Elementary Combinatory.

UNIT - I Mathematical Logic: (06 Hours)

Propositional logic; negation ,disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs; resolution principle; Set theory; Paradoxes in set theory; inductive definition of sets and proof by induction

UNIT - II Relations: (06 Hours)

Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Hasse diagram ,Lattices, Lattice and its Properties, Recurrence Relation: Calculating Coefficient of generating function, solving recurrence relation by substitution. Characteristics roots solution of In homogeneous Recurrence Relation.

UNIT - III Functions: (06 Hours)

Introduction, types of functions and characteristics of functions ,mappings; composition of functions; inverse functions; special functions; hashing functions, recursive function ,recursion in programming languages.

UNIT - IV Graph Theory: (06 Hours)

Representation of Graph, DFS, BFS, Spanning Trees, and planar Graphs. Graph Theory and Applications, Basic Concepts Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

UNIT - V Algebraic structures: (06 Hours)

Definition and elementary properties of groups, semi groups, monoids, rings, fields, Homomorphism of Groups and Semigroups, Group Codes,Error recovery in group code,vector spaces

UNIT - VI Elementary Combinatorics: (06 Hours)

Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Probability Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion –Exclusion. Pigeon hole principles and its application.

Term Work:

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. To describe various operations on Set and illustrate the same using C program.
2. Formulate the approach for generating a Power Set of a given set and apply it using C language.
3. List various properties of Relation and construct a program to evaluate it.

4. To formulate a program to find the Transitive Closure of a given relation using C.
5. To Build a program in C for Depth First Search And Breadth First Search on a graph.
6. To state various operations on a Graph and illustrate it using C language.
7. To Justify whether an entered Graph is a Simple or Multiple devising c program.
8. To Produce a Minimal Spanning Tree from given graph Using C programming language.
9. To Examine whether the graph contains Hamiltonian path or Eulerian path using C code.
10. To Build a program to find the various cycles present in the graph.

Assignment:

1. The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.
2. In case of assignments for internal 10 Marks students will be assigned two assignments containing based on problems of different types or any programming assignment and guided for the solution of the problem.
3. The assignments are to be submitted as a hard copy

Text books

- 1) "Discrete Mathematical Structures" : Tremblay and Manohar, Tata McGraw Hill
- 2) "Discrete Mathematics" : 1st edition by Maggard, Thomso
- 3) C.L.Liu, Elements of Discrete Mathematics, 2nd Edition , McGraw Hill Pub
- 4) V. K. Balakrishn, Graph Theory, TMH (Recommended for Graph)

Syllabus for Unit Test:

- | | |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

05: ENGINEERING ECONOMICS AND MANAGEMENT

TEACHING SCHEME:

Theory: 03 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test: 20 Marks

Attendance:10 Marks

Assignments: 10Marks

Total Marks: 100 Marks

CREDITS ALLOTTED:

03 Credits

Course Pre-requisites:

Students should have

1. Basic knowledge about communication skills.
2. General awareness of economics and financial terms.

Course Objectives:

1. To impart knowledge, with respect to concepts, principles of Economics, which govern the functioning of a firm/organization
2. To explain the students about concept of production, cost, national income, an aggregate supply and aggregate demand consumption.
3. To help the students to understand the fundamental concepts and principles of management, functions of management, various organizational structures and basic knowledge of marketing.

Course Outcomes:

1. Understand the fundamentals of economics and theory of demand and supply.
2. Describe concept of production and cost.
3. Explain the fundamentals of national income and Aggregate supply and aggregate demand consumption.
4. Comprehend the concepts of money and banking.
5. Brief the basic concepts of management and its functions.

6. Describe marketing, production and financial management concepts.

UNIT - I Introduction to Economics

(06 Hours)

Definition of economics, Concept of money, value, goods, wealth, Concept of Engineering economics, Difference between Microeconomics & Macroeconomics, Nature of Economic problem, Relation between Science, Engineering, Technology and Economics. Firm-Meaning, objectives, Theories of firm- concept of profit maximization, Theory of Demand & Supply: determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity: elasticity of demand, price elasticity, income elasticity, cross elasticity, concept of Capital.

UNIT - II Theory of production

(06 Hours)

Theory of production: production function, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur), Law of variable proportions & law of returns to scale. Cost: short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost, Laws of costs. Break even analysis: introduction, numerical, Return on investment. Inventory Control, Quality related concepts.

UNIT - III Markets

(06 Hours)

Markets: introduction, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly). National Income: meaning, stock and flow concept, NI at current price, NI at constant price, GNP, GDP, NNP,NDP, Personal income, disposal income. Aggregate supply and aggregate demand consumption, Investment and saving functions.

UNIT - IV Money

(06 Hours)

Concept of money and its functions, types. Meaning, objectives and tools of Monetary policy and fiscal policy. Banking: types, functions, Central Bank- RBI; its functions, concepts; CRR, bank rate, repo rate, reverse repo rate, SLR. Functions of central and commercial banks. Inflation, Deflation, Stagflation, Direct and Indirect taxes. . Monetary and cycles, new economic policy, Liberalisation, Globalisation, privatisation, market friendly state, fiscal policy of the government, Meaning and phases of business.

UNIT - V Management and its functions**(06 Hours)**

Introduction to Management, Nature, scope. Management & administration, skill, types and roles of managers. Management Principles: Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory. Functions of Management: Planning, Organizing, Staffing, Directing, Controlling. Organizational Structures: principles of organization, types-formal and informal, line, line & staff, matrix, hybrid, span of control, departmentalization. Decision making- steps in decision making.

UNIT - VI Marketing and Finance Management**(06 Hours)**

Team Management, Leadership –Trait theory and charismatic leadership, Qualities of a good leader, Leadership Styles. Introduction to Marketing management: Marketing Mix, concepts of marketing, demand forecasting and methods, market segmentation. Introduction to Financial management, Financial Statements, Profit and Loss Statement (Income Statement), Balance Sheet. Financial Analysis- Profit Analysis. Introduction to Production Management; definitions, objectives, functions, plant layout-types & factors affecting it, plant location- factors affecting it. Introduction to Human Resource Management; definition, objectives of manpower planning, process, sources of recruitment, process of selection. Corporate Social Responsibility and its importance. Business Ethics.

Assignments:

Quiz/ Test / Mini Project / Case Study / Presentations based on syllabus.

Reference Books:

- 1) R.Paneerselvam, Engineering Economics, PHI publication
- 2) O.P.Khanna, Industrial engineering and management
- 3) Robbins S.P. and Decenzo, Fundamentals of Management
- 4) Tripathy and Reddy, Principles of Management
- 5) N Gregory Mankiw, Economics: Principles of Economics, Cengage Learning
- 6) L.M.Prasad, Principles and Practices of Management
- 7) Dr. K. K. Dewett & M. H. Navalur, Modern Economic Theory, S. Chand Publications
- 8) P.N. Chopra, Principles of Economics, Kalyani Publishers

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

07: PROGRAMMING LABORATORY I

TEACHING SCHEME:

Practical: 04 Hours / Week

EXAMINATION SCHEME:

Term Work (Practical): 50 Marks

CREDITS ALLOTTED:

02 Credits

Course Pre-requisites:

The Students should have

1. Basics concepts of Object Oriented Programming
2. Basic mathematical ability

Course Objectives:

1. At the completion of this course, student is able to read, write, and debug java programs using good programming style.

Course Outcomes:

1. Write java programs using JDK & Solve arithmetic expressions using java program.
2. Gain knowledge & apply concepts of class fundamentals in various programming assignments.
3. Differentiate between String & String Buffer Class. And use different functions of these classes in various programming assignments.
4. Understand and implement the concept of interfaces and packages.
5. Learn the concept of Exception handling and Apply it.
6. Apply the functions of AWT classes in various programming assignments.

UNIT - I Java Evolution: Difference between Java , C, C++, Features of java, The java runtime environment (JDK, JVM, Command Line Arguments), Sample java program, Java statements and program structure, Fundamental programming constructs in java: (Constants, Variables, keywords, Data Types, Operators, Expressions and control structures) **(06 Hours)**

- UNIT - II** **Classes and methods:** Specification of a class, Introduction to Methods, Access specifiers, Constructors, Method overloading, this keyword, finalizer method, recursion, Introducing Final keyword , Concept of array, Introducing Nested and Inner Classes, Inheritance , Using Super, Method overriding, Dynamic method Dispatch, Abstract class concept. **(06 Hours)**
- UNIT - III** **String Handling:** **(06 Hours)**
The String Constructors, String Operations, CharacterExtraction, StringComparison, Modifying a String, String Buffer.
The Collections Framework:
More Utility Classes, Networking, the Applet Class, Event Handling, Collection Interface, List Interface, Set interface, Map Interface , Enumeration Introduction to Swing.
- UNIT - IV** **Package and Interfaces:** **(06 Hours)**
Introduction to package: Types of packages, User define packages, Use of package keyword, Importing packages.
Interfaces: Define and implement interface, use of interfaces to support multiple inheritance, variables in interfaces, interfaces can be extended.
- UNIT - V** **Exception Handling and Multithreaded programming:** **(06 Hours)**
Exception handling: Introduction to exception handling, predefined and user defined exceptions.
Use of try, catch, throw, throws and finally keywords.
Introduction to threads, life cycle of a thread, thread states, thread properties, methods in Threads and Runnable, setting priority of threads, synchronization and inter thread communication
- UNIT - VI** **Introducing the AWT, Using AWT controls, Images:** **(06 Hours)**
Introduction to AWT, events, listeners, event handling methods, a small application to demonstrate use of controls – label, button, check box, text, radio button, Dialog Box, scroll bar, choice controls ,List, Menu bars and Menus layout. Image Fundamentals image Observer, Double Buffering, and ImageProducer.
AWT classes, Frame windows, Creating a Frame Window in an Applet,

Working with graphics, Working with color, Setting the Paint Mode,
Working with Fonts, Control Fundamentals,

Term Work:

1. Introduction to Java.
2. Write a program to implement Class and Inheritance Concept.
3. Write a program to differentiate between method overloading and method overriding.
4. Write a program to understand the use of String class and string buffer class
5. Write a program to implement Applet.
6. Write a program to implement the concept of Package.
7. Write a program to implement concept of Exception Handling.
8. Write a program to implement the concept of Multithreaded Programming
9. Write a program to implement Frame and different graphics objects.
10. Write a program to use different controls of AWT classes.

Text Books:

1. E. Balagurusamy, Programming with Java, 3 e, McGraw-Hill Companies.
2. JAVA 7 Programming, Black Book ,Kogent Learning Solutions Inc.

Reference Books:

1. The complete reference Java 2 Third Edition, TMH publication by Patrick Naughton, Herbert Schildt.
2. Ken Arnold, James Gosling, David Holmes, “The Java Programming Language”, 3e, Sun Microsystems.

08: ENGINEERING MATHEMATICS – III

TEACHING SCHEME:

Theory: 03 Hours / Week

Tutorials: 1Hr/Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test : 20 Marks

Attendance: 10 Marks

Assignments: 10 Marks

CREDITS ALLOTTED:

04 Credits

Course Pre-requisites:

The Students should have knowledge of

1. Differential calculus
2. Integral calculus.
3. Complex numbers.

Course Objectives:

1. To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

Course Outcomes:

1. Develop mathematical modeling of systems using differential equations and solve linear differential equations with constant coefficient.
2. Evaluate complicated real integrals using basics of analytic functions and the basics in complex integration.
3. Solve problems on Fourier sine and cosine transform and solve difference equation by Z-transform.
4. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
5. Solve system of linear equation and ordinary differential equation by numerical methods.
6. Apply basics of statistics and probability.

UNIT - I Differential Equations:

(08 Hours)

Solution Of Linear Differential Equation Of n^{th} Order With Constant Coefficients, Method Of Variation Of Parameters, Cauchy's and Legendre's Linear Equation, Simultaneous Linear Differential Equations, Total Differential Equations, Symmetrical Simultaneous Differential Equations. Applications to Electrical Circuits.

UNIT - II Complex Variables (08 Hours)

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem.

UNIT - III Transforms (08Hours)

Fourier transforms: Fourier Integral Theorem, Fourier Sine And Cosine Integrals. Fourier Transform, Fourier Sine And Cosine Transforms, Inverse Fourier Transforms, Discrete Fourier Transform and its Applications.
Z – Transform: Definition, Properties, Inverse Z- Transform. Applications to difference equation, Relationship between Z- Transform and Fourier Transform.

UNIT - IV Laplace Transform (08 Hours)

Definition, Properties and Theorems, Inverse Laplace Transform, Methods of Finding Inverse Laplace Transforms, Laplace Transform of Unit-step Function. Dirac-Delta Functions, Periodic Functions, Ramp Functions.

UNIT - V Numerical Methods (08 Hours)

LU decomposition for systems of linear equations; numerical solutions of non-linear algebraic equations by Secant, Bisection and Newton-Raphson Methods; Numerical integration by trapezoidal and Simpson's rules

UNIT - VI Statistics and Probability (08 Hours)

Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates.

Theorems and Properties of Probability- Baye's Theorem, Probability Density Function, Discrete, Random and Continuous variables, Probability Distributions: Binomial, Poisson, Normal and Hypergeometric; Test of Hypothesis: Chi-Square test.

Stochastic Processes:

Markov Chains, stochastic Matrix.

Term Work:

- 1)Differential equations.
- 2) Complex variables.
- 3)Fourier transform and Z- transform.
- 4)Laplace transform.
- 5)Numerical methods.
- 6) Statistics and Probability.

Text Books:

1. Applied Mathematics (Volumes I and II,III) by P. N. Wartikar & J. N. Wartikar,Pune Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).

Reference Books:

1. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008).
2. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition(1999).
3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning,6th edition (2007).
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition(2002).

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

09: COMPUTER GRAPHICS AND VISUALIZATION

TEACHING SCHEME:

Theory: 03 Hours / Week
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Unit Test: 20 Marks
Attendance:10 Marks
Assignments:10 Marks
Term Work (Practical): 50 Marks
Total : 150 Marks

CREDITS ALLOTTED:

Theory :03 Credits
TW :01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Basics of “C” programming language
2. Basic mathematical ability
3. Basics of GLUT

Course Objectives:

1. To familiarize with the universal concepts of computer Graphics Programming.
2. To provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
3. To introduce computer graphics techniques, focusing on 2D and 3D modeling, image synthesis, and rendering.
4. To provide knowledge of how interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications.

Course Outcomes:

1. Apply fundamental concepts and practical skills in computer graphics.
2. Implement and use classic and modern algorithms and data structures in computer graphic to 3-D geometry, 3D modeling and 3D object Representation.
3. Acquire practical skills on additional advanced concepts, e.g. hidden surfaces & lines, curves & fractals.
4. Demonstrate graphics programming skills for different animation techniques & virtual reality.
5. Improve different solid modeling skills.
6. Apply basics of rendering & physical based modeling to image.

UNIT - I Basics of Computer Graphics:

(06 Hours)

Introduction to computer graphics, Graphics Primitives: Raster scan & random scan displays, display processor, display file structure, Display devices, Interactive devices, Data generating devices. line segments, vector generation, DDA and Bresenham’s line and circle drawing algorithms, thick lines, character generation methods.

UNIT - II Polygon:

(06 Hours)

Introduction, representation, entering Polygons, Polygon filling: Seed fill, Edge fill, scan conversion algorithm, filling with patterns. Windowing and Clipping Introduction, viewing transforms, 2D clipping, Cohen-Sutherland algorithm, Polygon Clipping, Sutherland-Hodgman algorithm, Generalized clipping

- UNIT - III 3-D Geometry: (06 Hours)**
 2-D Transformation: Basic Transformations, Homogenous coordinates, Rotation about an arbitrary point, coordinate transformation, Inverse transformation, Shear and Reflection transformation.
 3-D Transformations: Displays in three dimensions,, 3D transformations & matrix representation, Rotation about an arbitrary axis, Concept of parallel and perspective projections, Viewing parameters, 3D clipping, 3D viewing transformations. Case Study on 3D modeling and 3D object Representation
- UNIT - IV Hidden Surfaces and Lines: (06 Hours)**
 Back Face removal algorithm,Z-Buffer,Scan Line algorithm, Painter’s algorithm,Hdden line methods. Light, Colour and shading: Introduction, Diffused illumination, point source illumination, shading algorithm, reflections, shadows, ray tracing, Color models and tables, shading algorithm, transparency
- UNIT - V Segments and Animation: (06 Hours)**
 Introduction, The Segment Table, Segment creation, closing a segment, deleting a segment, renaming segment, saving and showing segments,
 Computer animation, Morphing, Methods of controlling animation, animation languages and tools. Virtual Reality,Rendering
- UNIT - VI Curves and Fractals: (06 Hours)**
 Curve generation, Interpolation,Interpolation alogorithm,B-splines,Curved surface patches,Bezier curve,fractals,factal line, surfaces,

Term Work:

1. State and discuss on basics of computer graphics.
2. Design and apply the Bresenham’s circle & line drawing algorithm using C language.
3. Design and build the DDA circle & line drawing algorithm using C language
4. Design and Illustrate 2D & 3D transformation.
- 5 Illustrate and construct 3D clipping algorithms.
6. Build shading algorithm using OpenGL.
7. Design and Construct interpolation algorithm using OpenGL.
8. State and discuss on real-time animation techniques.
9. Design a triangle in 3D format with solid model.(Using C with Open GLUT)
10. Illustrate to Render any 3D object using OpenGL.

Text Books:

2. Apurva A Desai,“Computer Graphics”,PHI Learning Pvt. Ltd.,2010
3. Donald Hearn & M. Pauline Baker, “Computer Graphics C version”, 2nd Ed, Pearson Education
3. David F. Rogers, “Procedural Elements for Computer Graphics”, 2nd Ed – Tata McGraw Hill Edition.
- 4 Tomas Moller and Eric Haines Real-Time Rendering A K Peters Ltd, 2nd edition, 2002
- 5 Alan H. Watt and Mark Watt, Advanced Animation and Rendering Techniques : Theory and Practice, Addison-Wesley, 1992
6. Matt Pharr and Greg Humphreys, Physically based rendering, Morgan Kaufmann,

7. James D. Foley, Andries van Dam, Steven K. Feiner and John F. Hughes, Computer Graphics : Principles & Practices, Addison Wesley, 2nd edition in C

Reference Books:

1. M.N. Sinha, A.D.Udai, "Computer Graphics", Tata McGraw Hill Edition.
2. Foley, Dam, Feiner, Hughes," Computer Graphics Principles & Practice", 2nd Ed, Pearson Education.
3. Hill, Kelly, "Computer Graphics using OpenGL", 3rd Ed, Eastern Economy Edition.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

10: SYSTEM PROGRAMMING

TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test Tests: 20 Marks

Attendance: 10 Marks

Assignments: 10 Marks

Term Work +Oral: 50Marks

CREDITS ALLOTTED:

Theory: 03 Credits

TW : 01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Knowledge of Microprocessor concepts and Assembly language

Course Objectives:

1. To help the students understand functioning of various system programs
2. To initiate an understanding of design of language translators and brief about phases of compilers and other
3. To provide a theoretical framework for optimizing the code.
4. To brief the students about operating system concepts

Course Outcomes:

1. Understand theoretical and practical aspects of language translation.
2. Understand and show working and design of assemblers and microprocessors
3. Understand the concept of memory allocation, relocation along with the functions of loaders linkers and use various types of loaders.
4. Gain knowledge about phases of compiler and show it's working.
5. Gain knowledge of various operating system concepts and shell scripting.
6. Understand the concept and use of various device drivers

UNIT - I System Software and Assemblers:

(06 Hours)

	System software concepts, assembler basics, system software Components, Language translators, Language translation fundamentals Machine structure, Elements of Assembly language programming., Structure of an assembler, Design of single and two pass assembler	
UNIT II	- Macro processor	(06 Hours)
	Macro language and macro processor, macro instructions, features of macro facility, macro instruction arguments, conditional macro expansion, macro call within macros, macros instructions defining macros, Macroprocessor design	
UNIT III	- Linkers and Loaders:	(06 Hours)
	Loader scheme, absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, other loader schemes Binders, linking loaders, Overlays, Dynamic Binders, Design of an absolute Loaders, Design of a Direct –Linking loaders. Dynamic Link Libraries.	
UNIT IV	- Compiler:	(06 Hours)
	Basic Compiler Function Compiler phases - Lexical Analysis: Role of a Lexical analyzer, input buffering, specification and recognition of tokens, Designing a lexical analyzer generator, Syntax Analysis: Role of Parser, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers. Intermediate code generation three address code intermediate code forms,. Compiler generation tools –LEX and YACC. Interpreters. Case study: Java Compiler,JIT Compiler, Concurrent Compiler, embedded Compiler.	
UNIT V	- Operating system:-	(06 Hours)
	system concept, Operating system structure.O. S. Components, O.S. Services, System calls. Shell scripting Shell scripting (Bourne Shell (SH), Bourne-Again Shell (BASH), C-Shell (CSH), TCSH, Korn Shell (KSH))Shell commands (Basics, Pipelining, Background/Foreground, File Permissions, etc.) AWK Programing, Process control (ps,jobs, kill,bg,fg,fork,spawn,wait,pipe,socket)	
UNIT VI	- Unix Device Drivers:	(06 Hours)
	Definition, Anatomy and types, Device Programming, Installation and Incorporation of driver routines, Basic device driver operation, Implementation with Line printer, Comparative study between device drivers for Unix and Windows.	

Term Work:

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. Design and Build a single pass assembler.
- 2.Design and Build a two pass assembler.

- 3.Design and Build a two pass Macro processor
- 4.Illustrate use of DLLs.
5. Design and apply lexical analyzer using Lex Compiler.
6. Devise some programs using Shell Programming.
7. Illustrate and discuss use of various device drivers.

Text Books:

1. System Programming by John J. Donovan, TATA McGRAW-HILL Edition.
- 2.System Programming by Leland Beck, Pearson Ed.
- 3.D. M. Dhamdere : “Systems programming and operating system”, Tata McGraw Hill
4. Unix device drives by George Pajani, Pearson Education.
5. Bash Pocket Reference (Pocket Reference (O'Reilly))

Reference Books:

Unix programming Environment- Keringham and Pike, Pearson Education

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

11: FUNDAMENTALS OF SOFTWARE ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks Unit Test Tests: 20 Marks Assignment :10 Marks Attendance: 10 Marks	04 Credits

Course Pre-requisites:

The Students should have

1. programming paradigms
2. Basic mathematical ability

Course Objectives:

1. To introduce software engineering and its grandness.
2. To understand the process of developing new technology and the role of experimentation.
3. To introduce ethical and professional issues and to explain why they are of concern to software engineers.
4. Analyze, classify the requirements and design the software.
5. Demonstrate expertise in problem solving in the design, development, validation, evolution and sustainment of (software) products.

Course Outcomes:

- I. Recognize Distinguish Software engineering process models and describe specifications of the software to be developed or modified.
- II. Analyze, classify the requirements and design the software.
- III. Design and develop software qualitatively.
- IV. Analyze, classify, select software development process to develop, and maintain software systems that behave reliably and efficiently.
- V. Demonstrate expertise in problem solving in the design, development, validation,

evolution and sustainment of (software) products.

VI. Apply the techniques, skills, and modern engineering tools as Rational rose and Star UML etc. necessary for designing and constructing software systems

UNIT - I Introduction to Software Engineering (06 Hours)

Defining Software, What & Why Software Engineering? Difference between software and hardware, software engineering – A layered approach, Software Application Domains, Software Myths.

Process Models – Software process Framework, Process activities, Defining Framework Activity? Identifying a Task Set, Process Patterns, Traditional software development process model approach - Linear Framework model, Iterative Framework Model, Parallel Framework model, and Component based Model, Object oriented software development approach.

UNIT - II Software Specification (06 Hours)

What is requirement engineering, Requirement Elicitation and Analysis Process, Elicitation Techniques, Requirement Specification, Functional requirements and Non-Functional Requirements, Drafting Software Requirement Specification?

Requirement Analysis - Domain Analysis, Object Oriented Analysis, Requirement Modelling, Data modelling, and Flow oriented modelling, Functional Modelling, Process specification, CASE tools.

UNIT - III Software Evolution (06 Hours)

System Engineering Hierarchy, Information Engineering, Product Engineering, Introduction to Business area analysis, CASE Tools in software design.

Software Design Process, Design model – Data Design model, Architecture Design model, Transform and Transaction Flow, Interface design Flow, Component Level and Deployment level design elements.

Design Concepts – Abstraction, Architecture, Patterns, Modularity, Functional Independence, Refinement, Refactoring, Object-

Oriented Design Concepts.

UNIT - IV Software Evaluation (06 Hours)

Introduction to Software testing, Bugs, Defects and Errors, Internal and External view of Software testing, Types of Testing – White Box – Basis path testing, Control Structure testing, Black Box, Grey Box testing, Verification and Validation Model, Unit Testing, Integration Testing, System Testing, Strategic issues, Testing Strategy for OOPS .

Debugging – Debugging process, Debugging Strategies, Correcting Errors

UNIT - V Software Quality Assurance (SQA) (06 Hours)

Software Quality and Metrics, Quality Standards, Reviews and Inspection, Software Measurement and metrics, Elements of SQA, SQA tasks, Goals and Metrics, Formal approaches to SQA, SQA Plan, and Software Reliability.

Software Configuration Management – Elements of SCM, Baselines, Software Configuration Items, SCM Features, the SCM process.

UNIT - VI Project Planning and Management (06 Hours)

The management Spectrum – People, Product, Process, Project. Project Planning process, Process Metrics, Software Scope and Feasibility study, Project Scheduling, Software Project Estimation, Effort estimation model, the make-buy Decision, Outsourcing,

Risk management – Software Risks, Risk identification, Risk projection, Risk Refinement, RMMM plan.

CLASS ASSIGNMENTS –Guidelines

1. The Class Assignments with respect to this subject might be conducted using these tools (either one tool or combination):-
 - a. Asking each student to give one presentation on one topic related to this syllabus.
 - b. Conducting six Multiple choice question online test on each unit each test of 10 marks and then average out

- c. Asking students to prepare a report based on their understanding by viewing the NPTEL videos of this subject.
- d. Asking the students to perform these Assignments:-
 - i. Suggest Which SDLC model will be used to develop ATM software. Justify?
 - ii. Develop Requirement Specification for ATM Software.
 - iii. Design the Class Diagram and Use case Diagram for ATM software.
 - iv. Discuss on Automated Software Testing. Create Test cases for Functionality of ATM software using a Test Tool (Test Link).
 - v. Discuss and Prepare IEEE Quality Document for ATM software.
 - vi. Prepare a Gantt chart using MS Project CASE Tool for a small Project.

Text Books:

ROGER PRESSMAN - A Practitioner's Approach", 4th Ed., Tata McGraw Hill Publication Company.

Software Engineering.", Sommerville, 9th Edition, Addison Wesley, 2010

Reference Books:

- 1.ROGER PRESSMAN - A Practitioner's Approach"
- 2.Martin Fowler
- 3.Grady Booch
- 4.Rambaugh
- 5.Pfleeger S. L., "Software Engineering".

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

12: MICROPROCESSOR AND MICROCONTROLLER

TEACHING SCHEME:

Theory: 03 Hours / Week
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Unit Test Tests: 20 Marks
Practical + Term Work: 50Marks marks

CREDITS ALLOTTED:

04 Credits

Course Pre-requisites:

The Students should have

1. Binary number system, Boolean algebra , Combinational and sequential circuits and memory.

Course Objectives:

1. To develop an understanding of the architecture and functions of microprocessors and microcontrollers.
2. To learn machine language programming & interfacing techniques.

Course Outcomes:

1. Describe microprocessor and micro controller architecture.
2. Understand programmer's model of 80386.
3. Understand concepts of segmentation and paging
- 4.. Comprehend hardware and software interaction and integration.
5. Design microcontroller based systems.
6. Write assembly language program using 32 bit registers.

UNIT - I Introduction to 8086

(06 Hours)

Concepts of architecture of 8086 microprocessor and segmentation, 80386 DX architecture, Registers, Salient features of 80386 DX, Signal definition, Addressing modes, Instruction format, Instruction pipelining in 80386.

UNIT - II Real and protected mode

(06 Hours)

	Real mode programming model, Memory addressing in real mode, Interrupt handling and exceptions, Switching between real and protected mode, protected mode register model, segment translation, segment descriptors, paging	
UNIT - III	I/O interface	(06 Hours)
	Programmable peripheral devices and interfacing, Interfacing with PPI 8255, PIC 8259, USART 8251, PIT 8254, DMAC 8237, Block diagram, operating modes and control word formats.	
	Case study- I/O hub.	
UNIT - IV	Multicore Architecture	(06 Hours)
	Intel 64 bit architecture, Pentium processor functional block diagram, memory management, Multicore Architecture, Bus Connections, core to duo and dual core processors, characteristics and design guidelines.	
	.Case study:- i5/i7	
UNIT - V	Introduction to 8051 microcontroller	(06 Hours)
	Comparison of microprocessor and micro controller, Features of 8051, pin definition, 8051 architecture, Register set, memory organization, Timers and counters, serial port, Interrupt structure. Addressing modes, instruction set	
UNIT - VI	Programming and interfacing of 8051	(06 Hours)
	Counter and timer programming, interrupt programming, serial communication programming, Interfacing keyboard and Display. External memory interface, stepper motor interface.	
	Contemporary processor and controller survey.	

Term Work:

List of assignments

- 1) Design and build an Assembly language program for multiplication of two 16 bit numbers using 8086 microprocessor.
- 2) Design and build an ALP to count no. of positive and negative numbers from the array
- 3) Design and build an 8086 ALP to check whether the string is palindrome or not
- 4) Design and build an program to arrange given set of numbers in Ascending/Descending order.
- 5) Design and build an Assembly language program to convert Input hexadecimal to BCD Number.
- 6) Design and build an ALP to program to use GDTR, LDTR and IDTR in Real Mode.
- 7) Design and build an program to switch between real mode and protected mode
- 8) Design and build an Assembly language program to display current time from system.
- 9) Design and build an Assembly language program to interface 8051 Microcontroller with Keyboard and display.

10) Design and build an Assembly language program to interface 8051 Microcontroller with stepper motor.

Text Books:

1. Muhammad Ali Mazidi and Janice Gillispie Mazidi, “ The 8051 Microcontroller and embedded systems”, 2009, Pearson education
2. Krishna Kant “Microprocessors And Microcontrollers Architecture, Programming And System Design 8085, 8086, 8051, 8096” PHI
3. 80386 Microprocessor Handbook, Chris H. Pappas, William H. Murray

Reference Books:

1. intel microprocessor and peripheral handbook(32 bit) 80386 DX
2. D.V.Hall, “Micro Processor and Interfacing “, Tata McGraw-Hill.
3. Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design, 2nd ed., Liu & Gibson
4. Intel 64 and IA-32 bit architectures Software Developer’s Manual, Volume 3A, Intel, (Digital Content PDF: 253668.pdf)

Syllabus for Unit Test:

- | | |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

14: PROGRAMMING LABORATORY II

TEACHING SCHEME:

Practical: 04 Hours / Week

EXAMINATION SCHEME:

Term Work (Practical): 50 Marks

CREDITS ALLOTTED:

02 Credits

Course Pre-requisites:

The Students should have

1. Basics concepts of Object Oriented Programming
2. “Java” programming language (Core and Advanced Java)

Course Objectives:

1. To provide an insight of Internet programming and how to design and implement complete applications over the web.
2. To provide hands-on experience of the recent platform, technologies and design Methodologies used in developing web Applications.

Course Outcomes:

1. Develop WEB 2.0 Rich Internet Applications using the hierarchy of objects in HTML and XML.
2. Design dynamic and interactive web pages using HTML and Ajax performing client validation using Java Script.
3. Use ontology and inference engines in semantic web development.
4. Develop full-fledged Enterprise Applications
5. Implement enterprise beans and understand its benefits.
6. Develop Web services using SOAP .

UNIT - I Introduction to WEB 2.0 Rich Internet Applications:

(08 Hours)

Introduction: From Browsers to Rich Clients – browser drawbacks, A solution – rich clients, Rich clients today. HTML 5: Detecting HTML 5 features – Canvas, video, local storage, web workers, offline Applications , geo location, placeholders, input types, doc type, root, headers, articles, dates and times, navigation and footers. Introduction to PHP, Basic rules of PHP program, JSF, The WEB Model and XML,

	XPATH and XSLT .	
UNIT - II	AJAX-I:	(08 Hours)
	Java Script Fundamentals, Objects in Java Script, Dynamic HTML with Java Script, ASP, Basic communication techniques –AJAX with images, Dynamic script loading, AJAX libraries – JQuery, JSON, JSON versus XML, server-side JSON tools.	
UNIT - III	Semantic Web Technologies:	(08 Hours)
	Introduction to Semantic Web, Web 3.0 and Semantic Web; why Semantic Web; Impact of Semantic Web; Myths about Semantic Web; Ontologies: Introduction to Ontology; Types of Ontologies, Basic OWL; Class, Properties and Constraints; Ontology development methodology; Ontology tools- SPARQL, Search Engine Optimization(SEO).	
	Applications of Semantic Web: Software Agents; Semantic Search; Semantic Web Services; Semantics in Social Networking; SOA, ETL; Web crawling, Page Ranking Algorithm.	
UNIT - IV	Enterprise JAVA (J2EE):	(08 Hours)
	Defining the Enterprise, Introducing Enterprise Applications, Creating dynamic content with servlets, using Java server pages(JSP), NetBeans, interacting with relational databases using JDBC,MVC Architecture, JMS, Managing transactions with JTA/JTS, security aspects in system architecture, J2EE design patterns.	
UNIT - V	Enterprise Beans:	(08 Hours)
	Enterprise Bean, Benefits of Enterprise Beans ,When to Use Enterprise Beans, Types of Enterprise Beans - Session Bean, Message-Driven Bean , Contents of an Enterprise Bean ,Packaging Enterprise Beans in EJB JAR Modules ,Naming Conventions for Enterprise Beans ,The Lifecycles of Enterprise Beans - Stateful Session Bean , Stateless Session Bean, Creating the Enterprise Bean . Coding the Enterprise Bean Class.	
UNIT - VI	Web services:	(08 Hours)
	Introduction to Service Oriented Architecture, Combining protocols to build Web services – REST Services, REST – resources, representations, state, transfer – using HTTP methods. Web services using SOAP and WSDL.	

Term Work:

1. Design the static web pages required for a website using HTML 5.
2. Illustrate XML document processing in Java using XPath and XSLT.
3. Illustrate the use of Java Script in performing client side validation.
4. Describe and Build Dynamic web Pages using DHTML with Java Script.
5. Construct small applications using AJAX
6. Design and build small applications using JQuery, JSON and AJAX.
7. Outline and Discuss on Applications of Sematic Web Technologies.
8. Report how to use OWL to develop Ontologies.
9. Construct a Web Crawler
10. Outline and Discuss on implementation of Page Ranking Algorithm
11. Build and Illustrate an Enterprise Applications
12. Build and Apply Web Services using SOAP

Text Books:

1. Eric Van Der Danny Ayers et al, "Professional Web 2.0 Programming", Wrox Publications, 2007
2. Web Technologies: Black Book, Kogent Learning Solutions Inc. Wiley India Pvt. Ltd. 2006
3. David Hunter et al, "Beginning XML", 4th Edition, Wrox/John Wiley, 2007
4. Mark Pilgrim "HTML 5 Up and Running", O'REILLY | GOOGLE Press, 2010.
5. Nicholas C Zakas et al, "Professional AJAX", 2nd Edition, Wrox publications, 2007.
6. Thomas Erl, "SOA: Concepts, Technology and Design", Pearson, 2005
7. Karin K. Breitman, Marco Antonio Casanova and Walter Truskowski " Semantic Web: Concepts, Technologies and Applications", Springer International Edition, 2007.
8. Justin Couch and Daniel Steinberg, Hungry Minds Inc, "Java 2 Enterprise Edition Bible" 2002.

Reference Books:

1. Lee W. Lacy, OWL: Representing Information Using the Web Ontology Language, Trafford Publishing, 2005.
2. Christopher D. Manning, Prabhakar Raghavan & Hinrich Schütze, Introduction to Information Retrieval, Cambridge university press, 2008

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Board of Studies
Computer Engineering and IT.
Bharati Vidyapeeth University, Pune

STRUCTURE AND THE SYLLABI

B.TECH.

[COMPUTER ENGINEERING]

SEMESTER V AND VI

[2014 Course]

Bharati Vidyapeeth University, Pune
Faculty of Engineering & Technology
Programme: B. Tech (Computer Engineering) Sem – V (2014 Course)

Sr. No	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
1	Formal Language and Automata Theory	3	--	1	60	20	10	10	--	--	100	4	-	4
2	Software Testing	3	2	--	60	20	10	10	--	50	150	3	1	4
3	Computer Network	3	2	--	60	20	10	10	50	--	150	3	1	4
4	Database Management System	3	2	--	60	20	10	10	50	--	150	3	1	4
5	Elective - I	3	--	--	60	20	10	10	--	--	100	3	--	3
6	Professional Skill Development-V	4	--	--	100	--	--	--	--	--	100	4	--	4
7	Programming Lab-III	--	4	--	--	--	--	--	50	--	50	--	2	2
	TOTAL	19	10	1	400	100	50	50	150	50	800	20	05	25

Elective - I: a) Multimedia and Mobile Applications b) Scripting Languages c) Software Project Management d) Computational Genomics
Optional Subject

Sr. No	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

FORMAL LANGUAGE AND AUTOMATA THEORY

TEACHING SCHEME:

Theory: 3 Hours / Week

Tutorial: 1 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 04 Credits

Course Pre-requisites:

1. Discrete Mathematics
2. Introductions to algorithms

Course Objectives:

1. Learn types of grammars.
2. Understand various Computing models like Finite State Machine, Pushdown Automata, and
3. Turing Machine.
4. To Learn various applications of Formal Language Processing

Course Outcomes: After completion of course, students will able to:

1. Illustrate the importance of Automata Theory in designing computer languages.
2. Transform informal problems into formal ones.
3. Infer Grammars, languages modeling and compilers basics.
4. Investigate and prove the equivalence of languages described by pushdown automata
5. Design Language Acceptability by Turing Machine
6. Outline the applicability of the formal language and automata theory concepts.

UNIT I **Finite State Machine (FSM):** Introduction, difference between natural and formal (06 Hours)

languages, Basic machine - design of basic machines. Transition diagram, Transition graph, Acceptance of String, Acceptance of Language, examples, Finite Automata (FA), Deterministic Finite Automaton (DFA) and Non-Deterministic Finite Automaton (NFA), Conversions of NFA with ϵ and without ϵ , Minimization of DFA, Equivalence of NFA and DFA, Limitations of FA.

UNIT II **Regular expressions (RE)** - Introduction, FA and RE, RE to FA, FA to RE, algebraic laws, (06 Hours) applications of REs, FA for regular grammar, Uses of Regular expression, Pumping Lemma.

Moore and Mealy Machines: Introduction, Difference between Moore & Mealy, models, inter conversions, Equivalence of Mealy machine and Moore machine, Uses of both the machines.

UNIT III **Grammar-** Introduction, representation of grammar, Chomsky hierarchy, Context Free (06 Hours)

Grammar- Derivation, sentential form, inference, derivation, parse tree, ambiguity in grammar and language- ambiguous Grammar, removing ambiguity from grammar, Normal Forms- Chomsky normal form, Greibach normal form, Closure properties of CFL, Decision property of CFL, Reduced form grammar removal of unit productions, epsilon production,

useless symbols. left linear and right linear grammars and inter conversions.

- UNIT Push Down Automata (PDA):** Introduction, Pushdown Automata (PDA), Transition Diagrams, Functions and Tables, Deterministic Push- down Automata (DPDA) - definition, Nondeterministic Pushdown Automata (NPDA), Equivalence of context free grammars and PDA, properties of context free languages. Introduction to Post Machines (PMs) **(06 Hours)**
- UNIT Turing Machine (TM):** Introduction, Transitions Diagrams, Functions and Tables, Design of TM as generator, decider and acceptor, comparison of Turing machine (TM) with FSM, PDM, and PM. combination TM, iterative TM, recursive TM, universal TM, Language Acceptability by TM, Recursive sets, partial recursive functions, recursively enumerable sets, Church's Turing hypothesis, multi stack Turing machine, TM limitations. **(06 Hours)**
- UNIT Applications** –Application of RE, FA, PDA, CFG, TM. Syntax analysis language definition. Primitive recursive functions – Recursive and recursively enumerable languages – Universal Turing machine. Lexical analyzer, Text editor, and searching using RE. Introduction to Natural Language Processing. **(06 Hours)**

Assignment:

Note:

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Text books

1. E.V. Krishnamurthy, “Theory of Computer Science”, EWP Publication
2. Vivek Kulkarni “Theory Computation” Oxford higher education.

References:

1. Hopcroft Ullman, “Introduction to Automata Theory, Languages & Computations, Narosa
2. Daniel A. Cohen, “Introduction to Computer Theory”, Wiley Publication
3. John C. Martin, “Introduction to Language & Theory of Computation”, McGraw Hill
4. Mishra K L P and Chandrasekaran N, “Theory of Computer Science - Automata, Languages and Computation”, Third Edition, Prentice Hall of India, 2004

Syllabus for Unit Test:

- | | |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

SOFTWARE TESTING

TEACHING SCHEME:

Theory: 03 Hours / Week
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Exam: 60 Marks
Continuous Assessment: 40 Marks
Term Work/Oral: 50 Marks

CREDITS ALLOTTED:

Theory: 03 Credits
TW/OR: 01 Credits

Course Pre-requisites:

The Students should have

1. Basic knowledge of Software Engineering.

Course Objectives:

1. Create awareness among the students about the basic fundamentals of Software Testing Process.
2. To make students aware of various techniques and tools used for testing different kinds of software.

Course Outcomes: After completion of course, students will able to:

1. Define Software Testing level, techniques, test deliverables/artifacts, V-Model.
2. Comprehend various Testing Levels and Techniques.
3. Compare different testing approaches for various kinds of applications.
4. Analyze business and software Risks involved in managing Software Testing Projects. .
5. Outline substantial knowledge of Agile Testing Process.
6. Recite Agile Testing Techniques and Tools.

UNIT I	Introduction:	(06 Hours)
I	Testing as an Engineering Activity – Basic Definitions – Bug, Defect, Verification validation, Debugging ,Software Testing Principles – The Tester’s Role in software Development Organization , Iterative development – Risk Driven and Client Driven, Test driven Development, Evolutionary and adaptive development , Evolutionary requirements analysis – Early “Top Ten” high-level requirements and skillful analysis, Testing Fundamentals- Quality Assurance, Quality Control, V-Model of software testing, Testing techniques and Levels of Testing, Static Vs Dynamic testing, Test deliverables.	
UNIT II	Testing Techniques and Test Case Fundamentals.	(06 Hours)
II	Testing Levels- Unit Testing, Integration Testing, Functional and System Testing, Types of Testing- Stress Testing, Performance Testing, Usability Testing, Non-Functional Testing, Acceptance Testing, Regression Testing, Beta Testing, Testing techniques- Black Box Vs. White Box Testing, Black Box Techniques, White Box Techniques, and Verification Techniques: Inspection, Walk-Through, Peer Reviews. Test Case Fundamentals- Definition, Test Case Template, Test Case Parameters, Kinds of Test cases, Characteristics of Good Test Case, Writing Functional and Boundary Test Cases, Manual Test Cases Vs Automated Test Scripts.	
UNIT III	Testing approaches for different Types of Applications	(06 Hours)
III	Testing COTS (Commercial-Off-the-shelf Software, Web-based applications/e-commerce applications, Object-Oriented Systems, Wireless applications, Testing for security, Website Testing, Foreign Language Testing. Test Automation Tools: Web browser Automation through Selenium, Test	

Management Tool-Test Director, Defect Tracking Tool – Bugzilla, GUI Testing Tool- WinRunner, and Configuration Management Tools.

UNIT Managing Software Testing Projects (06 Hours)

IV Test Planning- Test strategy, Creating a test Plan, Test Plan document, Test Pass/Fail criteria, Risk analysis, Test Scoping and Effort Estimation, Test Scheduling and budgeting. Introduction to Testing Maturity Model (TMM).
Test Metrics: Types, Identifying Test Metrics, Methods for gathering Test metrics, Analyzing and Applying Test Metrics, GQM Paradigm. Defect Management: Defect Tracking, Defect Reporting, Defect Metrics.

UNIT Agile Methodology (06 Hours)

V Introduction to Agile Model, Agile Vs Waterfall Method, Methodologies of Agile Testing - Scrum- Practices, Process flow of Scrum, eXtreme Programming- Phases, Crystal Methodologies, DSDM (Dynamic Software Development Method), Agile Testing Lifecycle. Test-Driven Development, Acceptance Test-Driven Development, and Behavior-Driven Development, Role of the Agile Tester, Assessing Quality Risks in Agile Projects, Techniques in Agile Projects- Acceptance Criteria, Adequate Coverage, Applying Acceptance Test-Driven Development, Exploratory Testing and Agile Testing, Tools in Agile Projects.

UNIT Agile Testing Techniques and Quality Tools: (06 Hours)

VI Agile testing – Nine principles and six concrete practices for testing on agile teams. Six Sigma - Kaoru Ishikawa's Basic Seven QC (Quality Control) Tools- Cause and Effect diagram, Check Sheet, Control charts, Histogram, Pareto chart, Scatter diagram, Flowchart, PDCA (Plan-Do-Check-Act) cycle, Software Testing- ISO Standards, IEEE Standards- IEEE 829, IEEE 1008, IEEE 1012 etc.

Term Work:

1. Introduction to Software Testing Lifecycle Model and the SPRAE Software Testing Framework.
2. Design functional and boundary test cases manually, execute tests, and evaluate test results.
3. Write manual test cases for a C program which demonstrates the working of the following
 - A. Constructs: I) do...while II) switch
 - B. A program written in C language for Matrix Multiplication fails." Introspect the causes for its failure and write down the possible reasons for its failure".
4. Write the test cases for any known application (e.g. Banking application)
5. Create a test plan document for any application (e.g. Library Management System)
6. Consider any system (e.g. ATM system) and study its system specifications and report the various bugs.
7. Running test scripts using automated testing tool (e.g. Win runner)
8. Testing of a web application using the web testing tool (e.g. Selenium)
9. Tracking and reporting bugs using bug tracking tool (e.g. Bugzilla, bugbit)
10. Create a database of manual and automated tests using any open source test management tool.
11. Implement software testing on an Agile Project.

Assignments:

1. The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.
2. In case of assignments for internal 10 marks students will be assigned two assignments containing

- problems of different types or any programming assignment and guided for the solutions of the problem.
3. The assignments are to be submitted as hard copy.

Text Books:

1. William.E. Perry, “Effective Methods for software Testing”, Wiley 3rd Edition.
2. Ron Patton, “Software Testing”, Techmedia.
3. Elfriede Dustin,” Effective Software Testing”, Addison-Wesley, 1st Edition, 2003.
4. Lisa Crispin, Janet Gregory,” Agile Testing”, Addison-Wesley, 11th Edition, 2015.

Reference Books:

1. Marnie Hutcheson,” Software Testing Fundamentals: Methods and Metrics”, Wiley.
2. Paul C. Jorgensen, “Software Testing: A Craftsman's Approach”, Auerbach Publications, 2008.
3. Craig Larman, “Agile and Iterative Development – A Manager’s Guide”, Pearson Education – 2004.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

COMPUTER NETWORK

TEACHING SCHEME:

Theory: 3 Hours / Week

Practical: 2 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

Term work/Practical: 50 Marks

CREDITS ALLOTTED:

Theory:03 Credits

TW/PR:01 Credit

Course Pre-requisites:

1. Students should have basic knowledge of Computers and Internet.
2. C/C++/Java programming, algorithms & probability.

Course Objectives:

1. Developing the students with the knowledge of advanced computer networking.
2. Developing students with practical knowledge of latest networking technologies.

Course Outcomes: After completion of course, students will able to:

1. Recite the basics of Computer network.
2. Relate detailed structure of data link layer with other layers.
3. Enumerate the concept of Medium Access Control layer.
4. Recite the details of Network layer.
5. Discuss the details of Transport layer.
6. Infer the functionality of Application layer.

UNIT INTRODUCTION:

(06 Hours)

- I** Internet working, Use of the computer network, Physical layer, Networking hardware devices, networking software, types of networks, OSI model working, TCP/IP reference model, Wireless networks, Buffering, Switching, packets, frames, introduction to latest internet technologies.

UNIT Data Link Layer:

(06 Hours)

- II** Data layer working, Framing, Error Control, Flow Control, error detection and correction, data link protocols, IEEE standards.

UNIT MEDIUM ACCESS CONTROL SUBLAYER:

(06 Hours)

- III** MAC layer working, Ethernet, Static & Dynamic Channel Allocation, multiple access protocols, wireless technologies, RFID.

UNIT NETWORK LAYER: (06 Hours)

- IV Network layer working, Network layer design issues, routing algorithms, congestion control algorithms, quality of service, IP Addresses, Subnets, Configuring network settings, Firewalls, IP V6, Mobile IP V6.

UNIT TRANSPORT LAYER: (06 Hours)

V Transport layer working, services of transport layer and elements of transport protocols, congestion control in transport layer, Transport protocols-TCP &UDP, Performance issues, Mobile TCP.

UNIT APPLICATION LAYER: (06 Hours)

VI Application layer working, DNS, Email, WWW, Audio & video streaming, Content delivery, Caching in Web Browser remote login, Wireless web, browsers, NFS, SNMP, Telnet, FTP, HTTP, WiMAX, WSN.

Term Work:

- Introduction and configuration of networking devices
Practical Study of PC, router, Switches, hubs, servers, repeaters, Wi-Fi modem and its configurations
- Introduction to “CISCO’s Packet tracer”.
Working and study of CISCO’s Packet tracer
- Implementation of Packet switching using “CISCO’s Packet tracer” software.
- Client-Server setup. Connection establishment between client and server. Study of FTP and HTTP through this setup. Study of packet delivery. Simulation of packet delivery.
- Implementation of static routing using “Packet tracer” software.
- Distance vector routing algorithm. Packet switching using static routing algorithm
- Implementation of dynamic routing using “Packet tracer” software.
- Dijkstra's shortest path algorithm. Packet switching using dynamic routing algorithm.
- WAP in C to implement routing algorithm using Bellman Fords distance vector algorithm.
- Study of network throughput and efficiency using “Wireshark software”

- Packet delivery from one system to other. Observe its throughput by using Wireshark software.
- Data encryption using “GnuPG” Software.
- Encryption of the data using GnuPG software. Encrypt data and deliver it to other system and
- Observing the change in file size using Wireshark
- Experiment related to NS2/NS3 tool.
- Case study of “Networking commands in Linux based operating system”

Assignment:

NOTE:

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Text Books /Reference books

1. James f. Kurose, Keith w. Ross. Computer networking: a top-down approach. 6th ed.: Pearson.
2. Andrew s. Tanenbaum, David j. Wetherall. Computer networks. 5th ed.: Pearson.
3. Forouzan. Data comm.& netw. 5e. 5th ed.: McGraw-Hill.
4. William Stallings. Data and computer communications. 8th ed.: Pearson.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

DATABASE MANAGEMENT SYSTEM

TEACHING SCHEME:

Theory: 03 Hours / Week
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Continuous Assessment: 40 Marks
TW/Practical: 50 Marks

CREDITS ALLOTTED:

Theory: 03 Credits
TW/PR: 01 Credit

Course Pre-requisites:

1. Discrete mathematics and Data structures.
2. Programming languages.

Course Objectives:

1. To provide a strong formal foundation in database concepts, technology and practice.
2. To design and develop a database schema.
3. To understand Structured query language (SQL), indexing and query processing.

Course Outcomes: After completion of course, students will able to:

1. Differentiate significance of Database Management System over the file processing system.
2. Illustrate the fundamentals of data models and to conceptualize and depict a database system using data models.
3. Analyze and practice Relational Data Model.
4. Apply SQL queries for database definition and database manipulation.
5. Illustrate transaction management concepts like serializability, concurrency control and recovery system.
6. Investigate the knowledge about emerging trends in the area of database for unstructured data and applications for it

UNIT **Overview of Database Management System**

I Overview of DBMS: Data and Information, Database, characteristics of databases, (06 Hours)

Data Governance and Importance of database, Database Management System (DBMS), structure of DBMS, Objectives of DBMS: Data Availability, Data Integrity, Data Security, and Data Independence. Three level DBMS architecture and Data Abstraction. Classification of DBMS, File based System; Drawbacks of File based System, Advantages of DBMS.

Database Architecture: Two Tier, Three Tier, Multi-Tier. The DBMS Life Cycle, Information Life Cycle, Roles in Database Environment, Database users and Administrator, Introduction to Data models, Need for abstraction, Situation where DBMS is not necessary, DBMS vendors and their products.

UNIT **Data modeling and Design**

II Data modeling: Benefits of Data Modeling, Types of Data Modeling, Phases of (06 Hours)

Data Modeling, Building Blocks of Entity Relationship(E-R) model, Mapping Constraints, Keys, Weak and strong Entity Sets, Extended-R features, Reduction to relational schemas, a case study on building an ER Model.

Database design: Objectives of Database design, Database Design Tool, Features of Design Tool, merits and De-merits of database design tool, Different anomalies in designing a Database, Functional Dependency, Inference Rules, Closure of set

Functional Dependency, Purpose of Normalization, Steps in Normalization: 1 Normal Form(NF), 2NF, 3 NF Boyce-Codd normal form, denormalization: Types of De-normalization, Table De-Normalization Algorithm.

- UNIT III Relational Model and Algebra (06 Hours)**
Relational Data Model: CODD's Rule, Structure Part, Integrity Part, Manipulative, Table & Relation. Concept of Key: Super Key, Candidate Key, Foreign Key. Relational Integrity: Entity Integrity, NULL Integrity, Domain Integrity constraint, Referential Integrity, Data structure, Mapping ER model to Relational model.
Relational Algebra: Unary and Binary Operations, Rename Operation, Union Operation, Intersection, Difference, Division, Cartesian Product, Join Operations. Advantage and Limitation of Relational Algebra.
- UNIT IV SQL and Introduction to PL/SQL (06 Hours)**
SQL: SQL fundamentals, Data Definition Language(DDL), Data Manipulation Language(DML) and Data Control Language(DCL), Basic structure of SQL queries, set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, Sub queries, joins, Nested Sub queries, Complex queries, views: Creating, Dropping, Updation using Views.
PL/SQL: Introduction to PL/SQL block, Concept of Cursors, Stored Procedures, Triggers, Java Database Connectivity (JDBC), Open Database Connectivity (ODBC).
- UNIT V Transaction Processing and Query Optimization (06 Hours)**
Transaction processing: Concept of Transaction and its Management, concurrency Anomalies, Schedules, schedules and recoverability, Serializability, Hierarchy of serializable Schedules, Concurrency control and enforcing serializability, Deadlocks, Lock Granularity, Lock based Concurrency control, Multiple Granularity and Intension Locking, Time stamping Control, Optimistic Control, Evaluation of Concurrency Control Mechanism.
Query Processing and Optimization: Issues in Query Processing, Steps in Query Processing, Query decomposition, Query Optimization: Heuristic query optimization, Transformation rules, Heuristics optimization algorithm. Cost estimation in query optimization: Cost of components of query execution, cost for select and join operation, Query execution Plan.
- UNIT VI Data Warehousing and Data mining (06 Hours)**
Data Warehousing: Introduction, Evolution of Data Warehouse, Characteristics, and Benefits, Limitation of Data Warehousing, Main Components of Data Warehouse, Conceptual Models, Data Mart, and Online Analytical Processing (OLAP), Teradata Relational Database Management System(RDBMS), Teradata Technology.
Data Mining: Data Mining Concepts, Knowledge Discovery, Goals of Data Mining, Data Mining techniques, Machine learning using WEKA tool.
Emerging Database Technologies: Introduction to unstructured data, NOSQL, spatial and geographic databases, multimedia databases, Massive Datasets and Hadoop.

Term Work:

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. Write a simple PL/SQL program to check whether the given number is palindrome or not and insert into a table reverse if the given number is palindrome?
2. To import various schemas into database system by running the scripts. Schemas are human resource, Order entry, Product Media, Queued shipping, Sales history.
3. To apply the select statements for the given queries.
 - a. Display employees those who make more than \$900 or if their names fall between QUENTIN and ZYRYAB alphabetically.
 - b. Display employees those who make more than \$900 and if their names fall between QUENTIN and ZYRYAB alphabetically.
 - c. Display the name and job title of all employees who do not have a manager.
 - d. Display the name, salary and commission for all employees who earn commissions. Sort data in descending order of salary and commissions.
4. To apply the single column functions:
 - a. WAQ that displays the employee's names with the first letter capitalized and all other letters lowercase and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employee's name.
 - b. For each employee, display the employee's name and calculate the number of months between today and the date employee was hired. Label the column months worked. Order your results by the number of months employed. Round the number of months up to the closest whole number.
 - c. WAQ that produces following for each employee.
 - i. <Employee name> earns <salary> monthly but wants < 3 times salary>. Label the column dream salaries
5. To discuss normalization and build normalized schema of Hospital Management system.
6. To demonstrate queries on Joins.
 - a. Display the employee name and employee number along with their manager's name and manager number.
 - b. To display all employees including king, who as no manager. Order the results by employee number.
 - c. Display employee name, department name and all the employee who work in the same department as a given employee.
 - d. Create a query to display the name and hire date of any employee hired after employees Davies.
7. To demonstrate queries on aggregate functions
 - a. Determine the number of managers without listing them.
 - b. Display the Manager number and the salary of the lowest paid employee for that manager.
 - c. Display each department name, location, number of employee and the average salary for all employee in that department.
 - d. Create a query that displays total number of employees and of that total, the number of employees hired in 1995, 1996, 1997 and 1998.

8. Use WEKA tool to derive analytical model for the given dataset.
9. Apply the association rules on the dataset and derive the inferences from the results given by WEKA tool.
10. Case study on NOSQL database: MongoDB.

Assignment:

NOTE:

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty. For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Text books:

- 1) Silberschatz A., Korth H., Sudarshan S, "Database System Concepts", 6th Edition, McGraw Hill Publishers.
- 2) Ramakrishna R., Gehrke J., "Database Management Systems", 3rd Edition, McGraw- Hill.

Reference books:

- 1) Elmasri R., Navathe S., "Fundamentals of Database Systems", 5th Edition, Pearson Education.
- 2) Ryan K. Stephens, Ronald R. Plew, "SQL", 4th Edition, Pearson Education.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

ELECTIVE – I: MULTIMEDIA AND MOBILE APPLICATIONS

TEACHING SCHEME:

Theory: 03 Hours / Week

EXAMINATION SCHEME:

End Semester Exam: 60 Marks
Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 03 Credits

The Students should have

1. Basic knowledge of JAVA Programming.
2. Basic knowledge of Data Communication.

Course Objectives:

1. Create awareness among the students about the basic fundamentals in the design and development of multimedia systems and applications.
2. To make students aware of various techniques used for the development of distributed applications for mobile devices as well as introduce them to the design principles for applications for small devices

Course Outcomes: After completion of course, students will able to:

1. Recite basic building blocks of Multimedia systems and applications.
2. Differentiate between various Compression and Decompression Techniques.
3. Comprehend various Multimedia I/O, Storage and Retrieval technologies.
4. Analyze various issues pertaining to Multimedia Application Design.
5. Report on Multimedia Networks.
6. Discuss on Mobile Application Development.

UNIT I Introduction to Multimedia: (06 Hours)

Multimedia- Building Blocks, Overview of Multimedia Applications, Multimedia Systems- Components, Characteristics, key issues and Challenges, Evolving Technologies for Multimedia Systems, Multimedia Streaming Protocols (MSP).
Multimedia Data: Text and static data, Graphics, Images, audio, video.
Multimedia Data Compression- Lossy and Lossless compression techniques.

UNIT II Compression and Decompression Techniques (06 Hours)

Types of Compression, Binary Image Compression Schemes, Color, grayscale, still-video image compression, Discrete Cosine Transform, Video image compression, MPEG Coding methodology, Audio Compression, Data and File format standards- PDF, RTF, TIFF, RIFF, MIDI, JPEG, AVI, JPEG, MPEG.

UNIT III Multimedia I/O, Audio and Video (06 Hours)

Key Technology Issues, Pen Input, Video and Image Display Systems, Print Output Technologies, Image Scanners, Digital Voice and Audio, Video Images and Animation, Full Motion Video, Magnetic Media Technology, WORM optical drives, Cloud-Based Multimedia Storage systems.
Multimedia Databases: Design and Architecture of a Multimedia Database, Organizing Multimedia Databases on The Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data.

UNIT IV Multimedia Application Design (06 Hours)

Types of Multimedia systems - Virtual Reality Design - Components of Multimedia

system - Distributed Application Design Issues - Multimedia Authoring and User Interface - Hypermedia Messaging- Distributed Multimedia Systems, Multimedia Authoring Tools.

UNIT Multimedia Networks (06 Hours)

V Basics of Multimedia Networks, Multimedia Network Communications. Applications: Quality of Multimedia Data Transmission, Multimedia over IP, Multimedia over ATM Networks, Transport of MPEG-4, Media-on-Demand (MOD). Video Broadcasting Standards- HDTV, 4K TV and Ultra HD, Multimedia Content Management (MCM).

UNIT Introduction: Understanding Mobile Platforms, Android as Competition to itself, (06 Hours)

VI Building an App in Android, Debugging Android Apps. Building block of Mobile apps: App user Interface Designing, Layout, User Interface elements, Activity states and lifecycle, Mobile Databases such as SQLite and enterprise data access, Windows Mobile OS (Operating System).

Assignments:

NOTE:

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

In case of assignments for internal 10 marks students will be assigned two assignments containing problems of different types or any programming assignment and guided for the solutions of the problem.

The assignments are to be submitted as hard copy.

Text Books:

1. Ralph Steinmetz, Klara Nahrstedt –Multimedia computing, Communication & Application– Pearson Education, 6th Edition.
2. Ze-Nian Le, Mark.S. Drew, Jiang Chuan Liu, Fundamentals of Multimedia, Springer, 2nd edition.
3. JakobIversen, Michael Eierman, Learning Mobile App Development- A Hands-On Guide to Building Apps with iOS and Android, Addison-wesley, 1st edition, 2013.

Reference Books:

1. Tay Vaughan, “Multimedia making It work”, Tata Mc Graw Hill 5th Edition 2001.
2. Fred Halsall, “Multimedia Communications”, Addison Wesley, 1st Edition, 2000.
3. Andleigh P K and Thakrar K, “Multimedia Systems”, Addison Wesley , 1999.
4. Jeff Mc Wherter, Scott Gowell, “Professional Mobile Application Development”, Wiley Publications.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

ELECTIVE – I: SCRIPTING LANGUAGES

TEACHING SCHEME:

Theory: 3 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 03 Credits

Course Pre-requisites:

1. The course prerequisites are some general familiarity with programming language constructs such as loops, functions, and conditionals. And revision of regular expressions.

Course Objectives:

1. The study of the principles of scripting languages
2. Understand the difference between client side and server side scripting.
3. Understand the basic techniques used to create scripts for automating system administration tasks.

Course Outcomes: After completion of course, students will able to:

1. To Exemplify the fundamentals of scripting languages.
2. To design and implement JavaScript programs using web browser.
3. To analyze the DOM model and JSON.
4. To implement JQuery.
5. To demonstrate basics of PHP and implement the program using web server.
6. To exhibit the fundamentals of python script and implement it using python interpreter.

- UNIT I Introduction to Scripting Languages:** Motivation for and applications of Scripting languages; Difference between Scripting languages and non-Scripting languages; Merits of scripting languages; Types of Scripting languages, Client Side Scripting, Scripting for content structuring, Form design, Client Side Validation, dynamic page generation, adding interactivity, Styles, using HTML, DHTML, XHTML, CSS, Java Script. Server Side Scripting, Types of servers - Configuring and Using Web servers, Important features and Examples of other Scripting Languages. **(06 Hours)**
- UNIT II Java Script fundamentals& Working with Java Scripts:** **(06 Hours)**
Introduction to Java Script, History, Variables, Data Conversions, Interaction with the User, Operators, Math and Date Objects, Flow control, String Objects, String Methods, Number Objects, Formatting Numbers, Common Array Methods, Associative Arrays. Implementing Functions: Declaration & Invocation, Passing Arguments, Returning Values, Anonymous Functions and Event Handling.
- UNIT - III JavaScript Objects and JSON:** **(06 Hours)**
Browser Object Model, Document Object Model (DOM), JSON, jQuery Selectors and Filters, DOM Manipulation, jQuery Events, jQuery Event Model, Common jQuery Events, Delegated and Direct Events. jQuery Plugins, Ajax Requests Using jQuery.
- UNIT - IV XML:** Creating Markup with XML, Document Type Definition, Schemas Document Object Model, Simple API for XML, Extensible Stylesheet languages, Formatting Objects, Xpath, XLink and Pointer, Introduction to SOAP, Case Studies, Custom markup languages. Parsers: DOM and SAX - Evolution of AJAX. **(06 Hours)**

UNIT Python Script: Introduction, Conditional Statements, Looping, Control Statements, (06 Hours)
- V String Manipulation, Lists, Tuple, Dictionaries, Functions, Modules, Input-Output, Exception Handling.

UNIT Python Script with OOP: OOPs concepts, Classes in Python, Principles of Object (06 Hours)
- VI Orientation, Instance Methods, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Regular expressions, CGI, Database, Networking, Multithreading, GUI Programming.

Assignment:

Note:

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Text books:

- 1) Python: The Complete Reference by Martin C. Brown
- 2) JavaScript: The Complete Reference by Thomas Powell, Fritz Schneider.

Reference Books:

- 1) JavaScript in 24 Hours, 4th ed. Michael Moncur. 2007. Sams Publishing.
- 2) Python Tutorial by Guido van Rossum, and Fred Drake, Jr., editor, Release 2.6.4.
- 3) Programming Python, by Mark Lutz. O'REILLY
- 4) Xml: The Complete Reference by Willimson, Tata McGraw-Hill Education
- 5) Beginning Python: From Novice to Professional (2nd Edition) Author: Magnus Lie Hetland.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

ELECTIVE – I: SOFTWARE PROJECT MANAGEMENT

TEACHING SCHEME:

Theory: 03 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

Theory:03 Credits

Course Pre-requisites:

1. Understanding of Software Development Life cycle(SDLC)
2. Knowledge of management skills and strategies.

Course Objectives:

1. Articulate similarities and differences between IT projects and other types of projects
2. The ability to come up with a project schedule and assign resources
3. Identify project risks, monitor and track project deadlines.
4. The capability to work in a team environment and be aware of different modes of communications

Course Outcomes: After completion of course, students will able to:

1. Practice the process of project management and its application in delivering successful IT projects.
2. Distinguish between the different types of project and follow the stages needed to negotiate an appropriate scope.
3. Plan and Complete the tasks in time effectively and efficiently.
4. Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities.
5. Identify the resources required for a project and to produce a work plan and resource schedule.
6. Implement the project plans through managing people communications

UNIT An overview of IT Project Management

(06 Hours)

I

Introduction, the state of IT project management, context of project management, need of project Management, project goals, project life cycle, information technology project methodology (ITPM), project feasibility, project selection and approval, project contracting, PMBOK.

UNIT Project Integration & scope Management

(06 Hours)

II

Project management process, project Integration management, the project charter, project Management planning framework, the contents of a project plan, the planning process, project scope definition, Management project scope verification, change control, Work Breakdown Structure (WBS), linear responsibility chart.

- UNIT Project Time Management: (06 Hours)**
III Developing the project schedule, Management Scheduling Charts, logic diagrams and network (AOA, AON), critical path, calendar scheduling and time based network, PDM network, PERT, CPM, Resource loading, resource leveling, allocating scarce resources to projects.
- UNIT Project Quality and Cost Management: (06 Hours)**
IV Quality tools and philosophies, Quality management system, IT Project quality plan. Cost estimating, Cost escalation, Management system development cycle, Cost estimating process, Elements of budgets and estimates, Project cost accounting and MIS, Budgeting using cost accounts, Cost schedules and forecasts.
- UNIT Project Human Resource Management: (06 Hours)**
V Organization and project planning, Resource project team, multidisciplinary teams, project Management environment, project leadership, ethics in projects, multicultural projects, Role of project manager, IT governance.
- UNIT Project Human Communication Management: (06 Hours)**
VI Monitoring and controlling the project, Communication project plan, Project metric, Project Management control, designing the control system, the plan-monitor control cycle, data collection and reporting, reporting performance and progress.

Assignment:

Note: For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy

Text books

- 1., Hughes, cotterel, RajibMalll Tata McGraw Hill Software Project Management.
2. Edwin Bennatan Software Project management.

References

1. S.A. Kelkar Software Project Management
2. Whitten, Bentley and Dittman System Analysis and Design Methods

Syllabus for Unit Test:

- | | |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT – III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT – VI |

ELECTIVE – I: COMPUTATIONAL GENOMICS

TEACHING SCHEME:

Theory: 3 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Continuous Assessment: 40 Marks
Total: 100 Marks

CREDITS ALLOTTED:

Theory: 03 Credits

Course Pre-requisites:

In order to understand the content, gain knowledge and successfully complete this course, students should have a basic understanding of the computer algorithms, Programming skills and basic mathematics.

Course Objectives:

1. The purpose is to enable students to analyze and Interpret data generated by bioinformatics/genomics technology.
2. Enable student to use statistical concepts to design experiments and analyze high dimensional data.

Course Outcomes: After completion of course, students will able to:

1. Apply knowledge of data structures, algorithms and analysis of algorithms to problems in Computational Genomics
2. Recite and Express Knowledge needed to read and interpret cutting-edge results in computational genomics.
3. Express the strengths and limits of current genomics data analysis methods
4. Prepare to lead new research projects in computational genomics
5. Formulate and/or model a biological problem/system as a computer science problem
6. Investigate the applicability of algorithms & techniques in other domains such as text mining, speech recognition, pattern matching and string searching

UNIT Introduction to Genome Computational (06 Hours)

I Introduction to Challenges in Computational biology: gene finding, Sequence alignment, Database lookup, genome assembly, Regulatory Motif Discovery etc., Introduction to Probability: Probability Distribution, Multiple Random Variables, Random Variables assuming infinite values.
Introduction to Markov & Chebycheff inequalities, Hoeffding's inequality, Monte carlo simulation, Cramer's theorem.

UNIT Algorithms for computational genomics (06 Hours)

II Enumeration Approaches: Exhaustive search, Pruning, greedy algorithms, iterative refinement.
Content based indexing: hashing, database lookup, pre-processing.
Iterative Method: Combining sub problems, memorization, dynamic programming.
Statistical Method: Hypothesis testing, Maximum likelihood, Bayes Law, HMM's.
Machining learning technique: Supervised and unsupervised learning, classification.

UNIT Hidden Markov Processes (06 Hours)

III Markov Processes: Markov property and state transition matrix, estimating the

state transition matrix, stationary Markov chains: recurrent and transient states, hitting probabilities and mean hitting time, Basic properties: Three different looking models, equivalence between three models. The Viterbi algorithm, Baum-Welch Algorithm.

UNIT BLAST THEORY (06 Hours)

IV Anatomy, Problem formulation, Moment generating function, Finding local Matches, Application of main results, Proofs of main results.
BLAST & Database: W-mer Indexing data, Search algorithm, karlin-alschul statistics, Filtering, Two hit Blast, substitution matrices, pigeonhole principle.

UNIT Data Mining (06 Hours)

V Functional Genomics: Splicing & Alternative Splicing, Microarray based Functional genomics.
Data Transformation: data smoothing by discretization, Normalization and standardization, min-max normalization, z-score standardization, use decimal scaling.
Feature Selection: Filter Approaches, Wrapper Approaches.
Clustering Technique: Distance based clustering and measures, K-means Algorithm, k-modes algorithm, Genetic Distance measure, hierarchical clustering, Graph based clustering.

UNIT Classification in Genome and bioinformatics (06 Hours)

VI Bias variance tradeoff in supervised learning, Linear and Nonlinear classifiers, Model complexity and training data set size, support vector machines, Bayesian Approaches, Bayesian Network, Decision tree: tree pruning.
Applications: Sequence alignment using dynamic programming, Scoring matrices for protein sequences.

Assignments:

Note

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Reference Books

- [1] Data Mining for Bioinformatics, Sumeet Dua, Pradeep Chowriappa, CRC Press, 06-Nov-2012
- [2] Data Mining in Bioinformatics, Jason T. L. Wang, Mohammed J. Zaki, HannuToivonen, Dennis Shasha
- [3] Springer Science & Business Media, 30-Mar-2006
- [4] Hidden Markov Processes: Theory and Applications to Biology, M. Vidyannagar Princeton University Press, 24-Aug-2014
- [5] Theoretical and Computational Methods in Genome Research, Sandor Suhai, Springer Science & Business Media, 06-Dec-2012
- [6] Computational Genome Analysis: An Introduction, Richard C. Deonier, Simon Tavaré, Michael Waterman, Springer Science & Business Media, 13-Aug-2007

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

ENGINEERING MATHEMATICS-IV (OPTIONAL SUBJECT)

TEACHING SCHEME:

Theory: 04 Hours / Week

Practical: -- Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

04 Credits

Course Pre-requisites:

The Students should have knowledge of

1. Determinants
2. Matrices
3. Differentiation
4. Integration of functions
5. Differential equation

Course Objectives:

The course aims at making the students familiar about the most basic numerical methods and concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.

Course Outcomes:

The student should be able to

1. Derive appropriate numerical methods to solve algebraic and transcendental equations
2. Evaluate the accuracy of common numerical methods.
3. Develop appropriate numerical methods to solve a difference equation.
4. Be familiar with numerical interpolation and approximation of functions, numerical integration and differentiation.
5. Be familiar with numerical solution of ordinary differential equations.
6. To compute Numerical Solution of Partial Differential Equations.

UNIT - I Numerical solutions of algebraic and transcendental equations: (08 Hours)

Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.

UNIT - II Solution of system of linear algebraic equation (08 Hours)

Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.

- UNIT - III** **Difference equation and Solution of difference equations** **(08 Hours)**
 Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.
- UNIT - IV** **Interpolation and Numerical differentiation and integration** **(08 Hours)**
 Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting : Method of least squares. Straight line, Second degree, parabola, Exponential curve.
 Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.
- UNIT - V** **Numerical solution of I order ordinary differential equation** **(08 Hours)**
 Solution by Euler's, method Euler' Modified method Taylor's series. Runga-kutta method. Milne's Predictors and Correctors method.
- UNIT - VI** **Numerical Solution of Partial Differential Equations** **(08 Hours)**
 Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.

Text Books:

1. Gupta P.P.& Malik G.S., *Calculus of Finite Differences and Numerical Analysis*, Krishna Prakashan Mandir, Meerut, 21/e, 2006.
2. B.S.Grewal, *Engineering Mathematics*, Khanna Publishers, 12/e, 2006.

Reference Books:

1. Francis J. Scheid, *Schaum's Outline of Numerical Analysis*, McGraw-Hill, New York, 1989.
2. S. S. Sastry, *Engineering Mathematics*, Vol I, II Prentice Hall Publication, 3/e, 2004.
3. C.Ray Wylie & Louis C. Barretle, *Advanced Engineering Mathematics*, Tata McGraw Hill Publishing Co Ltd., 6/e, 2003.

Syllabus for Unit Test:

Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

Programming Lab-III

TEACHING SCHEME:

Practical: 04 Hours / Week

EXAMINATION SCHEME:

Term Work/Practical: 50 Marks

**CREDITS
ALLOTTED:**

TW/PR: 02 Credits

Course Pre-requisites:

The Students should have

1. Basic knowledge of object oriented programming.

Course Objectives:

1. To develop ability to use the computational languages necessary for engineering practice.

Course Outcomes: After completion of course, students will able to:

1. Recite and Express fundamentals of Visual Basic .NET Programming.
2. Illustrate Object Oriented Programming in VB.NET.
3. Demonstrate Windows Forms Application.
4. Apply the concept of developing Console Application.
5. Illustrate Inheritance and Polymorphism.
6. Experiment the data access using ADO.net.

UNIT Getting Started with Visual Basic .NET: (06 Hours)

- I

Introduction to Visual Basic .NET, MS. Net Project, MSIL, JIT, .NET frame

work class library.

Module and Variable: Module and Namespace, Variables, array and structure.

Control flow and Error Handlings: Execution flow control. commands, functions & constants. Error Handling, Debugging .NET applications.

UNIT Object Oriented Programming using VB.NET: (06 Hours)

- II

Methods, properties, constructors, object lifetime, events, Inheritance, in VB.NET., Interfaces, Attributes.

Programming in .NET Framework: Array, Lists and collection file, directories and streams.

UNIT - III Windows Forms Application: **(06 Hours)**

Windows forms Applications, Controls, Data Access in visual basic .NET, ADO.NET, Database connectivity.

UNIT - IV C#.net Language Basics **(06 Hours)**

Datatypes, Common Type System, Reference Type and Value Type, Variables Declaration, Concept of Class and Object.

Implicit and Explicit Casting, casting between other datatypes, Boxing and Unboxing, Enum and Constant, Operators, Control Statements, working with Arrays, working with Methods - Pass by value, Pass by reference.

Developing Console Application

Introduction to Project and Solution in Studio, compiling a C# program, Compiling and Building Projects, Using Command Line Arguments, Importance of Exit code of an application.

UNIT - V Inheritance, Polymorphism and Interface in C#.NET **(06 Hours)**

Exception Handling

Exception, Rules for Handling Exception, Exception classes and its important properties, use of try and catch, throwing exceptions, Importance of finally block.

Introduction to Operator Overloading, DLL, DLL Vs Exe., Types of DLL, concept and use of Class Library, Namespace.

WinForms

Introduction to Windows Forms, Controls, Menus and Context Menus, MenuStrip, ToolStrip, Graphics and GDI, SDI and MDI Applications, Dialogbox (Modal and Modeless), Form Inheritance.

UNIT - VI Data Access using ADO.NET **(06 Hours)**

Introduction to SQL. Creating Database using VS.NET, Establishing Connection with Database. Executing simple Insert, Update and Delete Statements, Executing Select Statement and using SqlDataReader

Data Access using ADO.NET – Dataset, Advantages of Dataset, Concept of Data Adapter, Data Table, DataGridView, Data Row, Adding / Editing / Deleting rows in the Data Table, Working with Data View.

Multithreading: Creating and Managing Threads, Threads Priority, Thread States, Thread Synchronization & Inter-thread Communication., Using Monitor

Delegates & Events: Delegate Declaration, Sample Application.

Term Work:

Concern Staff should frame assignments on Each Unit.

Text Books:

Jesse Liberty Learning Visual Basic .NET, O'Reilly.

Andrew Troelsen Pro C# 2008 and the .NET 3.5 Platform, Apress

Reference Books:

Steven Holzner, VB.NET Programming Black Book, Dreamtec Publications.

Matt Telles, C#Programming Black Book, Dreamtec Publications.
Syllabus for Unit Test: NA

OPERATING SYSTEM

TEACHING SCHEME:

Theory: 3 Hours / Week
Practical: 2 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Continuous Assessment: 40 Marks
TW/Oral: 50 Marks

CREDITS ALLOTTED:

Theory: 03 Credits
TW/OR:01 Credit

Course Pre-requisites:

1. Concept of system software, application software, knowledge of input output devices and its usage

Course Objectives:

1. To enable the students to understand basic concepts of operating system.
2. To brief the students about various design aspects of operating system functionality
3. To give hands on exposure to Linux commands and system.

Course Outcomes: After completion of course, students will able to:

1. Recite and Express theoretical and practical aspects of operating system.
2. Infer the concept of process, thread and Inter process communication
3. Outline the concept of deadlocks, necessary conditions for deadlock and various techniques to handle deadlock
4. Analyze memory management policies.
5. Describe file system File and Input /output structure.
6. Infer LINUX and Android Operating system.

UNIT I	OPERATING SYSTEMS OVERVIEW Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Multiprocessor and Multicore Organization. Operating system Overview-Kernel, Shell, objectives and functions, Evolution of Operating System- Computer System Organization- Operating System Structure and Operations- System Calls, OS Generation and System Boot., Virtual Machines.	(06 Hours)
UNIT II	PROCESS MANAGEMENT Processes-Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; Threads- Overview, Multicore Programming, Multithreading Models; Thread and SMP Management. Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Monitors.	(6 Hours)
UNIT IV	MEMORY MANAGEMENT Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64-bit architecture Examples; Virtual Memory- Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.	(6 Hours)
UNIT V	INPUT/OUTPUT SYSTEMS Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation- File System Structure, Directory Structure, Allocation Methods, Free Space Management, I/O Systems.	(6 Hours)

UNIT CASE STUDY**(6 Hours)**

VI Basic Concepts, of LINUX Multifunction Server, Virtualization- Xen, VMware with Linux Host, Android operating system –Features, characteristics, Basic building blocks, Architecture, System services.

Term Work:

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. Demonstrate the process creation and various states of a process
2. Apply various scheduling algorithms on a process.
3. Apply Banker's algorithm
4. Predict whether a system is in a Safe or Unsafe state.
5. Demonstrate various contiguous memory allocation strategies
6. Demonstrate various page replacement strategies
7. Apply disk Scheduling algorithms

Assignments:**Note:**

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Reference Books

- 1) Dhananjay M Dhamdhare, 'Operating Systems - A Concept Based approach', Tata McGraw, Hill publication
- 2) Abraham Silberschatz, Peter B. Galvin & Grege Gagne (Wiley)). Operating System Concepts'
- 3) Sumitabha Das, 'Unix Concepts and Applications, Tata McGraw Hill
- 4) Milan Milinkovic, 'Operating System: Concepts and Design, Tata McGraw Hill
- 5) Achyut S. Godbole, 'Operating System with case studies in Unix, Netware and Windows NT' Tata McGraw Hill
- 6) Karim Yoghmour 'Embedded Android', O'Reilly Publication

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

DESIGN AND ANALYSIS OF ALGORITHMS

TEACHING SCHEME:

Theory: 3 Hours / Week
Practical: 2 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Continuous Assessment: 40 Marks
TW/Oral: 50 Marks

CREDITS ALLOTTED:

Theory: 03 Credits
TW/OR: 01 Credit

Course Pre-requisites:

1. The students should possess the knowledge of Data Structures

Course Objectives:

1. To be able to understand the performance analysis of algorithms.
2. To analyze Dynamic Programming Algorithms.
3. Understand NP-Hard, NP- complete Problems.

Course Outcomes: After completion of course, students will able to:

1. Analyze time complexity
2. Analyze space complexity
3. Discuss Divide and Conquer Method
4. Design algorithms using greedy Methods
5. Infer Backtracking
6. Outline NP-Hard and NP-Complete Problems

UNIT I	Introduction: Algorithm Specification, Pseudocode Conventions, Recursive Algorithms, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notations, Performance Measurements.	(06 Hours)
UNIT II	Basic Algorithms: Basics of Probability Theory, Primality testing, Its Advantages and Disadvantages. Elementary Data Structures: Stack, Queues, Binary Trees, Binary Search trees, Heaps, Heap sort, Graphs, Basic Traversal and Search Techniques. Analysis for complexity of all algorithms.	(06 Hours)
UNIT III	Divide and Conquer: General Method, Binary Search, Finding the maximum and minimum, Merge sort, Quick sort, Performance Measurement, Worst case Analysis. Strassens's matrix multiplication.	(06 Hours)
UNIT IV	Greedy Method: The General Method, Knapsack problem, tree vertex splitting, Job sequencing. Minimum Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Optimal Merge Patterns, Single-Source shortest path. Dynamic Programming: The General Method, Multistage Graph, All pair shortest path, Single Source shortest path, General Weights, Optimal Binary Search Trees, String Editing, 0/1 Knapsack, Traveling Salesman Problem.	(06 Hours)

UNIT V Backtracking: The General Method, The 8- Queens Problem, Sum of Subsets, Graph Coloring, and Hamiltonian Cycles. Branch and Bound: Least Cost (LC) Search, the 15-puzzle Control abstraction of LC Search, Bounding, FIFO Branch and Bound, LC Branch and Bound. **(06 Hours)**

UNIT VI Algorithm Complexities: Non deterministic Algorithms, The classes NP- Hard and NP- Complete, Cook's Theorem, NP-Hard Graph Problems, NP-Hard Scheduling Problems, NP-Hard Code Generation Problems. Approximation Problems. **(06 Hours)**

Term Work:

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. Calculate the time complexity of various algorithms.
2. Calculate the space complexity of various algorithms.
3. Implement Knapsack Algorithm.
4. Implement Prim's Algorithm
5. Study and analysis of 8-Queens Problem.
7. Implement Optimal Binary Search Tree.
8. Analyze Quick Sort for Best Case, Worst Case.

Assignments:

Note

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty. For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Text books

1) ElitzHorowith and SartajSahani, S. Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications.

2) Alfred Aho, John E. Hopcroft, "Design and Analysis of Computer Algorithms", Pearson Education

References:
1) Thomas Cormen, Charles E Leiserson, Ronald Rivest, "Introduction to Algorithms, Tata Mc-Graw Hill Publication, Second Edition.

2) Rod Stephens, "Essential Algorithms: A Practical Approach to Computer Algorithms", John Wiley and Sons Publications

3) Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson Education

4) Robert Sedgewick, Philippe Flajolet, "An Introduction to the Analysis of Algorithms", Addison-Wesley Publication, Second Edition

5) Steven S. Skiena, "The Algorithm Design Manual", Springer Publication, Second Edition.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

DIGITAL SIGNAL PROCESSING

TEACHING SCHEME:

Theory: 3 Hours / Week
Practical: 2 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Continuous Assessment: 40 Marks
TW/Oral: 50 Marks

CREDITS

ALLOTTED:
Theory: 03 Credits
TW/OR: 01 Credit

Course Pre-requisites:

Basic knowledge of Mathematics, Data communication and Microprocessor

Course Objectives:

1. To analyze discrete time signals and systems in time and frequency domain.
2. To represent structures for discrete time systems.
3. To design digital filters and implement using open source software
4. To understand DSP processors and DSP based applications in real world.

Course Outcomes: After completion of course, students will able to:

1. Classify discrete-time signals and discrete time systems.
2. Evaluate LTI system in frequency domain using Fourier Transform, DFT and FFT.
3. Analyze discrete time signals and LTI system using Z transform.
4. Design structures for discrete time systems
5. Design and implement FIR and IIR filters using different methods.
6. Exhibit enhanced architecture and features of DSP processor.
7. Illustrate applications of DSP in speech and Image Processing.

UNIT Signals and Systems:

I Basic elements of DSP system, Analog to Digital conversion process, Aliasing effect Standard signals, Discrete time systems, classification and properties of discrete time systems, Linear Shift Invariant (LSI) systems, Impulse response, Conditions for causality and stability for LTI systems, Linear convolution. **(06 Hours)**

UNIT Fourier Transform

II Fourier transform of standard signals, Discrete Fourier Transform (DFT), DFT of standard signals, properties of DFT, Circular convolution, correlation, Radix-2 FFT algorithms, Decimation in Time (DIT) and Decimation in Frequency (DIF), Inverse DFT and computation of IDFT, relation between ZT, FT and DFT. **(06 Hours)**

UNIT Z transform

III Region of Convergence (ROC) and its properties, Z transforms of standard signals, properties of Z transform, Inverse Z transform, System functions from Z transform and pole-zero plots, computation of poles and zeros. **(06 Hours)**

UNIT Structures for discrete time systems: Implementation of general difference

IV equation, Basic structures for FIR systems, Basic structures IIR systems, Representation of structures using signal flow graphs, Feedback in IIR systems, Linear phase FIR filters. **(06 Hours)**

UNIT Digital Filters

V Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters, IIR filter **(06 Hours)**

design using impulse invariance and bilinear transformation method, Butterworth approximation, FIR filter design using Windows, Gibb's phenomenon.

UNIT VI	DSP Processors Architecture and applications DSP processors fundamentals, Characteristics, Evolution of DSP processors, Comparison of DSP processor and microprocessor, conventional and Enhanced architecture of DSP Case study: - TMS 320C64X Applications of DSP in image processing, Feature extraction and pattern matching. Applications of DSP in speech processing, Speech recognition, speech synthesis, Echo cancellation. Case study: - Multi-rate signal processing.	(06 Hours)
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Term Work:

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. WAP to generate samples of Sine, Cosine, Square and Random signal.
2. WAP to compute linear convolution
3. WAP to find N point DFT of a given sequence.
4. WAP to compute Circular convolution
5. WAP to implement Radix-2 DIT FFT Algorithm.
6. WAP to compute Z transform and draw pole zero plot
7. WAP to compute Z transform and draw pole zero plot
8. Find Fourier transform of various window functions
9. Assignment based on DSP applications in Image processing
10. Assignment based on DSP applications in speech processing

Assignment:

Note:

In case of assignments for internal 10 Marks students will be assigned two assignments based on different computer organization and architecture concepts and guided for the respective assignment.

The assignments are to be submitted as a hard copy

Text books

1. John G. Proakis, D.G. Manolakis, "Digital Signal Processing", Pearson Prentice Hall.
2. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press.

Reference Books

1. B. Venkataramani, M. Bhaskar, "Digital Signal Processors", Architecture programming & applications, TMH.
2. S.K. Mitra, "Digital Signal Processing Computer Based Approach", TMH.
3. M.H. Hayes "digital signal Processing" Schaum's outlines TMH
4. "TMS 320 C64X CPU & instruction set" Texas instruments reference guide
5. Fredic Harris "Multirate signal processing for communication System", PHI

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

COMPUTER ORGANIZATION AND ARCHITECTURE

TEACHING SCHEME:

Theory: 3 Hours / Week

Tutorial: 1 Hour / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 04 Credits

Course Pre-requisites:

1. Concept of digital logic and microprocessors
2. Basic Understanding of Computer System

Course Objectives:

1. To understand the core concepts about the computer architecture and computer organization.
2. To understand the design of the various functional units of computer system.

Course Outcomes: After completion of course, students will able to:

1. Solve fixed point and floating point arithmetic problems using algorithms.
2. Infer the architecture and functions of Central Processing Unit.
3. Outline the design approaches and functional requirements for implementing control unit.
4. Describe the I/O organization and interconnections
5. Analyze the characteristics of memory system.
6. Infer multiprocessor configuration and modern computer organization.

UNIT I	CPU structure and function: Components and functions of computer system, CPU architecture, Processor organization, Register Organization, Instruction Cycle, instruction pipeline. RISC and CISC architecture, The Pentium Processor, Power PC., Superscalar processors.	(06 Hours)
UNIT II	Computer Arithmetic ALU, Fixed and Floating point numbers, Integer arithmetic, Booth's algorithm, Hardware implementation, Restoring and Non-Restoring Division algorithm, Floating point representation, IEEE standards.	(06 Hours)
UNIT III	Control Unit Organization Micro-operation and their Register Transfer Language (RTL) specification, Hardware control design methods and implementation, Micro program control, Micro instruction Sequencing, Micro instruction execution.	(06 Hours)
Unit IV	Input/output Organization Computer system, I/O modules, Programmed I/O, Interrupt driven I/O, Interrupt processing, I/O channels and Processor, DMA, Interface circuits, Bus interconnection, Bus arbitration, Standard buses, Standard interfaces, PCI, SCSI,	(06 Hours)

USB bus.

UNIT V Memory Organization (06 Hours)

Internal memory, Characteristics of memory systems, Memory hierarchy, Error correction, Cache memory organization, Mapping, Replacement algorithms, Pentium cache organization, DDR3 Memory Organization, NUMA and UMA caches.
Hard disk drives, RAID levels, Flash drives, USB stick.

UNIT VI Multiprocessor Configuration: (06 Hours)

Flynn's classification for multiprocessor system, closely coupled, loosely coupled and tightly coupled configurations. Problems of Bus contentions, Inter Processor communication.
Multi core systems, Virtual processors. Case study: - Processor architecture in latest Mobile /Laptop.

Assignment:

Note:

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Text Books

1. William Stalling, "Computer Organization and Architecture", Fifth edition, PHI
2. Zaky S, Hamacher, "Computer Organization", Fifth Edition, McGraw-Hill Publications, 2001, ISBN 0071122184

Reference books

1. John P Hayes, "Computer Architecture and Organization", McGraw-Hill Publication, 2001, ISBN 0071004793.
2. Carpinelli, "Computer systems Organization & Architecture", Pearson Education India, 2001, ISBN: 8177587676, 9788177587678
3. Morris Mano, "Computer System Architecture, Pearson", Third edition (2008), ISBN: 978-8131700709
4. Andrew S. Tanenbaum "Structured Computer Organization" (5th Edition) ISBN-13: 978-0131485211
5. D.A. Patterson and J.L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", Morgan Kaufmann ISBN: 9780124077263

Syllabus for Unit Test:

Unit Test -1 UNIT – I, UNIT – II, UNIT - III

Unit Test -2 UNIT – IV, UNIT – V, UNIT - VI

ELECTIVE –II: VLSI

TEACHING SCHEME:

Theory: 03 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

**CREDITS
ALLOTTED:**

Theory:03 Credits

Course Pre-requisites:

1. Analog and Digital Electronics.
2. Semiconductor physics.

Course Objectives:

1. Introduce students to VLSI Design.
2. Introduce students to fabrication and testability techniques.
3. Introduce students to design Low-Power CMOS Logic Circuits.
4. Introduce students to design and simulate digital circuits using FPGA.

Course Outcomes: After completion of course, students will able to:

1. Express concept of Microelectronics and Introduction to MOS Technologies.
2. Outline Layout Design and Tools.
3. Infer Combinational Logical & Sequential Systems.
4. Identify and discuss key problems Dynamic Logic Circuits and its solutions.
5. Relate importance of Low-Power CMOS Logic Circuits.
6. Apply useful criteria for guiding design and evaluation of Chip Input and Output (I/O) Circuits.

UNIT I Review of Microelectronics and Introduction to MOS Technologies: MOS, CMOS, (06 Hours)

I

BiCMOS Technology. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits: $I_{ds} - V_{ds}$ relationships, Threshold Voltage V_T , G_m , G_{ds} and ω_0 , Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Z_{pu}/Z_{pd} , MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT II Layout Design and Tools: (06 Hours)

II

Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.

Logic Gates & Layouts:

Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.

UNIT III Combinational Logic: (06 Hours)

Layouts, Simulation, Delay, Interconnect design, Power optimization, Switch logic and

III Gates.

Sequential Systems:

Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

UNIT Dynamic Logic Circuits:

(06 Hours)

IV

Introduction, Basic Principles of Pass Transistor Circuits, Voltage Bootstrapping, Synchronous Dynamic, Circuit Techniques, Dynamic CMOS Circuit Techniques, High Performance Dynamic CMOS Circuits, Semiconductor Memories: Introduction, Dynamic Random Access Memory (DRAM), Static Random Access Memory (SRAM), Nonvolatile Memory, Flash Memory, Ferroelectric Random Access Memory (FRAM).

UNIT Low-Power CMOS Logic Circuits:

(06 Hours)

V

Introduction, Overview of Power Consumption, Low-Power Design Through Voltage Scaling, Estimation and Optimization of Switching Activity, Reduction of Switched Capacitance, Adiabatic Logic Circuits. BiCMOS Logic Circuits: Introduction, Bipolar Junction Transistor (BJT): Structure and Operation, Dynamic Behavior of BJTs, Basic BiCMOS Circuits: Static Behavior, Switching Delay in BiCMOS Logic Circuits, BiCMOS Applications.

UNIT Chip Input and Output (I/O) Circuits:

(06 Hours)

VI

Introduction, ESD Protection, Input Circuits, Output Circuits and $L(di/dt)$ Noise, On-Chip Clock, Generation and Distribution, Latch-Up and Its Prevention. Design for Manufacturability: Introduction, Process Variations, Basic Concepts and Definitions, Design of Experiments and Performance Modelling, Parametric Yield Estimation, Parametric Yield Maximization, Worst-Case Analysis, Performance Variability Minimization. ASIC Design Flow, Introduction to Verilog, Language Constructs and Conventions in Verilog, Gate Level Modeling, Architecture of FPGA.

Assignments:

Note:

1. For internal assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.
2. The assignments are to be submitted as a hard copy.

Reference books

- 1) Essentials of VLSI Circuits and Systems, K. Eshraghian Eshraghian. D, A. Pucknell, 2005, PHI.
- 2) Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.
- 3) Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
- 4) Principles of CMOS VLSI Design – N.H.E Weste, K. Eshraghian, 2nd Ed., Addison Wesley.
- 5) Sung Mo Kang & Yosuf Leblebici, “CMOS Digital Integrated Circuits: Analysis and Design”, Tata McGraw-Hill, Third Edition
- 6) Neil Weste and K. Eshragian, “Principles of CMOS VLSI Design: A System Perspective”, Second Edition,

Pearson Education (Asia) Pvt. Ltd. 2000.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

ELECTIVE –II: NATURAL LANGUAGE PROCESSING

TEACHING SCHEME:

Theory: 3Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

Theory:03 Credits

Course Pre-requisites:

Basic understanding of Theory of Computer Science, Systems Software,
Basic mathematics, Probability theory.

Course Objectives:

1. To understand approaches to syntax and semantics in Natural Language Processing and levels of language analysis.
2. To understand current methods for statistical approaches to machine translation.
3. To develop problem solving abilities using Mathematics.

Course Outcomes: After completion of course, students will able to:

1. Outline the Natural Language Processing basics and language representation.
2. Apply various parsing algorithms and its application.
3. Describe language modeling and various clustering techniques.
4. Recite the use of Machine Translation in Natural Language Processing.
5. Apply various filtering methods and semantic networks.
6. Infer advanced tools and parsers for Natural Language Processing.

UNIT I	Introduction to Natural Language Understanding The Study of Language Applications of Natural Language Understanding, Evaluating Language Understanding Systems, The Different Levels of Language Analysis, Representations and Understanding the Organization of Natural Language Understanding Systems, Structure of Natural Language Processing (NLP).	(06 Hours)
UNIT II	Grammars for Natural Language Parsing Algorithms, Robust and Scalable Parsing on Noisy Text as in Web documents, Hybrid of Rule Based and Probabilistic Parsing, Human Preferences in Parsing Encoding Uncertainty: Shift-Reduce Parsers, Deterministic Parser Techniques for Efficient Encoding of Ambiguity Partial Parsing, Part of speech tagging.	(06 Hours)
UNIT III	Natural Language Processing Modeling Automatic Morphology Learning, Named Entities, Maximum Entropy Models, Random Fields, Estimation Techniques, and Language Modeling, Parsing and Syntax, The EM Algorithm in Natural Language Processing, Stochastic Tagging, and Log-Linear Models, Probabilistic Similarity Measures and Clustering, Machine Translation, Discourse Processing: Segmentation.	(06 Hours)
UNIT IV	Natural Language Understanding Methods Finite State Machine Based Morphology; Automatic Morphology Learning;	(06 Hours)

Unsupervised Methods in NLP, Introduction to HMM, HMM Ergodic models, Graphical Models for Sequence Labeling in NLP, Probabilistic parsing, Forward Backward probability, Viterbi Algorithm.

UNIT V Ambiguity Resolution (06 Hours)
Selectional Restrictions, Semantic Filtering Using Selectional Restrictions, Semantic Networks, Statistical Word Sense Disambiguation, Statistical Semantic Preferences, Combining Approaches to Disambiguation.

UNIT VI Advanced tools, techniques and applications of NLP (06 Hours)
Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Cross Lingual Information Retrieval, Some applications like machine translation, database interface, Programming language Python Natural Language Tool Kit (NLTK), NLP applications in web mining and text mining, Parsers for NLP such as Stanford, Open NLP.

Assignments:

Note:

1. For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.
2. The assignments are to be submitted as a hard copy.

Text books

- 1) James Allen, "Natural Language Understanding", Pearson Publication, ISBN: 978-81-317-0895-8 2nd Edition
- 2) D. Jurafsky, J. H. Martin, "Speech and Language Processing", Pearson Education, 2002, 2nd Edition

Reference Books

- 1) Christopher D. Manning, HinrichSchutze, "Foundations of Statistical Natural Language Processing", 1st edition, Cambridge, Massachusetts, 1999.
- 2) Tanveer Siddiqui, US Tiwari, "Natural Language Processing and Information Retrieval" Oxford Higher Education.
- 3) Daniel M. Bikel, ImedZitouni, "Multilingual Natural Language Processing Applications" Pearson Education 1st edition.
- 4) Lutz and Ascher "[Learning Python](#)" O'Reilly ISBN: 0596002815

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

ELECTIVE – II: HUMAN COMPUTER INTERACTION

TEACHING SCHEME:

Theory: 03 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

**CREDITS
ALLOTTED:**

Theory:03 Credits

Course Pre-requisites:

1. Knowledge of user interface and human psychology.
2. Understanding of Input Output devices.

Course Objectives:

1. To apply knowledge of human psychology, design process on user interface development projects.
2. To provide the user interface designer with concepts and strategies for making design decisions.
3. To expose the user interface designer to tools, techniques and ideas.
4. To identify the importance of good user interface design.

Course Outcomes: After completion of course, students will able to:

1. Express the concept of human computer interaction.
2. Describe the principles of human computer interaction.
3. Outline design goals and standards of HCI designs.
4. Identify and discuss key problems in HCI and its solutions.
5. Recite the importance of software tools and techniques of human factors in developing an interactive system.
6. Apply useful criteria for guiding design and evaluation of user interfaces.

UNIT I	Introduction: Human interaction with computers, importance of human characteristics, human consideration, Motivations for Human Factors in design, Eight golden rules of HCI, Murphy's law. Human Psychology and understanding. Case study on human factors.	(06 Hours)
UNIT II	The graphical user interface: Popularity of graphics, the concept of direct manipulation, graphical system, Web user – Interface popularity, Principles of user interface. Current trends in GUI.	(06 Hours)
UNIT III	Design process: Importance of user interface, definition, importance of good design. Benefits of	(06 Hours)

good design, study of design process components, three Pillars of design, Social Impact for early design review.

UNIT Software Tools and Techniques in Interface: (06 Hours)

IV Specification methods, interface building tools, Interaction Devices: Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, pointing devices, navigation schemes.

UNIT Screen Designing: (06 Hours)

V Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow – visually pleasing composition, presentation information simply and meaningfully information retrieval on web, Case study on screen design. Evaluation of user interface.

UNIT Windows & Components: (06 Hours)

VI Selection of window, individual, multiple window design, image browsing and tightly coupled windows. Selection of devices based and screen based controls. Components – text and messages, icons and increases, Multimedia, colors, uses, problems, choosing colors.

Assignment:

Note:

For internal assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Reference books

- 1) Prece, Rogers, “Sharps Interaction Design”, Wiley India.
- 2) Ben Shneiderman, “Designing the user interface”. 3rd Edition, Pearson Education Asia
- 3) Soren Lauesen, “User Interface Design”, Pearson Education.
- 4) Alan Cooper, Robert Reimann, David Cronin, “Essentials of Interaction Design”, Wiley.
- 5) Alan Dix, Janet Finckay, Greg Goryd, Abowd, Russell, Bealg, “Human Computer Interaction”, Pearson Education.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

ELECTIVE – II: DATA STORAGE SYSTEMS

TEACHING SCHEME:

Theory: 3 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Continuous Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 03 Credits

Course Pre-requisites:

In order to understand the content, gain knowledge and successfully complete this course, students should have a basic understanding of the computer architecture, file systems, operating system and networking.

Course Objectives:

1. To enlighten the students with the knowledge of storage systems and to gain exposure to the storage industry

Course Outcomes: After completion of course, students will able to:

1. Describe the data storage systems and its elements
2. Evaluate various types of intelligent storage systems
3. Describe and Evaluate the deployment model of storage systems
4. Evaluate the various storage networking technologies
5. Infer the key processes for managing the storage infrastructure
6. Determine the appropriate storage solution for a given scenario

UNIT Introduction to Data Storage

(06 Hours)

- I** Data, Data Variety, Information, knowledge, Big Data, Data explosion, Storage, **Storage devices and its types**, Memory hierarchy, Secondary storage, tertiary storage. Storage architecture and its evolution, Data center, Components of Data center, Managing Data center.
Introduction to Application workloads, DBMS, Compute, Memory Virtualization, Device Driver, Volume Manager, File System, Object storage, Block storage, Server Virtualization.

UNIT File System and Storage System

(06 Hours)

- III** Local file system, Journaling, Snapshots, Network file systems, Principle, NAS, SAN, DAS.
Case Study: DAFS, Shared Disk File System, GPFS, Comparison of FC SAN, FCoE SAN, iSCSI SAN and NAS. Scale up and scale out architectures.
Protocols: SCSI, iSCSI, SC,FCoE, CIFS vs NFS

UNIT I/O path and Storage Virtualization

(06 Hours)

- IV** Define Virtualization, define storage virtualization, I/O path, Physical channel, Elements in Physical I/O Path, software Layers of I/O Path, Software stack, I/O path virtualized, Demerits and need of storage virtualization, Virtualization entity, replaceable storage device, use of dynamic storage allocation, use of data migration, virtualization on block and file level, virtualization at network level, symmetric and asymmetric.

UNIT Function and Network technologies (06 Hours)

- V** Functions: Instant Copies, Remote Mirroring, consistency groups, LUN Masking, Availability of Disk Storage systems.
Storage network: Transmission technique and protocol, SCSI and storage network, Fiber channel, Link, ports and Topology, IP storage, InfiniBand.

UNIT Performance Monitoring and Management (06 Hours)

- VI** Performance management: Why analyze performance, Capacity Management: capacity planning, I/O Capacity, SLA's, Reactive Style, Casually Observant, Actively Observant, Proactive style, Performance Lifecycle, Performance Hierarchy. Performance Metrics: IOPS, part of an I/O, Throughput, Latency, Utilization, understanding application workload.
Tools: Linux performance commands: TOP, IOSTAT, SAR, IOMeter and Iozone.

Assignments:

Note

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

Reference Books

- 1) Information Storage and Management, second edition, EMC education Services, John Wiley & Sons, Inc.
- 2)Storage Networks Explained, second edition, Ulf Troppens, Rainer erkens, Wolafka, haustein, Wolfgang, Wiley, SNIA.
- 3)Introduction to storage area networks and system networking, An IBM Redbooks Publication, Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel, Libor Miklas
- 4)The Design and Implementation of a Robust-storage-system Architecture, Robert C. Good, University of Waterloo, 1995,

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

PROGRAMMING LAB- IV

TEACHING SCHEME:

Practical: 4 Hours / Week

EXAMINATION SCHEME:

Term Work (Practical): 50 Marks

**CREDITS
ALLOTTED:**

Credits: 02 Credits

Course Pre-requisites:

1. Students are expected to have some rudimentary knowledge of computer networking in general and a working knowledge of system programming in C/C++ under Unix/Linux.

Course Objectives:

1. To understand inter-process and inter-system communication.
2. To understand socket programming in its entirety.
3. To understand usage of TCP/UDP / Raw sockets.

Course Outcomes: After completion of course, students will able to:

1. Outline the fundamentals of Unix environment.
2. State Process handling.
3. Recite Inter-Process Communication
4. Implement Unix Socket Programming.
5. Infer fundamental concepts of Shell Programming.
6. Implementation of shell meta-characters.

UNIT Overview of Unix OS

I UNIX Architecture, UNIX Standardization, Files and Directories, Unix Installation, Input and Output, Programs and Processes, Error Handling, Logging in, User Identification, System Calls and Library Functions, Signals & Time Values **(06 Hours)**

UNIT Process Environment

II Process Identifiers, Fork Function, Vfork Function, Exit Functions, Wait and Waitpid Functions, Waitid Function, Wait3 and Wait4 Functions, Process Accounting, User Identification, Terminal Logins, Network Logins, Process Groups, Sessions, Introduction of Daemon Processes. Performance Monitoring Tools: Process Status (ps), Top, Xosview, Treeps. **(06 Hours)**

UNIT Inter-process Communication

III System V IPC. Message Passing: Pipes and FIFOs, Message Queues: System V, Synchronization: Mutexes and Condition Variables, Read-Write Locks, Record Locking, System V Semaphores, System V Shared memory. **(06 Hours)**

UNIT Network IPC: Sockets

IV Introduction, Socket Descriptors, Addressing, Connection Establishment, Transport Layer, Socket Introduction, TCP Sockets, UDP Sockets, Raw Sockets, Socket Options, I/O Multiplexing, Name and Address Conversions. **(06 Hours)**

UNIT Introduction to Unix Shell Programming

V Types of Shells, Interactive Shell Scripts, Shell variables, Shell keywords, Positional Parameters, Command line arguments, shell script Arithmetic, Control Instructions, Loop control structure. Shell Metacharacters: Filename Substitution Metacharacters, I/O Redirection, **(06 Hours)**

Process execution, Conditional execution using && and ||, Quoting metacharacters, Special Parameters, Debugging a Script \$* and S@

UNIT Unix Network Tools

(06 Hours)

VI Unix Network Commands related to Connectivity, network interface commands, Routing, Arp, NFS/NIS etc.
Windows power shell: purpose of PowerShell, Windows management framework, cmdlets and understanding syntax.

Term Work:

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. Introduction to Unix commands using vi editor.
2. Implementation of Unix System calls
3. Write a program to implement message passing using Pipes and FIFOs.
4. Write a program to implement synchronization using semaphores.
- 5 Write a program to implement synchronization using Mutex variable.
- 6 Write a program to implement client-server communication using TCP sockets.
7. Write a program to implement client-server communication using UDP sockets.
8. Write a program to implement client-server communication using Raw sockets.
9. Write a shell script to pass command line arguments.
10. Write a shell script using metacharacters for I/O redirection.

Reference books

1. W. Richard Stevens, Stephen A. Rago, “Advanced Programming in Unix Environment”,3rd Edition, Addison-Wesley Professional.
2. W. Richard Stevens “UNIX Network Programming-Interprocess communication”, Volume 2, Second Edition, Prentice Hall Publication.
3. “UNIX Network Programming: The Sockets Networking Api”, Volume 1, 3rd Edition, Addison-Wesley Professional Computing.

BHARATI VIDYAPEETH UNIVERSITY, PUNE
FACULTY OF ENGINEERING AND TECHNOLOGY

Programme: B. Tech. (Computer) – SEM VII – 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments						
1	Distributed Systems	3		1	60	20	10	10	--	--	100	3	--	3
2	Network Security and Cryptography	3	2	--	60	20	10	10	50	--	150	3	1	4
3	Big Data Analytics and Architecture	3		--	60	20	10	10	--	--	100	3	--	3
4	Compiler Design	3		--	60	20	10	10	--	--	100	3	--	3
5	Elective III	3		--	60	20	10	10	--	--	100	3	--	3
6	Programming Lab - V	--	2	--	--	--	--	-	50	--	50	--	1	1
7	*Industrial Training	--		--	--	--	--	--	--	50	50	--	3	3
8	*Seminar	--	2		--	--	--	-	--	50	50	-	1	1
9	*Project Stage- I	--	8		--	--	--	-	--	50	50	-	4	4
	TOTAL	15	14	1	300	100	50	50	100	150	750	15	10	25

Elective -III: a) Grid Computing b) VLSI and Embedded System c) Artificial Intelligence and Robotics d) Ad-Hoc and Sensor Networks

BHARATI VIDYAPEETH UNIVERSITY, PUNE

FACULTY OF ENGINEERING AND TECHNOLOGY

Programme: B. Tech. (Computer) – SEM VIII– 2014 Course

Sr.no	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments						
10	Machine Learning	3	2	1	60	20	10	10	--	50	150	4	1	5
11	Image Processing and Pattern Recognition	3	2	--	60	20	10	10	50	--	150	3	1	4
12	Elective -IV	3	2	--	60	20	10	10	50	--	150	3	1	4
13	Data Mining and Knowledge Discovery	3	2	--	60	20	10	10	50	--	150	3	1	4
14	*Project Stage - II		16	--	--	--	--	--	--	150	150	--	8	8
	TOTAL	12	24	1	240	80	40	40	150	200	750	13	12	25

Elective - IV: a) Mobile Computing b) Design Patterns c) Network Management System d) Parallel and Distributed Computing

Total Credits

Semester - VII = 25

Semester –VIII = 25

Grand Total = 50

Distributed Systems

TEACHING SCHEME:

Theory: 3 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 03

Course Pre-requisites:

Data Structures, Operating System, Computer Networking.

Course Objectives:

1. Understand foundation of distributed system
2. Introduce the idea of peer to peer services and file system
3. Understand in detail the system level and support required for distributed system
4. Understand the issues involved in studying process and resource management

Course Outcomes: Upon completion of the course student will able to

1. Discuss trends in distributed Systems.
2. Apply network virtualization.
3. Apply remote method interaction and objects.
4. Design process and resource management systems

UNIT - I Introduction:

(6 Hours)

Need of Distributed system(DS), Examples of Distributed Systems, Pros and Cons of distributed System, models of DS, Trends in Distributed Systems ,focus on resource sharing, challenges, case study world wide web, System model , Inter process communication, The API for internet protocols, External data representation and multicast communication network, Virtualization, Overlay networks.

UNIT - II Communication in Distributed System : (6 Hours)

Case study MPUI remote method Invocation and object : Remote invocation and object : Remote invocation introduction, request reply protocols, remote procedure call, remote method invocation, case study java RMI group communication, publish, subscribe system message queues, shared memory approaches. Distributed objects case study Enterprise java beans from objects to components.

UNIT - III Peer to peer services and file system: (6 Hours)

peer to peer system introduction, napster and its legacy peer to peer systems middleware routing overlays case studies: pastry , japestry, distributed file system introduction file service architecture Andrew file system file system features file model file accessing models file sharing semantics Naming identifiers, address Name resolution, Name space Implementation, name cache LDAP.

UNIT - IV Synchronization and replication: (6 Hours)

Introduction, clocks, events and process states, synchronizing physical clock, logical time and logical clocks, global states, coordination and agreement, Introduction of distributed mutual exclusion, elections transactions and concurrency control, nested transactions, locks, optimistic concurrency control, time stamp ordering, atomic commit

protocols, distributed deadlocks, Replication , Case study CODA.

UNIT - V Process and resource management: (6 Hours)

Process management, process migration, features, mechanism, Threads, models, issues, implementation resource management, introduction, features of scheduling algorithms, task assignment approach, load balancing approach, load sharing approach.

UNIT - VI Security: (6 Hours)

Main threads and techniques for ensuring security (secure channels, firewalls) Fault tolerance and availability (passive /active replication, gossip architectures) application. Pervasive computing environments: active office, home and city, mobility and location- tracking etc.

Assignment:

1. Study of design and implementation issues of Distributed System.
2. Demonstrate the Mutual Exclusion and Deadlock detection of any Distributed System.
3. Study of CORBA RMI and CORBA-SERVICES.
4. Design and implementation issues of Distributed Shared Memory (DSM).
- 5.Design and implementation of any scheduling algorithm of any new DS
6. Study of Security aspects in Distributed System.
7. Case Study NFS and AFS.
8. Study of process management in CODA.
- 9.Case study : applications of pervasive Computing
10. Study of recourse management in Amoeba.

Text books:

1. George Coulouris, Jean Dolimore and Jim Kindberg “Distributed Systems Concepts and Design” fifth edition, Pearson education, 2012.
2. Pradeep K Sinha, “Distributed Operating Systems Concept and Design” Prentice Hall of India .

3. Tanenbaum A.S., Van Steen M “.Distributed Systems, Principles and Paradigms.” Pearson education 2007.

References:

1. Liu M. L. “ Distributed Computing Principles and Applications,” Pearson Education 2004.
2. Nancy A. Lynch, “Distributed Algorithms” Morgan Kaufman publishers USA.
3. Speciner, Kaufman and Perlman, “Network Security” Pearson Education 2009.

Network Security and Cryptography

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 2 Hours / Week	Internal Assessment: 40 Marks	TW & Practical: 01
	Term Work & Practical: 50 Marks	

Course Pre-requisites:

Basic knowledge of computer network.

Course Objectives:

- 1 To understand basics of cryptography, how it has evolved, and some key encryption techniques.
- 2 To learn security policies such as authentication, integrity and confidentiality.

Course Outcomes: Upon completion of the course student will able to

- 1 Understand the basics of network security
- 2 Learn different techniques of cryptography
- 3 Discuss details of key and certificate management
- 4 Learn about system security
- 5 Recite Network and Transport Layer security
- 6 Apply knowledge of network security and cryptography in real life

UNIT - I **Introduction to network security:** **(6 Hours)**
Goals of security, Threat scenarios, Types of attacks: Denial of service, Non-repudiation, Principles of security, A Model for

Network Security, Security approaches and policies, Authentication, Authorization and Accounting, Physical and logical access control, User authentication, Biometrics devices, Security services and mechanisms, Privacy and data protection, Cyber laws.

UNIT - II Symmetric and Asymmetric key cryptography: (6 Hours)

Symmetric and Asymmetric key cryptography:-Plain Text and Cipher Text, Substitution techniques, Transposition Techniques, Encryption and Decryption, Data Encryption standards, Block Cipher Design Principles ,Advanced Encryption Standards, RC4/RC5 algorithm, IDEA, RSA, Blowfish, S-Box theory, ElGamal Cryptosystem. Steganography, COMSEC, TRANSEC.

UNIT - III Key and Certificate Management (6 Hours)

Hash Functions, Digital Signatures, Digital Certificates, Knapsack Algorithm, Certificate & DDOS-Distributed Dos based authentication, Smart Cards, PKIX model, PKI components and Applications, LDAP protocol, Creating Digital certificates using Java, DNS certificates, Key agreement protocols: STS protocol, Diffie-Hellman Key Exchange

UNIT - IV System Security: (6 Hours)

Secure Socket Layer, Secure Electronic Transaction, 3-D Secure protocol, Secure HTTP, Time stamping protocol, Email Security, SMTP, PEM, PGP, Wireless Application protocol, Authentication applications- X.509, Kerberos. Key Distribution Centre, Single Sign ON approaches, Security in GSM and 3G.

UNIT - V Security in Network and Transport Layer: (6 Hours)

ICMP redirect hazard, ARP hazard, secures network infrastructure services: DNS, NTP, SNMP, Secure RSVP, TCP/IP protocol Suite, IP Security-IP security services, Security Associations. IPv4/IPv6 encapsulation header, IKE protocol,

Point to Point Tunneling Protocol, Layer 2 Tunneling Protocol, Replay Attacks, Encapsulating Security Payloads, Data Compression Using Zip.

UNIT - VI Network Security Practices:

(6 Hours)

Types of firewalls, Firewall Configurations and Implementation, Firewall forensic, Firewall services and limitations, Network address Translation (NAT), DMZ networks, Source masking and hidden channels, VPN Architecture, Intruders, Intrusion Detection, Network based and host based Intrusion Prevention System, Intrusion Detection tools, Architecture for Distributed Intrusion Detection, System Integrity Verifiers, Log File Monitors, Honeypots.

Term Work:

1. Introduction to Cryptography based Security Tools.
2. Write a Program in C/Java to implement symmetric encryption.
3. Write a Program in C/Java to implement asymmetric encryption.
4. Introduction to GnuPG encryption system.
5. Implementation of Decryption techniques using secret key in GnuPG.
6. Implementation of various cryptographic algorithms using HashCalc.
7. Study of how Firewall works in computing.
8. Study of how Antivirus works according to offline or online mode.
9. Implement mini project to develop antivirus application.
10. Case study on cyber security

Assignments:

1. Introduction to security and types of attacks.
2. Discuss Security approaches and policies.
3. Study of any one Symmetric key cryptography algorithm.
4. Explain any one Asymmetric key cryptography algorithm.
5. Explain the concept of digital certificates.
6. Explain email security and its security protocols.
7. Study of Key agreement protocols
8. Discuss system level security
9. Study of various protocols in network security

10. Study of network security practices

Text books:

1. Atul Kahate, “Cryptography and Network Security”, 2nd Edition, Tata McGrawHill
2. William Stallings, “Cryptography and Network Security”, Pearson Education.

References:

1. Bruce Schneier ,“Applied Cryptography-Protocols, Algorithms, and Source Code in C”.
2. William R. Cheswick. Steven M. Bellovin, Aviel D. Rubin, Addison-Wesley. “*Firewalls and Internet Security, Repelling the Wily Hacker*”.
3. J.W. Rittiaghouse and William M.Hancok – Elseviers. “Cyber Security Operations Handbook”.
4. Menezes, van Oorschot and Vanstone, “*Handbook of Applied Cryptography*”.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

Big Data Analytics and Architecture

TEACHING SCHEME:

Theory: 3 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 03

Course Pre-requisites:

Knowledge on Database Management System, Distributed Computing, Data Mining, File

System, Statistics.

Course Objectives:

This course focuses on the basic concepts of big data, methodologies for analyzing structured and unstructured data using Hadoop & R.

Course Outcomes: Upon completion of the course student will able to

- 1 To outline the Big Data fundamentals and various data challenges getting introduced.
- 2 To accurately and objectively examine, and critically investigate Big Data Technologies and Infrastructure concepts, theories.
- 3 To apply the novel architectures and platforms introduced for Big data, in particular Hadoop and MapReduce.
- 4 Being able to describe and apply the Data Analytics lifecycle to Big Data projects
- 5 To analyze methods and algorithms with respect to data and application requirements, and make appropriate design choices when solving real-world problems.
- 6 To Understand and apply secured policy oriented techniques for solving real-world problems.

UNIT - I Introduction to Big Data:

(6 Hours)

Types of Data, Characteristics of big data Information, Phases: capture, organize, integrate, analyze, and act, Defining Structured Data, exploring sources of big structured data, Understanding the role of relational databases in big data, Defining Unstructured Data, exploring sources of unstructured data, Understanding the role of a CMS in big data management, Integrating data types into a big data environment.

UNIT - II Statistics & Analytics: (6 Hours)

Numerical Data, Summary Statistics, Sampling and Confidence Intervals, From Population to Sampled Data, Different Types of Biases, Probability, Statistical Inference, Conditional Probability and Bayes Rule, Random Variables, Linear Regression, Bayesian Modeling, , Text Analytics, Characteristics of big data analysis, Linear Models, Decision trees, Neural Networks,

UNIT - III Predictive Analysis Process and R:

Data Analytics Lifecycle, Discovery, Data Preparation, Model Planning, Model Building, communicate results, Operationalize, Building a Predictive model.

Introduction to R, R graphical User Interfaces, Data import and Export, Dirty Data, Data Analysis, Statistical Methods for Evaluation, Linear regression with R, Clustering with R hypotheses testing.

UNIT - IV Big Data Storage and Computing Platforms: (6 Hours)

Distributed computing for big data, the changing economics of computing, the problem with latency, Demand meets solutions, Physical infrastructure layer, Big Data Stack, Layer 0: Redundant Physical Infrastructure, Layer 1: Security Infrastructure, Layer 2: Operational Databases, Layer 3: Organizing Data Services and Tools, Layer 4: Analytical Data Warehouses, virtualization in big data, Traditional RDBMS, NoSQL, Design Goals for MongoDB

UNIT - V Hadoop: (6 Hours)

The Core of Hadoop: MapReduce, Hadoop's Lower Levels: HDFS and MapReduce, Improving Programmability: Pig and Hive, Common

building blocks, Key/value pairs, Getting your data into Hadoop, Other Hadoop Components, Hadoop in action.

UNIT - VI Case Studies and Data Privacy:

(6 Hours)

Defining Privacy and Security, Data and User Anonymization Fraud and Big Data, Risk and Big data, Credit Risk Management, Big Data & Algorithm Trading, Advertising and Big Data, The Privacy Landscape, Rights and Responsibilities, Case Study: Recommendation Engine, Sentiment Analysis and Digital Marketing, Healthcare applications.

Assignment:

1. Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.
2. Case study on Resilient Distributed Datasets.
3. Case study on Big Data Analytics with Hadoop.
4. Case study on Big Data Analytics with Spark.
5. Case study on how data analytics stacks work and the factors influencing their performance.
6. Discuss in brief the Association analysis.
7. Prepare a case study on Deep Analysis.
8. Illustrate how WEKA can be used for big data Analysis
9. Illustrate and setup a single node Hadoop cluster.
10. Illustrate the best practices for setting-up and using Hadoop.

Text books:

Vignesh Prajapati, "Big Data Analytics with R and Hadoop," Packt Publishing Ltd, 2013,

References:

1. John Wiley & Sons, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, EMC Education Services, 2015, 1118876059, 9781118876053
2. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global, 2014, 1466658657, 9781466658653,
3. Wiley CIO, Michael Minelli, Michele Chambers, Ambiga Dhiraj, John Wiley & Sons, “ Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses”, 2012, 1118239156, 9781118239155

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Compiler Design

TEACHING SCHEME:

Theory: 3 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
Internal Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 03

Course Pre-requisites:

1. The students should have learnt Theory of Computation.
2. Basic of the structure of any Programming Language and Grammars.
3. Know the basics of Computer organization and Assembly Language Programming.

Course Objectives:

1. To study the Compiler Design Tools.
2. To understand the Compiler for various Programming Languages.

Course Outcomes: Upon completion of the course student will able to

1. To have knowledge of LEX and YACC Tools.
2. The students will have the knowledge of Lexical Analysis and formation of TOKENS.
3. Understand Parser and its various techniques.
4. Understand Syntax Directed Translation Scheme
5. Understand the use of Hash Tables and Symbol Tables.
6. Learn the techniques of Code Optimization

UNIT - I The Phases of a Compiler:

(6 Hours)

Translator issues, why to write Compiler, Compilation process in brief, Frontend and Backend Model, Compiler Construction tools, Interpreter and the related issues, Cross Compiler, Incremental Compiler, Boot Strapping, Byte code Compilers.

Lexical Analysis: The role of Lexical Analyzer, Input Buffering, Specification of tokens, recognition of tokens, and language for specifying Lexical Analysis alphabet, Token, Lexical error, Block schematic of Lexical Analyzer, "Automatic Construction of Lexical Analyzer-(LEX), LEX Specification and Features. Pattern Matching Algorithms and their Optimization, use of LEX.

UNIT - II Syntax Analysis Introduction:

(6 Hours)

Role of Parsers, Review of Context Free Grammar for Syntax Analysis. Top down-RD parser, Predictive parsers, LL (k) parsers, Bottom up Parsers - Operator Precedence Parsers, Shift-Reduce: SLR, LR (k),

LALR etc. using Ambiguous Grammars. Error Detection and Recovery, Automatic Construction of Parsers (YACC), YACC specifications. Canonical LR parsers, handling of ambiguous grammars, Error Reporting in LL (1), Operator Precedence and LR Parsing, Efficient Generation of LALR (1) sets, Optimization of LR parsers, Optimization of transformations, Detection, Reporting, Recovery and Repair of errors in the Compilation Process.

Semantic Analysis Need of Semantic Analysis, Type Checking and type Conversion Overloading of Functions and Operators, Polymorphic Functions, Unification Algorithm.

UNIT - III Syntax Directed Translation:

(6 Hours)

Syntax Directed Translation Schemes, Implementation of Syntax Directed Translators , Intermediate Code, Postfix Notation, Parse Trees and Syntax Trees, Three-Address code, Quadruples, and Triples, Translation of Assignment Statements, Boolean Expressions, Translation with a Top-Down Parser. Runtime Environment.

UNIT - IV Code Optimization:

(6 Hours)

Basic blocks and folding, optimization within iterative loops, global optimization through flow graph analysis, Code-Improving Transformations, Machine Dependent Optimization

Introduction, Classification of optimization, Principle sources Of Optimization, optimization of basic blocks, Loops in flow graphs, Optimizing transformations: compile time evaluation, Common sub-expression elimination, variable propagation, code movement, strength reduction, dead code elimination and loop optimization, Local optimization, Global Optimization: Control and data flow analysis, Computing Global Data flow information: Meet over paths, Data flow equations, Data flow analysis, Iterative Data Flow Analysis: Available

expressions, Live Range Identification.

UNIT - V Code Generation Introduction: (6 Hours)

Intermediate languages, Translation of Declarations & Assignments statements. Design issues of a Code generator, Target machine, Runtime storage Management, Basic blocks and flow graphs. Issues in code generation, Target machine description, Basic blocks and flow graphs, next-use information, Register allocation and assignment, Dag representation of basic blocks, Peephole optimization, Generating code from a DAG, Dynamic programming, Semantic stacks, Attributed Translation, Analysis of syntax, Directed Translation, Evaluation of expressions, control structures, Procedure calls.

UNIT - VI Case Study of GCC: (6 Hours)

Architecture, Command Line Options for assembly, preprocessing and Intermediate tokens. Optimization Levels of GCC. GCC Help

Assignment:

1. Study LEX and YACC Tools.
2. Divide a 'C' Language Program into Tokens and design a Lexical Analyzer Program to display the list of tokens in it. Display Libraries used, functions and variables defined
3. Study Top down Parser.
4. Study Bottom up Parser.
5. Study Different Syntax Directed Translation Scheme.
6. Represent High Level Language Instruction in the form of 3 address Code, Quadruples and Triples.
7. Study the different methods of Code Optimization.
8. Write a program to generate a Code for C Language Statements.
9. Study of GCC
10. Create a language translator from C to PHP.

Text books:

1. K. Cooper, L, Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers, ISBN 81-8147-369-8.
2. K. Louden, "Compiler Construction: Principles and Practice", Thomson Brookes/Cole (ISE), 2003, ISBN 981 - 243 - 694-4.
3. J. R. Levine, T. Mason, D. Brown, "Lex & Yacc", O'Reilly, 2000, ISBN 81-7366 -061-X.
4. S. Chattopadhyay, "Compiler Design", Prentice-Hall of India, 2005, ISBN 81-203-2725-X.
5. D. M. Dhamdhare, "Compiler Construction—Principles and Practice", (2/e), Macmillan India.
6. Andrew Appel, "Modern Compiler Implementation in C", Cambridge University press.
7. K C. Louden "Compiler Construction—Principles and Practice" India Edition, CENGAGE.
8. Bennett J.P., "Introduction to Compiling Techniques", 2/e (TMH).

References:

1. A V Aho, R. Sethi, J D Ullman, "Compilers: Principles, Techniques, and Tools", Pearson Education, ISBN 81 - 7758 - 590 – 8.

Syllabus for Unit Test:

Unit Test -1 UNIT – I, UNIT – II, UNIT - III

Unit Test -2 UNIT – IV, UNIT – V, UNIT - VI

Elective –III a):Grid Computing

TEACHING SCHEME:

EXAMINATION SCHEME:

CREDITS ALLOTTED:

Theory: 3 Hours / Week

End Semester Examination: 60 Marks

Theory: 03

Internal Assessment: 40 Marks

Course Pre-requisites:

Knowledge of distributed systems.

Course Objectives:

1. Understand how Grid computing helps in solving large scale scientific problems.
2. Learn how to program the grid.
3. Understand the security issues in the grid.

Course Outcomes: Upon completion of the course student will able to

1. Understand basic concepts grid computing with the help of case studies.
2. Understand basic architecture of grid.

UNIT - I Introduction to the Grid:**(6 Hours)**

History and Evolution of Computing from Mainframe to Grid, Difference between Grid and Cloud Computing, Introduction to High Performance Computing and Distributed Computing, Definition of Grid, Characterization of the Grid, Architecture of the Grid, Types of Grids, Scope and Applications of Grid Computing Applications. Grid Computing Organizations and Their Roles: Developing Grid Standards & Best Practice Guidelines.

UNIT - II Grid Services and Monitoring :**(6 Hours)**

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services. Grid Monitoring Architecture.

UNIT - III Grid Development Toolkits:**(6 Hours)**

GlobusGT3 Toolkit :Architecture - Programming Model Implementation-

High-Level Services

UNIT - IV Grid Scheduling and Resource Management: (6 Hours)

Introduction, Scheduling Paradigms, Working principles of Scheduling, A Review of Condor, SGE, PBS and LSF, Grid Scheduling with QoS.

UNIT - V Grid Security: (6 Hours)

Introduction, Cryptography, Grid Security Infrastructure and Authorization Models, Possible Vulnerabilities.

UNIT - VI Grid Portals and Grid Applications: (6 Hours)

Introduction, First and Second Generation of Grid Portals, GT3 Use Cases, Resource Management Case Studies, Grid Portal Use Cases.

Assignment:

1. Case Studies on Grid Computing.
2. Case Studies on Performance Analysis.
3. Illustrate difference between Grid Computing & Cloud Computing.
4. Explain Grid Monitoring Architecture in detail.
5. Describe Scheduling Paradigms of Grid Computing.
6. Illustrate difference between Condor, SGE, PBS and LSF.
7. Explain Grid Security Infrastructure.
8. Describe Grid Services.
9. Case study of GlobusGT3 Toolkit.
10. Case study of Resource Management.

Text books:

1. Joshy Joseph, and Craif Fellenstein, "Grid Computing", IBM Press, Pearson education, 2011.

2. Maozhen Li, Mark Baker, "The Grid: Core Technologies", ISBN: 978-0-470-09417-4.
3. Paul E. Ceruzzi, "A History of Modern Computing" Second Edition

References:

1. [Fran Berman](#), [Geoffrey Fox](#), Anthony J. G. Hey “Grid Computing: Making the Global Infrastructure a Reality”, John Wiley & Sons.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Elective –III b):VLSI and Embedded System

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03

Course Pre-requisites:

Digital Logic, Analog Circuits, Operating system, System Software, Computer Architecture and Organization, Basic Microprocessors, Theory of Computation, Discrete Mathematics.

Course Objectives:

To make students aware of basic embedded system architecture ,tools for developing embedded systems and to develop ARM programming model

Course Outcomes: Upon completion of the course student will able to

- 1 Understand the basic architecture of Embedded System.
- 2 Describe the various embedded system development tools
- 3 Develop a ARM programming model
- 4 Explain basic MOS transistor action
- 5 Analyze Combinational and Sequential Logic
- 6 Design Mealy and Moore state models using Verilog.

UNIT - I	<p>Introduction to Embedded Systems: Architecture of Embedded System, Design Methodology, Design Metrics, General Purpose Processor, System On chip. Embedded system design and development, Life-Cycle Models, Development tools. System design specifications Functional design, Architectural design, Prototyping.</p>	(6 Hours)
UNIT - II	<p>ARM Architecture: ARM Design Philosophy, Registers, PSR, Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families ARM architectural support for operating System, Memory subsystem architecture, Designing a cache system, Memory allocation, Communication protocols.</p>	(6 Hours)
UNIT - III	<p>ARM Programming Model: Instruction Set: Data Processing Instructions, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions. Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions ,Instruction Scheduling, Register Allocation, Conditional Execution and Loops.</p>	(6 Hours)
UNIT - IV	<p>Introduction to MOS Technology: Basic MOS Transistor action: Enhancement and Depletion Modes. Basic electrical properties of MOS, Threshold voltage and Body Effect. Design of MOS inverters with different loads, Basic Logic Gates with CMOS: INVERTER, NAND, NOR, AOI and OAI gates. Transmission gate logic circuits, Bi-CMOS inverter.</p>	(6 Hours)
UNIT - V	<p>Combinational Logic: Manchester, Carry select and Carry Skip adders, Crossbar and barrel shifters, Multiplexer.</p> <p>Sequential Logic: Design of Dynamic Register Element, Dynamic RAM Cell, Static RAM Cell.D flip flop using Transmission gates. NOR and NAND based ROM Memory Design.</p>	(6 Hours)
UNIT - VI	<p>Introduction to HDLs: Basic Concepts of Verilog, Data Types, System Tasks and Compiler Directives. Behavioural Modelling: Structured Procedures,</p>	(6 Hours)

Procedural Assignments, Timing control, Conditional statements, Sequential and Parallel Blocks, Generate Blocks. Switch level Modelling.

Tasks, Functions, Procedural Continuous Assignments, Design of Mealy and Moore state models using Verilog.

Assignment:

1. Define Embedded system and explain it's architecture
2. Study various tools used in development of embedded systems
3. Analyze various memory allocation algorithms
4. Explain in detail ARM architecture
5. Study instruction set required for developing ARM programming model
6. Explain use of basic logic gates in designing a transmission circuit
7. Distinguish between combinational and Sequential logic
8. Explain in detail various types of flip-flops
9. Describe in detail concept of Verilog
10. Case study Embedded system

Text books:

1. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, 2008.
2. Michael D. Ciletti, "Advanced Digital Design with Verilog HDL", PHI, 2005.
3. Kamran Eshraghian, Douglas A. Pucknell, and Sholeh Eshraghian, "Essentials of VLSI circuits and Systems", PHI, 2011.
4. John P. Uyemura, "Introduction to VLSI Circuits and Systems", Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.
5. Steve Furber, "ARM System-on-Chip Architecture", Second Edition, Pearson Education Publication.
6. James K. Peckol, "Embedded Systems: A Contemporary Design Tool", WILEY Student Edition Publication.
7. Tammy Noergaard, "Embedded Systems Architecture", Elsevier Publication.

References:

1. "Introduction to VLSI Systems: A Logic, Circuit and System Perspective", Ming-BO Lin, CRC Press, 2011.
2. "Principals of CMOS VLSI Design", N.H.E Weste, K. Eshraghian,, 2nd Ed., Addison Wesley.

Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

Elective –III c):Artificial Intelligence and Robotics

TEACHING SCHEME:

Theory: 3 Hours/Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

CREDITS ALLOTTED:

Theory: 03

Course Pre-requisites:

Data Structures, Algorithms, Discrete Mathematics,

Course Objectives:

To make student aware of basics of Artificial Intelligence (AI), Knowledge representation methods, learning concept and basics of robotics

Course Outcomes: Upon completion of the course student will able to

- 1 Understand the basic search algorithms
- 2 Describe the various knowledge representation strategies
- 3 Understand plan generation systems
- 4 Describe various learning methods
- 5 Understand basic robotics concepts
- 6 Understand kinematics of robot

UNIT - I Introduction to AI and Production systems:

(6 Hours)

Definition, Problem formulation Control strategies ,Search strategies, Problem Characteristics, Production systems, Problem Solving methods,- Problem Graphs Indexing, Heuristic functions, Hill Climbing, Best First Search, Minimax Search for two player games Constraints Satisfaction,- Related algorithms, Performance measure and analysis of search algorithms

UNIT - II Knowledge Representation:

(6 Hours)

Knowledge Representation using predicate logic, Predicate calculus, Resolution, Knowledge representation using predicate calculus Knowledge representation using other logic, Structured representation of knowledge. Production based systems, Frame based systems, Scripts, Conceptual dependency Forward and backward chaining, Rule value approach, Fuzzy

reasoning., Bayesian theory

UNIT - III	Planning: Basic plan generation systems, Components of planning system Advanced, Strips plan generation systems, K-strips strategic explanation Planning with state-space search – partial-order planning – planning graphs – planning and acting in the real world	(6 Hours)
UNIT - IV	Learning: Learning concept, Supervised and unsupervised learning, Learning from observation - Inductive learning – Decision trees – Explanation based learning – Statistical Learning methods - Reinforcement Learning	(6 Hours)
UNIT - V	Robotics an Application of AI : Brief history, types, classification and usage, Science and Technology of robots, Elements of robots -- joints, links, actuators, and sensors Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters,	(6 Hours)
UNIT - VI	Kinematics of Robots: Kinematics of serial robots, Mass and inertia of links, Lagrangian formulation for equations of motion for serial and parallel manipulators, Generation of symbolic equations of motion using a computer, Simulation Kinematics of parallel robots Dynamics of serial and parallel robots , Modeling and analysis of wheeled mobile robots	(6 Hours)

Assignment:

1. Analyze various search algorithms.
2. Illustrate different knowledge representation strategies with example.
3. Explain in detail Bayesian theory.
4. Describe in detail components of planning system.
5. Describe in detail planning and acting in the real world.
6. Case study learning.
7. Explain in detail the basics of robotics.
8. Describe in detail link representation using DH parameters.
9. Describe in detail kinematics of robotic.
10. Case study robotics.

Text books:

1. Stuart Russel and Peter Nurving, “AI-A Modern Approach”, 2nd Edition, Pearson Education.

2. Peter Jakson, ' Introduction to expert systems",3 rd Edition ,Pearson Education,2007
3. Ashitava Ghoshal "Robotics:Fundamental Concepts and Analysis", Oxford University Press,Second reprint, May 2008.
4. Deepak Khemani , "Artifitial Intelligence", Tata Mc Graw Hill Education ,2013

References:

1. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence :a logical approach", Oxford University Press, 2004.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

Syllabus for Unit Test:

- | | |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI |

Elective – III d): Ad-Hoc and Sensor Networks

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03

Course Pre-requisites:

1. Knowledge of Internet and its working, types of networks.

Course Objectives:

1. Create awareness among the students about the basic fundamentals of Ad-Hoc and Sensor networks.
2. Developing the students with the knowledge of updated networking technology.

Course Outcomes: Upon completion of the course student will able to

1. Understand the basics of ad hoc and sensor networks.
2. Understand the communication mechanism of Ad-Hoc & sensor networks.
3. Learning different routing protocols in Ad-Hoc & sensor networks.
4. Discuss the importance of security in Ad-Hoc & sensor networks.
5. Apply the knowledge about quality of service to Ad-Hoc networks.
6. Learning the structure of Ad-Hoc & Sensor networks by considering real life applications.

UNIT - I	Introduction: Basics of Ad Hoc and Sensor networks, Need of Ad-hoc networks, Types of Ad-hoc networks, Ad-hoc network architectures, Need of sensor networks, Types of sensor networks, Combined approach: Architectures of Ad-hoc & Sensor networks, Working of Ad-hoc & Sensor networks.	(6 Hours)
UNIT - II	Communication in Ad-hoc & Sensor Networks: Wireless communication technology, information transport through electromagnetic spectrum, role of radio waves in wireless networks, wireless channels, wired channels, internet working, Ad-hoc and Sensor network connections, requirement for Ad-Hoc and sensor network connectivity, wireless LAN configuration, multichannel MAC, IEEE 802.11 standards.	(6 Hours)
UNIT - III	Ad-Hoc & Sensor Network Protocols: TCP/IP in Ad-hoc networks, MAC protocols: Ad-hoc networks, sensor networks, Routing Protocols: Ad-hoc networks, multicast routing protocols: an architecture reference model for multicast routing protocols, classifications of multicast routing protocols, comparisons of multicast routing protocols.	(6 Hours)
UNIT - IV	Security in Ad-hoc and Sensor Networks: Need of security in Ad-hoc and sensor network , role of transport layer in ad-hoc and sensor networks, architecture of security layer in Ad-hoc networks, transport layer security protocols, TCP over Ad-hoc wireless networks, security in sensor networks, network security requirements, issues and challenges in security provisioning, network security attacks , secure routing in Ad-hoc and wireless sensor networks, issues in designing a transport layer protocol for Ad-hoc and sensor networks, real life example to understand need of security in Ad-hoc and sensor networks.	(6 Hours)
UNIT - V	QoS and Energy Management : Classifications of QoS Solutions: MAC Layer, Network Layer, Security, QoS Frameworks for Ad hoc Wireless Networks, energy management in Ad-hoc wireless networks, different schemes, types of energy resources, transmission power management schemes, system power management schemes, energy efficiency and utilization schemes in Ad-hoc and Sensor networks, issues and challenges in providing QoS in Ad-hoc and sensor Networks.	(6 Hours)

Programming Lab- V

TEACHING SCHEME:

Practical: 2 Hours / Week

EXAMINATION SCHEME:

Term Work & Practical: 50 Marks

CREDITS ALLOTTED:

TW & Practical: 01

Course Pre-requisites:

If students have any programming experience at all, he should be able to pick up the general R syntax quite easily.

Course Objectives:

To develop ability to use the computational languages necessary for engineering practice

To provide hands- on experience of the recent platform, technologies and design methodologies used in developing applications.

Course Outcomes: Upon completion of the course student will able to

1. Recite R language fundamentals and basic syntax
2. Demonstrate how R is used to perform data analysis
3. Recite major R data structures
4. Illustrate visualizations using R
5. Implement various functions using R studio.
6. Design different Statistical models.

UNIT - I	Understanding Big Data and R basics:	(6 Hours)
	Evolution of R, Features of R, Local Environment Setup, R Command Prompt, R Script File, Comments, R –Data Types, R –Variables, Types of Operators, the alternatives to R.	
UNIT - II	Data structures in R:	(6 Hours)
	Vectors, Vectors and assignment, Vector arithmetic, Generating regular sequences, Character vectors, Index vectors, Lists: Constructing and modifying lists, Matrices ,Arrays, Factors: Ordered and unordered factors, Data Frames: Making data frames, Working with data frames	
UNIT - III	R programming fundamentals:	(6 Hours)
	Conditions and loops, R Programming, R -If Statement, R –If...Else Statement, The if...else if...else Statement, R –Switch Statement, R -Repeat Loop, R-While Loop, R –For Loop, Loop Control Statements, Functions in R, Built-in Function, User-defined Function, Calling a Function, Objects and Classes, Debugging.	
UNIT - IV	Working with data in R:	(6 Hours)
	Getting and Setting the Working Directory, Reading data from files (CSV, EXCEL), The read. table() function, The scan() function, Accessing built-in datasets, , Reading text files, Reading XML File, XML to Data Frame,R-JSON file, JSON to a Data Frame Writing and saving data objects to file in R.	
UNIT - V	Strings and Dates in R:	(6 Hours)
	String operations in R:String Manipulation, Concatenating Strings -paste()	

function, Extracting parts of a string, Regular Expressions, Dates in R, R – Pie Charts, 3D Pie Chart , R-bar chart, Group Bar Chart and Stacked Bar Chart, use of functions ggplot & ggplot2

UNIT - VI Statistical models in R:

(6 Hours)

Defining statistical models; formulae, Linear models, Generic functions for extracting model information, Analysis of variance and model comparison, ANOVA tables, Updating fitted models, Generalized linear models, Graphical procedures, OS facilities, Research and industry Applications of R .

Term Work:

1. Introduction to Big Data Analytics.
2. Assignment based on Looping.
3. String Handling.
4. Storing and Retrieving Data Using Vectors and Data frames
5. Class and object using R.
6. Create Relationship Model & Get The Coefficients
7. Case studies: Perform regression analysis on existing datasets.
8. Plot The Pie Chart With Title And Rainbow Colour Pallet.
9. Reading And Writing Excel CSV Text Files
10. Subject Teacher should take one Mini Project in the group of 2 students based on above syllabus.

Text books:

1. The R Book, by Michael J Crawley 2nd Edition, wiley
2. Hands-On Programming with R: Write Your Own Functions and Simulations by Garrett Grolemond
3. Beginning R: the Statistical Programming Language, wiley

References:

1. “Using R for Numerical Analysis in Science and Engineering”, Chapman & Hall/CRC, 2014, Victor A,Bloomfield.

Industrial Training

TEACHING SCHEME:**EXAMINATION SCHEME:****CREDITS ALLOTTED:**

End Semester Examination: 50 Marks

Term Work & Oral: 03

Course Pre-requisites:

Professional Skills, Knowledge of core computer engineering subjects.

Course Objectives:

- To provide exposure for the students on practical engineering fields
- To have better understanding of engineering practice in general and a sense of frequent possible problems.
- To develop problem Identification abilities in real world
- To experience use of technology /tools for software development.
- To Identify their skills, values, beliefs, interests and personal abilities to develop the skills.
- To prepare and present a report.

Course Outcomes: Upon completion of the course student will able to

- I. Propose a solution to solve real world problems with the help of technology.
- II. Apply software engineering principles.

- III. Evaluate and compare the various methodologies to solve a real world problem.
- IV. Report hands on experience of using modern software development tools.
- V. Assess their skills, values, beliefs, interests and personal abilities and act in congruence with them.
- VI. Identify social and ethical responsibilities and develop skills to compete for lifelong learning.

As a part of the B.Tech Computer Engineering curriculum, Industrial Training is a Practical course, which the students B.Tech Computer Engineering should undergo in reputed Private / Public Sector / Government organization / companies as industrial training of 45 days weeks to be undergone by the student in the summer vacation after the semester VI. Examination. And Oral examination will be conducted at the end of the semester VII.

The Industrial Training Report:

An Industrial Training report should be prepared by each student.. The report is expected to demonstrate development of practical and professional skills in Engineering through technical experience and application of theoretical knowledge. Development of skills in dealing with people, and communication skills form part of the training experience. Students should seek advice from their employers to ensure that no confidential material is included into the report. The student should be able to present the report to prospective employers,

The following should be observed:

- i. Length of training
- ii. Preliminary information
- iii. Technical report/diary References should be made in the text to books, technical papers, standards etc., used during the training period and should be listed.
- iv. Finally, a conclusion should include comprehensive comments on the type and value of experience gained, and how this relates to your professional career.
- v. A copy of the report should be submitted to his/her employer, another copy to the Department (through the respective Adviser). Students should also retain a personal copy of the report.

Seminar

TEACHING SCHEME:

Practical: 2 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 50 Marks

CREDITS ALLOTTED

Term Work & Oral: 01

Course Pre-requisites:

Basics of Software engineering, Knowledge of core computer engineering subjects.

Course Objectives:

- To develop problem Identification abilities in real world.
- To study the use of technology for societal benefits.
- To acquire the knowledge of intellectual topics in computer engineering.
- To prepare and present a document .

Course Outcomes: Upon completion of the course student will able to

- I. Describe the broader trends of technological growth in the computer, engineering fields.
- II. Interpret that technology has profound impact as a trigger for global change.
- III. Develop skills to explore intellectual topics in computer engineering.
- IV. Develop better skills to succeed in the career.

v. Understand the responsibility and the of ethics as an engineer

The student has to prepare for the seminar presentation and present it before the group of students It is recommended that a student should meet the guide regularly during the course of the seminar.

The following are the guidelines for the seminar:

- He /She can select a paper from his/her area of interest.
- Recent research papers from any reputed journals like Springer/ACM/IEEE can be selected.
- After selecting the paper, the student has to get approval from the concerned faculty In charge /Seminar guide.
- Students are required to acquire a thorough knowledge on the subject by referring back papers and reference books.
- The student has to prepare a MS power point Preparation of slides and present it in front of group of students from the same class in presence of seminar guide followed by question answer session
- He /She have to write a comprehensive report about the seminar at the end of the semester.

The term work can be assessed based on selection of topic, decorum, communication skill, preparation of presentations/slide and seminar report.

Project Stage-I

TEACHING SCHEME:

Practical: 8 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 50 Marks

CREDITS ALLOTTED:

TermWork&Oral: 03

Course Pre-requisites:

Basics of Software engineering, Software testing and knowledge of core computer engineering subjects.

Course Objectives:

- To develop problem solving abilities using mathematics.
- To apply algorithmic strategies while solving problems.
- To develop time and space efficient algorithms.
- To develop software engineering documents and testing plans.
- To use algorithmic solutions using distributed, Embedded, concurrent and parallel environments.

Course Outcomes: Upon completion of the course student will able to

- I. Review and understand how previous experiences had an impact on affective states and intellectual performance.

- II. Identify and define the problem.
- III. Decide critically to solve the problem.
- IV. Demonstrate the ability to synthesize complex information from a variety of sources in decision-making.
- V. Predict and develop a group process and desired outcomes.

- VI. Plan and perform collaboratively towards a common purpose.

1. The project will be undertaken preferably by a group of at least 3- 4 students who will jointly work and implement the project over the academic year. The work will involve the design of a system or subsystem in the area of Computer Engineering.

2. If the project is chosen a hardware project it will involve the designing a system or subsystem or upgrading an existing system. The design must be implemented into a working model with necessary software interfacing and a user manual.

3. If the project is chosen in the pure Software Application it must involve the detail Software Design Specifications, Data Structure Layout, File Design, Testing with complete documentation and user interface, with life cycle testing and as an executable package.

4. The group will select a project with the approval of the guide (Staff-members assigned) and submit the name of the project with a synopsis of 2 or 3 pages in the month of August in the academic year. A preliminary study report by the group must be submitted and certified at the end of seventh Semester.

5. It is expected that at least one research paper is published by each group with guide.

The project report stage-I will contain the details

Problem definition and requirement specification, acceptance test procedure (ATP).

- a) System definition, requirement analysis.
- b) System design with UML.
- c) Documentation and references.

Documentation will use UML approach with Presentation, Category, Use Case, Class Diagrams, etc.

Machine Learning

TEACHING SCHEME:

Theory: 3 Hours / Week

Practical: 2 Hours / Week

Tutorial: 1 Hour / Week

EXAMINATION SCHEME:

End Semester Examination: 60

Internal Assessment: 40

Term Work & Oral: 50

CREDITS ALLOTTED:

Theory: 04

TW & Oral: 01

Course Pre-requisites:

Artificial intelligence, Discrete Mathematics, Database Management System, Engineering Mathematics, Programming Languages.

Course Objectives:

To provide a strong formal foundation of Machine Learning concepts and techniques

Course Outcomes: Upon completion of the course student will able to

5. Explain significance of Machine Learning
6. Distinguish between paradigms of Machine Learning.
7. Illustrate use of algorithms in Supervised Learning and Unsupervised Learning.
8. Build Learning Model.
9. Analyze performance of Supervised and Unsupervised Learning
10. Tackle real world problems in the domain of Data Mining, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

UNIT - I Introduction: (6 Hours)

Introduction to statistics, Introduction to Learning Systems, Structure of Learning System, Testing vs Training, learning vs Designing, Goal and Applications of Machine Learning, Examples of Machine Learning Problems, Need of Learning, Machine Intelligence

UNIT - II Machine Learning Techniques: (6 Hours)

Introduction to Machine Learning Techniques: Supervised Learning(SL) Vs Semi Supervised Learning(SSL) vs Unsupervised Learning(USL), Examples of SL, SS, and US Learning, how to choose Machine Learning Technique, Machine Learning Models, and Types, Examples: Linear based Models, Logic Based and Algebraic Models, Probabilistic Models

UNIT - III Classification: (6 Hours)

What is Classification?, Types: Naive Bayes Classifier, Decision Trees, Support Vector Machines, Rule based Classification, Backpropagation, Associative Classification, Classifier Accuracy Measures, Precision and Recall Measures.

UNIT - IV Regression: (6 Hours)

What is Regression? Types: Linear Regression, Logistic Regression, Classification vs Regression, Issues Regarding Classification, and Regression, Assessing performance of Regression, Predictor error measures, Applications of Supervised Learning.

UNIT - V Unsupervised Learning: **(6 Hours)**
Introduction to Clustering, Types: K Means Clustering Algorithm, Mixture Models, Hierarchical Clustering, Anomaly Detection, Neural Networks, Self-Organizing Map(SOM), Applications of Unsupervised Learning.

UNIT - VI **Trends in Machine Learning:** **(6 Hours)**
Ensemble methods for increasing accuracy: Bagging and Boosting, multitask learning, online learning and Sequence Prediction, Data Streams and Active Learning, Introduction to Deep Learning and Reinforcement Learning, Case Study: Latest Machine Learning Tools.

Term Work:

1. Distinguish between Supervised and Unsupervised Machine Learning.
2. Implement Linear and Nonlinear Learning models.
3. Implement Distance based Learning techniques.
4. Write study assignment to build tree based models.
5. Write study assignment to build rule based models.
6. WEKA: Tool for Machine Learning.
7. SCIKIT-LEARN: Tool for Machine Learning.
8. SHOGUN: Tool for Machine Learning.
9. ACCORD: Tool for Machine Learning.
10. Study assignment on Reinforcement Learning technique.

Assignment:

1. Distinguish between Learning and Designing with example.
2. Explain in detail Need of Machine Learning.
3. Explain in detail How to choose Machine Learning Algorithm.
4. Differentiate between different Machine Learning Models.
5. Explain in detail how Classification by Decision Tree Induction.
6. Explain in detail Support Vector Machine for Supervised Learning.
7. Distinguish between Classification and Regression with suitable example.
8. Demonstrate the use of Linear Regression for Supervised Machine Learning.
9. Implement K-Means Clustering Algorithm for Unsupervised Machine Learning.
10. Explain in detail Anomaly Detection.
11. What are the methods used to increase accuracy of machine learning algorithms? Explain.
12. Define Reinforcement Learning with example.

Text books:

1. Jiawei Han, Jian Pei, Micheline Kamber, "Data mining concepts and techniques", 3rd Edition.
2. K.P. Soman, R. Loganathan, V. Ajay, "Machine Learning with SVM and Other Kernel Methods"
3. Witten I.H. Author, "Data Mining Practical Machine Learning Tools and Techniques" 2nd Edition.
4. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data",
Cambridge University Press, Edition 2012.
5. Hastie, Tibshirani, Friedman, "Introduction to Statistical Machine Learning with Applications in R", Springer, 2nd Edition-2012.

References:

1. T. M. Mitchell, "Machine Learning", McGraw Hill.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer 1st Edition-2013.
3. Ethem Alpaydin, "Introduction to Machine Learning"

Syllabus for Unit Test:

Unit Test -1 UNIT – I, UNIT –II , UNIT –III.

Unit Test -2 UNIT – IV, UNIT – V, UNIT - VI

Image Processing and Pattern Recognition

TEACHING SCHEME:

Theory: 3 Hours / Week

Practical: 2 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60

Internal Assessment: 40

Term Work & Practical: 50

CREDITSALLOTTED:4

Theory: 03

TW& Practical: 01

Course Pre-requisites:

Set theory, Linear algebra and statistics, Computer Graphics and visualization, Signals and system, Digital signal processing.

Course Objectives:

- 1 Students should be able to understand digital image processing and advanced concepts.

- 2 Students should be able to properly implement algorithms using modern computing tools such as MATLAB, and to interpret and present the results.
- 3 To study fundamentals of colour Image Processing

Course Outcomes: Upon completion of the course student will able to

- 1 To explain the digital image processing and digital image formation.
- 2 To illustrate different mathematical preliminaries to deal with digital image processing
- 3 To explain the concept of Image restoration and image segmentation.
- 4 To apply the concept of pattern recognition and its different phases
- 5 To apply knowledge/ skills for solving real world problems.

UNIT – I Digital Image Fundamentals: (6 Hours)

Introduction, Fundamental steps and Components of Digital Image Processing, Image Sampling and Quantization: Basic concepts in Sampling and Quantization, Representing Digital images, Spatial and intensity resolution, Relationship between Pixels, Histogram Processing: Definition, Histogram Equalization,

UNIT – II Image Enhancement: (6 Hours)

Fundamentals of Spatial Filtering- The Mechanics of Spatial Filtering, Generating Spatial, Filter Masks, Noise Model, Smoothing Spatial Filters: Linear filters – Mean filters Non-linear (Order Statistic filters): Median, Mode, Max, Min filters, Image Enhancement by Frequency Domain Methods: Basic steps for Filtering in Frequency Domain, Frequency Domain low pass (Smoothing), High pass (Sharpening)

UNIT – III Image Compression and Segmentation: (6 Hours)

Fundamentals: Coding Redundancy, Spatial and temporal (Interpixel) Redundancy, Some Basic Compression Methods: Lossless Compression methods-Huffman coding, LZW coding, Fundamentals : Point , Line and Edge Detection, Line Detection, Edge Models, Basic Edge detection, Canny edge detector Thresholding : Foundation, Basic Global Thresholding, Optimal global thresholding, Multiple Thresholds.Region based segmentation: region growing, region splitting and merging.

UNIT – IV Morphological Image Processing and Color Image Processing: (6 Hours)

Morphological Image Processing, Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms: Boundary Extraction, Hole (Region) Filling, thinning, Color Image Processing: Color Fundamentals and Color Models Basics of Full-Color Image Processing, Color Transformations.

UNIT – V Basics of Pattern Recognition: (6 Hours)

Introduction and examples, Clustering vs. Classification; Supervised vs. unsupervised, Decision Boundaries, Decision region / Metric spaces/ distances, Object detection.

UNIT – VI Clustering and Classification: (6 Hours)

Bayes decision rule, Error probability, Linear Discriminates Function (equal covariance matrices)and non- Linear Decision Boundaries (unequal covariance matrices). Clustering: Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Minimum within cluster distance criterion. K-means algorithm, K-medoids, DBSCAN-Density-based Spatial clustering of application

with Noise.

Term Work:

1. Display of Grayscale Images.
2. Write a MATLAB code that reads a gray scale image and generates the flipped image of original image.
3. To enhance contrast using Histogram Equalization
4. Write a program for image enhancement.
5. Write a program for image compression
6. Write a program for Edge detection
7. Write a program for image segmentation
8. Write a program for image morphology
9. Illustrate and discuss use of various method of pattern recognition.
10. Write a program for face detection in MATLAB.

Assignment:

1. Write and explain concepts of histogram processing.
2. Write and explain edge detection and Line detection.
3. Write in details about Filtering in Frequency Domain.
4. Write any two algorithms for segmentation.
5. Write in detail about colour image processing.
6. Write and explain concepts of object detection.

7. Write and explain K-means algorithm.
8. Write and explain DBSCAN.
9. Case study on radiographic images to reduce noise in image.
10. Case study on pattern recognition.

Text books:

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", Pearson Education ,2008.
2. S.Jayaraman, S Esakkirajan,T Veerakumar "Digital Image Processing", McGrawHill Publication,2009.
3. R.O.Duda, P.E.Hart and D.G.Stork, "Pattern Classification", John Wiley.

References:

1. K. Fukunaga," Statistical pattern Recognition", Academic Press.
2. S.Theodoridis and K.Koutroumbas," Pattern Recognition", 4th Ed., Academic Press, 2009.
3. Anil K Jain, "Fundamentals of Digital Image Processing", PHI
4. B Chanda & Dutta Majumdar, "Digital Image Processing and Analysis", PHI
5. Rafael C Gonzalez, Richard E Woods, Eddins, "Digital Image Processing using MATLAB",Pearson Education

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Elective-IV a):Mobile Computing

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 2 Hours / Week	Internal Assessment: 40 Marks	TW & Practical: 01
	Term Work & Practical: 50 Marks	

Course Pre-requisites:

Computer Network , Fundamentals of Data Communication.

Course Objectives:

1. Understand the basic concept of mobile computing
2. Be familiar with network protocol stack
3. Learn the basics of mobile telecommunication
4. Develop system to be used in Ad-Hoc networks
5. Gain knowledge about different mobile platforms and application development

Course Outcomes: Upon completion of the course student will able to

1. Explain the basic of mobile telecommunication system
2. Choose the required functionality at each layer
3. Application identity solution for each functionality at each layer
4. Use similar tool and design Ad-hoc networks
5. Develop mobile application

UNIT - I Introduction: (6 Hours)

Mobile computing: mobile computing compared with wireless networking, mobile computing applications, characteristics of mobile computing, structure of mobile computing application: MAC protocol, wireless MAC issues, fixed assignment schemes, Random assignment schemes, and reservation based schemes.

UNIT - II Mobile Internet Protocol & Transport Layer: (6 Hours)

Overview of mobile IP, features of mobile IP, key mechanism in mobile IP, route optimization. Overview of TCP/IP, Architecture of TCP/IP, Adaption of TCP window, Improvement in TCP performance.

UNIT - III Mobile Telecommunication System: (6 Hours)

Global system for mobile communication (GSM), General packet radio service(GPRS),universal mobile telecommunication system(UMTS) Mobile technology generation, comparison between GMS vs UMTS vs 3G vs 4G vs 5G

UNIT - IV Mobile AD-HOC Network: (6 Hours)

Ad -Hoc basic concept, characteristic, Application, Design issues, Routing, Essential of traditional routing protocol, popular routing

protocol, vehicular Ad-hoc networks (VANET), MANET VS VANET-security.

UNIT - V Mobile Operating System & Application: (6 Hours)

Mobile device operating systems, special constraints & requirements, commercial mobile operating system, software development kit, iOS, iOS architecture, Android, Android architecture, How to develop application via Android, compiling & executing programs in Android, blackberry, window phone.

UNIT - VI Mobile Payment System using Mcommerce: (6 Hours)

Mcommerce- structure, pros & cons, mobile payment system, security issues, application issues, GSM mobility management administration.

Term Work:

1. Explain features of mobile IP & mechanism in mobile IP.
2. Explain comparison between GSM vs UMTS vs GPRS.
3. Explain comparison between 3G vs 4G vs 5G.
4. Develop small application in Android.
5. Develop small application in iOS.
6. Simulate the working of Android networking/Communication entities using software tools.

Assignment:

1. Discuss characteristics and applications of mobile computing
2. Explain structure of mobile computing application.
3. Describe TCP/IP architecture in detail.
4. Explain GPRS system with diagram.
5. Prepare a case study on Mobile OS : Android
6. Discuss in detail the implementation of TCP/IP stack in Mobile networks
7. Prepare a case study on MANET & VANET
8. Prepare a case study on Mobile OS : IOS
9. Prepare a case study on GSM architecture.

Elective – IV b): Design Patterns

TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term Work & practical: 50 Marks

CREDITS ALLOTTED:

Theory: 03

TW & Practical : 01

Course Pre-requisites:

Aware about basic java programming concepts.

Course Objectives:

1. To understand the concept of patterns and the catalog
2. To discuss the Presentation tier design patterns and their affect on: sessions, client access

Course Outcomes: Upon completion of the course student will able to

1. To demonstrate a thorough understanding of patterns and their underlying principles
2. To know what design pattern to apply to a specific problem
3. To demonstrate what tradeoffs need to be made when implementing a design pattern
4. To use design patterns for developing software.
5. To understand the variety of implemented bad practices related to the Business
6. To learn how to use design patterns to keep code quality high without overdesign.

UNIT - I Introduction To Design Patterns:

(6 Hours)

Introduction to design patterns: Design Pattern Definition, Strategy, Observer, Factory, Singleton, Command, Adapter, Facade, Template Method, Iterator, Composite, State, Proxy Design Patterns in Small Talk MVC, Describing Design Patterns, Organizing the Catalog, Solving of Design Problems using Design Patterns, Selection of a Design Pattern, use of Design Patterns.

UNIT - II Designing A Document Editor: (6 Hours)

Design problems, Document structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

UNIT - III Design Patterns Catalog: (6 Hours)

Creational Patterns, Abstract Factory, Builder, Factory Method, Prototype, Singleton. Discussion of Creational Patterns.

UNIT - IV Structural Patterns: (6 Hours)

Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Discuss of Structural Patterns

UNIT - V Behavioral Patterns: (6 Hours)

Behavioral Patterns- Chain of Responsibility Command, Interpreter, iterator, Mediator, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns, Expectations from Design Patterns.

UNIT - VI Case Studies: (6 Hours)

The World Wide Web - a case study in interoperability, Air Traffic

Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

Term Work:

1. Review the engineering design for the part of the product that you must implement. (Engineering Design)
2. Create a new project for this assignment and create a package within the project named scoring.
3. Implement creational pattern.
4. Implement the Score interface. (Design Specifications)
5. Implement the Abstract Score class. (Design Specifications)
6. Implement the Leaf Score class. (Design Specifications)
7. Implement the Composite Score class. (Design Specifications)
8. Solve any two Design Problems using Design Patterns.

Assignment:

1. A journal on PCs would like to investigate some properties of different PCs, e.g. the price, performance, etc. The results need to be sorted in a list. There are several sorting algorithms for sorting all the PCs depending on specific characteristics. These sorting algorithms behave differently with respect to the time and space performance. Therefore, it is required to select and switch to a different sorting algorithm at run-time.

a) Which design pattern can be applied to fulfill these requirements?

b) Draw a class diagram that incorporates this pattern.

2. In the future it is expected that class Computer Equipment will be extended with additional operations. The present structure of computer equipment is assumed not to change. It is also not desired to 'pollute' all the existing component classes with new operations.

a) Which design pattern would be suitable for this problem?

3. Study on Template Method in design pattern
4. Study on Proxy Design Patterns in Small Talk MVC.
5. Solve the Design problems using design patterns.
6. Study on Behavioral pattern.

7. Designing a Document Editor for any system
8. Comparison of design pattern catalogs
9. Study of various structural patterns.
10. Case study on Interpretability.

Text books:

1. Gamma, Helm, Johnson, "Design Patterns: Elements of Reusable Object Oriented Software," PEA.
2. Eric Freeman, "Head First Design Patterns", Oreilly.

References:

1. Cooper "Java Design Patterns", Pearson.
2. Horstmann, "Object Oriented Design and Patterns", Wiley.
3. Ali Bahrami, "Object Oriented Systems Development", MCG.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Elective-IV c):Network Management System

TEACHING SCHEME:

Theory: 3 Hours / Week
 Practical: 2 Hour / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks
 Internal Assessment: 40 Marks
 TW & Practical: 50 Marks

CREDITS ALLOTTED:

Theory: 03
 TW & Practical: 01

Course Pre-requisites:

Computer Network, Discrete Mathematics.

Course Objectives:

1. To help students to understand the principles of network management.
2. To provide knowledge about the various network management strategies and network management protocols.

Course Outcomes: Upon completion of the course student will able to

1. To understand network management architectures and protocols.
2. To gain knowledge about basic components of network management.
3. To gain the information about management communication patterns
4. To understand the protocols associated with network management
5. To gain the knowledge about remote monitoring
6. To understand network management metrics

UNIT - I Introduction to Network Management: (6 Hours)

Importance of network management, The Players: Different Parties with an Interest in Network Management, Case studies of Networking and Management, Challenges of Information Technology Managers, Current Status and future of Network Management,

The Network Operator's Arsenal:

Device Managers and Craft Terminals, Network Analyzers, Element Managers, Management Platforms , Collectors and Probes

UNIT - II The Basic Ingredients of Network Management: (6 Hours)

The Network Devices and its types with Configuration, The Management System, The Management Network, The Management Support Organization: Network Operations Center (NOC).

UNIT - III Management Communication Patterns: (6 Hours)

Layers of Management Interactions, Manager Initiated Interactions: Request and Response, Configuration Operations, Agent Initiated Interactions: Events and Event-Based Management.

UNIT - IV	<p>Common Management Protocols:</p> <p>SNMP (Simple Network Management Protocols): Classic and Perennial Favorite , SNMP Operations , SNMP Messages and Message Structure , SNMPv2/ SNMPv2c , SNMPv3, The SNMP Communication Model, Functional model, SNMPv2 Protocol, Major Changes in SNMPv2, SNMPv2 System architecture, SNMPv2 Structure of Management, Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.</p>	(6 Hours)
UNIT - V	<p>SNMP Management: RMON (Remote Monitoring):</p> <p>Remote Monitoring Basics, RMON SMI (Structure of Management Information) and Management Information Base (MIB), RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON.</p> <p>Telecommunications Management Network(TMN):</p> <p>Fundamentals of TMN, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, Implementation Issues.</p>	(6 Hours)
UNIT - VI	<p>Management Metrics: Assessing Management Impact and Effectiveness:</p> <p>Network Management Business Impact, Factors that Determine Management Effectiveness, Assessing Network Management Effectiveness.</p> <p>Web-Based Management:</p> <p>NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management</p>	(6 Hours)

Term Work:

1. Installation and study of Packet Analyzer tool Wireshark.
2. Installation and study of Honeypots tool.
3. Installation and study of Ethereal tool.
4. Installation and study of Wi-Fi manager.
5. Installation and study of open source Network Management platform (Network Management Information System).
6. Installation and study of Icinga 2 (Open source network monitoring tool).
7. Installation and study of Zabbix.
8. Configure SNMP Protocol on Cisco Packet Tracer.
9. Configure VLAN on Cisco Packet Tracer.
10. Installation and study of Packet Sniffer.

Assignments:

1. Explain the significance of network management system.
2. Describe the components of network management.
3. Justify the role of device Managers and craft terminals in The Network Operator's Arsenal
4. Explain the layers of management interactions.
5. Illustrate SNMP Messages and Message Structure
6. Explain SNMP communication model
7. Explain the improvement in SNMPv2 over the SNMPv1
8. Explain the RMON (Remote Monitoring) with SMI (Structure of Management Information) and Management Information Base (MIB)
9. Describe the TMN (Telecommunications Management Network) architecture.
10. Explain the NMS(network management system) with the context of Web Interface and Web-Based Management

Text Books

1. Mani Subramanian, "Network Management: Principles and Practice", sixth edition Pearson Education.
2. Alexander Clemm, "Network Management Fundamentals "
3. D.C. Verma, "Principles of Computer Systems and network Management"
4. Morris, Network management, Pearson Education.

5. Mark Burges, Principles of Network System Administration, Wiley Dreamtech.

Reference Books

1. William Stallings, “SNMP, SNMPv2, SNMPv3, and RMON 1 and 2” third edition, Addison-Wesley Professional
2. William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud”, Addison-Wesley Professional

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Elective – IV d): Parallel and Distributed Computing

TEACHING SCHEME:

Theory: 3 Hours / Week

Practical: 2 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term Work & Practical: 50 marks

CREDITS ALLOTTED:

Theory: 03

TW & Practical: 01

Course Pre-requisites:

C/C++/Java Programming Languages, Data Structures, Linux/Unix Operating System, Distributed Computing, Computer Organization.

Course Objectives:

To focus on the principles of parallel and distributed computing environment and the

implementation and performance issues associated with them.

Course Outcomes: Upon completion of the course student will able to

1. Ability to recite, explain and model the fundamental concepts and reasoning principles for parallel and distributed systems.
2. Ability to Identify and describe limitations and Challenges of Parallel and Distributed Systems.
3. Ability to adapt and apply the architectural models for various real time applications.
4. Ability to design, analyze algorithms for execution in parallel and distributed settings
5. Ability to report and account for models, limitations, and fundamental concepts in the area of message passing and shared memory concurrency, and apply this understanding to example systems and algorithms.
6. Ability to Outline and assess the significance of high performance computing and its impact in a Computer environment.

UNIT - I Fundamental of Parallel & Distributed Computing:

(6Hours)

Introduction to Parallel Processing Paradigms, Modeling and Characterizing Parallel Algorithms, Balanced Trees, Divide and Conquer, Partitioning, Combining, Language Categories and Parallel Programming Languages.

Introduction to Distributed Computing: Computation Model, Client-Server Systems, Peer to Peer Systems, Modularity, Message Passing, Messages on worldwide web.

UNIT - II Promises and Challenges of Parallel and Distributed Systems:

(6Hours)

Cost vs. Performance Evaluation, Software and General-Purpose PDC, Turing Machine as the Basis, and Consequences, Complexity Measures for Parallelism, Complexity Measures for Distributed Systems, Processing Technology, Networking Technology, Software Tools and Environments, Neural Networks and Complexity Issues, Tolerating Processor Failures in Synchronous Systems, Tolerating Processor Failures in Asynchronous Systems, Wait-Free Implementations of Shared Objects.

UNIT - III Parallel and Distributed Architectures:

(6Hours)

Computational Model, Engineering Model, RISC Architectures, Superscalar and VLIW Processors, SIMD-Processing: Concepts and Systems, MIMD Architectures: Shared and Distributed Memory Designs, Memory Hardware Technology, Memory System Architecture, User-Level Memory Models, and Memory Consistency Models.

UNIT - IV Algorithms & Data Structure for Parallel Programming:

(6Hours)

Arrays and Balanced Binary Trees, Linked Lists, Euler Tour vs. Parentheses String, Priority Queues (Heaps), Search Trees/Dictionaries, Impact of Data Distribution, CU/PE Overlap, Parallel Reduction Operations, Parallel Graph Algorithms, Parallel Computational Geometry.

UNIT - V Communication and its Framework:

(6Hours)

Message-Passing Model, Distributed Shared Memory Model, Message-Passing System: Desirable Features, Socket-Based Message Passing, p4, Parallel Virtual Machine, Message-Passing Interface(MPI), Separation of Data and Control Functions.

Directory-Based Cache Coherence, Shared Memory Consistency Models,

Distributed Memory Architectures, Basic Model: RMI, CORBA, DCOM, Comparison of the Three Paradigms.

UNIT - VI Applications, Tools & Technologies:

(6Hours)

HPC, Mixed-Mode Systems, Examples of Existing Mixed-Machine Heterogeneous Computing Systems, Overview of Clustering, Distinct Uses of Clusters, General-Purpose Parallel Computers, Optical Communication: Free-Space Interconnection, Considerations in Choosing the Interconnection Topology, Broadband Integrated Service Data Network (B-ISDN), Parallel and Distributed Computing Environment Over ATM, Parallelizing Compilers and Preprocessors, Performance Monitoring and benchmarking tools, Performance Visualization, Case Studies: Molecular Modeling, Genetic and Protein Sequence Data.

Term Work:

1. To implement a program that plays Conway's Game of Life. Conway's Game of Life is an example of discrete event simulation, where a world of entities live, die, or are born based on their surrounding neighbors. Each time step simulates another round of living or dying.
2. To implement parallel matrix multiply using Pthreads and evaluate the scalability of your implementation as you increase the problem size and the number of threads.
3. Client-server socket programs - To Design a multi-threaded server, using signals, and learning about the HTTP protocol.
4. To Study about CUDA. Implement a forest fire simulator using CUDA.
5. To Understand Locality, Load balancing, and Synchronization Effects using p-Threads.
6. To analyze the tradeoffs among different synchronization algorithms in terms of their latency, fairness, scalability, traffic, and storage requirements.
7. To understand the role of data communication using MPI as the message passing model. Setup the Environment and use the program of Gaussian Elimination.
8. To write a word count program on map-reduce framework.
9. To write a Jacobi Method to solve a system of linear equations using Map-reduce method.

Assignment:

1. To study about Hadoop Architecture.
2. To Study about Spark Architecture.
3. Prepare a case study on CUDA supporting Parallel programming and distributed application.
4. Case study on how to use Java-based TCP communication through a design of chat client and server program.
5. Case study on how to write a parallel-computing application using MPI Java
6. Case study on MPI
7. Note on comparing RMI and mobile agents in terms of programmability and performance.
8. Case study on design and implementation of a very simple distributed file system.
9. Prepare a presentation and case study on A Modern Multi-Core Processor: Forms of Parallelism + Understanding Latency and BW
10. Prepare a presentation and case study on Workload-Driven Performance

Text Books:

- 1) "Parallel and Distributed Computing: A Survey of Models, Paradigms and Approaches", A Wiley-Interscience publication, Volume 12 of Wiley Series on Parallel and Distributed Computing, Claudia Leopold, 0471358312, 9780471358312.

References:

1. "Tools and Environments for Parallel and Distributed Computing, Salim Hariri, Manish Parashar, Volume 34 of Wiley Series on Parallel and Distributed Computing", John Wiley & Sons, 0471474843, 9780471474845
2. "Parallel and Distributed Computing: Theory and Practice. Springer Science & Business Media", 3540580786, 9783540580782.
3. Péter Kacsuk, Dieter Kranzlmüller, Zsolt Németh, Jens Volkert, "Distributed and Parallel Systems: Cluster and Grid Computing, Volume 706 of The Springer International Series in Engineering and Computer Science", Springer Science & Business Media, 2012, 1461511674, 9781461511670
4. Jacek Błażewicz, Klaus Ecker, Brigitte Plateau, Denis Trystram, "Handbook on Parallel and Distributed Processing, International Handbooks on Information Systems", Springer Science & Business Media, 2013, 3662043033, 9783662043035

Syllabus for Unit Test:

Unit Test -1 UNIT – I, UNIT – II, UNIT - III

Unit Test -2 UNIT – IV, UNIT – V, UNIT - VI

Data Mining and Knowledge Discovery

TEACHING SCHEME:

Theory: 3 Hours / Week

Practical: 2 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term Work & Practical: 50 Marks

CREDITS ALLOTTED:

Theory: 03

TW & OR : 01

Course Pre-requisites:

Knowledge of Statistics, Database Management System.

Course Objectives:

1. Identify the scope and necessity of Data Mining & Warehousing for the society.
2. Describe the designing of Data Warehousing so that it can be able to solve the root problems.
3. Understand various tools of Data Mining and their techniques to solve the real time problems.
4. Develop ability to design various algorithms based on data mining tools.

Course Outcomes: Upon completion of the course student will able to

1. Define, describe, and clearly state the objectives of Knowledge Discovery and Data Mining.
2. Describe data mining algorithms
3. Suggest appropriate solutions to data mining problems
4. Analyze data mining algorithms and techniques
5. Identify and or develop software to execute the specified algorithm(s)/data mining technique(s)
6. Identify and distinguish data mining applications from other IT applications

UNIT - I **Introduction to Knowledge Discovery and Data Mining: (6 Hours)**

Data mining fundamentals, Classification of Data mining systems, Integration of Data mining system with Data warehouse, Data Preprocessing, KDD Fundamentals, KDD Process, Data clearing, Data integration and transformation, Data Reduction, Data mining Statistics.

UNIT - II	OLAP: Characteristics of OLAP system, Multidimensional view and data cube, Data Cube implementations and operations, Difference between OLAP, OLTP and OLAP Server-ROLAP, MOLAP, HOLAP Queries.	(6 Hours)
UNIT - III	Association Rule Mining: Introduction, The Task and Naive Algorithm, Apriori Algorithm, Improving the efficiency of Apriori algorithm, Direct hashing and pruning (DHP), Dynamic Item set counting (DIC), Mining frequent patterns without candidate generation (FP Growth).	(6 Hours)
UNIT - IV	Classification: Decision Tree, The Tree Induction Algorithm, Split algorithms based on information theory, Split Algorithm based on Gini Index, Decision tree Rule,	(6 Hours)
UNIT - V	Knowledge discovery: Introduction, KDD Process KDD process steps, Models, Integration of KDD with Database system, KDD system architecture, KDD Lifecycle,	(6 Hours)
UNIT - VI	Clustering: Cluster analysis, Categorization of major clustering methods such as Partitioning methods, Hierarchical methods, Density based methods, grid based methods, Model based clustering methods, clustering high dimensional data, Constraint based analysis, Data mining applications	(6 Hours)

Term Work:

1. Implementing Web document browsing a OLAP using existing ontologies.
2. Show the implementation of Naïve Bayes algorithm.
3. Demonstration of Association rule process on any dataset using apriori algorithm.
4. Case Study: How New York's Fire Department Uses Data Mining
5. Comparison of various data mining tool
6. Implementation/usage of WEKA for classification of social network dataset
7. Implementation/usage of k-nearest neighbor classifier
8. Find predominant themes in a collection of documents (clustering).
9. Clustering images based on feature localization.
10. Case Study on Data mining applications.

Assignment:

1. Explain Data mining Tasks, Issues, Evaluation and Terminologies.

2. Implementation of various KDD models.
3. Define hypercube? How do they apply in OLAP system?
4. State Codd's guidelines for OLAP system?
5. Case study on OLAP.
6. Apply Apriori algorithm to the dataset from Table 13.1 (textbook) and extract all frequent itemsets with support count ≥ 3 . For one longest itemset construct association rules using confidence threshold 50%. Show all your work (candidates, frequent itemsets, etc.).
7. List and explain Association rule mining algorithms in detail.
8. Implementation of Data Cube.
9. Compare various clustering algorithm.
10. Case Study :clustering algorithm

Text books:

1. Jiawei Han & Micheline Kamber, "Data Mining – Concepts and Techniques",Morgan Kaufmann Publishers, Elsevier,2nd Edition, 2006.
2. ",Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining, Pearson education.

References:

1. Arun K Pujari, "Data Mining Techniques",2nd edition, Universities Press.
2. Sam Aanhory & Dennis ,"Data Warehousing in the Real World",Murray Pearson Edn Asia.
3. K.P.Soman,S.Diwakar,V.Ajay, "Insight into Data Mining",PHI,2008.
4. Paulraj Ponnaiah, "Data Warehousing Fundamentals ",Wiley student Edition.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Project Stage-II

TEACHING SCHEME:

Practical: 16 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: 150 Marks

CREDITS ALLOTTED:

Term Work & Oral: 08

Course Pre-requisites:

Basics of Software engineering, software testing and knowledge of core computer engineering subjects.

Course Objectives:

- To develop problem solving abilities using mathematics.
- To apply algorithmic strategies while solving problems.
- To prepare software engineering documents and design test cases.
- To demonstrate use of algorithmic solutions in real time problem.
- To encourage and expose students for participation in National/ International paper presentation activities.
- Exposure to Learning and knowledge access techniques using Conferences, Journal papers and participation in research activities.

Course Outcomes: Upon completion of the course student will able to

- I. Understand how to solve the problem.
- II. Demonstrate the ability to synthesize complex information from a variety of sources in decision-making
- III. Plan and perform collaboratively towards a common purpose.
- IV. Demonstrate self-advocacy skills and self-reliant behavior.
- V. Demonstrate the ability to develop and maintain satisfying interpersonal relationships.
- VI. Evaluate and conclude the results with documentation.

1. The project will be undertaken preferably by a group of at least 3- 4 students who will jointly work and implement the project over the academic year. The work will involve the design of a system or subsystem in the area of Computer Engineering.

2. If the project is chosen a hardware project it will involve the designing a system –subsystem or upgrading an existing system. The design must be implemented into a working model with necessary software interfacing and a user manual.

3. If the project is chosen in the pure Software Application it must involve the detail Software Design Specifications, Data Structure Layout, File Design, Testing with complete documentation and user interface. With life cycle testing and as an executable package.

The group will submit at the end of Semester-VIII,

- i) The workable project.
- ii) The details of Research paper published in National/ International paper conferences/journals for the project work carried out.
- iii) Project Report in the form of bound journal complete in all aspects, 3 copies for the institute and 1 copy of each student in the group for certification.

The examiner in consultation with the guide will assess the term work.

Oral examination will be based on the project work completed by the candidate.

The project report will contain the following details:

1. Problem definition and requirement specification, acceptance tests procedure (ATP).
2. System definition, requirement analysis.
3. System design.
4. System implementation-code documentation –dataflow diagram / algorithm.
5. Test results and procedure, test report as per ATP.
6. Platform choice, use.
7. Appendix tools used, references.
8. Documentation will use UML approach with Presentation, Category, Use Case, Class Diagrams, etc.



Bharati Vidyapeeth

(Deemed to be University)

Pune, India

Faculty of Engineering and Technology

Programme: B.Tech (Computer Science and Business Systems)

COURSE STRUCTURE AND SYLLABUS

(Choice Based Credit System)

B.Tech (Computer Science and Business Systems)

2018 Course

Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune
B.Tech- Computer Science & Business Systems (Semester- I and II)
Revised New Syllabus

Semester I		Teaching Scheme				Examination Scheme-Marks							Credit		
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
1.1	Mathematics I	3	1	0	4	60	20	10	10	-	-	100	4	0	4
1.2	Statistics I	3	1	0	4	60	20	10	10	-	-	100	4	0	4
1.3	Principles of Electrical Engineering	3	0	2	5	60	20	10	10	-	50	150	3	1	4
1.4	Fundamentals of Computer Science	3	1	2	6	60	20	10	10	50	-	150	4	1	5
1.5	Fundamentals of Physics	3	0	2	5	60	20	10	10	-	50	150	3	1	4
1.6	Business Communication & Value Science - I	2	1	2	5	50	-	-	-	-	50	100	3	1	4
Total		17	4	8	29	350	100	50	50	50	150	750	21	4	25

Semester II		Teaching Scheme				Examination Scheme-Marks							Credit		
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
1.7	Mathematics II	3	1	0	4	60	20	10	10	-	-	100	4	0	4
1.8	Statistics II	3	1	0	4	60	20	10	10	-	-	100	4	0	4
1.9	Data Structures & Problem Solving	3	1	2	6	60	20	10	10	50	-	150	4	1	5
1.10	Fundamentals of Economics	3	0	0	3	60	20	10	10	-	-	100	3	0	3
1.11	Principles of Electronics	3	0	2	5	60	20	10	10		50	150	3	1	4
1.12	Business Communication & Value Science - II	2	1	2	5	50	-	-	-	-	50	100	3	1	4
1.13	Self Learning Module	0	0	2	2	-	-	-	-	-	50	50	0	1	1
Total		17	4	8	29	350	100	50		50	150	750	21	4	25

Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune
B.Tech- Computer Science & Business Systems (Semester- III and IV)
Revised New Syllabus

Semester- III		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
2.1	Formal Language and Automata Theory	4	1	2	6	60	20	10	10	-	50	150	5	1	6
2.2	Computer Organization & Architecture	4	0	2	5	60	20	10	10	-	50	150	4	1	5
2.3	Object Oriented Programming	3	0	2	5	60	20	10	10	50	-	150	3	1	4
2.4	Computational Statistics	3	0	2	5	60	20	10	10	50	-	150	3	1	4
2.5	Software Engineering	4	1	2	6	60	20	10	10	50	-	150	5	1	6
2.6	Indian Constitution (Non Credit)												0	0	0
Total		18	2	10	27	300	100	50	50	150	100	750	20	5	25
Semester- IV		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
2.8	Operating Systems	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.9	Database Management Systems	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.10	Software Design with UML	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.11	Introduction to Innovation, IP Management & Entrepreneurship	4	0	0	3	60	20	10	10	-	-	100	3	0	3
2.12	Business Communication & Value Science – III	2	0	4	6	50	0	0	0	-	50	100	2	2	4
2.13	Operations Research	2	0	2	4	60	20	10	10	-	50	150	2	1	3
2.14	Essence of Indian Traditional Knowledge(Non Credit)									-	-	0			
Total		20	0	12	28	350	100	50	50	150	100	800	19	6	25

BHARATI VIDYAPEETH (Deemed to be University)
COLLEGE OF ENGINEERING, PUNE-43
B. Tech. (Computer Science & Business Systems)

Vision of the Department

“To syndicate industry and institute to impart high quality knowledge through scholarship, research and creative endeavor”

Mission of the Department

- To impart contemporary technology conforming to a dynamic curriculum.
- To engage in professional development and scholarly endeavor through knowledge of common business principles.
- To promote the awareness of business discipline and ethical responsibility through industry alliance

Programme Educational Objectives

1. Prevail technical competency to concord the industry engrossment.
2. Assimilate business management skills.
3. Instigate business level innovation with societal consideration.

Programme Outcomes

The students of B.Tech (Computer Science & Business Systems) will be able to

- a. Demonstrate logical and programming skills through comprehensive programming foundation.
- b. Apply knowledge of mathematics, computer engineering and basic science to comprehend and solve real world problems.
- c. Develop software applications and processes for complex problems to provide efficient solutions by assessing its environmental, social and ethical constraints.
- d. Investigate and solve complex computing problems with alternate solutions.
- e. Use functional skills of modern IT tools and techniques for engineering activities.
- f. Understand the social and cultural impact of computing on society.
- g. Provide optimized computational solutions that apprehend the societal and environmental aspects.
- h. exhibit the professional, ethical and legal responsibilities related to industry.
- i. Perform as an individual and efficient team player to accomplish a goal.
- j. Present professional concepts through effective communication skills and documentation.
- k. Demonstrate management skills for developing time-bound projects within the available budget and resources.
- l. Develop the ability of life long learning for new IT practices.

Syllabus of Semester I

Mathematics I

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	
Lab: Nil	Term Work: Nil	

Course Pre Requisites:

The students should have basic Knowledge of high school math, including trigonometry, geometry and calculus

Course Objective:

The course introduces fundamental concepts of Calculus and Discrete Mathematics.

Course Outcomes:

- 1) Evaluate double integral and triple integral to compute area, volume for two dimensional and three-dimensional solid structure.
- 2) Understand and apply basic concepts of Boolean algebra.
- 3) To recall the basic concepts of sets, functions and relations.
- 4) Develop fundamental understanding of Elementary Combinatory.
- 5) Understand various concepts of algebraic systems.
- 6) Student will be able to prove mathematical statements using induction method.

Topics to Be Covered:

UNIT – I

[6 Hours]

Calculus: Differential calculus and integral calculus, double and triple integral.

UNIT – II

[6 Hours]

Application of double and triple integral.

UNIT – III

[6 Hours]

Boolean algebra: Introduction of Boolean algebra, truth table.

UNIT – IV

[6 Hours]

Basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

UNIT – V

[6 Hours]

Abstract algebra: Set, relation, group, ring, field.

UNIT – VI

[6 Hours]

Combinatorics: Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, strong form of induction, pigeonhole principle.

Home Assignments:

Assignments & tutorials covering the following: Successive differentiation, multiple integral, truth table, Karnaugh map, principle of mathematical induction, strong form of induction and pigeonhole principle.

Reference Books:

1. I. N. Herstein, “Topics in Algebra”, John Wiley and Sons.
2. M. Morris Mano, “Digital Logic & Computer Design”, Pearson
3. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publication, Delhi.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Statistics I

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs/Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr/Week	Continuous Assessment: 40 marks	
Lab: Nil	Term Work: Nil	

Course Pre-Requisites:

The students should have basic Knowledge of high school math and calculus

Course Objective:

The course introduces fundamental concepts of statistics and probability

Course Outcomes:

Course outcomes of Statistics-I

- 1) Students will be able to use appropriate statistical terms to describe data.
- 2) Students will be able to use appropriate statistical methods to collect, organize, display and analyze relevant data
- 3) Students will be able to identify the types of sampling.
- 4) Students will be able to understand mathematical expectation and moments generating function.
- 5) Students will be able to apply concepts of various probability distributions to find probabilities.
- 6) Students will be able to apply concepts of Normal, Poisson, Binomial, uniform, exponential, t and F-distribution.

Topics to Be Covered:

UNIT – I

[6 Hours]

Introduction to Statistics: Definition of Statistics. Basic objectives. Applications in various branches of science with examples

Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample.

UNIT – II

[6 Hours]

Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution. Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation.

UNIT III

[6 Hours]

Sampling Techniques: Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling

UNIT – IV

[6 Hours]

Expected values & moments: mathematical expectation & its properties, Moments (including variance) & their properties, interpretation, Moment generating function

UNIT – V

[6 Hours]

Probability Theory: concept of experiments, sample space, event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem

UNIT – VI

[6 Hours]

Probability distributions: discrete & continuous distributions, Binomial, Poisson & Geometric distributions, Uniform, Exponential, Normal, Chi-square, t, F distributions

Home Assignments:

Problem sets to be shared by faculty covering the following topics:

Graphical representation of data, Histograms, Descriptive measures - central tendency and dispersion Estimating moments, Distribution parameters, Simulation

Text Books:

1. Introduction of Probability Models, S.M. Ross, Academic Press, N.Y.
2. Fundamentals of Statistics (vol. I and vol. II) - A. Goon, M. Gupta and B. Dasgupta.

Reference Books:

1. A first course in Probability, S.M. Ross.
2. Probability and Statistics for Engineers (4th Edition) - I.R. Miller, J.E. Freund and R. Johnson.
3. Statistical Concepts & Methods - G.K. Bhattacharyya and R.A. Johnson.
4. Introduction to the Theory of Statistics - A.M. Mood, F.A. Graybill & D.C. Boes.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Principles of Electrical Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	TW and Oral :1 Credit

Course Pre-requisites:

The Students should have knowledge of Mathematics, physics

Course Objectives:

The course introduces fundamental concepts of DC and AC circuits, Electrostatics electromagnetism, transformer, electrical wiring.

Course Outcomes: After learning this course the students will be able to

1. Apply knowledge of basic concepts of work, power, energy for electrical, mechanical and thermal systems
2. Calculate current in electrical network using Kirchoff's laws and network theorems.
3. Describe construction, principle of operation, specifications and applications of capacitors and batteries
4. Define basic terms of single phase and three phase ac circuits and supply systems.
5. Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer.
6. Describe types of wiring and earthing system.

Topics to Be Covered:

UNIT – I

[4 Hours]

Basic Concepts: Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems

UNIT – II

[8 Hours]

Network Theorems: Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series-parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.

UNIT III

[4 Hours]

Electrostatics: Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.

UNIT – IV

[6 Hours]

AC Fundamentals & AC Circuits: AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph balanced AC Circuits.

UNIT – V

[8 Hours]

Magnetic Circuits & Transformer: Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, Ampere's law, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit

Faraday's law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance, coefficient of coupling,

Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.

UNIT – VI

[6 Hours]

Electrical Wiring and Illumination system: Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Introduction to measuring devices/sensors and transducers related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems and their practical application. :

Term Work: The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem

6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
 - a) Voltage and current ratios.
 - b) Efficiency and regulations.
10. Study of a Residential (L.T.) Bill

Text Books:

1. B.L. Theraja- “A Textbook of Electrical Technology” Volume- I, S.Chand and Company Ltd.,New Delhi
2. V. K. Mehta, - “Basic Electrical Engineering”, S. Chand and Company Ltd., New Delhi
3. I. J. Nagrath and Kothari – “Theory and problems of Basic Electrical Engineering”, Prentice Hall of India Pvt. Ltd

Reference Books:

1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Fundamentals of Computer Science

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr/Week	Continuous Assessment: 40 marks	
Lab: 2Hrs./Week	Term work & Practical: 50 Marks	TW and Practical :1 Credit

Course Pre-Requisites:

Knowledge of Class XII level computers will be helpful, but not mandatory.

Course Objective:

The course introduces fundamental concepts of computer science

Course Outcomes:

1. Understand the basics of computer science & the process of moving from a problem statement to a computational formulation of a method for solving the problem.
2. Apply the basic concepts of control structures.
3. Understand basic concepts of function.
4. Implement concept of arrays and pointers.
5. Develop an application using the concept of file handling.
6. Describe unix system interface and programming method.

Topics to Be Covered:

UNIT – I

[6 Hours]

General problem Solving concepts and Imperative languages: Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C) .**Types Operator and Expressions with discussion of variable naming and Hungarian Notation:** Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation

UNIT – II

[6 Hours]

Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming

UNIT – III

[6 Hours]

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Preprocessor, Standard Library Functions and return types

UNIT – IV

[6 Hours]

Pointers and Arrays: Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

UNIT – V

[6 Hours]

Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields

Input and Output: Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions

UNIT – VI

[6 Hours]

Unix system Interface: File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator

Programming Method: Debugging, Macro, User Defined Header, User Defined Library Function, makefile utility.

Home Assignments:

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
 - i. Small but tricky codes
 - ii. Proper parameter passing
 - iii. Command line Arguments
 - iv. Variable parameter
 - v. Pointer to functions

- vi. User defined header
- vii. Make file utility
- viii. Multi file program and user defined libraries
- ix. Interesting substring matching / searching programs
- x. Parsing related assignments

Text Books:

- 1. B. W. Kernighan and D. M. Ritchi, “The C Programming Language”, Second Edition, PHI.
- 2. B. Gottfried, “Programming in C”, Second Edition, Schaum Outline Series.

Reference Books:

- 1. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw Hill.
- 2. Yashavant Kanetkar, “Let Us C”, BPB Publications.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Fundamentals of Physics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs. /Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: Nil	Continuous Assessment: 40 marks	
Lab: 2 Hrs. / Week	Term Work and Oral : 50 marks	TW and Oral :1 Credit

Course Pre-Requisites:

Knowledge of Class XII level Physics and Mathematics

Course Objective:

The course introduces fundamental concepts of physics

Course Outcomes:

1. To understand the Importance of applications of Applied Physics in daily life
2. To provide students with a basic understanding of the Physics that may be required by engineers in the course of their careers
3. To impart knowledge related to the importance of EM waves and magnetic materials
4. To enhance knowledge related to lasers and its different components to make it suitable for various purposes
5. To introduce most important concepts of superconductivity, crystallography and fiber optics to the students
6. To introduce the learners to the basics of Special theory of relativity, X- rays, Quantum Mechanics

Topics to Be Covered:

UNIT – I

[6 Hours]

Oscillations: Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple springs mass system. Resonance-definition., damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators

UNIT – II

[6 Hours]

Classical Optics: Theory of interference fringes-types of interference-Fresnel’s prism-Newton’s rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel’s half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence, Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster’s law, double refraction.

UNIT – III

[6 Hours]

Quantum Physics: Introduction - Planck's quantum theory- Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one dimensional potential box, Heisenberg Picture.

UNIT – IV

[6 Hours]

X-ray & Crystallography: Crystallography - Basic terms-types of crystal systems, Bravais lattices, miller indices, d spacing, Debye Scherrer powder method, laue method- Atomic packing factor for SC, BCC, FCC and HCP structures. Semiconductor Physics - conductor, semiconductor and Insulator; Basic concept of Band theory

UNIT – V

[6 Hours]

Modern Optics: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO₂ and Neodymium lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and Applications, Types of optical fibers

UNIT – VI

[6 Hours]

Thermodynamics: Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

Home Assignments:

Problems based on Newton rings, Michelson interference, young double slit

Laboratory

- 1) Magnetic field along the axis of current carrying coil – Stewart and Gee
- 2) Determination of Hall coefficient of semiconductor
- 3) Determination of Plank constant
- 4) Determination of wave length of light by Laser diffraction method
- 5) Determination of wave length of light by Newton's Ring method
- 6) Determination of laser and optical fiber parameters
- 7) Determination of Stefan's Constant.

Text Books:

1. Halliday, Resnic and Walker, Fundamentals of Physics, 9th Ed., John Wiley, 2011.
2. Beiser A, Concepts of Modern Physics, 5th Ed., McGraw Hill International, 2003.

3. Ajoy Ghatak, Optics, 5th Ed., Tata McGraw Hill, 2012
4. University Physics-Sears & Zemansky (Addison-Wesley)

Reference Books:

1. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
2. Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Business Communication & Value Science – I

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 2Hr./Week	Semester Examination: 50 marks	Theory: 3 Credits
Tutorials: 1 Hr. / Week	Continuous Assessment: No	
Lab: 2 Hrs. / Week	Term Work and Oral: 50 marks	TW and Oral :1 Credit

Course Pre-Requisites:

1. Basic communication in tenses (past, present, future).
2. Awareness of common words (adjectives used in daily verbal communication).
3. Basic idea of sentence formation and thereby paragraph building and writing.
4. Communication according to daily and varied contextual scenarios.
5. Basic communication model/channel (sender, receiver and feedback), Active and passive listening skills.
6. Basic social etiquettes and knowledge of group work and communication that will enhance their professional growth.

Course Objective:

The course aims to augment student's overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The English language topics for this semester focus on the development of basic fluency in English, usage of words and also introduce them to the concept and importance of interpersonal skills so as to effectively present their personalities.

Course Outcomes:

1. Speak fluently in English without errors in tenses and hence present themselves as effective English communicators. They will be able to learn the 12 tenses and use them appropriately.
2. Differentiate between active and passive vocabulary and be able to use the 60 words discussed in class for their daily conversation and 40 words also given as assignments.
3. The ability to process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 100-150 words for paragraph writing.
4. Present them in a certain manner by using the 50-55 phrases discussed in class appropriately for group discussions, personal interviews during the campus recruitment process/competitive exams.
5. Enhance their communication skills by acquainting with the 2 important aspects of communication and helping them to overcome the 10 most common barriers of communication. Learn the 7 different types of listening skills; differentiate effective listening skills and understand the importance of it through 5 activities held in class and implement them in professional life.

6. Understand the importance of team work, team motivation and effective team communication for further implementation in the corporate life. They should also be able to identify concretely between team and group dynamics.

Topics to Be Covered:

UNIT – I [6 Hours]

Essential Grammar – I: Tenses: Basic forms and use, sentence formation (general & Technical), Common errors, Parts of speech through context, Direct and reported speech structures and voices.

UNIT – II [6 Hours]

Vocabulary Enrichment: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary

Phonetic: Pronunciation, Reduction of MTI in spoken English, Question formation with emphasis on common errors made during conversation

UNIT – III [6 Hours]

Written Communication – I: Letter Writing –Formal and Informal letter writing, Application letters, Report writing academic and business report, Job application letter

UNIT – IV [6 Hours]

Communication Skills: Importance of effective communication, types of communication- verbal and non - verbal, barriers of communication, effective communication, Listening Skills: Law of nature- Importance of listening skills, Difference between listening and hearing, Types of listening.

UNIT – V [6 Hours]

Self - Awareness & Self Development: Self - Assessment, Self - Appraisal, SWOT, Goal setting - Personal & career- Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self - appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, and prioritization

Socio-Cultural and Cross-Cultural Sensitivities at the Workplace: What is Inclusion? Women's contributions in Industry, work issues faced by women, what is sexual harassment, what is appropriate behavior for everyone at work

UNIT – VI [6 Hours]

Interpersonal Skills – I: Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural team activity

Time Management: The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritize using decision matrices, to beat the most common time wasters, how to plan, how to handle interruptions, to maximize your personal effectiveness, how to say “no” to Time wasters

Values of a good manager: Understanding Corporate Values and behavior; Personal / Human Values; Pride and grace in Nationalist

Text Books:

1. Business Communication – Dr. Saroj Hire math
2. English vocabulary in use – Alan McCarthy and O’Dell

There will be handouts and reference links shared.

Reference Books

1. Strategic Writing by Charles Marsh
2. The Seven Basic Plots by Christopher Booker

BHARATI VIDYAPEETH (Deemed to be University)

COLLEGE OF ENGINEERING, PUNE-43

B. Tech. (Computer Science & Business Systems)

Syllabus of Semester II

Mathematics II

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	
Lab: Nil	Term Work: Nil	

Course Pre-Requisites:

The students should have basic Knowledge of high school math, Boolean algebra and calculus.

Course Objective:

To develop ability to use the mathematical techniques, skills, and tools necessary for computer science.

Course Outcomes:

At the end of the course, a student will be able to:

- 1) Apply knowledge of basics of Matrices, Determinants.
- 2) Solve the consistency of any type of systems
- 3) Describe Vector space, Orthogonality and Projection.
- 4) Apply methods Gram-Schmidt orthogonalization and QR decomposition.
- 5) Calculate Eigenvalues and Eigenvectors.
- 6) Describe Singular value decomposition and Principal component analysis.

Topics to Be Covered:

UNIT – I

[6 Hours]

Introduction to Matrices and Determinants, Solution of Linear Equations, Cramer's rule, Inverse of a Matrix.

UNIT – II

[6 Hours]

Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

UNIT – III

[6 Hours]

Vector space, Dimension, Basis, Orthogonality, Projection.

UNIT – IV

[6 Hours]

Gram-Schmidt orthogonalization and QR decomposition.

UNIT – V

[6 Hours]

Eigenvalues and Eigenvectors, Positive definite matrices, Linear transformations, Hermitian and Unitary matrices.

UNIT – VI

[6 Hours]

Singular value decomposition and Principal component analysis, Introduction to their applications in Image Processing and Machine Learning.

Home Assignments:

Assignments & tutorials covering the following: Vectors and linear combinations, Matrices, Determinants, Linear transformations, Complete solution to $AX=b$, Eigenvalues and Eigenvectors.

Text Book:

1. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publication, Delhi.

Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil.
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education.
3. Introduction to linear algebra, 5th Edition, Gilbert Strang.
4. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Digital Image Processing, R C Gonzalez and R E Woods.
6. <https://machinelearningmastery.com/introduction-matrices-machine-learning/>

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Statistics II

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs/Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr/Week	Continuous Assessment: 40 marks	
Lab: Nil	Term Work: Nil	

Course Pre-requisites:

Basic of statistics and probability, Basic programming experience (in any language)

Course Objective:

The course introduces fundamental concepts of linear statistical models, estimation methods, hypothesis testing and fundamental concepts of programming in R

Course Outcomes:

The students completing this course will be able to

1. Understand the basic concepts of Statistical Inference,
2. Understand the basic concepts of Estimation methods,
3. Understand the basic concepts of Hypothesis Testing
4. Understand the basic concepts of linear statistical models.
5. Understand Introductory R language fundamentals, basic syntax and how to use R; what R is and how it's used to perform data analysis;
6. Understand major R data structures and create visualizations using R.

UNIT – I [6 Hours]

Linear Statistical Models: Simple linear regression & correlation, multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction)

UNIT – II [6 Hours]

Estimation: Point estimation, criteria for good estimates (unbiasedness, consistency), Methods of estimation including maximum likelihood estimation.

UNIT – III [6 Hours]

Sufficient Statistic: concept & examples, complete sufficiency, their application in estimation

UNIT – IV [6 Hours]

Test of hypothesis: concept & formulation, type I and type II errors, Neyman Pearson lemma, Procedures of testing

UNIT – V

[6 Hours]

Non-parametric Inference: Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman’s and Kendall’s test. Tolerance region

Basics of Time Series Analysis & Forecasting: Stationary, ARIMA Models: Identification, Estimation and Forecasting.

UNIT – VI

[6 Hours]

R statistical programming language: Introduction to R, Functions, Control flow and Loops, Working with Vectors and Matrices, Reading in Data, Writing Data, Working with Data, Manipulating Data, Simulation, Linear model, Graphics in R

Home Assignments:

Problem sets to be shared by faculty covering the following topics:

Estimation Methods: Parametric & Non – Parametric, Hypothesis Testing

Text Books:

1. Probability and Statistics for Engineers (4th Edition) - I.R. Miller, J.E. Freund and R. Johnson.
2. Fundamentals of Statistics (vol. I and vol. II) - A. Goon, M. Gupta and B. Dasgupta.
3. Hands-on Programming with R - Garrett Grolemund
4. R for Everyone: Advanced Analytics and Graphics - Jared P. Lander

Reference Books:

1. Statistical Theory with Engineering Application - A. Hald.
2. Statistical Methods - G.W. Snedecor and W.G. Cochran.
3. Statistical Concepts & Methods - G.K. Bhattacharyya and R.A. Johnson.
4. Introduction to Linear Regression Analysis - D.C. Montgomery & E.Peck
5. Introduction to the Theory of Statistics - A.M. Mood, F.A. Graybill & D.C. Boes.
6. Practical Non-Parametric Statistics - W.J. Conover
7. Applied Regression Analysis - N. Draper & H. Smith

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Data Structures & Problem Solving

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs. / Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1 Hr. / Week	Continuous Assessment: 40 marks	
Lab: 2 Hrs./ Week	Term Work and Practical: 50 Marks	TW and Practical :1 Credit

Course Pre Requisites:

Students should have knowledge of Fundamentals of data types and programming concepts

Course Objective:

The course is aimed to provide an understanding of key concepts underlying the choice and implementation of data structures, algorithms and step by step approach in solving problems with the help of these fundamental data structures.

Course Outcomes:

Students will be able to:

- 1) Understand the fundamentals and analysis of algorithms
- 2) Understand and implement Linear data structures
- 3) Understand and implement Non Linear data structure of Trees.
- 4) Understand and implement Non Linear data structure of Graphs.
- 5) Understand and implement the .
- 6) Understand the concepts of distributed system security.

Topics to Be Covered:

UNIT – I

[6 Hours]

Basic Terminologies & Introduction to Algorithm and Data Organization: Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction

UNIT – II

[6 Hours]

Linear Data Structure: Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures

UNIT – III

[6 Hours]

Non-linear Data Structure Trees Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree), Various Representations, Operations : search and traversal algorithms and complexity analysis
Applications of Trees.

UNIT – IV

[6 Hours]

Non-linear Data Structure Graphs: Graphs : Directed and Undirected, Various Representations
Operations: Search and traversal algorithms and complexity analysis
Applications of Graphs.

UNIT – V

[6 Hours]

Searching and Sorting: Sequential Search, Binary Search, Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap Sort, Introduction to Hashing

UNIT – VI

[6 Hours]

File: Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes

Home Assignments:

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.
3. Line editors with line count, word count showing on the screen.
4. Trees with all operations.
5. All graph algorithms.
6. Saving / retrieving non-linear data structure in/from a file

Text Books:

1. Fundamentals of Data Structures, E. Horowitz and S. Sahni, 1977
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman

Reference Books:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning)), 31st ed. Edition , Pat Morin

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Fundamentals of Economics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs/Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: Nil	Continuous Assessment: 40 marks	
Lab: Nil	Term Work: Nil	

Course Pre-requisites:

Knowledge of Class XII level Mathematics

Course Objective:

1. To impart knowledge, with respect to concepts, principles of Economics, which govern the functioning of a firm/organization
2. To explain the students about concept of production, cost, national income, an aggregate supply and aggregate demand consumption

Course Outcomes:

After completing this course, students should be able to:

1. Demonstrate an understanding of the methods and principles of microeconomic and macroeconomic theory, including tradeoffs, opportunity costs, and marginal decision making.
2. Explain how markets work and how market prices are determined using principles of supply and demand.
3. Assess the impact of market failure such as externalities, and public goods and evaluate possible public policy remedies.
4. Analyze financial markets and investments, including the stock market, and their relation to the economy.
5. Evaluate key economic indicators (including GDP, unemployment, inflation) and their use in evaluating macroeconomic conditions.
6. Understand major macroeconomic tools, including fiscal and monetary policies, and their use in managing the economy. Also apply ethical principles in a variety of economic contexts.

Topics to Be Covered:

UNIT – I

[6 Hours]

Microeconomics

Principles of Demand and Supply – Supply Curves of Firms – Elasticity of Supply

Demand Curves of Households – Elasticity of Demand Equilibrium and Comparative Statics
(Shift of a Curve and Movement along the Curve) Welfare Analysis – Consumers’ and
Producers’ Surplus – Price Ceilings and Price Floors

UNIT – II

[6 Hours]

Consumer Behaviour – Axioms of Choice – Budget Constraints and Indifference Curves
Consumer’s Equilibrium – Effects of a Price Change, Income and Substitution Effects –
Derivation of a Demand Curve
Applications – Tax and Subsidies – Intertemporal Consumption – Suppliers’ Income Effect

UNIT – III

[6 Hours]

Theory of Production – Production Function and Iso-quants – Cost Minimization
Cost Curves – Total, Average and Marginal Costs – Long Run and Short Run Costs
Equilibrium of a Firm Under Perfect Competition Monopoly and Monopolistic Competition

UNIT – IV

[6 Hours]

Macroeconomics

National Income and its Components – GNP, NNP, GDP, NDP
Consumption Function
Investment
Simple Keynesian Model of Income Determination and the Keynesian Multiplier
Government Sector – Taxes and Subsidies
External Sector – Exports and Imports

UNIT – V

[6 Hours]

Money – Definitions
Demand for Money – Transactionary and Speculative Demand
Supply of Money – Bank’s Credit Creation Multiplier
Integrating Money and Commodity Markets – IS, LM Model
Business Cycles and Stabilization – Monetary and Fiscal Policy – Central Bank and the
Government

UNIT – VI

[6 Hours]

The Classical Paradigm – Price and Wage Rigidities – Voluntary and Involuntary Unemployment.

Home Assignments:

In the discussion topics mentioned above, students should be asked to prepare in advance in groups
and present in class

Text Books:

1. Microeconomics- Pindyck, Robert S., and Daniel L. Rubinfeld Microeconomics
2. Macroeconomics- Dornbusch, Fischer and Startz

Reference Books:

Other articles could be sent through email as and when a relevant topic is discussed.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Principles of Electronics

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 3Hrs/Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: Nil	Continuous Assessment: 40 marks	
Lab: 2 Hrs/ Week	Term Work and Oral: 50 marks	TW and Oral :1 Credit

Course Pre Requisites:

The students should have knowledge of Class XII level Electronics, Physics & Mathematics

Course Objective:

The course introduces fundamental concepts of electronics

Course Outcomes:

Students will be able to,

1. Identify semiconductor materials, draw band-diagrams, distinguish between intrinsic and extrinsic semiconductors.
2. Explain the phenomenon of rectification, draw the I-V characteristics and calculate ripple factor.
3. Explain the I-V characteristics of BJTs – both input and output; learn to bias transistors as an amplifier.
4. Describe FET and MOSFET and differentiate between BJT, FET and MOSFET.
5. Explain the fundamentals of feedback amplifiers and Operational Amplifier .
6. Demonstrate the knowledge of Boolean algebra including simplification techniques and operation of basic types of flip-flops.

Topics to Be Covered:

UNIT – I

[6 Hours]

Semiconductors: Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers.

UNIT – II

[6 Hours]

Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance. Linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

UNIT – III

[6 Hours]

Bipolar Junction Transistors: Formation of PNP / NPN junctions; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor

UNIT – IV

[6 Hours]

Field Effect Transistors: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles

UNIT – V

[6 Hours]

Feed Back Amplifier, and Operational Amplifiers: Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability. Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator

Digital Electronics Fundamentals: Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters.

List of Experiments:

1. To plot V-I characteristics of PN junction diode.
2. To plot regulation characteristics of half wave rectifier
3. To plot regulation characteristics of Full wave rectifier
4. To plot input-output characteristics of CE configuration of BJT.
5. To study Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias circuits.
6. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
7. To study Colpitts Oscillator.
8. Study of OP-AMP circuits: Inverting and Non-inverting Amplifier.
9. Study of basic logic gates and De-Morgan's Theorem.
10. Study of half adder and full adder.

List of Assignments: -

1. Describe applications of diodes as Clippers and Clampers.
2. Describe application of Zener diode as Voltage regulator.
3. Study of characteristic curves for CB configuration of BJT using Virtual Lab.
4. Simulation of BJT amplifier using Virtual Lab.
5. Design and Implementation of Various Arithmetic Circuits using Virtual Lab.
6. To design, built and test any electronic circuit (Group activity)

Text Books:

1. Sedra & Smith: Microelectronics Engineering
2. Millman & Halkias: Integrated Electronics

Reference Books:

1. Electronic Devices and Circuit Theory by Robert Boylestad
2. Solid State Electronic Devices by Streetman, Banerjee
3. Malvino: Electronic Principle

4. Schilling & Belove: Electronics Circuits
5. Millman & Grabal: Microelectronics
6. Salivahanan: Electronics Devices & Circuits
7. Boylestad & Nashelsky: Electronic Devices & Circuit Theory

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Business Communication & Value Science - II

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 2 Hrs/Week	Semester Examination: 50 marks	Theory: 3 Credits
Tutorials: 1 Hr/ Week	Continuous Assessment: Nil	
Lab: 2 Hrs/ Week	Term Work and Oral: 50 marks	TW and Oral :1 Credit

Course Pre-requisites:

1. Basic knowledge of the parts of speech in English.
2. Vocabulary covered in the previous semester along with basic knowledge of verbs & adverbs.
3. Basic awareness of the need of speaking skills within social circle.
4. The elements of team dynamics done during the previous semester with proper application.
5. Basic awareness of the concepts of feedback, criticism.
6. The various common conflicts that may arise at varied situations.

Course Objective:

The course aims to augment students overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The soft skills topics for this semester are intended to develop student's expertise on public speaking skills and to deal positively with criticism and so as to effectively present their personalities

Course Outcomes:

By the end of the course, students should be able to

1. Speak fluently in English without errors in the sentence construction and hence present themselves as effective English communicators. They will be able to learn 20-25 common errors made in parts of speech and also use 10 modal verbs efficiently during professional communication.
2. Differentiate between vocabulary used as adjectives, verbs and adverbs and be able to use the 60-70 words for their daily conversation.

3. Overcome the fear of speaking and will be aware of the 3 types of public speaking necessary according to the contemporary requirements. They would be able to deliver a public speech according to the need of the audience and also be aware of positive body language to be manifested during a speech.
4. Deal with the deeper parameters of working in teams like team motivation, multicultural team activity and team conflict resolution.
5. Analyze them relating to their hobbies and strengths and hence set realistic goals in terms of personal and professional growth. They will be able to identify at least 5-7 strengths and a couple of goals to be achieved that will enable their lives to be directed appropriately.
6. Apply 5-6 positive strategies to diversity and inclusion during team work.

Topics to Be Covered:

UNIT – I

[6 Hours]

Essential Grammar – II: Application of tenses, Auxiliaries- correct usage and importance in formal communication, Business Vocabulary - Vocabulary exercises through web-based applications

UNIT – II

[6 Hours]

Written Communication II: Email writing- Formal and Informal email writing structure, Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc. Technical writing, Essay writing, Paragraph writing.

UNIT – III

[6 Hours]

Vocabulary- II: Vocabulary exercises through web-based applications, Usage and application through mock meetings

Situational Conversation: Application of grammar and correct spoken English according to context/ situation and application in business scenario.

UNIT – IV

[6 Hours]

Fundamentals of Effective Communication: Public Speaking: fundamentals of effective public speaking, types- Extempore speech, manuscript speech, and ways to enhance public speaking skills, storytelling, oral review

Presentation Skills: PowerPoint presentations, Effective ways to structure the presentation, importance of body language

Leadership Skills, Leader’s Role, Responsibilities And Skill Required: Understanding good Leadership behaviors, Learning the difference between Leadership and Management, Gaining insight into your Patterns, Beliefs and Rules, Defining Qualities and Strengths of leadership, Determining how well you perceive what's going on around you, interpersonal Skills and Communication Skills, Learning about Commitment and How to Move Things Forward, Making Key Decisions, Handling Your and Other People's Stress, Empowering, Motivating and Inspiring Others, Leading by example, effective feedback.

Problem Solving Skill: Problem solving skill, Confidence building

UNIT – V

[6 Hours]

Corporate / Business Etiquettes: Corporate grooming & dressing, etiquettes in social & office Setting-Understand the importance of professional behavior at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities

UNIT – VI

[6 Hours]

Diversity and Inclusion Part II: Socio-Cultural and Cross-Cultural Sensitivities at the Workplace: PwD and LGBT at the workplace, Learning disabilities at the workplace; Caste, class, regionalism, religion and poverty: the different identities of Indian employees and employers and how to include everyone; Global diversity identities of race, religion, nationhood; Appropriate Social Media Use

Values Sciences Part II: Values of a good manager: Ethics in Business; Embodying organizational pride with grace

Text Books:

1. Business Communication Today by Bovee, Thill, Raina
2. APAART: Speak Well 1 (English Language and Communication)
3. APAART: Speak Well 2 (Soft Skills)

Reference Books:

1. Strategic Communication by Charles Marsh
2. English vocabulary in use – Alan Mc’Carthy and O’dell
3. Business Communication – Dr. Saroj Hiremath

Self Learning Module

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 0 Hrs/Week	Semester Examination: Nil	
Tutorials: 0 Hr. / Week	Continuous Assessment: Nil	
Lab: 2 Hrs/ Week	Term Work and Oral: 50 marks	TW and Oral :1 Credit

Students will be undertaking self-learning courses in consultation with the faculty member as per their choices.



Bharati Vidyapeeth

(Deemed to be University)

Pune, India

Faculty of Engineering and Technology

Programme: B.Tech (Computer Science and Business Systems)

COURSE STRUCTURE AND SYLLABUS

(Choice Based Credit System)

B.Tech (Computer Science and Business Systems)

2018 Course

Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune
B.Tech- Computer Science & Business Systems (Semester- III and IV)

Revised New Syllabus

Semester- III		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
2.1	Formal Language and Automata Theory	4	1	2	6	60	20	10	10	-	50	150	5	1	6
2.2	Computer Organization & Architecture	4	0	2	5	60	20	10	10	-	50	150	4	1	5
2.3	Object Oriented Programming	3	0	2	5	60	20	10	10	50	-	150	3	1	4
2.4	Computational Statistics	3	0	2	5	60	20	10	10	50	-	150	3	1	4
2.5	Software Engineering	4	1	2	6	60	20	10	10	50	-	150	5	1	6
2.6	Indian Constitution (Non Credit)												0	0	0
Total		18	2	10	27	300	100	50	50	150	100	750	20	5	25

Semester- IV		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
2.8	Operating Systems	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.9	Database Management Systems	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.10	Software Design with UML	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.11	Introduction to Innovation, IP Management & Entrepreneurship	4	0	0	3	60	20	10	10	-	-	100	3	0	3
2.12	Business Communication & Value Science – III	2	0	4	6	50	0	0	0	-	50	100	2	2	4
2.13	Operations Research	2	0	2	4	60	20	10	10	-	50	150	2	1	3
2.14	Essence of Indian Traditional Knowledge(Non Credit)									-	-	0			
Total		20	0	12	28	350	100	50	50	150	100	800	19	6	25

BHARATI VIDYAPEETH (Deemed to be University)
COLLEGE OF ENGINEERING, PUNE-43
B. Tech. (Computer Science & Business Systems)

Vision of the Department

“To syndicate industry and institute to impart high quality knowledge through scholarship, research and creative endeavor”

Mission of the Department

- To impart contemporary technology conforming to a dynamic curriculum.
- To engage in professional development and scholarly endeavor through knowledge of common business principles.
- To promote the awareness of business discipline and ethical responsibility through industry alliance

Programme Educational Objectives

1. Prevail technical competency to concord the industry engrossment.
2. Assimilate business management skills.
3. Instigate business level innovation with societal consideration.

Programme Outcomes

The students of B.Tech (Computer Science & Business Systems) will be able to

- a. Demonstrate logical and programming skills through comprehensive programming foundation.
- b. Apply knowledge of mathematics, computer engineering and basic science to comprehend and solve real world problems.
- c. Develop software applications and processes for complex problems to provide efficient solutions by assessing its environmental, social and ethical constraints.
- d. Investigate and solve complex computing problems with alternate solutions.
- e. Use functional skills of modern IT tools and techniques for engineering activities.
- f. Understand the social and cultural impact of computing on society.
- g. Provide optimized computational solutions that apprehend the societal and environmental aspects.
- h. exhibit the professional, ethical and legal responsibilities related to industry.
- i. Perform as an individual and efficient team player to accomplish a goal.
- j. Present professional concepts through effective communication skills and documentation.
- k. Demonstrate management skills for developing time-bound projects within the available budget and resources.
- l. Develop the ability of lifelong learning for new IT practices.

FORMAL LANGUAGE & AUTOMATA THEORY

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	
Lab: Nil	Term Work: Nil	

Course Pre Requisites:

The students should have basic Knowledge Set algebra, elementary formal logic, constructing proofs, recurrence relations, Discrete Structures and Data structures and problem solving.

Course Objective:

1. To understand problem classification and problem solving by machines.
2. To understand the basics of automata theory and its operations.
3. To study computing machines by describing, classifying and comparing different types of computational models.
4. Encourage students to study theory of computability and complexity.
5. To understand the P and NP class problems and its classification.
6. To understand the fundamentals of problem decidability and reducibility.

Course Outcomes:

- 1) To construct finite state machines to solve problems in computing.
- 2) To write mathematical expressions for the formal languages.
- 3) To understand context free and context sensitive languages.
- 4) To construct Turing Machine for formal languages.
- 5) To express the understanding of the decidability and undecidability problems.
- 6) To understand NP Hard and complete problems.

Topics to Be Covered:

UNIT – I

[6 Hours]

Introduction: Alphabet, Strings and languages, Graphs, Directed Graphs, Trees.

UNIT – II

[6 Hours]

Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, *Kleene's theorem*, pumping lemma for regular languages, *Myhill-Nerode theorem and its uses*, minimization of finite automata.

UNIT – III

[6 Hours]

Context-free languages and pushdown automata: Productions and Derivation, Context-free grammars (CFG) and languages (CFL), Chomsky hierarchy of languages, Chomsky Normal Forms and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

UNIT – IV

[6 Hours]

Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

UNIT – V

[6 Hours]

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages.

UNIT – VI

[6 Hours]

Basic Introduction to Complexity: Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines, P and NP, NP-completeness, Cook's Theorem, other NP-Complete problems.

Reference Books:

Text Books:

1. *Introduction to Automata Theory, Languages, and Computation* John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman.

Reference Books:

1. *Elements of the Theory of Computation*, Harry R. Lewis and Christos H. Papadimitriou.
2. *Automata and Computability*, Dexter C. Kozen.
3. *Introduction to the Theory of Computation*, Michael Sipser.
4. *Introduction to Languages and the Theory of Computation*, John Martin.
5. *Computers and Intractability: A Guide to the Theory of NP Completeness*, M. R. Garey and D. S. Johnson.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Syllabus of Semester III

Computer Organization & Architecture

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	Theory: 4 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	TW and Oral :1 Credit

Course Pre-Requisites:

The students should have basic Knowledge Digital electronics and computer system

Course Objective:

To understand the design of the various functional units of computer system.

Course Outcomes:

After completion of this course students will be able to

- 1) Explain the architecture and functions of Central Processing Unit.
- 2) Solve fixed point and floating-point arithmetic problems using algorithms
- 3) List the design approaches and functional requirements for implementing control unit.
- 4) Analyze the characteristics of memory system.
- 5) Describe the I/O organization and interconnections.
- 6) Infer parallel processing and multiprocessor configuration.

Topics to Be Covered:

UNIT – I

[8 Hours]

Revision of basics in Boolean logic and Combinational/Sequential Circuits.

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.

Introduction to x86 architecture

Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

UNIT – II

[8 Hours]

Data representation: Signed number representation, fixed and floating point representations, character representation.

Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

UNIT III

[8 Hours]

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

UNIT – IV

[8 Hours]

Memory system design: Semiconductor memory technologies, memory organization.

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

UNIT – V

[4 Hours]

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCSI, USB

UNIT – VI

[4 Hours]

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Home Assignments: Assignments covering the following topics should be given

1. Booth's algorithm for multiplication
2. Restoring and non-restoring division
3. Fixed point and floating point representation

4. Programmer's model of 80386
5. Hardwired and micro-programmed design approaches.
6. Characteristics of Memory system
7. Cache organization and address mapping
8. Virtual memory and replacement algorithms
9. Calculating throughput and speed in pipelining
10. Multiprocessor architecture

Text Books:

1. Computer System Architecture M. M. Mano., 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
3. Computer Organization and Embedded Systems, Carl Hamacher.

Reference Books:

1. Computer Architecture and Organization, John P. Hayes.
2. Computer Organization and Architecture: Designing for Performance, William Stallings

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

B.Tech (Computer Science & Business Systems)

Semester – III

OBJECT ORIENTED PROGRAMMING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 3 Credits
Practical: 2 Hrs/Week	Continuous Assessment: 40 marks	
	Term Work and Practical: 50 marks	Term Work and Practical: 1 Credit

Course Pre Requisites:

The students should have basic Knowledge of “C” programming language.

Course Objective:

The course introduces fundamental concepts of Object oriented programming.

Course Outcomes:

At the end of this course students will able to:

- 1) Understand basic concepts of Procedural programming and, the overview of C programming language
- 2) Understand some basic difference between C and C++.
- 3) Understand basic concepts of Object Oriented Programming, classes and objects in OOP.
- 4) Apply the concept of Access Specifier, friend function, constructor, destructor and Error Handling using C++ programs
- 5) Implement the concept of polymorphism, virtual functions and inheritance using C++
- 6) Develop OOP applications using Templates and file Handling.

Topics to Be Covered:

UNIT-I

[6 Hours]

Procedural programming, An Overview of C: Types Operator and Expressions, Scope and Lifetime, Constants, Pointers, Arrays, and References, Control Flow, Functions and Program Structure, Namespaces, error handling, Input and Output (C-way), Library Functions (string, math, stdlib), Command line arguments, Pre-processor directive

UNIT-II

[6 Hours]

Some difference between C and C++: Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable, parameter passing – value vs reference, passing pointer by value or reference, #define

constant vs const, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments

UNIT-III

[6 Hours]

The Fundamentals of Object Oriented Programming: Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object.

UNIT-IV

[6 Hours]

More extensions to C in C++ to provide OOP Facilities: Scope of Class and Scope Resolution Operator, Member Function of a Class, private, protected and public Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception)

UNIT-V

[6 Hours]

Essentials of Object Oriented Programming: overloading, Inheritance – Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling

UNIT-VI

[6 Hours]

Generic Programming: Template concept, class template, function template, template specialization

Input and Output: Streams, Files, Library functions, formatted output

Object Oriented Design and Modelling: UML concept, Use case for requirement capturing, Class diagram, Activity diagram and Sequence Diagram for design, Corresponding C++ code from design

Text Books:

1. The C++ Programming Language, Bjarne Stroustrup.
2. C++ and Object-Oriented Programming Paradigm, Debasish Jana

Reference Books:

1. Programming – Principles and Practice Using C++, Bjarne Stroustrup.
2. The Design and Evolution of C++, Bjarne Stroustrup.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

B.Tech in Computer Science & Business Systems

Final Syllabus, Semester – III

Computational Statistics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
Practical: 04 Hours / Week	Continuous Assessment: 40 Marks	TW and Practical :1 Credit
	Term Work and Practical: 50 Marks	

Course Pre-requisites: The Students should have knowledge of basics of statistics.

Course Objectives:

The aim of this course is to give graduate students a solid foundation of computational statistics, basics of analysis and Python programming. The course objective is to exercise students for data set handling, data wrangling, data visualization etc. using Python.

Course Outcomes:

- Understand basics of normal distribution and linear regression model.
- Apply knowledge of multivariate regression and discriminant analysis.
- Outline component analysis and factor analysis.
- Design various clusters
- Understand and demonstrate fundamentals of Python programming.
- Demonstrate visualization in Python

Topics to Be Covered:

UNIT – I

[8 Hours]

Multivariate Normal Distribution: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

Multiple Linear Regression Model: Standard multiple regression models with emphasis on detection of collinearity, outliers, non-normality and autocorrelation, Validation of model assumptions.

UNIT – II

[5 Hours]

Multivariate Regression: Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance and covariance.

Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

UNIT III

[7 Hours]

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

Factor Analysis: Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

UNIT – IV

[5 Hours]

Clustering and Segmentation Analysis: Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering-Profiling and Interpreting Clusters.

UNIT – V

[6 Hours]

Python Concepts, Data Structures, Classes: Interpreter, Program Execution, Statements, Expressions, Flow Controls, Functions, Numeric Types, Sequences and Class Definition, Constructors, Text & Binary Files - Reading and Writing.

Data Wrangling: Combining and Merging Datasets, Reshaping and Pivoting, Data Transformation, String Manipulation, Regular Expressions

UNIT – VI

[6 Hours]

Data Aggregation, Group Operations, Time series: GroupBy Mechanics, Data Aggregation, Groupwise Operations and Transformations, Pivot Tables and Cross Tabulations, Time Series Basics, Data Ranges, Frequencies and Shifting

Visualization in Python: Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values, Patches.

Term Work

1. Introduction to python programming (String operation, Mathematical operation, loops, branching).
2. Implementation of classes and constructor in Python.
3. Implementation of basic data structures in Python.
4. File Handling in the Python.
5. Introduction to data set handling in Python.
6. Implement various pre-defined libraries in Python like Panda, NumPy, Cbor (Drawing of statistical graph).
7. Implementation Multivariate Normal Distribution.
8. Implementation Multiple Linear Regression Model
9. Implementation Multivariate Regression
10. Implementation Discriminant Analysis
11. Implementation clustering and segmentation
12. Implementation of data wrangling, data aggregation, group operations and time series operations.
13. Data Visualization in Python.

Text Books:

1. *An Introduction to Multivariate Statistical Analysis*, T.W. Anderson.
2. *Applied Multivariate Data Analysis, Vol I & II*, J.D. Jobson.
3. *Beginning Python: From Novice to Professional*, Magnus Lie Hetland. Edition, 2005.

Reference Books:

1. *The Foundations of Factor Analysis*, A.S. Mulaik.
2. *Introduction to Linear Regression Analysis*, D.C. Montgomery and E.A. Peck.
3. *Python for Data Analysis*, Wes Mc Kinney.
4. *Programming Python*, Mark Lutz.
5. *Python 3 for Absolute Beginners*, Tim Hall and J-P Stacey.

SOFTWARE ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4Hrs./Week	Semester Examination: 60 marks	Theory: 5 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
Lab: 2Hrs./Week	Term Work and Practical: 50	

Course Pre Requisites:

The students should have sound knowledge of data structures, programming experience and an extensive hands-on experience of using software.

Course Objective:

The course introduces key aspects of software engineering processes for the development of a complex software system.

Course Outcomes:

1. Learn importance of software engineering process and its principles
2. Understand the software development life cycle with appropriate models
3. Understand software quality concepts
4. Document user requirements using suitable techniques
5. Analyze the software design from and Object Oriented perspective.
6. Apply appropriate testing techniques on a software

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction: Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; engineering approach to software development; role of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline.

UNIT – II [6 Hours]

Software Project Management: Basic concepts of life cycle models – different models and milestones; software project planning –identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

UNIT – III [6 Hours]

Software Quality and Reliability: Internal and external qualities; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126; introduction to Capability Maturity Models (CMM and CMMI); introduction to software reliability, reliability models and estimation.

UNIT – IV [6 Hours]

Software Requirements Analysis, Design and Construction: Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics based control methods; measures of code and design quality.

UNIT – V [6 Hours]

Object Oriented Analysis, Design and Construction: Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object oriented construction principles; object oriented metrics.

UNIT – VI [6 Hours]

Software Testing: Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction based testing; testing for non-functional requirements – volume, performance and efficiency; concepts of inspection.

Home Assignments:

1. UML diagrams
2. Data Flow Diagrams
3. Testing
4. Software project covering various software development methodology techniques will be implemented.

Text Books:

1. *Software Engineering*, Ian Sommerville
2. *Object Oriented Software Engineering: A Use Case Driven Approach* --Ivar Jacobson

Reference Books:

3. *Fundamentals of Software Engineering*, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino

4. *Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices*, Michael Jackson
5. *The Unified Development Process*, Ivar Jacobson, Grady Booch, James Rumbaugh
6. *Design Patterns: Elements of Object-Oriented Reusable Software*, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides
7. *Software Metrics: A Rigorous and Practical Approach*, Norman E Fenton, Shari Lawrence Pfleeger

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

OPERATING SYSTEM

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 0Hr./Week	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
Lab: 2Hrs./Week	Term Work and Practical: 50	

Course Pre Requisites:

Prerequisites for this course include thorough knowledge in some high-level programming language of C or C++ and UNIX and Linux as programs are to be implemented by writing C code during the course and will cover the details of C and its close relationship to UNIX and Linux in the case study in 6th unit.

Course Objective:

1. To learn the basic concepts of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. To learn the methods of process scheduling.
4. To gain knowledge on Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
5. To know the management aspects of memory management and virtual memory
6. To learn programmatically file management techniques

Course Outcomes:

1. To learn the evolution of operating system.
2. To Understand the concept of process and process state transition and thread and concept of multithreading.
3. Understand the importance of scheduling and types of scheduling algorithms.
4. To understand the inter process communication strategies, concept of deadlock and criteria of deadlock occurrence along with its avoidance
5. To understand the memory management techniques, paging and segmentation.
6. To understand the file management and disk management techniques

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction: Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.

UNIT – II [6 Hours]

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT – III [6 Hours]

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT – IV [6 Hours]

Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Barber's shop problem.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Concurrent Programming: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

UNIT – V [6 Hours]

Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT – VI [6 Hours]

I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

Case study: UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

Home Assignments:

1. To implement scheduling algorithms
2. To implement resource allocation graph
3. To implement Banker's Algorithm
4. To implement the shell programming in UNIX OS

Text Books:

1. Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne.

Reference Books:

1. *Operating Systems: Internals and Design Principles*. William Stallings.
2. *Operating System: A Design-oriented Approach*. Charles Patrick Crowley.
3. *Operating Systems: A Modern Perspective*. Gary J. Nutt.
4. *Design of the Unix Operating Systems*. Maurice J. Bach.
5. *Understanding the Linux Kernel*, Daniel Pierre Bovet, Marco Cesati.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Database Management Systems

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: NIL	Continuous Assessment: 40 marks	Term Work and Practical : 1 credit
Lab: 2 Hrs./Week	Term Work and Practical: 50	

Course Objectives:

- 1) Identify various techniques to communicate with database.
- 2) Relate relevant data for effective processing of data.
- 3) Construct a database to maintain data adroitly.
- 4) Study various queries and tools to deal with the data.
- 5) Understand the relation between data set and respective means to access it.
- 6) Understand influence of data in the effective development of software.

Course Prerequisites:

Students should have knowledge of

- 1) Basic understanding of data and data structure
- 2) Basic understanding of programming language

Course Outcomes:

1. Model an application's data requirements using conceptual modeling tools
2. Demonstrate concepts of relational algebra and queries
3. Demonstrate concepts of relational database design
4. Interpret the query processing and optimization activities in database
5. Interpret the transaction activities in database
6. Recognize the emerging database applications and security concerns

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction: Introduction to Database. Hierarchical, Network and Relational Models.

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

UNIT – II[6 Hours]

Relational query languages: Relational algebra, Tuple and domain relational calculus,SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL,ORACLE, DB2, SQL server.

UNIT – III [6 Hours]

Relational database design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design.

UNIT – IV [6 Hours]

Query processing and optimization: Evaluation of relational algebra expressions, Queryequivalence, Join strategies, Query optimization algorithms.

Storage strategies: Indices, B-trees, Hashing.

UNIT – V [6 Hours]

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

UNIT – VI [6 Hours]

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Advanced topics: Object oriented and object relational databases, Logical databases, Webdatabases, Distributed databases, Data warehousing and data mining.

Assignments:

Assignments & tutorials covering the relational database design and operations in SQL and PL/SQL

Text Books:

1. Database System Concepts. Abraham Silberschatz, Henry F. Korth and S. Sudarshan.

Reference Books:

1. *Principles of Database and Knowledge – Base Systems*, Vol 1 by J. D. Ullman.
2. *Fundamentals of Database Systems*. R. Elmasri and S. Navathe.
3. *Foundations of Databases*. Serge Abiteboul, Richard Hull, VictorVianu.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Software Design with UML

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Lab: 2Hrs./Week	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
	Term Work and Practical: 50	

Course Pre Requisites:

The students should have sound knowledge software engineering and programming experience using data structures.

Course Objective:

To model software solutions, application structures, system behavior and business processes using .

Course Outcomes:

7. Apply Unified Modeling Language (UML) for representation of an object-oriented system using different modeling views
8. Analyze requirements to represent logical design that is recognized by various object relationships.
9. Identify interaction among structural elements to translate analysis model into design model.
10. Model dependencies among packages and package element ownership
11. Model dynamic behavior of the system and message flow from one object to other.
12. Envision the topology of the physical components of a system where the software components are utilized

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction to on Object Oriented Technologies and the UML Method: Software development process: The Waterfall Model vs. The Spiral Model; The Software Crisis, description of the real world using the Objects Model; Classes, inheritance and multiple configurations; Quality software characteristics; Description of the Object Oriented Analysis process vs. the Structure Analysis Model. **UML Language:** Standards; Elements of the language; General description of various models; The process of Object Oriented software development; Description of Design Patterns; Technological Description of Distributed Systems.

UNIT – II [6 Hours]

Requirements Analysis Using Case Modeling AND The Logical View Design: Analysis of system requirements; Actor definitions; Writing a case goal; Use Case Diagrams; Use Case Relationships. **The Static Structure Diagrams:** The Class Diagram Model; Attributes descriptions; Operations descriptions; Connections descriptions in the Static Model; Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.

UNIT – III [6 Hours]

Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams: Description of goal; Defining UML Method, Operation, Object Interface, Class; Sequence Diagram; Finding objects from Flow of Events; Describing the process of finding objects using a Sequence Diagram; Describing the process of finding objects using a Collaboration Diagram

UNIT – IV [6 Hours]

Package Diagram Model: Description of the model; White box, black box; Connections between packages; Interfaces. ; Create Package Diagram; Drill Down.

UNIT – V [6 Hours]

Dynamic Model: State Diagram / Activity Diagram: Description of the State Diagram; Events Handling; Description of the Activity Diagram; Exercise in State Machines.

UNIT – VI [6 Hours]

Component Diagram Model: Physical Aspect; Logical Aspect; Connections and Dependencies; User face; Initial DB design in a UML environment. **Deployment Model:** Processors; Connections; Components; Tasks; Threads; Signals and Events.

Home Assignments:

5. Study of UML notations
6. Class diagram
7. Interaction diagrams
8. Activity diagram
9. State diagram
10. Software project covering various software development methodology techniques will be implemented.

Text Books:

1. Object-Oriented Software Engineering: using UML, Patterns, and Java. Bernd Bruegge and Allen H. Dutoit.

Reference Books:

1. Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Introduction to Innovation, IP Management & Entrepreneurship

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 5 Credits
Tutorials: 0Hr./Week	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
Lab: 0Hrs./Week	Term Work and Practical: 00	

Course Pre Requisites:

Good knowledge of Fundamentals of Management (Covered in Year 2, Semester 1)

Course Objective:

The major emphasis of the course will be on creating a learning system through which management students can enhance their innovation and creative thinking skills, acquaint themselves with the special challenges of starting new ventures and use IPR as an effective tool to protect their innovations and intangible assets from exploitation.

Course Outcomes:

As a part of this course, students will:

- Learn to be familiar with creative and innovative thinking styles.
- Learn opportunity reorganization and entrepreneurship skills.
- Learn to investigate, understand and internalize the process of founding a startup.
- Understand financial aspects of Entrepreneurship.
- Learn to manage various types of IPR to protect competitive advantage.
- Understand the types of IP.

Topics to Be Covered:

UNIT – I [6 Hours]

Innovation: What and Why?

Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations.

Class Discussion- Is innovation manageable or just a random gambling activity?

UNIT – II [6 Hours]

Building an Innovative Organization

Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture

Class Discussion- Innovation: Co-operating across networks vs. 'go-it-alone' approach

UNIT – III [6 Hours]

Entrepreneurship:

- Opportunity recognition and entry strategies
- Entrepreneurship as a Style of Management
- Maintaining Competitive Advantage- Use of IPR to protect Innovation

UNIT – IV [6 Hours]

Entrepreneurship- Financial Planning:

- Financial Projections and Valuation
- Stages of financing
- Debt, Venture Capital and other forms of Financing

UNIT – V [6 Hours]

Intellectual Property Rights (IPR)

- Introduction and the economics behind development of IPR: Business Perspective
- IPR in India – Genesis and Development
- International Context
- Concept of IP Management, Use in marketing

UNIT – VI [6 Hours]

Types of Intellectual Property

- Patent- Procedure, Licensing and Assignment, Infringement and Penalty
- Trademark- Use in marketing, example of trademarks- Domain name
- Geographical Indications- What is GI, Why protect them?

- Copyright- What is copyright
- Industrial Designs- What is design? How to protect?

Class Discussion- Major Court battles regarding violation of patents between corporate companies.

Home Assignments:

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

Topic 1- Is innovation manageable or just a random gambling activity?

Topic 2- Innovation: Co-operating across networks vs. ‘go-it-alone’ approach.

Topic 3- Major Court battles regarding violation of patents between corporate companies.

Text Books:

1. Joe Tidd, John Bessant. *Managing Innovation: Integrating Technological, Market and Organizational Change*
2. Case Study Materials: To be distributed for class discussion

Syllabus for Unit Test:	Unit
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Business Communication and Value Science-III

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 2Hrs./Week	Semester Examination: 50 marks	Theory: Credits 02
Tutorials: 0 Hr./Week	Continuous Assessment: No	Term Work Credit: 02
Lab: 4 Hrs./Week	Term Work and Oral: 50	

Course Pre Requisites:

Good knowledge of Business Communication and Value Science (Covered Semester 1 and 2) Basic Knowledge of English (verbal and written) Completion of all units from Semesters 1 and 2

Course Objective:

Develop technical writing skills; introduce students to Self-analysis techniques like SWOT & TOWS and develop the sense of Pluralism & cultural spaces, Cross-cultural communication, Science of Nation building.

Course Outcomes:

Upon completion of the course, students shall have ability to

Apply & analyze the basic principles of SWOT & life positions.

Understand, analyze & leverage the power of motivation in real life.

Identify & respect pluralism in cultural spaces.

Understand and apply the concepts of Global, glocal and translocational

Analyze cross cultural communication

Apply the science of Nation building, the diverse culture of India

Identify the common mistakes made in cross-cultural communication, tools of technical writing, recognize the roles and relations of different genders.

Understand Artificial intelligence & recognize its impact in daily life

Topics to Be Covered:

UNIT – I

[6 Hours]

SWOT and Life Positions:

Summarize the basic principles of SWOT and Life Positions; apply SWOT in real life scenarios. TOWS analysis, research on TOWS and find out how you can turn your threat into opportunity

UNIT – II

[6 Hours]

SWOT and TOWS:

Research through SWOT and TOWS on what are the strengths they have identified to survive in the VUCA World, Motivation: its role and application in real life.

UNIT – III

[6 Hours]

Pluralism in cultural spaces:

Identify pluralism in cultural spaces, Respect pluralism in cultural spaces, Differentiate between the different cultures of India,

UNIT – IV

[6 Hours]

Cross cultural communication

Define the terms global, glocal and translocational, Differentiate between global, glocal and translocational culture, implications of cross-cultural communication, common mistakes made in cross-cultural communication, roles and relations of different genders

UNIT – V

[6 Hours]

Nation Building:

Role of science in nation building, tools and best practices of technical writing, technical writing in real-life scenarios

UNIT – VI

[6 Hours]

Roles of technical writing in science and technology:

AI (artificial intelligence), the importance of AI, Designing College in the year 2090 with help of technical writing and technology, role of technical writing in science and technology, IOT

Text Books:

1. Swot Analysis: A Guide to Swot for Business Studies Students by [Alan Sarsby](#)
2. The SWOT Analysis: Using Your Strength to Overcome Weaknesses, Using Opportunities to Overcome Threats by [Lawrence G. Fine](#)
3. Cross-Cultural and Intercultural Communication by [William B. Gudykunst](#)

Operations Research

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 2Hrs./Week	Semester Examination: 60 marks	Theory: 2 Credits
Tutorials: 0Hr./Week	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
Lab: 2Hrs./Week	Term Work and Practical: 50	

Course Pre Requisites:

Good knowledge of mathematics (Covered in Year 1,2)

Course Objective:

Course Outcomes:

As a part of this course, students will:

- Understand OR problem and associated models.
- Understand Linear Algebra.
- Use transportation and assignment problems.
- Use PERT for modeling.
- Use Inventory Control System.
- Apply queuing theory and modulation techniques.

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction to OR:

Origin of OR and its definition. Concept of optimizing performance measure, Types of OR problems, Deterministic vs. Stochastic optimization, Phases of OR problem approach – problem formulation, building mathematical model, deriving solutions, validating model, controlling and implementing solution.

UNIT – II [6 Hours]

Linear Programming:

Linear programming – Examples from industrial cases, formulation & definitions, Matrix form. Implicit assumptions of LPP.

Some basic concepts and results of linear algebra – Vectors, Matrices, Linear Independence / Dependence of vectors, Rank, Basis, System of linear eqns., Hyperplane, Convex set, Convex polyhedron, Extreme points, Basic feasible solutions.

Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy & degeneracy, Sensitivity analysis.

Simplex Algorithm – slack, surplus & artificial variables, computational details, big-M method, identification and resolution of special cases through simplex iterations.

Duality – formulation, results, fundamental theorem of duality, dual-simplex and primal-dual algorithms.

UNIT – III [6 Hours]

Transportation and Assignment problems:

TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations, Solution methods – NWCR, minimum cost and VAM, test for optimality (MODI method), degeneracy and its resolution.

AP - Examples, Definitions – decision variables, constraints, formulation, Balanced & unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

UNIT – IV [6 Hours]

PERT – CPM:

Project definition, Project scheduling techniques – Gantt chart, PERT & CPM, Determination of critical paths, Estimation of Project time and its variance in PERT using statistical principles, Concept of project crashing/time-cost trade-off.

UNIT – V [6 Hours]

Inventory Control:

Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics of inventory policy (order, lead time, types), Fixed order-quantity models – EOQ, POQ & Quantity discount models. EOQ models for discrete units, sensitivity analysis and Robustness, Special cases of EOQ models for safety stock with known / unknown stock out situations, models under prescribed policy, Probabilistic situations.

UNIT – VI [6 Hours]

Queuing Theory:

Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queuing system, queue types (channel vs. phase).

Kendall's notation, Little's law, steady state behavior, Poisson's Process & queue, Models with examples - M/M/1 and its performance measures; M/M/m and its performance measures; brief description about some special models.

Simulation Methodology:

Definition and steps of simulation, random number, random number generator, Discrete Event System Simulation – clock, event list, Application in Scheduling, Queuing systems and Inventory systems.

Text Books:

3. *Operations Research: An Introduction.* H.A. Taha.

Reference Books:

1. *Linear Programming.* K.G. Murthy.
2. *Linear Programming.* G. Hadley.
3. *Principles of OR with Application to Managerial Decisions.* H.M. Wagner.
4. *Introduction to Operations Research.* F.S. Hiller and G.J. Lieberman.
5. *Elements of Queuing Theory.* Thomas L. Saaty.
6. *Operations Research and Management Science, Handbook:* Edited By A. Ravi Ravindran.
7. *Management Guide to PERT/CPM.* Wiest & Levy.
8. *Modern Inventory Management.* J.W. Prichard and R.H. Eagle.

Syllabus for Unit Test:	Unit
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Essence of Indian Traditional Knowledge

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 2Hrs./Week	Semester Examination: 50 marks	Theory: Non-Credits

Course Objective: Give exposure to the repositories of our indigenous knowledge and wisdom which have evolved over centuries, and they still continue to serve social and cultural functions.

Course Outcomes: Student will be able to

1. Understand basic principles, thought process, reasoning and inference of Indian Traditional Knowledge Systems.
2. Recognize wisdom of Sanskrit literature and its importance in modern society with rapid technological advancements.
3. Be familiar with scientific worldview and basic principles of Yoga and holistic health care system
4. Understand that sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.

Topics to Be Covered:

UNIT – I [6 Hours]

Basic Structure of Indian Knowledge System: The historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), Traditional Knowledge (TK) Vs western knowledge traditional knowledge vis-à-vis formal knowledge. Significance of TK Protection, value of TK in global economy, Role of Government to harness TK. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act).

UNIT – II [6 Hours]

Modern Science and Indian Knowledge System; Mathematics in India, Early Historical Period, The Classical Period, The Classical Period, post-Āryabhaṭa, Features of Indian Mathematics. Early Chemical Techniques, Atomism in Vaiśeṣika, Chemistry in Early Literature, Indian Philosophy Sāṃkhya, Yoga, Vaiśeṣika, Nyāya, Mīmāṃsā, Vedānta, Sāṃkhya.

UNIT – III [6 Hours]

Yoga and Holistic Health care: Ayurveda for Life, Health and Well-being ,Definition of Ayurveda, The Principles of Ayurvedic Healing, Treating diseases to restore health, Astanga Ayurveda.

Reference Books:

1. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014.

2. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino
4. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016

E-Resources:

1. <https://www.youtube.com/watch?v=LZP1StpYEPM>
2. <http://nptel.ac.in/courses/121106003/>

Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune
B.Tech- Computer Science & Business Systems (Semester- V and VI)
Revised New Syllabus Structure

Semester- V		Teaching Scheme				Examination Scheme-Marks							Credit		
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
						Unit Test	Attendance	Assignments							
3.1	Design And Analysis of Algorithms	3	0	2	5	60	20	10	10	50	--	150	3	1	4
3.2	Compiler Design	3	0	2	5	60	20	10	10	50	--	150	3	1	4
3.3	Fundamentals of Management	4	0	0	4	60	20	10	10	--	--	100	4	0	4
3.4	Business Strategy	3	0	0	3	60	20	10	10	--	--	100	3	0	3
3.5	Design Thinking	3	0	2	5	60	20	10	10	--	50	150	3	1	4
3.6	Elective I	3	1	2	6	60	20	10	10	--	50	150	4	1	5
3.7	Mini Project	0	0	2	2	50	--	--	--	--	50	50	0	1	1
Total		19	1	10	30	410	120	60	60	100	150	850	20	5	25
Elective I		Conversational Systems													
		Cloud, Microservices & Application													
		Machine Learning													

Semester- VI		Teaching Scheme				Examination Scheme-Marks							Credit		
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
						Unit Test	Attendance	Assignments							
3.8	Computer Networks	3	0	2	5	60	20	10	10	50	--	150	3	1	4
3.9	Information Security	3	0	2	5	60	20	10	10	--	50	150	3	1	4
3.10	Artificial Intelligence	3	0	2	5	60	20	10	10	50	--	150	3	1	4
3.11	Financial & Cost Accounting	4	0	0	4	60	20	10	10	--	--	100	4	0	4
3.12	Business Communication & Value Science – IV	3	0	2	5	50	0	0	0	-	50	100	3	1	4
3.13	Elective II	3	1	2	6	60	20	10	10	--	50	150	4	1	5
Total		19	1	10	30	350	100	50	50	100	150	800	20	5	25

Elective II	Robotics and Embedded Systems
	Modern Web Applications
	Data Mining and Analytics

DESIGN AND ANALYSIS OF ALGORITHMS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs./Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: NA	Continuous Assessment: 40 marks	Term Work and Practical Credit: 1
Lab: 2 Hrs./Week	Term Work and Practical: 50	

Course Pre Requisites: Students should be well versed with algorithms and operations on basic data structures stacks, queues, linked lists, trees, graphs. Students should have knowledge of searching sorting algorithms.

Course Objective: Understand and compare important algorithmic design paradigms and methods of analysis. To choose and extend efficient algorithms required for designs.

Course Outcomes:

After successful completion of this course students will be able to :

1. Interpret the performance of algorithms using analysis techniques.
2. Examine the fundamental algorithmic strategies.
3. Compare the fundamental algorithmic strategies.
4. Implement Graphs and trees algorithms.
5. Interpret the tractable or intractable problem.
6. Summarize the advance types of algorithms.

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction: Characteristics of Algorithm. Analysis of Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior; Performance Measurements of Algorithm, Time and Space Trade-Offs, Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

UNIT – II [6 Hours]

Fundamental Algorithmic Strategies: Brute-Force technique, Heuristics, Greedy algorithms, , Illustrations of these techniques for Problem-Solving

UNIT – III [6 Hours]

Fundamental Algorithmic Strategies (contd.) : Dynamic Programming, Branch and Bound algorithms, Backtracking methodologies; Illustrations of these techniques for Problem-Solving

UNIT – IV [6 Hours]

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT – V [6 Hours]

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook’s theorem, Standard NP-complete problems and Reduction techniques.

UNIT – VI [6 Hours]

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE, Introduction to Quantum Algorithms.

Home Assignments:

Implementation of Different Algorithms based on various algorithmic strategies studied above using C

Text Books:

1. *Fundamental of Computer Algorithms*, E. Horowitz and S. Sahni, Orient Black Swan
2. *Introduction to Algorithms*, T. H. Cormen, C. E. Leiserson and R. L. Rivest, PHI Learning Pvt. Ltd. (Originally MIT Press)

Reference Books:

1. *The Design and Analysis of Computer Algorithms*, A. Aho, J. Hopcroft and J. Ullman, Pearson Education India
2. *Computer Algorithms: Introduction to Design and Analysis*, S. Baase, Pearson Education India
3. *The Art of Computer Programming, Vol. 1, Vol. 2 and Vol. 3*, .D. E. Knuth, Addison Wesley

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Compiler Design

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Oral credit: 1
Lab: 2Hrs./Week	Term Work and Oral: 50	

Course Pre Requisites:

1. The students should have learnt Theory of Computation.
2. Basic of the structure of any Programming Language and Grammars.
3. Know the basics of Computer organization and Assembly Language Programming.

Course Objective:

1. To study the Compiler Design Tools.
2. To understand the Compiler for various Programming Languages.

Course Outcomes:

1. Understands compiler and various phases in compilation.
2. Understand Parser and its various techniques.
3. Understands Syntax Directed Translation, Symbol Tables and their applications.
4. Learn the techniques of Code Optimization.
5. Learn the techniques of Code improvement.
6. Understands compilation of Object Oriented features.

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction: Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, relating regular expressions and finite automata, scanner generator (lex, flex).

UNIT – II [6 Hours]

Syntax Analysis (Top down Parser): Context-free languages and grammars, push-down automata, Elimination of Left recursion, Elimination of Left factoring, Top down parsing, FIRST and FOLLOW, Non-Recursive Predictive Parsing, LL(1) grammars .

UNIT – III [6 Hours]

Syntax Analysis (Bottom Up Parser): Operator grammars, Bottom-up parsing, Shift Reduce Parser, LR(O), SLR(1), LR(1), CLR,LALR(1) grammars, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)

UNIT – IV [6 Hours]

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

Symbol Table: Basic structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, scope.

. UNIT – V [6 Hours]

Intermediate Code Generation: Translation of different language features, different types of intermediate forms

Code Improvement (optimization): Control-flow, data-flow dependence etc.; local optimization, global optimization, loop optimization, peep-hole optimization etc.

UNIT – VI [6 Hours]

Architecture dependent code improvement: Instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation.

Advanced topics: Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

Home Assignments:

Assignments using Lex and Yacc

Text Books:

1. Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. Ullman.
2. Lex & Yacc, Levine R. John, Tony Mason and Doug Brown

Reference Books:

The Design and Evolution of C++, Bjarne Stroustrup.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

FUNDAMENTALS OF MANAGEMENT

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hrs/Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: NIL	Continuous Assessment: 40 marks	Term Work and Practical Credit: NIL
Lab: NIL	Term Work and Practical: Nil	

Course Pre Requisites: Preliminary awareness about the functioning of any organization

Course Objective:

1. To impart knowledge about various management and organization principles which governs the functioning of a firm/organization
2. To explain about concepts of leadership, organizational design, organization behavior and managerial ethics.

Course Outcomes: After completion of course, students should be able to

1. Understand the evolution of management
2. Explain intricacies of different functions of management.
3. Categorize behavior of individuals in an organization
4. Distinguish between approaches to organizational design.
5. Analyze importance and types of work ethics
6. Identify importance and traits of leadership

Topics to Be Covered:

UNIT – I [6 Hours]

Management Theories: Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical management Era (1880-1930), Neo-classical Management Era (1930-1950), Modern Management era (1950-on word). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc.

UNIT – II [6 Hours]

Functions of Management- Planning, Organizing, Staffing, Directing, Controlling

UNIT – III [6 Hours]

Organization Behavior: Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing Cultural Diversity

UNIT – IV [6 Hours]

Organizational Design: Classical, Neoclassical and Contingency approaches to organizational design; Organizational theory and design, Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure)

UNIT – V [6 Hours]

Managerial Ethics: Ethics and Business, Ethics of Marketing & advertising, Ethics of Finance & Accounting, Decision – making frameworks, Business and Social Responsibility, International Standards, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility

UNIT – VI [6 Hours]

Leadership: Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid.

Home Assignments: The topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Corporate social responsibility (CSR) and HRM implications: What does it mean to be socially responsible within an increasingly financially driven market economy?
2. Topic: Leaders are Born, Not Made! The debate

Text Books: Richard L. Daft, *Understanding the Theory and Design of Organizations*

Reference Books:

1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, *Organizational Behavior*
2. Other relevant articles or books could be sent later to the students.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

BUSINESS STRATEGY

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs./Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: NIL	Continuous Assessment: 40 marks	Term Work and Practical credit: NIL
Lab: NIL	Term Work and Practical: NIL	

Course Pre Requisites: Introductory awareness of Business terminologies and functions

Course Objective: Familiarize the fundamental principles and practices of business development

Course Outcomes:

This course will help students,

1. To summarize the important concepts of strategic management
2. To identify the process and capabilities for internal environment of a firm.
3. To understand the strategies applicable for external environments of firm
4. To examine corporate strategies
5. To compare the various business growth strategies
6. To understand the process of strategy implementation

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction to Strategic Management

- Importance of Strategic Management
- Vision and Objectives
- Schools of thought in Strategic Management
- Strategy Content, Process, and Practice
- Fit Concept and Configuration Perspective in Strategic Management

UNIT – II [6 Hours]

Internal Environment of Firm- Recognizing a Firm's Intellectual Assets

- Core Competence as the Root of Competitive Advantage
- Sources of Sustained Competitive Advantage
- Business Processes and Capabilities-based Approach to Strategy

UNIT – III [6 Hours]

External Environments of Firm- Competitive Strategy

- Five Forces of Industry Attractiveness that Shape Strategy
- The concept of Strategic Groups, and Industry Life Cycle
- Generic Strategies
- Generic Strategies and the Value Chain
-

UNIT – IV [6 Hours]

Corporate Strategy

- The Motive for Diversification
- Related and Unrelated Diversification
- Business Portfolio Analysis

UNIT – V [6 Hours]

Growth Strategies

- Expansion, Integration and Diversification
- Strategic Alliances, Joint Ventures, and Mergers & Acquisitions

UNIT – VI [6 Hours]

Strategy Implementation: Structure and Systems

- The 7S Framework
- Strategic Control and Corporate Governance

Home Assignments:

- Latest business events would be discussed in class and students should be ready to discuss these events (in groups). The topic will be mentioned beforehand. Students are required to meet in groups before coming to class and prepare on the topic.
- There will be periodic homework assignments relating to the course concepts or mini-cases. Specific instructions will be given separately.

Text Books:

1. Robert M. Grant (2012). *Contemporary Strategic Management*, Blackwell, 7th Edition.

Reference Books:

1. M.E. Porter, *Competitive Strategy*, 1980. M.E. Porter,
2. *Competitive Advantage*, 1985 Richard Rumelt (2011).
Good Strategy Bad Strategy: The Difference and Why It Matters.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

DESIGN THINKING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: NA	Continuous Assessment: 40 marks	Term Work credit: 1
Lab: 2 Hrs./Week	Term Work and Oral: 50	

Course Pre Requisites: Students should be well versed Completion of all units from Semesters 1, 2, 3 and 4

Course Objective:

1. Recognize the importance of DT
2. Explain the phases in the DT process
3. List the steps required to complete each phase in DT process
4. Apply each phase in the DT process
5. Use doodling and storytelling in presenting ideas and prototypes
6. Create value proposition statements as part of their presentations
7. Recognize how DT can help in functional work
8. Recognize how Agile and DT complement each other to deliver customer satisfaction

Course Outcomes:

After successful completion of this course students will be able to:

1. Implement the Phases in the DT process
2. Identify the steps required to conduct an immersion activity
3. Design personas to create problem statements in the define phase of DT
4. Apply the steps in the ideate phase of DT
5. Design a prototype to create a value proposition statement
6. Test a prototype created through a DT process

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction: Recognize the importance of Design Thinking why is Design Thinking important for business?, Why is Design Thinking important for you? , Identify the steps in the DT process What is DT? Empathize (search for rich stories and find some love), Define (user need and insights – their POV), Ideate (ideas, ideas, ideas), Prototype (build to learn), Test (show, don't tell)

UNIT – II [6 Hours]

Empathy Phase: Recognize the steps in the empathize phase of DT, What is empathy? Ask What? How? Why?, Different types to developing Empathy towards People Identify the steps required to conduct an immersion activity, How to empathize?, Intro to Immersion Activity, Conduct an immersion activity and fill up the DT question template, Immersion activity

UNIT – III [6 Hours]

Define Phase: Creating personas: Recognize the steps to create personas in the define phase of DT, What is a persona and how do I create one? Four Different Perspectives on Personas 1)Goal-directed Personas 2)Role-Based Personas 3) Engaging Personas 4) Fictional Personas, 10 steps to Creating Your Engaging Personas and Scenarios Recognize the steps to create problem statements in the define phase of DT, Problem statements, Defining problem statements, Define the problem statements in the define phase of DT

UNIT – IV [6 Hours]

Ideate Phase: How to Ideate?, Recognize the steps in the ideate phase of DT, Apply the steps in the ideate phase of DT, Ideation games: Game 1: Six Thinking Hats, Game 2: Million-dollar idea, Ideate to find solutions, Characteristics Required for Successful Ideation, Recognize how doodling can help to express ideas, Recognize the importance storytelling in presenting ideas and prototypes, What is Storytelling in DT?

UNIT – V [6 Hours]

prototype phase: Recognize the importance of the prototype phase in DT, Prototype your idea, Create a prototype: Types of Prototyping 1)Low-Fidelity Prototyping 2) High-Fidelity Prototyping , Guidelines for Prototyping, Recognize the importance of service value proposition, Create a value proposition statement

UNIT – VI [6 Hours]

Testing Phase: Testing in Design Thinking, Test the Prototype, Role of DT in your work, discuss How DT can help me to become a better coder?, Agile and DT complement each other to deliver customer satisfaction, Share your Satori.

Home Assignments:

Implementation of Different Design Thinking Phase based on various activities.

Text Books:

There are no prescribed texts for Semester 5 – there will be handouts and reference links shared.

Reference Books:

Hooked by Nir Eyal

The Art of Creative Thinking by Rod Judkins

Start Up nation by Dan Senor and Saul singer

Start with Why by Simon Sinek

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Practical

Summative Assessment based on End Semester Project

Bloom's Level	Topics	Contents		Marks
Understand	Understand, Analyze, Apply	Option 1: Each group needs to present a Prototype of how they can apply DT in their functional work or coding. Examples will be provided to explain what exactly they need to do. Option 2: Each group will apply DT to create a prototype to improve any existing product or service. For both options, groups need to complete all phases of the Stanford DT model and include the outputs of each phase in their presentation.		50
Apply	Conduct and apply DT in the project.		12 Hours	
Analyze				

Elective -I Machine Learning

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Oral Credit: 1
Lab: 2 Hrs./Week	Term Work and Oral: 50	

Course Pre-Requisites:

- 1) Basic concepts of statistics.
- 2) Knowledge of fundamentals of AI.

Course Objective:

- 1) To simulate decision making and thinking in machine.
- 2) To understand standard Machine Learning practices.
- 3) To apply algorithms for precise result.

Course Outcomes: Students will be able to

1. Learn relationship between human and machine.
2. Implement basic classification algorithms
3. Implement enhanced classification algorithms
4. Implement HMM in detail
5. Apply concepts of regression for various application
6. Apply expectation maximization techniques for optimization.

Topics to Be Covered:

UNIT – I

[6 Hours]

Introduction to Machine Learning (ML); Relationship between ML and human learning; A quick survey of major models of how machines learn; Example applications of ML

UNIT – II

[6 Hours]

Classification: Supervised Learning; The problem of classification; Feature engineering; Training and testing classifier models; Cross-validation; Model evaluation (precision, recall, F1-measure, accuracy, area under curve); Statistical decision theory including discriminant functions and decision surfaces.

UNIT – III

[6 Hours]

Naive Bayes classification; Bayesian networks; Decision Tree and Random Forests; k-Nearest neighbor classification; Support Vector Machines; Artificial neural networks including backpropagation; Applications of classifications; Ensembles of classifiers including bagging and boosting.

UNIT – IV

[6 Hours]

Hidden Markov Models (HMM) with forward-backward and Viterbi algorithms; Sequence classification using HMM; Conditional random fields; Applications of sequence classification such as part-of-speech tagging.

UNIT – V

[6 Hours]

Regression: Multi-variable regression; Model evaluation; Least squares regression; Regularization; LASSO; Applications of regression Association rule mining algorithms including apriori.

UNIT – VI

[6 Hours]

Expectation-Maximization (EM) algorithm for unsupervised learning Clustering: average linkage; Ward's algorithm; Minimum spanning tree clustering; K-nearest neighbors clustering; BIRCH; CURE; DBSCAN Anomaly and outlier detection methods.

Home Assignments:

- (1) Introduction to WEKA and R
- (2) Classification of some public domain datasets in UCI ML repository

Mini projects in the Lab:

- (1) Implementation of one clustering algorithm
- (3) Implementation of one association rule mining algorithm
- (4) Implementation of one anomaly detection algorithms
- (5) Implementation of EM algorithm for some specific problem

Text Books:

[1] R.O. Duda, P.E. Hart, D.G. Stork, **Pattern Classification**, 2/e, Wiley, 2001.

Reference Books:

- [1] C. Bishop, **Pattern Recognition and Machine Learning**, Springer, 2007.
- [2] E. Alpaydin, **Introduction to Machine Learning**, 3/e, Prentice-Hall, 2014.
- [3] A. Rostamizadeh, A. Talwalkar, M. Mohri, **Foundations of Machine Learning**, MIT Press.
- [4] A. Webb, **Statistical Pattern Recognition**, 3/e, Wiley, 2011.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Computer Network

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs/Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: NIL	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
Lab: 2 Hrs./Week	Term Work and Practical: 50	

Course Pre Requisites: The prerequisite for this class is successful completion of Object Oriented Design, Data Structures, Data Communications.

Course Objective:

1. Become familiar with layered communication architectures (OSI and TCP/IP).
2. Understand the client/server model and key application layer protocols.
3. Learn sockets programming and how to implement client/server programs.
4. Understand the concepts of reliable data transfer and how TCP implements these concepts.
5. Know the principles of congestion control and trade-offs in fairness and efficiency.
6. Learn the principles of routing and the semantics and syntax of IP.

Course Outcomes:

1. Have a good understanding of the OSI Reference
2. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
3. Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;
4. Have an understanding of the issues surrounding Mobile and Wireless Networks.
5. Have a working knowledge of datagram and internet socket programming
6. Have a basic knowledge of the use of cryptography and network security

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction: Computer networks and distributed systems, Classifications of computer networks, Preliminaries of layered network structures.**Data communication Components:** Representation of data and its flow, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media.**LAN:** Wired LAN, Wireless LAN, Virtual LAN

UNIT – II[6 Hours]

Data Link Layer and Medium Access Sub Layer: Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA\

UNIT – III [6 Hours]

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

UNIT – IV [6 Hours]

Application Layer: DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls.

UNIT – V [6 Hours]

Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT – VI [6 Hours]

Network Security: Electronic mail, directory services and network management, Basic concepts of Cryptography.

Home Assignments:

1. Socket Programming using C/C++
2. Network System Administration: Understanding switches and routers

Text Books:

1. *Computer Networks*, A. Tannenbaum.
2. *Data and Computer Communication*, William Stallings

Reference Books:

3. *Network Security*, Kaufman, R. Perlman and M. Speciner.
4. *UNIX Network Programming*, Vol. 1,2 & 3, W. Richard Stevens

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Subject Name : Information Security

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4Hrs./Week	Semester Examination: 60 marks	Theory: 5 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
Lab: 2Hrs./Week	Term Work and Practical: 50	

Course Prerequisites:		
Students should have primary knowledge of		
<ol style="list-style-type: none"> 1 Fundamentals of Digital Communication and Computer Networks. 2. Operating Systems 		
Course Objectives:		
<ul style="list-style-type: none"> • Discuss various administrative, technical, governance, regularity and policy aspects of Information Security Management. • Discuss and provide hands on approaches to better understand and to devise strategies related to security policy. • Understand different security issues related to computer network, operating systems and database systems. 		
Course Outcome:		
Students will be able to:		
1) Understand security parameters and cryptosystems.		
2) Understand security and access control models.		
3) Understand aspect of information security management including planning, process, policy, procedure and monitoring.		
4) Understand various issues related to threats like Threat Analysis, Threat Modeling, threat awareness and threat modeling		
5) Understand security issues related to networks, operating systems and database.		
6) Learn information audit and business continuity planning concepts.		
UNIT-I	Overview of Security Parameters and Cryptosystems	(6 Hours)
	Confidentiality, integrity and availability; Security violation and threats; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle. Simple Cryptosystems: Enciphering Matrices, Encryption Schemes, Symmetric and, Asymmetric Cryptosystems, Cryptanalysis, Different Ciphers used for Information Security, Secure Cryptosystem.	

UNIT-II	Access Control Models	(6 Hours)
	Discretionary, mandatory, roll-based and task-based models, unified models, access control algebra, temporal and spatio-temporal models, Authorization and Authentication - types, policies and techniques, Trusted Computing and multilevel security - Security models, Trusted Systems.	
UNIT-III	Security Policies	(6 Hours)
	Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, international standards, Security certification - Security monitoring and Auditing - Security Requirements Specifications - Security Policies and Procedures, Role of Information Security Department	
UNIT-IV	Security Threats	(6 Hours)
	Sources of security threats- Motives - Target Assets and Vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crime Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation – Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools -Threat identification - Threat Analysis - Threat Modeling - Model for Information Security Planning,	
UNIT-V	Logic-based System	(6 Hours)
	Malicious logic, vulnerability analysis, auditing, intrusion detection. Applications: Network security, user security, program security. Database Security Architecture, Operating Systems Security, Enterprise Security, Data privacy, introduction to digital forensics, Incidence Response and Forensics, enterprise security specification, Software security issues, Email and Internet use policies, Third Party Development - Intellectual Property Issues.	
UNIT-VI	Auditing and Business Continuity Planning	(6 Hours)
	Introduction to information security audit and principles of audit. Business continuity planning and disaster recovery. Case study: 9/11 tragedy. Backup and recovery techniques for applications and storage. Computer forensics: techniques and tools. Forensic tools VMware, Security testing tool BackTrack, Audit Tools: NESSUS and	

	NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues, Database auditing	
Assignment List:		
1.	Assignments on different ciphers.	
2.	Assignments on RSA, DSA, DES, AES, Blowfish, TripleDES.	
3.	Assignment based on the presentation on following topics: ISO 17799 Standard NESSUS and NMAP Audit Tools Asymmetric Cryptosystems	
4.	Case study on secure configuration of Email Server	
5.	Case study on Incidence Response and Forensics analysis	
6.	Assignment on Computer Forensic Tools	
Text Books:		
1)	Neal Koblitz, “A Course in Number Theory and Cryptography”, 2 nd Edition, Springer, 2002.	
2)	Johannes A. Buchman, “Introduction to Cryptography”, 2 nd Edition, Springer, 2004.	
3)	Serge Vaudenay, “Classical Introduction to Cryptography – Applications for Communication Security”, Springer, 2006.	
4)	Victor Shoup, “A Computational Introduction to Number Theory and Algebra”, Cambridge University Press, 2005.	
5)	William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall, 2008.	
6)	Thomas Calabres and Tom Calabrese, “Information Security Intelligence: Cryptographic Principles & Application”, Thomson Delmar Learning, 2004.	
Reference Books:		
1)	.Nina Godbole, Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Wiley, 2009	
2)	Information Security Policies, Procedures, and Standards:Guidelines for Effective Information Security Management (Paperback) Auerbach,1 st edition, 2001	
3)	Neal Koblitz, “A Course in Number Theory and Cryptography”, 2 nd Edition, Springer, 2002.	
4)	Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press, 2004.	
Syllabus for Unit Test:		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV, V and VI	

Artificial Intelligence

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4Hrs./Week	Semester Examination: 60 marks	Theory: 5 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
Lab: 2Hrs./Week	Term Work and Practical: 50	

Course Pre Requisites: Discrete mathematics, Data structures,

Course Objective:

To provide the insight to the students the about basic knowledge representation, problem solving, and learning methods of artificial intelligence.

Course Outcomes:

After completion of the course the students will able to,

1. Describe the concept of Artificial Intelligence, Intelligent agents and Learning agents
2. Identify issues in problem solving and apply the appropriate search methods.
3. Use the appropriate search method and identify the constraints
4. Describe and select the different knowledge representation methods
5. Identify the components of planning for a particular System
6. Use appropriate domain knowledge and develop an Expert system

UNIT – I [6 Hours]

Introduction, Overview of Artificial intelligence: Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

UNIT – II[6 Hours]

Problem Solving, Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

Search techniques: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search

UNIT – III [6 Hours]

Constraint satisfaction problems: Local search for constraints Satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

UNIT – IV

Knowledge & reasoning: Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

UNIT – V [6 Hours]

Probabilistic reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

UNIT – VI [6 Hours]

Expert Systems: Representing and using domain knowledge, expert system shells, and knowledge acquisition.

Home Assignments:

Assignments should include problems related to the topics covered in lectures, like heuristics, optimal search, and graph heuristics. Constraint satisfaction problems, k-nearest neighbors, decision trees, etc. can be included in home assignments.

Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach
2. Artificial Intelligence, Russel, Pearson

Reference Books:

1. Artificial Intelligence, Ritch & Knight, TMH
2. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
3. Logic & Prolog Programming, Saroj Kaushik, New Age International
4. Expert Systems, Giarranto, VIKAS

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

FINANCIAL AND COST ACCOUNTING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hrs/Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: NIL	Continuous Assessment: 40 marks	Term Work and Practical credit: -- NIL
Lab: NIL	Term Work and Practical: -- NIL	

Course Pre Requisites: familiarity with common concepts and terminologies in economics and accounts.

Course Objective:

1. To impart knowledge about different ways of accounting process
2. Understanding and interpreting financial statements.

Course Outcomes:

After successful completion of this course students will be able to

1. Understand the important concepts of accounting and their importance in management
2. Interpret the accounting process
3. Analyze financial statements
4. Review the cash flow and fund flow techniques
5. Interpret the costing systems
6. Infer the accounts and reports

Topics to Be Covered:

UNIT – I [6 Hours]

Accounting Concept: Introduction, Techniques and Conventions, Financial Statements- Understanding & Interpreting Financial Statements

UNIT – II [6 Hours]

Accounting Process:

- Book Keeping and Record Maintenance
- Fundamental Principles and Double Entry
- Journal, Ledger, Trial Balance, Balance Sheet, Final Accounts
- Cash Book and Subsidiary Books

- Rectification of Errors

UNIT – III [6 Hours]

Financial Statements: Form and Contents of Financial Statements, Analyzing and Interpreting Financial Statements, Accounting Standards.

Class Discussion: Corporate Accounting Fraud- A Case Study of Satyam

.UNIT – IV [6 Hours]

Cash Flow and Fund Flow Techniques: Introduction, How to prepare, Difference between them

UNIT – V [6 Hours]

Costing Systems:

- Elements of Cost
- Cost Behavior, Cost Allocation, OH Allocation
- Unit Costing, Process Costing, Job Costing
- Absorption Costing, Marginal Costing, Cost Volume Profit Analysis
- Budgets
- ABC Analysis

Class Discussion: Application of costing concepts in the Service Sector

UNIT – VI [6 Hours]

Company Accounts and Annual Reports:

- Audit Reports and Statutory Requirements
- Directors Report
- Notes to Accounts
- Pitfalls

Home Assignments: Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Corporate Accounting Fraud: A Case Study of Satyam
2. Topic: Application of costing concepts in the Service Sector

Text Books:

1. Robert N Anthony, David Hawkins, Kenneth Marchant, *Accounting: Texts and Cases*, McGraw-Hill
2. Case Study Materials: To be distributed for class discussion

Reference Books:

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

B. Tech (Computer Science and Business Systems) Sem-VI
BUSINESS COMMUNICATION & VALUE SCIENCE – IV

Designation of Course	BUSINESS COMMUNICATION & VALUE SCIENCE – IV		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	50 Marks	Theory: 03 Tutorial: 00 Practical: 01
Practical : 02 Hours/ Week	Term Work & Oral	50 Marks	
	Total	100 Marks	
	Continuous Assessment	Yes	04

Course Prerequisites:-	Basic Knowledge of English (verbal and written) Completion of all units from Semesters 1, 2, 3, 4 and 5
Course Objective	Recognize the importance of diversity in workplace, Recognize the best practices of communicative writing, Understand the importance of emotional intelligence in personal and professional lives, Apply emotional intelligence in real life scenarios, Use the best practices of public speaking in real life scenarios, Understand the importance of corporate social responsibility (CSR), Understand the importance of corporate etiquettes, Practice corporate etiquettes in real life scenarios
Course Outcomes:-	<p>Upon completion of the course, students shall have ability to</p> <ol style="list-style-type: none"> 01. Understand the importance of diversity in workplace 02. Recognize the best practices of communicative writing 03. Apply knowledge of multiple intelligences and learning styles in interpersonal interactions 04. Recognize the attributes needed to function and grow in a corporate environment 05. Identify the best practices to manage stress 06. Understand the importance of corporate social responsibility (CSR)

Course Contents

Unit 1	Diversity and Inclusion at workplace	(6 Hrs.)
<p>Recapitulation activity of Satori, Introduce the concept of Diversity in corporate environments through an activity. Understand the importance of diversity and inclusion at workplace, Diversity and inclusion matter at workplace.</p>		
Unit 2	Communicative Writing:	(6 Hrs.)
<p>Aspects of communicative writing, Application of communicative writing in real life scenarios , Use of charts and graphs in communicative writing, The best practices of communicative writing</p>		
Unit 3	Emotional Intelligence	(6 Hrs.)
<p>what is emotional intelligence?, Emotional intelligence in personal and professional lives its importance need and application, public speaking at workplace, Importance , need and ways, The best practices of public speaking, Apply public speaking in real life scenarios</p>		
Unit 4	Corporate Social Responsibility (CSR)	(6 Hrs.)
<p>Corporate social responsibility (CSR) its importance and need, Stalwarts in CSR, the attributes needed to function and grow in a corporate environment, the best practices to share and receive feedback for CSR</p>		
Unit 5	Intelligences and learning styles in interpersonal interactions:	(6 Hrs.)
<p>Application of emotional intelligence in real life scenarios, intelligences and learning styles in interpersonal interactions, the impact of conflicts, Basic guidelines required to manage conflicts</p>		
Unit 6	Corporate etiquette, Stress & Time Management:	(6 Hrs.)
<p>The key features of corporate etiquette, Application of the business idioms and corporate terms, the impact of stress in life and work, the best practices to manage stress, the importance of time management, the best time management practices</p>		
Project: (Summative Assessment based on End Semester Project)	<p>Each group to create a POC (Proof of Concept) for their start-up applying their learning's from the CSBS course (core subjects + BCVS).</p> <p>The evaluation for this POC will be done as part of the Sem end assessment by the TCS team. During the assessment, students need to share the journey of creating their start-up: from inception to POC.</p>	

Reference Books:

01	Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman
02	Putting Emotional Intelligence To Work by Ryback David
03	How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion by Dale Carnegie
04	TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations
05	Diversity, Inclusion and Engagement 3rd Edition by <u>Mervyn Hyde</u> <u>Lorelei Carpenter</u> , <u>Shelley Dole</u>
Web References:	
https://www.tata.com/about-us/tata-group-our-heritage	
https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity-philanthropy-and-ethics/articleshow/41766592.cms	
Online Resources:	
https://youtu.be/reu8rzD6ZAE	
https://youtu.be/Wx9v_J34Fyo	
https://youtu.be/F2hc2FLOdhI	
https://youtu.be/wHGqp8lz36c	
https://youtu.be/hxS5He3KVEM	
https://youtu.be/nMPqsjuXDmE	

ELECTIVE II : Robotics and Embedded Systems

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Oral Credit: 1
Lab: 2Hrs./Week	Term Work and Oral: 50	

Course Prerequisites:		
Students should have primary knowledge of		
<ol style="list-style-type: none"> 1 Good programming skills in C/C++. Basic knowledge of linear algebra. (for Robotics) 2. Basic knowledge of operating system 3. Basic knowledge of microprocessors and microcontrollers 		
Course Objectives:		
During the course the students will: - <ol style="list-style-type: none"> 1) Learn the concepts of embedded system, its components and its application areas. 2) Learn the concepts of robotics and robot design components. 		
Course Outcome:		
Students will be able to:		
<ul style="list-style-type: none"> • Acquire knowledge about microcontrollers embedded processors and their applications. • Understand the internal architecture and interfacing of different peripheral devices with Microcontrollers. • Understand the role of embedded systems in industry. • Understand the concepts of real time operating system. • Understand various applications of embedded system and various electronics parts used in embedded system design. • Understand different concepts in robotics, various parts used in robotics. 		
UNIT-I	Introduction to Embedded System	(6 Hours)

	Embedded system Vs General computing systems, History of Embedded systems, Purpose of Embedded systems, Microprocessor and Microcontroller, Hardware architecture of the real time systems.	
UNIT-II	Devices and Communication Buses	(6 Hours)
	I/O types, serial and parallel communication devices, wireless communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication protocols, parallel communication network using ISA, PCI, PCT-X, Intrnet embedded system network protocols, USB, Bluetooth.	
UNIT-III	Program Modeling	(6 Hours)
	Program Modeling Concepts; Fundamental issues in Hardware software co-design, Unified Modeling Language(UML), Hardware Software trade-offs DFG model, state machine programming model, model for multiprocessor system.	
UNIT-IV	Real Time Operating Systems	(6 Hours)
	Operating system basics, Tasks, Process and Threads, Multiprocessing and multitasking, task communication, task synchronization, qualities of good RTOS. Real time scheduling: Clock Driven, Weighted Round Robin, Priority Driven Approach, RM,EDF algorithms	
UNIT-V	Examples of Embedded System	(6 Hours)
	Mobile phones, RFID, WISENET, Robotics, Biomedical Applications, Brain machine interface etc. Popular microcontrollers used in embedded systems, sensors, actuators, Design of microcontroller systems using ADC/DAC, LED/LCD, PWM, Keyboard, Stepper motor etc.	
UNIT-VI	Robotics	(6 Hours)
	Robotics: Introduction, Elements of robots -- joints, links, actuators, and sensors Kinematics: Kinematics of serial robots, Kinematics of parallel robots, Motion planning and control Advanced Topics on Robotics: Sensing distance and direction, Line Following Algorithms, Feedback Systems, Other topics on advance robotic techniques	

List of Practical Assignments		
1.	Arithmetic Operations using 8051	
2	Interfacing ADC and DAC	
3	Interfacing LED and PWM	
4	Interfacing real time clock and serial port	
5	Interfacing keyboard and LCD	
6	Flashing of LEDES	
7	Interfacing stepper motor and temperature sensor.	
8	Study of robotic arm and its configuration	
9	Study the robotic end effectors	
List of Assignments/Tutorials		
	1) Assignment on State machine programming model of Fibonacci sequence generator. 2) Assignment on actuator behavior. 3) Assignment on Real time scheduling algorithms. 4) Assignment on CAN protocol. 5) Assignment on microcontrollers used in embedded systems. 6) Assignment on Program Modeling concepts.	
Text Books:		
1)	Introduction to Embedded Systems : Shibu K. V. (TMH)	
2)	Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)	
3)	Embedded Systems : Rajkamal (TMH)	
4)	Embedded Systems : L. B. Das (Pearson)	
5)	The 8051 Microcontroller and embedded systems by Muhammad Ali Mazidi, PHI.	
6)	Robotics: Fundamental Concepts and Analysis, Oxford University Press	
Reference Books:		
1)	Embedded System design : S. Heath (Elsevier)	
2)	Embedded microcontroller and processor design: G. Osborn (Pearson)	
3)	Embedded systems design by Steve Heath, Newnes	
Syllabus for Unit Test:		

Unit Test -1	Unit I,II and III
Unit Test -2	Unit IV, V and VI

ELECTIVE II : DATA MINING AND ANALYTICS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs/Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1 Hr./Week	Continuous Assessment: 40 marks	Term Work and Oral Credit: 1
Lab: 2 Hrs/Week	Term Work and Oral: 50	

Course Pre Requisites: Student should possess a strong mathematical background in Probability and Statistics. Also should have programming proficiency with algorithmic approach.

Course Objective: is to make statistical foundation, followed by various machine learning and data mining algorithms. This course will also give coverage to practical systems and software used in data analytics.

Course Outcomes:

1. Understand basic concepts and techniques of Data Mining
2. Evaluate different models used for OLAP and data preprocessing.
3. Classify and differentiate between situations for applying data-mining techniques such as frequent pattern mining, association, correlation, classification, prediction, cluster, and outlier analysis.
4. Apply knowledge for understanding data and select suitable linear, nonlinear data model and time series analysis model.
5. Develop skills of using data mining software for solving practical problems.
6. Understand and apply several statistical analysis techniques: regression, ANOVA, data reduction

Topics to Be Covered:

UNIT – I [6 Hours]

Introduction to Data Mining: What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications

UNIT – II[6 Hours]

Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Experiments with Weka - filters, discretization

Data mining knowledge representation: Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques

Attribute-oriented analysis: Attribute generalization, Attribute relevance, Class comparison, Statistical measures

UNIT – III [6 Hours]

Data mining algorithms - Association rules: Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis

Data mining algorithms - Classification: Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules

Data mining algorithms – Prediction: The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), linear models

UNIT – IV [6 Hours]

Descriptive analytics: Data Modeling, Trend Analysis, Simple Linear Regression Analysis

Forecasting models: Heuristic methods, predictive modeling and pattern discovery, Logistic Regression: Logit transform, ML estimation, Tests of hypotheses, Wald test, LR test, score test, test for overall regression, multiple logistic regression, forward, backward method, interpretation of parameters, relation with categorical data analysis. Interpreting Regression Models, Implementing Predictive Models

UNIT – V [6 Hours]

Generalized Linear model: link functions such as Poisson, binomial, inverse binomial, inverse Gaussian, Gamma.

Non Linear Regression (NLS): Linearization transforms, their uses & limitations, examination of non-linearity, initial estimates, iterative procedures for NLS, grid search, Newton-Raphson, steepest descent, Marquardt's methods. Introduction to semiparametric regression models, additive regression models. Introduction to nonparametric regression methods

UNIT – VI [6 Hours]

Time Series Analysis: Auto - Covariance, Auto-correlation and their properties. Exploratory time series analysis, Test for trend and seasonality, Exponential and moving average smoothing, Holt – Winter smoothing, forecasting based on smoothing

Linear time series models: Autoregressive, Moving Average, Autoregressive Moving Average and Autoregressive Integrated Moving Average models; Estimation of ARMA models such as Yule-Walker estimation for AR Processes, Maximum likelihood and least squares estimation for ARMA Processes, Forecasting using ARIMA models

Prescriptive Analytics: Mathematical optimization, Networks modeling-Multi-objective optimization-Stochastic modeling, Decision and Risk analysis, Decision trees.

Home Assignments:

Course faculty must design one home assignment on every unit.

Text Books:

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers, 3rd ed, 2010.
2. Lior Rokach and Oded Maimon, “Data Mining and Knowledge Discovery Handbook”, Springer, 2nd edition, 2010
3. Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control, Holden-Day.

Reference Books:

1. Draper, N. R. and Smith, H. (1998). Applied Regression Analysis (John Wiley) Third Edition.
- Hosmer, D. W. and Lemeshow, S. (1989). Applied Logistic Regression (Wiley).

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune
B.Tech- Computer Science & Business Systems (Semester- VII and VIII)
Revised New Syllabus Structure

Semester- VII		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
4.1	Usability Design of Software Applications	3	0	2	5	60	20	10	10	50	—	150	3	1	4
4.2	IT Workshop	3	0	2	5	60	20	10	10	50	—	150	3	1	4
4.3	Financial Management	3	0	0	3	60	20	10	10	—	—	100	3	0	3
4.4	Human Resource Management	3	0	0	3	60	20	10	10	—	—	100	3	0	3
4.5	Elective III	3	0	2	5	60	20	10	10	—	50	150	3	1	4
4.6	Elective IV	3	0	2	5	60	20	10	10	—	50	150	3	1	4
4.7	Project Evaluation I	0	0	2	2	—	—	—	—	—	50	50	0	1	1
4.8	Internship	0	0	0	0	—	—	—	—	—	50	50	0	2	2
Total		18	0	10	28	360	120	60	60	100	200	900	18	7	25
Elective III		DS	Cognitive Science & Analytics												
		DTS	Introduction to IoT												
		DS	Cryptology												
Elective IV		CS	Quantum Computation & Quantum Information												
		DS	Advanced Social, Text and Media Analytics												
		DTS	Mobile Computing												

Semester-VIII		Teaching Scheme				Examination Scheme-Marks							Credit		
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
4.9	Services Science & Service Operational Management	4	0	2	6	60	20	10	10	50	-	150	4	1	5
4.10	IT Project Management	3	0	2	5	60	20	10	10	-	50	150	3	1	4
4.11	Marketing Research & Marketing Management	3	0	0	3	60	20	10	10	-	-	100	3	0	3
4.12	Elective V	3	0	2	5	60	20	10	10	-	50	150	3	1	4
4.13	Elective VI	3	0	2	5	60	20	10	10	-	50	150	3	1	4
4.14	Project Evaluation II	0	0	6	6	-	-	-	-	-	150	150	0	3	3
4.15	Seminar	0	0	2	2	-	-	-	-	-	50	50	0	2	2
Total		16	0	16	30	300	100	50	50	50	350	900	16	9	25
Elective V		SH	Behavioral Economics												
		MS	Computational Finance & Modeling												
Elective VI		SH	Psychology												
		DTS	Enterprise Systems												
		MS	Advance Finance												
		DTS	Image Processing and Pattern Recognition												

Usability Design of Software Applications

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	3Hours/Week	End Semester Examination: 60Marks		Theory	Credits 3
Practical:	2 Hours/Week	Continuous Assessment: 40 Marks			
Tutorials:	NIL	TW & Practical: 50 Marks		TW & Practical:	1
		TW & Oral: NA		TW & Oral:	NA
		Term Work:	NA	Term Work	NA
Total	150Marks	Total	4		

Course Overview

This course teaches concepts of User Centered Design.

Prerequisite:

Basic understanding of web and mobile app development

Course Outcomes: On completion of the course, students will have the ability to:

1. To sensitise the students to the fundamentals of User Centred Design and User Experience their relevance and contribution to businesses
2. Familiarise them to the facets of User Experience (UX) Design, particularly as applied to the digital artefacts
3. Appreciation of user research, solution conceptualisation and validation as interwoven activities in the design and development lifecycle
4. Acquire the ability to constructively engage with the Design professionals they would work with in the future

Unit I 06 Hours

Introduction to User Centred Design.

Unit II 06 Hours

Aspects of User Centred Design
Product Appreciation Assignment – Evaluating the product from user centred design aspects such as functionality, ease of use, ergonomics, and aesthetics.

Unit III 06 Hours

Heuristic Evaluation: Heuristic Principles, Examples
Heuristic Evaluation: Group Assignment initiation (Website and App)
Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.

Unit IV 06 Hours

Group Project identification, UX Research
Understanding users, their goals, context of use, and environment of use.
Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX

Unit V 06 Hours

Scenarios and Persona Technique , Presentation of Personas for the group project, Design Thinking Technique, Discovery and brainstorming, Concept Development, Task flow detailing for the Project

Unit VI

06 Hours

Prototyping Techniques

Paper, Electronic, Prototyping Tools, Project Prototyping Iteration 1, Project Prototyping Iteration 2

Textbooks

1. Interaction Design: Beyond Human-Computer Interaction, 4th Edition, Jenny Preece, Helen Sharp and Yvonne Rogers
2. About Face, 4th Edition, Alan Cooper and Robert Reimann
3. Understanding Design Thinking, Lean, and Agile - Jonny Schneider.

Reference Books

1. Observing the User Experience, Second Edition: A Practitioner's Guide to User Research. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed
2. The Elements of User Experience: User-Centered Design for the Web and Beyond 2nd Edition, Jesse James Garrett

List of Assignments

2 -3 Assignment to be framed on each Unit.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

IT Workshop

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	3 Hours/Week	End Semester Examination: 60Marks		Theory	Credits 3
Practical:	2Hours/Week	Continuous Assessment: 40 Marks			
Tutorials:	NIL	TW & Practical: 50 Marks		TW & Practical:	1
		TW & Oral: NA		TW & Oral:	NA
		Term Work	NA	Term Work	NA

Total150Total4

Course Overview

Prerequisite:

Need to know basics of image representation.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand Matlab
2. Learn Matlab Workspace
3. Learn Mathematical functions of Matlab
4. Learn Plotting
5. Understand Matlab Programming
6. Learn Debugging

Unit I 06 Hours

Introduction to MATLAB

History, basic features, strengths and weaknesses, good programming practices and plan your code.

Unit II 06 Hours

Working with variables, workspace and miscellaneous commands

Creating MATLAB variables, overwriting variable, error messages, making corrections, controlling the hierarchy of operations or precedence, controlling the appearance of floating point number, managing the workspace, keeping track of your work session, entering multiple statements per line, miscellaneous commands.

Unit III 06 Hours

Matrix, array and basic mathematical functions

Matrix generation, entering a vector, entering a matrix, matrix indexing, colon operator, linear spacing, creating a sub-matrix, dimension, matrix operations and functions matrix generators, special matrices, array and array operations, solving linear equations, other mathematical functions.

Unit IV 06 Hours

Basic plotting

Overview, creating simple plots, adding titles, axis labels, and annotations,

multiple data sets in one plot, specifying line styles and colours

Unit V

06 Hours

Introduction to programming

Introduction, M-File Scripts, script side-effects, M-File functions, anatomy of a M-File function, input and output arguments, input to a script file, output commands

Control flow and operators

``if ... end" structure, relational and logical operators, ``for...end" loop, ``while ... end" loop, other flow structures, operator precedence, saving output to a file

Unit VI

06 Hours

Debugging M-files

Debugging process, preparing for debugging, setting breakpoints, running with breakpoints, examining values, correcting and ending debugging, correcting an M-file

Textbooks

1. *Digital Image Processing using MATLAB*. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Pearson Education, Inc., 2004.
2. *MATLAB: A Practical Introduction to Programming and Problem Solving*. Stormy Attaway, Butterworth-Heinemann.

Reference Books

1. <https://www.mathworks.com/content/dam/mathworks/mathworks-dot-com/moler/exm/book.pdf>
2. https://www.mathworks.com/help/releases/R2014b/pdf_doc/matlab/getstart.pdf

List of Assignments

2-3 Assignment for each unit to be framed by the Course Instructor and Implementation of various Image Processing Algorithms

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

FINANCIAL MANAGEMENT		
<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>

				Credits
Lecture:	3 Hours/Week	End Semester Examination:	60Marks	Theory 3
Practical:	-	Continuous Assessment:	40 Marks	
Tutorials:	-	TW & Practical:	NA	TW & Practical: NA
		TW & Oral:	NA	TW & Oral: NA
		Term Work	NA	Term Work NA
Total	100 Marks	Total	3	

Course Overview

This course intends to introduce students to understand the financial aspects of IT projects. They shall understand the management of funds for a project and risks and returns involved therein.

Prerequisite:

Students should be familiar with the basic concepts of economics and project life cycle.

Course Outcomes: On completion of the course, students will have the ability to:

1. Interpret the fundamental concepts of financial management time value of money
2. Categorise valuation of securities, risks and returns
3. Summarise leverage for deciding financial angle of IT projects
4. Understand capital cost and budgeting
5. Understand working Capital and cash management
6. Analyse accounts receivable management

Unit I

06 Hours

Introduction : Introduction to Financial Management - Goals of the firm - Financial Environments.

Time Value of Money : Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.

Unit II

06 Hours

Valuation of Securities : Bond Valuation, Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM.

Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM)

Unit III

06 Hours

Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study

Unit IV

06 Hours

Cost of Capital : Concept, Computation of Specific Cost of Capital for Equity - Preference - Debt, Weighted Average Cost of Capital - Factors affecting Cost of Capital 4L

Capital Budgeting : The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods

Unit V

06 Hours

Working Capital Management: Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.

Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring

Unit VI

06 Hours

Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period. 4L

Textbooks

1. Chandra, Prasanna - Financial Management - Theory & Practice, Tata McGraw Hill.

Reference Books

1. Srivastava, Misra: Financial Management, OUP
2. Van Horne and Wachowicz : Fundamentals of Financial Management, Prentice Hall/ Pearson Education

List of Assignments

Case studies based on Time Value of Money, Valuation of Securities, Risk & Return, Cost of Capital, Capital Budgeting, Working Capital Management, Cash Management, Accounts Receivable Management

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Human Resource Management

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	03Hours/Week	End Semester Examination:	60Marks	Theory	Credits 03
Practical:	NA	Continuous Assessment:	40 Marks		
Tutorials:	NA	TW & Practical:	Marks	TW & Practical:	NA
		TW & Oral:	NA	TW & Oral:	NA
		Term Work	NA	Term Work	
Total :	100 Marks	Total	3		

Course Overview

Students must be aware of the basic principles of Human Resource Management because success in today's complex business environment depends on effective management of its human resources. This introductory course on Human Resource Management will familiarize the students with the basic concepts, roles, functional areas and activities of HR and help students understand organization's employees, their interest, motivation and satisfaction, and their belief of fair treatment- all of which actually impact the firm's current performance and sustainability in the long run.

Prerequisite: NIL

Course Outcomes: On completion of the course, students will have the ability to:

1. Effectively manage and plan key **human resource** functions within organizations.
2. Examine current issues, trends, practices, and processes in **HRM**.
3. Contribute to employee performance **management** and organizational effectiveness.
4. Problem-solve **human resource** challenges.
5. Develop employability skills for the Canadian workplace.

Unit I **06 Hours**
Human Resource Management: Concept and Challenges, HR Philosophy, Policies, Procedures and Practices.

Unit II **06 Hours**
Human Resource System Design: HR Profession, and HR Department, Line Management Responsibility in HRM, Measuring HR, Human resources accounting and audit; Human resource information system

Unit III **06 Hours**
Functional Areas of HRM: recruitment and staffing, benefits, compensation, employee relations, HR compliance, organizational design, training and development, human resource information systems (H.R.I.S.) and payroll.

Unit IV **06 Hours**
Human Resource Planning: Demand Forecasting, Action Plans– Retention, Training, Redeployment & Staffing, Succession Planning

Unit V **06 Hours**

Strategic Management of Human Resources: SHRM, relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace

Unit VI

06 Hours

Human Resource Management in Service Sector- Special considerations for Service Sector including

- Managing the Customer – Employee Interaction
- Employee Empowerment and Customer Satisfaction
- Service Failure and Customer Recovery – the Role of Communication and Training
- Similarities and Differences in Nature of Work for the Frontline Workers and the Backend
- Support Services - Impact on HR Practices Stressing Mainly on Performance
- Flexible Working Practices – Implications for HR

Textbooks

1 Gary Dessler, *Human Resource Management*

Reference Books

1. Dave Ulrich, *Human Resource Management*, Mc Graw Hill Publication

List of Activities

Further, the topic for class discussion will be mentioned beforehand. Students are required to meet in groups before coming to class and prepare for the topic to be discussed. Instructor may ask the student groups to present their analysis and findings to the class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Understanding the issues and challenges involved in managing a diverse workforce
2. Topic: Is The Only Purpose of a Corporation to Maximize Profit?
3. Topic: Similarities and Differences in Manufacturing and Service Sector - Impact on HR Practices

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective III a) Cognitive Science & Analytics

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	<u>Credits</u>
Lecture: Hours/Week Practical: 3 Hours/Week Tutorials: Hours/Week	End Semester Examination: 60 Marks Continuous Assessment: 40 Marks TW & Practical: NA TW & Oral: 50 Marks Term Work NA	Theory TW & Practical: TW & Oral: Term Work	3 1	
Total : 100 Marks Total		4		

Course Overview

The course teaches cognitive Sciences.

Prerequisite:

Knowledge of Neural Networks and Artificial Intelligence.

Course Outcomes: On completion of the course, students will have the ability to:

1. Know Introduction to Cognitive Science, Psychology, Nervous system and brain
2. Understand Brain and sensory motor information, Representation of sensory information
3. Analyse From Sensation to Cognition; Roots of Cognitive Science
4. Develop Language and Embodiment
5. Implement Affordances in biological and artificial systems, Cognitive Development
6. Make Attention, Learning, Memory, Reasoning, Social Cognition.

Unit I

06 Hours

Introduction to the study of cognitive sciences. What is language? Affordances, Categories and concepts; Concept learning, Introduction to the study of cognitive sciences. Neural Network Models ,Linguistic knowledge: Syntax, semantics, (and pragmatics), Direct perception, Machine learning. History of cognitive science, Processing of sensory information in the brain, Ecological Psychology, Constructing memories, Methodological concerns in philosophy, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Generative linguistic, Affordance learning in robotics, Explicit vs. implicit memory

Unit II

06 Hours

Cognitive Science and its methodology concerns in philosophy, Written materials needed to get a CogNeuro research study with human subjects off the ground: Runsheets, SOPs, questionnaires, informed consent forms, Perform stemming operation in python using NLTK, Writing and running Robot programs – Activity of PICK and Place of an object, Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

Unit III

06 Hours

Artificial intelligence and psychology, Brain Imaging, Brain and language, Affordance learning in robotics, Information processing (three-boxes) model of memory, Structure and constituents of the brain, fMRI, MEG, Language disorders,

Development, Brief history of neuroscience, PET, EEG, Lateralization, Child and robotic development, Sensory memory; Short term memory, Mathematical models, Multisensory integration in cortex, Lateralization, Attention and related concepts, Long term memory, Rationality.

Unit IV

06 Hours

Experimental approach to studying the working human brain and body. How to use Brain Voyager Brain Tutor. How to use the BESA dipole simulator? Introduction to EEG recordings. Theory, physiology, practical aspects of recording and analyzing scalp recorded brain potentials. Perform lemmatization in python using NLTK. Make simulation model using Rockwell ARENA 11.0 to show the functions / predictions for a manufacturing work cell. Evaluating ML algorithm with balanced and unbalanced datasets Comparison of Machine Learning algorithms.

Unit V

06 Hours

Mathematical models, Information fusion, The great past tense debate, Human visual attention, Bounded rationality; Prospect theory ; Heuristics and biases, Looking at brain signals, From sensation to cognition, The great past tense debate, Computational models of attention, Reasoning in computers. Looking at brain signals, Cybernetics, Cognitivist and emergent stand points, Computational models of attention, Key points in social cognition.

Unit VI

06 Hours

Processing of sensory information in the brain. From physics to meaning, Analog vs. Digital: Code duality. A robotic perspective, Applications of computational models of attentional, Context and social judgment; Schemas; Social signals, Experimental approach to processing sensory information in the brain using python. EEG analysis: How to get from the raw recording to specific brain waves. An example analysis. Perform parts of speech tagging in python using NLTK, Simulation modeling of four machine system using Rockwell ARENA 11.0., Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Textbooks

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 3rd ed, 2010.

Reference Books

1. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010
2. Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control, Holden-Day.
3. Draper, N. R. and Smith, H. (1998). Applied Regression Analysis (John Wiley) Third Edition. Hosmer, D. W. and Lemeshow, S. (1989). Applied Logistic Regression (Wiley).

List of Assignments

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

ELECTIVE-III b)Introduction to IoT

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
Lecture: 03 Hours/Week	End Semester Examination: 60Marks	Theory	Credits 03
Practical: 02 Hours/Week	Continuous Assessment: 40 Marks		
Tutorials: NIL	TW & Practical: -- Marks	TW & Practical:	NA
	TW & Oral: 50 Marks	TW & Oral:	01
	Term Work -- Marks	Term Work	
	TotalMarks: 150	Work	
		TotalCredits: 04	

Course Overview

This course covers the development of Internet of Things (IoT) products and services—including devices for sensing, actuation, processing, and communication—to help the learners to develop skills and experiences which they can employ in designing novel systems.

Prerequisite:

1. Basic principles of Electronics
2. Basic Programming Skills

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand basic principles and concepts of Internet-of-Things use cases, applications, architecture and technologies
2. Get an overview of an end-to-end IoT system encompassing the edge, cloud and application tier
3. Architect a complete IoT application on their own
4. Build upon the foundations created in the pre-requisite courses
5. Think innovatively to come up with a hardware solution to a given problem
6. Understand various industrial IoT applications as well as IIoT

Unit I Introduction to IoT and Use cases

Understanding basic concepts of IoT, Consumer IoT vs Industrial Internet, **06 Hours**
Fundamental building blocks, Use Cases of IoT in various industry domains,

Unit II Architecture

IoT reference architectures, Industrial Internet Reference Architecture, Edge **06 Hours**
Computing, IoT Gateways, Data Ingestion and Data Processing Pipelines, Data Stream Processing

Unit III Sensors and Industrial Systems

Introduction to sensors and transducers, integrating sensors to sensor processing **06 Hours**
boards, introduction to industrial data acquisition systems, industrial control systems and their functions

Unit IV Networking for IoT

Recap of OSI 7 layer architecture and mapping to IoT architecture, Introduction to proximity networking technologies (ZigBee, Bluetooth, Serial Communication), Industrial network protocols (Modbus, CANbus), **06 Hours**

Unit V Communication for IoT

Communicating with cloud applications (web services, REST, TCP/IP and UDP/IP sockets, MQTT, WebSockets, protocols. Message encoding (JSON, Protocol Buffers) **06 Hours**

Unit VI IoT Data Processing and Storage

Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection, **06 Hours**

Textbooks

1. The Internet of Things, Samuel Greengard, MIT Press Essential Knowledge Series
- 2 Getting started with Internet of Things, Cuno Pfister
- 3 Precision: Principles, Practices and Solutions for the Internet of Things, Timothy Chou
- 4 Learning Internet of Things, Peter Waher
- 5 Analytics for the Internet of Things (IoT), Andrew Minter

Reference Books

1. Industrial Internet Reference Architecture - <http://www.iiconsortium.org/IIRA.htm>
2. World Economic Forum Report on Industrial Internet of Things - <https://www.weforum.org/reports/industrial-internet-things>
3. 50 Sensor Applications for a Smarter World - http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/
4. Visualizing Data-Exploring and Explaining Data with the Processing Environment, By Ben Fry, Publisher: O'Reilly Media
5. Raspberry Pi Computer Architecture Essentials, by Andrew K Dennis
6. Getting Started with Arduino, M. Banzai, O'Reilly Media
7. GSMA IoT Security Guidelines & Assessment - <https://www.gsma.com/iot/future-iot-networks/iot-security-guidelines/>

List of Assignments

1. Setting up the Arduino Development Environment, connecting analog sensors to an Arduino Boarding and reading analog sensor data.
2. Digital Input and Output reading using and Arduino board and Arduino Development Environment.
3. Integrate an Arduino Board to a Raspberry Pi computer and send sensor data from Arduino to the R Pi

4. Setup Python on the R Pi and run sample R Pi programs on the R Pi. Read the data from Arduino using Python language
5. Connect a R Pi Camera module to the Raspberry Pi and using Python programming capture still images and video
6. Set up TCP/IP socket server on a PC. Send a message from the R Pi to the PC using socket communication
7. Set up a MQTT broker on the PC. Send data from R Pi to PC using MQTT protocol. Receive data from PC to R Pi using MQTT protocol
8. Connect LED lights to an Arduino. Connect the Arduino to the R Pi. Send Message from PC to R Pi via MQTT protocol. On receipt of the message , toggle the LED lights on the Arduino
9. Connect LED lights to an Arduino. Connect the Arduino to the R Pi. Send Message from PC to R Pi via MQTT protocol. On receipt of the message , toggle the LED lights on the Arduino
10. Set up an account in a cloud service (such as Google / AWS or Azure). Set up a simple Http server using a language of your choice. Push the image captured from the R Pi camera to this web service. On receiving the image, store the image in a database or file
11. Develop a mobile application to view the images captured by the R Pi camera

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective III c) Cryptology

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 3Hours/Week	End Semester Examination: 60Marks	Theory 3
Practical: 2 Hours/Week	Continuous Assessment: 40 Marks	
Tutorials: Hours/Week	TW & Practical: Marks	TW & Practical: NA
	TW & Oral: 50 Marks	TW & Oral: 1
	Term Work NA	Term Work
	TotalMarks: 150	TotalCredits: 04

Course Overview

To highlight the features of different technologies involved in Cryptology.

Prerequisite:

- Basic knowledge in Discrete Mathematics, logarithms and set theory.
- Basic knowledge in networking concepts of presentation layer and application layer.

Course Outcomes: On completion of the course, students will have the ability to:

1. An overview of basic cryptographic concepts and methods
2. A good knowledge of some commonly used cryptographic primitives and protocols
3. A sound understanding of theory and implementation, as well as limitations and vulnerabilities
4. An appreciation of the engineering difficulties involved in employing cryptographic tools to build secure systems

Unit I 06 Hours

Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary Cryptosystems.

Unit II 06 Hours

Basic security services: confidentiality, integrity, availability, non-repudiation, privacy

Unit III 06 Hours

Symmetric key cryptosystems:Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC; Block Ciphers: DES, AES, Modes of Operation; Hash Functions; Authentication

Unit IV 06 Hours

Public Key Cryptosystems:RSA, ECC; Digital signatures

Unit V 06 Hours

Security Applications (Selected Topics):Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis

Unit VI

06 Hours

Introductory topics in Post-Quantum Cryptography: Refer to <https://csrc.nist.gov/projects/post-quantum-cryptography>. May discuss any two ciphers from this list.

Textbooks

1. *Cryptography, Theory and Practice*. D. R. Stinson, CRC Press.
2. *Handbook of Applied Cryptography*. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone, CRC Press

Reference Books

1. *A course in number theory and cryptography*. N. Koblitz:, GTM, Springer.
2. *Cryptography and Network Security*. W. Stallings, Prentice Hall.
3. *Security Engineering*, R. Anderson, Wiley
4. *RC4 Stream Cipher and Its Variants*. G. Paul and S. Maitra: CRC Press, Taylor & Francis Group, A Chapman & Hall Book, 2012
5. *Design & Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony*. C. S. Mukherjee, D. Roy, S. Maitra, Springer 2020
6. *Contact Tracing in Post-Covid World - A Cryptologic Approach*. P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, Springer 2020
8. Presskil Lecture notes: Available online:
<http://www.theory.caltech.edu/~preskill/ph229/>

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Elective IV a) Quantum Computation & Quantum Information

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	<u>Credits</u>
Lecture: 3 Hours/Week	End Semester Examination: 60 Marks	Theory	3
Practical: 3 Hours/Week	Continuous Assessment: 40 Marks		
Tutorials: --Hours/Week	TW & Practical: -- Marks	TW & Practical:	--
	TW & Oral: 50 Marks	TW & Oral:	--
	Term Work NA	Term Work	1
Total 150	Total 4		

Course Overview

This is an introductory course on quantum computing from perspective of computer science. This course will introduce the students to the postulates of quantum computing, formalisms like density matrices, effects of measurement. It will cover the quantum Turing machine and quantum circuit models of computation, and discuss Shor's factoring and Grover's search algorithms in this model.

Prerequisite: Linear Algebra, Probability, Analysis and Design of Algorithms

Course Outcomes: On completion of the course, students will have the ability to:

1. To understand principles of quantum computing
2. To understand different quantum models of computation
3. To implement important quantum algorithms
4. To understand random number generation exploiting quantum physics
5. To learn quantum key distribution protocols
6. To apply quantum computing to different computational areas like cryptography

Unit I **06 hours**

Quantum Mechanics: Hilbert space, Unitary and stochastic dynamics, Probabilities and measurements, Entanglement, Density operators and correlations.

Unit II **06 Hours**

Introduction to Quantum Information: States, Operators, Measurements, Quantum Entanglement: Quantum Teleportation, Super-dense coding, CHSH Game, Quantum gates and circuits

Unit III **06 Hours**

Quantum Algorithms: Deutsch-Jozsa, Simon, Grover, Shor, Implication of Grover's and Simon's algorithms towards classical symmetric key cryptosystems, Implication of Shor's algorithm towards factorization and Discrete Logarithm based classical public key cryptosystems

Unit IV **06 Hours**

Quantum True Random Number Generators (QTRNG): Detailed design and issues of quantumness, Commercial products and applications

Unit V **06 Hours**
Quantum key distribution (QKD):BB84, Ekert, Semi-Quantum QKD protocols and their variations, Issues of Device Independence, Commercial products

Unit VI **06 Hours**
Refer to <https://csrc.nist.gov/projects/post-quantum-cryptography>. May discuss any two ciphers from this list. Quantum key distribution, entropic uncertainty relations

Note: If any student also opts for Cryptology course, in that case the ciphers discussed in this course must differ from the ciphers that will be discussed in Cryptology course.

Textbooks

1. Quantum Computation and Quantum Information. M. A. Nielsen and I. L. Chuang, Cambridge University Press
2. Presskil Lecture notes: Available online: <http://www.theory.caltech.edu/~preskill/ph229/>

Reference Books

1. An Introduction to Quantum Computing. P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York
2. Quantum Computer Science. N. David Mermin:, Cambridge University Press
3. Quantum Cryptography. D. Unruh:, Available online: https://courses.cs.ut.ee/all/MTAT.07.024/2017_fall/uploads/
4. NIST Post Quantum Cryptography, Available online: <https://csrc.nist.gov/projects/post-quantum-cryptography/round-2-submissions>
5. Quantum Algorithms for Cryptographically Significant Boolean Functions - An IBMQ Experience. SAPV Tharmashastha, D. Bera, A. Maitra and S. Maitra, Springer 2020.
6. Quantum Algorithm Zoo. <https://quantumalgorithmzoo.org/>
7. Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone. CRC Press

List of Assignments-

Will be provided by Course Coordinator. 1 or 2 assignments on each unit.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective IV b) Advanced Social, Text and Media Analytics

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	Credits
Lecture: 3Hours/Week	End Semester Examination: 60Marks	Theory	3
Practical: 2Hours/Week	Continuous Assessment: 40 Marks		
Tutorials: 0Hours/Week	TW &Practical: NA	TW & Practical:	
	TW &Oral: 50Marks	TW & Oral:	
	Term Work NA	Term Work	1
	TotalMarks: 150	TotalCredits: 04	

Course Overview Students will be able to hone their skills even further by embracing the newer techniques in our data-driven world. Understanding how Web & Data Analytics, Artificial Intelligence & Machine Learning can be applied to Social Media and Digital Marketing will be the prime objective of this content rich program.

Prerequisite: Machine Learning ,Database and Data mining

Course Outcomes: On completion of the course, students will have the ability to:

1. To be able to use various tools for Text Mining and carry out Pattern Discovery, Predictive Modeling.
2. Explore the use of social network analysis to understand the growing connectivity and complexity in the world around us on different scales ranging from small groups to the World Wide Web.
3. Perform social network analysis to identify important social actors, subgroups (i.e., clusters), and network properties in social media sites such as Twitter, Facebook, and YouTube.
4. Summarize knowledge on extraction and analyzing of social web
5. Describe Association rule mining algorithms
6. Recognize the evolution of social networks

Unit I **06 Hours**

Text Mining: Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications

Unit II **06 Hours**

Methods & Approaches: Content Analysis; Natural Language Processing; Clustering & Topic Detection; Simple Predictive Modeling; Sentiment Analysis; Sentiment Prediction

Unit III **06 Hours**

Text Extraction:Text Extraction: Introduction, Rapid automatic keyword extraction: candidate keywords, keyword scores, adjoining keywords, extracted keywords, Benchmark evaluation: precision and recall, efficiency, stoplist

generation, Evaluation on new articles.

Unit IV

06 Hours

Web Analytics: Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization, Web crawling and Indexing, Ranking algorithms, Web traffic models

Unit V

06 Hours

Social Media Analytics: Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization; Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis

Unit VI

06 Hours

Extracting And Analyzing Web Social Networks:

Extracting Evolution of Web Community from a Series of Web Archive, Temporal Analysis on Semantic Graphusing Three-Way Tensor, Decomposition, Analysis of Communities and Their Evolutions in DynamicNetworks.

Textbooks

- 1 Peter Mika, "Social networks and the Semantic Web", Springer, 2007. 2.
2. GuandongXu,Yanchun Zhang, and Lin Li, "Web Mining and Social Networking Techniques and Applications", Springer

Reference Books

- 1Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
- 2.Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
- 3.Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social InformationRetrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
- 4.Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011.

List of Assignments

- 1.Review two case studies of applying social media analytics using both textand network analysis available.
- 2.Students will select two companies/organizations/groups to conduct acomparative analysis of social networks by examining social mediaactivity.
- 3.Identify 2 relevant social media platforms used by both entities and use Netlytic to collect publicly available social media data (e.g., Twitter messages, Facebook page posts, etc.).
- 4.Conduct text and network analysis of each platforms used by theorganizations. Students will end up with a set of interactive visualizationsto investigate the similarities and differences between the contentdiscussed and social networks developed among each organization.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective IV c) Mobile Computing

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	03 Hours/Week	End Semester Examination: 60Marks		Theory	Credits 03
Practical:	02 Hours/Week	Continuous Assessment: 40 Marks			
Tutorials:	00 Hours/Week	TW & Practical: 00 Marks		TW & Practical:	00
Total	05 Hours/Week	TW & Oral:	50 Marks	TW & Oral:	01
		Term Work	00 Marks	Term Work	00
Total	150	Total	04		

Course Overview

Course covers Mobile structure, communication technologies.

Prerequisite: Basic understanding of networking is required

Course Outcomes: On completion of the course, students will have the ability to:

1. Study Mobile Infrastructure
2. Understand Location Management of Mobile.
3. Understand the Multiple Access Control
4. Use wireless Network
5. Understand Cognitive radio network
6. Use 5G technology.

Unit I

06 Hours

Introduction: Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations:- 1G to 5G.

Unit II

06 Hours

Location and handoff management: Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based); Mobility models characterizing the movement of groups of nodes (Reference point based group mobility model, Community based group mobility model); Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based); Terminal Paging (Simultaneous paging, Sequential paging); Location management and Mobile IP; Overview of handoff process; Factors affecting handoffs and performance evaluation metrics; Handoff strategies; Different types of handoffs (soft, hard, horizontal, vertical).

Unit III **06 Hours**

Wireless transmission fundamentals: Introduction to narrow and wideband systems; Spread spectrum; Frequency hopping; Introduction to MIMO; MIMO Channel Capacity and diversity gain; Introduction to OFDM; MIMO-OFDM system; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and zigbee).

Unit IV **06 Hours**

Mobile Ad-hoc networks: Characteristics and applications; Coverage and connectivity problems; Routing in MANETs.

Wireless sensor networks: Concepts, basic architecture, design objectives and applications; Sensing and communication range; Coverage and connectivity; Sensor placement; Data relaying and aggregation; Energy consumption; Clustering of sensors; Energy efficient Routing (LEACH).

Unit V **06 Hours**

Cognitive radio networks: Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

Unit VI **06 Hours**

D2D communications in 5G cellular networks: Introduction to D2D communications; High level requirements for 5G architecture; Introduction to the radio resource management, power control and mode selection problems; Millimetre wave communication in 5G.

Textbooks

1. *Mobile Communications*. Jochen Schiller, Pearson Education.
2. *Wireless Communications*. Andrea Goldsmith, Cambridge University Press.
3. *Wireless Communications: Principles and Practice*. Theodore Rappaport, Pearson Education.
4. *Wireless Communications*. Ezio Biglieri, MIMO, Cambridge University Press.
5. *Handbook of Wireless Networking and Mobile Computing*. Ivan Stojmenovic, Wiley.

Reference Books

- 1 *Dynamic Location Management in Heterogeneous Cellular Networks*. James Cowling,

2 *Wireless Device-to- Device Communications and Networks*.Lingyang Song, Dusit Niyato, Zhu Han, and Ekram Hossain, Cambridge University Press.

List of Assignments

- 1 Understand the cell splitting in crowded region.
- 2 Study the evolution from 1G to 5G
- 3 Use handoff approach for switching of network
- 4 Explain various mobility models in detail.
- 5 Use frequency hopping approaches in detail.
- 6 Exemplify the compatibility issues.
- 7 Explain energy efficient routing.
- 8 Explain dynamic spectrum access in detail
- 9 List out issues in D2D communication.
- 10 Analyse the changes required in architecture for 5G

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Semester VIII

Services Science & Service Operational Management

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
				Credits
Lecture:	04 Hours/Week	End Semester Examination: 60Marks	Theory	4
Practical:	02 Hours/Week	Continuous Assessment: 40 Marks		
Tutorials:	NA	TW &Practical: 50Marks	TW &	01
			Practical:	
		TW &Oral: NA	TW & Oral:	NA
Total	06 Hours/Week	Total : 150 Marks	Total	5

Course Overview

Introduction to service, its nature, operations, development, design, quality relationships and Innovation.

Prerequisite:

Fundamentals of Management, Operations Research

Course Outcomes: On completion of the course, students will have the ability to:

5. Understand concepts about Services and distinguish it from Goods.
6. Able to identify characteristics and nature of Services.
7. Comprehend ways to design Services and evaluate those using Service qualities.
8. Understand how various methods can be used to operate and manage Service businesses.
9. Understand how innovation can be approached from Services point of view.
10. Understand the need of Services Innovation.

Unit I

06 Hours

Introduction: Introduction to the course, Introduction to service operations, Role of service in economy and society, Introduction to Indian service sector.

Nature of Services and Service Encounters: Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters.

Unit II

06 Hours

Service-Dominant Logic: From Goods-Dominant logic to Service-Dominant logic, Value Co-creation. **Service Strategy and Competitiveness:** Development of Strategic Service Vision (SSV), Data Envelopment Analysis.

New Service Development: NSD cycle, Service Blueprinting, Elements of service delivery system.

Service Design: Customer Journey and Service Design, Design Thinking methods to aid Service Design.

Unit III

06 Hours

Locating facilities and designing their layout: models of facility locations (Huff's retail model), Role of service-scape in layout design.

Service Quality: SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools.

Service Guarantee & Service Recovery: How to provide Service guarantee?

How to recover from Service failure?

Unit IV

06 Hours

Forecasting Demand for Services: A review of different types of forecasting methods for demand forecasting.

Managing Capacity and Demand: Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.

Managing Facilitating Goods: Review of inventory models, Role of inventory in services.

Unit V

06 Hours

Managing service supply relationship: Understanding the supply chain/hub of service, Strategies for managing suppliers of service.

Vehicle Routing Problem: Managing after sales service, Understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes.

Unit VI

06 Hours

Service Innovation: Services Productivity, Need for Services Innovation.

Student Project:

Option 1: Choose any service organization around and present it from the perspective of: nature of service, classification of service, blueprint or service design analysis, service quality, and any additional perspective you would like to add.

Option 2: Choose any latest research paper in services and explain your understanding and feedback on the same.

Textbooks

1. Fitzsimmons & Fitzsimmons, *Service Management: Operations, Strategy, Information Technology*, McGraw Hill publications (7th edition).

Reference Books

1. Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). *Services marketing: Integrating customer focus across the firm*. McGraw Hill.
2. Lovelock, C. (2011). *Services Marketing, 7/e*. Pearson Education India
3. Reason, Ben, and Lovlie, Lavrans, (2016) *Service Design for Business: A Practical Guide to Optimizing the Customer Experience*, Pan Macmillan India.
4. Chesbrough, H. (2010). *Open services innovation: Rethinking your business to grow and compete in a new era*. John Wiley & Sons.

List of Assignments

1. Manufacturing game (in-class activity)
2. Online activities (industrial service spotting blog, commenting)
3. Article reviews (in-class activity, in groups of 4 students)
4. Learning cases (visiting lectures, case examples)
5. Course essay (group activity in groups of 2 students)

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

IT Project Management				
<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>		
Lecture: 3 Hours/Week	End Semester Examination: 60 Marks	Theory		Credits 3
	Continuous Assessment: 40 Marks			
Practical: 2 Hours/Week	TW & Oral: 50 Marks	TW& Oral		1
Total 5 Hours/Week	Total: 150 Marks			

Course Overview

Course provides an in depth understanding of project management principles and industry perspective software project management practices

Prerequisite:

Knowledge of Software Engineering Principles.

Course Outcomes: On completion of the course, students will have the ability to:

1. Learn the techniques to effectively plan
2. Perform the Project Scheduling, tracking, Quality management and Project Cost estimation using different techniques
3. Develop strategies to calculate risk factors involved in IT projects.
4. decide an effective project management strategy by assessing the project's business background and scope
5. understand responsibility as a professional practitioner of project management
6. Use project management and monitoring tools.

Unit I

06 Hours

Project Overview and Feasibility Studies: Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal.

Unit II

06 Hours

Project Scheduling: Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

Unit III

06 Hours

Cost Control and Scheduling: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Levelling

Unit IV

06 Hours

Project Management Features: Risk Analysis, Project Control, Project Audit and Project Termination.

Agile Project Management: Introduction, Agile Principles, Agile methodologies:
Agile Methodologies: XP, FDD, DSDM, Crystal.

Unit V

06 Hours

Scrum: Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum. Relationship between Agile Scrum and Lean.

Unit VI

06 Hours

DevOps: Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring.

Textbooks

1. Mike Cohn, Succeeding with Agile: Software Development Using Scrum
2. Notes to be distributed by the course instructor on various topics

Reference Books

3. Roman Pichler, *Agile Product Management with Scrum*
4. Ken Schwaber, *Agile Project Management with Scrum (Microsoft Professional)*

List of Assignments

Case studies will be distributed to students beforehand and students should prepare and try to solve these cases before coming to class. Students will be asked submit and present their understanding of the cases and solutions before the class.

Note: Workshops will be conducted as a part of this course which is mandatory for students to attend. The primary objective of the workshops is to teach the students the agile project management including Scrum and DevOps through group activities.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Marketing Research & Marketing Management

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	3 Hours/Week	End Semester Examination:	60Marks	Theory	Credits 3
Practical:	NA	Continuous Assessment:	40 Marks		
Tutorials:	NA	TW & Practical:	NA	TW & Practical:	NA
		TW & Oral:	NA	TW & Oral:	NA
		Term Work:	NA	Term Work	NA
Total	3 Hours/Week	Total:	100 Marks	Total	3

Course Overview:

Course includes concepts of Marketing, Product Management, Business Marketing and marketing management.

Prerequisite:

Students should have basic knowledge about marketing skills.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the basic marketing concepts.
2. Comprehend the concept of Product Life cycle and Product development.
3. Understand the basics of Pricing, Promotion and Distribution Strategy.
4. Comprehend the dynamics of marketing and analyze how its various components interact with each other in the real world.
5. Leverage marketing concepts for effective Internet Marketing.
6. Understand basic concepts and application of statistical tools in Marketing research.

Unit I

06 Hours

Marketing Concepts and Applications: Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector.

Marketing Planning & Environment: Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social.

Understanding the consumer: Determinants of consumer behaviour, Factors influencing consumer behaviour.

Market Segmentation: Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning.

Unit II

06 Hours

Product Management: Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging

Unit III

06 Hours

Pricing, Promotion and Distribution Strategy: Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising.

Unit IV

06 Hours

Marketing Research: Introduction, Type of Market Research, Scope, Objectives & Limitations, Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research

Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis.

Unit V

06 Hours

Internet Marketing: Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing.

Unit VI

06 Hours

Business to Business Marketing: Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy.

Textbooks

1. Marketing Management (Analysis, Planning, Implementation & Control) – Philip Kotler
2. Fundamentals of Marketing – William J. Stanton & Others
3. Marketing Research – Rajendra Nargundkar
4. Marketing Management – V.S. Ramaswamy and S. Namakumari
5. Market Research – G.C. Beri
6. Market Research, Concepts, & Cases – Cooper Schindler

Reference Books

1. Marketing Management – Rajan Saxena
2. Marketing Management – S.A. Sherlekar
3. Service Marketing – S.M. Zha
4. Journals – The IUP Journal of Marketing Management, Harvard Business Review
5. Research for Marketing Decisions by Paul Green, Donald, Tull
6. Business Statistics, A First Course, David M Levine at al, Pearson Publication

List of Assignments

1. Case study on various marketing management, Product Management, Data Analysis, Internet Marketing
2. Field visit & live project covering steps involved in formulating Market Research Project
3. Measuring Internet Marketing Effectiveness: Metrics and Website Analytics

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Elective V a) Behavioral Economics

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
Lecture:	3 Hours/Week	End Semester Examination:60 Marks	Theory	Credits 3
Practical:	2 Hours/Week	Continuous Assessment: 40 Marks		
Tutorials:	NA	TW & Practical:50 Marks	TW & Practical:	1
		TW & Oral:NA	TW & Oral:	NA
		Term Work :NA	Term Work	NA
Total	5 Hours/Week	Total:150 Marks	Total	4

Course Overview: : To impart knowledge on current ideas and concepts regarding decision making in Economics, particularly from a behavioral science perspective, which can affect choices and behavior of firms, households and other economics entities

Prerequisite: Knowledge of Mathematics

Course Outcomes: On completion of the course, students will have the ability to:

1. various concepts in understand and apply traditional and modern Microeconomics, focusing on decision making, and
2. develop a holistic understanding of these concepts and their interconnections

Unit I **06 Hours**

Introduction The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; losses, money illusion, charitable donation.

Unit II **06 Hours**

Basics of choice theory Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies

Unit III **06 Hours**

Beliefs, heuristics and biases Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and self-projection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia

Unit IV **06 Hours**

Choice under uncertainty Background and expected utility theory; prospect theory and other theories; weighting; applications – reference points; loss

aversion; marginal utility; decision and performance and probability ownership and trade consumption, income, in sports.

Unit V **06 Hours**

Intertemporal choice Geometric discounting; preferences over time,

of inter-temporal decisions; hyperbolic; discounting instantaneous; utility alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings clubs and membership, consumption planning

Unit VI

06 Hours

Strategic Choice

1. Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signaling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry

2. Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion; policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design

Textbooks

1 An Introduction to Behavioral Economics, by N. Wilkinson and M. Klaes

Reference Books

1 Colin Cramer, George Loewenstein, Mathew Rabin Advances in Behavioral Economics, Princeton University Press

List of Assignments

2 -3 Assignment on Each Unit

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective V b) Computational Finance and Modelling

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
Lecture:	3 Hours/Week	End Semester Examination:60 Marks	Theory	Credits 3
Practical:	2Hours/Week	Continuous Assessment: 40 Marks		
Tutorials	NIL	TW & Practical: NIL	TW & Practical:	1
		TW & Oral: 50 Marks	TW & Oral:	
		Term Work:	Term Work	
Total	5 Hours/Week	Total: 150 Marks	Total	4

Course Overview

Computational finance emphasizes practical numerical methods rather than mathematical proofs and focuses on techniques that apply directly to economic analyses

Prerequisite:

Numerical Methods, Probability, Statistics, ordinary and partial differential equations, linear algebra and analysis.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand existing financial models in a quantitative and mathematical way.
2. Apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering.
3. Explain the approaches required to calculate the price of options.
4. Identify the methods required to analyse information from financial data and trading systems.
5. Understanding Statistical Analysis
6. Understanding Incomplete Markets and Electronic Trading

Unit I

06 Hours

Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance: examples of exact solutions including Black Scholes and its relatives, finite difference methods including algorithms and question of stability and convergence, treatment of near and far boundary conditions, the connection with binomial models, interest rate models, early exercise, and the corresponding free boundary problems, and a brief introduction to numerical methods for solving multi-factor models.

Unit II

06 Hours

Black-Scholes framework: Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. The Greeks: theta, delta, gamma, vega & rho and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local vol and volatility surfaces.

Simulation including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo

integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the “Greeks. ”

Unit III

06 Hours

Financial Products and Markets: Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging.

Unit IV

06 Hours

Application areas include the pricing of American options, pricing interest rate dependent claims, and credit risk. The use of importance sampling for Monte Carlo simulation of VaR for portfolios of options.

Unit V

06 Hours

Statistical Analysis of Financial Returns: Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data.

Unit VI

06 Hours

Copulas, Hedging in incomplete markets, American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.

Textbooks

1. R. Seydel: Tools for Computational Finance, 2nd edition, Springer-Verlag, New York, 2004.
2. P. Glasserman: Monte Carlo Methods in Financial Engineering, Springer-Verlag, New York, 2004.

Reference Books

1. W. Press, S. Teukolsky, W. Vetterling and B. Flannery, Numerical Recipes in C: The Art of Scientific Computing, 1997. Cambridge University Press, Cambridge, UK. Available on-line at: <http://www.nr.com/>
2. A. Lewis: Option Valuation under Stochastic Volatility, Finance Press, Newport Beach, California, 2000.
3. A. Pelsser: Efficient Methods for Valuing Interest Rate Derivatives, Springer-Verlag, New York, 2000.
4. D. Ruppert, Statistics and Data Analysis for Financial Engineering
5. R. Carmona: Statistical Analysis of Financial Data in S-Plus
6. N. H. Chan, Time Series: Applications to Finance
7. R. S. Tsay, Analysis of Financial Time Series
8. J. Franke, W. K. Härdle and C. M. Hafner, Statistics of Financial Markets: An Introduction

List of Assignments

- 1 Implement different Numerical methods
- 2 Implement variance reduction methods
- 3 Study Financial Markets
- 4 Implement Monte Carlo Method

- 5 Analyze frequency data.
- 6 Study High Dimensional Covariance Matrix

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Elective V c) PSYCHOLOGY

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
Lecture:	03 Hours/Week	End Semester Examination: 60Marks	Theory	Credits 03
Practical:	02 Hours/Week	Continuous Assessment: 40 Marks		
Tutorials:	00 Hours/Week	TW & Practical: 00 Marks	TW & Practical:	
		TW & Oral: 50 Marks	TW & Oral:	01
		Term Work: 00 Marks	Term Work	
Total	05 Hours/Week	Total: 150 Marks	Total	04

Course Overview

Introduces students to the content areas of industrial psychology and the application of psychological theory to organizational issues. Topics include employment law, job analysis, recruitment and selection, training, performance appraisal and discipline, employee motivation, and workplace safety. Using an applied approach, this course will help prepare students for their roles as employees and managers.

Prerequisite:

Statistics courses are a must for any psychology major. Statistics offers a core background for understanding how psychologists investigate human behaviour.

Course Outcomes: On completion of the course, students will have the ability to:

1. Become conversant about the major content areas of Industrial Psychology (i.e., job analysis, recruitment, selection, employment law, training, performance management, and health/well-being issues in the workplace).
2. Gain further comfort with statistical concepts in the context of making personnel decisions to reinforce content learned in PSY203 or an equivalent introductory statistics course.
3. Gain practical experience by completing a series of hands-on projects involving job analysis, selection decisions, training programs, and employee well-being.
4. Deepen your understanding of tests and measurements so that you can collect accurate information and make sound data-based decisions.
5. Prepare for other focused seminar courses in Industrial/Organizational Psychology or Human Resource Management.
6. To allow the students to observe and interpret individual differences in behaviour in the light of sound theoretical systems of personality.

Unit I

06 Hours

What is I/O Psychology? Research Methods, Statistics, and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modeling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment.

Unit II

06 Hours

Identifying Criteria & Validating Tests and Measures, Screening Methods, Intensive Methods.

Unit III

06 Hours

Performance Goals and Feedback, Performance Coaching and Evaluation,

Evaluating Employee Performance

Unit IV **06 Hours**
Employee Motivation, Satisfaction and Commitment, Fairness and Diversity

Unit V **06 Hours**
Leadership, Organizational Climate, Culture, and Development, Teams in Organizations, The Organization of Work Behaviour

Unit VI **06 Hours**
Stress Management: Demands of Life and Work

Textbooks

- 1 Landy, F. J. and Conte, J. M. (2013). Work in the 21st Century (4th Edition). Oxford: Blackwell Publishing
- 2 Introduction to Psychology, University of Minnesota Libraries Publishing, ISBN 13: 9781946135131
- 3 Introduction to Psychology, Manoj Kr Singh, Anmol Publications Pvt. Ltd.

Reference Books

- 1 Encyclopedia of Psychology (English, Hardcover, unknown), Oxford University Press Inc
ISBN: 9781557981875, 9781557981875, Edition: 2000

List of Assignments

- 1 Case study on Legal Context of Industrial Psychology
- 2 How to get Employee Motivation, Satisfaction and Commitment in working environment?
- 3 How to reducing the stress for compromising demands of life?
- 4 Case Study on Evaluating Employee Performance

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Elective VI a) Enterprise Systems

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	Credits
Lecture: 3 Hours/Week	End Semester Examination: 60Marks	Theory	03
Practical: 2 Hours/Week	Continuous Assessment: 40 Marks		
Tutorials: NA	TW & Practical: NA	TW & Practical:	
	TW & Oral: 50 Marks	TW & Oral:	01
	Term Work NA	Term Work	
	Total 150 Marks	Total	04

Course Overview

The course deals with Enterprise Systems, Service Oriented Architecture.

Prerequisite:

Have the knowledge of Databases and Networks.

Course Outcomes: On completion of the course, students will have the ability to:

- Design and deploy Simple Web Applications using MVC
- Design SOA and ERP models
- Design of CRM models
- Design interactive network and application
- Manage, Maintain and configuration of Networking
- Learn how to use the user interface using ERP Tools and Technologies.

Unit I

06 Hours

Overview of: Database Management Systems. Overview of Model - View - Control (MVC),Control (MVC) method of software development in a 3 tier environment

Tools and Technologies: overview of the following : Java server pages , Related Java Technologies, Microsoft .NET framework, PHP, Ruby on Rails, Javascript, Ajax.

Unit II

06 Hours

Service Oriented Architecture (SOA): Principles of loose coupling, encapsulation Inter-operatibility ,Web Services as the implementation vehicle protocols, usage
Enterprise Resource Planning (ERP): systems and their architecture, Overview of SAP and Oracle Applications, Generic ERP Modules: Finance, HR, Materials Management, Investment, etc , Examples of Domain Specific Modules .

Unit III

06 Hours

Electronic Data Exchange, Customer Relationship Management (CRM), Supplier Relationship Management (SRM)

Security Issues - Authentication, Authorisation, Access control, Roles; single-sign-on, Directory servers, Audit trails; Digital signatures; Encryption: review of IPsec, SSL and other technologies; Simple Applications Demo .

Unit IV

06 Hours

Network management in ERP: Overview of : MPLS, Virtual Private Networks (VPN),

Firewalls, Network monitoring and enforcement of policies.

Unit V

06 Hours

ERP Software Acquisition Process: Tendering; conditions of contract, Commercial off the shelf software (COTS) versus Bespoke Implementations; Total cost of ownership, Issues on using Open source software or free software, Licensed software.

Unit VI

06 Hours

Hardware Architectures for Enterprise Systems : Servers ,Clustering, Storage area networks, Storage units,Back-up strategies, Local Area Network (LAN) technologies and products, Data Centres.

Disaster recovery site design and implementation issues, Hardware Acquisition Issues.

Textbooks

1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.
2. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.
3. Enterprise Resource Planning - Ravi Shankar & S. Jaiswal , Galgotia

Reference Books

1. E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft : A Practical Roadmap For Success By Dr. Ravi Kalakota

List of Assignments

1. Create a Movie Database Application using MVC
2. Creating an ASP.NET MVC Web Application Project.
3. Explore the client/server architecture of SAP. Learn how to use the user interface
4. Create vendor, material master data for purchasing. Execute the Purchasing process in SAP
5. A model of customer relationship management and business intelligence systems for catalogue and online retailers.
6. Firewalls configuration
7. COTS configuration and Implementation
8. A model of customer relationship management and business intelligence systems for catalogue and online retailers

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective VI b) Advance Finance

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	Credits
Lecture: 3Hours/Week	End Semester Examination: 60Marks	Theory	3
Practical: 2Hours/Week	Continuous Assessment: 40 Marks	TW & Practical:	NIL
Tutorials: NA	TW & Practical: NA	TW & Oral:	1
	TW & Oral: 25 Marks	Term Work	
	Term Work 25 Marks		
Total 150 Marks	Total 4		

Course Overview: This course focuses on advanced financial decisions of corporate managers. The course uses case studies to illustrate the application of theoretical concepts to real-life.

Prerequisite: Basics of Financial accounting

Course Outcomes: On completion of the course, students will have the ability to:

1. Imbibe knowledge about the decisions and decision variables involved with financial activities of the firm.
2. Develop skills for interpretation business information and application of financial theory in corporate investment decisions, with special emphasis on working capital management.
3. Familiarizing the students with the corporate and financial restructuring.
4. Explain optionality and its application to financial management and financial decisions
5. Present ideas and advocate for decisions using effective finance arguments, models and frameworks
6. Analyse how organisations can effectively manage risk in today's uncertain economy

Unit I : Sources of Funds (including regulatory framework) 06 Hours

- Types of securities
- Issuing the capital in market
- Pricing of issue
- Valuation of Stocks and bonds

Unit II: Dividend Decisions: Traditional Approach, Dividend Relevance Model, 06 Hours
Miller and Modigliani Model, Stability of Dividends, Forms of Dividends, Issue of bonus shares, Stock Split.

Unit III: Evaluation of Lease Contracts, 06 Hours
Corporate Restructuring

- Mergers and Acquisitions- Types of Mergers, Evaluation of Merger Proposal
- Take-over
- Amalgamation
- Leverage buy-out
- Management buy-out
- Corporate Failure and Liquidation

Unit IV : Financial Restructuring

06 Hours

- Share Split
- Consolidation
- Cancellation of Paid-up Capital
- Other Mechanisms

Unit V: Working Capital Management:

06 Hours

- Working Capital Planning
- Monitoring and Control of Working Capital
- Working Capital Financing
- Managing the Components of Working Capital
 - Cash Management
 - Receivable Management
 - Inventory Management

Unit VI: Introduction to derivatives

06 Hours

- Basics of Futures, Forwards, Options, Swaps
- Interest rate Payoff Diagrams, Pricing of Futures, Put Call Parity, Option Pricing using Binomial Model and Black Scholes Model
- Use of Derivatives for Risk-Return Management- Credit Default Swaps

Textbooks

1. Brealey, Myers and Allen, *Principles of Corporate Finance*
2. Case Study Materials: To be distributed for class discussion

List of Assignments

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Historical perspectives of markets like major boom and busts, bull and bear cycles, major market crashes, bubbles
2. Topic: Major scams in the market, e.g. Satyam case

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Elective VI c) Image Processing and Pattern Recognition

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	<u>Credits</u>
Lecture:	3 Hours/Week	End Semester Examination:60 Marks	Theory	3
Practical:	2 Hours/Week	Continuous Assessment: 40 Marks		
		TW & Oral: 50 Marks	TW & Oral:	1
Total	150	MarksTotal		4

Course Overview

It emphasizes general principles of image processing, rather than specific applications. This course includes foundations of pattern recognition algorithms and machines, including statistical and structural methods.

Prerequisite:

Fundamental knowledge of computer graphics algorithms, probability theory and transform operations in mathematics.

Course Outcomes: On completion of the course, students will have the ability to:

The major **emphasis** of the course will be on creating a learning system through which management students can enhance their innovation and creative thinking skills, acquaint themselves with the special challenges of starting new ventures and use IPR as an effective tool to protect their innovations and intangible assets from exploitation.

1. Understand Basics of Image formation and transformation using sampling and quantization
2. Understand different types of signal processing techniques used for image sharpening and smoothing
3. Perform and apply compression and coding techniques used for image data
4. Understand the nature and inherent difficulties of the pattern recognition problems
5. Understand concepts, trade-offs, and appropriateness of the different feature types and classification techniques.
6. Understand and select a suitable classification process, features, and proper classifier to address a desired pattern recognition problem.

Unit I: Introduction to Image Processing

06 Hours

Image formation, image geometry perspective and other transformation, stereo imaging elements of visual perception. Digital Image-sampling and quantization serial & parallel Image processing.

Unit II: Image Restoration

06 Hours

Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.

Unit III: Segmentation Techniques

06 Hours

Segmentation Techniques-thresh holding approaches, region growing, relaxation, line and edge detection approaches, edge linking, supervised and unsupervised classification techniques, remotely sensed image analysis and applications, Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape

descriptors, Skelton detection, Hough trans-form, topological and texture analysis, shape matching.

Unit IV: Pattern Recognition

06 Hours

Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit V: Statistical Patten Recognition

06 Hours

Bayesian Decision Theory, Classifiers, Normal density and discriminant functions, Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation.

Unit VIDimension reduction methods

06 Hours

Principal Component Analysis (PCA), Hough Transform, Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM),Gaussian mixture models.

Textbooks

1. Digital Image Processing – Ganzalez and Wood, Addison Wesley.
2. Fundamental of Image Processing – Anil K.Jain, Prentice Hall of India.
3. Pattern Classification – R.O. Duda, P.E. Hart and D.G. Stork, John Wiley.

Reference Books

1. Digital Picture Processing – Rosenfeld and Kak, vol.I & vol.II, Academic.
2. Computer Vision – Ballard and Brown, Prentice Hall.
3. Pattern Recognition and Machine Learning – C. M. Bishop, Springer.
4. Pattern Recognition – S. Theodoridis and K. Koutroubas, 4th Edition, Academic Press.

List of Assignments

1. Implement the noise reduction for the noisy image.
2. Implement various transformation methods
3. Implement the histogram equalization for two images
4. Implemented Hough Transform for circles from scratch.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

B. Tech. (Electronics) – 2014 Course

Semester- I					Contact Hours: 30 Hrs/week						
					Total Credits: 25						
					Total Marks: 700						
Sr. no.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)					Total Marks	Total Credits
		L	P	T	End Semester Exam	Continuous Assessment			TW		
						Unit test	Tutorials / Assignments	Attendance			
1	Engineering Mathematics-I	3	1	0	60	20	10	10	-	100	4
2	Fundamentals of Civil Engineering	3	0	2	60	20	10	10	25	125	4
3	Engineering Graphics	4	0	2	60	20	10	10	25	125	5
4	Engineering Chemistry	4	0	2	60	20	10	10	25	125	5
5	Elements of Electronics Engineering	3	0	2	60	20	10	10	25	125	4
6	Professional Skill Development-I	2	0	0	30	0	20	0	0	50	2
7	Workshop Technology	0	0	2	0	0	0	0	50	50	1
	Total	19	01	10	330	100	70	50	150	700	25

Note:

1. Sem-I & Sem-II are common to the branches (Electronics, Biomedical & E & T/C)
2. * indicates subjects common to the branches (Electronics, Biomedical & E & T/C)
3. ** indicates subjects common to the branches (Electronics & E & T/C)
4. Engineering Mathematics –I, II, III are common to the branches (Electronics, Biomedical & E & T/C)
5. Internal assessment of 40 marks comprises of 20 marks average of two Unit tests,10 marks tutorials/assignments and 10 marks attendance

B. Tech. (Electronics) – 2014 Course

Semester- II												
Contact Hours: 30 Hrs/week												
Total Credits: 25												
Total Marks: 700												
Subject Code	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)						Total Marks	Total Credits
		L	T	P	End Semester Exam	Continuous Assessment			TW			
						Unit test	Tutorials / Assignments	Attendance				
8	Engineering Mathematics -II	3	1	0	60	20	10	10	-	100	4	
9	Fundamentals of Mechanical Engineering	3	0	2	60	20	10	10	25	125	4	
10	Fundamentals of Engineering Mechanics	4	0	2	60	20	10	10	25	125	5	
11	Engineering Physics	4	0	2	60	20	10	10	25	125	5	
12	Fundamentals of Electrical Engineering	3	0	2	60	20	10	10	25	125	4	
13	Professional Skill Development-II	2	0	0	30	0	20	0	0	50	2	
14	Fundamentals of Computing	0	0	2	0	0	0	0	50	50	1	
	Total	19	01	10	330	100	70	50	150	700	25	

ENGINEERING MATHEMATICS-I

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

(08 Hours)

Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

02: Fundamentals of Civil Engineering

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:		
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits		
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks				
		Term Work: 25 Marks		01 Credit		
Course Pre-requisites:						
The Students should have						
1.	Concepts of units and conversions of units.					
2.	Basic knowledge of Chemistry					
3.	Basic knowledge of geography, concept of latitude and longitude.					
Course Objectives:						
	To make student understand the scope and application of Civil Engineering					
Course Outcomes:						
Students will be able to understand						
1.	Different building components and material					
2.	Classification of surveying					
3.	Levelling of the ground					
4.	Planning of building					
5.	Methods of irrigation and water supply					
6.	Different methods of transportation					
UNIT - I						
UNIT - I	Civil Engineering Scope And Applications.				(06 Hours)	
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.					
UNIT - II						
UNIT - II	Surveying				(06 Hours)	
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.					
UNIT - III						
UNIT - III	Building Planning And Bye Laws				(06 Hours)	
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.					
UNIT - IV						
UNIT - IV	Foundations and Earthquakes				(06 Hours)	
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.					

UNIT - V	Irrigation And Water Supply	(06 Hours)
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
UNIT - VI	Infrastructure	(06 Hours)
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
Term Work:		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
Reference Books:		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p>Lines and Dimensioning in Engineering Drawing Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p>Curves used in Engineering Practice Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p>Orthographic Projection Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p>Isometric Projections Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p>Projections of Points and Lines and planes Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p>Projection of Solids Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p>Section of Solids Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes

4. Orthographic Projections
5. Isometric views
6. Projection of Solids

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

ENGINEERING CHEMISTRY

Teaching Scheme:
Lectures: 4Hrs/Week
Practical: 2Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory: 04
Practical: 01
Term Work: 25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process

(08 Hours)

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

(08 Hours)

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

(08 Hours)

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

(08 Hours)

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

(08 Hours)

Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

Course: ELEMENTS OF ELECTRONICS ENGINEERING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS</u>
Lectures : 03 Hrs/week Practicals : 02 Hrs/week	End semester exam : 60 Marks Continuous Assessment : 40 Marks Term work : 25 Marks	03 01

Course Prerequisite:

Students have completed a course in Physics and have the knowledge of laws of Dynamics

Course Objective:

This course will introduce the concepts of electronic engineering . By the end of the course, student will be familiar with electronic components, semiconductor devices and their applications. The course emphasizes on Electronic devices, ICs and Digital systems.

Course Outcomes:

At the end of the course, a student will be able to

- 1 understand the basic semiconductor physics and semiconductor devices.
- 2 understand transport phenomenon of semiconductor devices through energy band diagrams.
3. to identify electronic components like, resistors, capacitors, inductors and to study characteristics of semiconductor devices.
4. apply the knowledge of diodes to the rectifier and filter circuits.
5. to represent numerical values in various number systems and perform number conversions between different number system and study applications of logic gates.

Unit-I

(08 Hours)

Electron Dynamics:

Motion of electron in electric, magnetic and combined electric and magnetic fields. Detection and focusing system of Oscilloscope tube-Television picture tube- LCD and Flat panel displays.

Unit-II

(08 Hours)

Transport phenomenon in semiconductor:

Mobility and conductivity - Drift and Diffusion currents – Continuity Equation – Minority carrier injection and recombination in Homogeneous semiconductor – Thermistors – Piezo Resistors – Hall Effect – Thermoelectric effect

Unit-III

(08 Hours)

Electronic components:

Resistors -Inductors and Capacitors and their types – Construction and characteristics of PN junction diode – Zener Diode – Tunnel diode - Bipolar junction transistors – CB,CC,CE circuits, Field Effect transistors .

Unit-IV

(08 Hours)

Electronic Devices and Linear ICs:

Rectifiers: Half wave, Full wave and Bridge rectifiers - capacitor filter-wave forms-ripple factor regulation characteristics. Special semiconductor devices: FET - SCR - LED - VI characteristics – applications. Introduction to Op-Amp and Timers.

Unit-V**(08 Hours)****Digital system:**

Number system: Binary system, Decimal to Binary, Octal system, Hexadecimal system, binary –addition, subtraction, multiplication and division.

Logic gates: OR, AND, NOT, Exclusive-OR, NOR, NAND gates, Logic networks, Gate Standardization, Introduction to Logic Circuits –Combinational and Sequential Circuits.

(08 Hours)**Unit-VI****Consumer Electronics:**

Basic study of various products such as radio receivers , television sets , MP3 players, video recorders , DVD players , digital cameras , microwaves , personal computers , video game consoles , telephones and mobile phones , laptops and palmtops and fax machines

Term work: For term work assessment the students will have to perform minimum of eight practicals.

- 1) To study various electronics components: Resistors, Inductors, Capacitors, diodes and transistors.
- 2) To study CRO and different modes of operation and some application.
- 3) To plot V-I characteristics of PN junction diode.
- 4) To plot regulation characteristics of half wave rectifier with and without capacitor filter.
- 5) To plot regulation characteristics of Full wave rectifier with and without capacitor filter.
- 6) To plot input-output characteristics of CE configuration of BJT.
- 7) To study basic logic gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR.
- 8) To realize the Boolean expression using basic gates.
- 9) To verify the De-Morgan's theorem.
- 10) To fabricate at least 5 electronics component on a PCB.

TEXT BOOKS

1. Mottershed Allen, Electronic Devices & Circuits, PHI
2. R. P. Jain, Modern Digital Electronics, Mc Graw Hill

REFERENCE BOOKS

1. Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)
2. Millman & Halkis, Electronic Devices & Circuits, PHI
3. Malvino Leach, Digital Principles & Applications, Mc Graw Hill
4. Millman & Halkis, Integrated Electronics, MGH

Syllabus for Unit Test :

Unit Test 1	Unit I ,II & III
Unit Test 2	Unit IV, V &VI

Workshop Technology

TEACHING SCHEME:

Theory: -
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -
Continuous Assessment: -
Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

ENGINEERING MATHEMATICS-II

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment:40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

(08 Hours)

Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I, II, III

Unit Test II :- Unit IV, V, VI

FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Thermodynamics- Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p>Introduction to I.C. Engines and turbines- Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p>Introduction to refrigeration, compressors & pumps- Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p>Energy Sources - Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p>Heat transfer- Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

UNIT-IV	<p>Properties of fluids- Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p>Properties of Materials and their Applications- Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p>Mechanical devices - Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p>Mechanisms- Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p>Machine Tools- Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p>Introduction to manufacturing processes and Their Applications- Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner

5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johnston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

10: Engineering Mechanics

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 25 Marks	01 Credit
Course Pre-requisites:			
The Students should have knowledge of			
1.	Scalar and Vector		
2.	Newton's law of motion		
3.	Law of friction		
4.	Concept of physical quantities, their units and conversion of units		
5.	Concept of differentiation and integration		
Course Objectives:			
	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.		
Course Outcomes:			
The student should be able to			
1.	calculate resultant and apply conditions of equilibrium.		
2.	analyze the truss and calculate friction force.		
3.	calculate centroid and moment of inertia.		
4.	solve problem on rectilinear motion.		
5.	solve problems on curvilinear motion.		
6.	use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.		
UNIT - I	Resultant and Equilibrium	(06 Hours)	
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.		
UNIT - II	Truss and Friction	(06 Hours)	
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.		
UNIT - III	Centroid and Moment of Inertia	(06 Hours)	
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.		

UNIT - IV	Kinematics of Rectilinear motion of a Particle	(06 Hours)
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	Kinematics of Curvilinear motion of a Particle	(06 Hours)
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	Kinetics of a Particle	(06 Hours)
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	
Term Work:		
A) The term-work shall consist of minimum Five experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
B) The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.		
Text Books:		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
Reference Books:		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	

ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
	Term Work: 25marks	

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

(08hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajous figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Planck's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

02: Fundamentals of Electrical Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have

1. Mathematics
2. Physics

Course Objectives:

The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.

Course Outcomes:

1. Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems
2. Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks
3. Describe construction, principle of operation, specifications and applications of capacitors and batteries
4. Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer
5. Define basic terms of single phase and three phase ac circuits and supply systems
6. Know and use electrical safety rules

UNIT - I	Basic concepts	(06 Hours)
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	Network Theorems	(06 Hours)
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	Electrostatics	(06 Hours)
	Electrostatic field, electric field intensity, electric field strength, absolute	

	permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
UNIT - IV	Magnetic Circuit & Transformer	(06 Hours)
	Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.	
UNIT - V	AC Fundamentals & AC Circuits	(06 Hours)
	AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
UNIT - VI	Electrical Wiring and Illumination system	(06 Hours)
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

Term Work:

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
 - a) Voltage and current ratios.
 - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books:	
1) B.L.Theraja- “A Textbook of Electrical Technology” Volume- I, S.Chand and Company Ltd.,New Delhi	
2) V. K. Mehta, - “Basic Electrical Engineering”, S. Chand and Company Ltd., New Delhi	
3) I. J. Nagrath and Kothari – “Theory and problems of Basic Electrical Engineering”, Prentice Hall of India Pvt. Ltd	
Reference Books:	
1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

FUNDAMENTALS OF COMPUTING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS</u>
Practical: 2 Hours/Week	Term Work: 50 Marks	01

Course Prerequisite:

Students must possess knowledge about basic fundamentals of computer and professional Microsoft office development tools.

Course Objective:

This course will introduce the concepts of C language software development and compiling tool. By the end of the course, student will be familiar with various fundamentals of C- language, software file system, computer graphics and its various multimedia applications.

Course Outcomes: At the end of the course, a student will be able to

1. Write C programs using conditional statements and loops.
 2. Execute the logic using Arrays and strings and perform matrix operation using them.
 3. Perform logic operations using Structures & Unions and use them with pointers.
 4. Write C program for File manipulations and Dynamic memory allocation
 5. Understand the concept and application of Graphics & Multimedia.
-

Unit –I

(08 Hours)

Introduction: Computer systems, Hardware & software concepts.

Algorithm / pseudo code, flowchart, program development steps, Computer Languages: machine, symbolic, and high-level languages, Creating and running programs: Writing, editing, compiling, linking, and executing.

Basic of C: Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operators, bit-wise Operators expressions, type conversions, conditional expressions, precedence and order of evaluation, Managing input and output operations, Sample programs.

Conditional Statements and Loops: Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, sample programs

Unit-II

(08 Hours)

Arrays & Strings

Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays , Array applications: Matrix Operations

Unit –III

(08 Hours)

Function & Pointers

FUNCTIONS: basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, Towers of Hanoi, header files, example c programs. Passing arrays & strings to functions.

Pointers: concepts, initialization of pointer variables, pointers and function arguments, passing by address, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays.

Unit-IV

(08 Hours)

Structures & Unions

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications.

Unit-V

(08 Hours)

Files and Dynamic Memory Allocation

Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations, example programs.

Dynamic memory allocation, malloc, calloc, realloc ,free. Concepts of linked lists, Sample programs

Unit-VI

(08 Hours)

Graphics and Multimedia

Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application, Description of graphics devices, Input Devices for Operator Interaction

Introduction to Multimedia:History, elements of multimedia – text, audio, video, image, animation, Multimedia applications different areas

TEXT BOOKS

1. Programming in ANSI C – E Balagurusamy (5th Edition-TMH)
2. Computer Graphics: Principles and Practices in C – Andrea Von Dam, Steven K Fiener, F Hughes John [2nd Edition- Pearson]

REFERENCE BOOKS

1. Let Us C- Yashwant Kanitkar
2. D. Hearn, M. Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 2002, ISBN 81 - 7808 - 794 – 4
3. Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communication and Applications"
4. Judith Jeffcoate, " Multimedia Technique"

Term work will consist of minimum of ten assignments based on C programming language.

List of Practicals

1. a. Write a C program to take user Input and print it on the screen.
b. Write a C program to perform addition or subtraction of two numbers.
c. Write a C program to find whether the number is Odd or Even.
2. a. Write a C program to find out Prime numbers.
b. Write a C program to find out Fibonacci series.
3. Write C programs to print different patterns
4. a. Write a C program to do factorial using recursion.
b. Write a C program to find out Armstrong number.
5. Write a C program to sort the array in Ascending & Descending order.
6. Write C programs to perform operations on 2-D arrays
7. Write a C program to perform different operations on strings.
8. Use of Pointers
 - a. Write a C program to swap numbers using pointers
 - b. Write a C program to show the use of pointers in arrays.
 - c. Write a C program to use functions using pointers.
9. a. Write a C program to create student mark sheet using structures
b. Write a C program to show the use of structure using pointers
10. Write a C program to perform different operations on Files.
11. Write a C program to create single Linked List.
- 12.** Application of Graphics and Multimedia

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Electronics) Sem – III (2014 Course)

Sr. No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)						Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			T W & P R	T W & O R		Theory	T W	Total Credits
		L	P	T		Un it Test	Attenda nce	Assignm ents						
15	Engineeri ng Mathemat ics-III	3	0	1	60	20	10	10	-	-	100	4	-	4
16	Analog Electronic s	4	2	0	60	20	10	10	50	-	150	4	1	5
17	Signals & Systems	3	2	0	60	20	10	10	-	50	150	3	1	4
18	Digital Logic Circuits	3	2	0	60	20	10	10	50	-	150	3	1	4
19	Circuit theory	3	2	0	60	20	10	10	50	-	150	3	1	4
20	Profession al Skill Developm ent-III	4	0	0	100	0	00	0	-	-	100	4	0	4
	Total	20	8	1	400	100	50	50	150	50	800	21	04	25

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Electronics) Sem – IV (2014 Course)

Sr No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)							Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW	TW	Theory		TW	Total Credits	
		L	P	T		Unit Test	Attendance	Assignments	& PR	& OR					
21	Analog integrated circuits	3	2	0	60	20	10	10	50	-	150	3	1	4	
22	Electronic Circuits and Applications	4	2	0	60	20	10	10	50	-	150	4	1	5	
23	Instrumentation & Control System	3	0	1	60	20	10	10	-	-	100	4	0	4	
24	Analog Communication	3	2	0	60	20	10	10	-	50	150	3	1	4	
25	Data Structure & Files	3	2	0	60	20	10	10	-	50	150	3	1	4	
26	Professional Skill Development- IV	4	0	0	100	-	--	-	-	-	100	4	0	4	
Total		20	08	01	400	100	50	50	100	100	800	21	4	25	

Total Credits Sem – III : 25

Total Credits Sem – IV : 25

Grand total : 50

B.Tech.(Electronics) Sem-III



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- III

SUBJECT: - Engineering Mathematics-III

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

Credits: 04

Course prerequisites:

Students should have basic knowledge of:

- Differential calculus
- Integral calculus
- Complex numbers
- Vector algebra

Course objective:

To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

Course Outcomes: On successful completion of this course, students will be able to

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

Contents:

Unit-I

Linear Differential Equations (LDE) (06Hours)

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

Unit-II

Complex Variables (06Hours)

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

Unit-III

Transforms (06Hours)

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit-IV

Laplace Transform (LT) (06Hours)

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit -V

Vector Differential Calculus (06Hours)

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

Unit-VI

Vector Integral Calculus

(06Hours)

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

Assignments:

1. Solve the problem based on Linear Differential Equations
2. Solve the problem based on Complex Variables
3. Solve the problem based on Fourier and Z -Transforms
4. Solve the problem based on Laplace Transform
5. Solve the problem based on Vector Differential Calculus
6. Solve the problem based on Vector Integral Calculus

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- III

SUBJECT: - Analog Electronics

Teaching Scheme:	Examination Scheme	
Lecture: 4 Hours/week	End Semester Exam:	60 Marks
Practical: 2 Hours/week	Continuous Assessment:	40 Marks
	TW & PR.:	50 Marks
	Credits:	05

Course prerequisites:

- Knowledge of Electronic Components
- Fundamentals of P-N diode.
- Knowledge of BJT and its configuration

Course objective:

1. To make student understand working of bipolar junction transistor and field effect transistor with different biasing techniques
2. To make student understand a practical approach of design and analysis of waveshaping circuits using diode and multivibrator using transistors
3. To make student understand working of FET and MOSFET and its applications
4. To make student understand working of optoelectronic devices and its applications.
5. To make student understand the fabrication process of PCB

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate knowledge of working and applications of diode.
2. Demonstrate knowledge of working of BJT with different biasing techniques.
3. Analyze applications of BJT as an amplifier and multivibrator.
4. Explain working of FET and MOSFET and its applications.
5. Demonstrate knowledge of working of optoelectronic devices.

6. Design, built and test any small electronic circuit on PCB.

Contents:

Unit-I

Transistor Biasing (08Hours)

Need of biasing, DC load line analysis, operating point, Thermal runaway. Requirements of a biasing circuit, Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for all biasing circuits, Design of biasing circuits, Transistor as an amplifier.

Unit-II

BJT Amplifiers (08Hours)

Two port device and Hybrid model , transistor Hybrid model, h- parameters, Simplified CE Hybrid Model, Analysis of amplifiers using Approximate Model(CE, CC, CB), BJT Single Stage Amplifiers, Small Signal Analysis of Single Stage BJT Amplifiers, Distortion in Amplifiers.

Unit-III

Field Effect Transistor (FET) (08Hours)

Types of FET viz. JFET, MOSFET, JFET -construction, VI characteristics, transfer characteristics, Characteristics Parameters of JFET, FET Biasing(Self Bias, Fixed Bias, Current Source Bias), JFET amplifiers-CS, CD and CG amplifiers, Application of FET.

Unit-IV

MOSFETs (08Hours)

Types of MOSFET viz. D-MOSFET, E-MOSFET, n-MOS, p-MOS and CMOS devices, DMOSFET and EMOSFET characteristics and parameters, non-ideal V-I characteristics viz. finite output resistance, body effect, subthreshold conduction ,breakdown effects and temperature effects, MOSFET as VLSI device

Unit -V

Wave shaping and Multivibrator Circuits (08Hours)

Diode as clipper- series and parallel forms of clipper circuits, biased clipper, their operations, Diode as a clamper, voltage multiplier circuits-voltage doubler, tripler and quadrupler configuration, Multivibrator circuits-astable and monostable multivibrator circuit using BJT.

Unit-VI

Optoelectronic devices and PCB design

(08Hours)

Construction ,V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optocoupler.

PCB: types of PCB, PCB design rules, layout design, artwork design, fabrication process of single sided PCB, different copper clad laminates, composition of solder metal.

List of Experiments:

1. Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias
2. To plot frequency response of single stage CE amplifier and find its bandwidth
3. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
4. To study different types of Clipper circuits
5. To study different types Clamper circuits
6. To plot transfer characteristics of Optocoupler
7. To plot V-I and optical characteristics of LED and LDR
8. To plot V-I and optical characteristics of Photodiode and phototransistor

Assignments:

1. Simulation of BJT amplifier using Multisim.
2. Define h-parameters for CE, CB, CC configuration and describe how these parameters are determined from BJT characteristics.
3. Describe fabrication process of MOSFET and any two real time applications of MOSFETs
4. Real time applications of optoelectronics devices such as LED, Optoisolator
5. To design, built and test given electronic circuits (Group activity)
6. Obtain industry exposure based on product design industry and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. “Electronic Devices and Circuits” by S. salivahanan,Suresh kumar- Mc Graw Hill Publication
2. “Integrated Electronics”, by Millman J and Halkias .C., TMH publication
3. “Electronic Devices and Circuits “ by Millman ,Halkies,TMH publication

Reference Books:

1. “Electronic Devices and Circuits” by Allen Mottershed- PHI Publication
2. “Electronic Devices and Circuits” by J.B. Gupta-Katson educational series
3. “Microelectronics “by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
4. “Printed Circuits Handbook “ by Clyde F. Coombs - McGraw Hill Handbooks
5. “Microelectronic Circuits Theory and applications “by Adel S. Sedra , Kenneth C. Smith- Oxford



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- III

SUBJECT: - Signals and Systems

Teaching Scheme:

Lecture: 3 Hours/week

Tutorial: 1Hour/week

Examination Scheme

End Semester Exam: 60 Marks

Continuous Assessment: 40 Marks

TW & OR.: 50 Marks

Credits: 04

Course prerequisites:

Before proceeding with this tutorial, you must have a basic understanding of differential and integral calculus, limits and adequate knowledge of mathematics.

Course objective:

The course aims to develop good understanding about signals, systems and their classification and analysis tools in the time and frequency domain. It also provides knowledge of correlation function and sampling.

Course Outcomes: On successful completion of this course, students will be able to

1. Represent & classify signals, Systems & identify LTI systems
2. Analyze the systems in time domain using convolution.
3. Apply Fourier transform, Laplace transform and Z-Transform for analysis of LTI systems.
4. Conceptualize the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

Contents:

Unit-I

Introduction to signals

(06 Hours)

Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic, energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.

Unit-II

Classification of Discrete time systems (06 Hours)

Definition, Classification of System, System Interconnections, state space analysis, Linear & non-linear, Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.

LTI system Analysis: Introduction to LTI systems. Block Diagram, Linear Convolution-Convolution Integral, Impulse response, Methods of Convolution. Properties of convolution

Unit-III

Continuous Time system Analysis: (06 Hours)

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, applications of Fourier series & Fourier transforms to the system analysis.

Unit-IV

System Analysis in Laplace Transform (06 Hours)

Laplace Transform: Definition and its properties, ROC and pole zero concept. Applications of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties.

Unit-V

System Analysis in Z-Transform (06 Hours)

Z-Transform: Definition and its properties, Region of Convergence for the Z-Transform, the Inverse z-Transform, Applications of Z-Transform to the LTI system analysis

Unit VI:

Correlation and Spectral Density (06 Hours)

Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation

between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.

Assignments:

Perform the following assignments using MATLAB (any three) and Virtual Lab (any three)

1. Generation of Signals
2. Linear convolution of any two signals
3. Fourier transform of given signal
4. Laplace Transform of given signal
5. Z-transform of given signal
6. Sampling Theorem & aliasing effect.

Content Delivery Methods: Chalk & talk, Power point presentation, Quiz

Assessment Methods:

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books:

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc,2004.

Reference Books:

1. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005
2. H. P Hsu, R. Ranjan, "Signals and Systems", Scham"s outlines, McGraw Hill,2006
3. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



**Class: B.Tech (Electronics) SEM: - III
SUBJECT: - Digital Logic Circuits**

Teaching Scheme:	Examination Scheme	
Lecture: 3 Hours/week	End Semester Exam:	60 Marks
Practical: 2 Hours/week	Continuous Assessment:	40 Marks
	TW & PR.:	50 Marks
	Credits:	04

Course Prerequisite:

1. Fundamentals of Number Systems.

Course Objective:

1. To understand principles, characteristics & operations of combinational & sequential logic circuits.
2. To design combinational circuits by using logic gates, MSI circuits, PLDs.
3. To design, implement analyze, asynchronous & synchronous sequential circuits using flip flops.

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate the knowledge of Boolean algebra including simplification techniques.
2. Describe the characteristics of Logic families TTL, CMOS, ECL & explain the fundamentals of semiconductor memories.
3. Analyze & design digital combinational circuits such as of multiplexers, Demultiplexer, encoder, decoder and arithmetic circuits.
4. Demonstrate the knowledge of operations of basic types of flip-flops, registers, counters & the design of Finite State Machine.
5. Describe the characteristics of PLDs, Semiconductor memories and their applications.

Contents:

Unit –I

Number Systems, Codes & reduction techniques: (6 Hours)

Review of Binary number system: Binary addition and subtraction using 1's, 2's complement method, sign magnitude representation. BCD codes, 8421, Excess –3, Grey code, codes with more than four bits, ASCII code.

Fundamental theorems of Boolean algebra, Canonical and standard forms (SOP and POS), minimization of logic functions, Karnaugh maps up to 4 variables, Don't care conditions, Quine Mc-Cluskey method.

Unit-II

Combinational Logic Modules and their Applications (6 Hours)

Adder, subtractor, carry look ahead adder, BCD adder, magnitude comparator, Excess-3 Adder, series and parallel adder, ALU.

Code conversion, Multiplexer, Demultiplexer, Encoder, Decoder and their applications. Parity generator and checker.

Unit-III

Logic Families (6 Hours)

Parameter definitions - Noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL, CMOS & ECL. Two input TTL NAND gate, TTL logic families standard, Totem – pole, open collector, tri-state (concept & application). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS ECL.

Unit-IV

Sequential Logic Modules (7 Hours)

Basic sequential circuits-latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, MS J-K flip flop, T flip-flop.

Definition of state machines, Moore and Mealy machine, Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization.

Unit-V

Shift Registers & Counters

(5 Hours)

Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter.

Unit-VI

PLDs & Memories

(6 Hours)

Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.

Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.

List of Experiments:

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. 1 & 2 bit digital comparator and ALU verification
6. Function implementation using Multiplexer and Demultiplexer
7. Sequence generator using MSJK flip flop IC's
8. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
9. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
10. BCD Adder/Subtractor with Decoder driver and 7 segment display

Assignments:

1. Implement a multiplexer using Virtual laboratory
2. Design example based on combinational circuit
3. Design for e.g. digital clock, digital event counter,timers,and various multi-vibrator circuits, small processor ports or scrolling display
4. Implementation of combinational logic using PLAs
5. Design a pulse train generator using shift register

6. Design example based on state machine

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books:

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12th reprint TMH Publication, 2007.
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI
3. Tocci R.J., Neal S. Widmer, *Digital Systems: Principles and Applications*, Pearson Education Asia, Second Indian Reprint 2002

Reference Books :

1. J.F.Wakerly “Digital Design: Principles and Practices”, 3rd edition, 4th reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano ‘Digital Design’-- (Third Edition),.PHI
4. Thomas L Floyd & R.P Jain, *digital Fundamentals* (Eight editions), Pearson



Class: B.Tech (Electronics) SEM: - III
SUBJECT: - Circuit Theory

Teaching Scheme:	Examination Scheme	
Lecture: 3 Hours/week	End Semester Exam:	60 Marks
Practical: 2 Hours/week	Continuous Assessment:	40 Marks
	TW & PR.:	50 Marks
	Credits:	04

Course prerequisites:

- Knowledge of KCL and KVL Laws from Basic Electrical Engineering
- Knowledge of Linear Differential Equations and Systems of Linear Equations from Engineering Mathematics - I and II.

Course objective:

The objective of the course is to enable the student to perform any of the network analysis task required in the subsequent courses. The student is exposed to some concepts in graph theory for providing a good foundation for the methods of Mesh Analysis and Node Analysis. The transient analysis using Laplace Transforms is also included. The series and parallel resonance circuits which occur quite frequently in electronics are analyzed. The topic of constant K filter is included as it finds many applications in electronic design. The two port network parameters which are of fundamental importance in many courses on electronic devices are included in the last unit.

Course Outcomes: On successful completion of this course, students will be able to:

1. To find voltages and currents in a given network using Mesh Analysis or Node Analysis or Network Theorems.
2. To find voltages and currents in a given network by formulating network equilibrium equations from graph theory.
3. To find the transient response in a given network consisting of series or a parallel combination of resistance, capacitance and inductance.
4. To find all the parameters relating to a given series or a parallel resonant circuit.

5. To design a constant K prototype low pass, high pass, band pass or a band stop passive filter
6. To find any of the two port parameters of a given two port network.

Contents:

Unit I

Fundamentals Of Network (6 Hours)

KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Mesh and Node Analysis in Sinusoidal Steady State
Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

Unit II

Application Of Graph Theory (6 Hours)

Network Graph, tree, cotree & loops, Incidence Matrix, tie set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of Duality

Unit III

Transient Analysis (6 Hours)

Initial Conditions in networks. A procedure for evaluating initial conditions. Solution of step response in RC, RL, RLC circuits using classical method, Analogous equivalence of mechanical system.

Unit IV

Resonance (6 Hours)

Resonant condition, Definition of Quality factor. Finding resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. General case of resistance present in both branches of parallel resonant circuit. Comparison of series and parallel resonant circuits, Applications of resonant circuits

Unit V

Passive Filters

(6 Hours)

Filter Fundamentals, Image impedance, Characteristic impedance, Propagation constant. Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters

Unit VI

Two Port Networks

(6 Hours)

Network Functions, Two port network parameters, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Interconnections of two-ports, Reciprocity and Symmetry conditions

List of Experiments:

1. To verify Thevenin's and Norton's Theorem.
2. To verify Superposition and Reciprocity Theorem.
3. To find resonant frequencies of series and parallel circuit.
4. To plot frequency response of frequency selective network (Twin T or Wein Bridge).
5. To plot frequency response & cut-off frequency of constant-k LPF and HPF.
6. To plot frequency response & cut-off frequency of constant-k BPF and BSF.
7. To find Z and Y parameters of given two port network.
8. To find H and ABCD parameters of given two port network.

Assignments:

1. Analyze the circuit using mesh and node analysis.
2. Apply graph theory for circuit.
3. Describe any two real time applications of passive filters.
4. Simulation of series and parallel resonance circuit using Multisim.
5. Transient response of RC, RL and RLC circuit using Multisim.
6. Obtain industry exposure based on product design industry and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books :

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)

References Books:

1. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
2. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition

B.Tech.(Electronics) Sem-IV



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem: - IV

SUBJECT: - Analog Integrated Circuits

Teaching Scheme:	Examination Scheme	
Lecture: 3 Hours/week	End Semester Exam:	60 Marks
Practical: 2 Hours/week	Continuous Assessment:	40 Marks
	TW & PR.:	50 Marks
	Credits:	04

Course prerequisites:

- Knowledge of KCL and KVL Law
- Basic knowledge of Op-Amp and its configurations

Course objective:

This course provides in depth knowledge on the Op-Amp. Also it introduces the design of PLL, Waveform generators, Timer IC's and Converters.

Course Outcomes: On successful completion of this course, students will be able to

1. Design linear and nonlinear applications of Op-Amp.
2. Design of first and second order active filters.
3. Analyze and design Waveform Generators.
4. Demonstrate knowledge of Phase Locked Loop IC 565 and Converters.
5. Design of multivibrators using Timer IC 555

Contents:

Unit-I

Fundamentals of Operational Amplifier

(06 hours)

Block diagram representation of a typical op-amp, Schematic symbol for op-amp, Definition of integrated circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal & external offset voltage compensation, Frequency Response of an op-amp.

Unit-II

Operational Amplifier – Linear circuits

(06 hours)

Inverting amplifier, Non-inverting amplifier, Voltage Follower, Adder, Subtractor, Scaling averaging amplifier, Integrator, Differentiator, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge, Peaking amplifier

Unit-III

Operational Amplifier - Non-linear circuits

(06 hours)

Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.

Unit-IV

Active filters and waveform generators

(06 hours)

First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Sawtooth wave generator and study of function generator or IC 8038

Unit-V

Special function IC's

(06 hours)

IC 555- as Monostable and Astable Multivibrators and its applications.

IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector

Unit-VI

Interfacing circuits

(06 hours)

V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.

List of Experiments:

1. To design and build Integrator and draw frequency response
2. To design and build Differentiator and draw frequency response
3. To design and build precision rectifier

4. To design and build schmitt trigger and find threshold levels
5. To design and build first order Butterworth low pass filter
6. To design and build first order Butterworth high pass filter
7. To design and build triangular waveform generator using IC 741
8. To design and build Function generator using IC 8038
9. To design and build Astable multivibrator using timer IC 555.

Assignments:

1. Find out any three ICs of op-amp other than IC 741 and compare the characteristics with IC 741.
2. List out any two linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
3. List out any two non-linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
4. Design sinusoidal generators using op-amp for a given frequency.
5. Real time applications of IC555/ IC565.
6. Obtain industry exposure based on product design and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4th Edition, 2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10th edition, 2010

References Books:

1. David A. Bell, “Operational Amplifiers and Linear ICs”, Oxford publication, 3rd edition, 2011
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, Tata McGraw Hill, 3rd edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 4th edition, 2010.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- IV

SUBJECT: - Electronic Circuits and applications

Teaching Scheme:	Examination Scheme	
Lecture: 4 Hours/week	End Semester Exam:	60 Marks
Practical: 2 Hours/week	Continuous Assessment:	40 Marks
	TW & PR.:	50 Marks
	Credits:	05

Course prerequisites:

- Knowledge of linear circuit theory
 - Basic concept of BJT
-

Course objective:

1. To make student understand analysis of multistage transistor amplifier.
 2. To make student understand a practical approach of design and analysis of feedback amplifiers ,power amplifiers and oscillators
 3. To make student understand analysis and design of voltage regulators.
 4. To make student understand the behavior of high frequency BJT amplifiers
-

Course Outcomes: On successful completion of this course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier and power amplifier and oscillators
3. Analyze and design voltage regulators.
4. Characterize behavior of high frequency BJT amplifiers.

Contents:

Unit-I

Multistage amplifiers

(08hours)

Need of Multistage amplifiers, Parameter evaluation such as R_i , R_o , A_v , A_i & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct

coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier

Unit-II

Feedback amplifiers (08 hours)

Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.

Unit-III

Power amplifiers (08 hours)

classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis

Unit-IV

Oscillators (08 hours)

Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator

Unit- V

Regulators (08 hours)

Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's :78XX,79XX,723,LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.

Unit-VI

High frequency amplifiers

(08hours)

High frequency T model. Common base short circuit current frequency response, alpha cut-off frequency, CE short circuit current frequency response, high frequency hybrid π CE model, Amplifier response taking into account source and load resistances.

List of Experiments:

1. Study of CE two-stage amplifier with capacitive coupling
2. Study of Voltage series and current series feedback amplifiers
3. Study of Voltage shunt and current shunt feedback amplifiers
4. Study of Class B/AB push – pull/ Complementary Symmetry power amplifier.
5. Study of RC Oscillators - phase shift and wien bridge oscillators
6. Study of LC oscillators – Hartley, Colpitt oscillators
7. Study of Linear voltage regulators – series regulator using series pass transistor, shunt regulator using zener diode
8. Study of Fold back current limiting using IC 723

Assignments:

1. Analyze given feedback amplifier.
2. Describe any two real time applications of power amplifier.
3. Simulation of oscillator using Multisim.
4. Describe any two real time applications of regulator.
5. To design, built and test given electronic circuits(Group activity)
6. Obtain industry exposure based on electronic product design and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. “Electronic devices and circuits” by S. Salivahanan, Suresh Kumar Vallavaraj, Mc Graw Hill Publication

2. "Electronic devices and circuits "by Millaman Halkies ,TMH publication
3. "Integrated Electronics", by Millman J and Halkias .C., TMH publication

Reference Books:

1. "Electronic Devices and Circuits "by Allen Mottershed- PHI Publication
2. "Electronic Devices and Circuits "by J.B. Gupta- KATSON educational series books
3. " Microelectronic Circuits Theory and applications "by Adel S. Sedra, Kenneth C. Smith- Oxford
4. "Microelectronics "by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
5. "Electronic Principles "by Albert Malvino and David J Bates, 7 edition, Tata McGrawHill
6. "Basic Electronics" by Zbar, Malvino and Miller, 7 edition, Tata McGraw Hill



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- IV

SUBJECT: - Instrumentation & Control System

Teaching Scheme:	Examination Scheme	
Lecture: 3 Hours/week	End Semester Exam:	60 Marks
Tutorial: 1Hour/week	Continuous Assessment:	40 Marks
	Credits:	04

Course prerequisites:

- Basic knowledge of signals.
- Basic mathematical tools like Laplace transform.
- Basic knowledge of software like MATLAB.

Course objective:

This course provides in depth knowledge of the various control systems. Also it introduces the stability of system, transducers, controllers etc.

Course Outcomes: On successful completion of this course, students will be able to

1. Identify various control systems and determine the 'Transfer Function' of a system using block diagram reduction technique and signal flow graph.
2. Measure various Non-electric quantities such as displacement, temperature, angular speed, acceleration etc using suitable transducer.
3. Determine the error in various control systems.
4. Evaluate the stability of a system using Routh's Stability Criterion, root locus and different graphical methods like Bode plot and polar plot.
5. Compare various control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID.

Contents:

Unit I

Control System (06 Hours)

Introduction to Control System, control problems, Feedback and Non-feedback Systems, Transfer Function, Analysis of T.F. using Block diagram and signal flow graph.

Unit II

Transducers and Controller Components (06 Hours)

Classification of Transducers and its Characteristics. RTD, Thermocouple, Thermister, capacitive transducer, LVDT, strain gauge and Electromagnetic flow-meter. Linear Approximation of Nonlinear Systems, synchros, dc and ac servomotors, tacho-generators, electro hydraulic valves, electro pneumatic valves.

Unit III

Time Response Analysis (06 Hours)

Standard Test Signals, Time Response of First order system and second order system, steady state error (e_{ss}) and error constants (K_p , K_v , K_a), performance indices.

Unit IV

Stability (06 Hours)

Concept of stability, necessary conditions for stability, Hurwitz and Routh stability criteria, stability of system modeled in state variable form, root locus technique.

Unit V

Frequency Response Analysis (06 Hours)

Relationship between time & frequency response, Polar plots, Bode plot, stability in frequency domain, Nyquist stability criterion.

Unit VI

Controllers (06 Hours)

Control actions – On/Off, P, PI, PD, PID. PLC Architecture, Introduction to Ladder Diagram

List of Practicals:

1. Unit Step and Impulse response of the Transfer function using MATLAB.
2. To draw Root Locus theoretically and verify it using MATLAB.
3. To draw Bode plot theoretically and verify it using MATLAB.
4. Magnitude and phase plot of Lead network.
5. Magnitude and phase plot of Lag network.
6. To Study characteristics of temperature transducer.
7. To Study characteristics of LVDT for displacement measurement.
8. Study of Strain gauge.

Assignments:

1. Transfer function of closed loop system.
2. Transient response specifications of second order system.
3. Describe characteristics of temperature transducers..
4. Effect of addition of poles and zeros.
5. Describe architecture of PLC.
6. Simulation of Controller using Virtual Lab and LabVIEW.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books /Reference Books:

1. I. J. Nagrath & M. Gopal, "Modern Control Engineering", New Age International, New Delhi (Fifth Edition) 2007.
2. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991
3. A K Sawhney, Electrical and Electronic Measurements and Instrumentation, Dhanpt Rai and Co. Ltd.
4. H S Kalsi, Electronic Instrumentation, Tata McGraw-Hill.
5. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- IV
SUBJECT: - Analog Communication**

Teaching Scheme:	Examination Scheme	
Lecture: 3 Hours/week	End Semester Exam:	60 Marks
Practical: 2 Hours/week	Continuous Assessment:	40 Marks
	TW & OR.:	50 Marks
	Credits:	04

Course prerequisites:

- Basic knowledge of signals and systems.
- Basic mathematical tools like fourier series & transform

Course objective:

1. To introduce to student essential components of communication system and emphasize need of modulation.
2. To make student recognize concept of noise and its effects.
3. To make student understand amplitude & frequency modulation and demodulation and its mathematical background.
4. To make student understand working of radio receivers.

Course Outcomes: On successful completion of this course, students will be able to

- 1.Describes basic components of communication system and explains need of modulation.
- 2.Describes concept of noise and also recognizes its effects.
- 3.Describes amplitude and frequency modulation and demodulation and can do analysis in time and frequency domain.
- 4.Describes components of communication receiver system.

Contents:

Unit-I

Introduction to Communication Systems

(6 Hours)

Review of signals and systems, Frequency domain of signals, Block schematic of communication system, types of communication channels, base band signals, RF bands, Necessity of modulation.

Unit-II

Noise

(6 Hours)

Types of noise, External noise, Internal Noise, Noise calculations, signal to noise ratio, noise figure, and noise temperature.

Unit-III

Amplitude Modulation

(6 Hours)

Amplitude Modulation, low level and high level transmitters, Frequency spectrum of AM wave, Representation of AM, power relations in AM, Generation of AM, DSB suppressed carrier (DSBSC)-modulator, Single Side Band (SSB):-Principle, Filter method, phase shift method and third method, Independent sideband (ISB) and Vestigial Side Band (VSB) principles and transmitters, Diode detector, practical diode detector, and square law detector. Demodulation of DSBSC, Demodulation of SSBSC.

Unit-IV

Angle Modulation

(6 Hours)

Basic concept, mathematical analysis, frequency spectrum of FM wave, sensitivity, phase deviation and modulation index, frequency deviation and percent modulated waves, bandwidth requirement, deviation ratio, Narrow Band FM, and Wide Band FM. Varactor diode modulator, FET reactance modulator, stabilized reactance modulator- AFC, Direct FM transmitter, indirect FM Transmitter, pre-emphasis and de-emphasis. Amplitude limiting, FM demodulators

Unit-V

Radio Receivers

(6 Hours)

Block diagram of AM and FM Receivers, TRF receiver, Super heterodyne Receiver, Performance characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection. IF Amplifiers. Tracking, AGC, Mixers.

Unit -VI

Pulse Analog Modulation

(6 Hours)

Pulse modulation. Sampling process, Sampling Theorem for low pass and band pass signals, Nyquist criteria , Sampling techniques, aliasing error, and aperture effect. PAM, PWM, PPM generation and detection. TDM and FDM.

List of Experiments (Minimum 08):

1. Study of Amplitude Modulation and Demodulation.
2. Study of Frequency Modulation and Demodulation
3. Study of SSB Modulation & Demodulation.
4. Analysis of standard signals (square and triangular) and Modulated signals (all types of AM, FM) using spectrum analyzer.
5. Sampling And Reconstruction.
6. Study of Pulse Amplitude Modulation (PAM.)
7. Study of Pulse Width Modulation.(PWM)
8. Study of Pulse Position Modulation.(PPM)
9. Study of PAM-TDM.
10. Study of Super heterodyne (AM) Receiver.

Assignments

1. Design of circuit for noise and noise figure analysis using Multisim.
2. Simulation of AM modulation and demodulation using MATLAB.
3. Simulation of FM modulation and demodulation using MATLAB.
4. Design and simulation of AM Receiver using MATLAB. Simulink.

5. Design of PWM modulator using Multisim.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Book:-

B.P.Lathi 'Modern Digital and analog Communication System' Oxford University press.

Reference Books:-

1. George Kennedy 'Electronics Communication System'- IV th Edition-Tata McGraw Hill Publication.
2. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- IV

SUBJECT: - Data structures and Files

Teaching Scheme:	Examination Scheme	
Lecture: 3 Hours/week	End Semester Exam:	60 Marks
Practical: 2 Hours/week	Continuous Assessment:	40 Marks
	TW & OR.:	50 Marks
	Credits:	04

Course prerequisites:

- Basic Knowledge of C language.

Course objective:

This course provides in depth knowledge of the various types of data structures and various algorithms. Also it introduces the concept of linked list, stack, queues, graph and tree.

Course Outcomes: On successful completion of this course, students will be able to

1. Write a program involving pointers and structures.
2. Write a program involving search and sorting techniques.
3. Write a program using linked and double linked lists.
4. Implement stacks and queues involving linked list.
5. Perform operations on a tree using linked lists.
6. Find the shortest path in a given graph.

Contents:

Unit-I

C Programming Revision

(5 Hours)

Pointers, Arrays, Single and Multi-Dimensional arrays, Row major and Column Major, Arrays and polynomials, Structures , Call by Value ,Call by Reference , Passing arrays
Passing a function to function, Pointer to function ,Pointers.

Unit-II

Data Structure and Analysis of algorithms. (4 Hours)

Introduction to data structure, Data representation, Abstract Data types, Primitive data types, Data structure and data types, Differences between data types. Algorithms and different approaches to designing an algorithm, Complexity, Big O notation, algorithm analysis .Recursion. Sorting: Bubble sort, Selection sort, Quick sort, Merge sort, Insertion sort.

Unit-III

Linked Lists (4 Hours)

Definition, operations on linked list, Reversing the links, Merging of linked lists, Circular Linked list, Recursive operation on linked list, Doubly linked list, Linked list and Polynomials,

Unit-IV

Stack and Queues (3 Hours)

Operation on stacks, Stack as an array, Stack as a linked list, Application of stack, Infix to prefix conversion, Infix to postfix conversion, Postfix to prefix conversion, Postfix to infix conversion.

Representation of Queue as an array, Queue as a linked list, Circular Queue, Priority queue

Unit-V

Tree (3 Hours)

Binary tree, Linked and array representation of Binary tree, Binary search tree, Operation: Searching of a Node in a Binary tree, Insertion of a node in binary tree, deletion from a binary tree. Threaded binary tree. AVL trees

Unit-VI

Graphs (3 hours)

Definition ,Adjacent vertices and Incident edges, graph representation, depth first search ,breadth first search, Spanning tree, Kruskal.s Algorithm, Shortest path algorithm, Dijkstra.s algorithm.

List of Experiments:

1. Program to create & manipulate database using structure.
2. Program to add two polynomial using array of structure.
3. Program to implement primitive operation on Sequential file.
4. Program to search for record from a given list of records stored in array using
 - i) Linear search
 - ii) Binary search
5. Program to sort an array of names using
 - i) Bubble sort
 - ii) Insertion sort
 - iii) Quick sort
6. (a) Program to implement following operation on singly linked list:
 - i) Create
 - ii) Delete
 - iii) Insert
 - iv) Display
 - v) Search(b) Program to add two polynomials using linked list.
7. (a) Program to implement stack using:
 - i) Array
 - ii) Linked list(b) Program to convert an infix expression to postfix expression & evaluate the resultant expression.
8. Program to Implement Queue using: (i) Array (ii) linked list
9. Program to create a Binary search tree & Perform following primitive operation on it:
 - i) Search
 - ii) Delete
 - iii) Traversals (inorder, pre-order, post-order -recursive)
 - iv) Non-recursive in order traversal
10. Program to create a graph using adjacency list & traverse it using BFS & DFS methods

Assignments:

1. State various types of data types and create a database of students in a class using structures.
2. Write a C code to create a digital clock, rainbow etc.
3. Case study on any real time application.

Example :

- i. Whatsapp, Hike, Wechat, Line social communication software
 - ii. Cars lined up at a car wash.
 - iii. Customers at a grocery store check out.
 - iv. Airplane taking off and landing on a runway, etc
4. Comparison between various types of programming languages.
 5. Write a c program to construct tower of Hanoi.
 6. Write a c program to sort structures on the basis of structure elements.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. "Data structure using C" ISRD group, TMH.
2. "Data Structure through C" ,Yashwant kanetkar,BPB Puplication.

Reference Books:

1. "Data structure using C" AM Tanenbaum, Y Langsam and MJ Augustein, Prentice Hall India.
2. "Data structure and Algorithm Analysis in C" Weiss, Mark Allen Addison Wesley.
3. "Data structure – A Pseudocode Approach with C", Richard F Gilberg Behrouz A. Forouzan, Thomson
4. "Let us C" .Yashwant Kanetkar.BPB Publication.

SUBJECT: - Rehabilitation Engineering

Bharati Vidyapeeth University, Pune
Faculty of Engineering & Technology

Programme : B.Tech (Electronics) Sem – V (2014 Course)

Sr. No.	Name of the Course	Teaching Scheme (Hrs/week)			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			T W & P R	T W & O R		Theory	T W	Total Credits
						Unit Test	Attendance	Assignments						
27	Microprocessors and Microcontrollers	4	2	0	60	20	10	10	50	-	150	4	1	5
28	Electronic Instruments & Measurement System	3	2	0	60	20	10	10	-	50	150	3	1	4
29	Digital Communication	3	2	0	60	20	10	10	-	50	150	3	1	4
30	Power Devices & Machines	3	2	0	60	20	10	10	-	50	150	3	1	4
31	Electromagnetic Engineering	3	0	1	60	20	10	10	-	-	100	4	-	4
32	Professional Skill Development-V	4	0	0	100	0	-	-	-	-	100	4	-	4
	Total	20	08	01	400	100	50	50	50	150	800	21	4	25

Optional Subject

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme						Credits			
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Electronics) Sem – VI (2014 Course)

Sr · No.	Name of the Course	Teaching Scheme (Hrs/week)			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			T W & PR	T W & O R		Theo ry	T W	Total Credi ts
						Un it test	Attenda nce	Assignme nts						
33	Digital Signal Processing	4	2	0	60	20	10	10	-	50	150	4	1	5
34	Embedded Systems	3	2	0	60	20	10	10	-	50	150	3	1	4
35	VLSI Design	3	2	0	60	20	10	10	50	-	150	3	1	4
36	Project Managem ent & Finance	3	0	0	60	20	10	10	-	-	100	3	-	3
37	Electronic Circuit Design	4	2	0	60	20	10	10	-	50	150	4	1	5
38	Profession al Skill Developm ent-VI	4	0	0	100	0	-	-	-	-	100	4	-	4
	Total	21	8	0	400	100	50	50	50	150	800	21	4	25

Total Credits Sem – V : 25

Total Credits Sem – VI : 25

Grand total : 50



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- V

SUBJECT: - Microprocessors & Microcontrollers

Teaching Scheme

Lecture: 4 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

TW & PR: 50 Marks

Credits: 05

Course Prerequisites: Students should have basic knowledge of:

- Hexadecimal Number System
 - Concept of Encoder Decoder & Multiplexer Demultiplexer
-

Course Objectives:

- To understand the architecture, instruction sets and various techniques to interface them with different real world I/O devices to accomplish certain tasks.
 - To study the architecture of microcontrollers like 8051 and PIC and the instruction set and programming concepts.
 - To know the techniques of interfacing them to the real world peripheral devices.
 - To impart practical knowledge of 8051, and PIC Microcontroller.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Identify the different block of microprocessor and microcontroller
2. Study the architecture and instruction set of 8051 and PIC microcontrollers.
3. Use the knowledge of instruction set to perform practical for 8051 and PIC Microcontrollers.
4. Interface peripheral devices with 8051 microcontroller for different applications.

Contents:

Unit I

(08 Hours)

Introduction to Microprocessors

Evolution of Microprocessors, comparison of Microprocessor & Micro controller. Difference between RISC & CISC microcontrollers, Harvard & Von Neumann Architectures Internal architecture of 8 bit Microprocessor 8085, concept of fetch –decode and execute, Stack and Subroutines, concept of Memory mapped I/O, I/O mapped I/O

Unit-II

8051 Micro Controllers

(08 Hours)

Architecture, Pin configuration, 8051 timers, counter and related SFR's, Internal RAM structure, 8051 addressing modes.8051 Interrupts Interrupt Priority in the 8051 concept of RESET. Introduction to 8051 assembly language programming: JUMP, LOOP and CALL instructions, Arithmetic instructions, Logic and Compare instructions, and I/O PORT Single bit instruction programming, single bit operations with CY.

Unit-III

8051 Serial Communication &Interfacing of 8051(08 Hours)

Serial Communication of 8051: Basics, SBUF register, SCON and PCON registers, Modes of operation Simple program of serial communication.

Interfacing of 8051 with devices: LED, LCD, keyboard, LM35 temperature sensor & A/D converter

Unit-IV

Communication Protocols

(08 Hours)

Use of communication protocols, need of communication interface in embedded system

Serial communication protocols: I2C, CAN, USB, UART, Serial peripheral interface(SPI),synchronous serial protocol(SSP).

Parallel communication protocol: PCI,PCI-X

RS232C, RS485/422.

Unit -V

PIC18F Family

(08 Hours)

PIC18F programming model, instruction set Data copy, arithmetic, branch, logical, bit manipulation and multiply-divide operations, Stacks, subroutines and macros, Role of Assembler.

Unit-VI

Interrupts, Timers & Serial I/O in PIC18F

(08 Hours)

Concepts of Interrupts and Timers, Interrupts and their implementation in PIC18, The PIC18 timers, Use of Interrupts in applications. Concept of serial I/O, SPI protocol

List of Experiments:

Any 8 experiments should be conducted

1. Study of 8051 μ c using Keil software:
 - (a) Block transfer without memory overlapping
 - (b) Block transfer without memory overlapping
2. (a) To convert BCD no. to Hex no.
 - (b) To convert Hex no. to BCD no.
3. To perform: (a) BCD up Counter
 - (b) BCD down Counter
4. To generate a square wave of 5ms delay
5. To interface stepper motor with 8051 μ c
6. To interface LED with 8051 μ c
7. To interface Keyboard with 8051 μ c
8. To interface ADC/DAC with 8051 μ c
9. To perform 8/16-bit addition & subtraction using PIC microcontroller.
10. Serial communication by PIC microcontroller

List of Assignments:

1. Explain a Boolean processor of microcontroller 8051 with two examples
2. Mention a real time application of microcontroller 8051.
3. Mention a real time application of PIC microcontroller.
4. Design a microcontroller (8051) based interfacing system with memory.
5. What is memory address decoding? Explain the different types of decoding.
6. An overview on PIC families.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Muhammad Ali Mazidi, Janice Gillespie Mazidi, “The 8051 Microcontroller and Embedded System” Pearson Education.
2. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny Causey,” PIC Microcontroller and Embedded Systems”3rd Edition ,Pearson Education
3. Ramesh Gaonkar “Fundamentals of Microcontrollers and Applications in Embedded Systems” (with the PIC18 Microcontroller Family) 2007 Edition, Penram international

Reference Books:

1. John B Peatman “Designing with PIC Microcontrollers” 2004 Pearson Education.
2. Ajay V. Deshmukh, “Micro-controllers - Theory and Applications”, Tata McGraw Hill.
3. Kenneth J. Ayala, “The 8051 Micro-controller – Architecture, Programming & Applications”, Second Edition Penram International & Thomson Asia,



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B. Tech. (Electronics) Sem: - V

SUBJECT: - Electronic Instruments and Measurement System

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

TW &OR : 50 Marks

Credits: 04

Course Prerequisites:

- Knowledge of process instrumentation.
- Knowledge of Integrated circuits.

Course Objectives:

- To help the students to have knowledge of the basic of instrumentation.
- To study the principles of working of various signal generators and wave analyzers
- To study the principle of working of CRO is specifications, applications in detail and study the working of various advanced CRO's and their applications.

Course Outcomes: On successful completion of this course, students will be able to:

1. Describe specifications, features and capabilities of electronic instruments
2. Use the electronic instruments like signal generators, wave analyzers, and various oscilloscopes by knowing their specifications for electronic measurements.
3. Make the required measurement using various instruments

Contents:

Unit-I

Fundamentals of Instrumentation & Measurement: (06 Hours)

Necessity of Electronic Measurements, Block diagram of electronic measuring system, Concepts of Accuracy, Precision, Linearity, Sensitivity, Resolution, Hysteresis, Calibration etc. Measurement Errors, Voltage, Current, Resistance measurement using DMM- 4 ½ & 6 ½, Auto zeroing, Auto ranging.

Unit-II

Measuring Instruments (06 Hours)

Voltage, current and impedance measurement, VTVM, TVM, DVMs, AC voltmeters true RMS meters, vector voltmeter, vector impedance meter, direct current probes, alternating current probes, LCR-Q meter.

Unit-III

Signal Generators & counters (06 Hours)

standard signal generators, swept frequency generator, random noise generator, Audio frequency signal generation, RF generator, Pulse generator (block diagram), Function generator Time, Frequency, Ratio, Time interval, Period & Multiple Period averaging using digital universal frequency counter.

Unit-IV

Oscilloscopes: (06 Hours)

Overview of analog CRO, dual/ Multi-trace CRO, Various CRO probes & its applications. Digital Storage Oscilloscope - Sampling speed & Memory depth of DSO, Design considerations, Attachments to DSO for enhancing the functionality, Measurements such as FFT, Math Functions, Curve Tracer, and Power scope.

Unit-V

Communication Measurements: (06 Hours)

Communication measurements, Measurements on transmitter and receiver: sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc. Network analyzer-system elements, measurement accuracy, scalar network analyzer, vector network analyzer, S-parameter measurement using network analyzer, EMI/EMC standards.

Unit-VI

Signal Analyzers & computer aided measurements:

(06 Hours)

Harmonic and Wave analyzer, Distortion factor meter, Spectrum analyzer -FFT analyzer, tracking generator, Logic analyzer, logic timing analyzer, logic state analyzer, FFT analyzer, Mixed signal oscilloscope, IEEE 488, VXI based instruments, Introduction of Lab view software.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

List of Experiments:

1. Peak, average and r.m.s. measurement using rectifier circuit.
2. Measurement using spectrum analyzer and tracking generator. Observing spectrum of AM and FM waveforms for different modulation indices
3. Measurements on DSO:
 - i) FFT analysis of LF signal
 - ii) Capturing transients
 - iii) Storing and retrieving number of different signals
 - iv) Study of various operations like add, subtract, integrate, differentiate.
4. Measurement and timing analysis of digital signals using Logic Analyzer.
5. Measurement of Total harmonic distortion using distortion factor meter.
6. Measurements on L-C-R Q meter.
7. Measurements with Universal counter (Frequency, Period, frequency ratio, Period Averaging and Time interval).

8. Study of characteristics of Diode, Transistors using Curve Tracer.

List of Assignments:

1. Calibration of DVM for any one range: e.g. 200V dc, 200Vac, 200mA dc, using standard calibrator or standard 6½ DMM.
2. Presentation on LCR-Q meter.
3. Describe any one real time applications of random noise generator.
4. Mathematical operations using Lab view software.
5. Seminar on network analyzer.
6. Describe any one real time applications of power scope.

Text Books:

1. Oliver-Cage, “Electronic Measurements and Instrumentation”, TATA McGraw Hill, 1975.
2. M.M.S. Anand, “Electronics Instruments and Instrumentation Technology”, Prentice Hall India, New Delhi, 2009.
3. Albert D. Helfrick and William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2010.

Reference Books:

1. Coombs, Clyde F. Jr., “Electronic Instrument Handbook”, McGraw Hill, 2000.
2. J.J. Carr, “Elements of Electronic Instrumentation and Measurement”, Pearson Education India, New Delhi, 2011.
3. A. J. Bouwens, “Digital Instrumentation”, TATA McGraw Hill, 1997.
4. H.S. Kalsi, “Electronic Instrumentation”, Tata McGraw Hill, New Delhi, 2010



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem :- V
SUBJECT :- Digital Communication Systems**

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

TW &OR : 50 Marks

Credits: 04

Course Prerequisites:

- Understanding of continuous and discrete linear systems.
- Knowledge of probabilities and random variables.
- Understanding of Fourier Transform.

Course Objectives:

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand the basics of baseband and pass band digital communication systems.
- To analyze error performance of a digital communication systems.
- To acquire the knowledge of spread spectrum communication systems.

Course Outcomes: At the end of the course, a student will be able to

1. Solve and analyze problems related to Probability theory & random processes.
2. Identify and describe different modulation & detection techniques in digital communication & compare their performance.
3. Characterize error-control coding techniques

4. Analyze Performance of spread spectrum communication systems.

Contents:

Unit –I

(06 Hours)

Overview of Probability Theory and Random Variables:

Sample space, events, Conditional probability, Joint probability, Baye's rule, random variables. Continuous and discrete random variables, Cumulative distribution Function, probability distribution function, Statistical averages, Random Processes, Time average, Ergodicity.

Unit -II

Digital transmission of analog signals

(06 Hours)

Introduction to Digital Communication System, Sampling Process, Quantization–Uniform, Non-Uniform, Companding, A-Law, μ Law, Pulse code modulation Delta Modulation, Adaptive Delta Modulation, Delta Sigma Modulation, Differential Pulse Code Modulation.

Unit –III :

(06 Hours)

Baseband Transmission and Reception:

Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester, Properties & their spectra, M-ary Signaling, ISI, scrambler, Unscramble. Optimum Receivers-Matched Filters, Correlation receivers.

Unit-IV

(06 Hours)

Bandpass Modulation Techniques:

ASK, PSK, FSK, Binary Phase shift keying, Differential Phase shift keying, Differential encoded PSK, Quadrature PSK, M-ary PSK, Quadrature Amplitude shift keying (QASK), Binary frequency shift keying, Minimum shift keying (MSK) , signal space representation, Performance evaluation of modulation techniques in terms of probability of error (No derivations)

Unit-V

Error Control Coding:

(06 Hours)

Types of Errors & codes, Linear block codes, error detection & correction, Hamming codes. Cyclic codes: Encoding and syndrome decoding. Convolutional codes, Introduction to turbo codes.

Unit-VI

(06 Hours)

Spread Spectrum Techniques:

Introduction, Generation of PN Sequences and its properties, Direct Sequence Spread Spectrum Signals, Frequency Hopped Spread Spectrum Signals, Introduction to Multiple Access Techniques: CDMA, TDMA, FDMA.

List of Experiments:

Minimum 8 experiments should be conducted.

1. To verify the sampling theorem.
2. To study Pulse Code Modulation System (PCM) System.
3. To analyze a Delta modulation system and interpret the modulated and demodulated waveforms.
4. To perform ASK (Amplitude Shift Keying) System.
5. To study PSK (Phase Shift Keying) System.
6. To study FSK (Frequency Shift Keying) System.
7. To study of Quadrature Phase Shift Keying (QPSK).
8. To study of Spread Spectrum techniques.
9. To simulate any digital modulation scheme using MATLAB.
10. To perform different Data Formats
11. To study of Hamming codes.

List of Assignments:

Any six assignments can be completed

1. Study of sampling theorem using Virtual Labs
2. Study of ASK/FSK/PSK system using Virtual Labs.
3. Study of hamming code.
4. Experiments on random signals using MATLAB
5. Simulation of communication system using MATLAB.
6. Study of Eye Diagram using oscilloscope
7. Presentation on any communications topic relevant to the course.

8. Industrial Visit

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**
 1. Unit Test
 2. Assignments
 3. Continuous Assessment
 4. End term Examination

Text books:

1. Sklar, Bernard, "Digital Communications, Fundamentals & Applications," Second Edition, Prentice-Hall Inc.,2001.
2. Leon W. Couch, "Digital and Analog Communication Systems", Sixth Edition, Pearson Education, 2001.
3. Lathi B P, and Ding Z "Modern Digital and Analog Communication Systems," Fourth Edition ,Oxford University Press.

Reference Books:

4. Haykin Simon, "Digital Communication Systems," Forth Edition,John Wiley and Sons, New Delhi.
5. Taub, D. Schilling, and G. Saha, "Principles of Communication Systems," Third Edition, Tata McGraw Hill.
6. John G. Proakis , "Digital Communication" ,Fifth Edition, Pearson Education.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:-V
SUBJECT: - Power Devices & Machines**

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

TW &OR : 50 Marks

Credits: 04

Course Prerequisites:

- Knowledge of the principals and applications of electronic devices including semiconductor diodes, bipolar-junction and field-effect transistors.
- Understanding of transformers and magnetically coupled circuits

Course Objectives:

- To understand and acquire knowledge about various power semiconductor devices.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.

Course Outcomes: On successful completion of this course, students will be able to

1. Compare various power devices with their driver circuits & protection circuits
2. Comprehend the principle operation and models of different types of power electronic converters AC-DC, DC-AC and DC-DC converter systems.
3. Describe the basic principles of HVDC, UPS, motors, etc.

Contents:

UNIT I :

Power devices

(06 Hours)

Power Diodes: Construction, Switching characteristics; Power BJT, PBJT: Construction, Operation, switching characteristics, Power MOSFET: PMOSFET, Construction, Operation, Static characteristics, switching characteristics, safe Operating Area, IGBT: Construction, Operation, Switching characteristics, Safe operating area.

Thyristor: Construction, Operation, transistor analogy, static characteristics, switching characteristics, thyristor turn-on, thyristor turn-off. DIAC / TRIAC – construction and operating Principle, Applications. GTO: Construction, Operation, Turn off mechanism, Applications, driver, protection and snubber circuits for power devices

UNIT II.

(07 Hours)

Single phase AC-DC converters

Concept of line commutation, Single phase half controlled and fully controlled converters- Circuit diagram, operation and waveforms for resistive and highly inductive loads, Analysis of output voltage and supply current including following performance parameters: average and RMS output voltage, Fourier series expressions for supply current, power factor improvement, performance factors of line commuted converters, effect of source impedance.

UNIT III

(05 Hours)

Three phase AC-DC converters

Three phase half controlled and fully controlled converters- Circuit diagram, operation and waveforms for resistive and highly inductive loads, Analysis of output voltage and supply current including following performance parameters: average and RMS output voltage.

UNIT IV

(06 Hours)

Inverters

Single & Three-phase Inverters:

Circuit diagram, operation & waveforms for single phase full bridge & Push pull inverters. Switching techniques for obtaining square, quasi-square & sinusoidal PWM o/p waveforms. Use of Pulse width modulated IC's for Inverter control. Fourier analysis of quasi-square waveform & harmonic load currents for R & RL loads. Circuit diagram, operation & waveforms for three phase voltage source bridge inverters for 120 degree & 180 degree conduction for balanced star resistive load.

UNIT V.

(06 Hours)

Switched & resonant DC/DC converters

Control of DC/ DC converters. Circuit diagram, Waveforms & operation (o/p voltage calculation) of step down chopper (Buck converter), Step up chopper (Boost converter) & 2-

quadrant type C chopper. Circuit diagram, waveforms, operation & design of Fly back converter (SMPS)

Need for resonant converters:

Circuit diagram, waveforms & operation of SLR half bridge DC/DC converter in low frequency (discontinuous conduction) mode.

UNIT VI

(06 Hours)

Introduction to Motors and Power converter applications

Motors: DC motors, AC Motors, Special Purpose Motors, Induction Motor, Universal Motor, Stepper Motor, Servomotors etc. (Qualitative analysis only)

Applications: UPS, HVDC transmission, electronic ballast

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End term Examination

List of Experiments:

1. Study of characteristics of SCR
2. Study of Triggering circuits
3. Study of characteristics of IGBT
4. Study of characteristics of TRIAC
5. Study of single phase half controlled converter
6. Study of single phase fully controlled converter
7. Study of three phase half controlled converter
8. Study of TRIAC based AC motor control
9. Study of three phase VSI inverter
10. Study of first quadrant chopper
11. Study of UPS
12. Study of light dimmer

List of Assignments:

1. Real life applications of inverters.
2. Real life applications of PV cells.

3. Applications of single phase converter.
4. Different types of cyclo converters.
5. Describe AC Voltage regulators.
6. Real life applications of power devices.

Text Books:

1. M. H. Rashid, "Power Electronics Circuits, Devices And Applications", PHI, 3rd Edition, 2004, New Delhi
2. M D Singh & K B Khanchandani, "Power Electronics", TMH, New Delhi
3. P. C. Sen, "Modern Power Electronics", S. Chand & Co., New Delhi

Reference Books:

1. S. Tamil Asgar, "Power Electronics", PHI, 2004, New Delhi
2. N. Mohan, T. M. Undeland & W. P. Robbins, "Power Electronics, Converters Applications And Design", John Willey and sons, 3rd edition, Singapore
3. V. R. Moorthi, "Power Electronics, Devices, Circuits & Industrial Applications", Oxford University Press, New Delhi, 2005.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B. Tech (Electronics) Sem:-V

SUBJECT: - Electromagnetic Engineering

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1 Hour/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

Credits: 04

Course Prerequisites:

Fundamentals of integration, differentiations, partial diffraction.

Course Objectives:

- Provide fundamentals of Static Electromagnetic Fields.
- Explain basics of the vector Differential, Integral operators to Electromagnetic theory & Electrostatic & Electromagnetic fields.
- Define and derive different laws in Electrostatic & Electromagnetic fields.
- Explain Maxwell's equations and concepts of transmission lines.
- Analyze techniques for formulating and solving problems in Electrostatic & Electromagnetic fields.
- Develop mathematical skills related with differential, integral and vector calculus.

Course Outcomes: On successful completion of this course, students will be able to

4. Comprehend the fundamentals of Electrostatic and Electromagnetic fields..
5. Apply Gauss' law, Ampere's Law, Biot-Savart law, Faraday's law and laws related with steady magnetic field while solving problems in Electrostatic and Electromagnetic fields.
6. Develop field equations from understanding of Maxwell's Equations.

7. Extend the knowledge of basic properties of transmission lines to analyze electromagnetic wave propagation in generic transmission line geometries.
8. Demonstrate mathematical skills related with differential, integral and vector calculus.

Contents:

Unit I

Co-ordinate Systems

(5 Hours)

Vector Algebra, product of vectors, Co-ordinate systems, Curl, Divergence & Gradient, Stoke's Theorem, Poisson's and Laplace Equations, Coulomb's law, line, Surface & Volume Charge distribution.

Unit II

Electrostatic Fields

(7 Hours)

Electric Field Intensity, Electric Field due to infinite line and surface charges, Electric Flux Density, Gauss law (differential and integral form) and its applications, Divergence Theorem, Electric Potential and gradient, Work done, Energy Density, Electric Dipole and moment. Polarization in Dielectrics, Boundary conditions for Dielectric and Dielectric, boundary conditions for Conductor and Dielectric, boundary conditions for Conductor and free space. Method of Images for point and line charge, Capacitance – parallel, co-axial and spherical, Continuity equation.

Unit III

Magnetostatic Fields

(6 Hours)

Biot - Savart law, Magnetic Field Intensity due to infinite and finite line. Ampere's Circuital Law in integral and differential form, Applications of Amperes Circuital law, Magnetic flux density, vector magnetic potential, Magnetic Torque, moment and dipole, nature of magnetic material, magnetization, Magnetic boundary conditions

Unit IV

Time Varying Fields & Wave Propagation

(7 Hours)

Faradays law of induced emf, displacement current, Maxwell's Equations in point form & Integral form for various fields, Wave equations, wave propagation through different medium,

skin depth, Poynting theorem, wave polarization, Reflection of plane wave from conducting medium, perfect dielectric.

Unit V

Transmission Lines

(6 Hours)

Physical Description of Transmission line propagation, Transmission Line equations, Characteristic equation of infinite Transmission Line, Complex analysis of sinusoidal waves, Transmission lines equations & their solutions in phasor form, Uniform terminated Transmission Line, Input impedance, Phase velocity and group velocity, Short circuited and open circuited line, Reflection coefficient VSWR, smith chart (Numerical expected) and applications.

Unit VI

Waveguides & Electromagnetic radiation

(5 Hours)

Plane wave analysis of parallel-plate waveguide, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguide, EMI/EMC concepts, basic radiation principles, Hertzian dipole, magnetic dipole, thin wire antennas, antenna specifications, antenna arrays.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

4. Unit Test
5. Continuous Assessment
6. End term Examination

List of Assignments:

1. Analyze Coulombs law, Gauss Law, Divergence theorem with different problems on Scilab / MATLAB (Refer www.scilab.in-resources/completd book and Hayt& Buck, Engineering Electromagnetics, 7th Edition Tata McGraw-Hill).
2. Analyze Maxwell's equations for different fields on Scilab / MATLAB
3. Experimental study on antenna trainer kit & study different antenna specifications.
4. Analyze experimentally waveguides on Microwave test bench.
5. Analyze uniform plane wave for different media on Scilab / MATLAB

6. Analytical problems on transmission lines.

List of Tutorials: The main objective of this tutorial is to focus on the outcomes defined in the theory syllabus by solving the following problems based on paper work.

1. Find the Electric field intensity and electric flux density at a given point due to following charge distributions. (In all coordinate systems)

- Point charges
- Line charges (finite and infinite)
- Surface charges (finite and infinite)
- Mixed charges (Point charge, Line charge, Surface charge)

2. Application of Gauss's law

- Given ρ_v (volume charge density) in a particular region, find \bar{D} (electric flux density) using Law at the given location.
- Given ρ_s (surface charge density), find \bar{D} (electric flux density) using Gauss's Law at the given location.
- Given \bar{D} (electric flux density), find total charge enclosed by the surface (Q), ρ_v (volume charge density) using Gauss's Law.(In all coordinate systems).

3. Find the electrostatic fields (Tangential and Normal) at the boundary between,

- Free space and dielectric medium
- Free space and conductor
- Dielectric medium and conductor
- Two dielectric media.
- Two dielectric media when boundary is defined by a equation of plane.

4. Find \bar{H} (Magnetic field intensity) and \bar{B} (Magnetic flux density) at a given point due to,

- Infinitely long current carrying conductor
- Finite current carrying conductor
- Infinite conducting surface
- Finite conducting surface

- Different current carrying configurations (i.e. thin conductor, surface all together)
5. For the following current carrying configurations, find the \vec{H} (Magnetic field intensity) in a given region (or point) using Ampere's circuital law.
 - Infinitely long current carrying conductor
 - Infinite cylindrical surfaces of different radii all centered at the same axis.
 - Spherical surfaces of different radii all centered at a given point.
 6. Given the (Magnetic field intensity) of a particular region, find current (I), current density (J), enclosed by the given surface. (In all coordinate systems).
 7. Given \vec{H} (or \vec{E}) and the region properties (like ϵ , μ , σ etc.), find \vec{B} , \vec{D} and \vec{E} (or \vec{H}) using Maxwell's equations. (In all coordinate systems).
 8. Given the primary constants (R, L, G, C) along with the generator specifications and termination, find secondary constants (α , β , γ , Z_0) and other parameters like Velocity, wavelength, received voltage, received power, reflection coefficient etc.
 9. Problems on Transmission Line Analysis.
 10. Problems on Impedance matching and design of stub matching using Smith Chart.

Text Books:

1. A. Murthi, "Electromagnetic fields", S. Chand.
2. Edminister J.A, "Electromagnetics", Tata McGraw-Hill.

Reference Books:

1. Hayt & Buck, "Engineering Electromagnetics", 7th Edition, Tata McGraw-Hill.
3. Kraus, Fleisch, "Electromagnetics with applications", 5th Edition, McGraw Hill.
4. A. Das & S. K. Das, "Microwave Engineering", 2nd edition, McGraw Hill.
6. Jordan & Balmain, "Electromagnetic waves & radiating systems", 2nd edition, PHI.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B. Tech (Electronics) Sem:-VI

SUBJECT: - Digital Signal Processing

Teaching Scheme

Lecture: 4 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

TW& OR: 50 Marks

Credits: 05

Course Prerequisites:

- Knowledge of mathematics
- Knowledge of signals and systems

Course Objectives:

- To introduce the concept of discrete Fourier transform.
- To learn the algorithm of fast computation.
- To design the finite impulse response filter & infinite impulse response filter.
- To learn the finite word length effect of filter.
- To understand the architecture & programming of DSP processor.

Course Outcomes: On successful completion of this course, students will be able to

1. Compute the Discrete Fourier transform & Fast Fourier transform.
2. Design FIR and IIR filters.
3. Understand the finite word length effect in digital filters.
4. Implement the various applications on DSP processor.

Contents:

Unit –I

(07 Hours)

Discrete Fourier Transform:

Definition, periodicity concept, relationship with Z transform and Fourier series, properties, circular convolution, applications like linear filtering, overlap save, overlap add method, frequency analysis etc.

Unit-II

(09 Hours)

Fast Fourier Transform Algorithm:

Direct computation of D.F.T., its computational complexity, FFT algorithms, their classification, radix 2 FFT algorithms, DIT – FFT, DIF –FFT, Inverse radix 2 algorithms, FFT algorithms for composite value of N, Goertzel algorithm, Chirp Z transform algorithm, Quantization effects, applications.

Unit-III

(08 Hours)

Design of FIR Filters

Realization of FIR filters, Symmetric and anti symmetric FIR filters, design of linear phase FIR filters using different windows, frequency sampling method, FIR differentiators, Hilbert transformers, and Optimum equiripple linear FIR filters.

Unit-IV

(08 Hours)

Design of IIR Filters:

Realization of IIR filters, Butterworth and Chebyshev approximations, frequency transformations, design of IIR filters from analog filters using Approximation of derivatives, impulse invariance, Bilinear transform, design of IIR filters from pole zero plots.

Unit-V

(08 Hours)

Finite Word Length Effects in Digital Filters

Number representation, fixed point, sign-magnitude, one's complement, two's complement forms, floating point numbers, Quantization, truncation, rounding, effects due to truncation and rounding, Input quantization error, Product quantization error, co-efficient quantization error, zero-input limit cycle oscillations, overflow limit cycle oscillations, scaling, Quantization in Floating Point realization IIR digital filters, finite word length effects in FIR digital filters, quantization effects in the computation of the DFT- quantization errors in FFT algorithms.

Unit-VI

(08 Hours)

Introduction to DSP Processors

Introduction to fixed point and floating point DSP processor, multiplier and multiplier accumulator (MAC), modified bus structures and memory access schemes in DSPs, multiple access memory, multiport memory, VLIW architecture, pipelining, special addressing modes, on-chip peripherals .

Features of TMS 320C67xx DSP processor, architecture of TMS 320c67xx DSP processor, architecture features: computational units, bus architecture memory, data addressing, address generation unit, program control, program sequencer, pipelining, interrupts, features of external interfacing, Speech Processing: Speech analysis, digital processing of audio signals.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

7. Unit Test
8. Continuous Assessment
9. End term Examination

List of Experiments:

Minimum 10 experiments should be conducted using MATLAB & at least one using hardware.

1. To find DTFS for periodic and DTFT for non periodic signal.
2. To find DFT IDFT of DT signal.
3. To find the response of DT system using convolution.
4. To find the stability of DT system using the concept of convolution.
5. To perform convolution using overlap and add method.
- 6 To perform circular convolution.
7. To plot pole zero plot of Z-domain using transfer function.
8. To solve the difference equation and find the system response using Z transform.
9. To find the impulse invariance IIR digital filter to realize the first order analog Butterworth filter.
10. To design IIR filter for first order analog Butterworth approximation using bilinear transformation.
11. To find and plot the frequency response for the rectangular and Hamming window.
12. To Design FIR filter using frequency sampling method.
- 13.To plot spectrogram of speech signal.
- 14.To implement convolution sum using DSP processor.
15. To implement Speech processing applications using DSP processors.

List of Assignments:**Assignments should be conducted using SCILAB**

- 1.Linear and circular convolution
- 2.DFT and IDFT
- 3.FFT & IFFT
- 4.Realization of filters
- 5..Design of FIR filter
- 6.Design of IIR filter

Text Books:

- 1.Proakis J., Manolakis D., "*Digital Signal Processing*", Pearson Education

References Books:

1. Babu R., "Digital Signal Processing", 4th Edition, Scitech Publications.
2. Salivahanan, Ganpriya and Vallavraj,"Digital signal Processing"Tata McGraw-Hill.
3. Ifeachor, Jervis "Digital Signal Processing ", Pearson Education.
- 4.Texas Instruments, DSP Manual.
5. B. VenkataRamani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", Tata McGraw Hill.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B. Tech (Electronics) SEM:-VI

SUBJECT: - Embedded Systems

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

TW& OR: 50 Marks

Credits: 04

Course Prerequisites:

- Fundamentals of Computer, Digital Logic Circuits, Computer Organization and Architecture.

Course Objectives:

- To understand need and application of ARM Microcontroller in embedded system.
- To study the architecture of ARM series microcontroller
- To understand architecture and features of typical ARM7& ARM CORTEX-M3 Microcontroller.
- To learn interfacing of real world input and output devices

Course Outcomes: On successful completion of this course, students will be able to

1. Develop Firmware Embedded Systems.
2. Interface the advanced peripherals to microcontrollers.
3. Design embedded system with available resources.

Contents:

Unit 1: Introduction to Embedded Systems

(4 Hours)

Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Characteristics of Embedded Systems, Hardware and Software components of an Embedded System, Introduction to IDEs. Major Application Areas.

Unit 2: Introduction to embedded programming & RTOS**(8 Hours)**

Introduction to embedded data types in embedded C, addressing memory & I/O, I/O functions of embedded C. Examples on Embedded C.

RTOS: Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem.

Unit 3: ARM7 Based Microcontroller**(8 Hours)**

Introduction to ARM processors and its versions: ARM7, ARM9 & ARM11 features, ARM7 data flow model, programmer's model, modes of Operations, Overview of Instruction set.

ARM7 Based Microcontroller LPC2148: Features, Architecture (Block Diagram and Its Description), System Control Block (PLL and VPB divider), Memory Map, GPIO, Pin Connect Block, timer.

Unit 4: Interfacing with ARM7**(6 Hours)**

Interfacing the peripherals with LPC2148: LED, LCD, GLCD, KEYPAD, GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

Unit 5: ARM CORTEX Processors**(6 Hours)**

Introduction to ARM CORTEX series, improvement over classical series. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications.

ARM-CM3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, GPIO and Pin Connect Block.

Unit 6: Interfacing with ARM CORTEX M3**(4 Hours)**

Interfacing peripherals with LPC1768: RGB LED, Seven Segment, TFT Display, Motor control using PWM.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

3. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
4. End term Examination

List of Experiments: Minimum 8 experiments should be conducted.

1. Interfacing LPC2148 with LCD/GLCD
2. UART Interfacing LPC2148 in embedded system (GSM/GPS)
3. Interfacing LPC2148 for internal ADC on interrupt basis
4. Interfacing SD card with LPC2148
5. Interfacing EEPROM with LPC2148 using SPI protocol
6. SRAM interfacing with LPC2148/LPC1768.
7. Interfacing LPC1768 to Seven Segment / RGB LED
8. Generation of PWM signal for motor control using LPC1768
9. Interfacing TFT display to LPC1768
10. Implementing CAN protocol using LPC1768
11. Implementing ETHERNET protocol using LPC1768.
12. Semaphore as signaling and synchronizing in ARM7.
13. Mailbox implementation for message passing in ARM7.

List of Assignments:

1. Case study of any one of the latest ARM processors and Power point presentation of the same in class.
2. Survey of CORTEX M3 based controllers, its features and comparison.
3. Design of Firmware Embedded system using LPC 2148 (Simulation only).
4. Design of Firmware Embedded system using LLPC1768 (Simulation only).
5. Case study of any one of the RTOS with examples.

Text Books:

1. Rajkamal, “Embedded system-Architecture, Programming and Design”, TMH Publications, Edition 2003.
2. Andrew Sloss, Dominic Symes, Chris Wright, “ARM System Developers Guide – Designing and Optimizing System Software”, ELSEVIER.
3. Joseph Yiu, “The Definitive Guide to the ARM Cortex-M”, Newness, ELSEVIER.

Reference Books:

1. LPC 214x User manual (UM10139) :- www.nxp.com.
2. LPC 17xx User manual (UM10360) :- www.nxp.com
3. ARM architecture reference manual : - www.arm.com
4. Trevor Martin, “An Engineer’s Introduction to the LPC2100 series”, Hitex (UK) Ltd.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:-VI
SUBJECT: - VLSI Design**

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

TW& PR: 50 Marks

Credits: 04

Course Prerequisites:

- Analog Electronics
- Digital Electronics

Course Objectives:

- To introduce the VLSI Design Flow and design styles
- To introduce the VHDL Hardware Description Language (HDL) that shall help in describing a circuit to the tools for simulation and further processing of the same towards implementation.
- To introduce MOSFET physics and CMOS logic gates.

Course Outcomes: On successful completion of this course, students will be able to

1. Design and simulate digital system using structural, Behavioral, dataflow or mixed style of Modeling.
2. Apply concepts of Finite State Machine On sequential circuits.
3. Realize digital hardware system utilizing PLDs.
4. Identify MOSFET Physics and CMOS structures.
5. Implement CMOS combinational logic Design.

Contents:

UNIT I:

(07 Hours)

HDL Modeling and Design Flow

Introduction to VLSI design flow (with reference to an EDA tool), sequential, data flow and structural modeling, functions, procedures, attributes, test benches, synthesizable and non synthesizable statements, packages and configurations, VHDL modeling.

UNIT II:

(05 Hours)

FSM and sequential logic Principles

Sequential circuits, Meta stability synchronization, design of finite state machines and state minimization, Modeling of FSM-Mealy and Moore machines, FSM case studies- traffic light control, lift control, UART.

UNIT III:

(05 Hours)

Programmable logic devices

CPLD: Introduction, study of architecture. FPGA: Introduction, study of architecture, PLAs, PALs, function implementation using PLDs.

UNIT IV:

(07 Hours)

MOS Device Physics

MOSFET structure, MOS I/V characteristics, body effect, Scaling of MOS circuits, MOSFET capacitances, MOS small signal model, MOS amplifiers.

UNIT V:

(06 Hours)

CMOS VLSI

CMOS parasites, equivalent circuit, CMOS inverter characteristics, power dissipation, power delay product, Layout design rules, introduction to CMOS layout, CMOS logic structures, concept of regularity, modularity and locality.

UNIT VI:

(06 Hours)

CMOS Logic Circuits:

CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using CMOS gates , W/L calculations of CMOS, CMOS transmission gates, Designing with Transmission gates.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End term Examination

List of Experiments:

1. To model 8:1mux, 1:8 demux, 3:8line decoder, 8:3 encoder using VHDL
2. To model adder and subtractor
3. To model synchronous and asynchronous D FF
4. To model 4- bit universal shift register
5. To model 4-bit counter
6. To model bidirectional buffer
7. To model parity generator and checker
8. Study of RAM/FIFO
9. Study of Temperature sensing using ADC
10. Study of real time moving generator chip CMOS

List of Assignments:

1. Simulate TLC
2. Simulate UART
3. Simulate LIFT controller
4. Design Barrel shifter.
5. Design a Mealy and Moore Sequence Detector
6. Real life applications of FPGA/CPLD

Text Books:

1. Neil IL E. Weste and Kamran Eshraghain,"Principles of CMOS VLSI Deign", Pearson Education Publication.
2. Wayne Wolf, "Modern VLSI Design", Prentice Hall Publication.
3. J.Bhaskar"A VHDL primer" Pearson Education Publication.
4. BehzadRazavi,"Design of Analog CMOS Integrated Circuits", Tata McGraw Hill

Reference Books:

1. John Walkerly,"Digital Design Principles and Practices",Prentice Hall Publication
2. Douglas Perry,"VHDL", Pearson Education Publication.
3. Charles Roth, "Digital System Design using VHDL", Tata McCraw Hill.

4. Wayne Wolf, "FPGA Based System Design", Prentice Hall
6. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 2011.
7. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", TMH, 3rd Ed., 2011.
8. ParthPratimSahu, "VLSI Design", McCraw Hill Education Pvt. Ltd.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VI
SUBJECT: - Project Management & Finance**

Teaching Scheme

Lecture: 3 Hours/week

Examination Scheme

**End semester exam: 60 Marks
Continuous Assessment: 40 Marks
Credits: 03**

Course Prerequisite:

- Understanding the various forms of Math, Economics and Statistics.

Course Objectives:

- To understand basic principles/concepts of project management and finance.
- To describe the most well-known theories and perspectives on project managements.

Course Outcomes: At the end of the course, a student will be able to

1. Describes the Characteristics, objectives and Stages of Project management.
2. Explain importance of time and work estimation in Project management.
3. Analyze Management Concepts for Developing Project Plan.
4. Analyze and Understand Financial & Project Management.
5. Demonstrate Scope, Objectives and Importance of Financial Management.
6. Identify and understand the main responsibilities and tasks of Securities and Exchange Board of India (SEBI) in money market and capital Market.

Unit -I**(06 Hours)****Introduction to Project management:**

Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

Unit –II**(06 Hours)****Work Definition:**

Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Documentation Introduction to CMM, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, ,CPM/PERT Networks

Unit-III**(06 Hours)****Management Concepts:**

Developing Project Plan (Baseline) , Project cash flow analysis, Project scheduling with resource constraints: Resource Levelling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.

Unit-IV**(06 Hours)****Project Implementation:**

Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

Unit-V**(06 Hours)****Financial Management:**

Introduction of Finance, Types of Finance, Financial Management, Scope & Objectives of Financial Management, function of finance manager, Importance of Financial Management, Sources of finance, Security Finance.

Unit-VI**(06 Hours)****Working Capital Management:**

Capital Structure, Fixed & working capital, Role of Securities and Exchange Board of India (SEBI), function of money market and capital Market, sources of finance. Introduction to capital budgeting, Techniques of capital budgeting. Break even analysis - assumptions, importance, Cost-Benefit analysis, CVP graph.

List of Assignments:

1. Explain the nature and purpose of financial management
2. Discuss the relationship between financial objectives, corporate objectives and corporate strategy.
3. Identify the nature and role of money and capital markets, both nationally and internationally.
4. Write in brief on Concepts & Importance of organization.
5. Critically evaluate various approaches to the financial management
6. Explain the functions of a stock market and a corporate bond market..

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Shtub, Bard and Globerson, "Project Management: Engineering, Technology, and Implementation", Prentice Hall, India
2. C. Paramasivan and T. Subramanian, "Financial Management", New age international publishers.
3. John M Nicholas, "Project Management for Business and Technology: Principles and Practice", Prentice Hall, India, 2002.
4. Cleland and King, "VNR Project Management Handbook".
5. Wiest and Levy, "Management guide to PERT/CPM", Prentice Hall. India.

Reference Books:

1. Horald Kerzner, "Project Management: A Systemic Approach to Planning, Scheduling and Controlling", CBS Publishers, 2002.
2. S. Choudhury, "Project Scheduling and Monitoring in Practice".
3. P. K. Joy, "Total Project Management: The Indian Context", Macmillan India Ltd.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B. Tech (Electronics) Sem:-VI

SUBJECT: - Electronics Circuit Design

Teaching Scheme

Lecture: 4 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Continuous Assessment: 40 Marks

TW& OR: 50 Marks

Credits: 05

Course Prerequisites:

- Knowledge of basic electronics components and its functions.
- Knowledge of rectifiers, amplifiers, filters etc.
- Knowledge of basic Data acquisition systems.

Course Objectives:

- To introduce the basic concepts needed for Circuit design.
- To introduce the techniques such as signal amplification, filtering, audio power amplification etc
- To emphasize the understanding and practical implementations of the electronics circuits.

Course Outcomes: At the end of the course, a student will be able to

1. Choose proper electronic component for designing circuits.
2. Design basic electronics circuits like rectifiers, filters, voltage regulators, amplifiers, etc.
3. Distinguish between linear power supply and SMPS.
4. Implement Data Acquisition Systems.

Contents:

Unit-I

Electronic Components Selection:

(08 Hours)

Passive and active components, types of resistors, capacitors and Inductors. Transformers types: power transformer, audio frequency transformer and intermediate frequency transformer. Integrated Circuits (ICs), wire/cable selection, shielding and grounding techniques.

Unit-II

Design of Analog Filter: (08 Hours)

Low pass filter and high pass filter. Design of Inductor Filter, Capacitor filter, LC- filter, RC- Filter and π section Filter.

Unit-III

Design of Linear power supply: (08 Hours)

Block Schematic, Types of voltage regulators, Design of Zener diode shunt regulator, Transistor shunt regulator and transistor series voltage regulator. Short circuit protection, fold back current limiting. Discrete components & IC based design for linear power supply e.g. Three terminal regulators (LM317, LM78XX).

Unit-IV

(08 Hours)

Switched Mode Power Supply:

Topology of SMPS. Comparison between Linear Power Supply and SMPS. IC based design for switch mode power supply with latest SMPS ICs.

Unit-V

Design of Data Acquisition System: (08 Hours)

Circuit level design of DAS, Design should include signal sensing, isolation, and signal conditioning ADC storage & display systems.

Unit-VI

(08 Hours)

Audio Power Amplifier:

Design of Audio Power Amplifier: Design using ICs like TBA810, Design of signal conditioner, Design of pre amplifier, Design should include various controls, Parameters optimization & protection circuits.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

10. Unit Test
11. Continuous Assessment
12. End term Examination.

Mini Project & Assignments:

Mini-project should be from small systems required in laboratory or real life, project to be designed, tested on bread board, fabricated on manual or CAD based PCBs with due consideration to mechanical aspects for enclosure & control panel design. Complete documentation in the form of project report is to be submitted. Due consideration should be given to Mini Project while assessing students for term work.

Five assignments must be completed. Out of five assignments four should be corresponding to complete design of analog and digital system. Fifth assignment should be corresponding to the software simulation of system.

Use of softwares like MULTISIM / PROTEUSis expected.

List of Assignments:

1. Design of low pass filter.
2. Design of linear power supply using discrete components.
3. SMPS Topology.
4. Data acquisition system.
5. Design of audio power amplifier.

Text Books:

1. P.M.Chirliyal, "Analysis & Design of Integrated Electronic Circuits", Wiley Eastern.
2. Hayt&Nudeck, "Electronic Circuit Analysis & Design ", Jaico Publishing House.
3. Horowitz Paul & Winfield Hill, "Art of Electronics", Cambridge University Press 2nd Edition 1989.
4. B.S.Sonde, "Introduction to system Design Using Integrated Circuits", Wiley Eastern-2nd Edition.
5. M.M.Shah, "Design of Electronic Circuits & Computer Aided Design", Wiley Eastern.

Reference Books:

1. Sergio Franco, "Design with Operational amplifiers and analog Integrated circuits", 3rd edition, TMH.
2. Franklin P. Prosser, David E. Winkel, "The Art of Digital Design", PHI.
3. Gotlib, "Power Supply Design", PHI

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Electronics) Sem – VII (2014 Course)

Semester- VII					Contact Hours: 23 Hrs/week							
					Total Credits: 25		Total Marks: 750					
Sr. No.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)						Total Marks	Credits
		L	T	P	Continuous Assessment			Tw &Pr	TW & OR			
					End Semester Exam	Unit Test	Tutorials / Assignments			Attendance		
40	Computer Networks	3	0	2	60	20	10	10	-	50	150	4
41	Programmable Logic Controllers & Applications	3	0	2	60	20	10	10	50	-	150	4
42	Electronic System Design	3	0	0	60	20	10	10	-	-	100	3
43	Advanced Communication System	2	0	0	60	20	10	10	-	-	100	2
44	ELECTIVE-I	3	1	0	60	20	10	10	-	50	150	4
45	Project Stage-I	0	0	4	-	-	-	-	-	50	50	4
46	In-plant Training	0	0	0	-	-	-	-	-	50	50	4
Total		14	01	08	300	100	50	50	50	200	750	25

Elective-I

- 1) Mobile & Broadband Communication
- 2) Digital Image processing

- 3) Advanced Digital Signal Processing
- 4) Advance Computer Programming

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Electronics) Sem – VIII (2014 Course)

Semester- VIII												Contact Hours: 28 Hrs/week	
												Total Credits: 25	
												Total Marks: 750	
Sr. No.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)							Total Marks	Total Credits
		L	T	P	End Semester Exam	Continuous Assessment			Tw &Pr	TW & OR			
						Unit Test	Tutorials / Assignments	Attendance					
47	Optical Communication Fiber	3	0	2	60	20	10	10	50	-	150	4	
48	Biomedical Engineering	3	0	2	60	20	10	10	-	50	150	4	
49	Wireless Network	3	1	0	60	20	10	10	-	-	100	4	
50	Elective-II	3	1	0	60	20	10	10	-	50	150	4	
51	Seminar	0	0	2	-	-	-	-	-	50	50	1	
52	Project Stage-II	0	0	8	-	-	-	-	-	150	150	8	
	Total	12	02	14	240	80	40	40	50	300	750	25	
53	Environmental Studies	3	0	0	60	20	10	10	-	-	100	0	

Elective-II

- 1) Agricultural Electronics
- 2) SOC (System on Chip)

- 3) Speech Processing
- 4) Fuzzy Logic & Neural Network



Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B. Tech (Electronics) Sem:-VII

SUBJECT: - Computer Networks

Teaching Scheme

Lecture: 03 Hours/week

Practical: 02 Hours/week

Examination Scheme

End Semester Exam: 60 marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 marks

Credits: 04

Course Prerequisites:

Analog communication, Digital communication systems.

Course Objectives:

1. To introduce various topologies and types of computer networks.
 2. To introduce network hardware & OSI layers.
 3. To know how of congestion control mechanism.
 4. To familiarize the TCP/IP protocol.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Identify the types of computer networks and topologies.
2. Identify the functions of network connectors, Hubs, Switches, Routers, Bridges, NIC & network layers.
3. Implement various algorithms used in computer networks.
4. Use TCP/IP protocol.
5. Apply the various Network security techniques.

Contents:

Unit I

[06 Hours]

Introduction to computer networks

Networks definition & requirements, Networks topologies, Types of networks, network software issues, reference models- OSI TCP/IP and Hybrid.

Unit II

[06 Hours]

Physical layer

Transmission media Guided media-twisted pair, coaxial cable, optical fiber, unguided media-RF allocation, terrestrial microwave, satellite communication, cellular telephone, EIA 232 D interface standard, modem-types, block schematic & standards network device: network connectors, Hubs, Switches, Routers, Bridges, NIC, Fast Ethernet, Gigabit Ethernet.

Unit III

[06 Hours]

Data Link Layer

Design issues, error detection and correction, elementary data link protocols, sliding window protocols, HDLC-types of stations, modes of operation, HDLC frame formats, additional features, Medium access sub layer – channel allocation problem, multiple access protocols, IEEE 802 standards for LANS & WANS.

Unit IV

[06 Hours]

Network Layer

Design issues, Routing algorithms – shortest path, distance vector routing, link state routing, flow based routing, routing for mobile hosts, Congestion control – congestion prevention policies-leaky bucket algorithm, token bucket algorithm, congestion control in virtual circuit subnet and choke packets, RSVP.

Unit V

[06 Hours]

TCP/IP Protocol suit overview

TCP/IP and internet, IP protocol and it's header format, addressing, subnetting, other networks layer protocol – ARP, RARP, ICMP, IGMP, TCP, UDP, DHCP, Domain name system (DNS), Email, HTTP, IPV 6.

Unit VI

[06 Hours]

Network security

Cryptography Algorithms and Trust Models, Ciphers vs Codes, Symmetric-key algorithms (DES, AES), Public- key algorithms – RSA, Digital signatures, IPSec, Firewall, Managements of publics keys, communications security, Authentication Protocols.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Experiments

1. Study of Networking.
2. Introductions to Network Simulation.
3. Study of LAN.
4. Study of Installation of Windows 2003 Server & introduction to DHCP.
5. i) Character transfer using Simplex method
ii) Character transfer using Full-Duplex method
6. Simulation and implementation of bit stuffing Simulation and implementation of CRC
7. Study of Medium Access sub layer protocols and simulate using Network Simulator.
8. Simulation and implementation of
i) Stop-and Wait protocol
ii) Go-Back-N protocol
iii) Selective repeat Protocol
9. Simulation and implementation of i) Distance Vector Routing Algorithm ii) Link State Routing algorithm
10. Study of Token Bucket Algorithm.
11. Study of TCP/IP Protocol Suite and Simulation Address resolution protocols.

List of Assignments:

1. Study of types of Networks and topologies.
2. Study of Network Hardware.
3. Study of TCP/IP Architecture
4. Study of Physical Layer
5. Study of Data Link Layer.
6. Describe the various Encoding techniques.
7. Study of Network Layer.
8. Study of Congestion control Mechanism.
9. Study of Session layer.
10. Study of Presentation layer.
11. Study of Application layer.
12. Study of Network security Mechanism.

Text Books

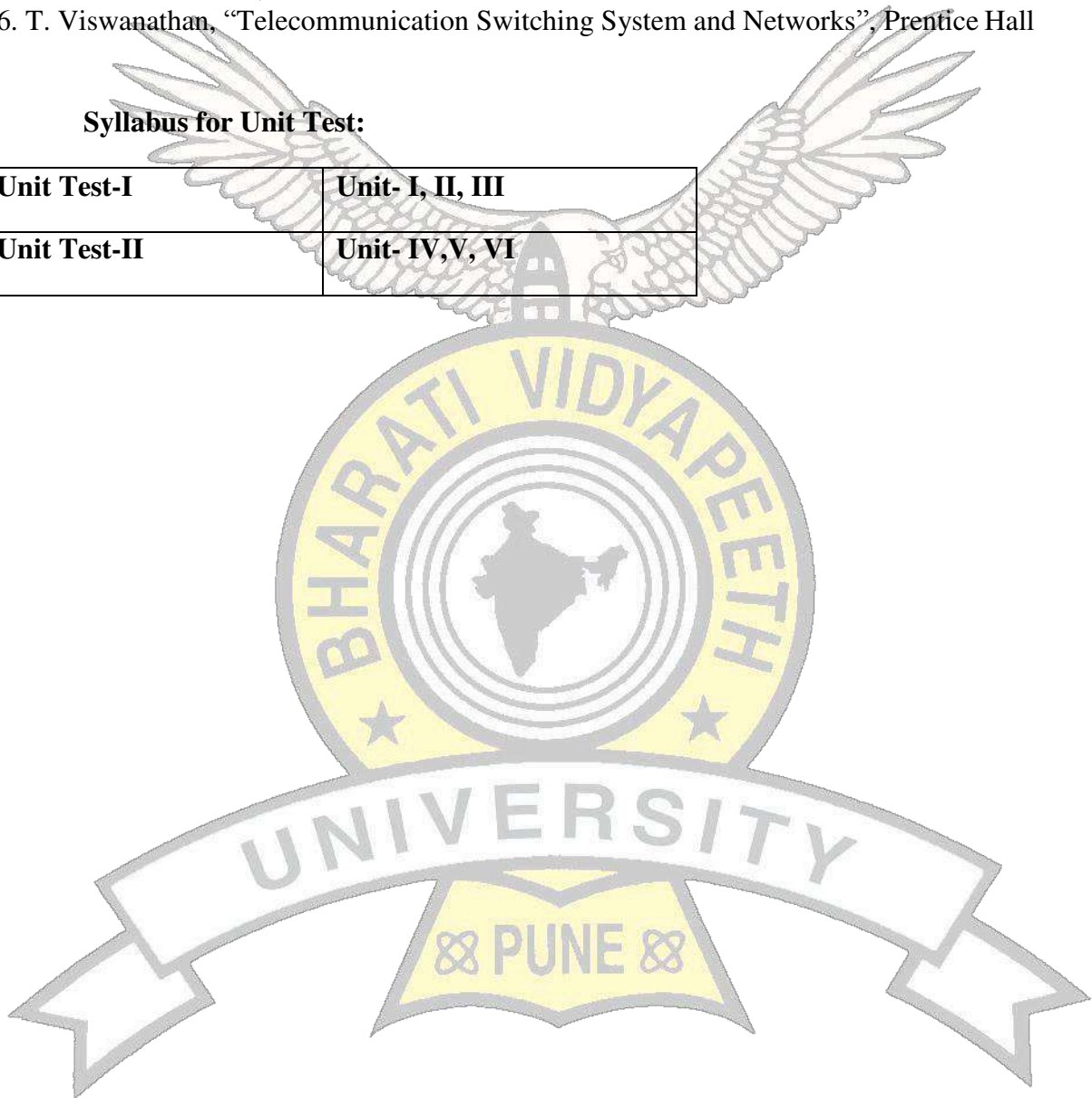
1. Andrew Tanenbaum, "Computer networks", Prentice Hall.
2. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition

References

1. S. Keshav, “An Engineering Approach to Computer Networking” , Pearson Education
2. J.F. Kurose and K. W. Ross, “Computer Networking – A top down approach featuring the Internet”, Pearson Education, 5th Edition
3. D. Comer, “Computer Networks and Internet/TCP-IP”, Prentice Hall
4. William Stallings, “Data and computer communications”, Prentice Hall
5. L. Peterson and B. Davie, “Computer Networks – A Systems Approach” Elsevier Morgan Kaufmann Publisher, 5 th Edition.
6. T. Viswanathan, “Telecommunication Switching System and Networks”, Prentice Hall

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI





Class: B. Tech (Electronics) Sem: -VII

SUBJECT: - Programmable Logic Controllers and Applications

Teaching Scheme

Lecture: 03 Hours/week

Practical: 02 Hours/week

Examination Scheme

End semester Exam: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW &Pr: 50 marks

Credits: 04

Course prerequisites:

Digital Electronics, Embedded systems, Power Electronics

Course objective:

1. To make the student aware of automation in industries.
 2. To introduce the student to the programmable logic controllers.
 3. To give the know-how of NC, CNC machines & their role in manufacturing industries.
 4. To impart the knowledge of protocols & networking of PLCs
-

Course Outcomes: On successful completion of this course, students will be able to

1. Write the ladder logic for applications using logical & mathematical instructions.
2. Write the ladder logic for applications using program & data flow instructions.
3. Interface digital & analog input/output to the PLC
4. Identify NC, CNC machines and networking of PLCs.
5. Identify the components of SCADA and HMI.

Contents

Unit I

Process Control & Automation [06 Hours]

Definition of Process control, PID Controller, Cascade control, Analog control, Digital control, Types of Automation, Advantages and limitations of Automation, controllers & actuators. Introduction to PLC, architecture, working of PLC, functions of PLC, selection of PLC, ladder programming

Unit II

Transmitters and Signal Conditioning [06 Hours]

Need of transmitters, 2-Wire & 3-Wire transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, Necessity of Analog input, output interface to PLC. Analog and Digital signal conditioning for various parameters, Smart and Intelligent transmitters.

Unit III

Input and Output modules [06 Hours]

Various functions of PLC like mathematical, logical, dataflow, special functions. Interfacing of Input and Output devices with PLC. Sourcing & sinking, Classification of input & output modules, discrete & analog modules.

Unit IV

PLC and Human Machine Interface (HMI) [06Hours]

PLC based automated systems. High frequency inputs. PLC programming standard IEC61131, Soft PLC techniques. IT Interfaces required: for ERP, MIS, MES. Supporting Applications interfaces: RFID, Barcode, Vision Systems. HMI: Block Diagram, Types, Advantages, Applications.

Unit V

SCADA & Distributed control system [06Hours]

Elements of SCADA, Features of SCADA, MTU- functions of MTU, RTU- Functions of RTU, Applications of SCADA, Communications in SCADA- types & methods used, Introduction to DCS, Architecture of DCS, Input and output modules, communication module, Specifications of DCS

Unit VI

Automation and CNC (Computer Numeric Control) Machines

[06 Hours]

Introduction of NC and CNC Machines: Need of CNC machines, Applications of CNC machines in manufacturing, Advantages of CNC machines.

Networking of PLCs - Network topology, industrial network, bus network, Device bus network, Process bus network, Modbus protocol Device net, Controlnet, AS-I interface, Foundation field bus, Profibus

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Practicals:

1. Application examples based on timers & counters.
2. Design & implement ON-OFF controller circuit
3. Application examples based on data flow instructions.
4. Application examples based on mathematical instructions.
5. Application examples using One shot rising instruction.
6. Application examples using advanced instructions.
7. Examples based on Industrial applications
8. Interfacing of analog inputs to PLC.

List of Assignments:

1. Conduct survey for different types of PLC programming.
2. Selection of PLC for a application with specifications.
3. Classify the timers & Counters with applications.
4. Design of signal conditioning circuit for any one analog application.
5. Identify sinking & sourcing PLC input output module.
6. Interface switch & sensor to PLC as input.
7. Communication between PLC HMI using Modbus protocol
8. Identify the applications of soft PLC.
9. Study of DCS in any industrial plant.

10. Practical examples where SCADA has played important role.
11. Identify different types of CNC machines (with applications) in industries.
12. Justify the need of networking of PLCs.

Text Books:

1. John W. Webb, Ronold A Reis, “Programmable Logic Controllers, Principles and Applications”; 5th Edition, Prentice Hall of India Pvt. Ltd
2. MadhuchhandaMitra, SamarjitSen Gupta, “Programmable Logic controllers and Industrial Automation”; Penram International Publishing India Pvt. Ltd

Reference Books:

1. Curtis Johnson, “Process Control Instrumentation Technology”; 8th Edition, Pearson Education
2. Kilian, “Modern control technology: components & systems, Delmar 2nd edition.
3. Bela G Liptak, Process software and digital networks, 3rd edition, 2002.
4. Pollack. Herman, W & Robinson., T. “Computer Numerical Control”, Prentice Hall. NJ.
5. Pabla, B.S. & Adithan, M. “CNC Machines”, New Age Publishers, New Delhi
6. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication Reference Books

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI



**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem: -VII
SUBJECT: - Electronic System Design**

Teaching Scheme

Lecture: 03 Hours/week

Practical: 00Hours/week

Examination Scheme

End semester Exam: 60 marks

Unit Test: 20 marks

Attendance: 10 marks

Assignments: 10 marks

Credits: 03

Course Pre-requisites:

Analog Electronics, Digital Electronics, Microprocessors & Microcontrollers, VLSI Design.

Course Objectives:

1. To introduce analog and digital interfacing techniques
 2. To create awareness of EDA tools and techniques for testing and fault diagnosis
 3. To imbibe the importance of international standards for electronic systems and packaging techniques
 4. To enable the students to design electronic systems compliant with EMI specifications
-

Course Outcomes: On successful completion of this course, students will be able to

1. Address interfacing issues in analog and digital circuits.
 2. Use EDA tools and Laboratory Instruments for testing and fault diagnosis.
 3. Identify various international standards, specifications for electronic systems.
 4. Use grounding and shielding techniques for safety in electronic systems and PCB designing.
-

Contents:

Unit I

Hardware Design- Analog

[06 Hours]

Analog Signal Conditioning: Factors affecting choice of Op-Amps in signal conditioning, applications, Need for Instrumentation Amplifiers- Case study. Error budget analysis with Case study. ADCs: Interpretation of ADC specifications from design view point, considerations in selecting references (V_{ref} for ADC). DACs: Interpretation of DAC specifications.

Unit II

Hardware Design- Digital

[06 Hours]

Interface examples for LED, HB LED, LCD, Keyboard, Relays (Electromagnetic and Solid State). Microcontrollers: Comparative study of different Microcontroller architectures, Factors affecting choice of Microcontroller for different applications with case study. Introduction to buses and protocols used in Electronic products- I2C, SPI, CAN, Lin, Flexray.

Unit III

EDA Tools and Standards

[06 Hours]

Different approaches to development of application software for Electronic Product. Debugging tools and techniques for software- Features of EDA, CAD, Simulators, Assemblers, ICE, and IDE. Documentation practices and templates for above software. Introduction to various international standards like IEEE, FCC, IEC, BS & ISO standards.

Unit IV

Testing and Fault Diagnosis

[06 Hours]

Analyses- DC/ Operating Point Analysis, AC (Frequency Response), Transient, Sensitivity, Monte Carlo. Debugging/ Fault finding- Features and limitations of Analog CRO, DSO, Logic Analyzer and Mixed Signal Oscilloscopes in finding hardware/software faults.

Unit V

ESD and Packaging

[06 Hours]

Packaging & Enclosures of Electronic System: Need for Environmental Testing, Effect of environmental factors on electronic systems: Temperature, Humidity, Vibration and Shock tests, nature of environment and safety measures. Packaging's influence and its factors. Cooling in/of Electronic System: Heat transfer, approach to thermal management, mechanisms for cooling, operating range, basic thermal calculations, cooling choices, heat sink selection.

Unit VI

PCB Design and EMC

[06 Hours]

PCB Design practices for Analog and Mixed signal circuits, High speed digital circuits, Precision circuits, Grounding of Electronic Systems: Safety grounds, signal grounds, single-point ground systems, multipoint-point ground systems, hybrid grounds, functional ground layout, practical low frequency grounding, hardware grounds, grounding of cable shields, ground loops, shield grounding at high frequencies.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Assignments:

1. State factors affecting choice of Op-Amps in signal conditioning.
2. State the need for Instrumentation Amplifier with an example.
3. State the need for signal conditioning circuits with an example
4. State selection criteria of Microcontroller for application with case study of one application.
5. Explain in details the I2C protocol for interfacing peripherals
6. Explain in details the SPI protocol for interfacing peripherals
7. Explain following International standards in detail
 - a. IEEE standards.
 - b. FCC standards.
 - c. IEC standards.
 - d. BS standards.
 - e. ISO standards.
8. List the different Layout design & Tools available in market and write the specifications in detail.
9. State need for Environmental Testing. Temperature, Humidity, Vibration and Shock tests etc.
10. State the need of Cooling in an Electronic system.
11. Explain the PCB design practices for Analog and Mixed signal circuits, High speed digital circuits, Precision circuits.
12. State the need for Grounding of Electronic Systems.

Text Books

1. Bernhard E. Bürdek, “History, Theory and Practice of Product Design”, SpringerScience, 2005
2. Paul Horowitz, “Art of Electronics”, Cambridge University Press.

Reference Books

1. Howard Johnson, Martin Graham, “High-speed Digital design- A Handbook of Black Magic”, Prentice Hall Publication.
2. G. Pahl and W. Beitz J. Feldhusen and K.-H. Grote, “Engineering Design – A Systematic Approach”, Springer,2007.
3. Tim Williams, “EMC for Product Designers”, Elsevier, Fourth edition 2007.
4. Jerry C Whitaker, “The Electronics Handbook”, CRC Press, IEEE Press, ISBN 08493-8345-5.
5. David Bailey, “Practical Radio Engineering and Telemetry for Industry”, Elsevier ISBN 07506 58037.
6. Pressman, “Software Engineering - A Practitioner's Approach”.
7. W.Bosshart“Printed Circuit Boards - Design & Technology”, 1st edition, Tata McGraw Hill.
8. G. Pahl and W. Beitz J. Feldhusen and K.-H. Grote, “Engineering Design – A Systematic Approach”, Springer, 2007.
9. John G. Webster, “Measurement, Instrumentation, and Sensors Handbook”, CRC Press, 1999.
10. Peter Wilson, “The Circuit Designer’s Companion”, Elsevier Ltd, 2012

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI



**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem: - VII

SUBJECT: - Advanced Communication System

Teaching Scheme

Lectures: 02 Hours/week

Practical: 00Hours/week

Examination scheme

End Semester Exam:60 Marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

Credits: 02

Course Prerequisite:

Analog Communication, Digital Communication Systems

Course Objectives:

1. To introduce radar & satellite communication system with its working principle and implementation techniques.
2. To enable student to integrate communication technologies in multidisciplinary applications.
3. To make the student aware of advanced communication techniques.

Course Outcomes: On successful completion of this course, students will be able to

1. Compare radio frequency and microwave frequency communication with respect to its working principle and its applications.
2. Describe satellite subsystem and analyze link budget for satellite.
3. Identify the fundamentals of orbital mechanics, the characteristics of common orbits used in satellite communications
4. Explore the concept of cognitive radio communication.
5. Apply different modulation techniques and access techniques for wireless communications.

Contents:

Unit I

[04 Hours]

Introduction to microwave techniques

Introduction to microwave fundamentals, microwave frequencies and microwave devices, microwave transmission lines- reflection coefficient and transmission coefficient, standing waves , wave guides, rectangular wave guides, TE mode wave, power transmission in wave guide, power losses, excitation of modes in wave guide

Unit II [04 Hours] **Satellite communication**

Basic transmission theory, system noise temperature and G/T ratio, orbital mechanics, look angle determination, satellite subsystem.

Unit III [04 Hours] **Satellite link design**

Design of downlink, link budget, design of uplink, modulation techniques, multiplex techniques, earth station, application overview-Radio and satellite navigation, GPS position location.

Unit IV [04 Hours] **Radar**

Radar fundamentals, radar principle, radar range equation, types of radar pulsed radar system, MTI, radar beacons, FMCW radar, Doppler radar, phased array radar, plane array radar.

Unit V [04 Hours] **Cognitive radio**

Cognitive Radio Architecture, Dynamic Access Spectrum, Spectrum Efficiency, Spectrum Efficiency gain in SDR and CR, Spectrum Usage, OFDM as PHY layer , OFDM Modulator, OFDM Demodulator

Unit VI [04 Hours] **Mobile Communication**

Mobile telephone service, Transmission protocols, Introduction to GSM, GPRS, CDMA switching techniques, Quality of service (QOS).

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Assignments:

1. Study of microwave components and equipments
2. Study of measurement of microwave frequency
3. Simulation of microwave building blocks
4. Study of Radar communication
5. Study of Satellite communication
6. Simulation of radar building blocks
7. Simulation of satellite communications building blocks

8. Visit to Mobile Telephone Switching Office (MTSO).
9. Compare GSM, GPRS and CDMA switching techniques.
10. Explain in detail the concept of cognitive radio
11. Analysis of 3G and 4G systems using any appropriate simulation tool.
12. Study of Transmission of Audio signal over satellite link.

Text books:

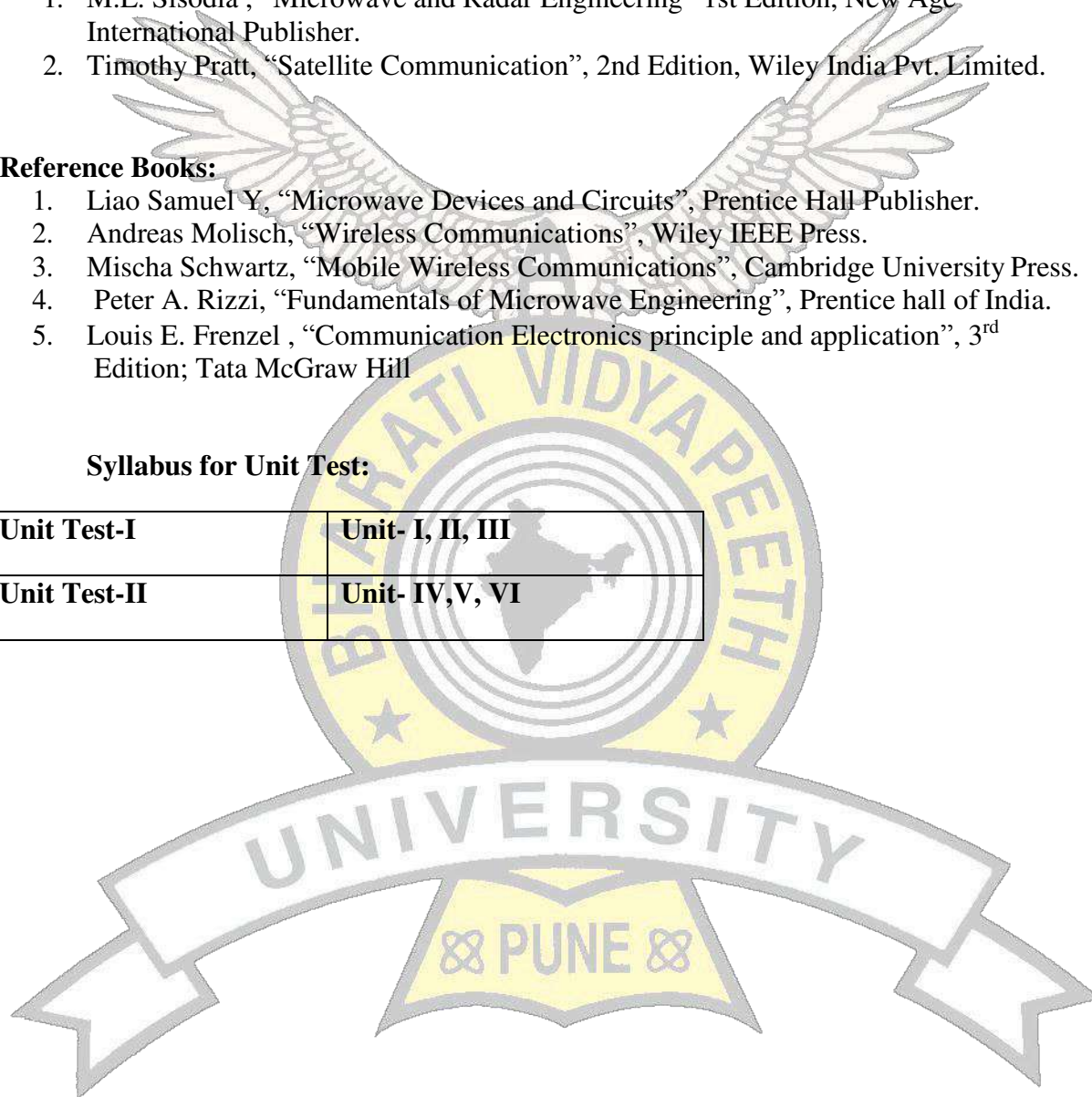
1. M.L. Sisodia , “Microwave and Radar Engineering” 1st Edition, New Age International Publisher.
2. Timothy Pratt, “Satellite Communication”, 2nd Edition, Wiley India Pvt. Limited.

Reference Books:

1. Liao Samuel Y, “Microwave Devices and Circuits”, Prentice Hall Publisher.
2. Andreas Molisch, “Wireless Communications”, Wiley IEEE Press.
3. Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University Press.
4. Peter A. Rizzi, “Fundamentals of Microwave Engineering”, Prentice hall of India.
5. Louis E. Frenzel , “Communication Electronics principle and application”, 3rd Edition; Tata McGraw Hill

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B. Tech (Electronics) Sem:-VII

SUBJECT: - Elective-I Mobile and Broadband Communication

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 01 Hour/week

Examination scheme

End semester Exam: 60 Marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 marks

Credits: 04

Course Prerequisites:

Analog Communication, Digital Communication

Course Objectives:

1. To make students familiar with fundamentals of mobile communication systems
 2. To make students familiar with GSM and CDMA technologies.
 3. To make students familiar with B-ISDN, services of B-ISDN, ATM networks.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Develop mobile communication systems (cellular theory) and the characteristics of different multiple access techniques in mobile communication
2. Analyze the different inter-networking challenges and solutions in wireless mobile Networks and Transport Layers.
3. Develop applications that are mobile-device specific and demonstrate current practice in mobile communication contexts.

Contents:

Unit I

Mobile and Personal Communication

[05 Hours]

Past, Present, and Future, The Cellular Concept, Multiple Access Technologies for Cellular System, Cellular System Operation and Planning: General Principles, Initial Implementations of the Cellular Concept: Analog Cellular Systems

Unit II

Digital Cellular Mobile Systems

[07 Hours]

GSM Standardization and Service Aspects, GSM Reference Architecture and Function Partitioning, GSM Radio Aspects, Security Aspects, GSM Protocol Model, IS-95: The North American CDMA Digital Cellular Standard, Introduction, Service Aspects, Network Reference Model and Security Aspects, 4G Systems: Introduction to OFDM and MC-CDMA

Unit III

Mobile Network & Transport Layer

[06 Hours]

Mobile IP, DHCP (Dynamic Host Control Protocol), Mobile adhoc networks, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast and Selective retransmission and recovery, Transaction oriented TCP, TCP over 2.5/3G wireless networks, Support for Mobility, File systems, Wireless application protocol, i-mode, SyncML, WAP 2.0.

Unit IV

ISDN

[05 Hours]

Switching Techniques, Principles of ISDN, Architecture, ISDN standards, I-series Recommendations, Transmission structure, User network interface, ISDN protocol architecture, ISDN connections, Addressing, Interworking,

Unit V

B-ISDN architecture and standards, B-ISDN Services

[06 Hours]

Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements, B-ISDN protocols, User plane, Control plane, Physical layer, Line coding, Transmission structure, SONET Requirement, Signal Hierarchy, System Hierarchy.

Unit VI

ATM

[07 Hours]

Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols, ATM switching, ATM cell processing in a switch, Matrix type switch, Input, Output buffering, Central buffering, ATM Traffic and congestion Control, Requirements for ATM Traffic and Congestion Control, Cell-Delay Variation, ATM Service Categories.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Tutorials/Experiments:

1. Analyze Cellular Concept & cellular hierarchy.
2. Study of Cellular system operation & planning.
3. Analyze GSM architecture & GSM service aspects.
4. Study of CDMA Digital cellular standards.
5. Study of design principles of Mobile IP, mobile transport layer.
6. Analyze and study of architecture of ISDN standards and addressing.
7. Study of B-ISDN Protocols.
8. Analyze design principles of ATM cells, AAL services, protocols and ATM switching.

List of Assignments:

1. Visit mobile station/telephone switching & prepare visit report.
2. To carryout telephone signal switching system using EPBX trainer.
3. To carry out AT commands mobile communication using GSM trainer.
4. To transfer data between two computers using ISDN terminal adapter modem.
5. To understand CDMA trainer using DSSS technology.
6. Analyze digital & analog cellular systems.
7. To study Mobile IP & Mobile Transport Layer
8. Analyze ISDN protocol architecture, ISDN connections, Addressing, Interworking.
9. To study B-ISDN protocols, User plane, Control plane, Physical layer & Line coding.

10. Analyze handoff management in mobile communication by virtual lab.
11. To study AAL services and protocols and ATM switching.
12. Analyze ATM Traffic and congestion Control.

Text Books:

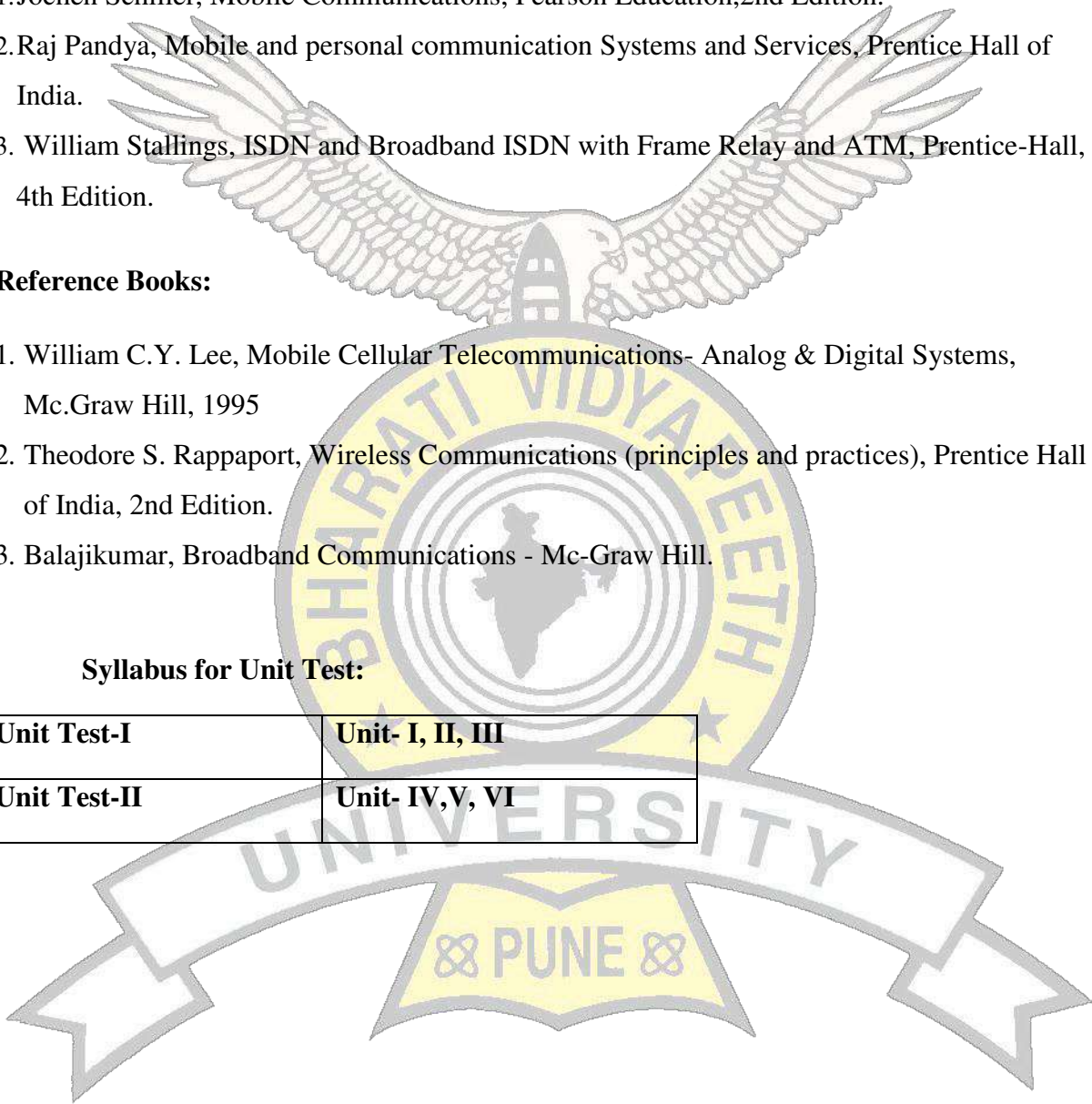
1. Jochen Schiller, Mobile Communications, Pearson Education, 2nd Edition.
2. Raj Pandya, Mobile and personal communication Systems and Services, Prentice Hall of India.
3. William Stallings, ISDN and Broadband ISDN with Frame Relay and ATM, Prentice-Hall, 4th Edition.

Reference Books:

1. William C.Y. Lee, Mobile Cellular Telecommunications- Analog & Digital Systems, Mc.Graw Hill, 1995
2. Theodore S. Rappaport, Wireless Communications (principles and practices), Prentice Hall of India, 2nd Edition.
3. Balajikumar, Broadband Communications - Mc-Graw Hill.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI





**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B.Tech (Electronics) SEM:- VII

SUBJECT:- Elective - I Digital Image Processing

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 01 Hour/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits: 04

Course prerequisites:

Signals and Systems, Digital Signal Processing.

Course objective:

- 1 To introduce the image fundamentals and enhancement techniques.
 - 2 To introduce the image segmentation and representation techniques.
 - 3 To familiarize various morphological operations on image.
 - 4 To introduce the concepts of image registration and image fusion.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate the fundamentals of digital image processing.
2. Design the image enhancement filters.
3. Analyze morphological operations and its effects on image.
4. To perform various morphological operations on image.
5. Determine features of various images by using segmentation method.

Contents:

Unit I

Fundamentals Digital Image Processing

[06 Hours]

Introduction, Fundamental steps in digital image processing and components, Elements of visual perception, Image sensing and acquisition, sampling and quantization, An Introduction to the mathematical tools used in digital image processing, Digital image representation, Relationships between pixels, Color models, Noises in color images.

Unit II

Image Enhancement

[06 Hours]

Spatial domain, Gray level transformations, Intensity transformation functions, Histogram processing, Basics of spatial filtering, Smoothing and sharpening spatial filtering, Frequency domain, Introduction to Fourier Transform, One-Dimensional Fourier Transform and Inverse of Fourier Transform, Smoothing and sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

Unit III

Multi Resolution Analysis and Compressions

[06 Hours]

Multi resolution analysis, Image pyramids, Multi resolution expansion, Wavelet Transforms, Image compression, Fundamentals Models, Elements of Information Theory, Error free Compression, Lossy Compression, Compression Standards.

Unit IV

Morphological Operations in Image Processing

[06 Hours]

Dilation and erosion, Opening and Closing, Hit or Miss transformation, Morphological algorithms, Extensions to grey scale images, Image Watermarking.

Unit V

Image Segmentation and Feature Extraction

[06 Hours]

Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds, First and second order edge detection operators, Hough transform, Types of Hough transform, shape features, Boundary descriptors, Localized feature extraction detecting image curvature.

Unit VI

Applications of Digital Image Processing

[06 Hours]

Image Classification, Image Recognition, Image Understanding, Working principle of Video Motion Analysis (GIF), Introduction to Iris Recognition, Difference between 2D and 3D image Sources of 3D Data sets, Image processing in 3D, Measurements on 3D images..

Content Delivery Methods:

Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments:

1. Study of Reading and Displaying Image in different File Format.
2. Study of Simple Binary and Gray Level Transformation.
3. Study of Histogram and Histogram Equalization of Image
4. Study of Smoothing of Image in Special Domain using Averaging and Median Method.
5. Study of Edge Detection of Image using First and Second Order.
6. Study of Morphological Operations.
7. Study of Segmentation using Thresholding.
8. Study of Image Compression using DCT.
9. Study of Hough transforms.
10. Study of Feature Detection and Feature Identification.
11. Study of Image Sources in 2D and 3D.
12. Study of Iris Recognition.

List of Assignments:

1. Discuss Digital image representation and Color Model.
2. Study of Fundamental steps in digital image processing and components.
3. Study of Spatial domain, Gray level transformations and Intensity transformation functions.
4. Discuss Histogram processing, Fourier Transform, Gaussian filters.
5. Perform various Morphological Operations on image.
6. Study of Dilation and erosion, Opening and Closing, Image Watermarking.
7. Analysis of resolutions of Image and color intensity.
8. Study Wavelet Transforms, Image compression and Compression.
9. Study image Segmentation and Thresholding, Hough transform.
10. Study of Boundary descriptors, Localized feature detection and extraction.
11. Discuss Video Motion Analysis.
12. Study of applications of Digital Image Processing in 2D and 3D.

Text Books:-

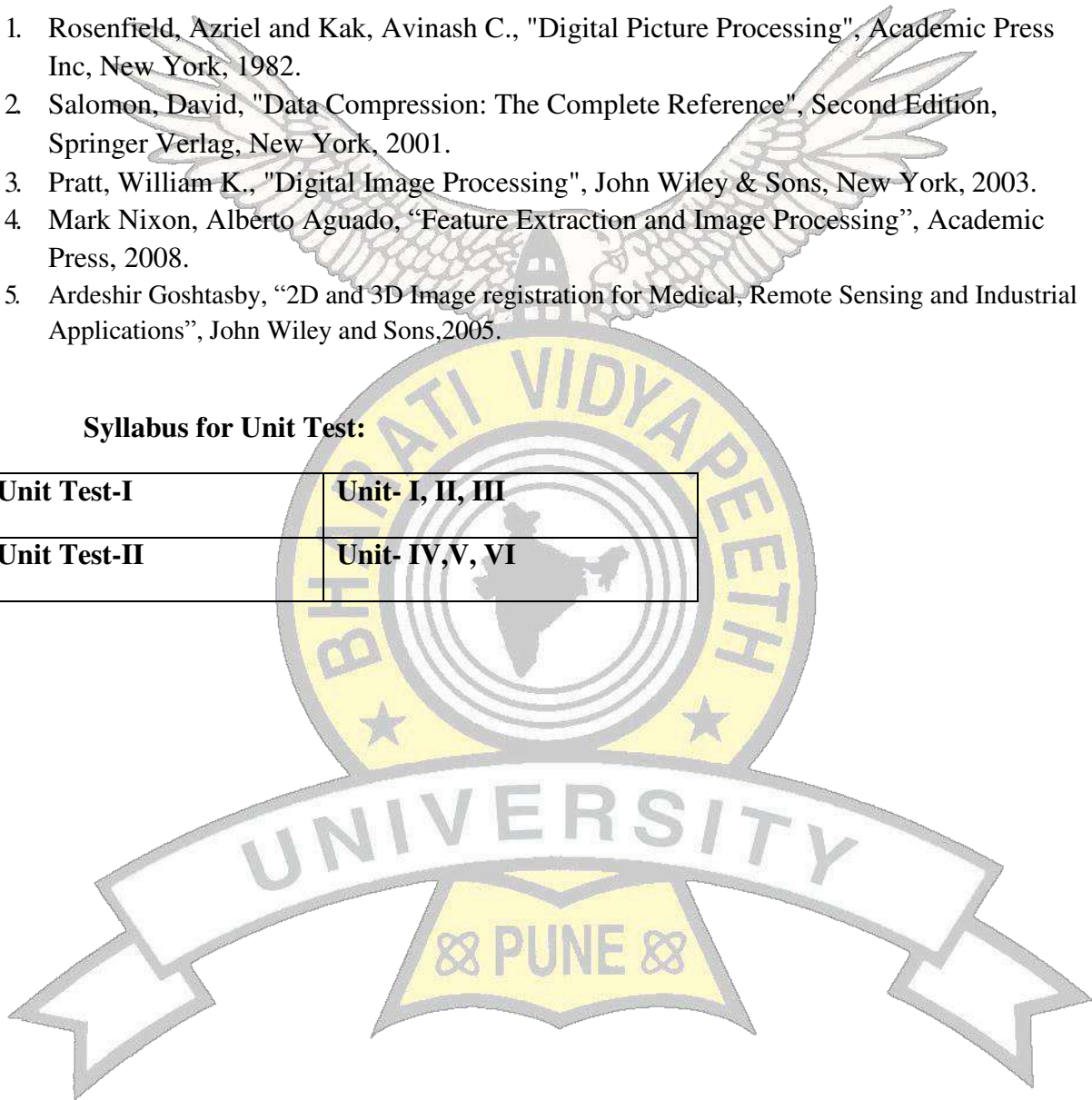
1. Gonzalez, Rafael C. and Woods, Richard E., "Digital Image Processing", Second Edition, Prentice Hall, 2006.
2. Jain, Anil K., "Fundamentals of Digital Image Processing", Prentice Hall of India, New Delhi.

Reference Books:-

1. Rosenfield, Azriel and Kak, Avinash C., "Digital Picture Processing", Academic Press Inc, New York, 1982.
2. Salomon, David, "Data Compression: The Complete Reference", Second Edition, Springer Verlag, New York, 2001.
3. Pratt, William K., "Digital Image Processing", John Wiley & Sons, New York, 2003.
4. Mark Nixon, Alberto Aguado, "Feature Extraction and Image Processing", Academic Press, 2008.
5. Ardeshir Goshtasby, "2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications", John Wiley and Sons, 2005.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI





**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B. Tech (Electronics) Sem :- VII

SUBJECT: - Elective-I Advanced Digital Signal Processing

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1 Hour/week

Examination Scheme

End semester exam: 60 Marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits: 04

Course Prerequisites:

Signals & systems, Digital Signal Processing

Course Objectives:

1. To make student familiar with basic principles of spectral estimation methods.
 2. To introduce the advanced concepts and techniques of digital signal processing.
 3. To create awareness about the practical applications in the field of Digital Signal Processing.
 4. To introduce DSP processor architecture.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Apply parametric and non-parametric techniques for estimating the power spectral density.
 2. Design and implement multistage sampling rate converter.
 3. Design appropriate adaptive filter in communication applications.
 4. Perform multi-resolution analysis using wavelet transform.
 5. To implement the signal processing application using DSP processor.
-

Contents:

**Unit I
DSP Processor Characteristics**

[06 Hours]

Features of DSP Processors, Harvard and modified Harvard Architecture, Multiply-Accumulate operation, Single Cycle Execution, Multiple on chip buses, ALU, MAC, Shifter Processing Units, Address Generation units, Modulo addressing, Bit reversed addressing, Efficient Looping Mechanisms, Examples of DSP Processors, Applications of DSP Processors

Unit II [06 Hours]

Linear Prediction

Random Processes, Stationary Random Process, Ergodic Random Process, AR process, MA process and ARMA process, AR lattice and ARMA lattice Ladder Filters, Forward and backward linear prediction, Solution of Normal Equations, Levinson-Durbin Algorithm, Properties of Linear Prediction Error Filters.

Unit III [06 Hours]

Power Spectrum Estimation

Estimate definition, Nonparametric methods-Periodogram, modified periodogram, Bartlett's method, Blackman-Tukey Method, Performance Comparisons of nonparametric methods, Parametric methods, Methods for estimating parameters of AR, MA and ARMA models

Unit IV [06 Hours]

Multirate DSP fundamentals

Need for Multi-rate DSP, Decimation by factor D , Interpolation by factor I , Sampling rate conversion by rational factor I/D , software implementation of sampling rate converters (Decimators and Interpolators), sample rate conversion using poly-phase filter structures

Unit V [06 Hours]

Adaptive filters

FIR adaptive filters – the MMSE criterion and LMS and RLS algorithms, Adaptive Lattice-Ladder Filters - Recursive Least Squares Lattice Ladder Algorithms, Applications of Adaptive Filters

Unit-VI [06 Hours]

Time Frequency Representation of signals

Time Frequency description of signals, Concept of Instantaneous frequency and Complex signal, Uncertainty principle, need for joint time frequency representation, tiling diagrams. Short Time Fourier Transform, Wigner Ville distribution, Continuous Wavelet Transform, Discretization of STFT & CWT, Spectrogram.

Content Delivery Methods:Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments:

1. Study of various addressing modes of DSP.
2. Describe the power spectrum estimation using Blackman and Tukey method.
3. Describe the role of Adaptive filters in Communication.
4. A brief survey of DSP applications in speech processing.
5. Implementation of Multi-rate application in digital audio processing.
6. Implementation of sub band coding for speech signal.
7. Discuss in detail various applications of wavelet transforms.
8. Explain the process of digital FM stereo signal generation.
9. Demonstration of Hardware and Software utilities for DSP starter kits.

List of Assignments:

1. Present a comparative study of DSP processors based on their features and applications.
2. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods.
3. Estimation of PSD of two sinusoids plus noise using Welch method
4. Find linear prediction coefficients and reflection coefficients using Levinson Durbin Algorithm .
5. Implement program to convert CD data into DVD data
6. Implement LMS algorithm using MATLAB.
7. Record a speech file in your own voice. Find pitch period for a voiced part of the segment.
8. Perform continuous and discrete wavelet analysis of a signal.
9. Implementation of Linear / Circular convolution on DSP processor.
10. Implementation of FIR filter using DSP processor
11. Design an Adaptive filter using LMS algorithm.
12. Mini-project based on the Matlab/Scilab.

Text books:

1. John G. Proakis, Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson education, Fourth Edition, 2007.
2. B. Venkataramani, M. Bhaskar, "Digital Signal Processors", TMH

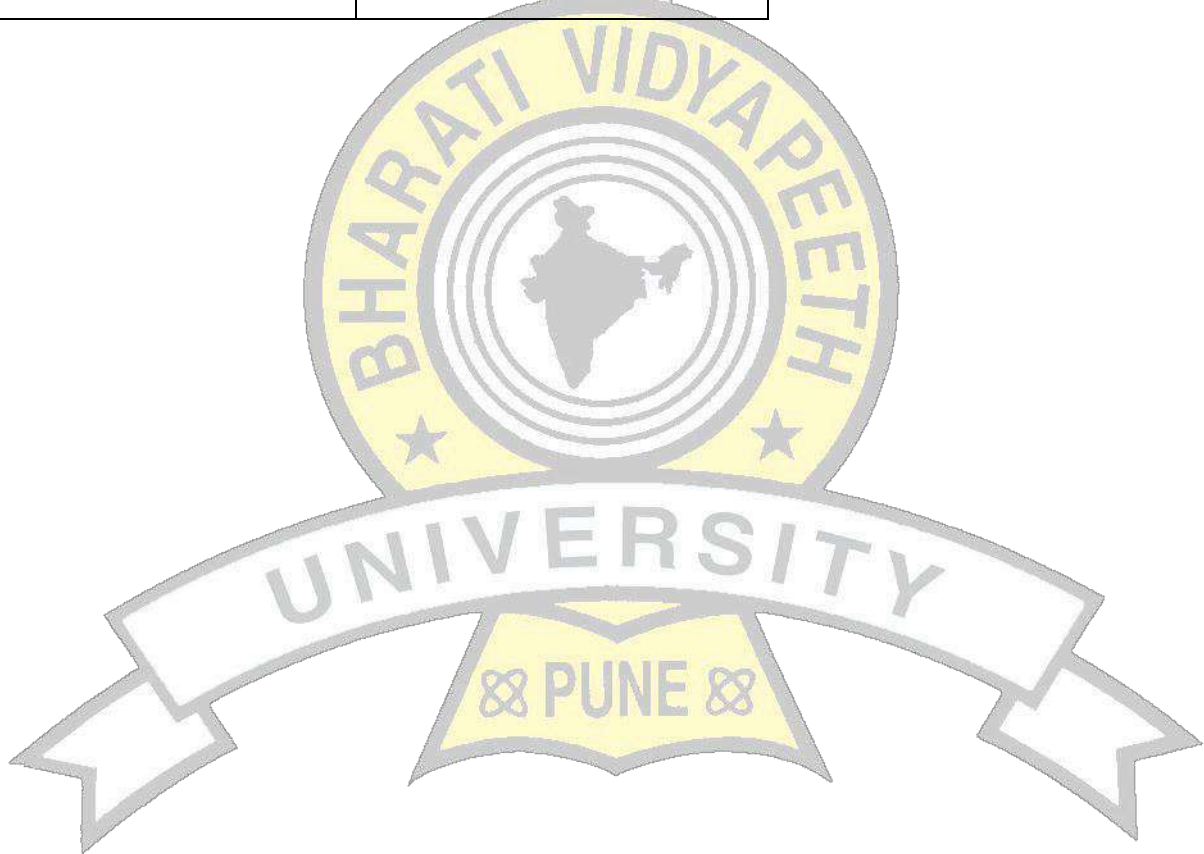
Reference Books:

1. E. C. Ifeachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2nd Edition, Pearson education. 2007.
2. Widrow, B. and Stearns, S.D., "Adaptive Signal Processing", Pearson Education. 1985

3. Manolakis, D.G., Ingle, V.K. and Kogon, M.S., “Statistical and Adaptive Signal Processing”, Artech House. 2005.
4. Diniz, P.S.R., “Adaptive Filtering: Algorithms and Practical Implementation”, Kluwer. 1997
5. S. D. Apte, “Advanced Digital Signal Processing,” Wiley Publications, 2014.
6. Leon Cohen, “Time-Frequency Analysis”, Prentice Hall,1995.
7. K.P Soman, K.I Ramchandran, N.G.Reshmi, “Insight into Wavelets- from theory to Practice,” PHI Learning Private Limited, Third Edition, 2010.
8. Rao R M and A S Bopardikar, “Wavelet Transforms Introduction to theory and Applications”, Pearson Education, Asia, 2000.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI





**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- VII

SUBJECT: - Elective-II Advanced Computer Programming

Teaching scheme

Lecture: 03 Hours/week

Tutorial: 01 Hour/week

Examination scheme

End Semester Exam: 60 marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

TW & Oral: 50 marks

Credits: 04

Course prerequisites:

Fundamentals of computing

Course objective:

1. To introduce object oriented programming concepts.
 2. To develop programming ability by learning advanced coding techniques.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate basic knowledge of object oriented programming concepts.
 2. Write simple programs in Java.
 3. Apply Java for HTML and Applet applications.
 4. Use SQL for database manipulation
-

Contents

Unit I

[06 Hours]

Object Oriented Programming:

Programming fundamentals, Basic Concepts, Different Programming Paradigms, Evolution of Different Programming Languages and their Characteristics, Object-Oriented Paradigm, Objects and Classes, Data Abstraction and Encapsulation,

Inheritance, Polymorphism, DynamicBinding, Message Communication, Benefits of OOP, Applications of OOP, Java Language as an OOP Language.

Unit II [06 Hours]

Introduction to Java:

Introduction to Java, Different Characteristics of Java, C++ and Java:Feature Comparisons, Improvements, Detailed Overview, Constants,Variables and Data Types, Operators and Expressions, Decision Making and Branching and Decision Making and Looping, Classes Objects and Methods, Arrays, Strings and Vectors, Interfaces.

Unit III [06 Hours]

Threads:

Packages in Java, Multithreaded Programming concepts and applications, Managing Errors and Exceptions, Managing Input/Output Files in JAVA.

Unit IV [06 Hours]

HTML and Java Applets:

History, W3C Standards, Standard HTML Tags for Image and TextFormatting, Tables, Lists, Frames. Introduction to dynamic HTML. JavaApplets: History, Introduction, HTML and Java Applet. Basic Applet programming, Applets on Web. Applet applications for Web.

Unit V [06 Hours]

SQL and Java:

Introduction to databases, Data Models, Concepts, Schema, RelationalQuery. Detailed Overview of SQL Language, Basic SELECT Query, WHERE Clause, ORDER BY Clause, Merging Data from MultipleTables: INNER JOIN, INSERT Statement, UPDATE Statement, DELETESStatement, and Installation of MySQL or PL SQL. Setting MySQL / PL SQLUser Account.

Unit VI [06 Hours]

Database Connectivity:

Introduction to JDBC, JDBC Architecture, Types of JDBC drivers, ResultSet, Metadata, Stored Procedure, Callable Procedure, Connection Procedure.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Tutorials/Experiments:

1. Write a Java program to implement Class and Inheritance Concept.
2. Write a Java program to differentiate between method overloading and method overriding.
3. Write a Java program to understand the use of String class and string buffer class
4. Write a Java program to implement the concept of Package.
5. Write a Java program to implement concept of Exception Handling.
6. Write a program to implement Frame and different graphics objects.
7. Write a program to implement Java Applet.
8. Write a SQL Program for implementation of DDL, DML, and DCL.

List of Assignments:

1. Write a C++ or Java Program to demonstrate the use of OOP features.
2. Write a Java Program to display pattern (Triangle, Pyramid) using different loops.
3. Implementation of different string functions by using switch case.
4. Write a Java Program implement multiple inheritances by using Interface.
5. Write a Java Program to perform different file operations.
6. Write a program to implement multithreading.
7. Design a College website containing detailed information using HTML Tags.
8. Write a program to implement a Java Applet.
9. Write a Java program to demonstrate JDBC connectivity.
10. Comparison of different database
11. Justify the role of SQL for database manipulation
12. A mini project on Java and SQL.

Text Books:

1. Programming with Java: A Primer, 3E by E Balagurusamy, Tata McGraw Hill Publishing Company.
2. Database System Concepts, Sixth Edition by Henry Korth, McGraw Hill Publishing Company
3. Java Complete Reference, Herbert Schildt, McGraw Hill Publishing Company

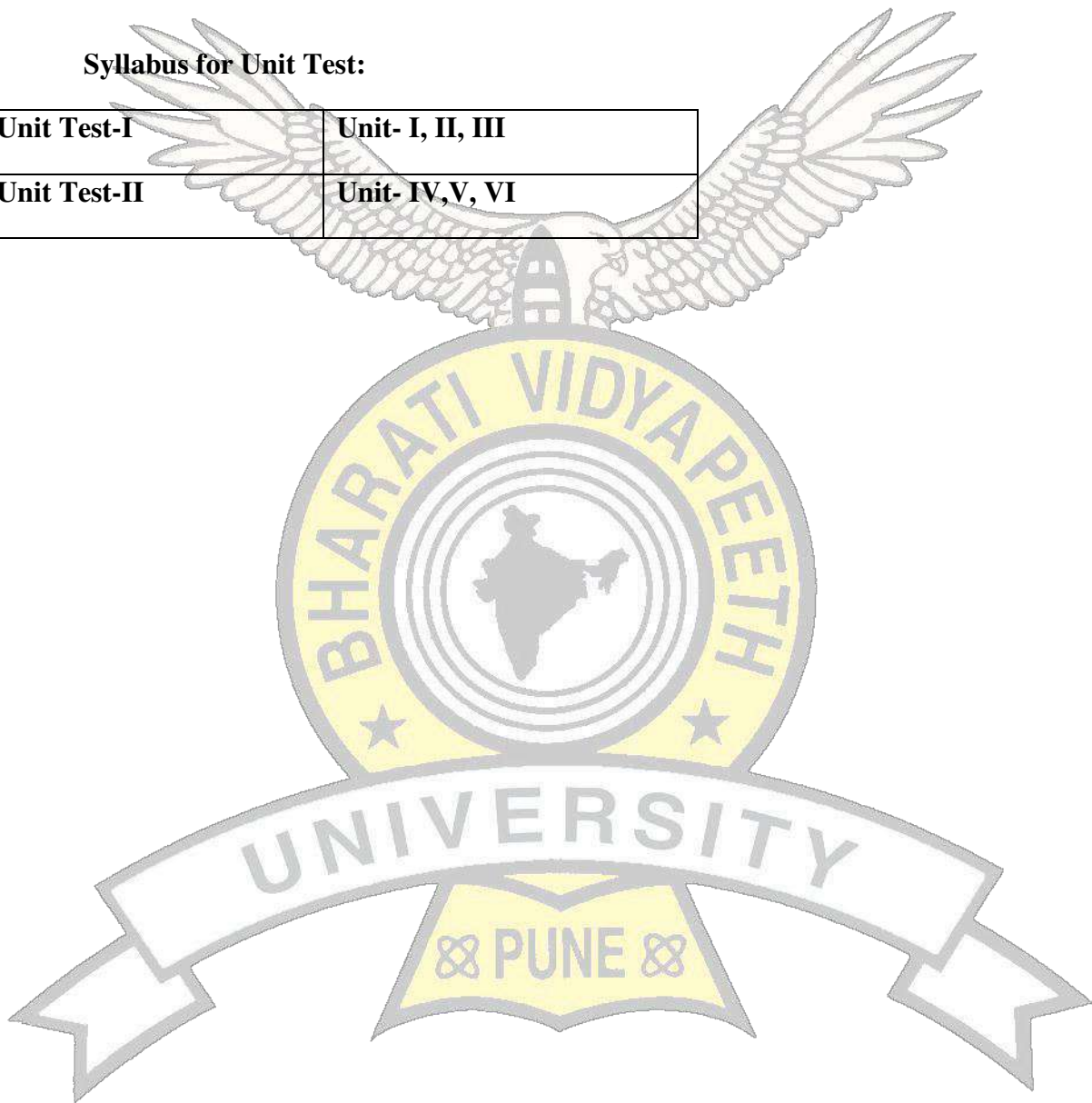
4. Java: How to Program by Deitel and Deitel

Reference Books:

1. Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI”, BPB Publication.
2. Korth, “Database System Concepts”, MGH Publication.
3. Ivan Bayross, “Programming with SQL”, Sybase Publication.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B.Tech (Electronics) Sem:- VII

SUBJECT: - Project stage - I

Teaching scheme

Practical: 04 Hours/week

Examination scheme

TW & Oral: 50 marks

Total Credits: 04

Course objective:

1. To familiarize the students with the product development cycle
 2. To impart the importance of working as a team.
 3. To introduce the student to literature survey and documentation process.
 4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Identify the problem for practical Engineering application
2. Formulate and design appropriate solution
3. Write specifications and identify constraints
4. Work as an effective team member
5. Effectively plan the financial budget for the project.

Project Stage –I includes various steps such as:

1. Problem Identification
2. Information gathering
3. Feasibility study
4. Synopsis
5. System analysis
6. Requirement analysis



**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B. Tech (Electronics) Sem:-VII

SUBJECT: - In-plant Training

Teaching scheme

-

Examination scheme

TW & OR: 50 marks

Credits: 04

Course Objectives:

1. To familiarize the students to industrial work processes.
2. To work as an effective team member.
3. To develop the communication and presentation skills.
4. To introduce the student to work ethics in industry.

Course Outcomes: On successful completion of this course, students will be able to

1. Work effectively in an industrial environment.
2. Effectively communicate and present himself/herself.
3. Identify the various sections in the industry.
4. Work in a team.

In-plant Training:

Every student has to undergo training on site or in office of some company in June & July for one and half month to get the exposure and practical experience. He has to submit the detailed report of training, on the basis of which the term work and oral marks should be awarded.

Note: - Student should complete in-plant industrial training after semester-VI for a period of six weeks. Evaluation will be done in semester-VII.



Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B.Tech (Electronics) Sem:- VIII

SUBJECT: - Optical Fiber Communication

Teaching Scheme

Lecture: 03 Hours/week

Practical: 02 Hours/week

Examination Scheme

End Semester Exam: 60 marks

Unit Test: 20 marks

Attendance: 10 marks

Assignments: 10 marks

TW & PR: 50 marks

Total credits: 04

Course prerequisites:

Analog Electronics, Analog Communication

Course objective:

1. To lay down the foundation for optical communication engineering.
 2. To introduce the working of optical transmitter and receiver.
 3. To familiarize the students to optical devices and concepts of various modulation techniques.
 4. To introduce the students to Optical Fiber measurement techniques.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate the advantages and applications of optical fiber communication.
2. Identify different optical Sources/detectors with their operating principle.
3. Choose the multiplexing technique and optical amplifier for optical communication.
4. Select the connectors /couplers in Optical fiber link and explain measurement technique for the optical fiber losses.

Contents:

Unit I

[06 Hours]

Introduction:

Advantages of optical fiber communication over other communication systems, Ray theory transmission, Electromagnetic mode theory for optical propagation, types of fibers, transmission characteristics of optical fibers-attenuation, scattering losses, fiber bend loss, dispersion, polarization, preparation of optical fibers.

Unit II

[06 Hours]

Optical transmitter

Optical sources: Basic Concepts, Light Emitting Diodes, Semiconductor Laser, Laser Diodes, Line Coding, Laser Characteristics, Different modulation schemes.

Optical transmitters: LED drive circuits for digital and analog transmission.

Unit III

[06 Hours]

Optical Receivers and Optical links:

Optical receiver: Detector responsivity, Rise time and Bandwidth, P-N Photo Diode, P-I-N Photo Diode, Avalanche Photo Diode, Receiver Noise, Receiver Sensitivity.

Point to point Links: System design considerations, Link Power budget, Rise Time budget, Multichannel transmission techniques.

Unit IV

[06 Hours]

WDM concept and Optical Amplifier:

WDM Concept, WDM Light wave Systems, WDM Components, System Performance Issues, Time Division Multiplexing, Sub Carrier Multiplexing, Code Division Multiplexing. Types of Optical Amplifier and its applications, Amplifier Noise, Optical SNR, Raman Amplifier.

Unit V

[06 Hours]

Optical Components and Optical Networks:

Power launching & Coupling: Fiber optic splices, connectors & couplers & Coupling losses. Optical couplers, Isolators and Circulators. Network Concepts, network Topology, SONET/SDH.

Unit VI

[06 Hours]

Optical Fiber measurements and application.

Fiber attenuation measurements, Fiber dispersion measurements, fiber numerical aperture measurement, reflectance and return loss measurements. OTDR. Application in military, industrial applications and applications in local area network.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of practicals:

1. Optical Source Characteristics: Aim: To plot the electrical and optical characteristics of different light sources.
2. Numerical Aperture of fiber: Aim: To estimate the numerical aperture of given fiber.
3. To measure the attenuation of given MMSI and SMSI fibers.
4. To measure the attenuation variation in length of optical cable.
5. To measure the attenuation due to bending of optical fiber.
4. Optical Detector Characteristics: Aim: To plot the frequency response of detectors with different values of load resistor.
5. Fiber Bandwidth/Data rate: Aim: To estimate the bandwidth of given fiber.
6. Transmission of analog signal using a simple fiber optic link.
7. Transmission of Digital signal using a simple fiber optic link.
8. To perform Frequency modulation using optical fiber.
9. To perform PWM using optical fiber
10. To find the optical power using "Optical Power Meter".
11. To find the optical response using "OTDR".
12. Determination of input, output and transfer characteristics of Optocoupler.

List of Assignments:

1. Explain different types of optical fibers.
2. Study of Electromagnetic mode theory of optical propagation.
3. Classify the types of optical connectors and couplers.
4. Study of the fiber optic analog and digital lab using Virtual Lab.
5. Study of the fiber optic bidirectional communication using Virtual Lab
6. Study of bending losses in optical fiber using virtual lab.
7. Study of LED and Detector characteristics using Virtual Lab
8. Study of attenuation loss in optical fiber using Virtual Lab
9. Numerical based on acceptance angle, N.A. and Number of guided modes.
10. To find power efficiency, optical power in LEDs.
11. Calculation of optical power budget.
12. Measurement of attenuation in optical fiber.

Text Books

1. Gerd Keiser, "Optical Fiber Communications", Tata McGraw Hill, Fourth Edition.
2. John M. Senior, Optical Fiber Communications-Principles and Practice, Prentice Hall of India, second Editio

References

1. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", Tata Mc Graw-Hill International Edition, 1998.
2. Djafar K.Mynbaev and Lowell L.Scheiner "Fiber optic communication Technology" Pearson education, 2001.
3. Eric Udd, Fiber Optic Sensors, John Wiley, New York, 1991.
4. J.H. Franz and V. K. Jain, "Optical Communication - Components and systems", Narosa Publishing house, 2000.
5. Bhattacharya "Semiconductor Opto Electronic Devices", PHI Learning, New Delhi, 1995

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI



Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B. Tech (Electronics) Sem: - VIII

SUBJECT: - Biomedical Engineering

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End Semester Exam: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & OR: 50 marks

Credits: 04

Course prerequisites:

Analog Electronics, Instrumentation and control system.

Course objectives:

1. To introduce various biopotentials, their measurements, and interpretations associated with human body.
 2. To familiarize the student with medical equipments.
 3. To expose the students to clinical laboratory equipments.
 4. To imbibe the importance of patient's safety.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Classify systems in a human body and Identify bio-potentials
2. To acquire and analyze ECG, EMG, EEG signals.
3. Correlate the parameters like B.P., ECG and PCG with the functioning of heart.
4. Categorize life saving equipments such as cardiac and respiratory equipments according to their applications.
5. Identify the equipments present in ICU/NICU and clinical laboratory.

6. Recognize physiotherapy equipments used for pain relief and describe various electrodes and techniques used for surgery.

Contents:

Unit I **[06 Hours]**

Human body & Origin of Bio-potentials

Human body: cell structure, overview of different systems in the body: cardiovascular system, respiratory system, nervous system, musculoskeletal system, gastrointestinal system, endocrine system and lymphatic system, Origin of Bio-potentials: action potential and muscle contraction, bio-potentials such as ECG, EEG, EMG.

Unit II **[06 Hours]**

Electrocardiograph, Phonocardiograph and Blood pressure measurements

Electrocardiography: ECG lead system, typical set up for ECG, electrodes used for ECG, Phonocardiograph: heart sounds and heart murmurs, microphones used in Phonocardiograph (PCG), recording set up of PCG, Blood pressure measurement techniques: direct and indirect methods, relationship between ECG, PCG and Blood pressure as a function of time.

Unit III **[06 Hours]**

Cardiac and Respiratory Equipments

Types of defibrillator, defibrillator electrodes, types of pacemaker, pacemaker leads and batteries, ventilator and Modes of ventilator.

Unit IV **[06 Hours]**

ICU and NICU-Architecture and monitoring systems

Architecture of ICU and NICU, patient monitoring system, central monitoring system, ambulatory monitoring system, Baby incubator and Phototherapy unit

Unit V **[06 Hours]**

Clinical Laboratory Instruments

Colorimeter, spectrophotometer, flame-photometer, blood cell counter, auto analyzer and pH/blood gas monitoring.

Unit VI

[06 Hours]

Physiotherapy & surgical diathermy instruments and Patient Safety

Short wave diathermy machine, microwave diathermy machine, surgical diathermy unit, types of electrodes used for electro-surgery, Patient safety: grounding, shielding and effect of electrical current on human body.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Experiments:

1. Study of Blood Pressure measuring techniques (Analog & Digital).
2. Study of ECG waveform & Heart Rate measurement using ECG system.
3. Study of Phonocardiograph.
4. Detection of Apnea and Tachypnea using respiration rate monitor and Respiration Simulator.
5. Study of DC Defibrillator.
6. Study of External Pacemaker.
7. Study of Spectrophotometer.
8. Study of Surgical Diathermy Unit.

List of Assignments:

1. State in your own words; Human body systems and their functions.
2. Choose any two Bio-potentials and state the vital role with the help of diagrammatic representation.
3. Differentiate between heart sounds and heart murmurs. Where and why they originate?
4. Association between ECG and B. P as a function of time.
5. Elaborate concepts of cardiac equipments.
6. Importance of Ventilator as a life supporting instrument.

7. Sketch ICU and NICU Architecture. Categorize and locate ICU and NICU equipments and their significance.
8. Describe central monitoring system for 8 bedded ICU.
9. Categorize blood tests and give importance of various clinical laboratory equipments.
10. By applying acquired knowledge select appropriate physiotherapy equipment for pain relief and explain.
11. Identify the equipment used for surgery in O.T. and describe.
12. Visit to the hospital/industry to understand the concepts of biomedical instruments.

Text Books

1. R. S. Khandpur, "Hand book of Biomedical Instrumentation", Tata McGraw Hill Publishing Company limited, New Delhi.
2. Leslie Cromwell, Fred J. Weibel, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", Second Edition, PHI.

Reference Books:

1. Joseph J. Carr & John M. Brown, "Introduction to Biomedical Equipment Technology", Forth Edition, PHI.
2. John G. Webster, "Medical Instrumentation- Application and Design", Third Edition, John Wiely and Sons Inc., New York.
3. Richard Aston, "Principles of Biomedical Instrumentation and Measurement", Merrill Macmillan Publishing Company, New York.
4. Dr. M. Arumugam, "Biomedical Instrumentation", Anuradha Agencies.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI



Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B. Tech (Electronics) Sem:-VIII

Subject: - Wireless Networks

Teaching Scheme

Lecture: 03Hours/week

Tutorial: 01 Hour/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

Credits: 04

Course Prerequisites:

Digital Communication

Course Objectives:

1. To familiarize the students with fundamentals of wireless communication systems
 2. To introduce the concepts and techniques associated with Wireless Cellular Communication systems.
 3. To familiarize with state of art standards used in wireless cellular systems.
 4. To introduce new technologies in wireless systems
-

Course Outcomes: On successful completion of this course, students will be able to

1. Identify the types of wireless communication systems.
2. Analyze the radio channel characteristics.
3. Analyze improved data services in cellular communication.
4. Work with GSM/CDMA/UWB technologies.

Contents:

Unit I

Introduction

[06 Hours]

Wireless network generations, evolution of next-generation networks, Systems and Design Fundamentals, Propagation Models Description of cellular system, Frequency Reuse, Co channel and Adjacent channel interference, Propagation Models for Wireless Networks, Multipath Effects in Mobile Communication, Models for Multipath Reception.

Unit II

Cellular Communications

[06 Hours]

Introduction to Cellular Communications, cellular terminology, cell structure and cluster, Frequency reuse, Multiple Access Technologies, Cellular Processes-Call Setup, Handover etc, Teletraffic Theory, Capacity Building, Blocking Probability

Unit III

GSM

[06 Hours]

GSM: Architecture and Protocols - Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multiframe, Control (Signaling) Channel Multiframe, Frames, Multi- frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber.

Unit IV

CDMA

[06 Hours]

Introduction to CDMA, Spread spectrum, CDMA call processing, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization, power control in CDMA.

Unit V

3G and 4G Wireless Standards/UWB

[06 Hours]

GPRS, EDGE technology, IMT-2000 standards, UMTS technology, WCDMA, LTE, 4G Technologies, Multicarrier Modulation, OFDM-MIMO Systems, WiMAX, UWB Definition and Features, UWB Wireless Channels, Bit-Error Rate Performance of UWB.

Unit VI

Emerging Wireless Network Technologies

[06 Hours]

WLAN technology, HIPERLAN, WPAN, WMAN, Mobile Ad-hoc network(MANET), Mobile IP and mobility management, Mobile TCP, Wireless sensor networks, RFID technology, WATM, Wireless application protocol, Home RF.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments:

1. Comparison of different wireless network generations.
2. Study of design principles of propagation models of cellular system.
3. Analyze the concept of frequency reuse, interference and multipath effects.
4. Study of design principles of cellular structure.
5. Study of multiple access technologies.
6. Analyze different methods of capacity expansion in cellular system.
7. Study of GSM architecture, channels and call setup procedure.
8. Study of CDMA calls processing.
9. Study of LTE & 4G network design issues.
10. Study of HIPERLAN standards & MANET.
11. Study of wireless sensor networks and WATM.
12. Study of WAP standards & Home RF.

List of Assignments:

1. Visit mobile station/telephone switching & prepare visit report.
2. To carry out AT commands mobile communication using GSM trainer.
3. To understand CDMA trainer using DSSS technology.
4. Analyze Radio Propagation and Propagation Path Loss Models on Scilab.
5. Analyze principles of cellular communication on Scilab (Refer Wireless Communications by T. L. Singal).
6. Analyze capacity of CDMA, calculate processing gain, number of users per cell, bandwidth efficiency, open loop power control in CDMA on Scilab. (Refer Scilab

Textbook Companion for Wireless Communications and Networking by V. Garg)

7. Prepare Ad-hoc network at your premises using mobile terminals/ laptops etc and analyze parameters like capacity, flexibility, complexity etc.
8. Comparison of HIPERLAN, WATM .
9. Understand about Wi-Fi network and its' different standards, protocols and requirements for connecting a Wi-Fi network on Virtual LAB. (Refer VLAB IIT Kharagpur, Advanced network Technologies Lab)
10. Simulating WiMAX network on Virtual LAB.(Refer VLAB IIT Kharagpur, Advanced network Technologies Lab)
11. Study the basics of Mobile and Adhoc network, various standards and different routing protocols including proactive and reactive on virtual lab.
12. Analyze Wireless Sensor Network Data Acquisition, Transmission, and Aggregation on virtual lab.

Text Books:

1. T L Singal, Wireless Communications, McGraw Hill Education India, 2014.
2. Kaveh Pahlavan, Prashant Krishnamurthy, Principles of Wireless Networks, Pearson Education Publication.

Reference Books:

1. William C.Y. Lee, Mobile Cellular Telecommunications- Analog & Digital Systems, Mc.Graw Hill, 1995
2. Wireless Communications (principles and practices) -(2nd Edition)-Theodore S. Rappaport (Prentice Hall of India).
3. Vijay Garg, Wireless Communication & Networking, Morgan Kaufmann Series

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI



Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B. Tech (Electronics) Sem:-VIII

SUBJECT: - Elective II Agricultural Electronics

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1Hours/Week

Examination Scheme

End Semester Exam: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 marks

Credits: 04

Course Prerequisites:

Basic Electronics, Instrumentation & control systems.

Course Objectives:

1. To inculcate the ability to recognize environmental problems and to provide solutions to agricultural sector.
 2. To give overview of technology of advanced topics like DAS, SCADA and Virtual Instrumentation.
 3. To enable students to select practices needed to develop and implement the Engineering Automation for Agricultural sector.
 4. To introduce Greenhouse Technology & Role of Electronics Governance.
-

Course Outcomes: After successfully completing the course students will be able to

1. Describe the role of computers & virtual instrumentation.
2. Provide communication solution for interpreting environmental parameters with Electronics systems.
3. Describe Instrument technology used in agriculture & apply knowledge of Electronics in Agriculture.

4. Describe Greenhouse Technology & Role of Electronics Governance

Contents

Unit I

Review of computers & Virtual instrumentation [06Hours]

Data loggers, Data acquisitions systems (DAS), Supervisory control and data acquisition (SCADA), Basics of PLC, Functional block diagram of computer control system, alarms, interrupts. Virtual Instrumentation: Historical Perspective, advantages, Block diagram and architecture of virtual instrument, data flow techniques, graphical programming in data flow, comparison with conventional programming.

Unit II

Communication Systems [06Hours]

Use of field buses, functions, international standards, field bus advantages and disadvantages, Instrumentation network: sensor networks, Open networks-advantages and limitations, HART Network, Foundation field bus network. Profibus PA: Basics, architecture, model, network design. Foundation field bus segments: General consideration, network design

Unit III

Instrument technology for agriculture [06Hours]

Instrument for measurement of pH, Electrical conductivity, gas analysis, humidity, leaf area, chlorophyll content, and soil moisture & temperature.

Unit IV

Precision Farming [06Hours]

An introduction to precision farming. GIS/GPS positioning system for precision farming, Yield monitoring and mapping, soil sampling and analysis. Computers and Geographic information systems. Precision farming- Issues and conditions. Role of electronics in farm machinery for precision farming.

Unit V

Electronics in Agriculture [06Hours]

Instrument for crop monitoring – moisture measurement – capacitive, infrared reflectance and resistance. Monitoring soil and weather – measurement of soil properties and meteorological parameters – irrigation control systems. Instruments for crop establishment monitoring. Crop spraying – selective crop spraying – flow control. Yield monitoring. Technology for precision farming. Instruments for protected cultivation – green house environment control – transducers and control system. Instruments and systems for crop handling processing and storage.

Unit VI

Applications & Electronics Governance

[06Hours]

Greenhouse: History of modeling and control of Greenhouse, Identification of control and manipulation variables for Greenhouse. Crop Preservation : Importance of Preservation of various commodities and parts of plants, Drying process for preservation, Variable identification for drying process, Electronic control system for grape drying process. Agriculture & Electronics Governance: Governance products & services in agriculture sector, Role of Electronics Governance in Agricultural sector.

Content Delivery Methods: Chalk & talk, Power point presentation NPTEL videos.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments

1. Case study of PLC for irrigation system.
2. Case study of Latest irrigation system.
3. Study of Profibus protocol for networking.
4. Role of GIS/GPS positioning system for precision farming.
5. Study of Computers and Geographic information systems for precision farming.
6. Concept of crop preservation.

List of Assignments:

1. Study of Data Acquisition Systems (DAS).
2. Study of Data logger.
3. Study of basics of PLC and applications in Agriculture electronics.
4. Study of Communication systems used in Agriculture electronics.
5. Study of Transducers and control systems.
6. Study of electronics systems for PH, gas, humidity, conductivity and temperature measurement.
7. Study of selective crop spraying, flow control, yield monitoring, green house environment control.
8. Study of Electronics Governance in Agricultural sector.
9. Describe GIS/GPS positioning system for precision farming.
10. Describe advantages and disadvantages of field bus and Open networks.
11. Write a note on HART Network.
12. Write a note on Greenhouse.

Text Books

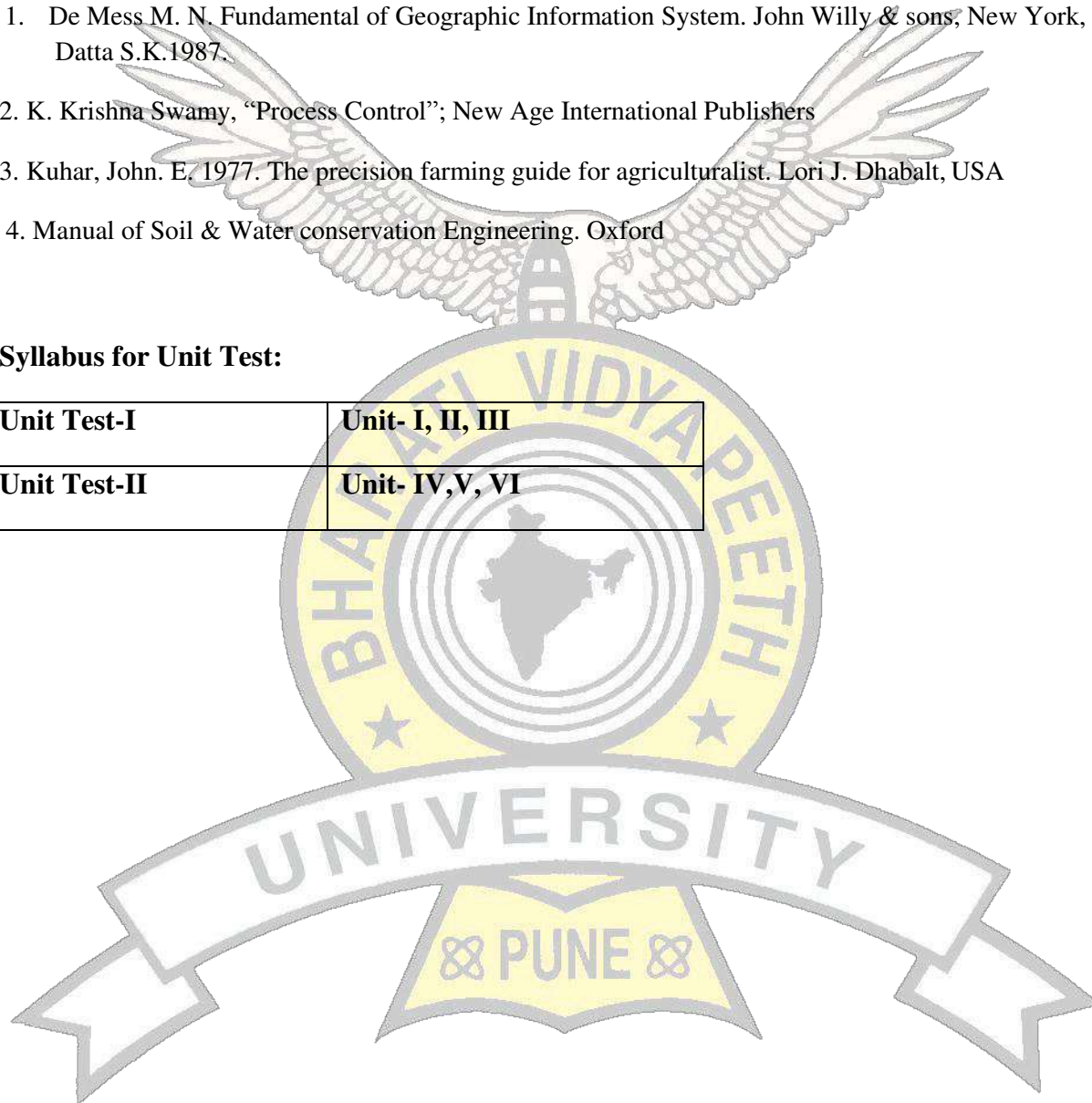
1. Curtis Johnson, “Process Control Instrumentation Technology”; 8th Edition, Pearson Education
2. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication

Reference Books

1. De Mess M. N. Fundamental of Geographic Information System. John Willy & sons, New York, Datta S.K.1987.
2. K. Krishna Swamy, “Process Control”; New Age International Publishers
3. Kuhar, John. E. 1977. The precision farming guide for agriculturalist. Lori J. Dhabalt, USA
4. Manual of Soil & Water conservation Engineering. Oxford

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI





Class: B.Tech (Electronics) SEM: -VIII
SUBJECT: - Elective-II System on Chip

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1Hour/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits: 4

Course Prerequisites: Digital Electronics, VLSI Design

Course objective:

- 1) To make students familiar with fundamentals of SOC design methodology.
- 2) To categorize requirements of SOC design.
- 3) To recognize essentials of SOC design.
- 4) To comprehend applications of SOC.

Course Outcomes: On successful completion of this course, students will be able to

- 1) Conceptualize SOC design methodology
- 2) Understand SOC design flow
- 3) Design complex SOC
- 4) Intellectualize future trends in SOC design

UNIT-I

SOC Design Methodology

(06 Hours)

The age of Megagate SOC's, The fundamental trends of SOC design, An improved design methodology for SOC design.

UNIT -II

SOC Design

(06 Hours)

Hardware System Structure, Software trends, Current SOC Design Flow, Six Major Issues in SOC Design.

UNIT -III

SOC Architecture (06 Hours)

The basics of Processor-Centric SOC architecture, Accelerating Processors for Traditional Software Tasks, System Design with Multiple Processors, New Essentials of SOC Design Methodology

UNIT -IV

System-Level Design of Complex SOCs (06 Hours)

Complex SOC System Architecture Opportunities, Major Decisions in Processor-Centric SOC Organization, Communication Design = Software Mode + Hardware Interconnect, Hardware Interconnect Mechanisms, The SOC Design Flow

UNIT -V

Advanced Topics in SOC Design (06 Hours)

Pipelining for Processor Performance, Inside Processor Pipeline Stalls, Optimizing Processors to Match Hardware, Multiple Processor Debug and Trace, Issues in Memory Systems

UNIT -VI

Scope of SOC (06 Hours)

The designer's dilemma in SOC design, The SOC design transition, future of SOC design, Future applications of complex SOC.

List of Tutorials/Experiments:

- 1) Study of SOC Components
- 2) Study of Integration Technology in SOC with standard CMOS process.
- 3) Study of Technology challenges in SOC design.
- 4) Study of SOC design requirements
- 5) Study of SOC architecture
- 6) Study of SOC test methodology
- 7) Application of SOC in Communication
- 8) Application of SOC in Computer
- 9) Application of SOC in Consumer
- 10) Case study: Complex SOC

List of Assignments:

- 1) What are the challenges in SOC design? Describe in brief.
- 2) List various design elements, tools and methodologies playing an important role in SOC Design.
- 3) Using diagram, explain SOC design flow.

- 4) Which are the important issues in SOC design? Explain in detail.
- 5) Discuss the basics of processor -centric SOC design.
- 6) Write essentials of SOC design methodology.
- 7) Define complex SOC system architecture opportunities.
- 8) Explain major decisions in processor-centric SOC organizations.
- 9) Discuss pipelining and exceptions.
- 10) Explain issues in memory system.
- 11) Describe designer's dilemma wrt SOC.
- 12) List future applications of complex SOC.

Content Delivery Methods: Chalk & talk, Power point presentation NPTEL videos.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

Text book:

1. Chris Rowen, Engineering the Complex SOC, Prentice Hall, 2004.

Reference books:

1. Rainer Leupers, Olivier Temam, Processor and System-on-Chip Simulation, Springer, 2010
2. Michael J. Flynn, Wayne Luk, Computer System Design System on Chip, Wiley, 2011
3. Bashir M. Al-Hashimi, System-on-Chip: Next Generation Electronics, IET, 2006
4. Steve Furber, ARM System on Chip Architecture, Pearson India, 2000
5. Wayne Wolf, Ahmed Amine Jerraya, Multiprocessor Systems-on-Chips, Elsevier, 2005
6. SudeepPasricha and NikilDutt, On-Chip Communication Architectures System on Chip
7. Interconnect, Elsevier, 2008



Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B.Tech (Electronics) Sem: - VIII

SUBJECT: - Elective-II Speech Processing

Teaching scheme

Lecture: 3 Hours/Week

Tutorial: 1 Hour/Week

Examination scheme

End Semester Exam: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW& Oral: 50 Marks

Credits 04

Course Prerequisite:

Engineering Mathematics-III, Signals and Systems, Digital Signal processing

Course Objective:

1. To introduce acoustic theory and time domain models for speech processing.
 2. To give overview of sampling, quantization and different modulation techniques.
 3. To enable students to apply STFT analysis and speech synthesis
 4. To introduce linear predictive coding as well as different techniques to enhance speech quality
-

Course Outcomes: At the end of the course, a student will be able to

1. Describe the mechanisms of human speech production and articulation mode of different classes of speech sounds determine their acoustic characteristics.
2. Represent the speech signal in time domain and frequency domain.
3. Describe and implement methods & systems for efficient quantization and coding of speech signals.
4. Analyze and synthesize speech using different methods.

5. Distinguish between different speech recognition modes.

Contents

Unit I [06 Hours]

Speech Production and Hearing

Anatomy & physiology of speech organs, articulatory, acoustic phonetics, acoustic theory of speech production, prosody, Anatomy & physiology of ear, sound perception, speech perception, vowel perception, consonant perception.

Unit II [06 Hours]

Speech Analysis

Short time speech analysis, time domain parameters, frequency domain parameters, LPC analysis, cepstral analysis, pitches estimation.

Unit III [06 Hours]

Coding of Speech Signals

Quantization, redundancies, Time domain, waveform coding Linear delta modulation, Adaptive delta modulation, adaptive differential pulse code modulation, Linear prediction based vocoders, phase vocoders channel vocoders and cepstral vocoders.

Unit IV [06 Hours]

Speech Synthesis

Principles of speech synthesis, synthesis methods, text to speech synthesis, Synthesis by rule, applications.

Unit V [06 Hours]

Speech Enhancement

Introduction, nature of interfering sounds speech enhancement techniques spectral subtraction & filtering, harmonic filtering, spectral subtraction, Adaptive noise cancellation.

Unit VI [06 Hours]

Automatic Speech Recognition

Parametric representation of speech, evaluation of similarity of speech patterns, various modes of speech recognition like MFCC, DTW, HMM Application.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination.

List Tutorials/Experiments:

1. To study spectral analysis of a noisy signal using MATLAB.
2. To obtain LPC coefficients.

3. To study the spectrogram of an audio signal using MATLAB.
4. To study VQ for speech.
5. To perform text to speech synthesis using MATLAB.
6. Estimation of fundamental frequency using Cepstrum.
7. To find Cepstral pitch period using method of autocorrelation.
8. To plot Welch power spectral density estimates for vowels 'a' 'e'.
9. To find Cepstral coefficients of voiced signal.
10. Speech classification on basis of frequency.

List of Assignments:

1. List out different speech processing applications.
2. Implement a Non-stationary nature of speech signal using Virtual laboratory.
3. Write a MATLAB program to find the envelope of the sound for the flute (Bansuri).
4. Describe any two speech recognition models.
5. Discuss different speech features like LPC, Cepstrum, MFCC, and Pitch.
6. Classify the different coders on the basis of waveform, parametric & transform domain coding of speech.
7. List out different applications of speech synthesis.
8. Different classifiers used in speech recognition.
9. Mention a real time application of speech technology.
10. Describe different types of software's used for speech processing.
11. Discuss different speech enhancement techniques.
12. Classify the different Audio File formats.

Text Books

1. Douglas O Shaughnessy "Speech Communication". Human and Machines Second Edition University Press.
2. Dr.Shaila D. Apte "Speech and Audio Processing," Wiley.

References

1. Lawrence Rabiner & Biing-Hwang Juang "Fundamentals of Speech Recognition Englewood Cliffs NJ:" PTR Prentice Hall (Signal Processing Series), c1993, ISBN 0-13-015157-2
2. L.R. Rabiner and R.W. Schafer "Digital Processing of Speech Signals" Prentice Hall.

3. Sadoaki Furui. “Digital Speech Processing: Synthesis and Recognition” CRC Press.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Bharati Vidyapeeth Deemed University
College of Engineering, Pune



Class: B. Tech (Electronics) Sem:-VIII

Subject: - Elective-II Fuzzy Logic & Neural Network

Teaching Scheme

Lecture: 03 Hours/week

Tutorial: 01 Hour/week

Examination Scheme

End semester exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Oral: 50 Marks

Credits: 04

Course Prerequisites:

Engineering Mathematics-II, Engineering Mathematics-III, Signals & Systems.

Course Objectives:

1. Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
 2. Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems Techniques.
 3. To create awareness of the application areas of neural network technique
 4. Provide alternative solutions to the conventional problem solving techniques in image/signal processing, pattern recognition/classification, control system.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Design fuzzy system for Electronics applications.
2. Describe the fundamentals of Crisp sets, Fuzzy sets, Fuzzy Relations and Fuzzy Logic Controller.
3. Describe the various architectures of building an ANN and its applications.
4. Design and implement neural network systems to solve real-world problems

5. Develop models for different applications using fuzzy system.

Contents:

Unit I

Fuzzy Logic -I

[05 Hours]

Concept of Fuzzy number, fuzzy set theory (continuous, discrete), Operations on fuzzy sets, Fuzzy membership functions (core, boundary, support), primary and composite linguistic terms, Concept of fuzzy relation, composition operation (T-norm, T-conorm), Fuzzy if-then rules.

Unit II

Fuzzy Logic -II

[07 Hours]

Fuzzification, Membership Value Assignment techniques, De-fuzzification (Max membership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules- Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.

Unit III

Fuzzy Control Systems

[06 Hours]

Assumptions in a Fuzzy Control System Design, Fuzzy Logic Controllers, Comparison with traditional PID control, advantages of FLC, Architecture of a FLC: Mamdani Type, Example Aircraft landing control problem, washing machine and vacuum cleaner.

Unit IV

Artificial Neural Network -I

[05 Hours]

Biological neuron, Artificial neuron model, concept of bias and threshold, Mc Culloch-Pits Neuron Model, implementation of logical AND, OR, XOR functions Soft Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model : concept of error energy, gradient descent algorithm and application of linear neuron for linear regression, Activation functions : binary, bipolar (linear, signum, log sigmoid, tan-sigmoid) Learning mechanisms: Hebbian, Delta Rule or Perceptron and its limitations
Draft.

Unit V

Artificial Neural Network -II

[07 Hours]

Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification and regression, Self-organizing Feature Maps, k-means clustering, Learning vector quantization Radial Basis Function networks: Cover's theorem, mapping functions (Gaussian, Multiquadrics, Inverse multi quadrics), Application of RBFN for classification and regression, Hopfield network, associative memories.

Unit VI

Adaptive Neuro-Fuzzy Inference Systems (ANFIS)

[06 Hours]

ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS Application of ANFIS/CANFIS for regression

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination.

List of Tutorials/Experiments:

1. Study of Fuzzy sets and operations.
2. Study of concepts of fuzzy sets core, support, alpha cuts..
3. Study of fuzzy relation, Max-min composition.
4. Analyze t-norms and t-conorms.
5. Analyze Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model.
6. Analyze architecture of a FLC: Mamdani Type with Example Aircraft landing control problem, washing machine and vacuum cleaner.
7. Study of learning mechanisms, approaches and activation functions in ANN.
8. Study of Multilayer perceptron (MLP) and back propagation algorithm.
9. Study of Radial Basis Function networks.
10. Study of ANFIS architecture and Hybrid Learning Algorithm.

List of Assignments:

1. Implement simple logic network using MP neuron model
2. Implement a simple linear regressor with a single neuron model.
3. Implement and test MLP trained with backpropagation algorithm
4. Implement and test RBF network.
5. Implement SOFM for character recognition.
6. Perform fuzzy sets operations.
7. Implement fuzzy membership functions (triangular, trapezoidal, gbell, PI, Gamma, Gaussian).
8. Implement defuzzification (Max-membership principle, Centroid method, Weighted average method)
9. Implement FIS with Mamdani inferencing mechanism.
10. Implement Simulink model for Vacuum cleaner, washing machine using Fuzzy Logic tools
11. Implement Fuzzy Logic Controller.
12. Implement perceptron learning, multilayer feed forward neural networks.

Text Books:

1. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, Laurene Fausett, Pearson Education, Inc, 2008.
2. Fuzzy Logic with Engineering Applications, Third Edition Thomas, Timothy Ross, John Wiley & Sons, 2010.
3. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private Limited.
4. Principles of Soft Computing , S. N. Sivanandam, S. N. Deepa, John Wiley & Sons, 2007

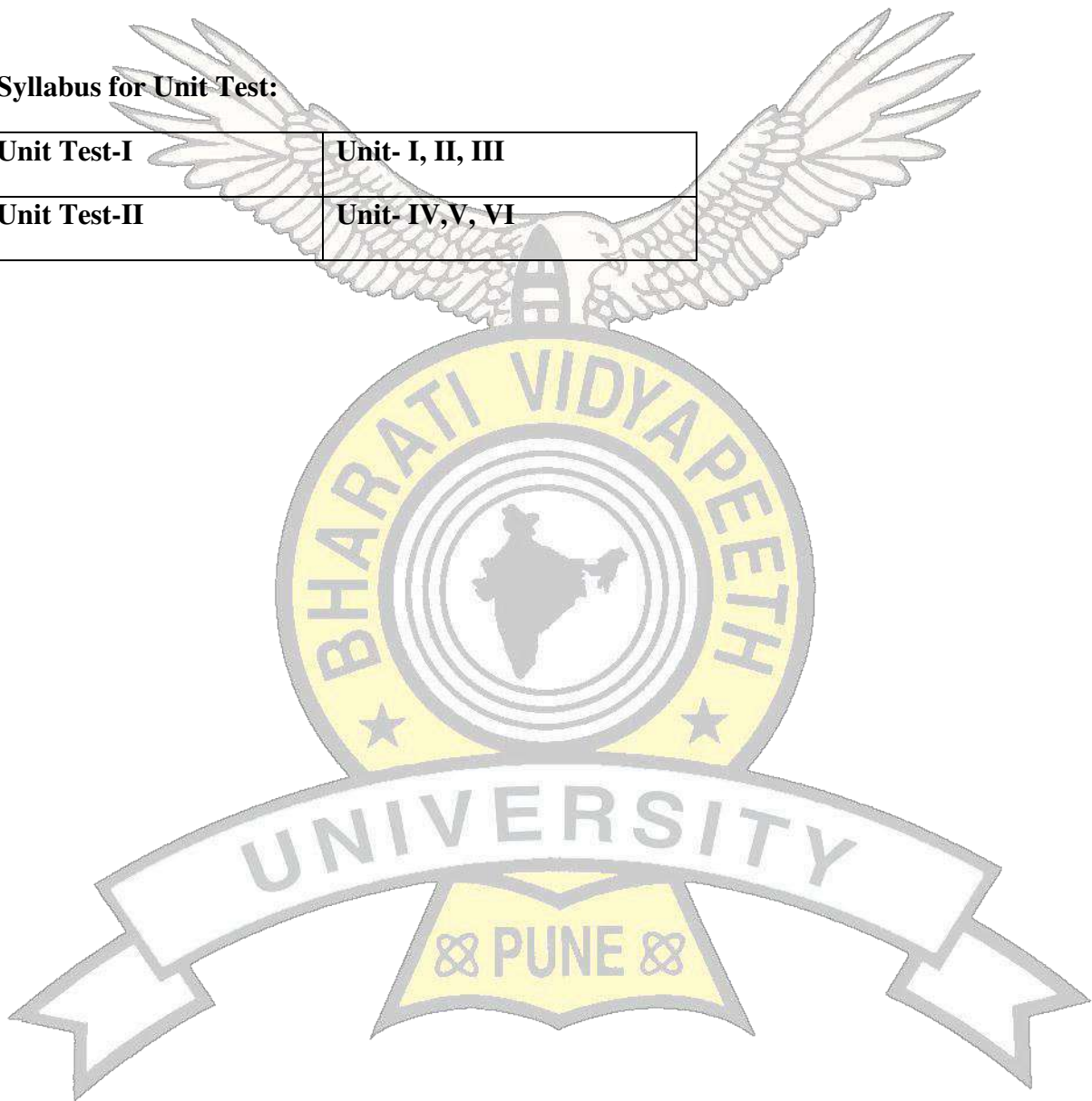
Reference Books:

1. Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991
2. Neural Networks A comprehensive foundation,, Simon Haykin, Prentice Hall International Inc- 1999.
3. Neural and Adaptive Systems: Fundamentals through Simulations, José C. Principe Neil R. Euliano , W. Curt Lefebvre, John-Wiley & Sons, 2000
4. Pattern Classification, Peter E. Hart, David G. Stork Richard O.Duda, Second Edition, 2000

5. Pattern Recognition, SergiosTheodoridis , Konstantinos Koutroumbas, Fourth Edition, Academic Press, 2008
6. A First Course in Fuzzy Logic, Third Edition, Hung T. Nguyen, Elbert A. Walker, Taylor & Francis Group, LLC, 2008
7. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam ,S.Sumathi, S. N. Deepa, Springer Verlag, 2007

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B.Tech (Electronics) Sem:- VII

SUBJECT: - Seminar

Teaching Scheme

Practical: 02 Hours/week

Examination Scheme

TW & Oral: 50 marks

Total Credits: 01

Course objective:

1. To develop ability of thinking and motivation for seminar
2. To expose the students to the state of the art
3. To develop ability to perform literature survey
4. To develop Seminar presentation and Technical Communication Skills

Course Outcomes: On successful completion of this course, students will be able to

1. Effectively communicate his technical idea or project
2. Learn master survey and literature survey techniques
3. Write Motivational Statement
4. Present the topic

Seminar Documentation should include

Cover Title page, plagiarism assessment, report Certificate from Guide, Abstract, list of Figures, List of Tables, Abstract, Presentation Slide using Microsoft power point including bibliography/references in IEEE standard format.

The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned Guide and head of the department.



**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B.Tech (Electronics) Sem:- VIII

SUBJECT: - Project stage - II

Teaching Scheme

Practical: 08 Hours/week

Examination Scheme

TW & Oral: 150 marks

Total Credits: 08

Course prerequisites:

Project Stage -I

Course objective:

1. To familiarize the students with the product development cycle.
 2. To impart the importance of working as a team.
 3. To introduce the student to literature survey and documentation process.
 4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Implement solution for an Engineering problem.
 2. Test and troubleshoot the implemented design.
 3. Execute the project implementation & financial budget in a timely manner.
 4. Student will be able to contribute and work effectively as team member.
 5. Generate project report and present it effectively.
-

Project Stage –II includes various steps such as:

1. System design
2. Testing
3. System documentation
4. Project report

B. Tech. (Electronics & Telecommunication) – 2014 Course

Semester- I					Contact Hours: 30 Hrs/week							
					Total Credits: 25							
					Total Marks: 700							
Sr. no.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)						Total Marks	Total Credits
		L	T	P	End Semester Exam	Continuous Assessment			TW			
						Unit test	Tutorials / Assignments	Attendance				
1	Engineering Mathematics-I	3	1	0	60	20	10	10	-	100	4	
2	Fundamentals of Civil Engineering	3	0	2	60	20	10	10	25	125	4	
3	Engineering Graphics	4	0	2	60	20	10	10	25	125	5	
4	Engineering Chemistry	4	0	2	60	20	10	10	25	125	5	
5	Elements of Electronics Engineering	3	0	2	60	20	10	10	25	125	4	
6	Professional Skill Development-I	2	0	0	30	0	20	0	0	50	2	
7	Workshop Technology	0	0	2	0	0	0	0	50	50	1	
Total		19	01	10	330	100	70	50	150	700	25	

Note:

1. Sem-I & Sem-II are common to the branches (Electronics, Biomedical & E & T/C)
2. * indicates subjects common to the branches (Electronics, Biomedical & E & T/C)
3. ** indicates subjects common to the branches (Electronics & E & T/C)
4. Engineering Mathematics –I, II, III are common to the branches (Electronics, Biomedical & E & T/C)
5. Internal assessment of 40 marks comprises of 20 marks average of two Unit tests,10 marks tutorials/assignments and 10 marks attendance

B. Tech. (Electronics & Telecommunication) – 2014 Course

Semester- II												
Contact Hours: 30 Hrs/week												
Total Credits: 25												
Total Marks: 700												
Subject Code	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)						Total Marks	Total Credits
		L	T	P	End Semester Exam	Continuous Assessment			TW			
						Unit test	Tutorials / Assignments	Attendance				
8	Engineering Mathematics -II	3	1	0	60	20	10	10	-	100	4	
9	Fundamentals of Mechanical Engineering	3	0	2	60	20	10	10	25	125	4	
10	Fundamentals of Engineering Mechanics	4	0	2	60	20	10	10	25	125	5	
11	Engineering Physics	4	0	2	60	20	10	10	25	125	5	
12	Fundamentals of Electrical Engineering	3	0	2	60	20	10	10	25	125	4	
13	Professional Skill Development-II	2	0	0	30	0	20	0	0	50	2	
14	Fundamentals of Computing	0	0	2	0	0	0	0	50	50	1	
	Total	19	01	10	330	100	70	50	150	700	25	

ENGINEERING MATHEMATICS-I

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

(08 Hours)

Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

02: Fundamentals of Civil Engineering

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
Course Pre-requisites:					
The Students should have					
1.	Concepts of units and conversions of units.				
2.	Basic knowledge of Chemistry				
3.	Basic knowledge of geography, concept of latitude and longitude.				
Course Objectives:					
To make student understand the scope and application of Civil Engineering					
Course Outcomes:					
Students will be able to understand					
1.	Different building components and material				
2.	Classification of surveying				
3.	Levelling of the ground				
4.	Planning of building				
5.	Methods of irrigation and water supply				
6.	Different methods of transportation				
UNIT - I					
Civil Engineering Scope And Applications.				(06 Hours)	
Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.					
UNIT - II					
Surveying				(06 Hours)	
Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.					
UNIT - III					
Building Planning And Bye Laws				(06 Hours)	
Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.					
UNIT - IV					
Foundations and Earthquakes				(06 Hours)	
Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.					

UNIT - V	Irrigation And Water Supply	(06 Hours)
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
UNIT - VI	Infrastructure	(06 Hours)
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
Term Work:		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
Reference Books:		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p>Lines and Dimensioning in Engineering Drawing Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p>Curves used in Engineering Practice Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p>Orthographic Projection Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p>Isometric Projections Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p>Projections of Points and Lines and planes Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p>Projection of Solids Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p>Section of Solids Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes

4. Orthographic Projections
5. Isometric views
6. Projection of Solids

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

ENGINEERING CHEMISTRY

Teaching Scheme:
Lectures: 4Hrs/Week
Practical: 2Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory: 04
Practical: 01
Term Work: 25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process

(08 Hours)

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

(08 Hours)

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

(08 Hours)

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

(08 Hours)

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

(08 Hours)

Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

Course: ELEMENTS OF ELECTRONICS ENGINEERING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS</u>
Lectures : 03 Hrs/week Practicals : 02 Hrs/week	End semester exam : 60 Marks Continuous Assessment : 40 Marks Term work : 25 Marks	03 01

Course Prerequisite:

Students have completed a course in Physics and have the knowledge of laws of Dynamics

Course Objective:

This course will introduce the concepts of electronic engineering . By the end of the course, student will be familiar with electronic components, semiconductor devices and their applications. The course emphasizes on Electronic devices, ICs and Digital systems.

Course Outcomes:

At the end of the course, a student will be able to

- 1 understand the basic semiconductor physics and semiconductor devices.
- 2 understand transport phenomenon of semiconductor devices through energy band diagrams.
3. to identify electronic components like, resistors, capacitors, inductors and to study characteristics of semiconductor devices.
4. apply the knowledge of diodes to the rectifier and filter circuits.
5. to represent numerical values in various number systems and perform number conversions between different number system and study applications of logic gates.

Unit-I

(08 Hours)

Electron Dynamics:

Motion of electron in electric, magnetic and combined electric and magnetic fields. Detection and focusing system of Oscilloscope tube-Television picture tube- LCD and Flat panel displays.

Unit-II

(08 Hours)

Transport phenomenon in semiconductor:

Mobility and conductivity - Drift and Diffusion currents – Continuity Equation – Minority carrier injection and recombination in Homogeneous semiconductor – Thermistors – Piezo Resistors – Hall Effect – Thermoelectric effect

Unit-III

(08 Hours)

Electronic components:

Resistors -Inductors and Capacitors and their types – Construction and characteristics of PN junction diode – Zener Diode – Tunnel diode - Bipolar junction transistors – CB,CC,CE circuits, Field Effect transistors .

Unit-IV

(08 Hours)

Electronic Devices and Linear ICs:

Rectifiers: Half wave, Full wave and Bridge rectifiers - capacitor filter-wave forms-ripple factor regulation characteristics. Special semiconductor devices: FET - SCR - LED - VI characteristics – applications. Introduction to Op-Amp and Timers.

Unit-V**(08 Hours)****Digital system:**

Number system: Binary system, Decimal to Binary, Octal system, Hexadecimal system, binary –addition, subtraction, multiplication and division.

Logic gates: OR, AND, NOT, Exclusive-OR, NOR, NAND gates, Logic networks, Gate Standardization, Introduction to Logic Circuits –Combinational and Sequential Circuits.

(08 Hours)**Unit-VI****Consumer Electronics:**

Basic study of various products such as radio receivers , television sets , MP3 players, video recorders , DVD players , digital cameras , microwaves , personal computers , video game consoles , telephones and mobile phones , laptops and palmtops and fax machines

Term work: For term work assessment the students will have to perform minimum of eight practicals.

- 1) To study various electronics components: Resistors, Inductors, Capacitors, diodes and transistors.
- 2) To study CRO and different modes of operation and some application.
- 3) To plot V-I characteristics of PN junction diode.
- 4) To plot regulation characteristics of half wave rectifier with and without capacitor filter.
- 5) To plot regulation characteristics of Full wave rectifier with and without capacitor filter.
- 6) To plot input-output characteristics of CE configuration of BJT.
- 7) To study basic logic gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR.
- 8) To realize the Boolean expression using basic gates.
- 9) To verify the De-Morgan's theorem.
- 10) To fabricate at least 5 electronics component on a PCB.

TEXT BOOKS

1. Mottershed Allen, Electronic Devices & Circuits, PHI
2. R. P. Jain, Modern Digital Electronics, Mc Graw Hill

REFERENCE BOOKS

1. Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)
2. Millman & Halkis, Electronic Devices & Circuits, PHI
3. Malvino Leach, Digital Principles & Applications, Mc Graw Hill
4. Millman & Halkis, Integrated Electronics, MGH

Syllabus for Unit Test :

Unit Test 1	Unit I ,II & III
Unit Test 2	Unit IV, V &VI

Workshop Technology

TEACHING SCHEME:

Theory: -
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -
Continuous Assessment: -
Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

ENGINEERING MATHEMATICS-II

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment:40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

(08 Hours)

Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I, II, III

Unit Test II :- Unit IV, V, VI

FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Thermodynamics- Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p>Introduction to I.C. Engines and turbines- Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p>Introduction to refrigeration, compressors & pumps- Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p>Energy Sources - Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p>Heat transfer- Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

UNIT-IV	<p>Properties of fluids- Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p>Properties of Materials and their Applications- Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p>Mechanical devices - Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p>Mechanisms- Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p>Machine Tools- Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p>Introduction to manufacturing processes and Their Applications- Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner

5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johnston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

10: Engineering Mechanics

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 25 Marks	01 Credit
Course Pre-requisites:			
The Students should have knowledge of			
1.	Scalar and Vector		
2.	Newton's law of motion		
3.	Law of friction		
4.	Concept of physical quantities, their units and conversion of units		
5.	Concept of differentiation and integration		
Course Objectives:			
	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.		
Course Outcomes:			
The student should be able to			
1.	calculate resultant and apply conditions of equilibrium.		
2.	analyze the truss and calculate friction force.		
3.	calculate centroid and moment of inertia.		
4.	solve problem on rectilinear motion.		
5.	solve problems on curvilinear motion.		
6.	use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.		
UNIT - I	Resultant and Equilibrium		(06 Hours)
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.		
UNIT - II	Truss and Friction		(06 Hours)
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.		
UNIT - III	Centroid and Moment of Inertia		(06 Hours)
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.		

UNIT - IV	Kinematics of Rectilinear motion of a Particle	(06 Hours)
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	Kinematics of Curvilinear motion of a Particle	(06 Hours)
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	Kinetics of a Particle	(06 Hours)
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	
Term Work:		
A) The term-work shall consist of minimum Five experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
B) The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.		
Text Books:		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
Reference Books:		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
Syllabus for Unit Test:		
Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	

ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
	Term Work: 25marks	

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

(08hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajous figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Planck's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

02: Fundamentals of Electrical Engineering

TEACHING SCHEME:		EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 25 Marks	01 Credit
Course Pre-requisites:			
The Students should have			
1.	Mathematics		
2.	Physics		
Course Objectives:			
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.		
Course Outcomes:			
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems		
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks		
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries		
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer		
5.	Define basic terms of single phase and three phase ac circuits and supply systems		
6.	Know and use electrical safety rules		
UNIT - I	Basic concepts	.	(06 Hours)
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems		
UNIT - II	Network Theorems		(06 Hours)
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.		
UNIT - III	Electrostatics		(06 Hours)
	Electrostatic field, electric field intensity, electric field strength, absolute		

	permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
UNIT - IV	Magnetic Circuit & Transformer	(06 Hours)
	Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.	
UNIT - V	AC Fundamentals & AC Circuits	(06 Hours)
	AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
UNIT - VI	Electrical Wiring and Illumination system	(06 Hours)
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

Term Work:

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
 - a) Voltage and current ratios.
 - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books:	
1) B.L.Theraja- “A Textbook of Electrical Technology” Volume- I, S.Chand and Company Ltd.,New Delhi	
2) V. K. Mehta, - “Basic Electrical Engineering”, S. Chand and Company Ltd., New Delhi	
3) I. J. Nagrath and Kothari – “Theory and problems of Basic Electrical Engineering”, Prentice Hall of India Pvt. Ltd	
Reference Books:	
1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

FUNDAMENTALS OF COMPUTING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS</u>
Practical: 2 Hours/Week	Term Work: 50 Marks	01

Course Prerequisite:

Students must possess knowledge about basic fundamentals of computer and professional Microsoft office development tools.

Course Objective:

This course will introduce the concepts of C language software development and compiling tool. By the end of the course, student will be familiar with various fundamentals of C- language, software file system, computer graphics and its various multimedia applications.

Course Outcomes: At the end of the course, a student will be able to

1. Write C programs using conditional statements and loops.
 2. Execute the logic using Arrays and strings and perform matrix operation using them.
 3. Perform logic operations using Structures & Unions and use them with pointers.
 4. Write C program for File manipulations and Dynamic memory allocation
 5. Understand the concept and application of Graphics & Multimedia.
-

Unit –I

(08 Hours)

Introduction: Computer systems, Hardware & software concepts.

Algorithm / pseudo code, flowchart, program development steps, Computer Languages: machine, symbolic, and high-level languages, Creating and running programs: Writing, editing, compiling, linking, and executing.

Basic of C: Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operators, bit-wise Operators expressions, type conversions, conditional expressions, precedence and order of evaluation, Managing input and output operations, Sample programs.

Conditional Statements and Loops: Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, sample programs

Unit-II

(08 Hours)

Arrays & Strings

Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays , Array applications: Matrix Operations

Unit –III

(08 Hours)

Function & Pointers

FUNCTIONS: basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, Towers of Hanoi, header files, example c programs. Passing arrays & strings to functions.

Pointers: concepts, initialization of pointer variables, pointers and function arguments, passing by address, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays.

Unit-IV

(08 Hours)

Structures & Unions

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications.

Unit-V

(08 Hours)

Files and Dynamic Memory Allocation

Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations, example programs.

Dynamic memory allocation, malloc, calloc, realloc ,free. Concepts of linked lists, Sample programs

Unit-VI

(08 Hours)

Graphics and Multimedia

Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application, Description of graphics devices, Input Devices for Operator Interaction

Introduction to Multimedia:History, elements of multimedia – text, audio, video, image, animation, Multimedia applications different areas

TEXT BOOKS

1. Programming in ANSI C – E Balagurusamy (5th Edition-TMH)
2. Computer Graphics: Principles and Practices in C – Andrea Von Dam, Steven K Fiener, F Hughes John [2nd Edition- Pearson]

REFERENCE BOOKS

1. Let Us C- Yashwant Kanitkar
2. D. Hearn, M. Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 2002, ISBN 81 - 7808 - 794 – 4
3. Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communication and Applications"
4. Judith Jeffcoate, " Multimedia Technique"

Term work will consist of minimum of ten assignments based on C programming language.

List of Practicals

1. a. Write a C program to take user Input and print it on the screen.
b. Write a C program to perform addition or subtraction of two numbers.
c. Write a C program to find whether the number is Odd or Even.
2. a. Write a C program to find out Prime numbers.
b. Write a C program to find out Fibonacci series.
3. Write C programs to print different patterns
4. a. Write a C program to do factorial using recursion.
b. Write a C program to find out Armstrong number.
5. Write a C program to sort the array in Ascending & Descending order.
6. Write C programs to perform operations on 2-D arrays
7. Write a C program to perform different operations on strings.
8. Use of Pointers
 - a. Write a C program to swap numbers using pointers
 - b. Write a C program to show the use of pointers in arrays.
 - c. Write a C program to use functions using pointers.
9. a. Write a C program to create student mark sheet using structures
b. Write a C program to show the use of structure using pointers
10. Write a C program to perform different operations on Files.
11. Write a C program to create single Linked List.
- 12.** Application of Graphics and Multimedia

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

**Programme : B.Tech (Electronics & Telecommunication) Sem – III (2014
Course)**

Sr.No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)						Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW & PR	TW & OR		Theory	TW	Total Credits
		L	P	T		Unit Test	Assignment	Attendance						
1	Engineering Mathematics-III	3	0	1	60	20	10	10	-	-	100	3	1	4
2	Electronic Devices and Applications	4	2	0	60	20	10	10	50	-	150	4	1	5
3	Signals & Systems	3	0	1	60	20	10	10	-	50	150	3	1	4
4	Digital Circuits & Applications	3	2	0	60	20	10	10	50	-	150	3	1	4
5	Network Theory	3	2	0	60	20	10	10	50	-	150	3	1	4
6	Professional Skill Development-III	4	0	0	100	--	--	--	--	-	100	4	0	4
	Total	20	6	2	400	100	50	50	150	50	800	20	05	25

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

**Programme : B.Tech (Electronics & Telecommunication) Sem – IV (2014
Course)**

Sr. No	Name of the course	Teaching Scheme			Examination Scheme (Marks)						Credits			
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW & PR	TW & OR				Total marks
		L	P	T		Unit test	Assignment	Attendance			Theory	TW	Total Credits	
7	Linear Integrated circuits	3	2	0	60	20	10	10	50	-	150	3	1	4
8	Applied Electronic circuits	4	2	0	60	20	10	10	50	-	150	4	1	5
9	Control System Engineering	3	2	1	60	20	10	10	-	-	100	3	2	5
10	Analog Communication System	3	2	0	60	20	10	10	-	50	150	3	1	4
11	Data Structures and Files	2	2	0	60	20	10	10	-	50	150	2	1	3
12	Professional Skill Development-IV	4	0	0	100	-	-	-	-	-	100	4	0	4
	Total	19	10	1	400	100	50	50	100	100	800	19	06	25

Total Credits Sem – III : 25

Total Credits Sem – IV : 25

Grant total : 50

B.Tech.(E&TC) Sem-III



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B. Tech (E & TC) Sem:- III

SUBJECT: - Engineering Mathematics-III

Lecture: 3 hours/week

Tutorial: 1 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

Course prerequisites:

Students should have basic knowledge of:

- Differential calculus
- Integral calculus
- Complex numbers
- Vector algebra

Course objective:

To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

Course Outcomes: On successful completion of this course, students will be able to

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

Contents:

Unit-I

Linear Differential Equations (LDE) (08Hours)

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

Unit-II

Complex Variables (08Hours)

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

Unit-III

Transforms (08Hours)

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit-IV

Laplace Transform (LT) (08Hours)

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit -V

Vector Differential Calculus (08Hours)

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

Unit-VI

Vector Integral Calculus

(08Hours)

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Assignments:

1. Linear Differential Equations
2. Complex Variables
3. Transforms
4. Laplace Transform
5. Vector Differential Calculus
6. Vector Integral Calculus

Text Books:

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar
(Pune Vidyarthi Griha Prakashan, Pune).



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B.Tech (E & TC) Sem:- III

**SUBJECT: - Electronic Devices and Applications
Alternative Name
(Electronic Devices & Applications)**

Lecture: 4 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Practical.: 50 marks

Course prerequisites:

- Knowledge of EEE.

Course objective:

1. To make student understand working of bipolar junction transistor and field effect transistor with different biasing techniques
2. To make student understand a practical approach of design and analysis of waveshaping circuits using diode and multivibrator using transistors
3. To make student understand working of FET and MOSFET and its applications
4. To make student understand working of optoelectronic devices and its applications.
5. To make student understand the fabrication process of PCB

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate knowledge of working and applications of diode.
2. Demonstrate knowledge of working of BJT with different biasing techniques.
3. Analyze applications of BJT as an amplifier and multivibrator.
4. Explain working of FET and MOSFET and its applications.
5. Demonstrate knowledge of working of optoelectronic devices.
6. Design, built and test any small electronic circuit on PCB.

Contents:

Unit-I

Transistor Biasing (08Hours)

Need of biasing, DC load line analysis, operating point, Thermal runaway. Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for all biasing circuits, Design of biasing circuits, Compensation techniques: Thermistor and diode compensation, Thermal Resistance

Unit-II

BJT Amplifiers (08Hours)

Two port device and Hybrid model , transistor Hybrid model, h- parameters, Simplified CE Hybrid Model, Analysis of amplifiers using Approximate Model(CE, CC, CB), BJT Single Stage Amplifiers, Small Signal Analysis of Single Stage BJT Amplifiers, Distortion in Amplifiers, Application of Transistor as a Switch

Unit-III

Field Effect Transistor (FET) (08Hours)

Types of FET viz. JFET, MOSFET, JFET -construction, VI characteristics, transfer characteristics, Characteristics Parameters of JFET, FET Biasing(Self Bias, Fixed Bias, Current Source Bias), JFET amplifiers-CS, CD and CG amplifiers, Application of FET.

Unit-IV

MOSFETs (08Hours)

Types of MOSFET viz. DMOSFET, EMOSFET, n-MOS, p-MOS and CMOS devices, DMOSFET and EMOSFET characteristics and parameters, non-ideal V-I characteristics viz. finite output resistance, body effect, subthreshold conduction , breakdown effects and temperature effects, MOSFET biasing, MOSFET as VLSI device

Unit -V

Wave shaping and Multivibrator Circuits (08Hours)

Diode as clipper- series and parallel forms of clipper circuits, biased clipper, their operations and transfer characteristics, Diode as a clamper, voltage multiplier circuits-voltage doubler,

tripler and quadruple configuration , Multivibrator circuits-astable and monostable multivibrator circuits using BJT

Unit-VI

Optoelectronics devices and PCB design

(08Hours)

Construction, V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optocoupler

PCB: types of PCB, PCB design rules, layout design, artwork design, fabrication process of single sided PCB, different copper clad laminates, composition of solder metal

List of Experiments:

1. Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias
2. To plot frequency response of single stage CE amplifier and find its bandwidth
3. To plot frequency response of single stage FET amplifier (CS/CD configuration)and find its bandwidth
4. To study different types of Clipper circuits
5. To study different types Clamper circuits
6. To study Astable multivibrator using BJT
7. To study monostable multivibrator using BJT
8. To plot transfer characteristics of Optocoupler
9. To plot V-I and optical characteristics of LED and LDR
10. To plot V-I and optical characteristics of Photodiode and phototransistor
11. To design, built and test any electronic circuit based on above syllabus.

Assignments:

1. Distinguish Biasing techniques of BJT- self bias, collector to base bias, fixed bias
2. Derive the equations for A_v , A_{vS} , A_c , A_{cS} , Z_i , Z_o for CE, CB and CC configurations of n-p-n transistor.
3. Draw the construction of JFET and explain operation of JFET in Fixed bias, Self bias and voltage divider bias.
4. Draw the construction of D-MOSFET, E-MOSFET and explain input, Output, transfer Characteristics
5. Draw the circuits for clipper, clamper, and voltage multiplier and explain their operations.

6. Design and test BJT amplifier/FET amplifier/Voltage multiplier/Multivibrators circuit on PCB
7. Visit to local Electronics Market

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

3. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
4. End term Examination

Text Books:

1. "Electronic Devices and Circuits" by S. salivahanan,Suresh kumar- Mc Graw Hill Publication
2. "Integrated Electronics", by Millman J and Halkias .C., TMH publication
3. "Electronic Devices and Circuits " by Millman ,Halkies,TMH publication

Reference Books:

4. "Electronic Devices and Circuits" by Allen Mottershed- PHI Publication
5. "Electronic Devices and Circuits" by J.B. Gupta-Katson educational series
6. "Microelectronics "by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
7. "Printed Circuits Handbook " by Clyde F. Coombs - McGraw Hill Handbooks
8. "Microelectronic Circuits Theory and applications "by Adel S. Sedra , Kenneth C. Smith- Oxford



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B.Tech (E&TC) Sem:- III

SUBJECT: - Signals and Systems

Lecture: 3 Hrs/week

Tutorial: 01 Hrs/Week

Theory: 60 marks

Unit Test: 20 Marks

Attendance: 10Marks

Assignments: 10Marks

TW & Oral: 50Marks

Course prerequisites:

Knowledge of Engineering Mathematics-I, Engineering Mathematics-II and Engineering Mathematics-III course.

Course objective:

The course aims to introduce the basic concepts of signals and systems analysis and their tools in the time and frequency domain. It also provides knowledge of correlation function and sampling.

Course Outcomes: On successful completion of this course, students will be able to

1. Characterize and analyze the properties of signals.
2. Classify the systems and analyze in time domain using convolution.
3. Apply Fourier transform, Laplace transform and Z-Transform for analysis of LTI systems.
4. Conceptualize the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

Contents:

Unit-I

Introduction to signals

(06 Hours)

Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic, energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.

Unit-II

Classification of Discrete time systems (06 Hours)

Definition, Classification of System, System Interconnections, state space analysis, Linear & non-linear, Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.

LTI system Analysis: Introduction to LTI systems. Block Diagram, Linear Convolution-Convolution Integral, Impulse response, Methods of Convolution. Properties of convolution

Unit-III

Continuous Time system Analysis: (06 Hours)

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, application of Fourier series & Fourier transforms to the system analysis.

Unit-IV

Laplace Transform and Applications (06 Hours)

Laplace Transform: Definition and its properties, ROC and pole zero concept. Application of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties.

Unit-V

Z-Transform and Applications (06 Hours)

Z-Transform: Definition and its properties, The Region of Convergence for the Z-Transform, the Inverse z-Transform, Application of Z-Transform to the LTI system analysis

Unit VI:

Correlation and Spectral Density (06 Hours)

Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation,

energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.

Assignments:

1. Classify and explain any 5 signals that occur physical world.
2. Explain LTI system by giving a real world example.
3. Find the Fourier Transform using MATLAB.
4. Find the Laplace Transform using MATLAB.
5. Find the Z-Transform using MATLAB.
6. Find the autocorrelation of sine sequence $x[n]$ with frequency 50Hz and sampling frequency 200Hz, using MATLAB. If the given signal $x[n]$ is affected by noise signal $z[n]$, such that $y[n] = x[n] + z[n]$, find the cross correlation between $x[n]$ and $y[n]$, using MATLAB.

Content Delivery Methods: Chalk & talk, Power point presentation, MATLAB

Assessment Methods:

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books:

1. Roberts M. J., Signals & Systems, TMH
2. Oppenheim, Wilsely & Nawab, Signals & Systems, MGH

Reference Books:

1. B.P.Lathi, Signal Processing & Linear Systems, Berkeley Cambridge, 1998 Edition



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

**Class: B.Tech (E & TC) SEM: - III
SUBJECT: - Digital Circuits and Applications**

Lecture: 3 Hours/Week

Practical: 2 Hours/Week

Theory: 60 marks

Unit Test: 20 Marks

Attendance: 10Marks

Assignments: 10Marks

TW& Practical: 50 Marks

Course Prerequisite:

1. Fundamentals of Number Systems.

Course Objective:

1. To understand principles, characteristics & operations of combinational & sequential logic circuits.
2. To design combinational circuits by using logic gates, MSI circuits, PLDs.
3. To design, implement analyze, asynchronous & synchronous sequential circuits using flip flops.

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate the knowledge of Boolean algebra including simplification techniques.
2. Describe the characteristics of Logic families TTL, CMOS, ECL & explain the fundamentals of semiconductor memories.
3. Analyze & design digital combinational circuits such as of multiplexers, demultiplexers, encoder, decoder and arithmetic circuits.

4. Demonstrate the knowledge of operations of basic types of flip-flops, registers, counters & the design of FSM.
5. Describe the characteristics of PLDs, Semiconductor memories and their applications.

Contents:

Unit –I

Binary Number Systems & Coding (6 Hours)

Review of Binary number system: Binary addition and subtraction using 1's, 2's complement method, sign magnitude representation. BCD codes, 8421, Excess –3, Grey code, codes with more than four bits, ASCII code.

Principles of combinational logic

Fundamental theorems of Boolean algebra, Canonical and standard forms (SOP and POS), minimization of logic functions, Karnaugh maps up to 4 variables, Don't care conditions, Quine Mc-Cluskey method.

Unit-II

Arithmetic modules (6 Hours)

Adder, subtractor, carry look ahead adder, BCD adder, magnitude comparator, Excess-3 Adder, series and parallel adder, ALU.

Combinational Logic modules

Code conversion, Multiplexer, Demultiplexer, Encoder, Decoder and their applications. Parity generator and checker.

Unit-III

Logic Families (6 Hours)

Parameter definitions - Noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL, CMOS & ECL. Two input TTL NAND gate, TTL logic families standard, Totem – pole, open collector, tri-state (concept & application). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS ECL.

Unit-IV

Sequential Logic systems (7 Hours)

Basic sequential circuits-latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, MS J-K flip flop, T flip-flop.

Definition of state machines, Moore and Mealy machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization. Designing state machine using ASM charts, using state diagram, sequence detector and design examples.

Unit-V

(5 Hours)

Application of Flip flops

Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter.

Unit-VI

(6 Hours)

PLDs & Semiconductor Memories: Programmable logic devices

Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.

Semiconductor memories

Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.

List of Experiments:

Hardware Experiments:

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. Function implementation using Multiplexer and Demultiplexer
6. Sequence generator using MSJK flip flop IC's
7. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
8. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
9. BCD Adder/Subtractor with Decoder driver and 7 segment display

Software Experiments:

Perform following experiments using Xilinx ISE simulator

1. Full Adder using half adder
2. 2 bit comparator

Assignments:

1. Solve four examples of Boolean expressions using K-maps, Quine-McClusky method using both minterms and maxterms.
2. Design carry look Ahead adder for adding two 4-bit numbers.
3. Design sequence detector using FSM and implement using suitable flip flops.
4. Design 4-bit/ 5-bit ripple counters, synchronous counters for positive edge/ negative edge triggered flip flops.
5. Study any CPLD/ FPGA board and make a report on the features of the board.
6. Study ISE of any platform(Xilinx, Quartus, Libero etc.) and make a report on working of the platform.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books:

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12th reprint TMH Publication, 2007.
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI

Reference Books :

1. J.F.Wakerly “Digital Design: Principles and Practices”, 3rd edition, 4th reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano ‘Digital Design’-- (Third Edition),.PHI



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

**Department of Electronics & Telecommunication
Engineering**



Class: B.Tech (E&TC) Sem:- III

SUBJECT: - Network Theory

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Practical: 50 marks

Course prerequisites:

- Knowledge of KCL and KVL Laws from Basic Electrical Engineering
- Knowledge of Linear Differential Equations and Systems of Linear Equations from Engineering Mathematics - I and II.

Course objective:

The objective of the course is to enable the student to perform any of the network analysis task required in the subsequent courses. The student is exposed to some concepts in graph theory for providing a good foundation for the methods of Mesh Analysis and Node Analysis. The transient analysis using Laplace Transforms is also included. The series and parallel resonance circuits which occur quite frequently in electronics are analyzed. The topic of constant K filter is included as it finds many applications in electronic design. The two port network parameters which are of fundamental importance in many courses on electronic devices are included in the last unit.

Course Outcomes: On successful completion of this course, students will be able to:

1. To find voltages and currents in a given network using Mesh Analysis or Node Analysis or Network Theorems.
2. To find voltages and currents in a given network by formulating network equilibrium equations from graph theory.

3. To find the transient response in a given network consisting of series or a parallel combination of resistance, capacitance and inductance.
4. To find all the parameters relating to a given series or a parallel resonant circuit.
5. To design a constant K prototype low pass, high pass, band pass or a band stop passive filter
6. To find any of the two port parameters of a given two port network.

Contents:

Unit I

Basic Circuit Analysis and Simplification Techniques (6 Hours)

KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Mesh and Node Analysis in Sinusoidal Steady State
 Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

Unit II

Graph Theory (6 Hours)

Network Graph, tree, cotree & loops, Incidence Matrix, tie set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive and non resistive networks, Principle of Duality

Unit III

Transient Analysis of Basic RC, RL, & RLC Circuits (6 Hours)

Initial Conditions in networks. A procedure for evaluating initial conditions. Solution of step response in RC, RL, RLC circuits using classical method and using Laplace Transform.

Unit IV

Resonance (6 Hours)

Resonant condition, Definition of Quality factor. Finding resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. General case of resistance present in both branches of parallel resonant circuit. Comparison of series and parallel

resonant circuits, Applications of resonant circuits, Analysis of some circuits in communication electronics.

Unit V

Passive Filters

(6 Hours)

Filter Fundamentals, Image impedance, Characteristic impedance, Propagation constant. Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters, Applications of passive filters.

Unit VI

Two Port Networks

(6 Hours)

Network Functions, Two port network parameters, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Interconnections of two-ports, Reciprocity and Symmetry conditions, Analysis of some circuits using two port network parameter theory.

Assignments:

- i. Determine the currents, voltages and power absorbed in the given branches in any given network by applying mesh and node analysis.
- ii. Determine the currents, voltages and power absorbed in the given branches in any given network using the concepts of graph theory.
- iii. Carry out transient analysis and determine the voltage and current expressions for a given network containing R, L and C with non zero initial conditions.
- iv. Search for circuits which involve series and parallel resonant circuits in the literature on communication electronics and perform resonant circuit analysis.
- v. Design a passive LC filter circuit for use in a DC power supply.
- vi. Search for circuits involving electronic devices where theory of two port network parameters can be applied and carry out the analysis.

List of Experiments:

1. To verify Thevenin's and Norton's Theorem.
2. To verify Superposition and Reciprocity Theorem.
3. To find resonant frequencies of series and parallel circuit.
4. To plot frequency response of frequency selective network (Twin T or Wein Bridge).
5. To plot frequency response & cut-off frequency of constant-k LPF and HPF.

6. To plot frequency response & cut-off frequency of constant-k BPF and BSF.
7. To find Z and Y parameters of given two port network.
8. To find H and ABCD parameters of given two port network.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)

References Books:

1. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
2. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B.Tech (E& TC) Sem:- III

SUBJECT: - Energy Studies

Lecture: 3 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

Course prerequisites:

- Basic knowledge of types of sources.
- Basic knowledge of consumption, energy conservation & economic development

Course objective:

This course provides in depth knowledge of energy sector and role of energy sector in nation development.

Course Outcomes: On successful completion of this course, students will be able to

1. Identify potential use of energy sources and justify energy conservation.
2. Evaluate global and Indian energy scenarios.
3. Evaluate energy polices framework.

Contents:

Unit-I

Energy Sources

(06 hours)

Fossil fuels, nuclear fuels, hydel, solar, wind and bio fuels in India, Energy conservation, Nuclear energy through fission and fusion processes.

Unit-II

Energy Conversion

(06 hours)

Energy Conversion- Energy conversion from source to utility, Solar, Nuclear, Geothermal, Tide and Wind Energies.

Unit-III

Global Energy Scenario

(06 hours)

Role of energy in economic development and social transformation, Overall energy demand, availability and consumption, Depletion of energy resources and its impact on economy, Non proliferation of nuclear energy. International energy policies of G-8, G-20, OPEC and European Union countries.

Unit-IV

Indian Energy Scenario

(06 hours)

Commercial and noncommercial forms of energy, Utilization pattern in the past, present and also future prediction and Sector wise energy consumption.

Unit-V

Energy Policy

(06 hours)

Energy policy issues at global level, national level and state level, Energy conservation act 2001, Electricity act 2003, Energy pricing and its impact on global variations. Energy policies and development – Case studies on the effect of Central and State policies on the consumption and wastage of energy – Critical analysis – Need for renewable energy policies in India.

Unit-VI

Energy and environment

(06 hours)

Green house effect – Global warming – Global scenario – Indian Environmental degradation – environmental laws– Water (prevention & control of pollution) Act 1974 – The environmental protection act 1986 – Effluent standards and ambient air quality standards – Latest development in climate change policies & CDM.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Jose Goldenberg, Thomas Johanson, and Reddy, A.K.N., Energy for Sustainable World, Wiley Eastern, 2005.
2. Charles E. Brown, World Energy Resources, Springer Publication, New York, 2002.
3. Culp, A.W., Principles of Energy Conversion, McGraw Hill New York, 2004.

Reference Books:

1. Bukhortsow, B., Energy Policy and Planning, Prentice Hall of India, New Delhi, 2003.
2. TEDDY Year Book, The Energy Research Institute (TERI), 2011.
3. International Energy Outlook, EIA Annual Publication, 2011.

B.Tech.(E&TC) Sem-IV



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B.Tech (E & TC) Sem:- IV

SUBJECT: - Linear Integrated Circuits

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Oral: 50 marks

Course prerequisites:

- Knowledge of KCL and KVL Law
- Basic knowledge of Op-Amp and its configurations

Course objective:

This course provides in depth knowledge on the Op-Amp. Also it introduces the design of PLL, Waveform generators, Timer IC's and Converters.

Course Outcomes: On successful completion of this course, students will be able to

1. Design linear and nonlinear applications of Op-Amp.
2. Design of first and second order active filters.
3. Analyze and design Waveform Generators.
4. Demonstrate knowledge of Phase Locked Loop IC 565 and Converters.
5. Design of multivibrators using Timer IC 555

Contents:

Unit-I

Introduction to op-amp

(06 hours)

Block diagram representation of a typical op-amp, Schematic symbol for op-amp, Definition of integrated circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal & external offset voltage compensation, Frequency Response of an op-amp.

Unit-II

Linear applications of op-amp

(06 hours)

Inverting amplifier, Non-inverting amplifier, Voltage Follower, Adder, Subtractor, Scaling averaging amplifier, Integrator, Differentiator, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge, Peaking amplifier

Unit-III

Non-linear applications of op-amp

(06 hours)

Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.

Unit-IV

Active filters and waveform generators

(06 hours)

First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Sawtooth wave generator and study of function generator or IC 8038. *Design and analysis of RF filters.*

Unit-V

Timer IC 555 and PLL IC 565

(06 hours)

IC 555- as Monostable and Astable Multivibrators and its applications.

IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector

Communication applications of PLL: Locking and tracking of frequency, Co-channel and adjacent channel rejection.

Unit-VI

Converters

(06 hours)

V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.

List of Experiments:

1. To design and build Integrator and draw frequency response
2. To design and build Differentiator and draw frequency response
3. To design and build precision rectifier

4. To design and build schmitt trigger and find threshold levels
5. To design and build first order Butterworth low pass filter
6. To design and build first order Butterworth high pass filter
7. To design and build triangular waveform generator using IC 741
8. To design and build Function generator using IC 8038
9. To design and build Astable multivibrator using timer IC 555.

Assignments:

1. Design of integrator for given frequency and its practical implementation using IC741.
2. Design of Differentiator for given frequency and its practical implementation using IC741.
3. Design of Schmitt Trigger for given frequency and its practical implementation using IC741.
4. Design of LPF and HPF for given cutoff frequency and its practical implementation using IC741.
5. Design of Astable Multivibrator for given frequency and its practical implementation using IC555.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books: References Books:

1. Ramakant Gayakwad, Op Amp & IC's, PHI
2. D. Roy Choudhari, Liner Integrated Circuits, PHI

References Books:

1. K. R. Botkar, Integrated Circuits, khanna Publishers.
2. Clayton, Integrated Circuits, MGH

Note: Topics added in Unit –IV and V and shown in Italian font



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B.Tech (E&TC) Sem:- IV

SUBJECT: - Applied Electronic Circuits

Lecture: 4 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW &Practical.: 50

marks

Course prerequisites:

- Knowledge of linear circuit theory
 - Basic concept of BJT
-

Course objective:

1. To make student understand analysis of multistage transistor amplifier.
 2. To make student understand a practical approach of design and analysis of feedback amplifiers ,power amplifiers and oscillators
 3. To make student understand analysis and design of voltage regulators.
 4. To make student understand the behavior of high frequency BJT amplifiers
-

Course Outcomes: On successful completion of this course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier and power amplifier and oscillators
3. Analyze and design voltage regulators.
4. Characterize behavior of high frequency BJT amplifiers.

Contents:

Unit-I

Cascade amplifiers

(08hours)

Need of Multistage amplifiers, Parameter evaluation such as R_i , R_o , A_v , A_i & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier

Unit-II

Negative Feedback amplifiers

(08 hours)

Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.

Unit-III

Power amplifiers

(08 hours)

classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis

Unit-IV

Oscillators

(08 hours)

Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator

Unit-V

Regulators

(08 hours)

Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator,

shunt regulator Study and design of regulators using IC's :78XX,79XX,723,LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.

Unit-VI

High frequency amplifiers

(08hours)

High frequency T model. Common base short circuit current frequency response ,alpha cut-off frequency ,CE short circuit current frequency response, high frequency hybrid π CE model, Amplifier response taking into account source and load resistances.

List of Experiments:

1. CE two-stage amplifier with capacitive coupling
2. Voltage series and current series feedback amplifiers
3. Voltage shunt and current shunt feedback amplifiers
4. Class A,B,C power amplifiers.
5. Class B/AB push – pull/ Complementary Symmetry power amplifier.
6. Class A transformer coupled amplifier
7. RC Oscillators - phase shift and wien bridge
8. LC oscillators – Hartley, Colpitt
9. Linear voltage regulators – series regulator using series pass transistor, shunt regulator using zener diode
10. Fix voltage regulators using IC 78XX &79XX, Adjustable voltage regulators using IC LM317

Assignments:

1. Artwork & layout preparation for any one circuit from above mentioned experiment list.
2. Simulation of the same circuit using Multisim.
3. Design & assemble simulated circuit on the Cu clad PCB.
4. Physical verification of the performance parameters for the designed PCB.
5. Presentation based on comparative analysis of the simulated results and physically verified results for the same circuit.
6. Report submission on the same kit with special components datasheets.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. “Electronic devices and circuits” by S. Salivahanan, Suresh Kumar Vallavaraj, Mc Graw Hill Publication
2. “Electronic devices and circuits “by Millaman Halkies ,TMH publication
3. “Integrated Electronics”, by Millman J and Halkias .C., TMH publication

Reference Books:

1. “Electronic Devices and Circuits “by Allen Mottershed- PHI Publication
2. “Electronic Devices and Circuits “by J.B. Gupta-KATSON educational series books
3. Microelectronic Circuits Theory and applications “by Adel S. Sedra, Kenneth C. Smith- Oxford
4. “Microelectronics “by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
5. Electronic Principles by Albert Malvino and David J Bates, 7 edition, Tata McGraw Hill
6. Basic Electronics by Zbar, Malvino and Miller, 7 edition, Tata McGraw Hill



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B.Tech (E&TC) Sem:- IV

SUBJECT: - Control System Engineering

Lecture: 3 hours/week

Practical: 2 hours/week

Tutorial : 1 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

Course prerequisites:

- Basic knowledge of signals.
- Basic mathematical tools like Laplace transform.
- Basic knowledge of software like MATLAB.

Course objective:

This course provides in depth knowledge of the various control systems. Also it introduces the stability of system, transducers, controllers etc.

Course Outcomes: On successful completion of this course, students will be able to

1. Identify various control systems and determine the 'Transfer Function' of a system using block diagram reduction technique and signal flow graph.
2. Measure various Non-electric quantities such as displacement, temperature, angular speed, acceleration etc using suitable transducer.
3. Determine the error in various control systems.
4. Evaluate the stability of a system using Routh's Stability Criterion, root locus and different graphical methods like Bode plot and polar plot.
5. Compare various control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID.

Unit I

Introduction to Control System

(06 Hours)

Classification of Control System, control problem, Feedback and Non-feedback Systems, Transfer Function, Block diagram and signal flow graph analysis, Mathematical models of physical system- Electrical & Mechanical System.

Unit II

Transducers

(06 Hours)

Characteristics, types of transducers, RTD, Thermocouple, Thermister, capacitive transducer, LVDT, strain gauge, flow-meters and level measuring instruments.

Unit III

Time Domain Analysis

(06 Hours)

Time response of first order & second order system using standard test signal, steady state errors and error constants, Root locus techniques- Basic concept, rules of root locus, application of root locus techniques for control system

Unit IV

Stability

(06 Hours)

Concept of stability, necessary conditions for stability, Hurwitz and Routh stability criteria, and stability of system modeled in state variable form, root locus techniques Effect of Poles and Zeros on the System Stability.

Unit V

Frequency Domain Analysis

(06 Hours)

Relationship between time & frequency response, Polar plots, Bode plot, stability in frequency domain, Nyquist stability criterion.

Unit VI

Controllers and Compensators

(06 Hours)

Control actions – On/Off, P, PI, PD, PID. PLC Architecture, Introduction to Ladder Diagram, Types of Compensators, Lead, Lag, Lead-Lag Compensators

List of Experiments:

1. Unit Step and Impulse response of the Transfer function using MATLAB.
2. Transient response of second order system
3. To draw Root Locus theoretically and verify it using MATLAB.
4. To draw Bode plot theoretically and verify it using MATLAB.
5. Magnitude and phase plot of Lead network.
6. Magnitude and phase plot of Lag network.
7. To Study characteristics of temperature transducer.
8. To Study characteristics of LVDT for displacement measurement.
9. Study of Strain gauge.
10. To study architecture of PLC.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. I.J. Nagrath, M.Gopal “Control Systems Engineering”, 5th Edition, New Age International Publication
2. Schaum’s Series book “Feed back Control Systems”.
3. Les Fenical “Control Systems”, 1st Edition, Cengage Learning India.

4. R. Anandanatarajan, P. Ramesh Babu , “Control Systems Engineering”, Scitech Publications

Reference Books:

1. Norman S. Nise “Control Systems Engineering”, 4th edition, Wiley edition.
2. Samarjeet Ghosh, “Control Systems Theory & Applications”, 1st edition, Pearson education.
3. S.K. Bhattacharya, “Control Systems Engineering”, 1st edition, Pearson education.
4. Hackworth, “Programmable Logic Controller”, 1st edition, Pearson education.

Assignments:

- Collaboration and discussion is encouraged on home works.
- The submitted MATLAB projects and all take-home quizzes must be individual work.
- Late take-home quizzes/assignments will be accepted, but will be penalized. Some homework problems for each chapter will be assigned but not graded.
- Take-home quizzes, when assigned, will generally be handed out on given date.
- Questions can be directed to the instructor during the tutorial or during office hours.
- In total, some take-home quizzes and a few MATLAB assignments will be assigned.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B.Tech (E&TC) SEM:- IV

SUBJECT: - Analog Communication System

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Oral: 50 marks

Course prerequisites:

- Basic knowledge of signals and systems.
- Basic mathematical tools like fourier series & transform

Course objective:

- 1.To introduce to student essential components of communication system and emphasize need of modulation.
- 2.To make student recognize concept of noise and its effects.
- 3.To make student understand amplitude & frequency modulation and demodulation and its mathematical background.
- 4.To make student understand working of radio receivers.

Course Outcomes:On successful completion of this course, students will be able to

1. Describes basic components of communication system and explains need of modulation.
2. Describes concept of noise and also recognizes its effects.
3. Describes amplitude and frequency modulation and demodulation and can do analysis in Time and frequency domain.
4. Describes components of communication receiver system.

Contents:

Unit-I

Introduction to Communication Systems (4 Hours)

Review of signals and systems, Frequency domain of signals, Block schematic of communication system, types of communication channels, base band signals, RF bands, Necessity of modulation.

Unit-II

Noise (6 Hours)

Types of noise, External noise, Internal Noise, Noise calculations, signal to noise ratio, noise figure, and noise temperature.

Unit-III

Amplitude Modulation (8 Hours)

Amplitude Modulation, low level and high level transmitters, Frequency spectrum of AM wave, Representation of AM, power relations in AM, Generation of AM, DSB suppressed carrier (DSBSC)-modulator, Single Side Band (SSB):-Principle, Filter method, phase shift method and third method, Independent sideband (ISB) and Vestigial Side Band (VSB) principles and transmitters, Diode detector, practical diode detector, and square law detector. Demodulation of DSBSC, Demodulation of SSBSC.

Unit-IV

Angle Modulation (6 Hours)

Basic concept, mathematical analysis, frequency spectrum of FM wave, sensitivity, phase deviation and modulation index, frequency deviation and percent modulated waves, bandwidth requirement, deviation ratio, Narrow Band FM, and Wide Band FM. Varactor diode modulator, FET reactance modulator, stabilized reactance modulator- AFC, Direct FM transmitter, indirect FM Transmitter, pre-emphasis and de-emphasis. Amplitude limiting, FM demodulators.

Unit-V

TRF and Super Heterodyne Radio Receiver

(6 Hours)

Block diagram of AM and FM Receivers, TRF receiver, Super heterodyne Receiver, Performance characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection. IF Amplifiers. Tracking, AGC, Mixers.

Unit -VI

Pulse Analog Modulation

(6 Hours)

Pulse modulation. Sampling process, Sampling Theorem for low pass and band pass signals, Nyquist criteria ,

Sampling techniques, aliasing error, and aperture effect. PAM, PWM, PPM generation and detection. TDM and FDM.

List of Experiments (Minimum 08):

1. Study of Amplitude Modulation and Demodulation.
2. Study of Frequency Modulation and Demodulation
3. Study of SSB Modulation & Demodulation.
4. Analysis of standard signals (square and triangular) and Modulated signals (all types of AM, FM) using spectrum analyzer.
5. Sampling And Reconstruction.
6. Study of Pulse Amplitude Modulation (PAM.)
7. Study of Pulse Width Modulation.(PWM)
8. Study of Pulse Position Modulation.(PPM)
9. Study of PAM-TDM.
10. Study of Super heterodyne (AM) Receiver.

Assignments:

1. Discussion is encouraged on home works of Analog Signal Transmission.
2. Design PCB of Modulation and Detection KIT.
3. SSB, DSBSC & VSB Modulation and Detection using Hardware.
4. AM, FM & Superhetrodyne Receivers.
5. PAM, PWM, PPM Modulation and Detection.
6. Visit to Radio station.

(Late take-home quizzes/assignments will be accepted, but will be penalized.)

Content Delivery Methods:Chalk & talk, Power point presentation.

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:-

1. George Kennedy 'Electronics Communication System'- IVth Edition-Tata McGraw Hill Publication.
2. B.P.Lathi 'Modern Digital and analog Communication System' Oxford University press.

Reference Books:-

1. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill.
2. Dennis Roddy, John Coolen.'Electronics Communications 'IVth Edition- Pearson Education



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Department of Electronics and Telecommunication

Class: B.Tech (E&TC) Sem:- IV

SUBJECT: - Data structures and Files

Lecture: 2 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Oral: 50 marks

Course prerequisites:

- Basic Knowledge in C programming.

Course objective:

This course provides in depth knowledge of the various types of data structures and various algorithms. Also it introduces the concept of linked list, stack, queues, graph and tree.

Course Outcomes: On successful completion of this course, students will be able to

1. Write a program involving pointers and structures.
2. Write a program involving search and sorting techniques.
3. Write a program using linked and double linked lists.
4. Implement stacks and queues involving linked list.
5. Perform operations on a tree using linked lists.
6. Find the shortest path in a given graph.

Contents:

Unit-I

C Programming Revision (5 Hours)

Pointers, Arrays, Single and Multi-Dimensional arrays, Row major and Column Major, Arrays and polynomials, Structures ,Unions, Call by Value ,Call by Reference , Passing arrays ,Passing a function to function, Pointer to function ,Pointers and Structures.

Unit-II

Data Structure and Analysis of algorithms. (4 Hours)

Introduction to data structure, Data representation, Abstract Data types, Primitive data types, Data structure and data types, Differences between data types. Program design. Algorithms and different approaches to designing an algorithm, Complexity, Big O notation, algorithm analysis .Recursion. Sorting Bubble sort, Selection sort, Quick sort, Merge sort, Insertion sort.

Unit-III

Linked Lists (4 Hours)

Definition, operations on linked list, Reversing the links, Merging of linked lists, Sorting the linked list, Circular Linked list, Recursive operation on linked list, Doubly linked list, Linked list and Polynomials,

Unit-IV

Stack and Queues (3 Hours)

Operation on stacks, Stack as an array, Stack as a linked list, Application of stack, Infix to prefix conversion, Infix to postfix conversion, Postfix to prefix conversion, Postfix to infix conversion.

Representation of Queue as an array, Queue as an linked list, Circular Queue, Priority queue

Unit-V

Tree

(3 Hours)

Binary tree, Linked and array representation of Binary tree, Binary search tree, Operation: Searching of a Node in a Binary tree, Insertion of a node in binary tree, deletion from a binary tree. Threaded binary tree, Forest. AVL trees

Unit-VI

Graphs

(3 hours)

Definition ,Adjacent vertices and Incident edges, graph representation, adjacency list, depth first search ,breadth first search, Spanning tree, Kruskal.s Algorithm, Shortest path algorithm, Dijkstra.s algorithm.

List of Experiments:

1. Program to create & manipulate database using structure.
2. Program to add two polynomial using array of structure.
3. Program to implement primitive operation on Sequential file.
4. Program to search for record from a given list of records stored in array using
 - i) Linear search
 - ii) Binary search
5. Program to sort an array of names using
 - i) Bubble sort
 - ii) Insertion sort
 - iii) Quick sort
6. (a) Program to implement following operation on singly linked list:
 - i) Create
 - ii) Delete
 - iii) Insert
 - iv) Display
 - v) Search(b) Program to add two polynomials using linked list.
7. (a) Program to implement stack using:
 - i) Array

- ii) Linked list
 - (b) Program to convert an infix expression to postfix expression & evaluate the resultant expression.
8. Program to Implement Queue using: (i) Array (ii) linked list
9. Program to create a Binary search tree & Perform following primitive operation on it:
- i) Search
 - ii) Delete
 - iii) Traversals (inorder, pre-order, post-order -recursive)
 - iv) Non-recursive in order traversal
10. Program to create a graph using adjacency list & traverse it using BFS & DFS methods

Assignments:*

1. write a c program to print a 100 year calendar.
2. Write a c program to find color code of a resistor.
3. case study of following topics
 - a> Chatting Applications (WhatsApp and true Caller)
 - b> Origin of programming languages
4. library assignments: Comparison of Object oriented programming.
5. Any of the lab experiments.
6. PPT presentation by students.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. "Data structure using C" ISRD group, TMH.
2. "Data Structure through C", Yashwant Kanetkar, BPB Publication.

Reference Books:

1. "Data structure using C" AM Tanenbaum, Y Langsam and MJ Augustein, Prentice Hall India.
2. "Data structure and Algorithm Analysis in C" Weiss, Mark Allen Addison Wesley.
3. "Data structure – A Pseudocode Approach with C", Richard F Gilberg Behrouz A. Forouzan, Thomson
4. "Let us C", Yashwant Kanetkar, BPB Publication.

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B.Tech (Electronics & Telecommunication) Sem – V (2014 Course)

Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	Theory
	L	P	T	End Semester Exam	Continuous Assessment			TW& PR	TW& OR		
					Unit test	Assignment	Attendance				
Sensors and Actuators	4	2	0	60	20	10	10	50	-	150	4
Instruments & Control System	3	2	0	60	20	10	10	-	50	150	3
Communication	3	2	0	60	20	10	10	-	50	150	3
Engines & Machines	3	2	0	60	20	10	10	-	50	150	3
Genetic Engineering	3	0	1	60	20	10	10	-	-	100	4
Skill Development- V	4	0	0	100	-	-	-	-	-	100	4
Total	20	8	1	400	100	50	50	50	150	800	21

Optional Subject

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme					
		L	P	T	ESE	Continuous Assessment			Practical	
						Unit Test	Attendance	Assignment	TW PR	TW OR
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B.Tech (Electronics & Telecommunication) Sem – VI (2014

Course)

Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	Theory
				End Semester Exam	Continuous Assessment			TW& PR	TW& OR		
	L	P	T		Unit test	Assignment	Attendance				
Digital Processing	4	2	0	60	20	10	10	-	50	150	4
Systems	3	2	0	60	20	10	10	-	50	150	3
	3	2	0	60	20	10	10	50	-	150	3
Theory and Antennas	3	2	0	60	20	10	10	-	25	125	3
Theory and Coding	3	0	0	60	20	10	10	-	-	100	3
Circuit Design&	0	2	0	-	-	-	-	-	25	25	0
Skill Development-	4	0	0	100	-	-	-		-	100	4
	20	09	0	400	100	50	50	50	150	800	20

Credits of Sem- V: 25

Credits of Sem- VI: 25

Total Credits:50

**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

B.Tech (E&TC) Sem- V

SUBJECT: - Electronic Instruments and Measurement System

Teaching Scheme

Lecture: 3 Hours/Week

Marks

Practical: 2 Hours/ Week

Marks

Marks

Examination Scheme

End Semester Exam: 60

Continuous Assessment: 40

TW & OR: 50

Credits: 04

Course Prerequisites:

- Fundamentals of instrumentation
- Signal conditioning units such amplifier, attenuator.

Course Objectives:

- Electronic Instruments and measurements include all type of instruments which will help direct measurement of electronic, electrical, and communication parameters.
- It is also useful for virtual implementation of electronic, electrical, and communication parameters using LABVIEW software. So the subject is useful for test and measurement industries to verify quality of product.

Course Outcomes: On successful completion of this course, students will be able to

1. Describe fundamentals of instrumentation and measurements.
2. Classify different electronic instruments according to its usage.
3. Analyze Universal Counter for the measurement of time, frequency, ratio and period with high frequency measurement techniques.
4. Describe various types of Oscilloscope & their functions.
5. Specify and perform communication measurements using various analyzers.

6. Specify functioning, specifications, and applications of different signal analyzing instruments.
7. Describe the operations involved in computer controlled test measurement techniques.

UNIT I

Fundamentals Of Instrumentation And Measurements (6 Hours)

Necessity of Electronic Measurements, Block diagram of Electronic Measurement system, Concept of static and dynamic properties of measurements, Types of errors, Voltage, current, resistance measurement using DMM, Units and Standards, Calibration, Auto zeroing, Auto ranging.

UNIT II

Basic Instruments (6 Hours)

Working principle, types, methods & applications of following Instruments: True RMS Meter, Vector voltmeter, Vector impedance meter, LCR-Q meter with important specifications.

UNIT III

Frequency Generation And Measurements (6 Hours)

Standard frequency generators, Types of frequency generators, Frequency, Ratio, Time interval, Period & Multiple Period Averaging using digital universal frequency counter, High frequency measurements and its techniques.

UNIT IV

Oscilloscope (6 Hours)

Overview of analog CRO, Dual/Multi-trace CRO, Various CRO probes & its applications; Digital Storage Oscilloscope, DSO Design considerations and specifications, DSO functionalities / Measurements such as FFT; Math Functions; Automatic Measurements, Curve Tracer.

UNIT V

Communication Measurements (6 Hours)

Basics of Communication measurements at transmitter – receiver, sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc; Network analyzer- system element, measurement accuracy, Types of network analyzers, S-parameter measurement using network analyzer, EMI measurements and suppression techniques.

UNIT VI

Signal Analyzers And Computer Controlled Test Measurements (6 Hours)

Harmonic and wave analyzer, Distortion factor meter, Spectrum analyzer -FFT analyzer, Logic analyzer, Protocol analyzer, Computer controlled test measurements, Virtual measurements and its applications, IEEE 488, PCI/PCI express, buses, Introduction of Lab view software.

List of Experiments: (Any 8 experiments should be conducted from following list.)

1. Voltage /current Measurements using CRO and DMM.
2. Voltage /current measurement of rectifier circuit using True RMS meter.
3. Measurement of resistance, inductance, capacitance and quality factor for any RLC circuit using LCR-Q Meter
4. Frequency, Period and frequency Ratio measurements using Digital Universal Frequency Counter.
5. Measurement and analysis of digital signals using Logic Analyzer.
6. Basic usage of Spectrum Analyzer for RF spectrum generation of sin, square and triangular wave.
7. Measurement of total harmonic distortion using Distortion Factor Meter.
8. Verification of diode and transistor characteristic using Curve Tracer.
9. Digital Storage Oscilloscope Measurements for FFT analysis, capturing transients, storing and retrieving different signals, and various operations like add, subtract and math functions.
10. Measurement of S parameters of transmitter and receiver using Network analyzers.

List of Assignments:

1. Preparation of basic block schematic of any instrument with design considerations and their justification. (Paper design)
2. Select any sensor or transducer. Find its important specifications. Select instrument for the measurement of those important specifications. (Case Study)
3. How quality or standard of any instrument is specified? Which are the important global parameters that can affect quality of measurement? (Presentation)
4. Search and enlist various testing methodologies, instruments and their important aspects. (Case Study)
5. Design any measurement system on Multisim, LABVIEW Software. (Report with design and result)
6. Design a code in C or C++ for any kind of electronic system. (Program with outcome)

• **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

• **Assessment Methods:**

- | | |
|--------------------------|-------------------------|
| 1. Unit Test | 2. Assignments |
| 3. Continuous Assessment | 4. End term Examination |

Text Books:

1. Cooper Helfric, "Electronic Instrumentation & Measurement Techniques", Prentice Hall Publication
2. H. S. Kalsi, "Digital Instrumentation", Tata McGraw Hill

Reference Books:

1. Oliver Cage, "Electronic Measurements and Instrumentation", Tata McGraw Hill
2. Clyde F. Coombs "Electronic Instrumentation Handbook" McGraw Hill



Bharati Vidyapeeth Deemed University, College of Engineering, Pune

Department of Electronics and Telecommunication

Class. B. TECH (E & TC) SEM.-V

SUBJECT: - Digital Communication

Teaching Scheme

Lecture: 3 Hours/week

Marks

Practical: 2 Hours/week

Marks

Marks

Examination Scheme

End Semester Exam: 60

Continuous Assessment: 40

TW & OR: 50

Credits: 04

Course Prerequisites:

- Basic knowledge of signals and systems.
- Basic mathematical tools like fourier series, fourier transform probability theory

Course Objectives:

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand and analyze the signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand concept of spread spectrum communication system.

Course Outcomes: On successful completion of this course, students will be able to

1. Classify analog to digital conversion techniques in communication system.
2. Apply mathematics knowledge to solve problems based on probability theory for Random Signals.

3. Understand bandwidth utilization schemes in digital communication systems.
4. study performance of communication system in presence of noise
5. Understand different multiplexing techniques.
6. understand detection and performance analysis of digital signals

UNIT-I

Analog To Digital Conversion

(6 Hours)

Pulse Modulation-Sampling process, Quantization, Pulse Code Modulation (PCM), Companding, Noise considerations in PCM Systems-Delta modulation, linear prediction, differential pulse code modulation, Adaptive Delta Modulation, LPC Speech synthesis.

UNIT-II

Random Processes

(6 Hours)

Introduction to Random Variables, Mathematical definition of a random process, Stationary processes, Mean, Correlation & Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density, Gaussian process, noise, Narrow band noise, Representation of narrowband noise in terms of in phase & quadrature components

UNIT-III

Line Coding And Digital Multiplexing

(6 Hours)

Line Coding & its properties. NRZ & RZ types, signaling format for unipolar, Polar, bipolar (AMI) & Manchester coding and their power spectra. Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Inter-symbol interference, Eye Patterns, Equalization.

UNIT-IV

Digital Carrier Modulation & Demodulation Techniques

(6 Hours)

Introduction, Amplitude Shift Keying (ASK), ASK Spectrum, ASK Modulator, Coherent ASK Detector, Noncoherent ASK Detector, Frequency Shift Keying (FSK), Frequency Spectrum of FSK, FSK Transmitter, Non-coherent FSK Detector, Coherent FSK Detector, Binary Phase Shift Keying, Binary PSK Spectrum, BPSK Transmitter, Coherent PSK Detection, Quadrature Phase Shift Keying (QPSK), QPSK Demodulator, M-Ary PSK, Quadrature Amplitude Modulation (QAM); MQAM transmitters and receivers, Band Width efficiency, Carrier Recovery; Differential PSK, DPSK transmitter and receiver, Minimum Shift Keying (MSK)

UNIT-V

Data Transmission

(6 Hours)

Base band signal receiver, probability of error, the optimum filter, and white noise-the matched filter, probability of error of the matched filter, coherent reception: correlation, application of coherent reception in PSK and FSK. Correlation receiver for QPSK.

UNIT-VI

Spread Spectrum System

(6 Hours)

Spread Spectrum Modulation- Pseudo- noise sequences, a notion of spread spectrum, Direct sequence spread spectrum with coherent binary phase shift keying, Signal space Dimensionality and processing gain , Probability of error , Frequency –hop spread spectrum ,Maximum length and Gold codes,TDMA,FDMA,CDMA.

List of experiments (Any 8 experiments should be conducted from following list.)

1. To perform Sampling and reconstruction of signal.
2. To perform Pulse Code Modulation (PCM).
3. To observe Delta modulated signal with staircase approximation.
4. To compare Delta Modulation (DM) System and Adaptive Delta Modulation (ADM) system
5. To perform Differential Pulse Code Modulation (DPCM).
6. To draw and observe practically Different Data Formats
7. To perform Amplitude Shift Keying (ASK) modulation and demodulation.
8. To perform Binary Phase Shift Keying (BPSK) modulation and demodulation.
9. To perform Binary frequency Shift Keying (BFSK) modulation and demodulation
10. To perform Quadrature Phase Shift Keying (QPSK) modulation and demodulation.
11. MATLAB simulation of digital modulation techniques.

List of Assignments

1. To solve problems on statistical parameters of random variables
2. To study Pulse digital modulation techniques
3. To draw different Line coding formats for given data
4. To study Digital carrier modulation
5. Derive Probability of error
6. To study Spread spectrum techniques

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**
 2. Unit Test
 2. Assignments
 3. Continuous Assessment
 4. End term Examination

Text Books:

1. Simon Haykins, "Communication Systems" John Wiley, 4th Edition, 2001
2. Taub& Schilling, "Principles of Digital Communication "Tata McGraw-Hill" 28th reprint, 2003

Reference books

1. John G. Proakis, "*Digital Communication*", McGraw Hill Inc 2001.
2. Simon Haykin, "Digital Communication Systems", John Wiley & Sons, Fourth Edition.
3. A.B Carlson, P B Crully, J C Rutledge, "Communication Systems", Fourth Edition, McGraw Hill Publication.

**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

B.Tech (E&TC) Sem- V

SUBJECT: Microprocessors and Microcontrollers

Teaching Scheme

Lecture: 4 Hours/week

Practical: 2 Hours/week

Examination Scheme

End Semester Exam: 60 Marks

Continuous Assessment: 40 Marks

TW & PR: 50 Marks

Credits: 05

Course Prerequisites:

- Students should have basic knowledge of 'Digital Electronics'.
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Course Objectives:

- To make students familiar with the basic blocks of microprocessor and microcontroller devices in general.
- To familiarize students with architecture and features of typical Microcontrollers.
- To learn interfacing of real world input and output devices and use assembly and high level languages to interface the microcontrollers to various applications

Course Outcomes: On successful completion of this course, students will be able to

1. Differentiate features of microprocessors and microcontrollers.
2. Use Hardware and software tools for microcontrollers.
3. Develop interfacing of microcontrollers with real world devices.

UNIT 1

Introduction To Microprocessors

(8 Hours)

Evolution of Microprocessors, comparison of Microprocessor & Micro controller. Difference between RISC & CISC microcontrollers, Harvard & Von Neumann architectures. Internal architecture of 8 bit Microprocessor 8085, Overview of instruction set, Addressing modes, instruction cycle, Stack and Subroutines, interrupts.

UNIT 2

8051 Microcontroller

(8 Hours)

MCS-51 architecture, family devices & its derivatives. Ports, registers, memory organization, Overview of Instruction set, Addressing modes, Machine cycles and bus timings, timers and its modes, Interrupt structure.

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UNIT 3

Peripheral Interfacing With 8051

(8 Hours)

Serial Communication with RS232, 8051 based system design – Address decoding data memory space Interfacing & Applications –LED, LCD, Stepper motor, DAC/ADC, Sensors, Keyboard. Programming in Embedded C.

UNIT 4

Pic Microcontroller

(7

Hours)

Comparison of Features of different PIC series, PIC 18F architecture, registers, memory Organization, oscillator options, BOD, power down modes and configuration bit settings, Overview of instruction set, Addressing modes.

UNIT 5

Peripheral Interfacing With Pic-I

(8 Hours)

Port structure, interrupts & timers of PIC18F. Interfacing of PIC18F with LED, Seven segment display, LCD and Keypad. Use of timers with interrupts, PWM generation. All programs in embedded C.

UNIT 6

Peripheral Interfacing With Pic-Ii

(9 Hours)

MSSP structure, CCP and ECCP, Study of UART, SPI, I2C, ADC. Interfacing serial port, ADC, RTC with I2C and EEPROM with SPI. Motor Control using PIC. All programs in embedded C.

List of experiments: Any 8 of below given list.

1. Find Largest/ Smallest number in an array in 8085.
2. Multiplication/ Division of 8-bit numbers in 8085.
3. Generate BCD up/ down counter in 8051.
4. Square wave generation using timers in 8051.
5. Serial Communication using 8051.
6. LCD interfacing with 8051.
7. Stepper motor interfacing with 8051.
8. Keyboard interfacing with 8051.
9. ADC/DAC interfacing with 8051.
10. Serial Communication using PIC.
11. LCD interfacing with PIC.
12. Stepper motor interfacing with PIC.
13. Keyboard interfacing with PIC.
14. Seven segment display interfacing with PIC.

List of Assignments:

1. Case study of any one of the latest processors.
2. Mini project using 8051/PIC microcontroller on topics such as design of Digital Multimeter, design of DAS system, DC Motor control using PWM, Frequency counter etc.(Simulation only)

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**
 3. Unit Test
 2. Assignments
 3. Continuous Assessment
 4. End term Examination

Text Books:

1. Mazidi, “8051 microcontroller & embedded system” 3rd Edition ,Pearson
2. Mazidi, “PIC microcontroller & embedded system” 3rd Edition ,Pearson

Reference Books:

1. Ajay V. Deshmukh, “Micro-controllers - Theory and Applications”, Tata McGraw Hill.
2. Kenneth J. Ayala, “The 8051 Micro-controller – Architecture, Programming & Applications”, Penram International & Thomson Asia, Second Edition.
3. John B. Peatman, “Design with PIC Micro-controllers”, Pearson Education Asia, Low Price Edition.
4. 18F xxx reference manual



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

SUBJECT: - Electromagnetic Engineering

Teaching Scheme

Lecture: 3 Hours/Week

Marks

Tutorials: 1 Hour/Week

Examination Scheme

End Semester Exam: 60

Continuous Assessment: 40 Marks

Credits: 04

Course Objectives

- To provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields.
- To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles such as fiber optics and electronic electromagnetic structures.

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Course Outcomes

After the successful completion of the course student should be able to:

1. Apply vector calculus to static electric-magnetic fields in different engineering situations.
2. Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
3. Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.

4. Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications.

5.

UNIT 1

Vector Analysis (06 Hours)

Introduction and significance of electromagnetic fields, introductory vector analysis and coordinate systems, concepts of gradient, divergence, curl,

UNIT 2

Electrostatic Field (06 Hours)

coulomb's law & electric field, field due to distributed charges, flux density, gauss's law , divergence theorem, electrostatic potential, potential gradient, electric dipole, electrostatic energy density, boundary conditions for electrostatic field.

UNIT 3

Steady Magnetic Field (06 Hours)

Biot-Savart's law, Ampere's circuital law, Stroke's Theorem, Magnetic flux density & Vector magnetic potential, Current carrying conductors in magnetic fields, Torque on loop, Energy stored in magnetic field, Boundary conditions for magneto static field.

UNIT 4

Time Varying Fields and Maxwell's Equations (06 Hours)

Continuity equations for static conditions, displacement current, Faraday's law, Inconsistency of Ampere's law, Maxwell's equations, Comparison of field & circuit theory. Energy stored in Electric and magnetic field time varying fields.

UNIT 5

Propagation of Electromagnetic Waves (06 Hours)

Wave propagation in dielectric & conducting media, wave equations for sinusoidal time variations, Characteristics of plane wave in pure dielectric media and conducting media. Reflection of electromagnetic wave for normal incidence, Polarization, Pointing theorem, Skin depth, phase velocity and group velocity, Boundary conditions

UNIT 6

Transmission Lines and waves theory (06 Hours)

Types of Transmission lines, Transmission line equation, Transmission line parameters, the terminated uniform transmission line, Reflection coefficient, VSWR, group velocity, phase velocity. Smith chart and impedance matching Technique, attenuation of waves, EMI- EMC.

List of Assignments:

1. Coordinate Systems.
2. Case Study of Electromagnetic fields.

3. Application note on- Electrostatic Discharge
4. Application note on- Electromagnetic interference and Compatibility
5. Analysis of transmission lines using Smith Chart.

List of Tutorials

1. Vectors & coordinate systems
2. Application of Stoke's theorem.
3. Application of Gauss's law.
4. Energy stored in capacitor.
5. Application of Poission's and Laplace's equations.
6. Applications of Ampere's law
7. Boundary conditions for electrostatic fields.
8. Boundary conditions for magnetic fields.
9. Poynting theorem and their applications.
10. Applications of Smith Chart.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

4. Unit Test	2. Assignments
3. Continuous Assessment	4. End term Examination

Text Books –

1. Matthew N. O. Sadiku, "Principles of Electromagnetics", 4th Edition, Oxford University Press.
2. John D. Kraus "Electromagnetic", McGraw Hill.

Reference Books:

1. William Hye "Electromagnetic Engineering", McGraw Hill.
2. Edminister J.A, Electromagnetics, Tata McGraw-Hill.
3. R.K Shevgaonkar, Electromagnetic waves, Tata McGraw-Hill.
4. S Salivahanan & S Karthie, "electromagnetic Field Theory" Vikas Publishing House Ltd.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

Class: B. TECH (E & TC) SEM-IV

SUBJECT: - Power Devices and Machines

Teaching Scheme

Lecture: 3 Hours/week

Marks

Practical: 2 Hours/week

Marks

Marks

Examination Scheme

End Semester Exam: 60

Continuous Assessment: 40

TW & OR: 50

Credits: 04

Course Prerequisites:

- Basic knowledge of electronic devices, electrical technology.
- Basic mathematical tools like Integration and Derivatives, Partial Derivatives Fourier series.

Course Objectives:

- To introduce to students the theory and applications of power electronics systems for high efficiency, renewable and energy saving conversion systems,
- To prepare students to know the characteristics of different power electronics switches and selection of components for different applications.
- To develop students with an understanding of the switching behavior and design of power electronics circuits such as AC-DC, AC-AC and DC-DC converters.

Course Outcomes:

After successfully completing the course students will be able to:

1. Explain construction, switching characteristics and justify the selection of power devices and thyristors.

2. Explain operating principle and suggest protection circuit for power devices and thyristors.
3. Explain construction and operating principle of DC machines and AC machines (1 ϕ and 3 ϕ).
4. Learn the role of Power Electronics in utility-related applications which are becoming extremely important.
5. Understand, simulate and design single-phase and three-phase thyristors converters.

UNIT I:

Power Diodes And Transistors

(6 Hours)

Power Diodes: Construction, Switching characteristics, Line frequency diodes.

Power BJT: Construction, Operation, Steady state characteristics, switching characteristics. Switching limits, Break down voltages, Second breakdown, Thermal runaway.

Power MOSFET: Construction, Operation, Static characteristics, Switching characteristics, Forward and reverse bias Safe Operating Area, Parallel operation.

IGBT: Construction, Operation, Steady state characteristics, Switching characteristics, Safe operating area.

Gate drive circuits for Power BJT, MOSFET & IGBT.

UNIT II:

Thyristors

(6 Hours)

SCR: Construction, Operation, Transistor analogy, Static characteristics, Switching characteristics. SCR ratings, Gate Characteristics, Triggering requirements, Triggering techniques, Isolation techniques.

TRIAC: Construction, Operation, Steady state characteristics, triggering modes.

GTO: Construction, Operation, Turn off mechanism, Applications.

UNIT III:

Power Converters – I

(6

Hours)

Controlled Rectifiers (AC – DC converters): Concept of line & forced commutation Single phase Semi & Full converters for R & R-L loads, Effect of free-wheeling diode,

Three phase Semi & Full converters for R load.

AC – AC converters: Single phase AC voltage controller for R & R-L loads, three phase AC voltage controller for R load.

(Qualitative analysis only)

UNIT IV:

Power Converters – II

(6 Hours)

DC - DC converters: DC Chopper: - Working principle of step down chopper, control strategies, step down chopper for R-L load, step up chopper; SMPS.

DC- AC converters: Inverter: - Working principle of single phase, Bridge inverter for R & R-L load, three phase bridge inverter for R load, Harmonic reduction using PWM technique.

(Qualitative analysis only)

UNIT V:

Introduction to Motors

(6 Hours)

DC motors, AC Motors, Special Purpose Motors,

Induction Motor, Universal Motor, Stepper Motor, Servomotors etc.

(Qualitative analysis only)

UNIT VI:

Industrial Applications

(6 Hours)

Introduction to drives, speed control techniques, illumination and lighting control protocol, Electric Heating, Electric Welding, High Voltage DC transmission, UPS- On line and off line, LED drives, Solar PV.

List of Experiments: Minimum 6 experiments to be performed from the following List.

1. SCR/TRIAC/ MOSFET/IGBT Characteristics.
2. Triggering circuits and phase control circuits for SCRs/MOSFET Driver Circuits
3. Single phase FW bridge converter feeding DC motor.
4. Three Phase Converter (HW and FW Bridge)
5. Single phase AC Voltage Regulator
6. Chopper (Step up and Step down)
7. Single phase / three phase Inverter with Resistive/Induction Motor load.
8. Simulation of Converter / Chopper using MATLAB/ Lab View/ Multisim.
9. Simulation of PWM Inverter using MATLAB/ Lab View/ Multisim.

List of Assignments:

1. Study of 1- phase AC to DC controlled converter (half controlled and full controlled).
2. Study of 3- phase AC to DC full controlled converter.
3. Study of Thyristor based dc to dc converter (dc chopper).
4. Study of a 3- phase PWM inverter with fixed (50Hz) output frequency and study of a non-PWM type inverter with 120-degree conduction of switches.
5. MOSFET based dc to dc converter (buck, boost and buck-boost types with non-isolated output voltage.)
6. Study of an industrial type fly-back dc to dc converter with isolated and regulated output voltage.
7. Case study of the real time application of electrical systems.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

- | | |
|--------------------------|-------------------------|
| 5. Unit Test | 2. Assignments |
| 3. Continuous Assessment | 4. End term Examination |

Text Books:

1. M. H. Rashid, "Power Electronics circuits devices and applications", PHI 3rd edition, 2004 edition, New Delhi.
2. M. D. Singh & K B Khanchandani, "Power Electronics", TMH, New Delhi.

Reference Books:

1. P.C. Sen, "Modern Power Electronics", S Chand & Co New Delhi.
2. Ned Mohan, T. Undeland & W. Robbins, "Power Electronics Converters applications and design" 2nd edition, John Willey & sons.
3. B. L. Thareja & A. K. Tahreja, "Electrical Technology" Volume 1 & 2, S.Chand Publications.
4. H. Cotton, "Electrical Technology", CBS.
5. Nagrath Kothari, "Electrical Machines", TMH.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) Sem.-VI

SUBJECT: - Digital Signal Processing

Teaching Scheme

Lecture: 4 Hours/week

Practical: 2 Hours/week

Marks

Examination Scheme

End Semester Exam: 60 Marks

Continuous Assessment: 40

TW & OR: 50 Marks

Credits: 05

Course Prerequisite:

- Signals and System

Course Objective:

- To introduce the student to a very broad and advanced topic of Digital Signal Processing (DSP) which is one of the core subjects in the curriculum.
- To teach the student the basic concepts and tools in the field of DSP
- To enable the student to apply knowledge of Digital Signal Processing (DSP) in the fields of Signal Processing, Communication, Speech Processing, Instrumentation, Medical Electronics and research

Course Outcomes: After the successful completion of the course the student will be able to

1. To enumerate the advantages of DSP over processing in analog domain.
2. To be able to find Discrete Fourier Transform of a digital signal.
3. To design a Finite Impulse Response (FIR) Filter given the specifications.
4. To design a Infinite Impulse Response (IIR) Filter given the specifications.
5. To quantify the finite word length effects in the field of DSP.
6. To enumerate the features of a DSP Processor.

UNIT 1:

Introduction

(7 Hours)

Basic elements of DSP and its requirement, Advantages of digital over analog signal processing, z-Transform and its application to the analysis of LTI systems, Discrete

Complex exponentials and their properties, Frequency domain analysis of LTI systems, Frequency response of LTI systems, LTI systems as Frequency selective filters

UNIT 2:

Discrete Fourier Transform

(9 Hours)

Overview of Frequency Analysis of signals, Discrete Time Fourier Transform(DTFT), Discrete Fourier Transform as Sampled DTFT, Properties of DFT, Linear filtering methods based on DFT and IDFT, Goertzel Algorithm, Frequency analysis using DFT. FFT algorithms, Saving in computation achieved by FFT algorithm, Decimation in time and decimation in frequency FFT algorithms, Butterfly computation.

UNIT 3:

FIR Filter Design

(9 Hours)

Advantages and overview of FIR filters, Symmetric & Anti-symmetric FIR filters, Design of FIR filters using windows, Frequency sampling method, Equiripple optimum Chebyshev FIR filter design, Alternation theorem, Design of some special FIR filters: FIR differentiators, Hilbert Transformers and Raised Cosine Filters. FIR filter structures - Direct form, Cascade form and Frequency-Sampling structures.

UNIT 4:

IIR Filter Design

(9 Hours)

Advantages and overview of IIR Filters, IIR Filter design methods - Approximation of derivatives, Impulse invariance, Bilinear transformation. Limitations of the design methods, Designing of Butterworth and Chebyshev Filters, Frequency transformations in analog and digital domain, IIR filter structures - Direct form, Cascade Form, Parallel form structures and Lattice & Lattice-ladder structures

UNIT 5:

Finite Word Length Effects

(7 Hours)

Overview of Finite Word Length Effects, Quantization process and errors, Coefficient quantization effects, Arithmetic round-off errors, Dynamic range scaling, Limit cycles in IIR digital filters, Round-off errors in FFT algorithms, Minimizing the Finite Word Length Effects

UNIT 6:

DSP Processors And Applications Of DSP

(7 Hours)

Need for special purpose DSP Processors, Features of DSP Processors: Harvard and Modified Harvard Architectures, Bus structure, Addressing Modes, Processing Units, Address Generators, Single Cycle Execution. Case study of TMS320C67x DSP processor. Major applications of DSP: DTMF, Spectral Analysis, Musical Sound Processing, Transmultiplexers, Oversampling A/D and D/A converters

List of Experiments

Assignments to be carried out using software such as MATLAB

1) To plot magnitude and phase Spectra of DFT of a given sequence.

- 2) To verify properties of DFT
- 3) To implement filter using overlap add and overlap save method
- 4) To design FIR Filter for given specifications.
- 5) To design IIR Filter for given specifications.
- 6) To observe Finite Word Length Effect in any one application in DSP
- 7) To do Spectral Analysis of a real signal
- 8) To implement Dual Tone Multi Frequency signal generation and detection.
- 9) To implement an FIR Filter on a DSP Processor

List of Assignments

- 1) Write down what changes were brought due to the transition from analog processing to digital processing in any one field such as telephone system or a audio playback system.
- 2) Write down the significance of the contribution by Cooley and Tookey to the field of DSP.
- 3) Justify the need of window function in the design of FIR filter by windowing method.
- 4) What are the limitations of each of the IIR Filter design method?
- 5) Compare the structures used to implement digital filters with respect to Finite word length effects.
- 6) Write down the features of any one commercially available DSP Processor.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

6. Unit Test	2. Assignments
3. Continuous Assessment	4. End term Examination

Text Books

1. J. G. Proakis, D. G. Manolakis, "Digital Signal Processing ", PHI
2. S. K. Mitra, "Digital Signal Processing", TMH

Reference Books

1. D. G. Monolakis, V. K. Ingle, 'Applied Digital Signal Processing', Cambridge University Press

2. A. V. Oppenheim, R. W. Schaffer, "Discrete Time Signal Processing ", PHI
3. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors', TMH


**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

SUBJECT: - Embedded Systems

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End Semester Exam: 60 Marks

Continuous Assessment: 40 Marks

TW & OR: 50 Marks

Credits: 04

Course Prerequisites:

Fundamentals of Computer, Digital Logic Circuits, Computer Organization and Architecture.

Course Objectives:

- To understand need and application of ARM Microcontroller in embedded system.
 - To study the architecture of ARM series microcontroller
 - To understand architecture and features of typical ARM7 & ARM CORTEX-M3 Microcontroller.
 - To learn interfacing of real world input and output devices
-

Course Outcomes: On successful completion of this course, students will be able to

1. Develop Firmware Embedded Systems.
2. Interface the advanced peripherals to microcontrollers.
3. Design embedded system with available resources.

UNIT 1

Introduction to Embedded Systems (4 Hours)

Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Characteristics of Embedded Systems, Hardware and Software components of an Embedded System, Introduction to IDEs. Major Application Areas.

UNIT 2

Introduction to embedded programming & RTOS (8 Hours)

Introduction to embedded data types in embedded C, addressing memory & I/O, I/O functions of embedded C. Examples on Embedded C.

RTOS: Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem.

UNIT 3

ARM7 Based Microcontroller

(8 Hours)

Introduction to ARM processors and its versions: ARM7, ARM9 & ARM11 features, ARM7 data flow model, programmer's model, modes of Operations, Overview of Instruction set.

ARM7 Based Microcontroller LPC2148: Features, Architecture (Block Diagram and Its Description), System Control Block (PLL and VPB divider) , Memory Map, GPIO, Pin Connect Block, timer.

UNIT 4

Interfacing with ARM7

(6 Hours)

Interfacing the peripherals with LPC2148: LED, LCD, GLCD, KEYPAD, GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

UNIT 5

ARM CORTEX Processors

(6 Hours)

Introduction to ARM CORTEX series, improvement over classical series. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications.

ARM-CM3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, GPIO and Pin Connect Block.

UNIT 6

Interfacing with ARM CORTEX M3

(4 Hours)

Interfacing peripherals with LPC1768: RGB LED, Seven Segment, TFT Display, MOTOR control using PWM.

List of experiments: Any 8 of below given experiments.

1. Interfacing LPC2148 with LCD/GLCD
2. UART Interfacing LPC2148 in embedded system (GSM/GPS)
3. Interfacing LPC2148 for internal ADC on interrupt basis
4. Interfacing SD card with LPC2148
5. Interfacing EEPROM with LPC2148 using SPI protocol
6. SRAM interfacing with LPC2148/LPC1768.
7. Interfacing LPC1768 to Seven Segment / RGB LED
8. Generation of PWM signal for motor control using LPC1768

9. Interfacing TFT display to LPC1768
10. Implementing CAN protocol using LPC1768
11. Implementing ETHERNET protocol using LPC1768.
12. Semaphore as signaling and synchronizing in ARM7.
13. Mailbox implementation for message passing in ARM7

List of Assignments:

1. Case study of any one of the latest ARM processors and Power point presentation of the same in class.
2. Survey of CORTEX M3 based controllers, its features and comparison.
3. Design of Firmware Embedded system using LPC 2148 (Simulation only).
4. Design of Firmware Embedded system using LLPC1768 (Simulation only).
5. Case study of any one of the RTOS with examples.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

- | | |
|--------------------------|-------------------------|
| 7. Unit Test | 2. Assignments |
| 3. Continuous Assessment | 4. End term Examination |

Text Books:

3. Rajkaml, “Embedded system-Architecture, Programming and Design”, TMH Publications, Edition 2003
4. Andrew Sloss, Dominic Symes, Chris Wright, “ARM System Developer’s Guide – Designing and Optimizing System Software”, ELSEVIER
5. Joseph Yiu, “The Definitive Guide to the ARM Cortex-M”, Newness, ELSEVIER

Reference Books:

5. LPC 214x User manual (UM10139):- www.nxp.com.
6. LPC 17xx User manual (UM10360) :- www.nxp.com
7. ARM architecture reference manual : - www.arm.com
8. Trevor Martin,"AnEngineer"s Introduction to the LPC2100 series", Hitex (UK) Ltd.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) SEM:-VI

SUBJECT: VLSI Design

Teaching Scheme

Lecture: 3 Hours/Week

Marks

Practical: 2 Hours/Week

Marks

Marks

04

Examination Scheme

End Semester Exam: 60

Continuous Assessment: 40

TW& PR: 50

Credits:

Course Prerequisite

Analog Electronics, Digital Electronics and Semiconductor Physics

Course objectives:

To introduce students to VLSI Design, Fabrication and Testability techniques.

Course Outcomes:

- Ability to design analog and digital VLSI circuits.
- Ability to study fabrication theory and to implement stick diagrams.
- Ability to design and simulate digital circuits using VHDL.
- Ability to learn low power CMOS VLSI design.
- Ability to understand the concepts of Design for Testability.

Unit-I

(06 Hours)

Introduction to VLSI Design– Introduction to VLSI, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity & Locality.

Fabrication of MOSFETs-Introduction, Fabrication Process flow: Basic steps, C-MOS n-Well Process, Layout Design rules, Stick Diagram of NAND, NOR, Inverter

UNIT-II

(06 Hours)

MOS Transistor- The Metal Oxide Semiconductor (MOS) structure, The MOS System under external bias, Operation of MOS transistor, MOSFET Current-Voltage characteristics, MOSFET scaling & small-geometry effects, MOSFET capacitances.

MOS Inverters – CMOS Inverter Characteristics, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.

UNIT-III

Digital VLSI Design-1

(06 Hours)

VHDL Entity-Architecture Concepts, Introduction to various modeling styles of VHDL (Behavioral, Dataflow and Structural), VHDL Basic Elements (Data types, Data objects and Operator), Dataflow Modeling: Example based on dataflow modeling, When-Else and With Select Statement, Structural modeling: Concept of Component .

UNIT-IV

Digital VLSI Design-2

(06 Hours)

Behavioral modeling for digital design, If-else, Loop, Case and Wait Statements. Moore and Mealy FSM Design using VHDL, Overview of PLDs, CPLD and FPGA architecture overview, Modes of configuration.

UNIT- V

Low – Power CMOS Logic Circuits

(06 Hours)

Introduction, Overview of Power Consumption, Low Power Design through Voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits.

UNIT- VI

Design for Testability

(06 Hours)

Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable design Techniques, Scan Based and BIST Techniques

List of experiments:

1. Introduction to Xilinx tools and design of various Gates.
2. Dataflow Modeling -1
 - A) Design Full-adder using dataflow modeling.
 - B) Design 3x8 Decoder using dataflow modeling.
3. Dataflow Modeling-2
 - A) Design 8x3 encoder using when else statement.
 - B) Design 4x1 Multiplexer using with select statement.
4. Structural Modeling-1
 - A) Design a Half adder using Structural modeling.
 - B) Design a 4bit adder using Full adder as component.
5. Structural Modeling-2
Design 8-bit odd parity detector using Structural Modeling. Assume 2i/p X-OR as component.
6. Behavioral Modeling-1
 - A) Implementation of Positive edge triggered D-FF.
- B) Implementation of Positive edge triggered T-FF.
7. Behavioral Modeling-2
 - A) Design a 4bit buffer register.
 - B) Design a 4bit Ring counter using wait statement.
8. FSM Design-1
Design a BCD counter using Moore FSM
9. FSM Design-2
Implement sequence detector 1010 using Mealy machine.
10. Layout Design-1
Introduction to Microwind and design of Inverter.
11. Layout Design-2
Using Microwind, Design NAND and NOR.

List of Assignments:

1. Any one complex Digital VLSI Design Example using VHDL
2. Presentation based on any advanced topics of VLSI Design.
3. Layout design of Ring Oscillator using Microwind

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

- | | |
|--------------------------|-------------------------|
| 8. Unit Test | 2. Assignments |
| 3. Continuous Assessment | 4. End term Examination |

Text Books:

1. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.
2. Douglas Perry, "VHDL: Programming by Example", McGraw Hill, Fourth Edition, 2002.

Reference Books:

1. Neil H.E. Weste, Davir Harris, "CMOS VLSI Design: A Circuits and system perspectives", Pearson Education 3rd Edition, 2004.
2. Charles Roth, Larry Kinney, "Fundamentals of Logic Design", Cengage Learning, Seventh edition, 2014.
3. J. Bhaskar "A VHDL Primer", PHI Learning, Third Edition, 1998.
4. V. Pedroni, "Circuit Design and Simulation with VHDL", MIT Press, Second Edition, 2010

**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) SEM:-VI

SUBJECT: - Microwave Theory and Antennas

Teaching Scheme

Lecture: 3 Hours/Week

Marks

Practical: 2 Hours/Week

Marks

Marks

Examination Scheme

End Semester Exam: 60

Continuous Assessment: 40

TW& OR: 25

Credits: 04

Course Prerequisites:

Students should have basic knowledge of:

- Electromagnetic engineering

Course objective:

- To develop ability to design antenna and understanding of Microwave communication.

Course Outcomes: On successful completion of this course, students will be able

1. To perform wave propagation on a line and Use Smith chart.
2. To understand concepts of Modes and Calculate network parameters.
3. To understand Microwave devices and use them.
4. To calculate antenna parameters.
5. To design different Antenna arrays.
6. To Design Microstrip Antenna.

UNIT 1

Introduction and Transmission Line Theory (6 Hours)

Applications of Microwave Engineering, A Short History of Microwave Engineering, Wave Propagation on a Transmission Line, The Lossless Line, Transmission Line Parameters, Propagation Constant, Group Velocity, Power Flow for the Lossless Coaxial Line, The Combined Impedance–Admittance Smith Chart, The Quarter-Wave Transformer, Load Matched to Line, Conjugate Matching, The Terminated Lossy Line, Single-Stub Tuning, Shunt Stubs Series Stubs, Double-Stub Tuning, Smith Chart Solution

UNIT 2

Waveguides and Network Parameters (6 Hours)

Concept of Mode, Characteristics of TEM, TE and TM Modes, Losses associated with microwave transmission Concept of Impedance in Microwave transmission, Coaxial Line. Rectangular Waveguide, Circular waveguide, Equivalent Voltages and currents for non-TEM lines. Network parameters for microwave Circuits, Scattering Parameters

UNIT 3

Microwave Devices(6 Hours)

Microwave Passive components: Directional Coupler, Power Divider, Microwave Passive components: Magic Tee, attenuator, resonator, Microwave Active components: Diodes, Transistors, Microwave Active components: oscillators, mixers, Microwave Semiconductor Devices: Gunn Diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron, klystron Amplifier

UNIT 4

Antenna parameters (6 Hours)

Introduction ,Types of Antennas ,Radiation Mechanism ,Radiation Pattern ,Radiation Power Density ,Radiation Intensity ,Beam width , Directivity, Numerical Techniques, Antenna Efficiency ,Gain , Beam Efficiency , Bandwidth, Polarization ,Input Impedance , Antenna Radiation Efficiency ,Antenna Vector Effective Length and Equivalent Areas ,Maximum Directivity and Maximum Effective Area , Friis Transmission Equation and Radar Range Equation , Antenna Temperature , Far-Field Radiation

UNIT 5

Antennas and its array (6 Hours)

Small Dipole, Finite Length Dipole, Half-Wavelength Dipole, Cylindrical Dipole, Folded Dipole ,Loop antennas, Circular Loop of Constant Current, Two-Element Array, N-Element Linear Array: Uniform Amplitude and Spacing, N-Element Linear Array: Uniform Spacing,

Non uniform Amplitude, Circular Array , Traveling Wave Antennas, Broadband Antennas, Log-Periodic Antennas, Fractal Antennas

UNIT 6

Microstrip and Other antennas

(6 Hours)

Field Equivalence Principle: Huygens' Principle, Babinet's Principle, Microstrip Antennas , Rectangular Patch, Circular Patch, Quality Factor, Bandwidth, and Efficiency, Input Impedance, Coupling, Arrays and Feed Networks, Horn Antennas, Conical Horn, Parabolic Reflector Antennas, Smart-Antenna, Signal Propagation in Smart antennas , Mobile Ad hoc Networks, Smart-Antenna System Design.

List of Experiments: Any of the 8 below Experiments.

1. Frequency & Wavelength measurement of Klystron tube.
2. Determination of VSWR & reflection Coefficient
3. I-V characteristics of Gunn diode.
4. Frequency & Wavelength Measurement
5. Study of Magic tree
6. Design of Microstrip antenna using Ansys HFSS
7. Design of Horn antenna using Ansys HFSS
8. Design of parabolic antenna using Ansys HFSS
9. Design of antenna with array using Ansys HFSS
10. Study of Smart antennas

List of Assignments:

1. Case study of Research paper on Antenna.
2. Design and research Paper publication.
3. Advance applications in Microwave and Antenna.
4. PPT presentation on Subject Topic

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

9. Unit Test
2. Assignments
3. Continuous Assessment
4. End term Examination

Text Books:

1. Microwave Engineering by David M Pozzar (John willy& sons).
2. Antenna theory and Design C.A Balanis (John willy& sons.).

Reference Books:

1. R. E. Collin, "Antennas and Radio Wave Propagation", McGraw-Hill.,
2. F. B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005
3. W. L. Stutzman, and G. A. Thiele, "Antenna Theory and Design", 2nd Ed., John Wiley & Sons. 1998.

**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

Class: B. Tech (E & TC) SEM:-VI

SUBJECT: - Information Theory & Coding

Teaching Scheme**Lecture: 3 Hours/week****Marks****Marks****Examination Scheme****End Semester Exam: 60****Continuous Assessment: 40****Credits: 03**

Course Prerequisites:

- Digital Communication
- Analog Communication
- Signals and Systems

Course Objectives:

- To introduce the student to the field of Information Theory.
- To introduce the student to the fundamental concepts in information theory
- To enable the students to apply the algorithms of source coding and channel coding.

Course Outcomes: On successful completion of this course, students will be able to

1. To find a source code for a given information source and calculate its efficiency.
2. To find the mutual information for a given source and a channel.
3. To find the channel capacity for a given channel
4. To find the error correcting capacity for a given linear block code
5. To find the encoding and decoding circuit for a given cyclic code.
6. To apply Viterbi decoding algorithm for a given received sequence

UNIT - I**Source Coding****(6 Hours)**

Introduction, Historical Perspective of Information Theory, Information: Definition and physical significance, Properties of Information, Information Source, Discrete Memoryless Source, Binary Source, Entropy, Properties of Entropy, Some Source Coding Algorithms: Huffman Coding, Shannon-Fano Coding. Average Code length, Efficiency, Source Coding Theorem, Lempel-Ziv Coding.

UNIT – II

Mutual Information And Channel Coding Theorem (6 Hours)

Discrete Memoryless Channel, Channel Matrix, Mutual information, Conditional Entropy, Joint Entropy. Physical Significance of Mutual Information, Properties of Mutual Information, Channel Capacity, Channel Coding Theorem, Error Free Communication, Verification of Channel Coding Theorem for Binary Symmetric Channel.

UNIT - III

Channal Capacity Theorem (6 Hours)

Differential entropy and mutual information for continuous ensembles, Differential entropy for Gaussian distribution, Channel Capacity Theorem, Sphere Packing Problem, Implications of Channel Capacity Theorem, Rate Distortion Theory.

UNIT - IV

Linear Block Codes (6 Hours)

Introduction: Need of Error Control Coding, Classification of Error Correcting Codes, Error Detection and Error Correction Techniques, Systematic and nonsystematic Codes, Code rate. Linear Block Codes, Generator and Parity Check Matrices, Hamming Codes, Syndrome: definition and properties, Syndrome decoding, Hamming Bound, Perfect Code.

UNIT -V

Cyclic Codes

(6 Hours)

Cyclic Codes: Properties and significance, Generator Polynomial and its properties, Parity Check Polynomial, Syndrome Polynomial and its properties, Encoding and Decoding of Cyclic Codes using shift register. Overview of BCH Codes, RS codes, Golay codes, Burst error correcting codes.

UNIT-

VI

Convolutional Codes

(6 Hours)

Introduction, Encoding of Convolutional Codes, Code Tree, State diagram and Trellis Diagram, Transform Domain Approach, Maximum Likelihood Decoding-Viterbi Algorithm, Sequential Decoding, Overview of Turbo Codes.

List of Assignments:

1. To find Huffman code, average code length, coding efficiency for a given source.
2. To find mutual information for a given source and channel.
3. To find the channel capacity of a practical channel such as telephone line.
4. To find minimum distance for a given linear block code.
5. To find generator matrix representation for a given generator polynomial.
6. To decode a given received sequence of bits for a given convolutional code using Viterbi Algorithm

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

- | | |
|--------------------------|-------------------------|
| 10. Unit Test | 2. Assignments |
| 3. Continuous Assessment | 4. End term Examination |

Text Books:

1. Simon Haykin, ‘ Communication Systems’ 4th edition, John Wiley & Sons
2. Ranjan Bose, “Information Theory Coding and Cryptography” Tata McGraw-Hill.

Reference Books:

- 1 K. Sam Shanmugam, “Digital and analog communication systems”, John Wiley.
- 2 Thomas M. Cover, Joy A. Thomas,” Elements of Information Theory, 2nd Edition”, Wiley Publication.
- 3 Roberto Togneri, Christopher J.S deSilva “Fundamentals of Information Theory and Coding Design”, CRC Press.
- 4 Steven Roman,” Introduction to Coding and Information Theory”, Springer New York.
- 5 N. T. Markad “Communication System”, I K International Publishing House Pvt. Ltd., New Delhi.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**

Department of Electronics and Telecommunication

CLASS: B.TECH (E&TC) SEM. - VI

SUBJECT: - Electronic Circuit Design & Practices

Teaching Scheme

Examination Scheme

**Practical: 2 Hours/Week
marks**

TW & OR: 25

Credits: 01

Course prerequisites:

- Knowledge of basic electronics components
-

Course objective:

The aim is to enable the student to undertake an independent survey into a relevant area. This course is to familiarize the student with the analysis and design of Electronics circuits.

Course Outcomes: On successful completion of this course, students will be able to

- Design and implementation of small electronics systems
- Model and quantitatively analyze circuits with transistors and other nonlinear devices;
- Construct and test electronic circuits in the laboratory;
- Use software tools to simulate the behavior of electronic circuits

Contents:

- Tutorial and Laboratory work should consists of design and implementation of small electronics systems based on OP-AMP, Timer 555 IC, encoders, decoders, multiplexers, demultiplexers, switching regulators, PLL etc.
- A group consists of two students, who will work on one system for entire semester.
- The work includes design, implementation, validation and report writing of the system.

Note: Microcontroller based systems are strictly not allowed.

List of Experiments:

- Minimum 8 Experiments based on syllabus using simulation software.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. End term oral performance

Text Books:

- Millman J. and Halkias .C "Integrated Electronics ", 2nd Edition, Tata McGraw-Hill, 2001.

Reference Books:

4. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 8th Edition. PHI, 2002.
5. S.Salivahanan, et.al, "Electronic Devices and Circuits", TMH, 2008.
6. Floyd, Electronic Devices, Sixth edition, Pearson Education, 2003.
7. I.J. Nagrath, Electronics – Analog and Digital, PHI, 2009.

Bharati Vidyapeeth University, Pune
Faculty of Engineering & Technology
Programme: B.Tech (E&TC) Sem – VII (2014 Course)

Semester- VII												Contact Hours: 23 Hrs/week			
												Total Credits: 25			
												Total Marks: 750			
Sr.no	Subject	L	T	P	Examination Scheme (Marks)						Total Marks	Credits			
					Theory	Continuous Assessment			TW & PR	TW & OR		TH	TW	Total	
						Unit Test	Tutorials / Assignments	Attendance							
41	Computer Networks	3	0	2	60	20	10	10	-	50	150	3	1	4	
42	Project Management And Finance	3	0	0	60	20	10	10	-	-	100	3	0	3	
43	Mobile and Broadband Communication	3	0	2	60	20	10	10	50	-	150	3	1	4	
44	Radio Frequency Engineering	2	0	0	60	20	10	10	-	-	100	2	0	2	
45	ELECTIVE-I	3	1	0	60	20	10	10	-	50	150	3	1	4	
46	Project Stage-I	0	0	4	-	-	-	-	-	50	50	0	4	4	
47	In-plant Training	0	0	0	-	-	-	-	-	50	50	0	4	4	
Total		14	01	08	300	100	50	50	50	200	750	14	11	25	

Elective-I:

- | | |
|---------------------------------------|---------------------------------|
| 1) Wireless Sensor Network | 3) Digital Image Processing |
| 2) Advanced Digital Signal Processing | 4) Advance Computer Programming |

Bharati Vidyapeeth University, Pune
Faculty of Engineering & Technology
Programme: B.Tech (E&TC) Sem – VIII (2014 Course)

Semester- VIII					Contact Hours: 28 Hrs/week									
					Total Credits: 25									
					Total Marks: 750									
Sr.no	Subject	L	T	P	Examination Scheme (Marks)						Total Marks	Credits		
					Theory	Continuous Assessment			TW & PR	TW & OR		TH	TW	Total
						Unit Test	Tutorials / Assignments	Attendance						
48	Optical Fiber Communication	3	0	2	60	20	10	10	50	-	150	3	1	4
49	Satellite Communication	3	0	2	60	20	10	10	-	50	150	3	1	4
50	Software Defined Radios	3	1	0	60	20	10	10	-	-	100	4	0	4
51	Elective-II	3	1	0	60	20	10	10	-	50	150	3	1	4
52	Project Stage-II	0	0	8	-	-	-	-	-	150	150	0	8	8
53	Seminar	0	0	2	-	-	-	-	-	50	50	0	1	1
Total		12	2	14	240	80	40	40	50	300	750	13	12	25

Elective-II

- | | |
|---|---------------------------------|
| 1) Speech & Audio Processing | 3) System on Chip |
| 2) Artificial Intelligence and Robotics | 4) Fuzzy Logic & Neural Network |



Class: B.Tech (Electronics& Telecommunications) Sem:-VII

SUBJECT: - Computer Networks

Teaching Scheme

Lecture: 03 Hours/week

Practical: 02 Hours/week

Examination Scheme

End Semester Exam: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW& OR: 50 marks

Credits: 04

Course Prerequisites:

Analog and Digital Communications, Basic Embedded Systems, Probability Theory.

Course Objectives:

1. To introduce various topologies and types of networks.
 2. To introduce the concepts of network architecture & network design
 3. To give know how of congestion control mechanism.
 4. Familiarize with Networking Protocols & Layers
 5. Introduce network security aspects.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Identify the types of computer networks and topologies.
2. Identify the functions of network connectors, Hubs, Switches, Routers, Bridges, NIC& network layers.
3. Implement various algorithms used in computer networks.
4. Use TCP/IP protocol.
5. Apply the various Network security techniques.

Contents

Unit I

[06Hours]

Introduction to Computer Networks and Internet

Understanding of network hardware, network software and Internet, the network edge, the network core, understanding of Delay, loss and recovery in the circuit and packet switching network, TCP/IP Protocol Suite: The OSI Model, Comparison of the OSI and TCP/IP reference model.

Unit II

[06Hours]

Physical Layer

Guided transmission media, wireless transmission media, EIA 232 D interface standard, Circuit, Packet and Message Switching in Computer Network, High Speed Digital Access, Multi Access Protocols – ALOHA and CSMA, Collision free protocols, Ethernet, Gigabit Ethernet, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, API, hubs, bridges, switches, routers, modems and gateways.

Unit III

[06Hours]

Data Link Layer – LLC, MAC, CRC codes, Elementary Data Link Layer Protocols, sliding window protocol, HDLC, modes of operation.

Transport Layer – Multiplexing and Demultiplexing, Connection less transport (UDP), Principles of reliable data transfer, Medium access sub layer – channel allocation problem, multiple access protocols, IEEE 802 standards for LANS & WANS.

Unit IV

[06Hours]

Network Layer

Introduction, Virtual and Datagram networks, IP protocol and addressing in the Internet Routing algorithms Broadcast and Multicast routing Network Layer Design issues Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Hierarchical Routing, Congestion generation and control algorithms, policies-leaky bucket algorithm, token bucket algorithm, virtual circuit subnet and choke packets, Resource Reservation Protocol.

Unit V

[06Hours]

TCP/IP Protocol suit – RPC, Real Time Transport Protocols, The Internet Transport Protocols-The TCP Service Model, The Connection Establishment and in Release in TCP, The TCP Connection Management Modeling, TCP Congestion Control and Flow control.

Application Layer- Introduction, Applications layer paradigms, Client server model, Client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH, Protocols - PPP, ARP / RARP, ICMP, IGMP, UDP, IP, DHCP, DNS, EMAIL, Web and HTTP, IPV.4, IPV.6.

Unit VI

[06Hours]

Network security – Cryptography Algorithms and Trust Models, Ciphers vs Codes, Symmetric-key algorithms (DES, AES), Public-key algorithms – RSA, Digital signatures, IPSec, Firewall, Managements of public keys, communications security, Authentication Protocols

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Experiments: Min 8 experiments to be performed

1. Study of Networking
2. Implementation of bus topology using Network Simulator
3. Implementation of star topology using Network Simulator
4. Connecting two computers using RJ45
5. Establish a Ethernet LAN between computers
6. Telephone switching circuit using EPBX
7. Carry networking between two or more computers
8. Configuring different network topologies using MATLAB & introduction to DHCP
9. i) Character transfer using Simplex method
ii) Character transfer using Full-Duplex method
10. Simulation and implementation of bit stuffing
11. Simulation and implementation of CRC
12. Stop-and Wait protocol using MATLAB
13. Go-Back-N protocol using MATLAB
14. Selective repeat Protocol using MATLAB
15. Distance Vector Routing Algorithm using MATLAB
16. Link State Routing algorithm using MATLAB

List of Assignments:

1. Explain different types of Networks and topologies.
2. Describe functions of OSI layers and its architecture.
3. What is TCP / IP protocol model.
4. Explain the connections of Physical Layer using different mediums
5. Explain the functionalities of Data Link Layer and error control
6. Describe techniques of encoding and decoding
7. Explain Network Layer and Data Recovery Methods
8. Describe congestion control mechanism and routing mechanism
9. Explain session layer, addressing and subnetting in OSI reference model.
10. Explain cryptography, symmetric-key algorithms.
11. Explain the concepts if IPSec, Firewall Design
12. Explain different network security mechanisms.

Text Books

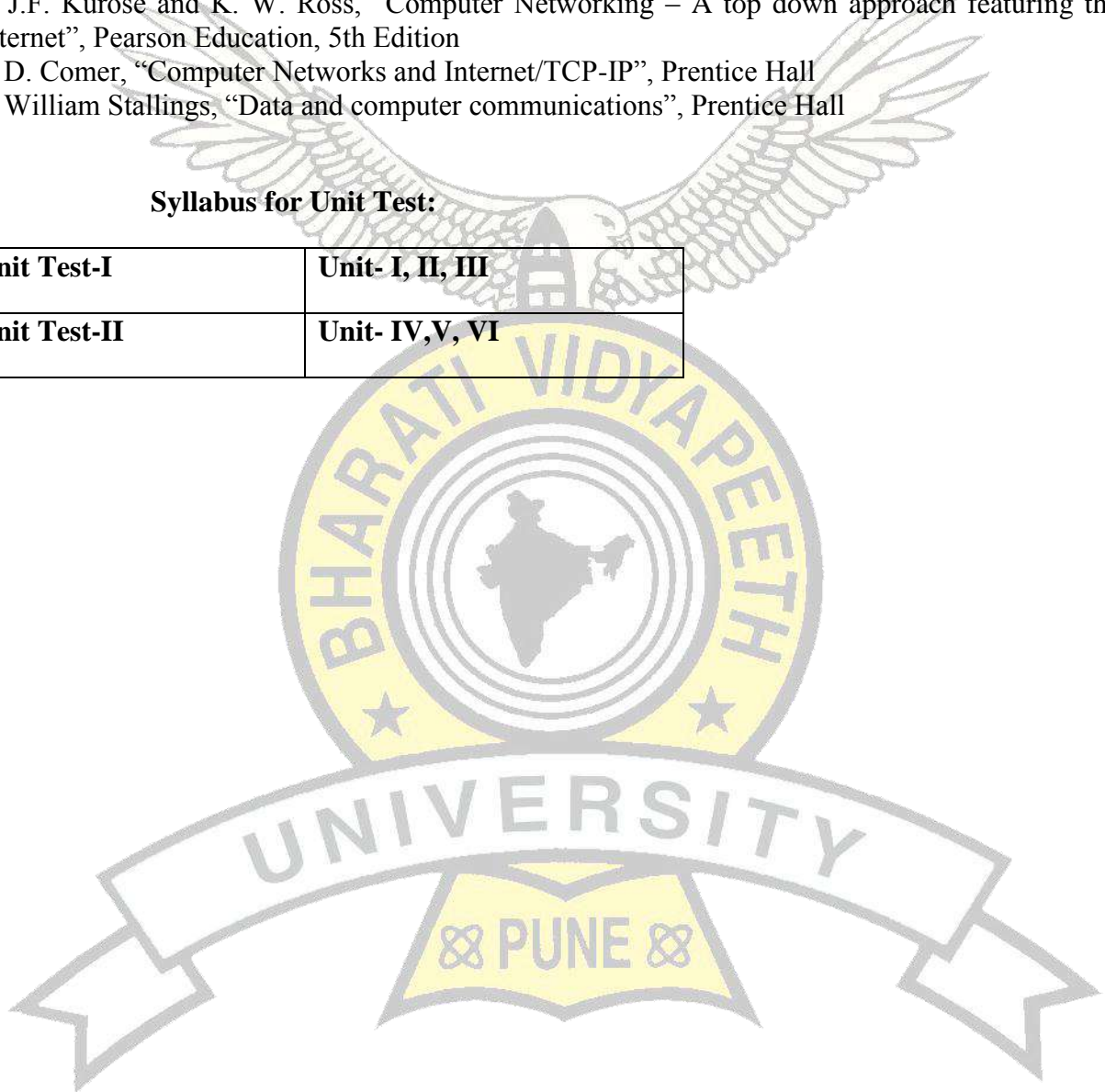
1. Andrew Tanenbaum, “Computer networks”, Prentice Hall
2. L. Peterson and B. Davie, “Computer Networks – A Systems Approach” Elsevier Morgan Kaufmann Publisher, 5thEdition.
3. T. Viswanathan, “Telecommunication Switching System and Networks”, Prentice Hall

References

1. S. Keshav, “An Engineering Approach to Computer Networking”, Pearson Education
2. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition
3. J.F. Kurose and K. W. Ross, “Computer Networking – A top down approach featuring the Internet”, Pearson Education, 5th Edition
4. D. Comer, “Computer Networks and Internet/TCP-IP”, Prentice Hall
5. William Stallings, “Data and computer communications”, Prentice Hall

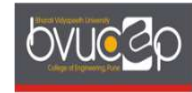
Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Bharati Vidyapeeth Deemed University
College of Engineering, Pune



Class: B. Tech (Electronics & Telecommunications) Sem: -VII

SUBJECT: - Project Management & Finance

Teaching Scheme

Lecture: 03 Hours/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

Credits: 03

Course Prerequisite:

Mathematics, Economics, and Statistics.

Course Objectives:

1. To realize basic principles/concepts of project management and finance.
 2. To describe the most well-known theories and perspectives on project managements.
-

Course Outcomes: At the end of the course, a student will be able to

1. Define the Characteristics, Objectives, and Stages of Project management.
2. Conceptualize the importance of time and work estimation in Project management.
3. Analyze Management Concepts for Developing Project Plan.
4. Analyze and Understand Financial & Project Management.
5. Demonstrate Scope, Objectives and Importance of Financial Management.
6. Identify and understand the main responsibilities and tasks of Securities and Exchange Board of India (SEBI) in money market and capital Market.

Contents

Unit I

[06 Hours]

Introduction to Project management:

Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

Unit II **[06 Hours]**

Work Definition:

Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Documentation Introduction to CMM, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, ,CPM/PERT Networks

Unit III **[06 Hours]**

Management Concepts:

Developing Project Plan (Baseline) , Project cash flow analysis, Project scheduling with resource constraints: Resource Levelling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.

Unit IV **[06 Hours]**

Project Implementation:

Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

Unit V **[06 Hours]**

Financial Management:

Introduction of Finance, Types of Finance, Financial Management, Scope & Objectives of Financial Management, function of finance manager, Importance of Financial Management, Sources of finance, Security Finance.

Unit VI **[06 Hours]**

Working Capital Management:

Capital Structure, Fixed & working capital, Role of Securities and Exchange Board of India (SEBI), function of money market and capital Market, sources of finance. Introduction to capital budgeting, Techniques of capital budgeting. Break even analysis - assumptions, importance, Cost-Benefit analysis, CVP graph.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Assignments:

1. Write characteristics of projects.
2. Define objectives of project management.
3. Discuss the relationship between financial objectives, corporate objectives and corporate strategy.
4. State the differences between PERT and CPM.
5. Discuss in brief: Project scheduling.
6. Explain project monitoring & control using PERT/Cost
7. Identify the nature and role of money and capital markets, both nationally and internationally.
8. Write in brief: Concepts & Importance of organization.
9. Discuss functions of finance manager.
10. Critically evaluate various approaches to the financial management
11. Discuss sources of finance.
12. Explain the functions of a stock market and a corporate bond market.

Text Books

1. Shtub, Bard and Globerson, "Project Management: Engineering, Technology, and Implementation", Prentice Hall, India
2. C. Paramasivan and T. Subramanian, "Financial Management", New age international publishers.
3. John M Nicholas, "Project Management for Business and Technology: Principles and Practice", Prentice Hall, India, 2002.
4. Cleland and King, "VNR Project Management Handbook".
5. Wiest and Levy, "Management guide to PERT/CPM", Prentice Hall. India.

Reference Books

1. Horald Kerzner, "Project Management: A Systemic Approach to Planning, Scheduling and Controlling", CBS Publishers, 2002.
2. S. Choudhury, "Project Scheduling and Monitoring in Practice".
3. P. K. Joy, "Total Project Management: The Indian Context", Macmillan India Ltd.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI



**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B.Tech (Electronics & Telecommunications) Sem:-VII

SUBJECT: - Mobile & Broadband Communication

Teaching Scheme

Lecture: 03 Hours/week

Practical: 02 Hours/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & PR: 50 Marks

Credits: 04

Course prerequisites:

Analog Communication System, Digital Communication System, Information Theory & Coding

Course objectives:

1. To make students familiar with fundamentals of mobile communication systems
 2. To choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc.
 3. To identify the requirements of mobile communication as compared to static communication
 4. To understand the three primary components of a fiber-optic communication system.
 5. To understand the system design issues and the role of WDM components in advanced light wave systems.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Understand with various generations of mobile communications
2. Understand the concept of cellular communication
3. Understand the basics of wireless communication
4. Carry out Link power budget and Rise Time Budget by proper selection of components and check its viability.
5. Carry out Satellite Link design for Up Link and Down Link

Contents

Unit I

Introduction to Mobile Communication

[06 Hours]

Mobile and Personal Communication, mobile and wireless devices, Specialized packet and mobile radio networks, circuit switched data services on cellular networks, packet switched data services on cellular networks

Unit II

Wireless LAN

[06 Hours]

Introduction, Infrared radio transmission infrastructure and adhoc networks, Detailed study of IEEE 802.11, HIPER LAN, Bluetooth, Wireless ATM

Unit III

Mobile Network Layer & Transport Layer

[06 Hours]

Mobile IP, DHCP (Dynamic Host Control Protocol), Mobile adhoc networks, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast and Selective retransmission and recovery

Unit IV

ISDN

[06 Hours]

Switching Techniques, Principles of ISDN, Architecture, ISDN standards, I-series Recommendations, Transmission structure, User network interface, ISDN protocol architecture, ISDN connections, Addressing, Interworking,

Unit V

B-ISDN architecture and standards, B-ISDN Services

[06 Hours]

Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements.

Unit VI

B-ISDN protocols

[06 Hours]

User plane, Control plane, Physical layer, Line coding, Transmission structure, SONET Requirement, Signal Hierarchy, System Hierarchy.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Experiments:

1. To understand and carryout fault finding of Pulse & Tone DTMF Telephone Trainer.
2. To Carryout telephone signal switching system using EPBX Trainer.
3. To install and configure PSTN switch configuration using T/S/T Switch.
4. To install and understand ISDN EPBX system.
5. To transfer voice between two computers using ISDN terminal Adaptors.
6. To transfer data between two computers using ISDN terminal adaptor modem.
7. To transfer video between two computers using ISDN system.
8. To study hardware section and carryout fault finding of Mobile handset trainer.
9. To carryout AT commands mobile communication using GSM trainer.
10. To carryout GPRS Internet data transfer using GPRS trainer.
11. To understand two user CDMA trainer using DSSS technology.
12. To carryout internet data transfer using CDMA trainer.
13. To send and receive DTMF signal using DTMF encoder and decoder circuit.
14. To carryout Voice Packet signal switching system using IP Protocol Trainer
15. To carryout Data Packet signal switching system using IP Protocol Trainer
16. To carryout Video Packet signal switching system using IP Protocol Trainer

List of Assignments:

1. How the Mobile and Personal Communication can works?
2. Distinguish Circuit Switching and Packet Switching with diagrams
3. Explain in detail of IEEE 802.11.
4. Write down the important features of HIPER LAN with its applications.
5. Write short note on DHCP (Dynamic Host Control Protocol)
6. What are prerequisites of Mobile ad hoc networks?
7. List the ISDN standards & explain any one of them.
8. What is mean by Interworking? Explain in detail.

9. List out the Business and Residential requirements. Explain in detail.
10. What are the services provided under B-ISDN?
11. Write a note on SONET.
12. List all the ISDN protocols, and explain the importance of them.

Text Books:

1. J. E. Flood , “Telecommunications Switching, Traffic and Networks”, Pearson Education
2. Krzysztof Wesolowski, “Mobile Communication Systems”, Wiley Student Edition.
3. Balaji Kumar,” A professional guide to ATM, Frame relay, SMDS, SONET,B-ISDN”, Tata McGraw-Hill Publications.
4. Robert Newman,” Broadband Communication”, PHI Publications.

Reference Books

1. Mobile Communications: Jachen Schiller (Addison Westy)
2. Wireless Networks by P. Nicopolitidis, M. S. Obaidat, G. I. Papadimitriou, A. S. Pomportsis ; Wiley Pub.
3. ISDN and Broadband ISDN with Frame Relay and ATM William Stallings, Prentice-Hall, 4th edition
- 4.Govind P. Agrawal, Fiber-Optic Communication Systems, Wiley, 3rd edition.
5. Dennis Roody, “Satellite Communications”, McGraw Hill

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI



Bharati Vidyapeeth Deemed University
College of Engineering, Pune



Class: B. Tech (Electronics & Telecommunications) Sem:-VII

SUBJECT: Radio Frequency Engineering

Teaching Scheme

Lecture: 02 Hours/Week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

Credits: 02

Course Prerequisites:

Electromagnetic Engineering, Microwave Theory and Antennas

Course objectives:

1. To introduce RF issues related to active and passive components.
 2. To introduce RF circuit design.
 3. To introduce modeling of RF circuits.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Understand behavior of passive components at high frequency and modeling of HF circuit.
 2. Design HF amplifiers with gain bandwidth parameters.
 3. Identify Mixer types and their characteristics.
 4. Gain the knowledge of PLLs and Oscillators with respect to circuit topologies.
-

Contents

Unit I

RF Behavior of Passive Components

[04 Hours]

HF Resistors, HF Capacitors, HF Inductors, Chip Components. Circuit Board Considerations: Chip Resistors, Chip Capacitors, Surface Mounted Inductors.

Unit II

RF Measurement & Bandwidth Estimation

[04Hours]

Network Analyzer, Spectrum Analyzer and RF Generator. Open Circuit Time Constant Method: Observations & Interpretations, Accuracy of OCts, Considerations, Short Circuit Time Constant Method.

Unit III

High Frequency Amplifier Design

[04 Hours]

Shunt Peaked Amplifier, Shunt Series peak Amplifier, Two port bandwidth enhancement, Design example. Bandwidth enhancement techniques. Tuned Amplifier: Common Source Amplifier with Single Tuned Load.

Unit IV

Low Noise Amplifier Design

[04 Hours]

MOSFET two port noise parameters, LNA topologies, Power-constrained noise optimization. Design examples: Thermal Noise, Shot Noise, Signal to Noise Ratio and Noise Figure.

Unit V

RF Oscillators

[04 Hours]

Oscillators Using a Common Emitter BJT, Oscillators Using a Common Gate FET, Crystal Oscillators. Colpitts Oscillator: Describing Function Model and Start-up Model of Colpitts Oscillator.

Unit VI

Mixers

[04 Hours]

Mixer fundamentals, Significant Characteristics of Mixer: Single-Ended Diode Mixer, Single-Ended FET Mixer, Balanced Mixer, Image Reject Mixer.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Assignments:

- 1) To study of Frequency measurement of Klystron tube.
- 2) Design a lumped element 'LC' network for matching $Z_L = 10 + j10 \Omega$ to a 50Ω transmission line at 1 GHz.

- 3) To plot the resonant frequency behavior of parallel LC circuit, as a function of resistance.
- 4) To determine stability regions of the device and sketch them in the Smith Chart. Assume suitable parameters.
- 5) Determination of VSWR & reflection coefficient Smart antennas using HFSS.
- 6) With neat diagram, explain the working principle of Gunn diode.
- 7) Explain characteristics of Gunn diode.
- 8) Derive the equation for the scattering matrix of magic Tee.
- 9) Study of Smart antennas using HFSS.
- 10) Explain difference between RF circulator and isolator.
- 11) Design of any one type oscillator.
- 12) Design of Single-Ended Diode Mixer.

Text Books:

1. Reinhold Ludwig, Pavel Bretchko, “RF Circuit Design Theory and Applications”, Pearson Education.
2. Thomas H. Lee, “The Design of CMOS Radio-Frequency Integrated Circuits”, Second Edition, Cambridge Publications.
3. David M. Pozar, “Microwave Engineering”, Fourth Edition John Wiley & Sons, Inc.

Reference Books:

1. T. Yettrdal, Yunhg Cheng, “Devices modeling for analog and RF COMS circuits design”, John Wiley publication.
2. Calvin Plett, “Radio frequency Integrated Circuits Design”, Artech house

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI



**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B.Tech (Electronics & Telecommunications) Sem:-VII

SUBJECT: Elective-I Wireless Sensor Network

Teaching Scheme

Lecture: 03 Hours/week

Tutorial: 01 Hour/week

Examination Scheme

End semester exam: 60 Marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits: 04

Course Prerequisites:

Engineering Mathematics I, Engineering Mathematics II, Engineering Mathematics III,
Analog communication and digital communication

Course objectives:

1. To introduce the concept of sensor network establishment, tasking- control and analysis of sensors using wireless medium.
 2. To provide knowledge of mathematical functions associated with sensor network.
 3. Familiarize the student with various routing algorithms
 4. Introduce the idea of Internet of Things and its future scope.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Define, characterize and analyze concept and need of wireless sensor network.
2. Design theoretical localization and tracking algorithms of wireless sensor network.
3. Analyze the effects of various types of routing in wireless sensor network.

4. Apply Mathematical tools to wireless sensor network establishment.
5. Define wireless sensor network tasking and controlling to fulfill the requirement of application area.
6. Categorize the databases of sensor networks and understand design challenges and handling of the huge database.

Contents

Unit I

Introduction [03 Hours]

Unique constraints & challenges, Advantages of sensor networks, Sensor network application, Collaborative processing, Key definitions of sensor network

Unit II

Localization & Tracking [03 Hours]

A tracking scenario, Problem formulation, distributed representation and interface of states, tracking multiple objects, sensor models, Performance, Comparison & Matrices

Unit III

Networking Sensors [03 Hours]

Key assumption, Medium access control, General issues, Geographic & Energy-aware routing, Attribute-based routing, IDSQR, Directed diffusion, Rumor routing.

Unit IV

Infrastructure Establishment [03 Hours]

Topology control, Clustering, Time Synchronization, Interval Methods, Reference broadcasts, Localization services, Ranging Techniques, Range Based localization algorithms

Unit V

Sensor Tasking and Control [03 Hours]

Task driven sensing, Roles of sensor nodes & utilities, Information-based sensor tasking, cluster leader based, Joint routing & Information aggregation, moving center of aggregation sensor GROUP MANAGEMENT

Unit VI

Sensor Network Databases and introduction of IOT [03 Hours]

Sensor database challenges, Querslater forces, Cougar sensor database, Abstract data types, In-Network aggregation, Tiny DB Query Processing, data indices & range queries, Temporal data, ,IOT, Cloud computing

Content Delivery Methods: The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Tutorials/Experiments:

1. Implement geographic routing for the application of human body health parameters using MATLAB.
2. To transmit and receive Weather parameters using energy aware routing in MATLAB.
3. To transmit and receive Raining water data using Rumor routing.
4. Write programme for automate Home or Industrial day to day needs using collaborative processing.
5. To direct power source controller using wireless sensor network in MATLAB establish its evaluation metric.
6. To control movement of unmanned vehicle using attribute routing in MATLAB.
7. To localize stationaryspot using wireless sensor network.
8. To trackand do time synchronization of high alert areas using wireless sensor network.
9. To monitor and control traffic on high intensity city-road.
10. To track and control greenhouse using wireless sensor network.
11. To control movement of unmanned vehicle using wireless sensor network in NS2 OR NS3.
12. To direct power controller using wireless sensor network in NS2 OR NS3.

List of Assignments:

1. Compare traditional telemetry and wireless sensor network.
2. Enlist and study various basic terminologies of wireless sensor network.
3. Case study of research papers on wireless sensor network for any application.
4. Write a survey paper based on assignment no.3.

5. Choose any wireless sensor application and for that enlist requirements of devices.
6. For the assignment no.5, count total number sensors and define functioning of each.
7. For the assignment no.5, decide priority of parameters such as response time, sensitivity, accuracy and cost of establishment.
8. For the assignment no.5, select best routing algorithm and do its MATLAB simulation or NS3 simulation.
9. Write programme using MATLAB to show failure detection in any wireless sensor application.
10. Enlist various control systems used with wireless sensor network.
11. Explain future applications of wireless sensor network with IOTs.
12. Enlist various disadvantages of wireless sensor network and write solutions to resolve them.

Text Books

1. "Wireless Sensor Networks: An Information Processing Approach" by Feng Zhao and Leonidas J. Guibas, 2007
2. "Information Processing in Sensor Networks," by Feng Zhao, and Leonidas J. Guibas (Eds)
3. "Designing the Internet of Things" by Adrian McEwen, Hakim Cassimally
4. KazemSohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.

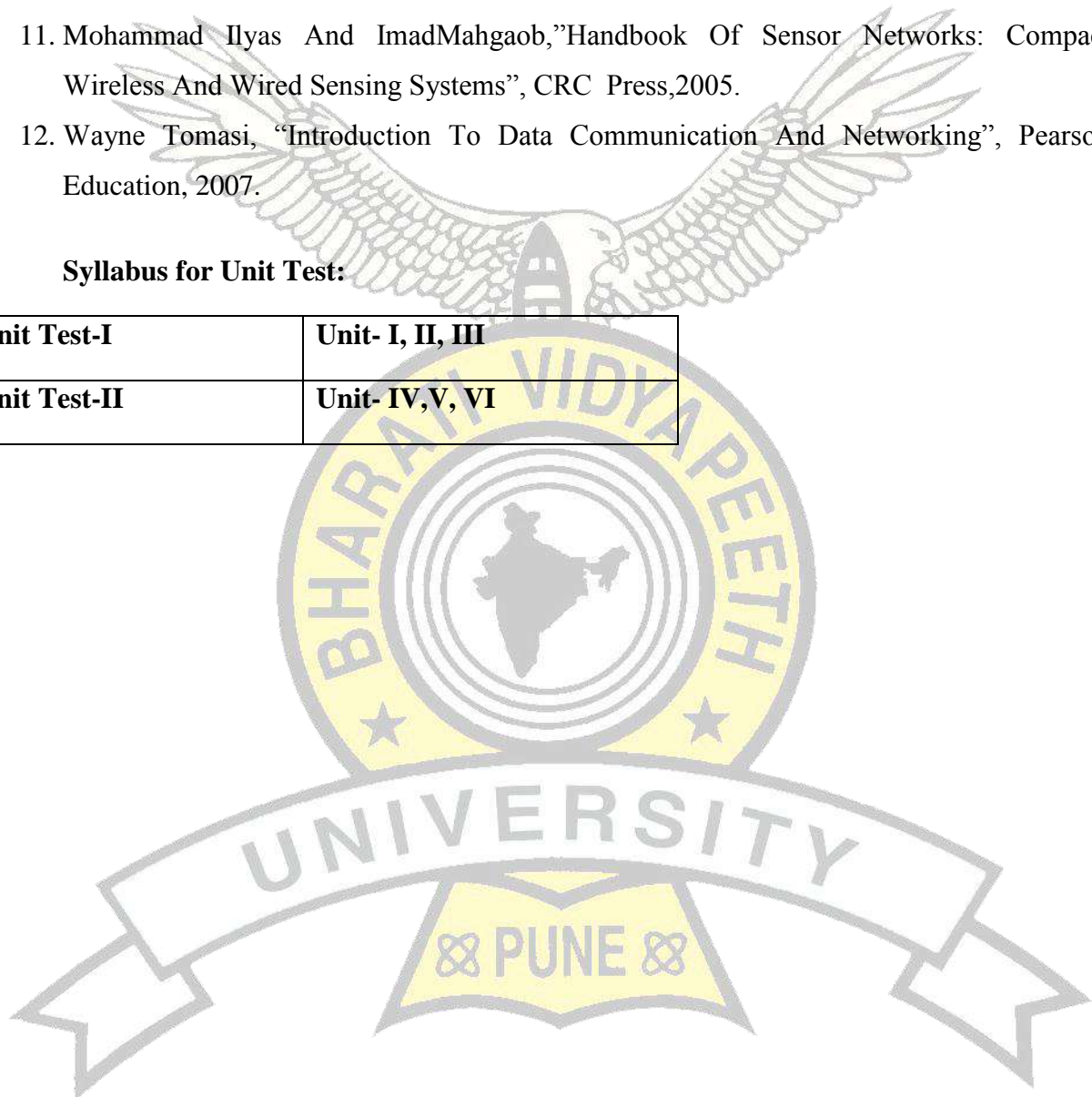
Reference Books

1. "Wireless sensor networks technology, Protocols, and Application" by KazemSohraby, Daniel Minoli, Taieb Znati
2. Anna Hac, "Wireless Sensor Network Designs," John Wiley & Sons.
3. Edgar H. Callaway, Jr. and Edgar H. Callaway, "Wireless Sensor Networks: Architectures and Protocols," CRC Press.
4. Victor Lesser, Charles L. Ortiz, and Milind Tambe, "Distributed Sensor Networks: A Multiagent Perspective," Kluwer.
5. "Getting Started with the Internet of Things" by Cuno Pfister
6. Shad Roundy, Paul Kenneth Wright, and Jan M. Rabaey, "Energy Scavenging for Wireless Sensor Networks: With Special Focus on Vibrations," Kluwer,

7. Jose A. Gutierrez, Edgar H. Callaway, Raymond Barrett, "IEEE 802.15.4 Low-Rate Wireless Personal Area Networks: Enabling Wireless Sensor Networks," .
8. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
9. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
10. BhaskarKrishnamachari, "Networking Wireless Sensors", Cambridge Press,2005.
11. Mohammad Ilyas And ImadMahgaob,"Handbook Of Sensor Networks: Compact Wireless And Wired Sensing Systems", CRC Press,2005.
12. Wayne Tomasi, "Introduction To Data Communication And Networking", Pearson Education, 2007.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Bharati Vidyapeeth Deemed University
College of Engineering, Pune



Class: B. Tech (Electronics & Telecommunications) Sem:-VII

SUBJECT: - Elective I Advanced Digital Signal Processing

Teaching Scheme

Lecture: 03 Hours/week

Tutorial: 01 Hour/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits: 04

Course Prerequisites:

Signals & systems, Digital Signal Processing

Course Objectives:

1. To make student familiar with basic principles of spectral estimation methods.
2. To introduce the advanced concepts and techniques of digital signal processing.
3. To create awareness about the practical applications in the field of Digital Signal Processing.
4. To introduce DSP processor architecture.

Course Outcomes: On successful completion of this course, students will be able to

1. Apply parametric and non-parametric techniques for estimating the power spectral density.
2. Design and implement multistage sampling rate converter.
3. Design appropriate adaptive filter in communication applications.
4. Perform multi-resolution analysis using wavelet transform.
5. To implement the signal processing application using DSP processor.

Contents

Unit I

[06 Hours]

DSP Processor Characteristics

Features of DSP Processors, Harvard and modified Harvard Architecture, Multiply-Accumulate operation, Single Cycle Execution, Multiple on chip buses, ALU, MAC, Shifter Processing Units, Address Generation units, Modulo addressing, Bit reversed addressing, Efficient Looping Mechanisms, Examples of DSP Processors, Applications of DSP Processors

Unit II

[06 Hours]

Linear Prediction

Random Processes, Stationary Random Process, Ergodic Random Process, AR process, MA process and ARMA process, AR lattice and ARMA lattice Ladder Filters, Forward and backward linear prediction, Solution of Normal Equations, Levinson-Durbin Algorithm, Properties of Linear Prediction Error Filters.

Unit III

[06 Hours]

Power Spectrum Estimation

Estimate definition, Nonparametric methods-Periodogram, modified periodogram, Bartlett's method, Blackman-Tukey Method, Performance Comparisons of nonparametric methods, Parametric methods, Methods for estimating parameters of AR, MA and ARMA models

Unit IV

[06 Hours]

Multirate DSP fundamentals

Need for Multi-rate DSP, Decimation by factor D , Interpolation by factor I , Sampling rate conversion by rational factor I/D , software implementation of sampling rate converters (Decimators and Interpolators), sample rate conversion using poly-phase filter structures

Unit V

[06 Hours]

Adaptive filters

FIR adaptive filters – the MMSE criterion and LMS and RLS algorithms, Adaptive Lattice-Ladder Filters - Recursive Least Squares Lattice Ladder Algorithms, Applications of Adaptive Filters

Unit VI

[06 Hours]

Time Frequency Representation of signals

Time Frequency description of signals, Concept of Instantaneous frequency and Complex signal, Uncertainty principle, need for joint time frequency representation, tiling diagrams. Short Time Fourier Transform, Wigner Ville distribution, Continuous Wavelet Transform, Discretization of STFT & CWT, Spectrogram.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous assessment
3. End semester Examination

List of Tutorials/Experiments:

1. Study of various addressing modes of DSP.
2. Describe the power spectrum estimation using Blackman and Tukey method.
3. Describe the role of Adaptive filters in Communication.
4. A brief survey of DSP applications in speech processing.
5. Implementation of Multi-rate application in digital audio processing.
6. Implementation of sub band coding for speech signal.
7. Discuss in detail various applications of wavelet transforms.
8. Explain the process of digital FM stereo signal generation.
9. Demonstration of Hardware and Software utilities for DSP starter kits.

List of Assignments:

1. Present a comparative study of DSP processors based on their features and applications.
2. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods.
3. Estimation of PSD of two sinusoids plus noise using Welch method
4. Find linear prediction coefficients and reflection coefficients using Levinson Durbin Algorithm.
5. Implement program to convert CD data into DVD data
6. Implement LMS algorithm using MATLAB.
7. Record a speech file in your own voice. Find pitch period for a voiced part of the segment.
8. Perform continuous and discrete wavelet analysis of a signal.
9. Implementation of Linear / Circular convolution on DSP processor.
10. Implementation of FIR filter using DSP processor
11. Design an Adaptive filter using LMS algorithm.
12. Mini-project based on the Matlab/Scilab.

Text books:

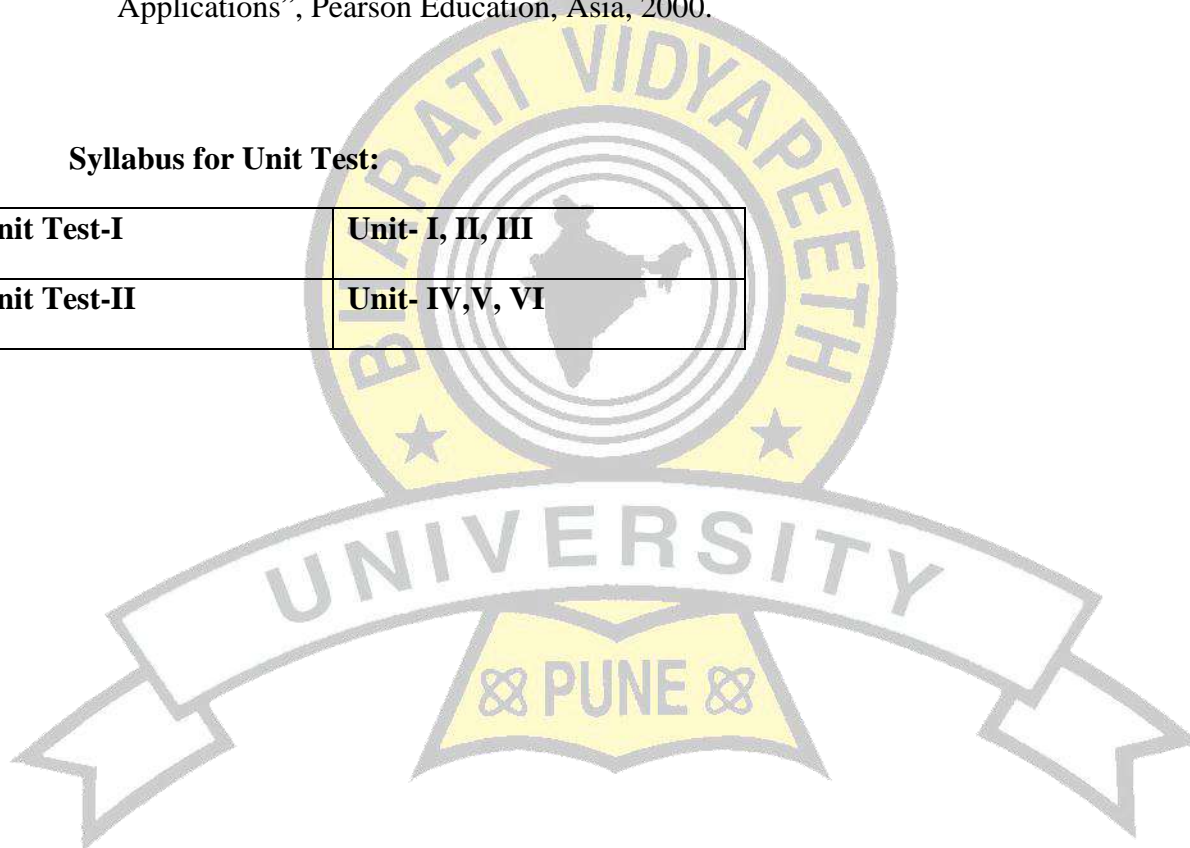
1. John G. Proakis, Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson education, Fourth Edition, 2007.
1. B. Venkataramani, M. Bhaskar, "Digital Signal Processors", TMH

Reference Books:

1. E. C. Ifeachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2nd Edition, Pearson education. 2007.
2. Widrow, B. and Stearns, S.D., "Adaptive Signal Processing", Pearson Education. 1985
2. Manolakis, D.G., Ingle, V.K. and Kogon, M.S., "Statistical and Adaptive Signal Processing", Artech House. 2005.
3. Diniz, P.S.R., "Adaptive Filtering: Algorithms and Practical Implementation", Kluwer. 1997
4. S. D. Apte, "Advanced Digital Signal Processing," Wiley Publications, 2014.
5. Leon Cohen, "Time-Frequency Analysis", Prentice Hall, 1995.
6. K.P Soman, K.I Ramchandran, N.G.Reshmi, "Insight into Wavelets- from theory to Practice," PHI Learning Private Limited, Third Edition, 2010.
7. Rao R M and A S Bopardikar, "Wavelet Transforms Introduction to theory and Applications", Pearson Education, Asia, 2000.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Class: B. Tech (Electronics & Telecommunications) Sem:-VII

SUBJECT: Elective-I Digital Image Processing

Teaching Scheme

Lecture: 03 Hours/week

Tutorial: 01 Hour/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits: 04

Course prerequisites:

Signals and System

Course objectives:

1. To understand the image fundamentals and mathematical transforms for image processing.
 2. To analyze the image enhancement techniques
 3. To introduce the concepts of image registration and image fusion.
 4. To identify different features of image by using segmentation.
 5. To perform measurement operations on extracted features of image.
 6. To analyze 3D Image Processing and Visualization
-

Course Outcomes: On successful completion of this course, students will be able to

1. To introduce fundamentals of digital image processing and Color transformation.
2. Design image enhancement and filters.
3. Analyze morphological operations and its effects on image.
4. Image resolution and compression method for image.
5. Determine features of various images by using segmentation method.

6. To learn different applications and gain experience in applying image processing algorithms to real problems.

Contents

Unit I

Fundamentals Digital Image Processing [06 Hours]

Introduction, Fundamental steps in digital image processing and components, Elements of visual perception, Image sensing and acquisition, sampling and quantization, An Introduction to the mathematical tools used in digital image processing, Digital image representation, Color models, Noise in color images, Image conversion – RGB to Gray, RGB to Binary.

Unit II

Image Enhancement [06 Hours]

Spatial domain, Gray level transformations, Intensity transformation functions, Histogram processing, Basics of spatial filtering, Smoothing and sharpening spatial filtering, Frequency domain, Introduction to Fourier Transform, One-Dimensional Fourier Transform and Inverse of Fourier Transform, Smoothing and sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

Unit III

Multi Resolution Analysis and Compressions [06 Hours]

Wavelet Transforms , Multi resolution analysis, Image pyramids, Multi resolution expansion, Image compression, Image compression Model, Shannon's Theorem, Elements of Information Theory, Error free Compression, Lossy Compression, Image format - TIFF, BMP,GIF, PNG, JPEG, JPEG-2000,H.264, Compression Methods – Huffman Coding, Arithmetic Coding, Run length Coding, Bit-plan coding and predictive coding.

Unit IV

Morphological Operations in Image Processing [06 Hours]

Dilation and erosion, Opening and Closing, Hit or Miss Transformation, Morphological algorithms, Extensions to grey scale images, Image Watermarking.

Unit V

Image Segmentation and Feature Extraction [06 Hours]

Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds, First and second order edge detection operators, Hough transform, Types of Hough transform, shape features, Boundary descriptors, Localized feature extraction detecting image curvature.

Unit VI

Applications of Digital Image Processing [06 Hours]

Image Classification, Image Recognition, Image Understanding, Working principle of Video Motion Analysis (GIF), Introduction to Iris Recognition, Difference between 2D and 3D image,

Sources of 3D Data sets, 3D Image Processing and Visualization, Measurements on 3D images.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Tutorials/ Experiments:

1. Displaying Image in different File Format in MATLAB.
2. Transformation of Simple Binary and Gray Level.
3. Explain Histogram effects in image.
4. Perform Histogram Equalization on Image.
5. Study of Smoothing of Image in Special Domain using Averaging.
6. Study of Smoothing of Image in Special Domain using Medium Method.
7. Analyze Edge Detection Techniques.
8. Study of Morphological Operations.
9. How to perform Segmentation using Thresholding.
10. Study operation of Hough transforms and Feature Detection.

List of Assignments:

1. Discuss Digital image representation.
2. Discuss Color Model.
3. Explain Gray level transformations and Intensity transformation functions.
4. Show working of Butterworth and Gaussian filters.
5. Explain and differentiate Image format
6. Write different Image compression Techniques.
7. Discuss in detail Image Watermarking
8. Write role of Dilation and erosion in image processing
9. What are different types of Edge detection
10. How Hough transform works for detecting varies shapes
11. What is Image Recognition
12. Explain Working principle of Video Motion Analysis (GIF).

Text Books:

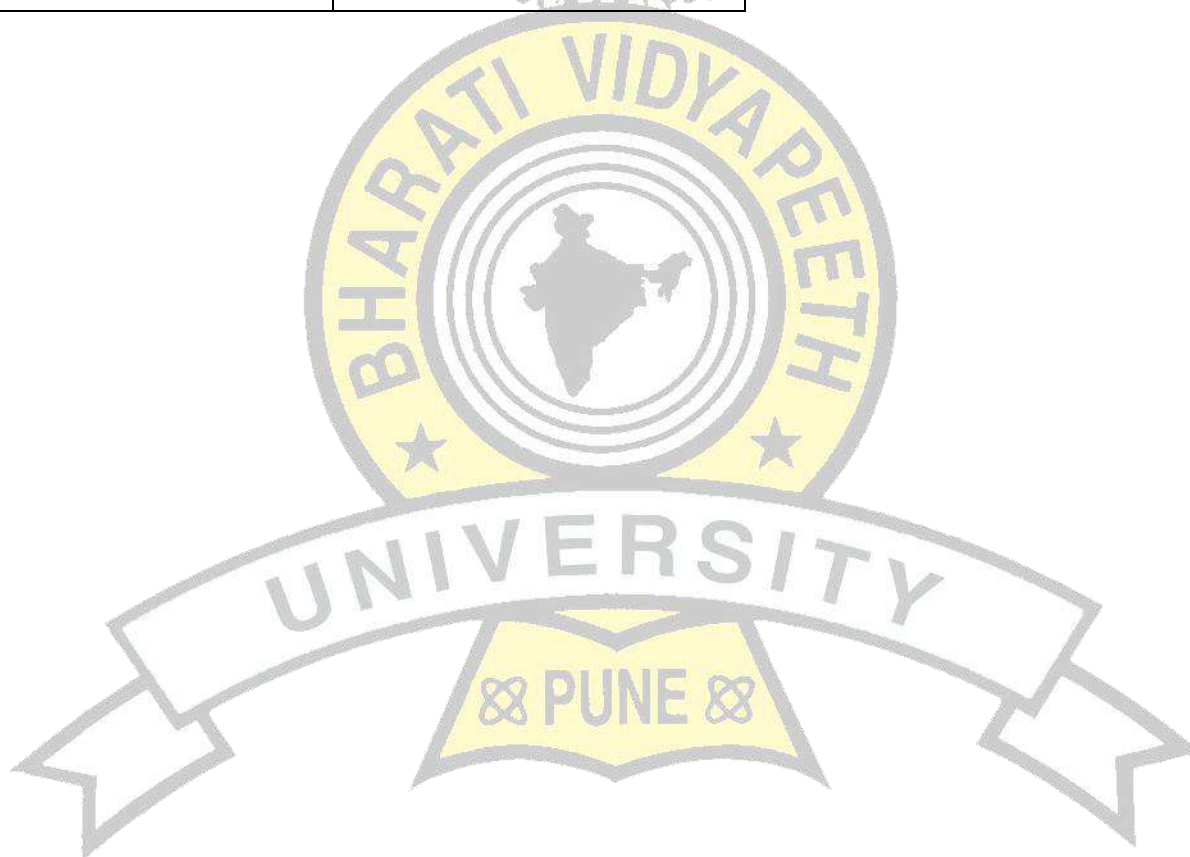
1. Gonzalez, Rafael C. and Woods, Richard E., "Digital Image Processing", Second Edition, Prentice Hall, 2006.
2. Ardeshir Goshtasby, "2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications", John Wiley and Sons, 2005.

Reference Books:

1. Rosenfield, Azriel and Kak, Avinash C., "Digital Picture Processing", Academic Press Inc, New York, 1982.
2. Salomon, David., "Data Compression: The Complete Reference", Second Edition, Springer Verlag, New York, 2001.
3. Pratt, William K., "Digital Image Processing", John Wiley & Sons, New York, 2003.
4. Jain, Anil K., "Fundamentals of Digital Image Processing", Prentice Hall of India, New Delhi.
5. Mark Nixon, Alberto Aguado, "Feature Extraction and Image Processing", Academic Press, 2008.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Class: B.Tech (Electronics & Telecommunications) Sem:- VII

SUBJECT: Elective-I Advanced Computer Programming

Teaching scheme

Lecture: 03 Hours/week

Tutorial: 01 Hour/week

Examination scheme

End Semester Exam: 60 marks

Unit Test: 20 marks

Attendance: 10 marks

Assignment: 10 marks

TW & Oral: 50 marks

Credits: 04

Course prerequisites:

Fundamentals of computing

Course objective:

1. To introduce object oriented programming concepts.
 2. To develop programming ability by learning advanced coding techniques.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate basic knowledge of object oriented programming concepts.
2. Write simple programs in Java.
3. Apply Java for HTML and Applet applications.
4. Use SQL for database manipulation

Contents

Unit I

[06 Hours]

Object Oriented Programming:

Programming fundamentals, Basic Concepts, Different Programming Paradigms, Evolution of Different Programming Languages and their Characteristics, Object-Oriented Paradigm,

Objects and Classes, Data Abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Communication, Benefits of OOP, Applications of OOP, Java Language as an OOP Language.

Unit II

[06 Hours]

Introduction to Java:

Introduction to Java, Different Characteristics of Java, C++ and Java: Feature Comparisons, Improvements, Detailed Overview, Constants, Variables and Data Types, Operators and Expressions, Decision Making and Branching and Decision Making and Looping, Classes Objects and Methods, Arrays, Strings and Vectors, Interfaces.

Unit III

[06 Hours]

Threads:

Packages in Java, Multithreaded Programming concepts and applications, Managing Errors and Exceptions, Managing Input/Output Files in JAVA.

Unit IV

[06 Hours]

HTML and Java Applets:

History, W3C Standards, Standard HTML Tags for Image and Text Formatting, Tables, Lists, Frames. Introduction to dynamic HTML. Java Applets: History, Introduction, HTML and Java Applet. Basic Applet programming, Applets on Web. Applet applications for Web.

Unit V

[06 Hours]

SQL and Java:

Introduction to databases, Data Models, Concepts, Schema, Relational Query. Detailed Overview of SQL Language, Basic SELECT Query, WHERE Clause, ORDER BY Clause, Merging Data from Multiple Tables: INNER JOIN, INSERT Statement, UPDATE Statement, DELETE Statement, and Installation of MySQL or PL SQL. Setting MySQL / PL SQL User Account.

Unit VI

[06 Hours]

Database Connectivity:

Introduction to JDBC, JDBC Architecture, Types of JDBC drivers, Result Set, Metadata, Stored Procedure, Callable Procedure, Connection Procedure.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

List of Tutorials/Experiments

1. Write a Java program to implement Class and Inheritance Concept.
2. Write a Java program to differentiate between method overloading and method overriding.
3. Write a Java program to understand the use of String class and string buffer class
4. Write a Java program to implement the concept of Package.
5. Write a Java program to implement concept of Exception Handling.
6. Write a program to implement Frame and different graphics objects.
7. Write a program to implement Java Applet.
8. Write a SQL Program for implementation of DDL, DML, and DCL.

List of Assignments:

1. Write a C++ or Java Program to demonstrate the use of OOP features.
2. Write a Java Program to display pattern (Triangle, Pyramid) using different loops.
3. Implementation of different string functions by using switch case.
4. Write a Java Program implement multiple inheritances by using Interface.
5. Write a Java Program to perform different file operations.
6. Write a program to implement multithreading.
7. Design a College website containing detailed information using HTML Tags.
8. Write a program to implement a Java Applet.
9. Write a Java program to demonstrate JDBC connectivity.
10. Comparison of different database
11. Justify the role of SQL for database manipulation
12. A mini project on Java and SQL.

Text Books:

Text Books:

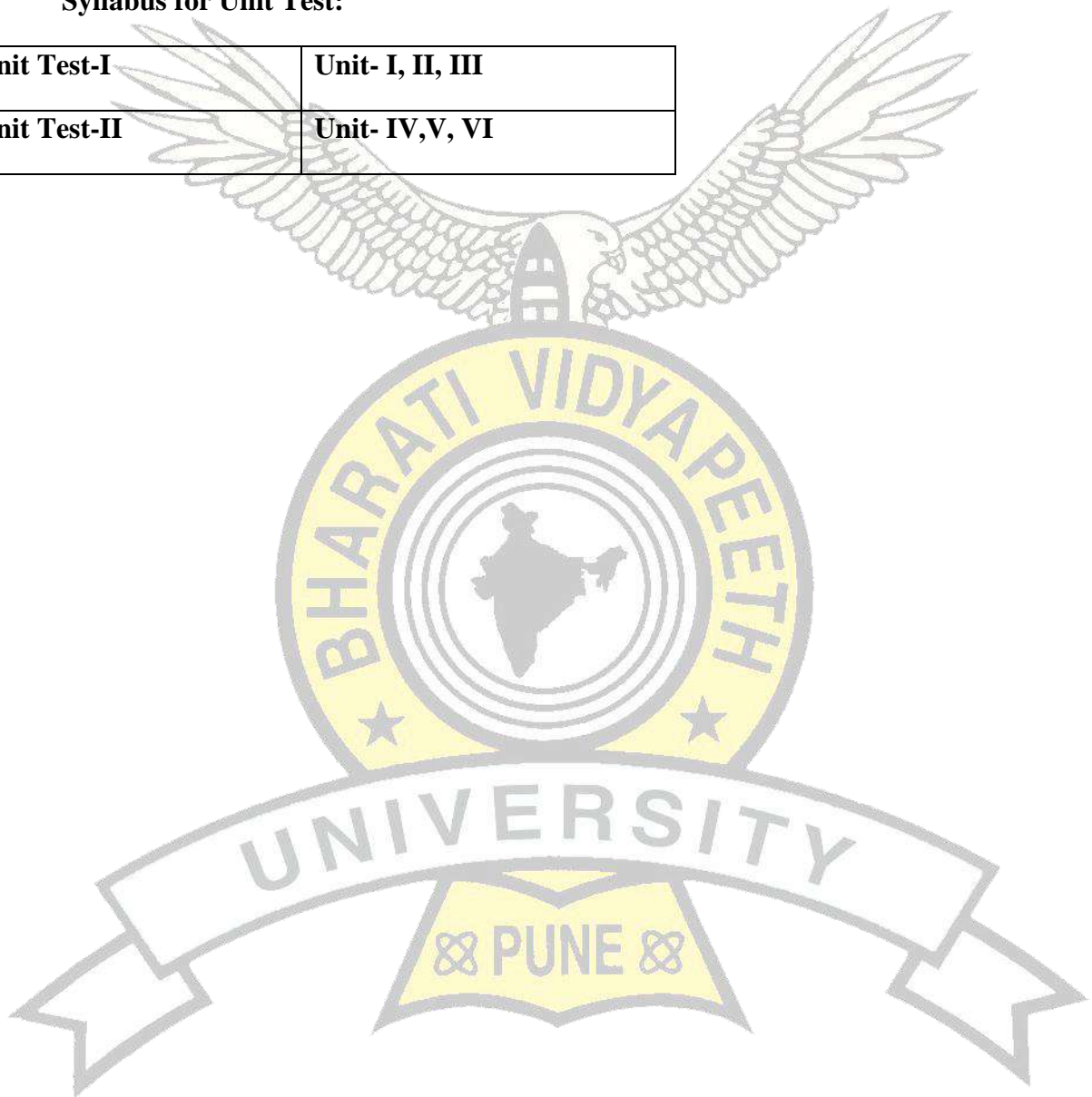
1. Programming with Java: A Primer, 3E by E Balagurusamy, Tata McGraw Hill Publishing Company.
2. Database System Concepts, Sixth Edition by Henry Korth, McGraw Hill Publishing Company
3. Java Complete Reference, Herbert Schildt, McGraw Hill Publishing Company
4. Java: How to Program by Deitel and Deitel

Reference Books:

1. Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI”, BPB Publication.
2. Korth, “Database System Concepts”, MGH Publication.
3. Ivan Bayross, “Programming with SQL”, Sybase Publication.

Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





Class: B.Tech (Electronics & Telecommunications) Sem:- VII

SUBJECT: Project stage –I

Teaching Scheme

Practical: 04 Hours/week

Examination scheme

TW & Oral: 50 marks

Total Credits: 04

Course objective:

1. To familiarize the students with the product development cycle
2. To impart the importance of working as a team.
3. To introduce the student to literature survey and documentation process.
4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.

Course Outcomes: On successful completion of this course, students will be able to

1. Identify the problem for practical Engineering application
2. Formulate and design appropriate solution
3. Write specifications and identify constraints
4. Work as an effective team member
5. Effectively plan the financial budget for the project.

Project Stage –I includes various steps such as :

1. Problem Identification
2. Information gathering
3. Feasibility study
4. Synopsis
5. System analysis
6. Requirement analysis



**Bharati Vidyapeeth Deemed University
College of Engineering, Pune**



Class: B. Tech (Electronics & Telecommunications) Sem:-VII

SUBJECT: - In-plant Training

Teaching Scheme

Examination Scheme

TW& OR: 50 marks

Credits: 04

Course Objectives:

1. To familiarize the students to industrial work processes.
2. To work as an effective team member.
3. To develop the communication and presentation skills.
4. To introduce the student to work ethics in industry.

Course Outcomes: On successful completion of this course, students will be able to

1. Work effectively in an industrial environment.
2. Effectively communicate and present himself/herself.
3. Identify the various sections in the industry.
4. Work in a team.

In-plant Training:

Every student has to undergo training on site or in office of some company in June & July for one and half month to get the exposure and practical experience. He has to submit the detailed report of training, on the basis of which the term work and oral marks should be awarded.

Note: Student should complete in-plant industrial training after semester-VI for a period of six weeks. Evaluation will be done in semester-VII.



**Bharati Vidyapeeth Deemed University,
College of Engineering, Pune**



Class: B. Tech (Electronics & Telecommunications) Sem: -VIII

SUBJECT: - Optical Fiber Communication

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & PR: 50 Marks

Total Credits:04

Course Prerequisites:

- Electromagnetic Engineering
- Analog Communication System

Course Objectives:

1. To introduce optical fiber modes and signal degradations associated with optical fiber.
2. To introduce optical sources, optical detectors and their use in the optical communication system.
3. To expose the student to digital transmission and its associated parameters on system performance.

Course Outcomes: On successful completion of this course, students will be able to

1. Analyze the basic elements of optical fiber, fiber modes configurations and structures.
2. Design optimization of SM fibers, RI profile and cut-off wave length.
3. Analyze the different kind of losses, signal distortion in optical wave guides and other signal degradation factors Also to analyze the fiber splicing and connectors

4. Analyze the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers. To analyze about different Detectors, PIN and APD and their noise performance.
5. Design the receiver operation and configuration. noise effects on system performance
6. Analyze the SONET, WDM optical networks
7. Analyze the operational principles WDM, solitons and optical CDMA

Contents:

UNIT-I

Introduction

[6 Hrs]

Introduction to Ray theory transmission: Total internal reflection; Acceptance angle; Numerical aperture, Types of Fiber, Electromagnetic mode theory of optical propagation: modes in planar guide, phase and group velocity, modes in cylindrical fibers.

UNIT-II

[6 Hrs]

Sources and Detectors

Optical sources: Light Emitting Diodes; LED structures ; internal quantum efficiency; injection laser diode structures ; comparison of LED and ILD, Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise –Noise sources , Signal to Noise ratio , Detector response time.

UNIT-III

[6 Hrs]

Transmission Characteristics of Optical Fiber

Attenuation: Absorption, Scattering; Fiber Bend losses; Dispersion, Optical fiber connectors, Fiber alignment and Joint Losses, Fiber Splices, Fiber connectors and Couplers.

UNIT-IV

[6 Hrs]

Fiber Optic Receiver and Measurements

Fundamental receiver operation, Pre amplifiers, Error sources, Receiver Configuration, Probability of Error, Quantum limit, Fiber Attenuation measurements, Dispersion measurements, Fiber Refractive index profile measurements , Fiber cut- off Wave length Measurements, Fiber numerical Aperture Measurements, Fiber diameter measurements, OTDR

UNIT-V

[6 Hrs]

Optical Networks

Basic Networks, SONET / SDH, Broadcast and select WDM Networks, Wavelength Routed Networks, Non-linear effects on Network performance.

UNIT-VI

Advance Optical Communication

[6 Hrs]

Performance of WDM with EDFA system, Solitons, Optical CDMA, Ultra High Capacity Networks.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Experiments:

1. Study the characteristics of optical source LED, Laser Diode.
2. Determination of Numerical Aperture of optical fiber.
3. Determination propagation loss and bending loss in optical fiber.
4. Design the analog/digital link using fiber optic cable.
5. Simulation of power budget presentation for basic optical network using optisystem software.
6. Simulation of 16 channel WDM system design.
7. Design and Simulation the channel switching based on MEMS.

8. Design and Simulation a ring switch using optispice software.
9. Setting of Fiber optic voice link using AM, FM& PWM.
10. Characteristics of photodetector.

List of Assignments

1. Classification of types of fibers and study of basic principle of optical fiber and its parameters.
2. Study of Electromagnetic mode theory of optical propagation.
3. Discuss the degradation of optical fiber.
4. Classify the types of optical connectors and couplers.
5. Study of characteristics of optical source like LED, LASER.
6. Study of characteristics of optical detector like PIN, APD.
7. Measurement of different parameters of optical fiber.
8. Study of receiver configuration, probability of error, quantum limit of optical receiver.
9. Study of SONET / SDH, Broadcast and WDM networks.
10. Discuss the non-linear effects on network performance.
11. Study of performance of WDM with EDFA system, Solitons.
12. Study of Optical CDMA, Ultra High Capacity Networks.

Text Books:

1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007
2. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition. 2000

Reference books:

1. R.P. Khare, “Fiber Optics and Optoelectronics”, Oxford University Press, 2007.
2. J.Gower, “Optical Communication System”, Prentice Hall of India, 2001
3. Rajiv Ramaswami, “Optical Networks “, Second Edition, Elsevier, 2004.
4. Govind P. Agrawal, “Fiber-optic communication systems”, third edition, John Wiley & sons, 2004



Bharati Vidyapeeth Deemed University

College of Engineering, Pune

Class: B. Tech (E & TC) Sem:-VIII

SUBJECT: - Satellite Communication

Teaching Scheme

Lecture: 3 Hours/week

Practical: 2 Hours/week

Examination Scheme

End semester exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & PR: 50 Marks

Credits: 04

Course Prerequisite: Analog Communication, Digital Communication

Course Objectives

- 1 To introduce the fundamental concept in the field of satellite communication.
- 2 To enable the student to understand how to place satellite in orbit.
- 3 To teach the concept of space subsystem.
- 4 To introduce design, analysis & evaluation of satellite communication subsystem.

Course Outcomes:On successful completion of this course, students will be able to

- 1 Understand Orbital aspects involved in satellite communication.
- 2 Calculate Power budget.
- 3 Identify Satellite system and services provided.
- 4 Analyze the performance of satellite communication system.

UNIT 1: Introduction of Satellite Communication

[6Hrs]

Introduction, basic concept of satellite communication, Orbital Mechanics, Look angle determination, Orbital perturbation, Orbital determination, Launchers and Launch vehicles, Orbital effects in communication system performance.

UNIT 2: Satellite subsystem **[6Hrs]**

Satellite Subsystem, Attitude and control system(AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystem, Satellite antennas, Equipment reliability and space qualification.

UNIT 3: Satellite Link Design **[6Hrs]**

Introduction, Basic transmission Theory, System Noise Temperature and G/T Ration, Design of Downlinks, Satellite System using Small Earth Stations, Uplink Design, Design of specified C/N : Combining C/N and C/I values in Satellite Links.

UNIT 4: Satellite Networks **[6Hrs]**

Reference architecture for satellite networks, basic characteristics of satellite networks, Onboard connectivity with transparent processing, analogue transparent switching, Frame organization, Window organization, On board connectivity with beam scanning.

UNIT 5: Low Earth Orbit and Non Geo-Stationary satellite system **[6Hrs]**

Introduction, Orbit considerations, Coverage and Frequency Consideration, Delay and Throughput Consideration, Operational NGSO constellation design: Iridium, Teledesic.

UNIT 6: Satellite Radio and GPS **[6Hrs]**

C-Band and Ku- Band Home satellite TV, Digital DBS TV, Satellite Radio Broadcasting, Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and codes.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment

3. End Semester Examination

List of Experiments:

1. To study Direct satellite broadcasting receiver
2. To study Low Noise Block converter
3. To study SAW filter
4. To study Ceramic filter
5. To study Satellite antenna
6. To study Microstrip patch antenna
7. To study Satellite transponder
8. To study Video IF amplifier
9. To study video power amplifier
10. To study Communication receiver

Text Books:

1. Satellite Communications-Timothy Pratt, Charles Bostian, Jeremy Allnut John Wiley & Sons (II Edition)
2. Satellite Communications-Anil k. Maine and Varsha Agaraval, Wiley Publications

Reference Books:

1. Satellite Communications, by Dennis Roddy(Fourth edition),McGraw Hill.
2. Satellite Communication Systems Engineering, by Wilbur L. Pritchard, Henri G. Suyderhoud, Robert A. Nelson (Second Edition), Pearson
3. Satellite Communication, by Timothy Pratt, Charles Bostian, Jeremy Allnutt(Second Edition), John Wiley & Sons.
4. Satellite Technology, Principles and Applications, by Anil K. Maini, Varsha Agarwal (Second Edition), Wiley.

List of Assignments

1. Explain in detail introduction to satellite communication
2. Explain Kepler's first, second and third law in detail
3. Explain in detail satellite antenna.
4. Write about radio wave propagation.
5. Explain in detail various layers existing in radio propagation
6. Explain in detail various polarisation existing in satellite antenna
7. Describe telemetry, tracking and orbital control existing in satellite communication.
8. Explain in detail multiplexer and demultiplexes existing in satellite communication
9. Explain working of satellite transponder
- 10 Explain working of satellite receiver



Bharati Vidyapeeth Deemed University
College of Engineering, Pune



Class: B. Tech (Electronics & Telecommunications) Sem:-VIII
SUBJECT: - Software Defined Radio

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1 Hours/week

Examination Scheme

End semester exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

Credits:04

Course Prerequisites:

- Digital Communication, RF Engineering, DSP, Microwave and Antenna theory

Course objective:

1. To provide the student with solid fundamental tools used for Software defined radio.
2. To introduce the design of antenna systems to accommodate the need of a software defined radio (i.e. smart antenna algorithms)
3. To develop ability to understand and implement structure of Software defined radio.
4. To provide understanding of analog and digital technologies used for software-defined radio.

Course Outcomes: On successful completion of this course, students will be able to

1. Understand the basic concepts of SDR.
2. To design algorithms for smart antenna.
3. Use DSP concepts for SDR.
4. Understand the architecture of SDR.
5. Understand different Applications of SDR and smart antennas.

Contents:

Unit 1

Introduction to Software Defined Radio

[6 Hrs]

Introduction to Software Defined Radio, Software Radio Applications, A Traditional Hardware Radio Architecture, An Ideal Software Defined Radio Architecture, Signal Processing Hardware History, Software Defined Radio Project Complexity, Radio Architectures, Hybrid Radio Architecture, Basic Software Defined Radio Block Diagram, System-Level Functional Partitioning, Digital Frequency Conversion Partitioning

Unit 2

RF design for SDR devices

[7 Hrs]

3G RF Performance Requirements, Receiver Requirements 3G Transmitter Requirements, ,14-Bit Software Radio ADC, DACs ,DAC Noise Budget ,ADC Noise Budget , Decimation, Interpolation, and Multirate Processing, Cascading Digital Converters and Digital, Frequency Converters

Unit 3

Signal Processing Hardware Components

[5 Hrs]

SDR Requirements for Processing Power, DSPs, DSP Devices, DSP Performance Summary, DSP Compilers, Reconfigurable Processors, Chameleon Reconfigurable Communications Processor (RCP), Adaptive Computing Machine FPGAs, Symbol Rate and Chip-Rate Partitioning

Unit 4

Software Architecture and Components

[6 Hrs]

Introduction Major Software Architectural Choices, Hardware-Specific Software Architecture, Abstracted Open Software Architecture, Software Standards for Software Radio, JTRS Software Communications Architecture Specification, SDRF Distributed Object Computing

Software Radio Architecture, The OMG, Software Design Patterns, Component Choices

Unit 5

Application & Smart antennas

[6 Hrs]

Software Defined Radio Examples Frameworks and Platforms, 3G SDR Testbeds, Applying Software Radio Principles to Smart Antenna Systems, Smart Antenna Architectures Switched Beam Array, A Software Radio Smart Antenna Architecture, Smart Antenna Performance,

Unit 6

Low-Cost Experimental Software Radio Platform

[6 Hrs]

Platform Requirements, System Architecture, Analog RF Interface, TMS320C62x EVM Daughterboard Interface, PCI Interface, Line-Level Audio Output Interface, System Design, DSP Clock Frequency, ADC Clock Source, Matching Sampling Rate, Functional Design, Low-Level Implementation Details, THS12082 Hardware, THS12082 Software, DSP BIOS Configuration, Potential Applications

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/ Experiments.

1. Implement SDR transmission/Modulation using MATLAB.
2. Implement SDR reception/Demodulation using MATLAB.
3. Parameter estimation for adaptation of wireless communication systems (learning environment and other factors)

4. Incorporate cognitive features in the upcoming standards (like 802.16m, LTE advanced, 802.11n, adaptive frequency hopping in Bluetooth) and in the 3G (2.5G) standards.
5. List down the Challenges and issues regarding the implementation of SDR?
6. Implement SDR in LabVIEW.
7. Implementing Software-Defined Radio: 4-QAM Modem in LabVIEW
8. Develop a model of a Software Defined Radio using SIMULINK tool to implement the IEEE 802.11 standard and the Bluetooth standard.
9. Implementing Single tone in NI-USRP using LabVIEW.
10. Implementing audio file modulation in NI-USRP using LabVIEW.

List of Assignments:

1. Draw hybrid radio architecture and explain each of its block.
2. Define Interpolation and Decimation & their Importance in digital communication?
3. List the advance applications in SDR?
4. Explain Symbol Rate and Chip-Rate Partitioning with examples?
5. Cognitive radio is related to SDR. Explain
6. List down the different FPGAs and differentiate between them.
7. List down the Software Standards for Software Radio.
8. Explain the salient features of Texas T1 DSP processors
9. Define Smart antennas and its importance.
10. Explain 3G SDR Testbeds.
11. List down the requirements of low level implementation of SDR
12. Differentiate between 3G,4G &5G

Text Books:

1. Software defined Radio for 3G by Joe Burns (Artech house).
2. Software defined radio by Walter Tuttlebee (Wiley.).

Reference Books:

1. Huseyinarslan, "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems ", Springer 2007
2. F. B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005



Bharati Vidyapeeth Deemed University

College of Engineering, Pune



Class: B. Tech (Electronics and Telecommunication) Sem: - VIII

SUBJECT: - Elective - II Speech & Audio Processing

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1 Hour/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits:04

Course prerequisites:

Engineering Mathematics-III , Signals and Systems, Digital Signal processing

Course objective:

- 1.To introduce speech & audio processing theory and time domain models
 2. To introduce the coding techniques for speech & audio signals.
 3. To enable students to apply STFT analysis and speech synthesis
 4. To introduce linear predictive coding as well as different techniques to enhance speech quality
-

Course Outcomes: On successful completion of this course, students will be able to

1. Qualitatively describe the mechanisms of human speech production and how the articulation mode of different classes of speech sounds determines their acoustic characteristics.
2. Apply programming tools (such as MATLAB, Lab VIEW) to analyze speech and audio signals in time and frequency domains, and in terms of the parameters of a source-filter production model and harmonic models.

3. Critically analyze, compare, and implement methods and systems for coding of speech and audio signals, and finally engineer efficient coding solutions.
4. Analyze, compare, and implement methods and systems for enhancement of speech and audio signals in environmental noisy conditions.

Contents:

Unit-I

[6 Hrs]

Fundamentals of Speech

The Human Speech Production Mechanism, LTI Model for Speech Production, Nature of the Speech Signal, Linear Time-Varying Model, Phonetics, Types of Speech, Voiced and Unvoiced Decision Making, Audio File Formats: Nature of the WAV File.

Unit-II

[6 Hrs]

Parameters of Speech: Pitch and Formants

Fundamental Frequency or Pitch Frequency, Parallel Processing Approach for Calculation of Pitch Frequency, Pitch Period Measurement Using Spectral Domain, Cepstral Domain, Formants and Their Relation With LPC, Evaluation of Formants Using Cepstrum, Evaluation of Formants Using Log Spectrum, Evaluation of Formants Using Power Spectral Density Estimate, Estimation of Formants: Other Methods.

Unit-III

[6 Hrs]

Spectral Parameters of Speech

Homomorphic Processing, Cepstral Analysis of Speech: Cepstral Coefficients, The Auditory System as a Filter Bank, Mel Frequency Cepstral Coefficients (MFCCs), Perceptual Linear Prediction (PLP), Log Frequency Power Coefficients (LFPCs), Relative Spectral Perceptual Linear Prediction (Rasta-PLP): Strategies for Robustness, Short-Time Spectral Analysis of Speech: Short-Time Fourier Transform (STFT), Wavelet Transform Analysis of Speech

Unit-IV

[6Hrs]

Linear Prediction of Speech

Lattice Structure Realization, Forward Linear Prediction, Autocorrelation Method, Covariance Method, Lattice Methods, Selection of Order of the Predictor, Line Spectral Frequencies/Line Spectral Pair Frequencies.

Unit -V

[6 Hrs]

Speech Quantization and Coding

Uniform and Non-Uniform Quantizers and Coder, Companded Quantizers, Uniform Quantization of Non-Uniform Sources: Adaptive Quantizers, Waveform Coding of Speech, Comparison of Different Waveform Coding Techniques, Parametric Speech Coding Techniques, Sinusoidal Speech Coding Techniques, Mixed Excitation Linear Prediction Coder, Multi-Mode Speech Coding (Hybrid Coder), Transform Domain Coding of Speech

Unit-VI

[6 Hrs]

Speech Processing Applications

Speech Recognition Systems, Architecture of a Large Vocabulary Continuous Speech Recognition System, Deterministic Sequence Recognition for ASR, Statistical Sequence Recognition for ASR, Statistical Pattern Recognition and Parameter Estimation, VQ-HMM-Based Speech Recognition, Discriminant Acoustic Probability Estimation, Word Spotting/Keyword Spotting, Speech Recognition and Understanding, Speaker Recognition, Distortion Measures: Mathematical and Perceptual, Speech Enhancement, Adaptive Echo Cancellation.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Practicals:

1. Record speech signal and find Energy and ZCR for different frame rates and comment on the result.

2. Record different vowels as /a/, /e/, /i/, /o/ etc. and extract the pitch as well as first three formant frequencies. Perform similar analysis for different types of unvoiced sounds and comment on the result.
3. Write a program to identify voiced, unvoiced and silence regions of the speech signal.
4. Record a speech signal and perform the spectrographic analysis of the signal using wideband and narrowband spectrogram. Comment on narrowband and wide band spectrogram.
5. Write a program for extracting pitch period for a voiced part of the speech signal using autocorrelation.
6. Write a program to design a Mel filter bank and using this filter bank write a program to extract MFCC features.
7. Write a program to perform the cepstral analysis of speech signal and detect the pitch from the voiced part using cepstrum analysis.
8. Write a program to find LPC coefficients using Levinson Durbin algorithm.
9. Write a program to enhance the noisy speech signal using spectral subtraction method.
10. Write a program to extract frequency domain audio features like SC, SF and Spectral roll off.

List of Assignments:

1. Provide the details of human speech production mechanism
2. Explain Types of Speech
3. Explain voiced and unvoiced signal decision making techniques
4. Describe Pitch and Formants of speech signal
5. Explain linear predictive coding (LPC).
6. Write a note on 'Autocorrelation Method for speech processing'
7. Explain Mel Frequency Cepstral Coefficients (MFCCs).
8. Study of Line Spectral Frequencies/Line Spectral Pair Frequencies.
9. Write a note on 'Speech Recognition Systems'
10. Compare VQ and HMM based Speech Recognition on various parameters
11. Study of Uniform and Non-Uniform Quantizers and Coder
12. Study of Log Frequency Power Coefficients (LFPCs)



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Class: B. Tech (Electronics & Telecommunications) Sem:-VIII

SUBJECT: - Elective - II Artificial Intelligence and Robotics

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1 Hours/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits: 4

Course Prerequisites:

- Programming languages, Microcontrollers.

Course Objectives:

1. To introduce basic concepts of Artificial Intelligence.
2. To familiarize the students with methods of solving problems using Artificial Intelligence.
3. To introduce the basic configuration of Robotics and various types of Robots.

Course Outcomes: On successful completion of this course, students will be able to

1. Identify problems that are amenable to solution by AI methods.
2. Identify appropriate AI methods to solve a given problem.
3. Formalize a given problem in the language/framework of different AI methods.
4. Implement basic AI algorithms in design of Robots

Content

UNIT 1

Scope of AI**[6 Hrs]**

Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction.

UNIT 2**Problem solving****[6 Hrs]**

State space search; Production systems, search space control: depth-first, breadth-first search, heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis.

UNIT 3**Knowledge Representation****[6 Hrs]**

Predicate Logic: Unification, modus ponens, resolution, dependency directed backtracking. Rule based Systems: Forward reasoning, conflict resolution, backward reasoning, use of no backtrack. Structured Knowledge Representation: Semantic Nets, slots, exceptions and default frames, conceptual dependency, scripts.

UNIT 4**Handling uncertainty and learning****[6 Hrs]**

Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, fuzzy logic. Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets.

UNIT 5**Robotics****[6 Hrs]**

Automation and Robotics, Definition, Basic Structure of Robots, Robot Classification, Robot Specification, notation, Present trends and future trends in robotics, Overview of robot subsystems.

UNIT 6**Direct and Inverse Kinematics****[6 Hrs]**

Co-ordinates Frames, Rotations, Homogeneous Coordinates, Arm Equation of four Axis SCARA Robot, TCV, Inverse Kinematics of Four Axis SCARA Robot.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials / Experiments:

1. Program to find truth and probability in evolutionary game.
2. Program for optimal search and graph heuristics
3. Forward and backward Chaining.
4. K-nearest neighbors.
5. Implement Predicate logic
6. Write a program for face detection.
7. Implement knowledge representation
8. Constraint satisfaction problems
9. Breadth-first search
10. Hill climbing algorithm
11. Depth-first search

List of Assignments:

1. Write a note on different AI techniques.
2. Explain Optimal search and graph heuristics.
3. What are problem solving, search and control strategies?
4. Define Mean-end analysis.
5. Discuss Forward chaining and backward chaining with an example.
6. Explain modus ponens with formal notation
7. Write a note on artificial neural network.

8. Explain fuzzy logic with examples.
9. Define basic structure of robot and its classification.
10. Write the Present trends and future trends in robotics
11. Discuss SCARA ROBOT with neat diagram.
12. Explain Inverse Kinematics of Four Axis SCARA Robot

Text Books:

1. E. Rich and K. Knight, “Artificial intelligence”, TMH, 2nd ed., 1992.
2. Robin R Murphy, Introduction to AI Robotics PHI Publication, 2000
3. Fundamentals of Robotics: Analysis and Control – Robert J Schilling, PHI, New Delhi
4. Robotic Engineering – Klafter, Thomas, Negin, PHI, New Delhi

Reference Books:

1. D.W. Patterson, “Introduction to AI and Expert Systems”, PHI, 1992.
2. R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.
3. George Lugar, .AI-Structures and Strategies for and Strategies for Complex Problem solving., 4/e, 2002, Pearson Educations.
4. Robotics for Engineers – YoramKoren, McGraw Hill



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Class: B.Tech (Electronics & Telecommunications) SEM: -VIII

SUBJECT: - Elective-II System on Chip

Teaching Scheme

Lecture: 3 Hours/week

Tutorial: 1 Hour/week

Examination Scheme

End Semester Exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignment: 10 marks

TW & OR: 50 Marks

Credits: 4

Course Prerequisites: Processor Design, Digital Electronics

Course objective:

- 1) To make students familiar with fundamentals of SOC design methodology.
- 2) To categorize requirements of SOC design.
- 3) To recognize essentials of SOC design.
- 4) To comprehend applications of SOC.

Course Outcomes: On successful completion of this course, students will be able to

- 1) Conceptualize SOC design methodology
- 2) Understand SOC design flow
- 3) Design complex SOC
- 4) Intellectualize future trends in SOC design

Unit-I

The Case for a New SOC Design Methodology

[6 Hrs]

The age of Megagate SOCs, The fundamental trends of SOC design, An improved design methodology for SOC design.

Unit-II

SOC Design Today

[6 Hrs]

Hardware System Structure, Software trends, Current SOC Design Flow, Six Major Issues in SOC Design.

Unit-III

A New Look at SOC Design

[6 Hrs]

The basics of Processor-Centric SOC architecture, Accelerating Processors for Traditional Software Tasks, System Design with Multiple Processors, New Essentials of SOC Design Methodology

Unit-IV

System-Level Design of Complex SOCs

[6 Hrs]

Complex SOC System Architecture Opportunities, Major Decisions in Processor-Centric SOC Organization, Communication Design = Software Mode + Hardware Interconnect, Hardware Interconnect Mechanisms, The SOC Design Flow

Unit -V

Advanced Topics in SOC Design

[6 Hrs]

Pipelining for Processor Performance, Inside Processor Pipeline Stalls, Optimizing Processors to Match Hardware, Multiple Processor Debug and Trace, Issues in Memory Systems

Unit-VI

The future of SOC Design

[6 Hrs]

What's happening to SOC design, The designer's dilemma, The SOC design transition, Looking into future of SOC design, Future applications of complex SOC.

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

List of Tutorials/Experiments:

- 1) Study of SOC Components
- 2) Study of Integration Technology in SOC with standard CMOS process.
- 3) Study of Technology challenges in SOC design.
- 4) Study of SOC design requirements
- 5) Study of SOC architecture
- 6) Study of SOC test methodology
- 7) Application of SOC in Communication
- 8) Application of SOC in Computer
- 9) Application of SOC in Consumer
- 10) Case study: Complex SOC

List of Assignments:

- 1) What are the challenges in SOC design? Describe in brief.
- 2) List various design elements, tools and methodologies playing an important role in SOC Design.
- 3) Using diagram, explain SOC design flow.
- 4) Which are the important issues in SOC design? Explain in detail.
- 5) Discuss the basics of processor -centric SOC design.
- 6) Write essentials of SOC design methodology.
- 7) Define complex SOC system architecture opportunities.

- 8) Explain major decisions in processor-centric SOC organizations.
- 9) Discuss pipelining and exceptions.
- 10) Explain issues in memory system.
- 11) Describe designer's dilemma wrt SOC.
- 12) List future applications of complex SOC.

Text book:

- 1) Chris Rowen, Engineering the Complex SOC, Prentice Hall, 2004.

Reference books:

- 1) Rainer Leupers, Olivier Temam, Processor and System-on-Chip Simulation, Springer, 2010
- 2) Michael J. Flynn, Wayne Luk, Computer System Design System on Chip, Wiley, 2011
- 3) Bashir M. Al-Hashimi, System-on-Chip: Next Generation Electronics, IET, 2006
- 4) Steve Furber, ARM System on Chip Architecture, Pearson India, 2000
- 5) Wayne Wolf, Ahmed Amine Jerraya, Multiprocessor Systems-on-Chips, Elsevier, 2005.
- 6) Sudeep Pasricha and Nikil Dutt, On-Chip Communication Architectures System on Chip Interconnect, Elsevier, 2008



**Bharati Vidyapeeth Deemed University,
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Class: B. Tech (Electronics & Telecommunication) Sem:-VIII

Subject: - Elective-II Fuzzy Logic & Neural Network

Teaching Scheme

Lecture: 03 Hours/week

Tutorial: 01 Hour/week

Examination Scheme

End semester exam: 60 Marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Oral: 50 Marks

Credits: 04

Course Prerequisites:

Engineering Mathematics-II, Engineering Mathematics-III, Signals & Systems.

Course Objectives:

1. Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
 2. Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems Techniques.
 3. To create awareness of the application areas of neural network technique
 4. Provide alternative solutions to the conventional problem solving techniques in image/signal processing, pattern recognition/classification, control system.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Design fuzzy system for Electronics applications.
2. Describe the fundamentals of Crisp sets, Fuzzy sets, Fuzzy Relations and Fuzzy Logic Controller.

3. Describe the various architectures of building an ANN and its applications.
4. Design and implement neural network systems to solve real-world problems
5. Develop models for different applications using fuzzy system.

Contents:

Unit I

Fuzzy Logic -I

[05 Hours]

Concept of Fuzzy number, fuzzy set theory (continuous, discrete), Operations on fuzzy sets, Fuzzy membership functions (core, boundary, support), primary and composite linguistic terms, Concept of fuzzy relation, composition operation (T-norm, T-conorm), Fuzzy if-then rules.

Unit II

Fuzzy Logic -II

[07 Hours]

Fuzzification, Membership Value Assignment techniques, De-fuzzification (Max membership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules- Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.

Unit III

Fuzzy Control Systems

[06 Hours]

Assumptions in a Fuzzy Control System Design, Fuzzy Logic Controllers, Comparison with traditional PID control, advantages of FLC, Architecture of a FLC: Mamdani Type, Example Aircraft landing control problem, washing machine and vacuum cleaner.

Unit IV

Artificial Neural Network -I

[05 Hours]

Biological neuron, Artificial neuron model, concept of bias and threshold , Mc Culloch-Pits Neuron Model, implementation of logical AND, OR, XOR functions Soft Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model : concept of error energy , gradient descent algorithm and application of linear neuron for linear

regression, Activation functions : binary , bipolar (linear, signum, log sigmoid, tan-sigmoid)
Learning mechanisms: Hebbian, Delta Rule o Perceptron and its limitations Draft.

Unit V

Artificial Neural Network -II

[07 Hours]

Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification and regression, Self-organizing Feature Maps, k-means clustering, Learning vector quantization Radial Basis Function networks: Cover's theorem, mapping functions (Gaussian, Multiquadrics, Inverse multi quadrics), Application of RBFN for classification and regression, Hopfield network, associative memories.

Unit VI

Adaptive Neuro-Fuzzy Inference Systems (ANFIS)

[06 Hours]

ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS
Application of ANFIS/CANFIS for regression

Content Delivery Methods: Chalk & talk, Power point presentation.

Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination.

List of Tutorials/Experiments:

1. Study of Fuzzy sets and operations.
2. Study of concepts of fuzzy sets core, support, alpha cuts..
3. Study of fuzzy relation, Max-min composition.
4. Analyze t-norms and t-conorms.
5. Analyze Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model.
6. Analyze architecture of a FLC: Mamdani Type with Example Aircraft landing control problem, washing machine and vacuum cleaner.
7. Study of learning mechanisms, approaches and activation functions in ANN.
8. Study of Multilayer perceptron (MLP) and back propagation algorithm.

9. Study of Radial Basis Function networks.
10. Study of ANFIS architecture and Hybrid Learning Algorithm.

List of Assignments:

1. Implement simple logic network using MP neuron model
2. Implement a simple linear regressor with a single neuron model.
3. Implement and test MLP trained with backpropagation algorithm
4. Implement and test RBF network.
5. Implement SOFM for character recognition.
6. Perform fuzzy sets operations.
7. Implement fuzzy membership functions (triangular, trapezoidal, gbell, PI, Gamma, Gaussian).
8. Implement defuzzification (Max-membership principle, Centroid method, Weighted average method)
9. Implement FIS with Mamdani inferencing mechanism.
10. Implement Simulink model for Vacuum cleaner, washing machine using Fuzzy Logic tools
11. Implement Fuzzy Logic Controller.
12. Implement perceptron learning, multilayer feed forward neural networks.

Text Books:

1. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, Laurene Fausett, Pearson Education, Inc, 2008.
2. Fuzzy Logic with Engineering Applications, Third Edition Thomas, Timothy Ross, John Wiley & Sons, 2010.
3. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private Limited.
4. Principles of Soft Computing , S. N. Sivanandam, S. N. Deepa, John Wiley & Sons, 2007

Reference Books:

1. Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991

2. Neural Networks A comprehensive foundation,, Simon Haykin,Prentice Hall International Inc- 1999.
3. Neural and Adaptive Systems: Fundamentals through Simulations, José C. Principe Neil R. Euliano , W. Curt Lefebvre, John-Wiley & Sons, 2000
4. Pattern Classification, Peter E. Hart, David G. Stork Richard O.Duda,Second Edition,2000
5. Pattern Recognition, SergiosTheodoridis , Konstantinos Koutroumbas, Fourth Edition, Academic Press, 2008
6. A First Course in Fuzzy Logic, Third Edition, Hung T. Nguyen, Elbert A. Walker, Taylor & Francis Group, LLC, 2008
7. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam ,S.Sumathi, S. N. Deepa, Springer Verlag, 2007



**Bharati Vidyapeeth Deemed University,
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Class: B.Tech (Electronics& Telecommunications) Sem:- VIII

SUBJECT: - Project stage - II

Teaching Scheme

Practical: 08 Hours/week

Examination Scheme

TW & Oral: 150 marks

Total Credits: 08

Course prerequisites:

Project Stage -I

Course objective:

1. To familiarize the students with the product development cycle
 2. To impart the importance of working as a team.
 3. To introduce the student to literature survey and documentation process.
 4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.
-

Course Outcomes: On successful completion of this course, students will be able to

1. Implement solution for an Engineering problem.
2. Test and troubleshoot the implemented design.
3. Execute the project implementation & financial budget in a timely manner.
4. Student will be able to contribute and work effectively as team member.
5. Generate project report and present it effectively.

Project Stage –II includes various steps such as:

1. System design
2. Testing
3. System documentation
4. Project report



**Bharati Vidyapeeth Deemed University,
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Class: B.Tech (Electronics& Telecommunications) Sem:- VII

SUBJECT: - Seminar

Teaching Scheme

Practical: 02 Hours/week

Examination Scheme

TW & Oral: 50 marks

Total Credits: 01

Course prerequisites: Electronics Engineering, Telecommunication Engineering

Course objective:

1. To develop ability of thinking and motivation for seminar
 2. To expose the students to the state of the art
 3. To develop ability to perform literature survey
 4. To develop Seminar presentation and Technical Communication Skills
-

Course Outcomes: On successful completion of this course, students will be able to

- Effectively communicate his technical idea or project
- Learn master survey and literature survey techniques
- Write Motivational Statement
- Present the topic

Seminar Documentation should include

Cover Title page, plagiarism assessment, report Certificate from Guide, Abstract, list of Figures, List of Tables, Abstract, Presentation Slide using Microsoft power point including bibliography/references in IEEE standard format.

The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned Guide and head of the department.

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**B. Tech. (I. T.) - 2014 Course
Semester –I**

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Semester Examination	Continuous Assessment			TW	Total	Th	TW
						Unit Test	Attendance	Assignments				
1	Engineering Mathematics - I	3	--	1	60	20	10	10	--	100	4	--
2	Fundamentals of Civil Engineering	3	2	-	60	20	10	10	25	125	3	1
3	Engineering Graphics	4	2	-	60	20	10	10	25	125	4	1
4	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1
5	Fundamentals of Electrical Engineering	3	2	-	60	20	10	10	25	125	3	1
6	Professional Skill Development - I	2	--	-	30	--	--	20	--	50	2	--
7	Programming Principles and Paradigms	--	2	-	--	--	--	--	50	50	--	1
Total		19	10	1	330	100	50	70	150	700	20	5

Teaching Scheme			Examination Scheme-Marks						Credits	
Lectures	Practical	Tutorials	End Semester Examination	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
19	10	1	330	100	50	70	150	700	20	5

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**B. Tech. (I. T.) - 2014 Course
Semester –II**

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks							Credits	
					End Semester Exam.	Continuous Assessment			TW	Total	Th		
		L	P/D	T		Unit Test	Attendance	Assignments					
8	Engineering Mathematics-II	3	--	1	60	20	10	10	--	100	4	--	
9	Fundamentals of Mechanical Engineering	3	2	--	60	20	10	10	25	125	3	1	
10	Engineering Mechanics	4	2	--	60	20	10	10	25	125	4	1	
11	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1	
12	Object Oriented Programming	3	2	--	60	20	10	10	25	125	3	1	
13	Professional Skill Development - II	2	--	--	30	--	--	20	--	50	2	--	
14	Workshop Technology	--	2	--	--	--	--	--	50	50	--	1	
	Total	19	10	1	330	100	50	70	150	700	20	5	

Teaching Scheme			Examination Scheme-Marks							Credits	
Lectures	Practical	Tutorials	End Semester Examination	Unit Test	Attendance	Assignments	TW	Total	Theory	TW	
19	10	1	330	100	50	70	150	700	20	5	

Total Marks of Semester –I and Semester-II = 1400

Total Credits of Semester –I and Semester-II = 50

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ENGINEERING MATHEMATICS-I

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence. **(08 Hours)**

Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

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MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Civil Engineering

TEACHING SCHEME:		EXAMINATION SCHEME:		CREDITS ALLOTTED:	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
Course Pre-requisites:					
The Students should have					
1.	Concepts of units and conversions of units.				
2.	Basic knowledge of Chemistry				
3.	Basic knowledge of geography, concept of latitude and longitude.				
Course Objectives:					
	To make student understand the scope and application of Civil Engineering				
Course Outcomes:					
Students will be able to understand					
1.	Different building components and material				
2.	Classification of surveying				
3.	Levelling of the ground				
4.	Planning of building				
5.	Methods of irrigation and water supply				
6.	Different methods of transportation				
UNIT - I	Civil Engineering Scope And Applications.				(06 Hours)
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.				
UNIT - II	Surveying				(06 Hours)
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.				
UNIT - III	Building Planning And Bye Laws				(06 Hours)
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.				
UNIT - IV	Foundations and Earthquakes				(06 Hours)
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.				
UNIT - V	Irrigation And Water Supply				(06 Hours)
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures; Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.				
UNIT - VI	Infrastructure				(06 Hours)
	Roads- types of roads and their suitability, cross section of roads, meaning of				

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	<p>terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.</p> <p>Railways- Types of gauges, section of railway track, components of railway track, advantages.</p> <p>Bridges: Components - Foundation, Piers, Bearings, Deck.</p> <p>Airways- Components -Runway, Taxiway and Hangers.</p>	
Term Work:		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
Reference Books:		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p>Lines and Dimensioning in Engineering Drawing Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p>Curves used in Engineering Practice Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p>Orthographic Projection Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p>Isometric Projections Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p>Projections of Points and Lines and planes Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p>Projection of Solids Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p>Section of Solids Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views

6. Projection of Solids

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India,
New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International
Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria
and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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ENGINEERING CHEMISTRY

Teaching Scheme:
Lectures: 4Hrs/Week
Practical: 2Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory: 04
Practical: 01
Term Work: 25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process
(08 Hours)

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.
(08 Hours)

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.
(08 Hours)

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.
Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.
(08 Hours)

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.
Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.
(08 Hours)

Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers
Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,
Conformations :- conformations of ethane, conformations of n-butane
(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Electrical Engineering		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Mathematics	
2.	Physics	
Course Objectives:		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
Course Outcomes:		
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
5.	Define basic terms of single phase and three phase ac circuits and supply systems	
6.	Know and use electrical safety rules	
UNIT - I	Basic concepts	(06 Hours)
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	Network Theorems	(06 Hours)
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	Electrostatics	(06 Hours)
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
UNIT - IV	Magnetic Circuit & Transformer	(06 Hours)

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	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.</p>	
UNIT - V	AC Fundamentals & AC Circuits	(06 Hours)
	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
UNIT - VI	Electrical Wiring and Illumination system	(06 Hours)
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

Term Work:

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
 - a) Voltage and current ratios.
 - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books:

- 1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi
- 2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi
- 3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd

Reference Books:

1. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication
2. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications
3. John Omalley Shawn – "Basic circuits analysis" Mc Graw Hill Publications

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4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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ENGINEERING MATHEMATICS-II

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorials: 1Hr/Week

Examination scheme:
End Semester Examination: 60 marks
Continuous Assessment: 40 marks

Credits Allotted:
Theory : 03
Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

(08 Hours)

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Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition(1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Thermodynamics- Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p>Introduction to I.C. Engines and turbines- Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p>Introduction to refrigeration, compressors & pumps- Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p>Energy Sources - Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p>Heat transfer- Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)
UNIT-IV	<p>Properties of fluids- Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p>Properties of Materials and their Applications- Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p>Mechanical devices - Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p>	(08)

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	<p>Mechanisms- Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	
UNIT-VI	<p>Machine Tools- Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p>Introduction to manufacturing processes and Their Applications- Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

- 1 “Thermodynamics An Engineering Approach” Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. “Applied Thermodynamics for Engineering Technologists” T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. “I.C. Engines Fundamentals” J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. “Internal Combustion Engine “: V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 “Strength of Materials” H. Ryder, Macmillians, London, 1969, 3rd edition.
6. “Mechanics of Materials” Johnston and Beer TMH, 5th edition
- 7 “Mechanisms and Machine Theory” Ambekar A.G., Prentice-Hall of India, 2007.
8. “Theory of Machines” S.S. Rattan, Tata McGraw- Hill, 2nd edition.

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9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication,
New Delhi, 2nd edition.

10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th
edition

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10: Engineering Mechanics

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Scalar and Vector
2. Newton's law of motion
3. Law of friction
4. Concept of physical quantities, their units and conversion of units
5. Concept of differentiation and integration

Course Objectives:

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

Course Outcomes:

The student should be able to

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

UNIT - I	Resultant and Equilibrium	(06 Hours)
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
UNIT - II	Truss and Friction	(06 Hours)
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	Centroid and Moment of Inertia	(06 Hours)
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
UNIT - IV	Kinematics of Rectilinear motion of a Particle	(06 Hours)
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	Kinematics of Curvilinear motion of a Particle	(06 Hours)
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	Kinetics of a Particle	(06 Hours)
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum	

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Principle, Coefficient of Restitution, Direct Central Impact.	
Term Work:	
A) The term-work shall consist of minimum Five experiments from list below.	
1. Determination of reactions of Simple and Compound beam.	
2. Study of equilibrium of concurrent force system in a plane.	
3. Determination of coefficient of friction for Flat Belt.	
4. Determination of coefficient of friction for Rope.	
5. Study of Curvilinear motion.	
6. Determination of Coefficient of Restitution.	
B) The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.	
Text Books:	
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.	
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.	
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.	
Reference Books:	
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.	
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.	
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.	
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.	
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.	
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VI

ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
	Term Work: 25marks	

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

(08hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

Object-Oriented Programming in 'C++'

TEACHING SCHEME

Lectures : 2 Hrs/week

Practicals : 2 Hrs/week

EXAMINATION SCHEME

ESE (End Semester Examination) : 60 Marks

Continuous Assessment: 40 Marks

Term Work : 25 Marks

Credits : 3 Credits

Course Pre-requisite:

Programming Principles and Paradigms, "C" programming language.

Course Objectives:

- To familiarize with the universal concepts of computer programming.
- To present the syntax and semantics of the "C++" language as well as basic data types offered by the language
- To discuss the principles of the object-oriented model and its implementation in the "C++" language
- To demonstrate the means useful in resolving typical implementation problems with the help of standard "C++" language libraries

Course Outcomes:

At the end of this course students will able to :

- Understand basic concepts of Object Oriented Programming and applications of OOP.
- Use basic, user-defined and derived data types, Operator precedence.
- Apply Decision Structure, Loops and Functions
- Write, Debug and Compile Programs of C++
- Implement OOP concepts like – Inheritance using C++ programming.

UNIT I

(3 Hours)

Principles of Object Oriented Programming:

Object Oriented Programming Paradigm, Basic concepts of Object Oriented Programming, Benefits of OOP, Object Oriented Languages, Applications of OOP.

UNIT II

(5 Hours)

Beginning with C++:

Overview of C++, Sample C++ Program, C++ statements, Structure of C++ program, Creating source file , compiling and Linking, Tokens, Keywords , Identifiers and Constants, Basic data types, User-defined data types, Derived data types, Declaration of variables, Dynamic initialization of variables, Scope Resolution Operator, Operator Overloading, Operator precedence, Control Structures.

UNIT III

(5Hours)

Functions in C++:

The Main Function, Function Prototyping, Call by Reference, Inline functions, Default arguments, Function Overloading , Friend and Virtual Functions .

Classes and Objects:

Class specification , Class Objects , Scope resolution operator, Accessspecifiers- Public, Private, Protected, Defining member Functions, Nesting of Member Functions, Private Member Functions, Static Data Members , Static Member Functions, Data hiding.

UNIT IV

(6 Hours)

Inheritance: Extending Classes:

Defining Derived Classes, Single Inheritance, Making a Private member inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Class, Abstract class. Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes, Constructors, Destructors , Passing parameters to base class constructors, virtual base classes. STL: An overview, containers, vectors, lists, maps.

UNIT V

(6 Hours)

Constructors and Destructors:

Constructors, Parameterized constructors, Default Constructors, Copy constructor, Dynamic Initialization of Objects, Destructors.

Polymorphism:

Base class, Virtual Functions, Pure Virtual Functions, Calling a virtual function through a base class reference, Early and Late Binding.

UNIT VI

(3 Hours)

Managing Console I/O operations:

C++ Stream Classes, Unformatted I/O Operations, Working with Files, Opening and Closing a file, Formatted I/O.

Text Books/References:

- *Herbert Schildt, "The Complete Reference C++", 4th Edition, Mc Graw Hill, 2003.*
- *Stanley.B.Lippmann, Josee Lajoie, Barbara.E.Moo, "C++ Primer", 5th Edition, Pearson Education, 2013.*
- *Scott Meyers: "Effective C++", Third Edition, Addison-Wesley, 2005.*

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- *E. Balaguruswamy, "Object Oriented Programming using C++", 4th Edition, Mc Graw Hill, 2010.*

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI

Workshop Technology

TEACHING SCHEME:

Theory: -
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -
Continuous Assessment: -
Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

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FACULTY OF ENGINEERING AND TECHNOLOGY

Programme: B. Tech. (I.T.) – SEM III – 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits			
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Oral	Total	Theory	TW & Pr	TW & Or	Total	
						Unit Test	Attendance	Assignments							
1	Fundamentals of Software Engineering	3	--	1	60	20	10	10	--	--	100	4	--	--	4
2	Discrete Mathematics	3	2	--	60	20	10	10	50	--	150	3	1	--	4
3	Software Project Management	3	--	--	60	20	10	10	--	--	100	3	--	--	3
4	Data Structures and Files	3	2	--	60	20	10	10	50	--	150	3	1	--	4
5	Platform Independent Programming Paradigms	3	2	--	60	20	10	10	--	50	150	3	--	1	4
6	Professional skill Development-III	4	--	--	100	--	--	--	--	--	100	4	-	--	4
7	IT Lab-I	--	4	--	-	--	--	--	50	--	50	--	2	--	2
	TOTAL	19	10	1	400	100	50	50	150	50	800	20	04	01	25

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FACULTY OF ENGINEERING AND TECHNOLOGY

Programme: B. Tech. (I.T.) – SEM IV – 2014 Course

Sr.no	Subject	Examination Scheme (Marks)							Credits			
		P/D	T	End Semester Examination	Continuous Assessment	TW & Practical		TW & Oral	Theory	Tw & Or		Total
						Unit Test	Attendance			Assignments		
1	Advanced Data Structure	2	-	60	20	10	10	--	3	1	--	4
2	Digital Electronics and Logic Design	--	--	60	20	10	10	--	3	-	--	3
3	Database Management System	2	--	60	20	10	10	50	3	-	1	4
4	Engineering Mathematics III	--	1	60	20	10	10	--	4	-	-	4
5	Computer Graphics	2	--	60	20	10	10	--	3	1	--	4
6	Professional skill Development--IV	--	--	100	-	-	-	-	4	-	--	4
7	IT Lab-II	4	-	--	--	-	-	-	-	2	--	2
	TOTAL	10	1	400	100	50	50	50	20	04	01	25

Total CreditsSemester - III = 25

Total CreditsSemester - IV = 25

Grand Credits = 50

Fundamentals of Software Engineering

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Tutorial : 1Hr/Week	Continuous assessment : 40 Marks	

Course Objectives:

To enable students to work in teams and use the latest software technologies to develop and implement creative solutions to complex problems.

Course Prerequisites:

Students should have knowledge of

- 1) Developing well-structured, modular programs
- 2) Mathematical knowledge of computer science, including discrete structures, algorithms design and analysis.

Course Outcome:

Students will be able to:

- 1) learn appropriateness of software development model for given software system.
- 2) document user requirement using different communication techniques.
- 3) create the analysis model of the system under consideration .
- 4) gain knowledge of data, control and function design concepts
- 5) understand software quality concepts
- 6) Formulate a testing strategy for a software system,

UNIT-I Introduction to Software Engineering : (6 Hours)

Definition of Software Engineering, Software characteristics, Applications, Software myths, Software Development Process models: The Waterfall model, Incremental process models, Evolutionary Process models, Component based development process model, The Formal Method Model, Aspect–Oriented software Development, Unified Process, Agile Processes Models.

UNIT-II System Engineering Practices: (6 Hours)

Analysis Modeling Principles, Design Modeling Principles, Coding Principles, Testing Principles, Computer based system, System Modeling, System Simulation, System Modeling
Requirement Engineering: Requirements Engineering Tasks, Initiating Requirement engineering Process, Eliciting requirement, Introduction to SRS format, creating SRS.

UNIT-III **Analysis and modeling:** Elements of Analysis Model, Analysis modeling approaches: Data modeling, Scenario based modeling, Flow oriented modeling. **(6 Hours)**

UNIT-IV **Design Engineering:** **(6 Hours)**
System Design: Design Concepts, The Design model architecture, cohesion and coupling, Data Design, Architectural Styles and Patterns, Architectural Design, Mapping Data flow into Software Architecture ,User Interface design.
Coding: TOP-DOWN and BOTTOM-UP structure programming, Information Hiding, Programming Style.

UNIT-V **Software Change Management :** **(6 Hours)**
Software configuration management (SCM), Elements of SCM, Base lines, Software configuration items, SCM Repository, SCM process: Version Control, Change Control, Configuration Audit, Status Reporting.

UNIT-VI **Testing Strategies:** **(6 Hours)**
Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Test case design, A strategic approach to software Testing: Verification and Validation Testing, Organizing for software Testing, Software Testing Strategy for conventional Architecture: Unit Testing Integration Testing, Validation Testing, System Testing, Debugging, White-box, Black-box testing, Basis path Testing, Control structure testing.

Assignments: Implement Study assignments assigned by course faculty .

Text Books:

- 1) Roger S. Pressman, Software Engineering: A Practitioner's Approach (6/e.) McGraw Hill, 2011.

- 2) James F. Peter, Software Engineering - An Engineering Approach, John Wiley (2004).
- 3) Pankaj Jalote, Software Engineering: A Precise Approach , Wiley India, 2010.
- 4) Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.

Reference Books:

- 1) *A Shalloway and J Trott, Design Patterns Explained: A new perspective on object oriented design (2/e), Pearson, 2004.*
- 2) *Rajib Mall, Fundamentals Of Software Engineering ,PHI Learning Pvt. Ltd 2009*

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III
Unit Test -2 Unit IV, V and VI

Discrete Mathematics

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Practical : 2 Hrs/Week	Continuous Assessment : 40 Marks	Tw & Pr : 1
	Term Work and Practical (Tw & Pr) : 50 Marks	

Course Objectives:

1. To apply and relate knowledge of mathematics in computer science.

2. To learn proof theory with propositional calculus and induction.
3. To map and express network problem with trees and graphs

Course Prerequisites: Students should have fundamental mathematical knowledge.

Course Outcome:

Students will be able to:

1. Formulate real world problems into statement forms using sets and relations which can be solved or proved mathematically using set theory and logic.
2. Find and map relation between mathematical statements.
3. Design mathematical model from theoretical statements.
4. Find optimum solution using theory of probability.
5. Apply knowledge graphs to solve network problems.
6. Design searching algorithm efficiently by applying tree and tree traversal logic.

UNIT-I	Propositional Logic and Proof Theory Sets, Set operations, Finite and Infinite sets, Venn diagram, Principle of inclusion and exclusion, Multisets. Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, methods of proofs.	(06 Hours)
UNIT-II	Relations and Functions Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence, Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains. Functions, Composition of functions, Invertible functions, Pigeonhole Principle.	(06 Hours)
UNIT-III	Induction and Recurrence Relations Mathematical Induction, Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Total solutions, Solutions by the method of generating functions	(06 Hours)
UNIT-IV	Probability Basics of permutations and combinations, Discrete Probability, Conditional Probability, Probability distribution: normal, binomial, Poisson , Bernoulli distribution .	(06 Hours)
UNIT-V	Graphs Basic terminology, multi graphs and weighted graphs, paths and circuits, shortest path in weighted graph, Hamiltonian and Euler paths and circuits, factors of a graph, planer graph and Travelling salesman problem.	(06 Hours)

UNIT-VI**Trees****(06 Hours)**

Trees, rooted trees, path length in rooted trees, prefix codes, binary search trees, spanning trees and cut set, minimal spanning trees, Kruskal's and Prim's algorithms for minimal Spanning tree.

Assignment List:

1. Write a program to implement following set operations.
 - i) Union
 - ii) Intersection
 - iii) Cartesian product
 - iv) Power set
2. Write a program to implement Warshall's algorithm.
3. Write a program to calculate value of polynomial for variable x.
4. Write a program to find fogoh, where $g(x)$ and $h(x)$ is taken from user.
5. Write a program to check whether Eulerian circuit is present in the given graph.
6. Write a program to find shortest path between the vertices in given graph.
7. Write a program to create binary search tree for the values taken from user.
8. Write a program to implement various tree traversals.
9. Write a program to implement Kruskal's algorithm.
10. Write a program to implement Prim's algorithm.

Text Books:

- 1) Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th Edition, McGraw Hill.
- 2) Seymour Lipschutz, M.Lipson, Discrete Mathematics, 3rd Edition, McGraw Hill.

Reference Books:

- 1) C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics: A Computer Oriented Approach, 4th Edition, McGraw Hill.
- 2) J.P.Tremblay, R. Manohar, Discrete Mathematical Structures With Applications to Computer Science, McGraw Hill.

Syllabus for Unit Test:**Unit Test -1 Unit I ,II and III****Unit Test -2 Unit IV, V and VI**

Software Project Management

Teaching Scheme
Theory : 3Hrs/Week

Examination Scheme
End Semester Examination: 60 Marks
Continuous assessment : 40 Marks

Credit Allotted
Theory: 3

Course Objectives:

- 1) To help the students gain understanding of the functions and responsibilities of the manager, and enable them to analyze and understand the environment of the organization.
- 2) To introduce them with techniques used in the performance of managerial job
- 3) Enable them to analyze and understand the environment of an IT organization

Course Prerequisites: N/ A

Course Outcome:

Students will be able to:

- 1) Understand basic concepts of management functions
- 2) Understand the process of IT project initiation
- 3) Understand the IT project planning process
- 4) Understand the team dynamics of a project team
- 5) Understand the concepts of quality and process improvement for IT projects
- 6) Introduce modern concepts in IT management

UNIT-I	Conceptual difference between terms Management, Administration and Organization, Functions and Principles of Management, Levels of Management, Type of business organization , Organization structures.	(06 Hours)
UNIT-II	Defining Project management life cycle, Gathering and establishing project requirements, Defining the project goals and Scope management, Risk management, Budgeting a project, Creating a work breakdown structure.	(06 Hours)
UNIT-III	Building project plan, Preparing and implementing the project plan, Project schedule, Project network diagram creation and analysis, Project constraints, Tracking project progress and financial obligations, Revising the project plan, Establishing change control, Coping with project delays	(06Hours)
UNIT-IV	Recruitment and selection, Training, Creating roles and responsibilities, Team Management: Leading, Mechanics, Meetings, Maintaining, Motivating, Conflict Management, Job evaluation and merit rating	(06 Hours)
UNIT-V	Metric Frameworks for software projects, Metrics for process and product quality, Quality of deliverables, Quality assurance and standards, Quality planning and control, Process: Classification, measurement, analysis and modeling, Process change, Six sigma, CMM, CMMI, PCMM, ISO standards.	(06 Hours)
UNIT-VI	Knowledge management: Definition, needs, techniques and architecture. Learning Organizations, Knowledge management system life cycle, Knowledge workers and knowledge audits, Supply chain management, Change management, Stress management, Credit rating of software projects, Intellectual property rights and Cyber laws	(06 Hours)

Assignment List: N/ A

Text Books:

- 1) Joseph Phillips, "IT Project Management", Tata McGraw-Hill 2003 Edition
- 2) Pankaj Jalote, "Software Project Management", Addison-Wesley, 2002

Reference Books:

- 1) Kathy Schwalbe, "Information Technology Project Management", Cengage Learning, 7th Edition
- 2) Rajib Mall, "Fundamentals of Software Engineering", PHI Learning, 2009, 3rd Edition
- 3) Ian Sommerville, "Software Engineering", Pearson Education India
- 4) Roger S. Pressman, "Software Engineering: A Practitioner's Approach", Palgrave Macmillan
- 5) Elias M. Awad Hassan M. Ghaziri, "Knowledge Management", Pearson Education
- 6) By Harold R. Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", John Wiley & Sons Inc., 10th Edition
- 7) Debora J. Halbert, "Resisting Intellectual Property", Taylor and Francis Group, Routledge-2007

Syllabus for Unit Test:

Unit Test -1 Unit I,II and III
Unit Test -2 Unit IV,V and VI

Data Structures and Files

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Practical : 2 Hrs/Week	Continuous Assessment : 40 Marks	Tw & Pr : 1
	Term Work and Practical (Tw & Pr) : 50 Marks	

Course Objectives:

1. To study fundamentals of data structures
2. To implement linear sequential and linked organization data structures
3. To study fundamentals of Files and hashing

Course Prerequisites:**Students should have knowledge of**

- 1) 'C' programming
- 2) Basics of OOP

Course Outcome:**Students will be able to:**

- 1) Understand the fundamentals of data structure.
- 2) Implement linear sequential data structures.
- 3) Implement linear linked organization data structures.
- 4) Implement non-linear linked organization data structures.
- 5) Implement searching, sorting techniques.
- 6) Understand Hashing terms and techniques.

UNIT-I Review of 'C' programming (06 Hours)

Arrays, Pointers, Structure, Functions, Recursive Function

Introduction to Data Structures:

Concept of Data object, Data structure, Abstract Data Types (ADT), realization of ADT in 'C'. Types of data structures. Algorithm Analysis: Definition and Characteristics of Algorithm, Analyzing Programs, Time and Space Complexity, Big 'O' Notation, Graphical Representation of Time Complexity, best, Average and Worst Case of Complexity

UNIT-II Linear Data Structures using Sequential Organization: (06 Hours)

Concept of sequential organization, arrays as ADT, sparse matrix, Polynomial representation using array.

Stack: Concepts, Operations on Stacks, Multi-stack, Application of Stack: Polish notation (infix, prefix, postfix expressions), Conversion and Evaluation of expressions

Queue: Concept, Operations on Queue, Circular Queue, Priority Queue, Double Ended Queue, Applications of Queue

UNIT-III Linear Data Structure Using Linked Organization: (06 Hours)

Linear Data Structures using Linked Organization, Limitations of static memory allocation, Dynamic memory allocation in C. Single Linked List, Double Linked List, Circular Linked List, Generalized Linked List, Application of DLL in dynamic storage management, garbage collection and compaction

UNIT-IV Non-Linear Data Structure: (06 Hours)

Trees: Basic terminology, Binary Trees, representation and operations of binary tree, Binary tree traversal (Inorder, Postorder, Preorder), Threaded Binary Tree, Binary Search Tree (Weighted BST), AVL Tree

Graphs: Basic terminology, Representation of Graph using adjacency Matrix, List and Multilist, Graph Traversal (DFS & BFS), Spanning Tree. Kruskal's and Prim's Algorithm for MST, Dijkstra's algorithm for shortest Path.

UNIT-V Sorting and Searching Techniques: (06 Hours)

Sorting: Need of Sorting and Searching, Internal & External sorting. Bubble sort, Selection sort, Insertion sort, Shell sort, Radix sort, Quick sort, Heap sort, Merge sort. Analysis of sorting techniques,
Searching: Sequential search, Binary search, Fibonacci search

UNIT-VI File Organization and Hashing: (6 Hours)

Introduction to files, File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random access files, File Organization, Indexing

Hashing: symbol table, Hash tables, Hashing Functions, Overflow Handling and Collision Resolution strategies

Assignment List:

1. Write a Program to implement fibonacci series, factorial of no and checking for prime no.
2. Write a Program to implement functions for Stack, Queue and Circular Queue data structure.
3. Write a Program to convert expression from
 1. Infix to Prefix
 2. Infix to Postfix
4. Write a Program to implement polynomial operations
5. Write a Program to implement Sparse Matrix operations

6. Write a menu driven program to implement Singly Linked List for basic operations
7. Write a menu driven program that implements Doubly Linked List for basic operations
8. Write a Program to implement Binary Search Tree and Traversal in BST(Inorder, Preorder, Postorder)
9. Write a Program to implement Threaded Binary Tree and its Traversals.
10. Write a Program to implement Breadth First search and Depth First Search in graph.
11. Write a C Program to implement Linear and Binary Search
12. Write a Program to implement sorting methods. (Bubble sort, Selection sort, Insertion sort, Quick sort)

Text Books:

1. S. Lipschutz, “Data Structures”, McGraw Hill Pub.
2. Y. Langsm, M. Augentin, A. Tanenbaum, “Data Structure Using C and C++”, Pearson Education
3. R. Gilberg, B. Forozon, “Data Structure: A pseudo code approach with C”

Reference Books:

1. Ellis Horowitz, Sartaj Sahni , “Data Structures,Algorithms&Applications Inc++, University Press”, 2nd Edition
2. Trembley Jean Paul, Sorn Soon Paul G, “An Introducton to Data Structures with Applications”, Tata McGraw-Hill Publishing Company, 2008

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III
Unit Test -2 Unit IV, V and VI

Platform Independent Programming Paradigm

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/ Week	End Semester Examination : 60 Marks	Theory : 3
Practical : 2 Hrs/ week	Continuous assessment : 40 Marks	Tw & Or :1
	Term Work and Oral (Tw & Or) : 50 Marks	

Course Objectives:

- 1) To provide an understanding of Platform Independent Programming
- 2) To instill basics of Ruby, Python and Web-applications

Course Prerequisites:

Students should have knowledge of

- 1) C, C++
- 2) Basic Knowledge of Computing terminologies

Course Outcome:

Students will be able to:

- 1) Convey basic concepts of cross platform software development.
- 2) Analyze programs in Ruby and Python.
- 3) Demonstrate JAVA concepts in terms of OOP.
- 4) Analyze the concepts of HTML and CSS for creating webpages.
- 5) Analyze the applications of Cross Platform Programming.
- 6) Describe the architecture of JUCE.

UNIT-I	Introduction Cross platform software development, Software Platforms, Operating Systems – introduction and its relevance to application software, Scripting, Compilers and Interpreters.	(06 Hours)
UNIT-II	Ruby Programming Language Semantics, Syntax, data types – strings & collections, conditional statements and loops, Implementation of Class.	(06 Hours)
UNIT-III	Java Architecture, JVM, Byte code, data types, conditional statements and loops, functions.	(06 Hours)
UNIT-IV	Python Semantics, Syntax, data types, statements, methods.	(06 Hours)
UNIT-V	Internet Web servers, Browsers, Webpages, Introduction to Scripting languages, Basics of HTML and CSS.	(06 Hours)
UNIT-VI	Applications Cross platform development & challenges, Cross platform mobile development, HTML5. JUCE Introduction, JUCE Module Format, Introjucer, Data Structure, Working with Media Files.	(06 Hours)

Assignment List: (Term work shall consist of Six assignments from above syllabus.)

- 1) Demonstrate the programming model of Ruby using a simple example.
- 2) Discuss OOP features available in JAVA.
- 3) Summarize atleast 10 Methods of Python.
- 4) Write a Case Study of JUCE Module Format.
- 5) Explain the various types of CSS with suitable example.
- 6) Compare HTML webpage with HTML5 webpage.

Text Books:

- 1) “System Software and Operating System” – D M Dhamdhare (Tata McGraw Hill)
- 2) “The Ruby Programming Language” - David Flanagan & Yukihiro Matsumoto (O’Reilly Media)

- 3) “Java - The Complete Reference” - Herbert Schildt(McGraw Hill)
- 4) “Think Python” - [Allen Downey](#) (O’Reilly)
- 5) “Web Technologies” – Black Book (Dreamtech Press)
- 6) “Getting started with JUCE” - Martin Robinson (PACKT Publishing)

Reference Books:

- 1) “Professional Cross-Platform Mobile Development” - Scott Olson, John Hunter(Wrox Publication)

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV,V and VI

ITL - I

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 4 Hrs/Week	Practical and Term Work : 50 Marks	Tw & Pr : 2

Course Objectives: To

- 1) Apply concepts of programming language to meet the requirements specified.
- 2) Sketch an outline of a website with GUI.
- 3) Solve various problems during development of website.
- 4) Analyze the given requirement to design the pages for a website.
- 5) Test the functionalities required.
- 6) Design web application on an internet.

Course Prerequisites:

Students should have knowledge of

- 1) Programming language
- 2) Presentation layer, properties

Course Outcome:

Students will be able to:

- 1) Design the layout of a website
- 2) Maintain the presentation logic and business logic
- 3) Solve customers’ requirement by designing web pages
- 4) Understand principals of GUI
- 5) Validate the component’s role and functionalities associated with it

6) Design website using various client side and server side scripting.

- UNIT-I** **Introduction to an Internet:** Introduction to internet and its applications, E- mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, World Wide Web and its evolution, uniform resource locator (URL), browsers - internet explorer, netscape navigator, opera, firefox, chrome, mozilla. Search engine, web saver - apache, IIS, proxy server, HTTP protocol. **(06 Hours)**
- UNIT-II** **HTML :** HTML Tag Reference, Global Attributes, Event Handlers, Document Structure Tags, Formatting Tags, Text Level formatting, Block Level formatting, List Tags, Hyperlink tags, Image and Image maps, Table tags, Form Tags, Frame Tags, Executable content tags. Imagemaps : What are Imagemaps Client-side Imagemaps, Server-side Imagemaps, Using Server-side and Client-side Imagemaps together, alternative text for Imagemaps, Tables : Introduction to HTML tables and their structure, The table tags, Alignment, Aligning Entire Table, Alignment within a row, Alignment within a cell, Attributes, Content Summary, Background color, Adding a Caption, Setting the width, Adding a border, Spacing within a cell, Spacing between the cells, spanning multiple rows or columns, Elements that can be placed in a table. Passing form data Style Sheets : What are style sheets, Why are style sheets valuable Different approaches to style sheets, Using Multiple approaches, Linking to style information in s separate file, Setting up style information, Using the tag, embedded style information. **(06 Hours)**
- UNIT-III** **JavaScript:** Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators : Assignment Operators, Comparison Operators Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDbClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload. **(06 Hours)**
- UNIT-IV** **XML :** Introduction to XML, Anatomy of an XML, document, Creating XML Documents, Creating XML DTDs, XML Schemas, **(06 Hours)**

XSL.

UNIT-V **PHP** : Why PHP and MySQL?, Server-side web scripting, **(06 Hours)**
Installing PHP, Adding PHP to HTML, Syntax and Variables,
Passing information between pages, Strings, Arrays and Array
Functions, Numbers, Basic PHP errors / problems.

UNIT-VI **Advanced PHP and MySQL** : PHP/MySQL Functions, **(06 Hours)**
Displaying queries in tables, Building Forms from queries, Basic
CRUD functionalities using PHP, Cookies and HTTP, Type and
Type Conversions, E-Mail.

Assignment List:

- 1) Design a web page for Department of Information Technology, BVUCOE, Pune.
- 2) Develop a website using CSS alignment.
- 3) Simulate e-album of images using Imagemap.
- 4) Maintain database of student using XML and publish the data on a web.
- 5) Using Java Script design a web page that prints factorial / Fibonacci series / any given series.
- 6) Design a form and validate all the controls placed on the form using Java Script.
- 7) Design a DTD, corresponding XML document and display it in browser using CSS.
- 8) Develop MIS for student, faculty, lab and syllabus.
- 9) Simulate cookies using PHP.
- 10) Implement CRUD operation on MySQL

Text Book:

- 1) Web Design The complete Reference, Thomas Powell, Tata McGrawHill
- 2) PHP : The Complete Reference By Steven Holzner, Tata McGrawHill

Reference Books:

- 2) HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
- 3) JavaScript 2.0 : The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider

Advanced Data Structure

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Practical : 2 Hrs/Week	Continuous assessment : 40 Marks	Tw & Pr : 1

Term Work and Practical (Tw & Pr) : 50 Marks

Course Objectives:

- 1) Apply important algorithmic design paradigms and methods of analysis
- 2) Analyze the Complexity of Algorithms

Course Prerequisites:

Students should have knowledge of basic data structures with their operations.

Course Outcome:

Students will be able to:

- 1) Understand the analysis of algorithms, Concept of Complexity of Algorithms
- 2) Understand and analyze threaded binary trees.
- 3) Understand graph algorithms
- 4) Understand pattern matching algorithms
- 5) Understand queues and its types.
- 6) Understand dynamic programming

UNIT-I Analysis of Algorithms : (06 Hours)

Algorithms, Designing Algorithms, Analyzing Algorithms, frequency count and its importance in analysis of an algorithm, Analysis of algorithm efficiency- asymptotic notations and its properties. Performance analysis: Time complexity and Space complexity. Analyzing Recursive Programs.

UNIT-II Threaded Trees : (06 Hours)

Properties of Threaded trees, Insertion, deletion and traversal AVL Trees, Properties of AVL trees, rotations, insertion and deletion, Red-Black Trees, Properties of Red-Black Trees, rotations, insertion and deletion, B-Trees, Definition of B-Trees, Basic operations on B-Tree, Deleting a key from B tree.

UNIT-III Graphs: (06 Hours)

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; All-

Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm.

UNIT-IV Strings : (06 Hours)

String Matching: The Native String-Matching Algorithm – Brute force, Rabin-Karp and Knuth-Morris-Pratt Algorithms, Boyer-Moore algorithm, String matching with automata.

UNIT-V Priority Queues : (06 Hours)

Definition, ADT, Realizing a Priority Queue using Heaps, Definition, insertion, Deletion, External sorting Model, Multiway merge, Polyphase merge.

UNIT-VI Dynamic Programming : (06 Hours)

Concept of Dynamic Programming, Dynamic Programming basic strategy, General Method of Dynamic Programming, Limitations of Dynamic Programming, traveling salesman problem ,0/1 Knapsack Problem.

Assignment List:

- 1) To analyze the algorithm of anagram detection by writing a Boolean function that will take two strings and return whether they are anagrams.
- 2) Given a list of numbers in random order, write an algorithm that works in $O(n\log(n))$ to find the kth smallest number in the list.
- 3) Implement the non-recursive pre-order tree traversal algorithm.
- 4) Construct AVL tree for the list {J,F,M,A,N,K,L,A,S,O,P,D}?
- 5) To implement the Floyd Warshall algorithm to find the shortest path.
- 6) Given two strings – a text and a pattern, determine whether the pattern appears in the text using Rabin-Karp and Knuth-Morris-Pratt Algorithms.
- 7) Write a C program to implement queue ADT using Arrays.
- 8) Write a C program to implement queue ADT using Linked List.
- 9) To generate the sets $S^i \cdot 0 \leq i \leq 3$ for the following knapsack instance: $n = 3$, $(w_1, w_2, w_3) = (2, 3, 4), (p_1, p_2, p_3) = (1, 2, 5)$ and $M = 6$. In addition find an optimal solution.

Text Books:

- 1) Anany Levitin-“Introduction to design and analysis of algorithms”, Third Edition, Pearson Education, 2012
- 2) Aho Hopcroft Ullman —Data Structures and Algorithms, Pearson Education, 2002.
- 3) “Fundamentals of Computer Algorithms”, Horowitz, Sahani, Rajsekharan, Galgotia Publications.

Reference Books:

1)

Tanenbaum A.S, Langram Y, Augustine M.J., Data Structures using C & C++||, Prentice

Hall of India, 2002.

2)

Mark Allen Weiss, —Data Structures and Algorithm Analysis in C++||, Pearson Education,

2002.

3) Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount, Wiley student edition, John Wiley and Sons.

4) Thomas H.Corman,Charles E.Leiserson,Ronald L.Rivest and Clifford Stein, ”Introduction to algorithms”Third Edition ,PHI Learning Private Limited,2012.

5) Fundamentals of DATA STRUCTURES in C: 2nd ed, Horowitz, Sahni, Anderson-freed, Universities Press.

6) Advanced Data Structures :A.A.Puntambekar,Technical Publications

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Digital Electronics and Logic Design

Teaching Scheme	Examination Scheme	Credit Allotted
Theory :3 Hrs/Week	End Semester Examination : 60 Marks	Theory :3
	Continuous assessment : 40 Marks	

Course Objectives:

- 1) To introduce number systems and codes.
- 2) To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
- 3) To introduce the concept of memories, programmable logic devices and digital ICs.
- 4) Give students the basic tools for the design and implementation of digital modules and subsystems.

- 5) Give students the concept of digital logic design.
- 6) Reinforce theory and techniques taught in the classroom through project assignments.

Course Prerequisites:

Students should have knowledge of

- 1) Basic electronics

Course Outcome:

Students will be able to:

- 1) Understand various logic families, number systems and different theorems in Boolean Algebra.
- 2) Understand various combinational circuits and reduction of Boolean expressions using different techniques.
- 3) Understand various sequential circuits and solve design problems using this circuits.
- 4) Understand concept of state machines.
- 5) Understand different types of memories, working of cache and different advanced DRAMs.
- 6) Understand the concept and writing programs in VHDL.

UNIT-I Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements.TTL logic. Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic , open drain output. Interfacing CMOS and TTL. Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I²L, DCTL.
Boolean Algebra : Number System : Binary, Hexadecimal numbers, octal numbers and number conversion. Signed Binary number representation: Signed Magnitude, 1's complement and 2's complement representation, Binary, Octal, Hexadecimal Arithmetic: 2's complement arithmetic.Algebra for logic circuits: Logic variables, Logic functions -NOT, AND, NOR, XOR, OR, XNOR, NAND.

UNIT-II Standard representations for logic functions, k map representation of logic functions (SOP m POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don't care conditions,

Design Examples: Arithmetic Circuits, BCD - to - 7 segment decoder, Code converters. Adders and their use as subtractions, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers and their use in combinational logic designs, Decoders, demultiplexer trees. Introduction to Quine McCluskey method.

- UNIT-III** 1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops. Conversion of flip flops. Application of Flip flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter. Effect on synchronous designs. **(06 Hours)**
- UNIT-IV** Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector. **(06 Hours)**
- UNIT-V** Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM, expanding memory size, Synchronous DRAM (SDRAM), Double Data Rate SDRAM, Synchronous SRAM, DDR and QDR SRAM, Content Addressable Memory. **(06 Hours)**
- UNIT-VI** Algorithmic State Machines: ASM charts, notations, design of simple controller, multiplexer controller method: **(06 Hours)**
Introduction to HDL, VHDL: Library, Entity, Architecture, Modeling styles, Data objects, Concurrent and sequential statements, Design examples using VHDL for basic combinational and sequential circuits.

Text Books:

- 1) Morris Mano, Digital Design, Prentice Hall of India, 2002.
- 2) R.P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN 0 –

07 – 049492 – 4

- 3) Malvino, D. Leach “ Digital Principles and Applications”, 5th edition, Tata McGraw Hill

Reference Books:

- 1) John M. Yarbrough, ‘Digital Logic, Application & Design’, Thomson, 2002
- 2) Thomson, 2002. 2. Thomas L. Floyd, “Digital Fundamentals”, PHI, 2003.
- 3) J. Bhaskar, “VHDL Primer” 3rd Edition. PHI Publication

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Database Management System

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3Hrs/Week	Semester Examination : 60 Marks	Theory : 3
Practical : 2Hrs/Week	Continuous assessment : 40 Marks	Tw & Or : 1
	Term Work and Oral (Tw & Or) : 50 Marks	

Course Objectives:

- 1) Identify various techniques to communicate with database.
- 2) Relate relevant data for effective processing of data.
- 3) Construct a database to maintain data adroitly.
- 4) Study various queries and tools to deal with the data.
- 5) Understand the relation between data set and respective means to access it.
- 6) Understand influence of data in the effective development of software.

Course Prerequisites:

Students should have knowledge of

- 1) Basic understanding of data and data structure
- 2) Basic understanding of programming language

Course Outcome:

Students will be able to:

- 1) Design database to store data related with application.
- 2) Identify technique to deal with data.
- 3) Extend power of SQL by adding programming paradigm.
- 4) Predict suitable environment for data processing as per type data.
- 5) Apply knowledge of dbms to process the software efficiently.

UNIT-I Introduction to DBMS: What is database management system, Use of database system, view of data, relational databases, database architecture, transaction management, Data Models The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction. Design of Database, ER-Diagram Database design. ER Model: overview of ER-Model, Constraints, ER-Diagrams, Extended ER Diagrams. **(06 Hours)**

- UNIT-II Relational database model:** Logical view of data, keys, integrity rules. Design of Relational Database: features of good relational database design, Normalization (1NF, 2NF, 3NF, BCNF). Relational Algebra and Calculus Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities. **(06 Hours)**
- UNIT-III Integrity Constraints:** What are constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views Introduction to SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers. **(06 Hours)**
- UNIT-IV PL/SQL:** Introduction ,Declaring Variables , Writing Executable Statements , Interacting with Oracle Server , Writing Control Structures , Working with Composite Data Types , Writing Explicit Cursors , Writing Implicit Cursors , Handling Exceptions , Creating Procedures , Creating Functions , Managing Subprograms , Creating Packages , More Package concepts , Oracle supplied Packages, Manipulating Large Objects , Creating Database Triggers. **(06 Hours)**
- UNIT-V Transaction management:** ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management. **(06 Hours)**
- UNIT-VI Data Intensive Computing:** Introduction to big data, unstructured data processing using Hadoop , NoSQL database using MangoDB. **(06 Hours)**

Assignment List:

- 1) Draw an ER Diagram to maintain database of Bank
- 2) Normalize the database of Library, upto BCNF
- 3) Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints
- 4) Calculate turnover of a banks in pune using group by query
- 5) WAP to implement autorollback option on deletion using trigger.
- 6) WAP to implement Procedure to calculate square of a number.

- 7) Implement implicit cursor using PL/SQL.
- 8) Simulate two phase locking protocol on the database of Movie.
- 9) Perform document processing using MangoDB,.
- 10) Solve word count problem using Hadoop.

Text Books:

- 1) A Silberschatz, H Korth, S Sudarshan, “Database System and Concepts”, Sixth Edition McGraw-Hill
- 2) Oracle SQL and PL/SQL Guide Till 10gR2
- 3) Ramkrishna R., Gehrke J., Database Management Systems, 3rd Edition, McGraw-Hill

Reference Books :

- 1) Rob, Coronel, “Database Systems”, Seventh Edition, Cengage Learning.
- 2) Bipin Desai, Introduction to Database Management Systems.
- 3) Groff James R., Paul Weinberg, LAN times guide to SQL.

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III
Unit Test -2 Unit IV, V and VI

Engineering Mathematics-III

Teaching Scheme:

Theory : 3 Hrs / Week

Tutorial : 1 Hrs/Week

Examination Scheme:

End Semester Examination: 60 Marks

Continuous Assessment : 40 Marks

Credits Allotted:

Theory : 4

Course Pre-requisites:

Students should have basic knowledge of:

1. Differential calculus
2. Integral calculus
3. Complex numbers
4. Vector algebra

Course Objectives:

To develop ability to use the mathematical techniques, skills, and tools necessary for

engineering practice.

Course Outcomes:

At the end of the course , a student will be able to:

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

UNIT - I Linear Differential Equations (LDE) (06 Hours)

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

UNIT - II Complex Variables (06 Hours)

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

UNIT - III Transforms (06 Hours)

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

UNIT – V Laplace Transform (LT) (06 Hours)

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit

Impulse, ramp, jump, . Problems on finding LT & inverse LT.
Applications of LT and Inverse LT for solving ordinary differential equations.

UNIT - V Vector Differential Calculus (06Hours)

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

UNIT - VI Vector Integral Calculus (06 Hours)

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

Assignments:

1. Linear Differential Equations
2. Complex Variables
3. Transforms
4. Laplace Transform
5. Vector Differential Calculus
6. Vector Integral Calculus

Text Books:

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).

Syllabus for Unit Test:

Unit Test -1 UNIT – I, UNIT – II, UNIT - III
Unit Test -2 UNIT – IV, UNIT – V, UNIT - VI

Computer Graphics

Teaching Scheme

Examination Scheme

Credit Allotted

Theory : 3Hrs/Week End Semester Examination : 60 Marks Theory : 3
Practical : 2Hrs/Week Continuous assessment : 40 Marks Tw &Pr : 1
Term Work and Practical(Tw & Pr) : 50 Marks

Course Objectives:

- 1) learn basic and fundamental computer graphics techniques;
- 2) learn image synthesis techniques
- 3) examine applications of modeling, design and visualization

Course Prerequisites:

Students should have knowledge of

- 1)C / C++ programming
- 2)Data structures and files

Course Outcome:

Students will be able to:

- 1) Understand history and evolution of computer graphics, both hardware and software and use a current graphics API (OpenGL).
- 2) Implement algorithms including: line drawing, polygon filling, clipping, and transformations.
- 3) Write programs that demonstrate geometrical 2 D transformations
- 4) Write programs that demonstrate geometrical 3 D transformations
- 5) Understand illumination and shading concepts
- 6) Implement Fractals.

UNIT-I Introduction to Computer Graphics (06 Hours)

Overview of Computer Graphics, , Description of graphics devices, Input Devices, Graphics Devices, Display Technologies, Raster Refresh (Raster-Scan) Graphics Displays, Scan Basics, Video Basics, The Video Controller, Random-Scan, Display Processor, LCD displays, display file and structure, display processor, Graphics file formatComputer Graphics Application and Software Introduction to OPENGL, Applications of Computer graphics, Animation.

UNIT-II Scan conversion – lines, circles and Ellipses; Filling polygons and clipping algorithms (06 Hours)

Line and circle drawing: DDA, Bresenham's, algorithms, Thick line segment, Aliasing, Anti aliasing , Polygons Filling algorithms, edge data structure, Line Clipping algorithms– Cyrus-Beck, Cohen-Sutherland, Polygon Clipping algorithms: Sutherland Hodgeman, Color models.

UNIT-III Transformations: **(06 Hours)**

Matrix Representation of 2D Transformations: Rotation, Reflection, Scaling, Combined Transformation, Translations and Homogeneous Coordinate system, Transformation of Points, Transformation of the Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, Window-to-Viewport Transformations. Introduction, Matrix Representation of 3D Transformations: Scaling, Shearing, Rotation, Reflection, Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Composition of 3D Transformations.

UNIT-IV Projections: **(06 Hours)**

Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections. Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, viewing, Coordinate Systems and matrices, camera model and viewing pyramid.

UNIT-V Hidden Surface Determination: **(06 Hours)**

Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms, Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.

Illumination and Shading

Illumination and Shading Models for Polygons, Reflectance properties of surfaces, Ambient, Specular and Diffuse reflections, Atmospheric attenuation, Phong's model, Gouraud shading, some examples.

UNIT-VI Curves and fractals: **(06 Hours)**

Curve Representation, Nonparametric Curves, Parametric Curves, The General Conic Equation, Representation of Space Curves, Cubic Splines, Bezier Curves, B-spline Curves, B-spline Curve Subdivision,

Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces, fractals and fractal surfaces, Hilbert's curve, Koch curve.

Assignment List:

- 1) Laboratory exercises will normally be conducted using the currently available computer graphics API such as OpenGL
- 2) Implement Cohen Sutherland/DDA line drawing algorithm.
- 3) Implement Cohen Sutherland/DDA circle drawing algorithm.
- 4) Write a program to implement polygon filling algorithm.
- 5) Implement Cohen Sutherland Line clipping algorithm
- 6) Implement following 2D Transformations:
 - i) Translation
 - ii) Rotation
 - iii) Scaling
 - iv) Shearing
- 7) Implement 3D Transformations
 - i) Translation
 - ii) Rotation
 - iii) Scaling
 - iv) Shearing
 - v) Shearing
- 8) Write a program to draw fractals
- 9) Write a program to draw Koch curve
- 10) Write a program to draw Hilbert's curve
- 11) Using OPENGL libraries create an animation.

Text Books:

- 1) S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6. 2.
- 2) D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371– 4.

Reference Books:

- 1) J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Second Edition in C, Pearson Education, 2003.
- 2) D. Hearn and M. Pauline Baker, Computer Graphics (C Version), Pearson Education, 2nd Edition, 2004.

- 3) D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill International Edition, 1990.
- 4) F. S. Hill Jr., Computer Graphics using OpenGL, Pearson Education, 2003

Syllabus for Unit Test:

Unit Test -1 Unit I,II and III

Unit Test -2 Unit IV, V and VI

IT Lab – II

Teaching Scheme	Examination Scheme	Credit Allotted
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Practical :4 Hrs/Week	Term work and Practical (Tw & Pr) : 50 Marks	Tw & Pr : 2
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Course Objectives: To

- 1) Compute time and space complexity for given program.
- 2) Demonstrate concepts OOPS using java
- 3) Solve specified requirement
- 4) Infer various approach to decide efficiency of given approach.
- 5) Formulate given problem by providing the proof of behavior of given model.
- 6) Design an application using platform independent approach.

Course Prerequisites:

Students should have knowledge of

- 1) Object Oriented Programming language
- 2) Logic to solve given problem

Course Outcome:

Students will be able to:

- 1) Design simple application meeting the requirements.
- 2) Develop their logical skill through various assignments and practicals.
- 3) Breakdown complex problem into subpart and then handle every part to achieve the goal.
- 4) Model a solution to any real world problem
- 5) Analyze significance of platform independency.

6) Design application using object oriented norms.

UNIT-I	Introduction to Java : Java Fundamentals, Features of Java OOPs concepts Java virtual machine Reflection byte codes Byte code interpretation Data types, variable, arrays, expressions, operators, and control structures Objects and classes .	(06 Hours)
UNIT-II	Classes and objects : Java Classes, Abstract classes Static classes Inner classes Packages Wrapper classes Interfaces This Super Access control, embedded style information Exception handling Exception as objects Exception handling mechanism: Try catch finally Throw, throws.	(06 Hours)
UNIT-III	Object oriented Properties: Inheritance, Encapsulation, Polymorphism, Data Binding, data abstraction. Implementation of these concepts using various statements like if, switch and loops like for,do – while, while.	(06 Hours)
UNIT-IV	IO mechanism: IO package Input streams Output streams Object serialization Deserialization Sample programs on IO files Filter and pipe streams	(06 Hours)
UNIT-V	Threading and Multithreading: Lifecycle of Thread, Basic functions of thread, multithreading, synchronization.	(06 Hours)
UNIT-VI	Collections and Generics: Introduction to collection framework, List, Set, Maps, utility class, Reflection API.	(06 Hours)

Assignment List:

- 1) WAP to create array of an object to maintain data of an employee.
- 2) WAP to design user defined exception to reject negative numbers
- 3) Count the number of objects created for a class using static member function.
- 4) Write programs on interfaces.
- 5) Write programs on packages.
- 6) Write programs to copy contents of file into other file using all possible alternatives.
- 7) WAP to simulate traffic signal using multithreading
- 8) WAP to Maintain the record of student using collection API.

- 9) WAP to map roll and name to maintain data of students.
- 10) WAP to maintain record of an employee using List.

Text Books:

- 1) Programming with Java A Primer, E. Balaguruswamy Tata Mc-Graw Hill Companies.
- 2) SCJP 1.6 – Khalid Mughal
- 3) SCJP 1.6 – Kathy Sierra

Reference Books

- 1) Herbert Schildt, Java 2 Complete Reference – 5th Edition, Tata Mc-Gra Hill
- 2) Dietel & Dietel, Java How to Program

Bharati Vidyapeeth Deemed University
B.Tech.(I.T.) - 2014 Course
Semester-V

S r. N o	Course Title	Teaching Scheme			Examination Scheme							Credits			
					End Semester Examination	ContinuoAssessment			TW & Practical	T W & Or al	Tot al Marks				
		L	T	P	Theory	Un it Test	Attenda nce	Assignm ents				Theory	T w & Pr	Tw & Or	Tot al
1	Theory Of Automata & Formal Languages	3	1	-	60	20	10	10	--	--	100	4	--	--	4
2	Data Communication and Networks	3	-	2	60	20	10	10	--	50	150	3	--	1	4
3	System Programming	3	-	2	60	20	10	10	50	--	150	3	1	--	4
4	Microprocessor Architecture and Programming	3	-	2	60	20	10	10	50	--	150	3	1	--	4
5	Elective-I	3	-	-	60	20	10	10	--	--	100	3	--	--	3
6	Professional skill Development -V	4	-	-	100	--	--	--	--	--	100	4	-	--	4
7	IT Lab-III	-	-	4	--	--	--	--	50		50	--	2	--	2
	TOTAL	19	1	10	400	100	50	50	150	50	800	20	04	01	25

ELECTIVE- I:

- | | |
|---|--------------------------------|
| 1) Software Testing and Quality Assurance | 3) Human Computer Interactions |
| 2) Management of Information System | 4) Information Theory & Coding |

Bharati Vidyapeeth Deemed University
B.Tech.(I.T.) - 2014 Course
Semester-VI

Sr · N	Course	Teachin g Scheme	Examination Scheme				Credits
			End Semester	Continuous Assessment	T	Tota	

o.	Title				r Examination				W & P R	T W & O R	I Mar ks				
		L	T	P		Theory	U nit Te st	Attend ance				Assign ments	The ory	T w & P r	T w & O r
1	Operatin g System	3	- -	2	60	20	10	10	50	--	150	3	1	--	4
2	Advance d Databas e Manage ment Systems	3	- -	2	60	20	10	10	--	50	150	3	--	1	4
3	Design and Analysis of Algorith ms	3	1	--	60	20	10	10	--	--	100	4	--	--	4
4	Elective- II	3	- -	--	60	20	10	10	--	--	100	3	--	-	3
5	Comput er Organiz ation and Architec ture	3	- -	2	60	20	10	10	50	--	150	3	1	--	4
6	Professi onal skill Develop ment -VI	4	- -	--	100	--	--	--	--	--	100	4	--	- -	4
7	IT Lab- IV	--	- -	4	--	--	--	--	50	--	50	-	2	--	2
	TOTAL	19	1	10	400	100	50	50	150	50	800	20	04	01	25

ELECTIVE-II:

- 1) Multimedia Techniques
- 2) Embedded System

- 3) Geographical Information System
- 4) Cyber Law and Security Policies

Optional Subject: Mathematics- IV

Course Title	Teaching Scheme			Examination Scheme							Credits		
				End Semester Examination	Continuous Assessment			TW & P R	TW & O R	Total Marks			
	L	T	P	Theory	Unit Test	Attendance	Assignments				Theory	TW	Total
Mathematics- IV	4	-	-	60	20	10	10	--	--	100	4	-	4
TOTAL	4	-	-	60	20	10	10	-	-	100	4	-	4

Theory of Automata and Formal Languages

Teaching Scheme	Examination Scheme	Credit Allotted
Theory :3Hrs/Week	End Semester Examination : 60 Marks	Theory : 4
Tutorials :1Hr/Week	Continuous assessment : 40 Marks	

Course Objectives:

Students will learn about a variety of issues in the mathematical development of computer science theory, particularly finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures.

Course Prerequisites: Students should have knowledge of set theory and state transition diagrams.

Course Outcome:

Students will be able to:

- 1) Design automata machines for strings given.
- 2) Write regular expression for the given string and find set of strings if regular expression is given.
- 3) Write grammar rules for the strings given.
- 4) Design push down automata for the string and grammar.
- 5) Design Turing machine and apply the same to solve algorithmic problems.
- 6) Apply knowledge of TAFL in compiler construction.

UNIT-I **State Machines:** **(06 Hours)**

Abstract Machine, Acceptance of language by machine. Finite Automata (FA) - Definition, Types of FA, NFA and DFA, Language accepted by NFA and DFA, Designing of finite state machines.

Equivalence and difference between DFA and NFA, Inter-conversion between NFA and DFA, Machines with output- Moore and Mealy machines, Designing, Inter-conversion between Moore and Mealy machine.

UNIT-II Regular Expression (R.E.): (06 Hours)

Operators of RE, Building RE, Precedence of operators, Algebraic laws for RE, Arden's theorem, FA and RE: DFA to RE, RE to DFA, Properties of Regular Languages: Pumping lemma for Regular Languages, Closure and decision properties of regular languages, Equivalence and minimization of automata.

UNIT-III Grammars: (06 Hours)

Definition, Production rules, Derivation trees, Ambiguous Grammar, Removal of ambiguity, Regular Grammar, Inter-conversion between RE and Grammar, Reduced form of grammar- Removal of unit production, Removal of useless symbols, Removal of epsilon symbol. Linear grammar: left & right linear grammar, Inter-conversion. Chomsky hierarchy of languages, Context Free Grammar- Definition, Context free language (CFL. Normal Forms- Chomsky Normal Form(CNF), Griebach Normal Form(GNF).

UNIT-IV Push Down Automata (PDA): (06 Hours)

Limitations of FA, PDA: Definition, Uses, Equivalence between FA and PDA, Designing of PDA, Deterministic Push Down Automata and Non-Deterministic Push Down Automata- Definition, Language accepted by PDA, Properties of CFL, Pumping Lemma for CFL. Limitations of PDA, Applications of PDA.

UNIT-V Turing Machine(TM): (06 Hours)

Definition, Model, Comparison of TM, FSM, PDA, Design of TM, Examples of TM- Combinational TM, Iterative TM, Recursive TM, Universal TM, TM as a language acceptor, Some Problems that cannot be solved by Turing Machines, Language accepted by TM, Recursive sets, Partially recursive functions. Church's Turing hypothesis, Multitask TM, TM limitations, Halting problem.

UNIT-VI Applications: (06 Hours)

Comparison between FA, PDA, TM. Application of RE: Regular expressions in Unix, GREP utilities of Unix, Lexical analysis and finding patterns in text, Application of CFG: Parser, Markup languages, XML and Document Type Definitions. Applications of PDA and TM.

Assignment List:

1. Solve problems on designing of finite automata.
2. Design and inter-convert Moore and Mealy Machine for same problems.

3. Form grammar rules for language or set of regular expression or strings given.
4. Design Push Down Automata for grammar or given string.
5. Construct Turing Machine to solve given problem.
6. Compile all the applications of RE, Grammar, TM.
7. Study Assignment on Complexity Theory.

Text Books:

- 1) John Martin. Introduction to Languages and Theory of Computation. McGrawHill.
- 2) Michael Sipser. Introduction to The Theory of Computation . ISE.
- 3) Vivek Kulkarni. Theory of Computation. Oxford University Press.

Reference Books:

- 1) John E. Hopcroft, Rajeev Motwani, Jeffrey D-Ullman. Introduction to Automata Theory Languages And Computation. Addison-Wesley.
- 2) Sanjeev Arora, Boaz Barak. Computational Complexity: A Modern Approach. Cambridge University Press
- 3) Mishra K.L.P., Chandrasekaran N. Theory of Computer Science: Automata, Languages and Computation. Prentice Hall India.
- 4) Christos H. Papadimitriou. Computational Complexity. Pearson Education.
- 5) Cristopher Moore, Stephan Mertens. The Nature of Computation. Oxford University Press

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Subject Code: Data Communication and Networks.		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 03 Hrs/Week	End Semester Examination : 60 Marks	Theory :03
Practical : 02 Hrs/Week	Continuous assessment : 40 Marks	Term Work :01
	Term Work : 50 Marks	
Course Objectives:		
1) Build an understanding of the fundamental concepts of computer networking		
2) Familiarize the student with the basic taxonomy and terminology of the computer Networking area.		
3) Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.		
4) Gain expertise in some specific areas of networking such as the design and maintenance of individual networks.		
Course Prerequisites:		
Students should have knowledge of		
1) how computer networks operate and the fundamentals of data communication		
2) Concepts and fundamental design principles of modern computer networking in a top-down approach, focusing on the Internet's architecture and protocols.		
Course Outcome:		
Students will be able to:		
1) describe network architecture		
2) understand basic computer network technology		
3) analysis including error detection, error control and flow control.		
4) recognize the different types of network topologies and protocols		
5) analyze the different types of network devices and their functions within a network		
6) familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation		
UNIT-I	Fundamentals of digital communications :	(06 Hours)
	Introduction to digital communications. Definitions of terms. Signal propagation. Signal types: Sine waves, Square waves. Signal parameters: Amplitude, Frequency, and Phase. Channel effects on transmission: Attenuation, Effects of limited bandwidth. Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission impairment, Data Rate Limits, Performance. Digital Transmission: Analog-to-Digital Conversion, Digital-to-Digital Conversion. Analog Transmission: Digital-to-analog Conversion (ASK, FSK, PSK, QAM), Analog-to- Analog Conversion.	
UNIT-II	Transmission Media and Technologies:	(06 Hours)

	<p>Transmission Media: Guided Media: Twisted pair cables, Co-axial cables, Fiber optic cables. Unguided Media: Radio waves, Microwave, Infrared. Wireless Transmission Medium.</p> <p>Introduction to switching: – Switching, Circuit-Switched Networks, Datagram networks, Concept of Virtual circuit networks, Structure of circuit and packet switch. Types of services: Connection oriented services (Virtual circuits) Connectionless services (Datagrams).</p>	
UNIT-III	Data transmission mechanisms:	(06 Hours)
	<p>Communication modes: Simplex, Half-duplex, Full – duplex. Transmission modes: Serial transmission, Parallel transmission.</p> <p>Synchronization: Asynchronous transmission, Synchronous transmission.</p> <p>Multiplexing: Frequency division multiplexing, Synchronous time division multiplexing, Statistical time division multiplexing. (Time slots & frames, interleaving, data rate management). Spread Spectrum – FHSS, DSSS.</p>	
UNIT-IV	Introduction to computer networks :	(06 Hours)
	<p>Introduction to computer networks, Network Topologies: Bus, Star, Ring. Types of networks: Local area networks (LAN), Wide area networks (WAN), Metropolitan Area networks (MAN), Personal area networks (PAN). Layered network model: OSI model, TCP/ IP model.</p> <p>Connecting Devices Repeaters, Hubs, Bridges, Two & Three layer Switches Routers, Gateways, Backbone networks, Concept of VLAN.</p> <p>Data Link Layer – Error correction & detection. Types of errors. Block Coding, Cyclic Codes, Checksum, Data Link control, Framing, Flow and Error Control.</p>	
UNIT-V	NETWORK LAYER :	(06 Hours)
	<p>Internetworking, IPv4 & IPv4 protocol packet format, IPv6 Protocol & Packet format, IPv4 VS IPv6, Transition from IPv4 to IPv6,</p> <p>Address Resolution protocols (ARP, RARP), BOOTP, DHCP. Address Mapping ICMP, IGMP, ICMPv6.</p> <p>Routing Protocols – Delivery, forwarding, routing, types of routing, routing tables, Unicast Routing, Unicast Routing protocols, RIP, Concepts of OSPF, and BGP & Multicast Routing, Multicast routing protocols.</p>	
UNIT-VI	TRANSPORT LAYER :	(06 Hours)
	<p>Process-Process Delivery: UDP, TCP and SCTP, Process-to-Process Delivery, User Datagram Protocol (UDP), Congestion Control and Quality of service : Data Traffic, Congestion, Congestion Control (Open Loop, Closed Loop & Congestion control in TCP), Quality Services (QoS), Techniques to improve QoS, Integrated services, Differentiated Services and Flow Characteristics.</p> <p>Introduction to Application Layer – DNS, Remote Logging (Telnet), SMTP, FTP, WWW, HTTP.</p>	
Assignment List:		
1)	Socket programming - TCP and UDP.	
2)	Socket programming Client Server using RPC.	
3)	Study and demonstration of CISCO packet tracer with data transmission. (Windows/Linux)	
4)	Study and demonstration of CISCO packet tracer with data loss. (Windows/Linux)	
5)	Study and execution of Network commands.	

6)	What are the responsibilities of physical layer, data link layer, network layer?
7)	Explain the differences in the impact on performance of : a) TCP packet being lost or dropped. b) UDP packet being lost or dropped.
8)	Implementation of CRC.
9)	Explain IP 4& IP 6 .Identify the class and default subnet mask of the IP address 217.65.10.7.
10)	Demonstration of Setting Firewall, Enabling /Disabling Ports.

Text Books:

1)	Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan, TMH.
2)	Computer Networks, A.S.Tanenbaum, 4th edition, Pearson education.
3)	Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education.

Reference Books:

1)	Introduction to Data communications and Networking, W.Tomasi, Pearson education.
2)	Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group.
3)	An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
4)	Understanding communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning.
5)	William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000.

Syllabus for Unit Test:

Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

System Programming

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Practical: 2Hrs/Week	Continuous assessment : 40 Marks	Tw & Pr : 1
	Term Work and Practical (Tw & Pr) : 50 Marks	

Course Objectives:

- 1) To learn & understand fundamentals of system software program as Assembler, Linkers, and loaders.
- 2) To study phases of compiler in detail.
- 3) To learn how to design system programs.

Course Prerequisites:

Students should have knowledge of

- 1) Data Structures
- 2) Computer Organization
- 3) Microprocessor
- 4) Basic Searching & Sorting Algorithms

Course Outcome:

Students will be able to:

- 1) Understand operating system user view point, fundamentals of Language processing
- 2) Understand general machine structure and instruction formats.
- 3) Design & implement low level programming using TASM, software for programming development
- 4) Design & implement System Programs as Macroprocessor
- 5) Understand various loader schemes and Design of absolute and direct linking loaders
- 6) Understand Compiler phase
- 7) use tool Lex for generation of Lexical Analyzer
- 8) use tool YACC for generation of Syntax Analyzer.

UNIT-I Introduction: (06 Hours)

Evolution Of the Components of Programming System, Evolution Of Operating System

Operating system User Viewpoint : Functions , Operating System

User Viewpoint : Batch Control Language , Operating System

User Viewpoint : Facilities

Language Processing Activities, Fundamentals of Language

Processing, Language processor development t tools

UNIT-II Machine Structure, Machine Language And Assembly Language (06 Hours)

General Machine Structure :General Approach to a new Machine,
Machine Structure : 360 and 370

Machine Language: Long Way, No Looping, Address Modification
Using Instructions as Data, Address Modification Using Instructions
Using Index Registers, Looping

Assembly Language : An Assembly Language Program, Example
using Literals

UNIT-III Assemblers : (06 Hours)

General Design Procedure, Design Of Assembler,

Table Processing :

Searching: Linear Search, Binary Search

Sorting : Interchange Sort, Shell Sort, Bucket Sort, Radix Exchange
Sort, Address Calculation Sort, Comparison of Sorts

UNIT-IV MACRO Language And The MACROPROCESSOR : (06 Hours)

Macro Instructions, Features of Macro Facility, Implementation Of
Restricted Facility : A Two pass Algorithm

UNIT-V Loaders : (06Hours)

Loader Schemes : Compile-And-Go Loaders, General Loader
Scheme, Absolute Loaders, Subroutine Linkages, Relocating
Loaders, Direct Linking Loaders,, Other Loader Schemes,

Linkers:

Relocation and linking concepts, Design of linker, self relocating
programs, Static and dynamic linking

Design of Absolute and Direct-Linking Loaders

UNIT-VI Compilers : (06 Hours)

Basics of Compiler:

Recognizing Basic Elements

Recognizing Syntactic Units and Interpreting Meaning

Storage Allocation

Code Generation

Phases Of Compiler :

Lexical Phase, Syntax Phase, Interpretation Phase, Optimization,
Storage Assignment, code Generation ,Assembly phase

Text Books:

- 1) D.M. Dhamdhere ,”Systems Programming and Operating Systems”, Tata McGraw-Hill, ISBN-13:978-0-07-463579-7
- 2) JOHN J.DONOVAN “System Programming “,TATA McGRAW-HILL EDITION
- 3) Alfred V. Aho, Ravi Sethi, Reffrey D. Ullman, “Compilers Principles, Techniques, and Tools”,Addison Wesley, ISBN 981-235-885-4

Reference Books:

- 1) Terence Parr, “Language Implementation Patterns”,SPD,2009
- 2) Leland L. Beck, “System Software An Introduction to Systems Programming” 3rd Edition, Person Education, ISBN 81-7808-036-2
- 3) R.K. Maurya Wiley-dreamtech , “System Programming and Compiler Construction”
- 4) Srimanta Pal ,” System Programming “ OXFORD Publication
- 5) Richard Anthony,” **Systems Programming: Designing and Developing Distributed Applications**” 1st Editio

Assignment List:

- 1 To Study Fundamentals of language processing.
- 2 Write an assembly language program using Literals.
- 3 Write an assembly language program for table processing.(Searching & sorting)
- 4 To study the design of two pass Macroprocessor.
- 5 To study the phases of compilers.
- 6 To study the design of Absolute and Direct-Linking Loaders
- 7 Use of tool Lex for generation of Lexical Analyzer.
- 8 Use of tool YACC for generation of Syntax Analyzer.

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Microprocessor Architecture and Programming

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Practical : 2 Hrs/Week	Continuous assessment : 40 Marks	Tw & Pr : 1
	Term Work and Practical (Tw & Pr) : 50 Marks	

Course Objectives:

- 1) To study 8-bit Microcontroller
- 2) To study Advanced Computer Architectures
- 3) To study 16-bit Microprocessor and Peripherals

Course Prerequisites:

Students should have knowledge of

- 1) Basic Electronics Engineering

Course Outcome:

Students will be able to:

- 1) Understand basics of microprocessors, 16-bit microprocessor architecture
- 2) Understand various microprocessor peripherals and their interfacing with 8086
- 3) Understand assembly language programming concepts
- 4) Understand advanced computer architectures
- 5) Understand 8-Bit Microcontroller architecture, Programming and Interfacing
- 6) Understand multiprocessor and multicore architecture.

UNIT-I	16-Bit Microprocessor Architecture: Basic microprocessor architecture, Bus concept, Intel 8086 microprocessor: Features, Block diagram and pin configuration, Max/min mode, Instruction cycles, Read Write cycles. Memory segmentation, 8086 Memory organization, , Instruction pipelining, Instruction set, 8086 Interrupt structure	(06 Hours)
UNIT-II	8086 Assembly Language Programming: Programmers model of 8086, 8086 addressing modes, Assembler directives, DOS and BIOS interrupts, Function calls, Procedures and Macros, EXTRN and PUBLIC directives, FAR procedure, Turbo debugger, Writing programs in C using int86, int86x, intdos, intdosx functions.	(06 Hours)
UNIT-III	NDP and Peripherals : 8087 Architecture, Communication and Interfacing with 8086, Writing basic programs using 8087, Architecture, Modes and Interfacing of following peripherals with 8086 : 8255 Programmer Peripheral Interface, 8259 Programmable Interrupt Controller, 8253 Programmable Interval Timer, 8237 DMA Controller, Designing 8086 based applications using above peripherals	(06 Hours)

- UNIT-IV Advanced Processor Architectures :** (06 Hours)
Multiprocessor Architectures : Closely coupled and Loosely coupled, RISC and CISC Architectures, SPARC, Superscalar Architecture, Multicore Architecture, Intel i3, i5 and i7 architectures
- UNIT-V 8-bit Microcontroller-I** (06 Hours)
Microcontroller 8051 Architecture, On-Chip data memory and program memory organization, Programming of 8051 : Register set, Register bank, SFRs, Instruction format & addressing modes. Instruction set. External data memory and program memory & its interfacing, I/O ports programming.
- UNIT-VI 8-bit Microcontroller-II** (06 Hours)
Interrupts structure and Response. Timers/counters and their programming, Serial port and programming, Interrupt programming, Design of minimum system using 8051 micro-controller for various applications, Software & hardware tools for development of microcontroller based system such as assembler, compiler, IDE, Emulators, debugger, programmer, development board, DSO, Logic Analyzer.

Text Books:

- 1) Microprocessor Architecture and Interfacing : Ramesh Gaonkar
- 2) Microprocessor and Interfacing : Douglas V.Hall
- 3) 8086 Microprocessor: Programming and Interfacing, Keneth Ayala
- 4) Microprocessors and Microcontrollers : N.Senthil Kumar
- 5) 8051 microcontroller & embedded system, Mazidi
- 6) IBM PC Assembly Language Programming, Peter Abel

Reference Books:

- 1) Liu, Gibson, "Microcomputer Systems: The 8086/88 Family", 2nd Edition, PHI,2005
- 2) Ray Dunkon, "Advanced MSDOS Programming", 2nd Edition, BPB Publication.
- 3) Kip Irvine, "Assembly language for IBM PC", PHI, 2nd Edition, 1993
- 4) Intel Microprocessor and peripheral Handbook: Volume 1
- 5) Yashwant Kanitkar, "TSR through C", BPB Publication, 1995, ISBN 81- 7029-520-3.

List of Assignments :

- 1) Programs based on numerical computing, code conversion
- 2) Programs based on string processing
- 3) Programs using EXTRN, PUBLIC directives
- 4) Creating library of macros and using it in programs.
- 5) Programs in C using int86, int86x, intdos, intdosx functions
- 6) Simple 8051 programs based on 8085 development board
- 7) Program on Timer programming: ISR based

- 8) Program with interfacing : a) A/D Converter
b) D/A Converter
c) Stepper motor

Syllabus for Unit Test:

Unit Test -1 Unit I,II and III

Unit Test -2 Unit IV, V and VI

Elective-I : Software Testing and Quality Assurance

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
	Continuous assessment : 40 Marks	

Course Objectives:

This course equips the students with a solid understanding of:

- 1) Practices that support the production of quality software
- 2) Software testing life cycle and activities
- 3) Software Quality Assurance and Models

Course Prerequisites:

Students should have knowledge of

Software Engineering, Software development life cycles, methodologies

Course Outcome:

Students will be able to:

- 1) Understand the concepts of software testing
- 2) Learn techniques of dynamic black box testing
- 3) Learn techniques of dynamic white box testing
- 4) Learn techniques of static black and white box testing
- 5) Understand special Software Testing Activities

- 6) Study software quality assurance, models

UNIT-I	Introduction to Software Testing	(06 Hours)
	Basics of Software Testing, Software quality, Need of software testing, Testing principles, Goals, Software Testing Life Cycle(STLC), Error, Fault, Failure, Defect Life Cycle, Testing terms and definitions: Precision and Accuracy, Verification and Validation, Quality and Reliability, Testing and Quality Assurance, Software test plan (IEEE format), Software Failure Case Studies	
UNIT-II	Dynamic Testing: Black Box Testing	(06 Hours)
	Need of Black Box Testing, Black box testing concept, Requirement analysis, Test case design criteria, Testing methods, requirement based testing, positive & negative testing, boundary value analysis, equivalence class testing, state based testing, cause effect graph based testing, error guessing, design of test cases	

UNIT-III Dynamic Testing: White Box Testing (06 Hours)

Need of white box testing, White box testing concept, Logic coverage criteria, Structure- Control flow testing, Cyclomatic complexity, Loop Testing, Data flow testing, Slice based testing, Mutation Testing, Design of test cases, Challenges in White box testing.

UNIT-IV Static Testing: (06 Hours)

Static Black Box Testing: testing the specification, performing a high level review of the specification, low- level specification test techniques
Static White Box Testing: examining the design and code, Formal reviews: peer reviews, walkthroughs, inspections, coding standards and guide lines, generic code review checklist.

UNIT-V Software Testing Activities: (06 Hours)

Levels of testing: Unit testing, Integration testing, system testing, Acceptance Testing
Special tests: GUI testing, compatibility testing, configuration testing, recovery testing, stress testing, load testing, recovery testing, regression testing, usability testing, documentation testing, website testing
Debugging process and tools, Software testing tools: Static and Dynamic testing tools, Automation testing and tools

UNIT-VI Software Quality Assurance: (06 Hours)

Software quality, Quality cost, Quality attribute, Quality assurance, Quality control & assurance, Quality management, Quality management and project management, Methods of quality management, SQA models: ISO 9126, Capability Maturity Model(CMM), Software Total Quality Management, Six Sigma.

Text Books:

- 1) Software Testing Principles and Practices By Naresh Chavan Oxford Publication
- 2) Software Testing Principles and Tools By M.G. Limaye TMG Hill Publication
- 3) Software Testing, Second Edition By: Ron Patton, Pearson Education

Reference Books:

- 1) Metric and Model in Software Quality Engineering, Stephen H Kan, Pearson Education
- 2) Effective methods for software testing by William Perry , Willey Publication
- 3) Foundation of software testing by Dorothy Graham, Erik Van Veenendaal, CENGAGE learning
- 4) Introducing to Software Testing, Louis Tamres, Addison Wesley Publications
- 5) Software Quality Assurance, Daniel Galin, Pearson Education.

Syllabus for Unit Test:

Unit Test -1 Unit I,II and III

Unit Test -2 Unit IV, V and VI

Elective-I : Management of Information System

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory :3
	Continuous assessment : 40 Marks	

Course Objectives: To

- 1) Understand significance management of information.
- 2) Use technology and resources for effective usage of information.

Course Prerequisites:

Students should have knowledge of

- 1) Introduction to computer
- 2) Significance of Information needed for business

Course Outcome:

Students will be able to:

- 1) Understand necessity of information.
- 2) Use effective technique to maintain the data.
- 3) Analyze information using tools and techniques to increase the business.
- 4) Use huge data available due to social networking site and internet.
- 5) Apply information analysis for decision making.
- 6) Apply adequate tool for MIS

UNIT-I	Introduction of MIS Architecture of MIS, data storage, processing and formatting. Need of MIS, pre requisites for MIS.	(06Hours)
UNIT-II	Transaction processing System Information Technology, Information extraction, Information retrieval, Approach and algorithms used to store and manage data.	(06 Hours)
UNIT-III	Information Filtration and analysis: Information extraction, representation of useful information, derives various forms of information, reporting useful for business.	(06 Hours)
UNIT-IV	Social Engineering: Effective use of social engineering sites, use of internet to increase the reach, Extract the information and deliver the necessary things in adequate form at social network.	(06 Hours)
UNIT-V	Decision Support System: Data Analytics, business intelligence, chart and report generation , logical conclusion to ease the process of decision making	(06 Hours)

(06 Hours)

UNIT-VI

Applications of MIS

ERP, CRM, SCM, KMS, case study of SAP, openbiz

Assignment List:

- 1) Analyze different forms of information required for particular business domain.
- 2) Use technology to collect the information.
- 3) Design expert system to manage the information for business.
- 4) Use information extraction approaches and algorithms.
- 5) Analyze valuable information by representing it in suitable format.
- 6) Use social engineering in decision making.
- 7) Use google analytics to create complete history of user, needed for decision making.
- 8) Apply various filtration techniques using OLAP for decision making.
- 9) Understand working of SAP – case study.
- 10) Understand working of moodle– case study.

Text Books:

- 1) Management Information Systems, Laudon and Laudon, 7th Edition, Pearson Education Asia.
- 2) Management Information Systems, Jawadekar, Tata McGraw Hill.
- 3) Management Information Systems, Davis and Olson, Tata McGraw Hill.

Reference Books:

- 1) Decision Support Systems and Intelligent Systems, Turban and Aronson, Pearson Education Asia .
- 2) Management Information Systems, Schulthesis, Tata McGraw Hill.
- 3) Management Information Systems - Sadagopan, Prentice Hall.
- 4) Management Information Systems - Jayant Oke.
- 5) MIS: Managing Information Systems in Business, Government and Society , Rahul De.

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Elective-I : Human Computer Interaction

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
	Continuous assessment : 40 Marks	

Course Objectives:

To build interaction between human and computer using Graphical User Interface, Design processes, software tools and various interaction devices

Course Prerequisites:

Students should have knowledge of

1) Analysis and design of software

Course Outcome:

Students will be able to:

- 1) Understand User interface design
- 2) Understand Graphical user interface and its characteristics
- 3) Identify various design processes
- 4) Understand screen designing
- 5) Understand Windows, Components and Software Tools
- 6) Identify various interaction devices

UNIT-I Introduction: (06 Hours)

Importance of user interface, Importance of good design, Benefits of good design, A brief history of screen design.

UNIT-II The Graphical User Interface: (06 Hours)

Popularity of Graphics, The concept of direct manipulation, Graphical system, Characteristics, Web user-Interface popularity, characteristics- Principles of user interface.

UNIT-III Design process: (06 Hours)

Human interaction with computers, importance of human characteristics, Human consideration, Human interaction speeds and understanding business junctions.

UNIT-IV Screen Designing: (06 Hours)

Design goals-Screen planning and purpose, organizing screen elements, ordering of screen data and content-screen navigation and flow, information retrieval on web-statistical graphics-Technological

consideration in interface design

UNIT-V Windows,Components and Software Tools: (06 Hours)

Windows: New and navigation schemes,selection of window,selection of devices based and screen based controls.

Components:Text and messages,Icons,Multimedia,colors

Software Tools:Specification methods,interface-Building Tools.

UNIT-VI Interaction Devices (06 Hours)

Keyboard and function keys-Pointing devices-speech recognition digitization and generation-image and video displays-drivers.

Assignment List:

- 1) A Case study on Graphical User Interface
- 2) A Case study on Design process
- 3) A Case study on Screen Designing
- 4) A Case study on Windows and Components
- 5) A Case study on Software Tools
- 6) A Case study on Interaction Devices

Text Books:

- 1) Designing the user interface,Third edition,Ben Shneiderman,Pearson Education Asia
- 2) The essential guide to user interface design,Wilbert O Galitz,Wiley Drdeam Tech

Reference Books:

- 1) User Interface Design,soren Lauesen,Pearson Education
- 2) Human Computer Interaction,Alan Dix,janet Fincay,Gregoryd,Abowd,Russell Bealg,Pearson Education

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Elective-I : Information Theory & Coding

Teaching Scheme	Examination Scheme	Credit Allotted
Theory :3Hrs/Week	End Semester Examination: 60 Marks	Theory:3
	Continuous assessment : 40 Marks	

Course Objectives:

- 1) To deeply understand the mathematics of Information Theory and its physical meaning
- 2) To understand various channel coding techniques
- 3) Students will be introduced to convolution and block codes, decoding techniques, and automatic repeat request

Course Prerequisites:

Students should have knowledge of

- 1) Student should have knowledge of Communications Systems or equivalent.
- 2) Knowledge of calculus, algebra, and probability

Course Outcome:

Students will be able to:

- 1) This course covers the fundamental concepts of information theory and error control coding.
- 2) Students will be introduced to the basic notions of information and channel capacity.
- 3) Students will be understood how error control coding techniques are applied in communication systems.
- 4) Design a data compression scheme using suitable source coding technique.
- 5) Design a convolution coding scheme for a communication system.
- 6) Evaluate performance of a communication system

UNIT-I Introduction: Introduction to Information Theory, uncertainty and information, number theory, group theory average mutual information and entropy, average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequence, Mark-off statistical model for information source, source coding theorem. **(06 Hours)**

UNIT-II Channel Capacity: Channel models, channel capacity, Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels. information capacity theorem, Entropy and information rate of mark-off source, random selection of codes. **(06 Hours)**

UNIT-III Coding: Error control coding: linear block codes and their properties, decoding of linear block code, perfect codes, Shannon-Fano coding, Huffman coding, Arithmetic coding, Lempel-Ziv algorithm, run- **(06 Hours)**

length encoding and rate distortion function hamming codes, and optimal linear codes and MDS codes .

UNIT-IV Cyclic Codes: Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, burst error correction, fire codes, golay codes, CRC codes, circuit implementation of cyclic codes. BCH codes: minimal polynomials, generator polynomial for BCH codes, decoding of BCH codes, Reed-Solomon codes and nested codes. **(06 Hours)**

UNIT-V Convolution Codes: Tee codes and trellis codes, polynomial description of convolution codes, distance notions for convolution codes, generation function, matrix description of convolution codes, viterbi decoding of convolution codes, distance bounds for convolution codes, turbo codes and turbo decoding. **(06 Hours)**

UNIT-VI Trellis Coded Modulation: Concept of coded modulation, mapping by set partitioning, Ungerboeck's TCM design rules, TCM decoder, Performance evaluation for Additive White Gaussian Noise (AWGN) channel, TCM for fading channels, applications and use cases of ITCT, applications of coding technique in cryptography, cryptosystem like ECC(Ellyptical curve cryptography). **(06 Hours)**

Assignment List:

- 1) A code is composed of dots and dashes. Assume that the dash is 3 times as long as the dot and has one-third the probability of occurrence. (i) Calculate the information in dot and that in a dash; (ii) Calculate the average information in dot-dash code; and (iii) Assume that a dot lasts for 10 ms and this same time interval is allowed between symbols. Calculate the average rate of information transmission.
- 2) State Shannon-Hartley's law. Derive an equation showing the efficiency of a system in terms of the information rate per Unit bandwidth. How is the efficiency of the system related to B/W?
- 3) Consider a source with 8 alphabets and respective probabilities as shown: A B C D E F G H 0.20 0.18 0.15 0.10 0.08 0.05 0.02 0.01 Construct the binary Huffman code for this. Construct the quaternary Huffman and code and show that the efficiency of this code is worse than that of binary code
- 4) If C_i and C_j are two code vectors in a (n,k) linear block code, show that their sum is also a code vector and Show $CHT = 0$ for a linear block code.
- 5) A) Write short notes on BCH codes B) Draw the general block diagram of encoding circuit using $(n-k)$ bit shift register and explain its operation.

- 6) What are convolutional codes? How is it different from block codes? Implement a convolutional code with a viterbi (trellis) and a sequential decoder.
- 7) Write a program to ensure to ensure integrity of packet transfer using coding technique similar top CRC
- 8) Analysis and study of crypt tool.

Text Books:

- 1) Ranjan Bose, “Information Theory, Coding and Cryptography”, Tata McGraw- Hill, 2002.
- 2) K. Sam Shanmugam, John Wiley “Digital and analog communication systems”, 1996

Reference Books:

- 1) Viterbi, “Information Theory and Coding”, McGraw-Hill, 1982.
- 2) John G. Proakis, “Digital Communications”, McGraw-Hill, New edition, 2000.
- 3) Gareth A. Jones and J. Mary Jones, “Information and Coding Theory”, Springer Undergraduate Mathematics Series, 2000. 104
- 4) Glover and Grant; “Digital Communications”, Pearson Ed. 2nd Ed 2008

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

IT Lab-III

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 4Hrs/Week	Term Work and Practical (Tw & Pr) : 50Marks	Tw & Pr :2

Course Objectives: To

- 1) Understand web environment for building the application.
- 2) Implement web application.
- 3) Implement server side programming.
- 4) Analyze life cycle servlet.
- 5) Analyze life cycle JSP.

Course Prerequisites:

Students should have knowledge of

- 1) Core Java
- 2) Scripting languages

Course Outcome:

Students will be able to:

- 1) Understand the lifecycle of web application
- 2) Understand flow of request and data in web application.
- 3) Implement relevant technology based on the functionalities involved in the respective web application.
- 4) Design a competitive web application which will work real web environment.
- 5) Implement server side technology.
- 6) Apply server side programming to implement web application.

UNIT-I JDBC: (06 Hours)

Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases

UNIT-II Servlet Basics: (06 Hours)

Web Application Basics, Architecture and challenges of Web, application. Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml). Handling Request and Response Initializing a Servlet, Accessing Database, Servlet Chaining, Session Tracking & Management, Dealing with cookies.

UNIT-III Servlet Advanced: (06 Hours)

Transferring Request, Accessing Web Context, Passing INIT and CONTEXT Parameter, Sharing information using scope object Controlling concurrent access User Authentication, Filtering Request and Response, Programming Filter, Filter Mapping, Servlet Listeners

UNIT-IV Java Server Pages : Standard approach: (06 Hours)

Basic JSP Architecture, Life Cycle of JSP (Translation, compilation), JSP Tags and Expressions, Role of JSP in MVC-2, JSP with Database, JSP Implicit Objects.

UNIT-V Java Server Pages : Customized approach: (06 Hours)

Tag Libraries, JSP Expression Language (EL), Using Custom Tag, JSP Capabilities Exception Handling Session Management Directives JSP with Java. Case study of struts and spring framework.

UNIT-VI RMI (Remote Method Invocation) & EJB (Enterprise java Beans): (06 Hours)

Bean RMI overview, RMI architecture, concept of stub and skeleton, Example demonstrating RMI ,Introduction to EJB , Types of enterprise beans Advantages of enterprise beans, The Life Cycles of Enterprise Beans, Types of EJB.

Assignment List:

- 1) Maintain record of students and perform CRUD functionality.
- 2) Write a program to redirect a request using a dynamic approach.
- 3) Write a program to pass the data using session
- 4) Write a servlet to remove spam.
- 5) Maintain the record of faculty member using jsp action tags and directives.
- 6) Design a tag to perform the necessary editing in a given report.
- 7) Design reusable components of the form using taglib.
- 8) Perform multiplication of two numbers using RMI.
- 9) Implement submission of assignment and evaluation of the same using EJB.
- 10) Understand working of framework – struts, spring- case study

Text Books:

- 1) SCWCD Exam Study Kit: Java Web Component Developer Certification
Hanumant Deshmukh, Jignesh Malavia, Manning Publication
- 2) Head First Servlets and JSP , by Bryan Basham (Author), Kathy Sierra (Author), Bert Bates, Head First Publication
- 3) J2EE: The complete Reference, Jim Keogh (Author)

Reference Books:

- 1) OCEJWCD Study Companion: Certified Expert Java EE 6 Web Component Developer (oracle Exam 1Z0-899), by Charles E. Lyons (Author), Garner Press.
- 2) JDBC, Servlets and JSP Black Book Paperback , by Santosh Kumar K. (Author), Kogent Solutions Inc.
- 3) Java Server Programming Java EE7 (J2EE 1.7): Black Book

- Kogent Learning Solutions Inc
- 4) Sun Certified Enterprise Architect for Java EE Study Guide(Second edition) Mark Cade (Author)
 - 5) Sun Certified Enterprise Architecture for J2EE Technology Study Mark Cade (Author), Simon Roberts (Author)

Operating System

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Practical : 2 Hrs/Week	Continuous assessment : 40 Marks	Tw & Or : 1
	Term Work and Oral (Tw & Or) : 50 Marks	

Course Objectives:

- 1) To Introduce basic concepts and functions of modern operating systems
- 2) To Understand the concept of process, and thread management
- 3) To Understand how the resources are scheduled and managed
- 4) To Understand the concepts of process synchronization and deadlock
- 5) To know the concept of I/O and File management
- 6) To Understand various Memory management techniques
- 7) To be aware of latest trends in Operating Systems

Course Prerequisites:

Students should have knowledge of

- 1) Computer Organization
- 2) Data Structure

Course Outcome:

Students will be able to:

- 1) Possess knowledge of the role of Operating Systems and their types.
- 2) Apply the concept of a process, thread and scheduling algorithms.
- 3) Apply the concepts of process synchronization and how it is achieved.
- 4) Realize the concept of deadlock and different ways to handle it.
- 5) Realize various memory management techniques, concept of I/O management and File system.
- 6) Realize latest trends and techniques in various operating systems

UNIT-I Operating System Overview (06 Hours)

Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines, OS Design Considerations for Multiprocessor and Multicore architectures, Microsoft Windows Overview, Modern UNIX Systems, Linux, Android. Booting Process of all the above operating systems.

UNIT-II Process Description and Control (06 Hours)

Process: Concept of a Process, Process States, Process Description, Process Control (Process creation, Waiting for the process/processes, Loading programs into processes and Process Termination), Execution of the Operating System.

Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using pthreads, Multicore processors and threads, Linux Process and Thread Management,

Android Process and Thread Management.

Scheduling: Uniprocessor Scheduling Types of Scheduling, Scheduling Algorithms, and Thread Scheduling, An introduction to Multiprocessor and RealTime Scheduling, Traditional UNIX Scheduling, Linux Scheduling.

UNIT-III Concurrency: Mutual Exclusion and Synchronization (06 Hours)

Concurrency: Process/thread Synchronization and Mutual Exclusion Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex), Programming Language Support (Monitors),

Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem.

Concurrency: Deadlock and Starvation Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock detection, An Integrated Deadlock Strategy, Example: Dining Philosophers Problem, Linux interprocess communication and concurrency mechanisms, Android Interprocess communication mechanisms and concurrency mechanisms

UNIT-IV Memory Management (06 Hours)

Memory Management: Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation.

Virtual Memory: Hardware and Control Structures, Operating System Software, Linux Memory Management, Windows Memory Management, Android Memory Management

UNIT-V Input/Output And Files (06 Hours)

I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, Disk Cache, Linux I/O.

File Management: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management, Linux Virtual File System, Android File Management.

UNIT-VI Recent And Future Trends In OS (06 Hours)

Linux Kernel Module Programming, Embedded Operating Systems: Characteristics of Embedded Systems, Embedded Linux, and Application specific OS. Basic services of NACH Operating System. Introduction to Service Oriented Operating System (SOOS), Introduction to Ubuntu EDGE OS, etc.

Assignment List:

- 1) Study of hardware and software requirements of different operating systems (UNIX,

- LINUX, WINDOWS XP, WINDOWS 7/8/10)
- 2) Implement CPU scheduling policies a) SJF (b) Priority (c) FCFS (d) Multi-level queue
 - 3) Implement file storage allocation techniques: (a) Contiguous (using array) (b) Linked –list (using linked list) (c) Indirect allocation (indexing)
 - 4) Implementation of Contiguous allocation techniques: (a) Worst-Fit (b) Best-Fit (c) First-Fit
 - 5) Calculation of external and internal fragmentation.
 - 6) Implementation of Compaction for the continually changing memory layout and calculate total movement of data.
 - 7) Implementation of resource allocation graph (RAG).
 - 8) Conversion of resource allocation graph (RAG) to wait-for-graph (WFG) for each type of method used for storing graph.
 - 9) Write a program where parent process counts number of vowels in the given sentence and child process will count number of words in the same sentence. Use FORK and JOIN construct.
 - 10) Implement the solution for Bounded Buffer (Producer-Consumer) problem using inter process communication technique – Semaphores.
 - 11) Study latest trends in various operating systems.

Text Books:

- 1) William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN10: 0133805913 • ISBN13: 9780133805918
- 2) Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons ,Inc., 9th Edition,2012, ISBN 9781118063330
- 3) Maurice J. Bach, “Design of UNIX Operating System”, PHI

Reference Books:

- 1) Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, Inc., 1st Edition, 2007.ISBN10: 0596009526 | ISBN13: 9780596009526
- 2) Harvey M. Deitel, Operating Systems, Prentice Hall, 3rd Edition,2003, ISBN10: 0131828274 | ISBN13: 9780131828278
- 3) Andrew S. Tanenbaum, Modern Operating System, Prentice Hall, 3rd Edition, 2007,ISBN10: 0136006639 | ISBN13: 9780136006633
- 4) Operating System in depth by Thomson

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III
Unit Test -2 Unit IV, V and VI

Advanced Database Management Systems

Teaching Scheme	Examination Scheme	Credit Allotted
Theory :3Hrs/Week	End Semester Examination : 60 Marks	Theory :3
Practical :2Hrs/Week	Continuous assessment : 40 Marks	Tw &Pr :1
	Term Work and Practical (Tw & Pr) : 50 Marks	

Course Objectives:

Exploring the working of large scale and emerging database management systems
Study and analysis of query processing and query optimization

Course Prerequisites:

Student should be well aware of database management systems, analysis of data structure and algorithms and sufficient programming experience

Course Outcome:

Students will be able to:

- 1) Understand the concepts of Object Oriented Database Management Systems
- 2) Understand various system architectures
- 3) Understand the processes of query processing and optimization
- 4) Understand Data warehousing concepts
- 5) Understand Data mining concepts
- 6) Familiarize with emerging database applications

UNIT-I Object-Oriented and Object Relational Databases (06 Hours)

Overview of Object-Oriented Concepts, Object Identity, Object Structure, and Type Constructors, Encapsulation of Operations, Methods, and Persistence, Type and Class Hierarchies and Inheritance,

Complex Objects, Overview of the Object Model of ODMG, The Object Definition Language, The Object Query Language, Object Database Conceptual Design, Other Objected-Oriented Concepts

Database design for an ORDBMS–Nested relations and collections, Implementation and Related Issues for Extended Type Systems, The Nested Relational Model, Extended ER diagram, Comparison of OODBMS, ORDBMS and RDBMS.

UNIT-II Database-System Architectures (06 Hours)

Centralized and Client –Server Architectures, Server System Architectures

Parallel Databases: Introduction to Parallel Systems , I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Design of Parallel Systems.

Distributed Databases: Introduction to Distributed Systems, Homogeneous and Heterogeneous Databases, Distributed Data Storage, Availability, Heterogeneous Distributed Databases.

UNIT-III Query Processing and Query Optimization (06 Hours)

Query Processing : Overview, Measures of Query Cost, Algorithms for Selection, Sorting and Join Operation, Evaluation of Expressions.

Query Optimization : Overview, Transformation of Relational Expressions, Estimating Statistics of Expression, Results, Choice of Evaluation Plans, Semantic Query Optimization, Materialized Views, Introduction to dynamic query evaluation.

UNIT-IV Data Warehousing and OLAP (06 Hours)

Characteristics of Data warehouse, Data marts, Building data warehouse, Architectural strategies and organizational issues, Design considerations, Data Content, Metadata, Distribution of data, Tools for Data Warehousing, Applications of Data warehousing.

OLAP and OLTP, Data Modeling- Star and snowflake schema.

UNIT-V Data Mining and information retrieval (06 Hours)

Overview of data mining, Steps of data mining, Association Rules, Classification, Clustering, Applications of data mining

Decision support systems, Information retrieval systems, Web search engines, Directories.

UNIT-VI Emerging Database Technologies and Applications (06 Hours)

Time in Databases, Spatial and Geographic Data, Geographic Information Systems, Genome Data Management, Multimedia Databases, Mobility and Personal Databases, Mobile Databases.

Performance Tuning, Performance Benchmarks, Standardization, Application Migration, Transaction-Processing Monitors.

Assignment List:

1. Study and implementation of nested relations using SQL.
2. Study and implementation of Object types and collection in SQL .
3. Study and design of Extended ER diagram for any given DBMS.

4. Study (and implementation if possible) of web search engine (Lucene).
5. Study and implementation of selection, sorting and join operations.
6. Study and implementation of semantic queries.
7. Study, implementation and comparison of Views and Materialised views.
8. Study, implementation and comparison of Snowflake and Star schema
9. Study and demonstrating of OLAP operations in SQL.
10. Implementation of triggers in PL/SQL (Performance statistics and diagnostics)

Text Books:

- 1) Fundamentals of Database Systems, Sixth Edition, Ramez Elmasri, Shamkant B. Navathe, Pearson Education
- 2) Database System Concepts, Seventh Edition, Avi Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
- 3) Data Warehousing: Concepts, Techniques, Products and Applications, 3rd Edition, C.S.R. PRABHU, PHI Learning Pvt. Ltd.,

Reference Books:

- 1) Database Management Systems, 3rd Edition, Raghu Ramakrishnan and Johannes Gehrke, Mcgraw Hill Education
- 2) An Introduction to Database Systems, 8th Edition, C.J. Date, Pearson
- 3) Database Systems: A Practical Approach to Design, Implementation, and Management, Third Edition, Thomas Connolly, Carolyn Begg, Pearson

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Design and Analysis of Algorithms

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 4
Tutorials : 1Hr/Week	Continuous assessment : 40 Marks	

Course Objectives:

Students will be able to find a best suited algorithmic approach as a solution for given problem.

Course Prerequisites:

Students should have knowledge advanced data structures, graph theory and algorithmic steps in problem solving.

Course Outcome:

Students will be able to:

- 1) Understand fundamental data structures and with the manner in which these data structures can best be implemented.
- 2) Learn how to analyze algorithms and estimate their worst-case and average-case behavior.
- 3) Ability to analyze and design algorithms divide and conquer approach.
- 4) Ability to understand and design algorithms using greedy strategy and dynamic programming
- 5) Learn fundamental knowledge of computational complexity, approximation and randomized algorithms.
- 6) Apply subject knowledge in various scenarios .

UNIT-I Introduction: (06 Hours)

Elementary data structures: Linear data structures, Graphs, Trees.
Algorithm: Understanding problem, Designing, Analyzing, and Coding.
Mathematical analysis of algorithms, Standard and Asymptotic Notations.

UNIT-II Brute Force and Exhaustive Search: (06 Hours)

Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Closest-Pair and Convex-Hull Problems by Brute Force, Exhaustive Search: Traveling Salesman Problem, Knapsack Problem. Depth-First Search and Breadth-First Search

UNIT-III Divide and Conquer: (06 Hours)

Merge sort, Quick sort, Binary Tree Traversals and Related Properties, Multiplication of Large Integers and Strassen's Matrix Multiplication,

Multiplication of Large Integers, Strassen's Matrix Multiplication, The Closest-Pair and Convex-Hull Problems by Divide-and-Conquer, The Closest-Pair Problem, Convex-Hull Problem. Heaps and Heap sort.

UNIT-IV Dynamic Programming and Greedy Techniques: (06 Hours)

The Knapsack Problem and Memory Functions, Optimal Binary Search Trees, Warshall's and Floyd's Algorithms, Greedy Techniques: Prim's Algorithm, Kruskal's Algorithms, Dijkstra's Algorithm, Huffman Trees and Codes.

UNIT-V Backtracking and Complexity Theory: (06 Hours)

Lower-Bound Arguments, Problem Reduction, Decision Trees, Decision Trees for Sorting, Decision Trees for Searching a Sorted Array, P, NP and NP-Complete, Coping with the Limitations of Algorithm Power, Backtracking: n-Queens Problem, Hamiltonian Circuit Problem, Subset-Sum Problem, Branch-and-Bound, Knapsack Problem, Traveling Salesman Problem.

UNIT-VI Applications: (06 Hours)

Case Studies of Algorithmic Designs & Applications, Deadlock detection and avoidance implementation. Resource allocation algorithm with deadlock avoidance, Heuristic search algorithm. Recent advances in the subject.

Assignment:

Concerned course faculty can arrange classroom tutorials, MCQ tests and students presentations on each unit. Discuss recent advances in the subject.

Text Books:

- 1) Anany Levitin. *Introduction to Design and Analysis of Algorithms*. Pearson Education.
- 2) Horowitz E, Sahni S, Rajasekaran S. *Fundamentals of Computer Algorithms*. University Press.
- 3) Thomas H. Cormen. *Introduction to Algorithms*. MIT Press.

Reference Books:

- 1) Jon Kleinberg. *Algorithm Design*. Pearson Education.
- 2) Gilles Brassard, Paul Bratley. *Fundamentals of Algorithms*. Pearson Education.
- 3) Donald E. Knuth. *Art of Computer Programming*. Dorling Kindersley Pvt Ltd.
- 4) Steven S Skiena, *The Algorithm Design Manual*. Springer.
- 5) Michael T. Goodrich. *Algorithm Design*. Wiley.

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Computer Organization and Architecture

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Practicals : 2 Hrs/Week	Continuous assessment : 40 Marks	Tw & Pr : 1
	Term Work and Practical (Tw & Pr) : 50 Marks	

Course Objectives:

- 1) To study various advanced computer architectures.
- 2) To study 32-bit/64-bit processor architecture
- 3) To study latest technology

Course Prerequisites:

Students should have knowledge of

- 1) Basic Microprocessors and Microcontrollers

Course Outcome:

Students will be able to:

- 1) Learn 32-bit as well as 64-bit processor architectures.
- 2) Learn latest computer architectures
- 3) Learn design of the control unit
- 4) Learn various latest memory and bus technologies
- 5) Learn parallel processing concepts

UNIT-I **80386DX Features:** Functional Block Diagram, PIN Description, (06 Hours)

Register set, Flags, Physical address space, Data types
80386Dx descriptor Tables GDT, LDT, IDT, descriptor cache, Code, data and stack descriptors, system descriptors, privilege levels, Segmentation in 80386DX, comparison of segmentation with 8086, paging, TSS, Nested Tasks, Operating in Real Mode, Protected Mode, Virtual 86 mode, Virtual addressing, 80386DX instruction set, setting protected mode, setting v86 mode, Real mode programming, Memory Management, Protection Mechanism.

UNIT-II **Memory Organizations:** Flash memory, SDRAM, DDR3, DDR4, (6Hours)

Advanced DRAMs, Memristors, PRAM (Phase change RAM / PCM – Phase Change Memory) by IBM, Magneto-resistive RAM (MRAM), Resistive RAM (RRAM), Spin Transfer Torque RAM (STT-RAM), Ferro-electric RAM (FRAM), MLC NAND Flash, 3-D NAND, , 3 -D XPoint Technology by Intel and Micron, Intelligent RAM (IRAM) , NUMA and UMA, Memory allocation policies, Cache memory: Concept, architecture (L1, L2, L3), mapping Techniques, Replacement algorithms, Cache coherency, Interleaved and Associative memory. Virtual Memory: Concept, Segmentation and Paging, Page replacement policies.
Secondary Storage: RAID, Blue Ray Disk, Solid State Drives

(SSD), Cloud storage

Bus design considerations, Bus types : PCI, ISA, AGP, SCSI, GPIB, USB, Bus arbitration

UNIT-III Single Bus Organization, Micro operations and Register Transfers (6Hours)

Hardwired Control Design methods, Typical Example - Multiplier Control unit, Micro-programmed Control: Basic concepts, Microprogram, Microinstruction sequencing, micro-program sequencing, A complete microprogram, Applications of microprogramming

UNIT-IV Intel Pentium Processor (6Hours)

Features, Block Diagram, Pin grouping according to function, Modes, Programmer's model, Superscalar Operation, Integer & Floating Point Pipeline Stages, Branch Prediction, Cache Organization, Cache coherence, MESI. Study of features of Pentium Pro, Pentium 2, Pentium 3 and Pentium 4 Processors.

UNIT-V Advanced Processor Architectures : (6Hours)

Multiprocessor Architectures : Closely coupled and Loosely coupled, UMA, NUMA, COMA, RISC and CISC Architectures, Basics of ARM processor, Superscalar Architecture, SuperSPARC, Nehalem micro-architecture, Intel Haswell micro-architecture Multicore Architecture, Hyper Threading Technology (HTT), Intel 64bit Architecture: Block Diagram, Intel Core i3, i5 and i7 architectures, Supercomputer architectures : CDAC PARAM, IBM Blue Gene

UNIT-VI Introduction to parallel processing systems: (6Hours)

Introduction to parallel processing concepts, Architectural classification of parallel processors, pipeline processing, instruction pipelining, pipeline stages (Intel Pentium pipelining), pipeline hazards, Performance evaluation of pipeline, Data dependency analysis, concurrency analysis, Bernstein's conditions, Message passing libraries like PVM, MPI, CUDA : Parallel Programming Model, Vector processing concepts, NVIDIA GPU Computing

Text Books:

- 1) C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", McGraw Hill, 2002, 5th edition.
- 2) J. Hays, "Computer Architecture and Organization", 2nd Edition, McGraw-Hill, 1988 ISBN 0-07-100479-3
- 3) 2. Stallings William, "Computer Organization and Architecture: Principles of structure and function", 2nd Ed, Maxwell Macmillan Editions, 1990 ISBN 0 - 02 -946297 - 5.
- 4) 80386 Microprocessor Handbook, Chris H. Pappas, William H. Murray

- 5) Pentium Processor System Architecture: Tom Shanley & Don Anderson, Addison-Wesley.
- 6) Advanced Computer Architecture: Parallelism, Scalability and Programmability-Kai Hwang

Reference Books:

- 1) B. Govindarajulu, "Computer Architecture and Organization: Design Principles and Applications", Second Edition, Tata McGraw-Hill.
- 2) Dr. M. Usha, T. S. Srikanth, "Computer System Architecture and Organization", First Edition, Wiley- India.
- 3) John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
- 4) The 80386DX Microprocessor: Hardware, Software and Interfacing: Walter A Triebel, Prentice Hall.

List of Assignments :

- 1) A program for
 - a) LRU page replacement algorithm.
 - b) FIFO page replacement algorithm.
- 2) A program to simulate the mapping techniques of Cache memory.
 - a) Direct Mapped cache
 - b) Associative Mapped cache
 - c) Set Associative Mapped cache
- 3) A program to simulate memory allocation policies.
 - a) First-fit algorithm
 - b) Best-fit algorithm
- 4) A program to implement serial communication (PC - PC communication).
- 5) A program to implement parallel communication. (PC - Printer communication).
- 6) A program for printer simulation.
- 7) A program for keyboard simulation.
- 8) Write ALP using to read and display the table content pointed by GDTR/LDTR and IDTR.

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Elective-II : Multimedia Techniques

Teaching Scheme	Examination Scheme	Credit Allotted
Theory :3 Hrs/Week	End Semester Examination : 60 Marks	Theory: 3
	Continuous assessment : 40 Marks	

Course Objectives:

- 1) To enable the students to develop synchronization concepts and mechanisms across the whole multimedia system architecture.
- 2) To study the basic concepts for multimedia transmission at the physical, Medium access control layers presenting the past and existing network technologies

Course Prerequisites:

Students should have knowledge of

- 1) Student have knowledge of Computer Graphics and GUI Programming
- 2) Student should have knowledge of Computer programming with C and C++

Course Outcome:

Students will be able to:

- 1) Understand the concepts of Multimedia architecture, elements, applications and interface standards.
- 2) Learn the different types of compression techniques and different types of data file Format used in multimedia systems.
- 3) Understand Different types of audio and video file formats.
- 4) Develop an interactive multimedia application to display their ability to use multimedia tools including multimedia authoring.
- 5) Have an insight into how the quality of multimedia systems is perceived and how this relates to the design of multimedia input, output and editing systems.
- 6) Student will able develop any academic or commercial application.

UNIT-I

Introduction to Multimedia and Graphic Devices:

Types of media, Introduction to Multimedia, Multimedia (06 hours)
Information, Multimedia Objects, Multimedia in business and work.
Convergence of Computer, Multimedia Elements, Color Schemes,
Picture representation, display devices, display adapters.

UNIT-II

Data Compression

Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, (06 hours)
Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite
Context Modelling, Dictionary based Compression, Sliding Window
Compression, LZ77, LZW compression, Compression, Compression

ratio loss less & lossy compression

UNIT-III

Audio and Video

Basic sound concept, Multimedia system sound, MIDI versus digital audio, Audio file formats, National interchange file formats, Digital Audio software's. Types of Video, Video broadcasting standards, Video Quality, Digital Video Software's, Video file formats (for web), Video Compression, Video codec's. **(06 hours)**

UNIT-IV

Image/Graphics and Animation

Still images, Types of Image, Image Quality, Image Compression, Graphics Software's, Image file formats (for web) Principals of animation, Methods of Animation, Animation Software's, Animation file formats (for web) (JPEG, & MPEG standards). **(06 hours)**

UNIT-V

Multimedia Storage Devices

Magnetic media, optical media, file systems (traditional, multimedia), Communication devices, Multimedia software's, presentation tools, CD, DVD construction details, recording and reproducing data from CD & DVD. CDROM, COMBO DRIVE, DVD Writer technologies. **(06 hours)**

UNIT-VI

Multimedia Applications:

Media preparation, communication, entertainment using commercial tools, Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors. **(06 hours)**

Assignment List:

- 1) Explain Types of Multimedia? Multimedia Objects
- 2) An audio clip has duration of 8 minutes. The highest frequency in the sound wave is 15 kHz. This is to be sampled using 8 bits per sample and in stereo mode. Calculate the file size. Mention any assumptions made?
- 3) Sound capturing & editing using tools like SOUNDFORGE
- 4) An MPEG-1 video has a frame sequence: IBBPBBPBBPBBI. Determine the size of GOP. Derive the transmission sequence of the frames?
- 5) Creating/editing motion video/animation clips (using tools like Flash / Adobe Premier)
- 6) Consider a TV camera where the maximum intensity of a color signal is represented by 1 volt. An unsaturated magenta signal is formed by mixing 70% R, 20% G and 60% B. What is the luminance output voltage for the signal? What would this value be if the magenta color is saturated?

7) A CD-ROM contains 333000 blocks to be played back in 74 minutes. Calculate the data rate and capacity of the CD-ROM when operating in (a) Mode 1 (b) Mode 2 333000 blocks are played back in 74 minutes?

8) Prepare case study on Educational application Or Industrial application

Text Books:

- 1) Multimedia – Making it work 5th edition by Tag Vaughan (TMGH)
- 2) Multimedia Communication – Pearson Education Fred Halsall.
- 3 Mark Nelson “Data Compression Book” BPB

Reference Books:

- 1) David Hillman “Multimedia technology and Applications” Galgotia Publications.
- 2) Rosch “Multimedia Bible” Sams Publishing.
- 3) Sleinreitz “Multimedia System” Addison Wesley.
- 4) James E Skuman “Multimedia in Action” Vikas.
- 5) J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Elective-II : Embedded System

Teaching Scheme	Examination Scheme	Credit Allotted
Theory :3 Hrs/Week	End Semester Examination : 60 Marks	Theory :3
	Continuous assessment : 40 Marks	

Course Objectives:

- 1) To enable the students to gain a fair knowledge on characteristics and applications of Embedded systems
- 2) To introduce students to the design issue of embedded system
- 3) To understanding and experience of state-of-the-practice industrial embedded systems and intelligent embedded system development

Course Prerequisites:

Students should have knowledge of

- 1)) Students have knowledge about the basic functions of embedded systems Outcomes
- 2) Digital hardware, introductory electrical circuits concepts, computer architecture, programming & systems programming

Course Outcome:

Students will be able to:

- 1) Identify the unique characteristics of real-time systems,
- 2) Explain the general structure of a real-time system,
- 3) Define the unique design problems and challenges of real-time systems,
- 4) Apply real-time systems design techniques to various software programs
- 5) Understand the basics of an embedded system,
- 6) Program an embedded system,
- 7) Design, implement and test an embedded system

UNIT-I INTRODUCTION:- (06 Hours)

Introduction to embedded systems ,Classification, Characteristics and requirements, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design, Concept of Real time Systems, Challenges in Embedded System Design, Design Process Requirements, Specifications, Architecture Design, Designing of Components and System Integration,.

UNIT-II EMBEDDED SYSTEM ARCHITECTURE:- (06 Hours)

Instruction Set Architecture-CISC architecture [8051] and RISC instruction set architecture [ARM processors], DSP Processors, Coprocessors and Hardware Accelerators, Processor Performance Enhancement Pipelining, Super-scalar Execution, CPU Power Consumption, Memory System Architecture-, Caches, Virtual Memory,

- Memory management unit and address Translation.
- UNIT-III DESIGNING EMBEDDED COMPUTING PLATFORM: - (06 Hours)**
 Designing with Processors System Architecture, Hardware Design, Implementation Development Environment, Debugging Techniques, Manufacturing and Testing. Design Using CPU Bus: Bus Protocols, Bus Organization, I/O Device Interfacing, Interfacing Protocols-GPIB, FIREWIRE, USB, Watchdog Timers.
- UNIT-IV OPERATING SYSTEMS:- (06 Hours)**
 Kernel Features: Real-time Kernels, Polled Loops System, Co-routines, Interrupt driven System, Multi-rate System, Processes and Threads, Context Switching, Cooperative Multi-tasking, Pre-emptive Multi-tasking, Scheduling-Rate, Monotonic Scheduling, Earliest-Deadline First Scheduling, Task Assignment, Fault-Tolerant Scheduling. Inter-process Communication-Real-time Memory Management: Stack Management, Dynamic Allocation-Evaluating and Optimizing Operating System Performance-Response.
- UNIT-V RTOS- (06 Hours)**
 Tasks, states, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes. 8. Advanced Processor-(only architectures) 80386, 80486 and ARM (References)
- UNIT-VI EMBEDDED CONTROL APPLICATIONS: - (06 Hours)**
 Open-loop and Closed Loop Control Systems-Application Examples- Washing Machine, Automotive Systems, Auto-focusing digital camera, Air-conditioner, Elevator Control System, ATM System.

Assignment List:

Concerned course faculty can arrange classroom tutorials, MCQ tests and students presentations on each unit. Discuss recent advances in the subject.

Text Books:

- 1) Raj Kamal, "Embedded Systems", TMH, first edition, 2004
- 2) David E. Simon, "An Embedded Software Primer", Pearson Education, 1999.
- 3) Microcontroller (Theory and Applications) Ajay V Deshmukh, Tata McGraw- Hill@2005

Reference Books:

- 1) Wayne wolf, "Computers as components", Morgan Kaufmann publishers, 2nd Edition, 2008.
- 2) Ayala. K.J. "The 8051 Microcontroller", Penram International, 1991.
- 3) Dr. Prasad, "Embedded Real Time System", Wiley Dreamtech, 2004.
- 4) Jean J.Labrosse, "Embedded system building blocks", CMP books, 2nd Edition, 1999.
- 5) Arnold berger, "Embedded system design", CMP books, 1st Edition, 2001.
- 6) Narayan and gong, "Specifications and design of embedded systems", Pearson education, 2nd Edition, 1999.

Syllabus for Unit Test:

Unit Test -1 Unit I,II and III
Unit Test -2 Unit IV, V and VI

Elective-II : Geographical Information System

Teaching Scheme	Examination Scheme	Credit Allotted
Theory :3Hrs/Week	End Semester Examination : 60 Marks	Theory :3
	Continuous assessment : 40 Marks	

Course Objectives:

To understand use of GIS data and systems in various applications that we can use in our life.

To understand use of GIS data and systems to analyze geographical resources and its management

Course Prerequisites:

Students should have knowledge of

- 1) Basic graphical elements and Maps
- 2) Basic computer operating skills

Course Outcome:

Students will be able to:

- 1) Understand Maps and its use in GIS.
- 2) Understand GIS data Acquisition and Management.
- 3) Understand GIS data Processing and Visualization.
- 4) Understand Terrain Mapping, Geocoding.
- 5) Understand role of Remote Sensing in GIS.
- 6) Understand GIS Project and Trends .

UNIT-I Fundamentals of GIS: (06 Hours)

Introduction, Definition of GIS, Evolution of GIS, Roots of GIS , Definition, GIS Architecture, Models of GIS, Framework for GIS, GIS Categories, Map as a Model, Spatial Referencing System, Map Projections, Commonly Used Map Projections, Grid Systems, Cartographic Symbolization, Types of Maps, Typography, Map Design, Map Productions, Map Applications.

UNIT-II Data Management, Models and Quality Issues: (06 Hours)

Conceptual Models, Geographical Data Models, Data Primitives, Data Types - Raster and Vector Approach, Digital Terrain Modeling , Approaches to digital terrain data modeling , Acquisition of digital terrain data, Data Modeling and Spatial Analysis, Sources of Geographical Data, Data Collectors and Providers, Creating Digital Data Sets, Data Presentation, Data Updating, Data Storage, Spatial Data Costs, Quality of GIS Output, Sources of Errors in Spatial Data, Factors affecting Reliability of Spatial Data, Faults from Assumptions, spatial autocorrelation, Quadrat counts and Nearest. Neighbour analysis, Trend surface analysis, Gravity models.

UNIT-III GIS Data Processing, Analysis and Visualization: (06 Hours)

Raster based GIS data processing, Vector based GIS data processing, Human computer interaction and GIS, Visualization of geographic information, principles of cartographic design in GIS, Generation of information product, Image Classification and GIS, Visual Image Interpretation, Types of Pictorial Data Products, Image Interpretation Strategy, Image Interpretation Process, Overview of Image Interpretation Equipments.

UNIT-IV Terrain Mapping, Geocoding and Segmentation: (06 Hours)

Interpolation, Visualization of Continuous Surfaces, Data Sources for Interpolations, Methods for Interpolations, Global Interpolation, Local Deterministic Methods, Comparison of Global and Local Method, Optimal Interpolation Using Geo Statistics. Kriging, Variogram, Geocoding, Applications of Geocoding, Dynamic Segmentation, Applications of Dynamic Segmentation.

UNIT-V Remote Sensing Fundamentals: (06 Hours)

Remote Sensing - Basic Principles, Electromagnetic Remote Sensing, Energy Sources, Energy Interactions with Earth's Surface Materials, Microwave Remote Sensing, The Radar Principle, Factors Affecting Microwave Measurements, Radar Wavebands, SLAR Systems, Sar, Interpreting Sar Images, Geometrical Characteristics, Remote Sensing, Platform and Sensors, Satellite System Parameters, Sensor Parameters, Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites.

UNIT-VI GIS Project Design and Management: (06 Hours)

Software engineering as applied to GIS, GIS project planning, System analysis and study of user requirement, Geographic database design methodology, GIS application software design methodology, system implementation, system maintenance and support.

Issues and Applications in GIS: Changes in Technology, Data Supply and Users, Role of Satellite Imagery and Data Sets, Trends in GIS, GIS users, Urban and Municipal Applications, Other Applications.

Assignment List:

- 1) Analyze google Maps for geographical area of any city
- 2) Analyze data from google Maps for any city's geographical structure
- 3) Study data resource sources for any GIS system
- 4) Analyze Google Map with Geocoded Address
- 5) Study various remote sensing application
- 6) Analyze any GIS Project with tools and techniques used.

Text Books:

- 1) M. Anji Reddi ,” Remote Sensing and Geographical Information Systems” B. S.

- Publications, Second Edition
- 2) George B Korte, .The GIS Book., Onword press, Thomson Learning, 5th Edition, 2003.
 - 3) Ian Heywood, Sarah Cornelius & etal., .An Introduction to Geographical Information Systems., 2nd Edition, Pearson Education

Reference Books:

- 1) Tor Bernhardsen, .Geographic Information Systems. An Introduction., 3rd edition,Wiley.
- 2) Peter A Burrough and McDonell, .Principles of Geographical Information Systems, Oxford University Press, 1998
- 3) M. N. DeMers, .Fundamentals of Geographic Information Systems., 3rd edition, Wiley.

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Elective – II : Cyber Law and Security Policies

Teaching Scheme	Examination Scheme	Credit Allotted
Theory :3 Hrs/Week	End Semester Examination: 60 Marks	Theory:3
	Continuous assessment : 40 Marks	

Course Objectives: To

- 1) Understand significance of cyber security and its effect on Individual and society at large.
- 2) Use of IT ACT 2000 for its possible implementation.

Course Prerequisites:

Students should have knowledge of

- 1) Working of the Internet
- 2) Basic security related issues.

Course Outcome:

Students will be able to:

- 1) Understand security policies
- 2) Use effective technique to maintain the data.
- 3) Analyze information using tools and techniques to increase the business.
- 4) Use huge data available due to social networking site and internet.
- 5) Apply information analysis for decision making.
- 6) Apply adequate tool for MIS

UNIT-I	Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.	(06 Hours)
UNIT-II	Secure System Planning and administration: Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.	(06 Hours)
UNIT-III	Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy-developing standards.	(06 Hours)
UNIT-IV	Information security:	(06 Hours)

fundamentals-Employee responsibilities- information classification-Information handling- Tools of information security- Information processing-secure program administration.

UNIT-V Organizational and Human Security: (06 Hours)

Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

UNIT-VI Indian IT Act 2000 and 2008: (06 Hours)

Introduction, Definitions in Act, Electronic signature, certifying authority,

Assignment List:

Text Books:

- 1) Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media
- 2) Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall
- 3) Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global

Reference Books:

- 1) Thomas R Peltier, Justin Peltier and John blackley, "Information Security Fundamentals", 2nd Edition, Prentice Hall
- 2) Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag
- 3) Matt Bishop, "Computer Security: Art and Science", Addison-Wesley Professional
- 4) Joseph M.Kizza, "Computer Network security", Springer
- 5) Thomas R.Peltier, "Information Security Risk Analysis", CRC Press

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

IT Lab-IV

Teaching Scheme	Examination Scheme	Credit Allotted
Practical :4	Term Work and Practical (Tw & Pr) : 50 Marks	Tw & Pr :2

Course Objectives:

- 1) Describe the basic features of the Linux operating system.
- 2) Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.
- 3) Discuss correct synchronization techniques for both application programs and kernel code running on uniprocessor as well as multiprocessor (SMM) platforms.
- 4) Use UNIX/Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks.
- 5) Apply the UNIX/Linux system to accomplish typical personal, office, technical, and software development tasks.
- 6) Ability to use Linux environment and write programs.

Course Prerequisites:

Students should have knowledge of

- 1) Prior exposure to a computer running an operating system such as Apple or Windows.
- 2) A Unix editor, understands files and directory structures, shell mechanisms.
- 3) Basic fundamentals of shell programming.

Course Outcome:

Students will be able to:

- 1) Understand the open source software movement and the advantages and disadvantages of open source software.
- 2) Acquire knowledge of script programming basics.
- 3) Acquire a fundamental knowledge of operating system file systems.
- 4) Use modern operating system calls such as Linux process and synchronization libraries.
- 5) Understand process management, concurrent processes and threads, memory management, virtual memory concepts, deadlocks.

UNIT-I Introduction : (06 Hours)

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities, sed – scripts, operation, addresses, commands, applications, awk – execution, fields and records, scripts, operation, patterns, actions, functions, using system commands in awk.

UNIT-II Working with the Bourne again shell(bash): (06 Hours)

Introduction, shell responsibilities, pipes and input Redirection, output redirection, here documents, running a shell script, the shell

as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

UNIT-III **Files:** **(06 Hours)**

File Concept, File System Structure, Inodes, File Attributes, File types, Library functions, the standard I/O and formatted I/O in C, stream errors, kernel support for files, System calls, file descriptors, low level file access – File structure related system calls(File APIs), file and record locking, file and directory management – Directory file APIs, Symbolic links & hard links.

UNIT-IV **Process :** **(06 Hours)**

– Process concept, Kernel support for process, process attributes, process control - process creation, waiting for a process, process termination, zombie process, orphan process, Process APIs. Signals– Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

Interposes Communication: Introduction to IPC, Pipes, FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory. Message Queues- Kernel support for messages, Unix system V APIs for messages, client/server example.

UNIT-V **Multithreaded Programming:** **(06 Hours)**

Differences between threads and processes, Thread structure and uses, Threads and Lightweight Processes, POSIX Thread APIs, Creating Threads, Thread Attributes, Thread Synchronization with semaphores and with Mutexes, Example programs.

UNIT-VI **Sockets:** **(06 Hours)**

Introduction to Sockets, Socket Addresses, Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs

Assignment List:

- 1) Installation of Unix/Linux operating system
- 2) Study of logging/logout details.
- 3) Study of Unix/Linux general purpose utility command list obtained from (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown) commands.

- 4) Write a shell script program to display the process attributes.
- 5) Write a shell script program to check variable attributes of file and processes.
- 6) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
- 7) Study of Unix/Linux files system (tree structure).
- 8) Study of .bashrc, /etc/bashrc and Environment variables.
- 9) Shell script program to copy contents of one file to another.
- 10) Create directory, write contents on that and Copy to a suitable location in your home directory.

Text Books:

- 1) Unix System Programming using C++, T.Chan, PHI.(UNIT III to UNIT VIII)
- 2) Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
- 3) Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.

Reference Books:

- 1) Linux System Programming, Robert Love, O'Reilly, SPD.
- 2) Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson Education.
- 3) Unix Network Programming, W.R.Stevens,PHI.
- 4) Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education.

Semester-VII

Sr. no	Course Title	Teaching Scheme				Examination Scheme							Credits	
		L	T	P	Contact hrs/wk	Theory	Unit Test	Attendance	TA & Assignments	PR& TW	OR& TW	Total Marks	Theory	TW
1	Compiler Construction and Design	4	-	2	6	60	20	10	10	--	50	150	4	1
2	Computer Forensics and Cyber Laws	3	-	2	5	60	20	10	10	50	-	150	3	1
3	Software Testing	3	-	2	5	60	20	10	10	50	--	150	3	1
4	Elective –III	2	2	-	4	60	20	10	10	--	50	150	2	2
5	Seminar I	-	-	2	2	--	--	--	--	--	50	50		1
6	Project Stage-I	-	-	2	2	--	--		--	--	50	50	-	4
7	Industrial Training	-	--	-	-	--	--		--	--	50	50	-	3
TOTAL		12	2	10	24	240	80	40	40	100	250	750	12	13

Elective III :

- 1) Web Services
- 2) Natural Language Processing
- 3) Network Modeling & Designing
- 4) Neural Network

Teaching Scheme			Examination Scheme							Credits	
Lecture	Practical	Tutorial	Theory	Unit Test	Attendance	Assignments	PR&TW	OR&TW	Total	Theory	TW
12	10	02	240	80	40	40	100	250	750	12	13

Compiler Construction and Design

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 4 Hrs/Week	End Semester Examination: 60 Marks	Theory:04
Practical : 2 Hrs/Week	Internal Assessment:40 Marks	Term Work:01
	Oral and Term Work: 50 Marks	

Course Objectives:

- 1) Students will understand concepts of compiler phases and design.
- 2) Students will get deeper insights into the more advanced semantic aspects of programming language and compilers.

Course Prerequisites:

Students should have knowledge of

- 1) Basic Programming Skills
- 2) Data Structure Fundamentals.
- 3) Theory of Automata and Formal Languages

Course Outcome:

Students will be able to:

- 4) Learn about different phases of a compiler and their functioning.
- 5) Implement a program to exhibit basic functionalities of compiler.
- 6) Understand how compilers generate source code to machine code and manages memory during runtime.
- 7) Acquaint with techniques for simple code optimizations.
- 8) Use compiler construction tools and softwares like LEX, YACC and FOSS.
- 9) Know functioning of advanced compilers and advancements in the field.

UNIT-I Lexical Analysis: (06 Hours)

Language Processor: Preprocessor, compiler, assembler, interpreters, Translation Process, Phases of Compiler, Compiler construction: Design issues, Tools. Lexical Analysis: Role, Regular expressions, Specification and recognition of tokens, LEX, Construction of lexical analyzer using LEX.

UNIT-II Syntax Analysis: (06 Hours)

Context free grammar, writing a grammar, Top down parsing, Bottom up parsing, LR parsers: LR parsing algorithm, Constructing SLR parsing tables, Constructing canonical LR parsing tables, Constructing LALR parsing tables, Using ambiguous grammars, YACC. Symbol tables: use and need of symbol tables.

UNIT-III Syntax Translation: (06 Hours)

Syntax directed definition and analysis, Syntax tree construction, Bottom up evaluation, S and L attribute definitions, Top down translation, Space allocation at compile time, Type checking, Type

conversion.

UNIT-IV Run Time Environment and Intermediate Code Generation: (06 Hours)

Runtime Environment: Storage organization, Stack allocation, Access to non-local data, Heap management, Parameter passing mechanisms, Garbage collection, Dynamic storage allocation techniques.

Intermediate Code Generation: Declaration, Assignment statement, Boolean expression, Case statement, Backpatching, Procedure calls.

UNIT-V Code Generation: (06 Hours)

Issues in Code generation, Basic Code generation techniques, run time storage management, Basic blocks and Flow graphs, Next-use information, A simple Code generator, DAG representation of Basic blocks, Peephole optimization, Generating code from dags, Code generation algorithms.

UNIT-VI Code Optimization and Applications: (06 Hours)

Code optimization techniques, Principal Sources of Optimization, Optimization of basic Blocks, Global Data Flow Analysis, Runtime Environments, Source and Target Language issues, Dynamic compilation, Cross compilers, Decompiler, Tools: FOSS, C Compiler, GCC, javac, JIT, Interpreters (JVM/Dalvik).

Assignment List:

- 1) Analyze source program compilation with respect to compilation phases.
- 2) Explain the role of lexical analysis in compilation process.
- 3) Explain in brief i) Top down parsing ii) Bottom up parsing.
- 4) Write a short note on necessity of type checking and type conversion.
- 5) Write a procedure to insert an item into a linked list by passing a pointer to the head of the list. Under what parameter passing mechanisms does this procedure work?
- 6) Discuss dynamic storage allocation techniques.
- 7) Explain DAG representation of basic blocks with suitable example.
- 8) Briefly explain runtime storage management in code generation phase.
- 9) Write a short note on code optimization technique.
- 10) Enlist and explain advanced compiler tools.

Term Work Assignment List:

- 1) Understand basic syntax of LEX specifications, built-in functions and variables.
- 2) Implement a preprocessor for C program.
- 3) Implement a lexical analyzer for subset of C language.
- 4) Implement a parser for an expression grammar using YACC and LEX.
- 5) Write a program to simulate symbol table generator.
- 6) Implement operations of semantic analysis like type checking, verification of function parameters, variable declarations and coercions etc.

- 7) Simulation and Demo: Compiler and interpreter using LEX and YACC.
- 8) Implement intermediate code generator for the Boolean expression in three Address code format.
- 9) Implement the front end of a compiler that generates the three-address code for a simple language.
- 10) Generate an appropriate Target Code from the given intermediate code assuming suitable processor details.

Text Books:

- 1) Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Edition.
- 2) J. R. Levin, T. Mason, D. Brown, "Lex and Yacc", O'Reilly.

Reference Books:

- 1) *Kenneth C. Loudon., "Compiler Construction Principles and Practice", Cengage Learning India.*
- 2) *Andrew Appel and Jens Palsberg., "Modern Compiler Implementation in ML: Basic Techniques", Cambridge University Press.*
- 3) *Anthony J. Dos Reis, "Compiler Construction Using Java, JavaCC and Yacc", Wiley.*
- 4) *Keith D. Cooper, Linda Torczon, "Engineering a Compiler", Elsevier.*
- 5) *Axel T. Schreiner, H. George Friedman Jc, "Introduction to Compiler Construction with Unix", Prentice Hall.*

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Computer Forensics and Cyber Laws

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3Hrs/Week	End Semester Examination : 60Marks	Theory : 03
Practical : 2 Hrs/Week	Internal Assessment : 40 Marks	Term Work : 01
	Practical and Term Work : 50 Marks	

Course Objective:

To maintain an appropriate level of awareness, knowledge and skill required to minimize the occurrence and severity of incidents related to forensics and cyber law.

Course Prerequisites:

Students should have knowledge of

- 1) Basics of data communication.
- 2) Aware about security issues with digital world.

Course Outcome:

Students will be able to:

- 1) Understand how to analyze evidences and its use in investigation.
- 2) Demonstrate data recovery in computer forensic.
- 3) Analyze hardware and operating systems in cyber security.
- 4) Demonstrate Computer Forensic tools and Disaster Recovery.
- 5) Understand Network Forensic and Mobile Network Forensic.
- 6) Discuss cyber laws.

UNIT-I Introduction to Computer Forensics: (06 Hours)

computer crimes, evidence, extraction, preservation

Overview: Concept of Computer Forensic, Types of Forensic Science, Storage device, Storage device characteristics, types of storage device. Forensic Investigator: Role of Computer Forensic Investigator, line of investigation, investigation steps, responsibilities of Computer Forensic Investigator.

Evidence: Definition of evidence, life cycle of evidence, types of evidence, rules for evidence, evidence.

Storage and its Security Incident Response: Introduction, Investigations, Pre-Incident Preparations, Formation of Incident Response Team, Role of Incident Response Team.

UNIT-II Data recovery: (06 Hours)

Computer crime and Legal issues: Intellectual property, privacy issues, Criminal Justice system for forensic, audit/investigative situations and digital crime scene, investigative procedure/standards for extraction, preservation, and deposition of legal evidence in a court

of law.**Data Recovery:** Definition of data recovery, Identifying hidden data, Encryption/Decryption, Steganography, recovering deleted files.data recovery mechanism, tools used for recovery.**Digital evidence controls:** uncovering attacks that evade detection by Event Viewer, Task Manager, and other Windows GUI tools, data acquisition, disk imaging, recovering swap files, temporary & cache files

UNIT-III Hardware and Operating Systems: (06 Hours)

Overview of hardware and operating systems: structure of storage media/devices; windows/Macintosh/ Linux -- registry, boot process, file systems, file metadata.**Investigating Logs:** Audit logs and security, system log, remote logging, configuring Windows, logging, setting up remote logging in Windows, event reporter and Application Logs.**Software Reverse Engineering:** defend against software targets for viruses, worms and other malware, improving third-party software library, identifying hostile codes-buffer overflow, provision of unexpected inputs, etc.

UNIT-IV Computer Forensic tools and Disaster Recovery: (06 Hours)

Computer Forensic tools: X-Ways, Index.dat Analyzer, Data Doctor ,Encase, Helix, FTK, Autopsy, Sleuth kit Forensic Browser, FIRE, Found stone Forensic ToolKit, WinHex, Linux dd and other open source tools. **Disaster Recovery:** Preparing for disaster recovery, backing up data, scheduling backup jobs, restoring data, recovering from server failure, selecting disaster recovery methods.

UNIT-V Network Forensic and Mobile Network Forensic: (06 Hours)

Network Forensic: Collecting and analyzing network-based evidence, reconstructing web browsing, email activity, and windows registry changes, intrusion detection, tracking offenders, etc. **Mobile Network Forensic:** Introduction, Mobile Network Technology, Investigations, Collecting Evidence, Where to seek Digital Data for further Investigations, Interpretation of Digital Evidence on Mobile Network.

UNIT-VI Cyber Law: (06 Hours)

Battling Cyber Squatters and Copyright Protection in the Cyber World : Concept of domain name and reply to cyber squatters, meta-tagging, legislative and other innovative moves against cyber squatting, freedom and control on the internet, works in which copyright subsists and meaning of copyright, copyright ownership and assignment, license of copyright, copyright term and respect for foreign works, copyright infringement, offences and remedies, copyright protection and content on the internet, copyright notice, disclaimer and

acknowledgment, downloading for viewing contents, hyper-linking and framing, liability of ISPs for copyright, violation in the cyber world, legal developments in the US, Napster and its cousins, computer software piracy. Licenses and versions of GPL, Trademark, Patent. Digital Signature, Certifying Authorities and E-Governance : Digital signature, digital signature certificate, certifying authorities and liabilities, digital signature Governance in India

Term Work Assignment List:

1. Explain role of Computer Forensic Investigator and investigation steps.
2. Explain life cycle of evidence and its types.
3. Demonstrate deleted data recovery by using suitable tools.
4. Demonstrate setting up remote logging in Windows.
5. Use Computer Forensic tools.
6. Demonstrate backing up data and restoring data.
7. Implement collecting and analyzing network-based evidence.
8. Implement interpretation of digital evidence on mobile network.
9. Design copyright protection in the cyber world.
10. Implement digital signature.

Assignment List:

1. Discuss types of Forensic Science
2. Discuss Intellectual property.
3. Demonstrate data recovery mechanism
4. Demonstrate event reporter and Application Logs
5. Discuss selecting disaster recovery methods
6. Demonstrate computer Forensic tool X-Ways
7. Discuss Collecting and analyzing network-based evidence
8. Demonstrate intrusion detection
9. Demonstrate digital signature certificate heads.
10. Differentiate between Copyright, Patent and Trademark.

Text Books:

- 1) Jay A. Siegel "Forensic Science: The Basics ", CRC Press.
- 2) Anthony J. Bertino, "Forensic Science: Fundamentals and Investigations", Cengage Learning.
- 3) Joe Nickell and John F. Fischer, "Crime Science: Methods of Forensic Detection", Kentuckypress.
- 4) Sherri Davidoff, Jonathan Ham, " Network Forensics: Tracking Hackers Through Cyberspace", Prentice Hall, 2012.

Reference Books:

- 1) *Stuart H. James and Ph. D., Jon J. Nordby, "Forensic Science: An Introduction to Scientific and Investigative Techniques", 2nd edition.*
- 2) *Andy Jones and Debi Ashenden, "Risk Management for Computer Security: Protecting Your*

- Network & Information Assets*".
- 3) Colin Evans, *"The Casebook of Forensic Detection: How Science Solved 100 of the World's Most Baffling Crimes"*.
 - 4) Edward Amoroso, *"Cyber Security, Computer Network Security and Cyber Ethics"*, 2nd edition by Joseph Migga Kizza.
 - 5) Robert McCrie, *"Security Operations Management"*, Second Edition.

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Software Testing

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 2 Hrs/Week	Internal Assessment : 40 Marks	Term Work: 01
	Practical and Term Work : 50 Marks	

Course Objectives:

- 1) Students will learn the advanced techniques that underlie the practice of software testing.
- 2) Course will provide deeper insights into quality assurance of developed softwares.

Course Prerequisites:

Students should have knowledge of

Software Development and Software Engineering concepts.

Course Outcome:

Students will be able to:

- 1) Classify measurement models and software metrics.
- 2) Perform unit and integration tests by determining test design and test automation.
- 3) Apply suitable higher order testing techniques and methods in order to achieve verified and validated software by following best testing practices.
- 4) Understand the methods of software quality measurement.
- 5) Understand various test processes, fault models and methods of test generation.
- 6) Acquaint with software automation tools and applications.

UNIT-I Principles of Testing: (06 Hours)

Purpose of Software Testing, Testing Principles, Goals of Testing, Software components, characteristics, architecture, Software testing life cycle, Testing aspects: Requirements, Test Scenarios, Test cases, Test scripts/procedures. Strategies for Software Testing, Testing Activities, Mistakes, Faults & Failures, Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods, Levels of Testing, White-Box Testing, Black-Box Testing.

UNIT-II Functional Testing: (06 Hours)

Test Plan, Test Management, Test Execution and Reporting, Test Specialist Skills, Tester's Workbench and Tool Categories, Test Maturity Model and Test Process Assessment, Functionality Matrix (FM), Debugging & Root Cause Analysis, Software Items, Component & Units, Test Bed, Traceability and Testability, Attributes of Testable Requirements, Test Matrix, Types of Testing, Creating Test Cases from Requirements and Use cases, Software Defects: Origins, Classes, cycle, attributes, Need for Testing.

UNIT-III Higher Order Testing: (06 Hours)

Object Oriented Testing, Specification Based Testing, Performance Testing, Ad-hoc Testing, Usability and Accessibility Testing, Risk-based Testing, Exploratory Testing, Scenario-based Testing, Random Testing Compatibility Testing, User Documentation Testing, Client–Server System Testing, RAD Testing, Configuration Testing, Testing internal Controls, Multiplatform Environment Testing, Security Testing, Web-based System Testing. IEEE Standards Related to Testing.

UNIT-IV Software Measurement: (06 Hours)

Objectives, Measurement and Models, Measurement Scales, Classification of Software Measures, Measurement Framework, Software measurement validation, Measuring Internal Product Attributes: Size, structure, Halstead’s Software Science, Product Quality Metrics, In-Process Quality Metrics, Software Reliability: Measurement and Prediction, The Rayleigh Model, Exponential Distribution and Reliability Growth Models, SRE process.

UNIT-V Software Quality Assurance and Test metrics: (06 Hours)

Software Quality Concepts, Planning for SQA, Six Sigma Principles, Malcolm Baldrige Assessment, Edward Deming’s Principles, Ishikawa’s Seven Basic Tools, Software Maintenance, Software inspection concepts, Software Benchmarks and Baselines, Identifying Software Best and Worst Practices.
Test metrics: Types of metrics, project metrics, Progress metrics, Test Defect metrics, Development defect metrics, Productivity metrics, Release metrics.

UNIT-VI Automation and Applications: (06 Hours)

Software test automation: Introduction, Scope. Design and architecture for automation: External modules, test cases and test framework modules, tools and result modules, report generator, process model for automation, challenges. Manual testing, Automated Testing Tools & Case studies, Study of Testing tools: QTP, Rational Robot, Winrunner, Loadrunner, Bugzilla, Selenium.

Assignment List:

- 1) Explain in detail the difference between Software Product and Software Project.
- 2) Explain the need of Software Testing in software development.
- 3) Explain software defects with reference to origins, classes and defect repository.
- 4) What is minimization and prioritization of Test Cases for Regression Testing? Explain with suitable example.
- 5) Write a short note on ‘Quality Standards’ of testing.
- 6) Explain in detail ‘Software Reliability’.
- 7) Enlist different software reliability models, briefly explain each.

- 8) Explain Defect cycle and Bug execution.
- 9) Write a short note on tools and models to measure Software Quality.
- 10) What is the need of regression testing? Which test cases are executed in regression testing?

Term Work Assignment List:

- 1) Describe architecture, components, characteristics, type, category, types of users and user expectations for given software application.
- 2) State and describe software development life cycle (SDLC) and software testing life cycle (STLC) phases.
- 3) Create Functionality Matrix (FM) for any software application.
- 4) Write down test scenario and test cases on mobile application.
- 5) Construct Requirement Traceability Matrix (RTM) for software application.
- 6) Perform following testing for E-commerce application,
 - a) Functional Testing
 - b) Performance Testing
 - c) UI testing
 - d) Security testing.
- 7) Installation and Demo of open source testing tool (Selenium, Bugzilla etc.)
- 8) Test your project as a software application using any software testing tool.
- 9) Study different Defect Tracking Tool, and Create Defect report using Bugzilla.
- 10) Study assignment: Explain Quality attributes of Software Application and differentiate between QA, QC, and QMS.

Text Books:

- 1) Fenton, Pfleeger, "Software Metrics: A Rigorous and practical Approach", CRC Press.
- 2) Desikan, Ramesh, "Software Testing: principles and Practices", Pearson Education.

Reference Books:

- 1) *Burnstein, "Practical Software Testing", Springer International Edition.*
- 2) *William E. Perry, "Effective Methods for Software Testing", John Wiley and Sons.*
- 3) *Yogesh Singh, "Software Testing", Cambridge University Press.*
- 4) *Ronald Radice, "Software Inspections", Tata McGraw Hill.*
- 5) *Capers Jones, "Software Assessments, Benchmarks, and Best Practices", Addison-Wesley.*
- 6) *Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", CRC Press.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective-III: 1) Web Services

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 2 Hrs/Week	Internal Assessment : 40 Marks	Term Work : 01
	Oral and Term Work : 50 Marks	

Course Objectives:

This course will cover the practical aspects web services in detail. The goal of this course is to introduce the students to the basics of distributed application development. We will introduce the students to Web Services, Applications of Web Services.

Course Prerequisites:

Students should have knowledge of:

- 1) Understanding the working of Network with TCP / IP.
- 2) Basic idea of how the Internet Works.
- 3) .Net and Java Framework Knowledge.

Course Outcome:

Students will be able to:

- 1) To understand the details of web services technologies like WSDL, UDDI, SOAP.
- 2) To learn how to implement and deploy web service client and server.
- 3) To explore interoperability between different frameworks.

UNIT-I Introduction: (06 Hours)

Evolution and Emergence of Web Services – Evolution of distributed computing, Core distributed computing technologies — client/server, CORBA, JAVA RMI, Microsoft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services — The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services. Web Services Architecture — Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication models, basic steps of implementing web services.

UNIT-II SOAP: (06 Hours)

Fundamentals of SOAP — SOAP Message Structure, SOAP encoding, Encoding of different data types, SOAP message exchange models, SOAP communication and messaging, Java and Axis, limitations of SOAP.

UNIT-III WSDL: (06 Hours)

Describing Web Services — WSDL — WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL.

UNIT-IV Web Service Discovery: (06 Hours)

Discovering Web Services — Service discovery, role of service discovery in a SQA, service discovery mechanisms, UDDI — UDDI registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, Publishing API, Publishing, searching and deleting information in a UDDI Registry, limitations of UDDI.

UNIT-V Web Services Interoperability: (06 Hours)

Web Services Interoperability — Means of ensuring Interoperability, Overview of .NET, Creating a .NET client for an Axis Web Service, creating Java client for a Web service, Challenges in Web Services Interoperability. Web Services Security — XML security frames work, Goals of Cryptography, Digital signature, Digital Certificate, XML Encryption.

UNIT-VI Designing Web service: (06 Hours)

Java, and .Net Frame Work. Case Studies with Java and .Net.

Term Work Assignment List:

- 1) Compare different distributed computing technologies like CORBA, JAVA RMI, Microsoft DCOM, MOM.
- 2) Implement a simple web service of checking the status of client.
- 3) Implement SOAP in Java with simple messaging.
- 4) Identify limitations of SOAP. Suggest the solutions.
- 5) Study WSDL in detail with respect to WWW.
- 6) Implement a simple program for discovery.
- 7) Write a Java program to verify digital signatures.
- 8) Write a Java program to verify digital certificates.
- 9) Case Study: Use of Java for Web Services.
- 10) Case Study: Use of .NET for Web Services.

Text Books:

- 1) R. Nagappan, R. Skoczylas, R.P. Sriganesh, “Developing Java Web Services”, Wiley India.

Reference Books:

- 1) James McGovern, Sameer Tyagi et al., “Java Web Service Architecture”, Elsevier
- 2) S. Graham and others “Building Web Services with Java”, 2 Edition, Pearson Edn.

- 3) *D.A. Chappell & T. Jewell, "Java Web Service"s, O'Reilly,SPD.*
- 4) *G. Alonso, F. Casati, "Web Service's, Springer.Outcomes*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective III: 2) Natural Language Processing

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 2 Hrs/Week	End Semester Examination : 60 Marks	Theory : 02
Tutorial : 2 Hrs/Week	Internal Assessment : 40 Marks	Term Work : 02
	Oral and Term Work : 50 Marks	

Course Objectives:

- 1) To understand the concepts of morphology, syntax, semantics and pragmatics of the language.
- 2) To give introduction of knowledge acquisition, information retrieval and machine translation.

Course Prerequisites:

Students should have knowledge of

- 1) Probabilities and statistics.
- 2) Algorithms and programming experience.

Course Outcome:

Students will be able to:

- 1) Understand the models, methods, and algorithms of statistical Natural Language Processing (NLP).
- 2) Understand the basic NLP techniques, including syntactic parsing, semantic interpretation, lexical and morphological analysis.
- 3) Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars.
- 4) Choose appropriate solutions for solving typical NLP sub problems (tokenizing, tagging, parsing)
- 5) Understand basics of knowledge representation.
- 6) Understand resources of natural language data – corpora.

UNIT-I Language Modeling: (06 Hours)

NLP-Language and Grammar-Processing:Origins and challenges, Language models: Uni-gram, N-gram –Statistical Language Model, NLP Applications.

UNIT-II Natural Language and Formal Language: (06 Hours)

Text Preprocessing, Regular Expressions and Finite State Automata word recognition, lexicon. Phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax.

UNIT-III Part of Speech Tagging and Hidden Markov Models: (06 Hours)

The concept of parts-of-speech, Tagging, Tagsets, and Morphology, The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs). The Viterbi Algorithms.

UNIT-IV Grammars & Parsing Algorithms: (06 Hours)

Context-free Grammars, Parsing Regular Grammars, Parsing Context Free Grammars, Example Toy NL Grammar, Shift-Reduce Parsers, Probabilistic Parsing: Introduction.

UNIT-V Information Extraction: (06 Hours)

Vector space model, term weighting, homonymy, polysemy, synonymy, Improving user queries. Machine Translation– Overview, Applications of NLP- Spell-checking, Summarization.

UNIT-VI Linguistics resources: (06 Hours)

Introduction to corpus, elements in balanced corpus, TreeBank, PropBank, WordNet, VerbNet etc. Resource management with XML, Management of linguistic data with the help of GATE, The Semantic Web technologies, ontologies, OWL, NLTK.

Assignment List:

- 1) Write note on word normalization and stemming. Explain case folding with suitable example.
- 2) What is significance of decision tree in sentence segmentation also give implementation of decision tree for suitable example.
- 3) Discuss challenges of Machine translation. What are classical approaches of machine translation?
- 4) Case study on IBM translation model.
- 5) Case study on WordVET and VerbNet
- 6) Study of Hidden Markov Model and POS tagging.
- 7) Study assignment on Python—Analyzing Text with the Natural Language.
- 8) Research paper reading, analyzing and demonstrating.
- 9) Describe various Natural Language representation methods.
- 10) Describe different techniques for removal of ambiguity.

Term Work Assignment List:

- 1) Implement bottom up parser for any given grammar.
- 2) Analysis of natural language using lexical analysis.
- 3) Case study of any parsing algorithm.
- 4) Study of clustering algorithm in NLP.
- 5) Case study: NLP in web mining or text mining.
- 6) Case study of Viterbi Algorithm.
- 7) Study of Python features used in NLP.
- 8) Study assignment of information retrieval techniques.
- 9) Installation of NLTK Toolkit.
- 10) Implement program in Python to calculate frequency distribution.

Text Books:

- 1) Allen, J. “Natural Language Understanding”, The Benajmins/Cummings Publishing Company, Inc. 1994. ISBN 0-8053-0334-0.
- 2) Daniel Jurafsky and James H Martin. “Speech and Language Processing”, 2e, Pearson Education,

2009.

Reference Books:

- 1) James A".*Natural language Understanding*"2e, Pearson Education, 1994
- 2) Bharati A., Sangal R., Chaitanya V. "*Natural language processing: a Paninian perspective*", PHI, 2000.
- 3) Siddiqui T., Tiwary U. S. "*Natural language processing and Information retrieval*", OUP, 2008
- 4) NLTK – *Natural Language Tool Kit* - <http://www.nltk.org/>
- 5) *Journals : Computational Linguistics, Natural Language Engineering, Machine Learning, Machine Translation, Artificial Intelligence.*

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Elective III :3) Network Modeling & Designing

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 02 Hrs/Week	End Semester Examination : 60 Marks	Theory : 02
Tutorial : 02 Hrs/Week	Internal Assessment : 40 Marks	Term Work : 02
	Oraland Term Work : 50 Marks	

Course Objectives:

- 1) Build an understanding of the fundamental concepts of networking.
- 2) Familiarize the student with the basic taxonomy and terminology of the networking Design & Modeling.
- 3) Introduce the student to advanced networking concepts preparing the student for entry Advanced courses in computer networking.
- 4) Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Prerequisites:

Students should have knowledge of

The fundamental concepts of computer networking.

Course Outcome:

Students will be able to:

- 1) Understand basic network technology.
- 2) Understand and building the skills of network traffic.
- 3) Design a network topology.
- 4) Design a network algorithm.
- 5) Understand internals of main protocols such as SNMP v1,v2,v3, RMON1, RMON2.
- 6) Understand the organization of Network Administration.

UNIT-I Requirements Planning and Choosing Technology: (06 Hours)

User Requirements, documentation and planning, traffic sizing, tuning data size across the network, traffic characteristics, time and delay consideration

UNIT-II Traffic Engineering and Capacity Planning: (06 Hours)

Poisson Arrivals, Markov processes, Voice traffic modeling, Queuing system models, Markovian queuing system models M/D/1, M/M/1, Bernoulli process, Erlang formulas and M/M/c/e system priority queue system, LAN Traffic Modeling, Availability and Reliability.

UNIT-III Network Design: (06 Hours)

Designing the network topology and solutions-Top down Approach – Network Design Layers--Application Layer, Premises Architecture or Local Enterprise, Architecture Layer, Access Layer, Backbone Layer, Access Layer Design, Backbone Network Design.

UNIT-IV Network Design Problem definition: (06 Hours)

Network Design Problem definition : Multipoint line layout heuristics, CMST algorithm, ESAUWilliam's algorithm, Sharma's algorithm, Unified algorithm, Bin packing, Terminal assignments, Concentrator location.

UNIT-V Network Management Protocols: (06 Hours)

Network Management Protocols: SNMP v1,v2,v3, RMON1, RMON2, Netflow, Syslog. Network Management Standards, ASN.1, encoding structure, Macros, Functional Model.

UNIT-VI Network Administration: (06 Hours)

Functions and responsibilities, Network planning and implementation, Sub-netting, Bandwidth management, security issues, Tools for BW and security management, modifying network implementation.

Assignment List:

- 1) Explain in detail 'Requirement paling Traffic sizing of network'.
- 2) Discuss Various characteristics with time & delay consideration for better network design.
- 3) List and explain 'Markovian Queen system models'.
- 4) Discuss LAN traffic modeling with its average and Reliability.
- 5) Demonstrate Various design approach with respect to design layers for networking.
- 6) Describe backbone network design.
- 7) Summarize network design problem definition with various algorithm (CMST, Sharma's, Unified).
- 8) Justify network management protocol SNMPv1,v2,v3.
- 9) Draw and explain functions model of network management standard.
- 10) State various functions and responsibility of network administration.

Term Work Assignment List:

- 1) Study assignment: Network topology.
- 2) Simulate Markovian queuing system models.
- 3) Design LAN traffic model assuming suitable model.
- 4) Design network of your college considering layers present.
- 5) Implement CMST algorithm.
- 6) Implement Bin packing algorithm assuming suitable parameters.
- 7) Study assignment: Network management protocols.
- 8) Analyze traffic using traffic monitor analyzer.
- 9) Demonstrate tools used for network management.
- 10) Case study: Tools for Security Management.

Text Books:

- 1) Keshav S., "An Engineering Approach to Computer Networking," AddisonWesley.

Reference Books:

- 1) *Darren L. Spohn, "Data Network Design", Tata McGraw Hill Edition.*
- 2) *Mani Subramanian, "Network Management Principles and Practice", Pearson Education.*
- 3) *James D, "Network Analysis, Architecture, and Design", Morgan Kaufman.*
- 4) *Robert S Kahn, "Wide Area Network Design", Morgan Kaufman.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective III: 4) Neural Network

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 2 Hrs/Week	End Semester Examination : 60 Marks	Theory : 02
Tutorial : 2 Hrs/Week	Internal Assessment : 40 Marks	Term Work : 02
	Oral and Term Work : 50 Marks	

Course Objectives:

- 1) To understand the basics concept of biological Neural Network.
- 2) To learn the basics concept of artificial Neural Network
- 3) To analyze applications of ANN
- 4) To study different pattern recognition application using ANN.
- 5) To use the practical approach of artificial neural networks in various technical, organizational and economic applications.
- 6) To learn basic learning algorithms: the delta learning rule, the back-propagation algorithm, self-organized learning, etc.

Course Prerequisites:

Students should have knowledge of

- 1) Algorithms and programming, data structures.
- 2) Probability theory, calculus etc.

Course Outcome:

Students will be able to:

- 1) Analyze the role of neural networks in engineering, artificial intelligence, and cognitive modelling.
- 2) Understand the differences between for supervised and unsupervised learning.
- 3) Designing of single and multi-layer feed-forward neural networks.
- 4) Understand the concept of generalization and function approximation.
- 5) Understand the concepts and techniques of neural networks through the study of the most important neural network models.
- 6) Analyze the sufficient theoretical background to be able to reason about the behavior of neural networks.
- 7) Develop an application of neural network, and to know what steps to take to improve performance.

UNIT-I Introduction and Basics of Artificial Neural Networks: (06 Hours)

Introduction to Neural Networks, Features of ANN, Structure of Biological Neural Network, Comparison of BNN and ANN, Characteristics of neural network, Artificial Neural Model: McCulloch – Pitts model, Perceptron, Adaline model, Learning process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive Learning, Supervised and Unsupervised Learning,, Topology of neural network architecture.

- UNIT-II Architectures of Neural Networks: (06 Hours)**
Architecture of Feedforward and Feedback network, Single layer ANN, Multilayer perceptron, Perceptron Learning Algorithm, Perceptron Coverage Theorem, Backpropagation Learning, input - hidden and output layer computation, Backpropagation algorithm, applications, Selection of tuning parameters in BPN, Limitation of Backpropagation Algorithm.
- UNIT-III Associative Memories, Activation & Synaptic Dynamics: (06 Hours)**
Basic Concepts, Linear Associator, Basic Concepts of Recurrent Autoassociative Memory: Retrieval Algorithm, Storage Algorithm, Performance Considerations, Performance Analysis of Recurrent Autoassociative Memory, Bidirectional Associative Memory: Memory Architecture, Association Encoding and Decoding, Stability Considerations, Memory Example and Performance Evaluation, Improved Coding of Memories, Multidirectional Associative Memory, Associative Memory of Spatio-temporal Patterns, Introduction To Activation, Activation Dynamics models, Basics of Synaptic Dynamics models, Stability and Convergence.
- UNIT-IV Basic functional units of ANN: (06 Hours)**
Basic feedforward, Basic feedback, and basic competitive learning neural network, Feedforward neural networks: Linear responsibility X-OR problem and solution, Analysis of pattern mapping networks summary of basic gradient search methods, Feedback neural networks Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.
- UNIT-V Competitive learning, Matching and Self-Organizing Networks: (06 Hours)**
Components of CL network pattern clustering and feature mapping network, Hamming Net and MAXNET, Unsupervised Learning of Clusters: Clustering and Similarity Measures, Winner-Take-All Learning, Recall Mode, Initialization of Weights, Separability Limitations, Counter propagation Network, Feature Mapping, Self-organizing Feature Maps, ART networks, Features of ART models, character recognition using ART network, Cluster Discovery Network (ART1).
- UNIT-VI Applications of ANN: (06 Hours)**
Linear Programming Modeling Network, Robot Control, Pattern association, Pattern classification and pattern mapping tasks, Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters, Recognition of handwritten characters,

Connectionist Expert Systems for Medical Diagnosis

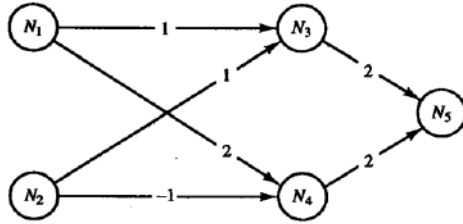
NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation

Assignment List:

- 1) Draw and Explain structure and working of Biological Neural Network
- 2) Write note on:
 - a) Mc Culloch – Pitts model
 - b) Adaline model
- 3) Explain when, where and why it is sensible to use the sigmoid (logistic) function as the activation function in a Back-Propagation network.
- 4) Describe how the basic Back-Propagation Learning Algorithm for Multi-Layer Perceptron (MLP) networks is related to gradient descent learning.
- 5) Explain the significance of each of the following theorems: (a) Cohen-Grossberg theorem (b) Cohen-Grossberg-Kosko theorem (c) Adaptive bidirectional associative memory theorem
- 6) Consider a stochastic unit with a bipolar I-1, 11 output function. The probability distribution for the unit is given by $P(s = 1 | x) = 1/(1 + \exp(-2 \lambda x))$ If the learning of the stochastic unit is based on gradient descent on the error between the desired and the average output, show that the resulting learning law is the same as the learning law obtained using delta learning for a deterministic unit with hyperbolic tangent as the output function.
- 7) How to perform the following tasks by a Boltzmann machine? (a) Pattern completion (b) Pattern association (c) Pattern recall from noisy input.
- 8) What is meant by full free energy and clamped free energy in a Boltzmann machine? How do you interpret the Boltzmann learning in terms of full free energy and clamped free energy?
- 9) Explain the Components of CL network pattern clustering and feature mapping network.
- 10) Explain the process of character recognition using ART network.
- 11) What is the significance of neural networks in the NETtalk application?
- 12) Explain how a constraint satisfaction model can be exploited for improving the recognition accuracy for. CV units.

Term Work Assignment List:

- 1) Consider the Neural Network of McCulloch-Pitts neurons shown in Figure. Each neuron (other than the input neuron N_1 and N_2) has a threshold of 2.
 - a) Define the purpose of neuron N_5 at time t in terms of the activations of the input neurons, N_1 and N_2 , at the appropriate time.
 - b) Show the activation of each neuron that results from the input signal of $N_1=1, N_2=0$ at $t=0$



- 2) What is Learning Process of Neural Network? Explain in Detail the types of Learning in NN.
- 3) Write and Explain Perceptron Learning algorithm and Perceptron Coverage Theorem.
- 4) Write a program implementing the error back-propagation training algorithm (EBPTA) for user-selectable I, J, and K values for a single hidden layer network. Learning constant η should be user-selectable; no momentum term is needed. The initial weights for the network should be selected at random. Provisions for specification of input pattern(s) and the desired response(s) should be made in order to initiate and carry out the training. Use bipolar continuous perceptrons
- 5) Assume that a linear associator has been designed using the crosscorrelation matrix for heteroassociative association of p orthonormal patterns. Subsequently, another orthonormal pattern $s^{(p+1)}$ associated with $f^{(p+1)}$ must be stored. An incremental change in the weight matrix needs to be performed using the cross-correlation concept. Prove that the association $s^{(p+1)} \rightarrow f^{(p+1)}$ results in no noise term present at the output
- 6) The weight matrix of the temporal associative memory is known as

$$W = \begin{bmatrix} -1 & 3 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & 3 \\ -1 & -1 & 3 & -1 & -1 \\ -1 & 3 & -1 & -1 & -1 \\ 3 & -1 & -1 & 3 & 1 \end{bmatrix}$$

Knowing that a vector $s^{(1)} = [-1 \ 1 \ -1 \ -1 \ 1]^t$ belongs to a sequence, find the remaining vectors of the sequence. Having found the full sequence, verify that encoding it actually yields the weight matrix W as specified in the problem. Calculate the noise term vectors generated at each recall step and determine that they are suppressed during the thresholding operation.

- 7) Explain the Concept of Feed Forward and Feed back NN with suitable Example.
- 8) Consider the ART1 neural net with four F1 units and three F2 units. After some training, the weights are as follows:

Bottom-up weights b_{ij}

$$\begin{bmatrix} 0.67 & 0.0 & 0.2 \\ 0.0 & 0.0 & 0.2 \\ 0.0 & 0.0 & 0.2 \\ 0.0 & 0.67 & 0.2 \end{bmatrix}$$

Top-down weights t_{ji}

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

Determine the new weight matrices after the vector $(0,0,1,1)$ is presented if

- a) the vigilance parameter is 0.3.
- b) the vigilance parameter is 0.7.
- 9) The MAXNET with four output nodes, $p = 4$, receives the input vector

$$y^0 = [0.5 \ 0.6 \ 0.7 \ 0.8]^t$$

- (a) Find the ϵ value that would be required to suppress the output of the weakest node exactly to the zero value after the first cycle.
- (b) Find subsequent responses of the network, y^1 and y^2 , for the computed value of ϵ .

- 10) Develop a multilayer feedforward character classifier for five printed digits shown as 5 X 5 black-white pixel maps on Figure. Devise a suitable network architecture for a local representation classifier. Prepare the set of five input/output binary training vector pairs. Train the network for zero decision errors. Perform the recall of nondistorted digits by reusing the training input data. Perform the evaluation of the classifier by recalling digits distorted by the center pixel (pixel 13) of the 5 X 5 field being white rather than black. Evaluate the classifier by recalling digits distorted by reversal of input pixels 12, 13, and 14.

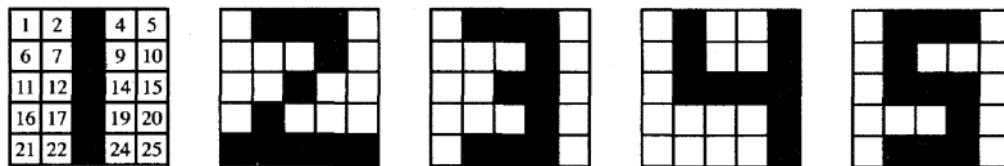


Figure. Pixel maps for digit recognition network in problem.

Text Books:

- 1) Stuart Russel, Peter Norvig, “Artificial Intelligence – A Modern Approach.
- 2) Patrick Henry Winston, “Artificial Intelligence”, Pearson Education.
- 3) L. Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms, and Applications”, Prentice-Hall.
- 4) Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishing.

Reference Books:

- 1) B. Yegnanarayana ,”Artificial neural Networks”, PHI Publication.
- 2) S. Raj sekaran , Vijayalakshmi Pari, “Neural networks, Fuzzy logic and Genetic Algorithms”, PHI Publication.
- 3) Laurene Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms, and Applications”, Prentice Hall International.
- 4) Satish Kumar, “Neural Networks”, McGraw Hill publication.
- 5) B. D. Ripley, “Pattern Recognition and Neural Networks”, Cambridge University Press
- 6) Simon Haykin, “Neural Networks: A Comprehensive Foundation”, pearson Education.

Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

Seminar I

Teaching Scheme
Practical: 02Hrs/Week

Examination Scheme
Oral and Term Work: 50 Marks

Credit Allotted
Term Work: 04

Course Objectives:

- 1) To improvise presentation, technical documentation and communication skills.
- 2) To learn recent technologies and understand its functioning.

Course Prerequisites:

Students should have knowledge of

- 1) Source of good research articles.
- 2) Basic knowledge of mathematical modeling.

Course Outcome:

Students will be able to:

- 1) Learn documentation of the seminar report.
- 2) Learn to communicate effectively.
- 3) Analyze the recent technologies.
- 4) Present their idea and convey the concepts.
- 5) Use the research material in the project.
- 6) Understand to draft research paper.

Guidelines for the project:

- 1) Refer quality research article from IEEE, Springer, Elsevier and ACM
- 2) Select a domain of interest and use of it in developing the project.
- 3) Check the demand and future scope of that topic to utilize it for research or startup.
- 4) Check the feasibility of research considering technology, timeline, available resources.
- 5) Propose novel approach to deal with the future scope mentioned in the paper.
- 6) Check plagiarism and quality of contents.
- 7) Prepare a presentation and documentation of your seminar.

Exam

Parameter	Marks
Novelty	10
Understanding of Mathematical Model	05
Presentation Skills	05
Publication or Demonstration	05

Project Stage - I

Teaching Scheme
Practical : 02 Hrs/Week

Examination Scheme
Oral and Term Work : 50 Marks

Credit Allotted
Term Work : 04

Course Objectives:

- 1) To apply concepts mathematics and basic science while doing literature survey.
- 2) To plan the project by assigning tasks per user.
- 3) To coordinate the project with project partners.

Course Prerequisites:

Students should have knowledge of

- 1) Logic used in programming language.
- 2) Basic concepts of database.

Course Outcome:

Students will be able to:

- 1) Identify the problem in the existing system.
- 2) Learn various approaches to deal with problem.
- 3) Decide best solution for optimization to solve the problem.
- 4) Learn management of project.
- 5) Propose novel approach to solve a problem.
- 6) Apply skills that they have acquired.

Guidelines for the project:

- 1) Prepare plan by following standards of project planning.
- 2) Select domain by using quality research papers like IEEE, Springer, Elsevier, ACM.
- 3) Analyze every approach by doing literature survey (preferably transaction journal of current year).
- 4) Identify the problem in the existing system.
- 5) Design solution by using mathematical model and prove it hypothetically.
- 6) Check the feasibility for implementation.
- 7) Select tools and technologies suitable for the implementation.
- 8) Prepare presentation, report and research paper on literature survey (To be submitted in IEEE transaction for critical analysis and uniqueness in contents and approaches).

Examination

Parameter	Marks
Selection of problem for betterment of a life	2.5
Analysis of Literature survey	05
Finalizing problem statement	2.5
Design of project plan	05
Mathematical Modeling	05
Review of paper by publishing agency – like IEEE, Springer, ACM, Elsevier, EOS, Scopus Indexed journals only	05

Industrial Training

Examination Scheme
Oral and Term Work: 50 Marks

Credit Allotted
Term Work: 03

Course Objectives:

- 1) To apply industry standards and technologies.
- 2) To learn to be good team player to coordinate tasks assigned at industry during the training.

Course Prerequisites:

Students should have knowledge of

Knowledge of Programming, Database Management, Software Engineering.

Course Outcome:

Students will be able to:

- 1) Learn to implement knowledge gained.
- 2) Learn to be a good team player.
- 3) Understand of work culture at industry.
- 4) Design efficient tools and techniques.
- 5) Apply the techniques and tools learnt.
- 6) Bridge the gap between industry and institute.

Guidelines for the Industrial Training:

- 1) Submit acceptance letter issued from organization before undergoing for the training.
- 2) Undergo for industrial training for 45 days in industries preferably government organization and NASSCOM listed organizations.
- 3) Apply the techniques and tools learnt during the curriculum.
- 4) Understand the new technologies for accomplishing the tasks.
- 5) Prepare Presentation and Reports based on the work completed at industry.
- 6) Maintain Log book and prepare day to day activity chart and get it authorized by concerned person from industry.
- 7) Work sincerely to grab opportunities for sponsored projects as well as job.

Exam

Parameter	Marks
Presentation	10
Log Book	10
Demonstration of skills acquired	05

Semester-VIII

Sr.no	Course Title	Teaching Scheme				Examination Scheme							Credits	
		L	T	P	Contact hrs/wk	Theory	Unit Test	Attendance	TA & Assignments	Practical& TW	Oral& TW	Total Marks	Theory	TW
1	Web Engineering	2	1	2	5	60	20	10	10	50	--	150	3	1
2	Component Engineering	2	1	2	5	60	20	10	10	--	50	150	3	1
3	Mobile Computing	2	1	-	3	60	20	10	10	--	--	100	3	-
4	Distributed Computing	2	1	-	3	60	20	10	10	--	--	100	3	-
5	Elective-IV	2	--	--	2	60	20	10	10	--	--	100	2	-
6	IT Lab-V	-	--	2	2	--	--	--	--	50	--	50	-	1
7	Project stage - II	-	-	4	4	--	--	--	--	50	50	100	-	8
	TOTAL	10	04	10	24	300	100	50	50	150	100	750	14	11
	Environmental Studies	4	-	-	4	100	-	-	-	-	-	100	-	-

Elective-IV :

- 1)Advanced TCP/IP
- 2)Genetic Algorithm
- 3) Network Security and Cryptography
- 4)Semantic Web Mining

Teaching Scheme			Examination Scheme							Credits	
Lecture	Practical	Tutorial	Theory	Unit Test	Attendance	Assignments	PR+TW	OR+TW	Total	Theory	TW
10	10	04	300	100	50	50	150	100	750	14	11

Web Engineering

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 2Hrs/Week	End Semester Examination : 60 Marks	Theory: 03
Tutorial : 1Hr/Week	Internal Assessment : 40 Marks	Term Work: 01
Practical : 2Hrs/Week	Practical and Term Work : 50 Marks	

Course Objectives:

- 1) Learn web application architectures.
- 2) Learn to model web applications.
- 3) Understand testing techniques for web applications.

Course Prerequisites:

Students should have knowledge of

- 1) Basic concepts of Software engineering.
- 2) Basic concepts of HTML, XML, CSS.

Course Outcome:

Students will be able to:

- 1) Understand categories and characteristics of web applications.
- 2) Understand client and server side technologies.
- 3) Understand Web Application Architectures.
- 4) Design model for Web Applications.
- 5) Design various Web Applications.
- 6) Test various Web Applications.

UNIT-I Introduction to web engineering: (06 Hours)

Motivation, Evolution and need for web engineering, Categories of web applications, Characteristics of web applications: Product related, Usage related, Development related.

Requirements Engineering

Introduction, Fundamentals, Requirements engineering activities, Requirements engineering specifics in web engineering, Adapting requirements engineering methods to web application development, Principles for requirements engineering of web applications, Requirement types, Tools.

UNIT-II Technologies for Web Applications: (06 Hours)

Client Side Technologies:HTML, HTML basic concepts, Static and Dynamic HTML, DHTML, XML, XSL,JavaScript.Server Side Technologies:Servlet, URI handlers, Middlewares, Web services.

UNIT-III Web Application Architectures: (06 Hours)

Introduction, Specifics of web application architecture, Layered

architectures(2-layer,N-layer),Database centric architectures, Data aspect architectures, Architectures for web document management, Components of generic web application architecture.

UNIT-IV Modeling Web Applications: (06 Hours)

Introduction, Modeling specifics in web applications, Modeling requirements, Hypertext modeling, Content modeling, Access modeling concepts, Customization modeling, Presentation modeling

UNIT-V Web Application Design: (06 Hours)

Web design from an evolutionary perspective, Software design, Information design, Problems in integrated web design, Presentation design, Device independent development, Interaction design, Navigation design, Designing link internals, Functional design.

UNIT-VI Testing Web Applications: (06 Hours)

Objectives of testing, Levels of testing, Test approaches, Test schemes, Test methods and techniques, Test automation, Test driven development, Test tools, Advantages and Disadvantages of automated test.

Web Project Management:

Understanding scope, defining framework activities, Web team building, Risk management, Schedule development, Quality management, Change management, Project tracking

Assignment List:

- 1) Explain evolution and need of web engineering
- 2) Describe requirement engineering methods for web application development
- 3) Explain in detail client side technologies for web applications
- 4) Explain in detail server side technologies for web applications
- 5) Describe various web application architectures
- 6) Explain in detail components of generic web application architecture
- 7) Explain various modeling techniques of web applications.
- 8) Describe various designing methods of web applications
- 9) Study of latest testing techniques of web applications
- 10) A case study on designing and testing websites

Term Work Assignment List:

- 1) A case study on any static websites like wikipedia, college websites, etc
- 2) A case study on any dynamic websites like E-commerce, social networking sites,etc
- 3) Design a client-side form validation webpage using javascript
- 4) Create a web application for student database

- 5) Design and develop IT department website
- 6) Design and develop E-commerce website
- 7) A case study on methodology, techniques and tools used in designing websites
- 8) A case study on latest testing techniques of web applications
- 9) Create a mini project using html, css and javascript
- 10) Test mini project using any testing methodology

Text Books:

- 1) Roger S.Pressman,DavidLowe,“Web Engineering”,TataMcGraw Hill Publication,2007
- 2) GertiKappel, Birgit Proll, “Web Engineering”, John Wiley and Sons Ltd, 2006
- 3) GertiKappel, Birgit Proll, Siegried Reich, Werner Retschitzegger,“Web Engineering: The Discipline of Systematic Development of Web Applications”,Wiley,2006

Reference Books:

- 1) *“Web Engineering: A Practitioner's Approach”Roger Pressman and David Lowe, McGraw-Hill, 2009.*
- 2) *Moller, “An Introduction to XML and Web Technologies” , Pearson Education New Delhi, 2009*
- 3) *“Web Engineering: Principles and Techniques”,Woojong Suh,Idea Group Inc.,2005*
- 4) *“Web Engineering:Managing Diversity and complexity of web application development”,Springer,2001*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Component Engineering

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 02 Hrs/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 02 Hrs/Week	Internal Assessment : 40 Marks	Term Work : 01
Tutorial : 01 Hr/Week	Oral and Term Work : 50 Marks	

Course Objectives:

- 1) To learn evolution of distributed computing.
- 2) To provide students with fundamental knowledge needed to design and implement object-oriented client-server applications.
- 3) To understand the object models
- 4) To design a framework to bridge the gap. In this framework, inter-component communication is separated from the components and handled by ports and links which deal with infrastructure level middleware and protocols, including CORBA

Course Prerequisites:

Students should have knowledge of

- 1) Object Oriented Programming.
- 2) Distributed System.
- 3) Java Programming and Applications.

Course Outcome:

Students will be able to:

- 1) Learn objectifying enterprise system.
- 2) Understand the component architecture.
- 3) Use CORBA Technology and the Java™ Platform Standard Edition.
- 4) Learn the issues regarding the designing of distributed objects.
- 5) Understand Object Reuse.
- 6) Analyze Java component technologies.

UNIT-I Object Technology: (06 Hours)

A typical OO system, Object Oriented concepts, Advantages of the client model, integrating object technology with Enterprise systems: Objectifying individual Modules, Objectifying Conventional Architecture model, Using OO language in an OO architecture Model, Objectifying enterprise system.

UNIT-II Component Technology: (06 Hours)

Component concepts, characteristics Of components, component and Objects, Modules, callbacks, fundamental properties of Component technology ,component Architecture, Interfaces – specification, Component Models objects, components and middleware ,Components and Object-Oriented Implementations, Bridging the Gap: Framework and Composition

- UNIT-III CORBA Component Technologies:** (06 Hours)
Introduction to Java and CORBA, Object Request Broker, System object model, CORBA's Objective and design criteria CORBA services-overview, information management services Model driven architecture
- UNIT-IV Distributed Object Technology:** (06 Hours)
Evolution Of Distributed Systems, Characteristics of Distributed Systems, Study of Distributed Objects, Characteristics of distributed Objects, Methods in distribution, Issues in designing of distributed objects, Need of multitier architecture, Evolution of multitier Architecture
- UNIT-V Interfaces in COM and DCOM:** (06 Hours)
Introduction to COM, OLE/ActiveX, DCOM and .NET, Introduction to interfaces, Interface definition Language, (IDL), COM – interface and versioning and object reuse
COM services: Dispatch interface, connectable objects
- UNIT-VI Java Based Component Models:** (06 Hours)
Introduction to Java Component Technologies EJB and Java Bean, Threads Introduction, Threads-state transition diagram, example
Enterprise Java Beans: EJB architecture, Enterprise JavaBeans and JavaBeans.
Types of Beans : Session beans- Stateful and stateless session beans, Entity beans and Message driven beans
Distributed Object Model : Introduction RMI, RMI Architecture ,RMI Service.

Assignments List:

- 1) Implement polynomial as an object in C++.
- 2) Create an RMI Application.
- 3) Explain CORBA component model.
- 4) Explain information management services.
- 5) Sketch simple components and define their interface.
- 6) Explain of evolution of multitier Architecture.
- 7) Discuss interfaces in COM and DCOM.
- 8) Write simple banking application program using CORBA IDL.
- 9) Write java component technologies EJB and Java Bean.
- 10) Create a Java Bean connecting to Google API.

Term Work Assignments List:

- 1) Describe Integrating object technology with Enterprise systems.
- 2) Explain the software architecture in object oriented programming.
- 3) Enlist and describe characteristics of components.

- 4) Explain object request broker.
- 5) Elaborate Evolution of Distributed Systems.
- 6) What is the Need of multitier architecture? Elaborate evolution of multitier Architecture.
- 7) Describe Interfaces in COM and DCOM.
- 8) Describe Component Technologies EJB and Java Bean.
- 9) Describe Enterprise Java Beans.
- 10) Describe RMI Architecture and RMI Service.

Text Books:

- 1) G. Sudha Sadasivam, "Component Based Technology", Wiley India Edition
- 2) Paul Allen, Stuart Frost, "Component-Based Development for Enterprise Systems: Applying the SELECT Enterprise", Cambridge University Press
- 3) Clemens Szyperski, "Component Software: Beyond Object-Oriented Programming", Pearson Education publishers, 2003

Reference Books:

- 1) Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999.
- 2) Mowbray, "Inside CORBA", Pearson Education, 2003.
- 3) Freeze, "Visual Basic Development Guide for COM & COM+", BPB Publication, 2001.
- 4) Hortsamann, Cornell, "CORE JAVA Vol-II" Sun Press, 2002.

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Mobile Computing

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 02 Hrs/Week	End Semester Examination : 60 Marks	Theory : 03
Tutorial : 01 Hr/Week	Internal Assessment : 40 Marks	

Course Objectives:

- 1) To study wireless network for clear understanding of Mobile Network.
- 2) To understand important terms of data communication required for mobile computing.
- 3) To apply knowledge of mobile computing for understanding of applications on operating systems used for mobile.

Course Prerequisites:

Students should have knowledge of

- 1) Operating system.
- 2) Network communication.

Course Outcome:

Students will be able to:

- 1) Understand mobile network.
- 2) Learn mobile communication technologies.
- 3) Understand GSM.
- 4) Analyze OS used in Mobile.
- 5) Design application on Android platform.
- 6) Design application on ios platform.

UNIT-I Introduction to Mobile Computing: (06 Hours)

Introduction to wireless Network, Concept of Mobile Computing, principles of Mobile Computing, usage of MAC in Mobile computing, types of Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer, issues in wireless communication.

UNIT-II Mobile Network: (06 Hours)

Introduction to IP, static and dynamic IP, usage of TCP/IP for communication, IPV6, acknowledgment, wireless network: allocation of channel, interferences, concept of handoffs and management of location, LAN, PAN, Bluetooth, ZigBee

UNIT-III Architecture of GSM: (06 Hours)

GSM Architectures, Radio Interfaces, PLMN Interface, Protocols Localization, Calling, SMS service, Modulation, Multiplexing, controlling the medium access, spread spectrum, methods of coding, CDMA, IMT 2000, WCDMA and CDMA 2000, 4G Networks, introduction to 5G, concept of GPRS.

UNIT-IV Mobile Data communication: (06 Hours)

Communication Asymmetry, classification of data delivery mechanism, data dissemination Broadcast models, selective tuning and indexing techniques, synchronization, synchronization software for mobile devices, synchronization protocols.

UNIT-V Mobile Operating System: (06 Hours)

Functions of operating system in mobile, Concept of kernel, interfacing between O.S. used in mobile and hardware, Mobile Computing Environment, protocols used, security in mobile operating system.

UNIT-VI Mobile Application Development: (06 Hours)

Android App development, Android SDK, publishing play store, ios app development, Windows phone app development, publicizing and monetization of App.

Assignment List:

- 1) Draw and explain wireless architecture.
- 2) Explain mobile communication in detail.
- 3) Explain different layers in mobile network.
- 4) Explain synchronization protocol.
- 5) Explain MANET in detail.
- 6) Explain characteristics of mobile OS.
- 7) Write a complete process of GSM tracking of a mobile.
- 8) Case study on mobile agents.
- 9) Implement login system using android sdk.
- 10) Implement login system using ios.

Text Books:

- 1) Jochen Schiller, "Mobile communications", Addison wisely, Pearson Education
- 2) Dr. Sunil kumar S. Manavi, Mahabaleshwar S. Kakkasageri, Wireless and Mobile Networks, concepts and protocols, Wiley, India.

Reference Books:

- 1) *T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.*
- 2) *Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press.*
- 3) *Andrew Tanenbaum, Modern Operating System, 3rd/e, Pearson Education International, ISBN 0-13-1BMST-L.*
- 4) *Digital Content: iOS Technology Overview: IOSTechOverview.pdf, Apple Inc. Copyright 2014.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Distributed Computing

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 2 Hrs/Week	End Semester Examination : 60 Marks	Theory :03
Tutorial : 1 Hr/Week	Internal Assessment : 40 Marks	

Course Objectives:

The course is aimed to provide an understanding of key concepts underlying the function of distributed computing systems along with issues in its design and implementation.

Course Prerequisites:

Students should have knowledge of

1) Fundamentals of Data Structures, Operating Systems, Networking concepts.

Course Outcome:

Students will be able to:

- 1) Understand the fundamentals of distributed computing environment.
- 2) Implement inter process communication.
- 3) Learn of process and threads and implement threads.
- 4) Understand the concepts of clock synchronization and distributed transaction.
- 5) Learn distributed file system and distributed shared memory.
- 6) Understand the concepts of distributed system security.

UNIT-I Fundamentals: (06 Hours)

Definition and evolution of Distributed Computing System, Models and Types of Distributed Computing Systems, Issues and Goals in designing Distributed System, Distributed Computing Environment, Peer to peer systems and its middleware, Routing overlays, Mobile and Ubiquitous computing.

UNIT-II Communication: (06 Hours)

Inter process communication (IPC): Introduction and need
Message Passing system: Desirable features of good message passing system, Issues in IPC, Group and multicast communication,
Remote Procedure Calls (RPC): The RPC Model, Implementation of RPC mechanisms (Stubs and marshalling)
Java RMI: Architecture, Implementation (Stubs and Skeletons)
Web services and SOAP.

UNIT-III Processes and Threads: (06 Hours)

Process Migration: Introduction, Features, Mechanisms, Advantages, use in heterogeneous systems.
Threads: Concept, Motivation, Models, Issues, Synchronization, Scheduling, Implementing.

UNIT-IV Synchronization and Distributed Transactions: (06 Hours)

Clock synchronization: Drifting, Issues, Algorithms, Event Ordering
Deadlock: Conditions, Modeling, Handling, Avoidance, Prevention, Detection, Election Algorithms
Distributed Transaction: Introduction, Locks, Optimistic Concurrency Control, Timestamp Ordering

UNIT-V Distributed File system and Distributed Shared memory: (06 Hours)

Distributed Files Systems: Advantages, Features, Models, Caching, Replication, Fault Tolerance
Distributed Shared Memory: Architecture, Design and Implementation Issues, Advantages, Granularity, Structure of Shared Space, Consistency Models, Replacement Strategy, Thrashing

UNIT-VI Distributed System Security: (06 Hours)

Distributed System Security: Goals, Design Principles, Attacks, Confinement Problem, Cryptography, Authentication, Access control, Digital Signatures.

Assignment List:

- 1) Study the details of IPC mechanism used by Sun RPC for DCE
- 2) Implement Java RMI client and server programs using stub and skeleton.
- 3) Elaborate the life cycle of process and threads.
- 4) Implement Threads in java and explain each step of its life cycle.
- 5) Compare the various algorithms available for clock synchronization.
- 6) Study any one journal paper which has proposed/ implemented any new mechanism for concurrency control.
- 7) Case study of Open Software Foundation's distributed file service.
- 8) Study of any one journal paper which has implemented/ proposed any one mechanism related to any issue of distributed shared memory.
- 9) Consider any one security mechanism you know and discuss how it achieves the goals and design principles of distributed system security.
- 10) Study any real-time security attack and propose alternate strategies that could have been used to counteract those.

Text Books:

- 1) Pradeep K. Sinha, "Distributed Operating Systems: Concepts and Design", Wiley-IEEE Press.
- 2) Andrew S. Tanenbaum, Maarten van Steen, "Distributed Systems: Principles and Paradigms", Prentice Hall India Learning Private Limited, Second edition
- 3) George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, "Distributed Systems: Concepts and Design", Pearson Education India; 5th edition

Reference Books:

- 1) *Ajay D. Kshemkalyani, Mukesh Singhal, “Distributed Computing: Principles, Algorithms, and Systems”, Cambridge University Press- South Asian edition*
- 2) *Abraham Silberschatz, Peter B. Galvin, Greg Gagne , “Operating System Concepts”, Wiley, 8th Edition*
- 3) *Andrew S. Tanenbaum, “Distributed Operating Systems”, Pearson, 2nd edition*
- 4) *Cay Horstmann and Gary Cornell, Core Java, Volume II - Advanced Features, Prentice Hall, 7 edition.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III
Unit Test -2 Unit IV, V and VI

Elective-IV : 1) Advance TCP/IP

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 2 Hrs/ Week	End Semester Examination : 60 Marks	Theory : 02
	Internal Assessment : 40 Marks	

Course Objectives:

The course is headed for afford theoretical and practical understanding regarding the TCP/IP networking. Concepts similar to multiplexing, switching, addressing, naming, quality of service, routing, flow and congestion control are explored all the way through their implementation in TCP/IP protocol suite.

Course Prerequisites:

Students should have knowledge of

- 1) A preliminary TCP/IP course or else has equivalent knowledge.
- 2) TCP/IP and it's configuration in addition to a operational knowledge of LAN plus WAN networking.
- 3) An admiration of the TCP/IP suit of protocols in addition to protocol stacks.

Course Outcome:

Students will be able to:

- 1) Enumerate layers of the OSI model as well as TCP/IP.
- 2) Describe the functioning of Internet Protocol.
- 3) Demonstration IP Address of allocation methods.
- 4) Understand and building the skills of routing mechanisms and sub netting.
- 5) Explain the Transmission Control Protocol concepts.
- 6) Understand the basic structure of IP Version 6.

UNIT-I Introduction: (06 Hours)
History of TCP/IP :The Internet, TCP/IP Architecture, The TCP/IP Suite. Standards Bodies – ISO, Open System Interconnection. ISO- OSI 7 - layer model, Layered Protocols Model, TCP/IPwithProtocol Encapsulation.

UNIT-II Internet Protocol (IP): (06 Hours)
What is Internet Protocol, IPv4 Address Classes, Classful IPv4 Address Ranges, Internet Protocol Addressing, Multicast Addresses, IPv4 Reserved Addresses.IPv4 Address Assignment, IPv4 Private Network Addressing, Internet Protocol Routing, The IPv4 Header, Protocol Numbers, IP Fragmentation.
IP Precedence (Type Of Service), Differentiated Services – DiffServ, Per Hop Behavior (PHB), Commonly Used DSCP's.

UNIT-III Address Resolution and Address Allocation (06 Hours)
Address Allocation :
Dynamic IP Address Allocation – RARP, BOOTP, BOOTP Message

format, Operations. Dynamic IP Address Allocation – DHCP, The DHCP Server, DHCP Address Acquisition States, DHCP Operations, DHCP Relay, Windows DHCP Commands.

Address Resolution:

Address Resolution Protocol (ARP), Default Gateway, Connecting Hosts – Similar Network, Connecting Hosts – Dissimilar Network, ARP Message Format, Network Protocol Analyzers.

UNIT-IV Internet Protocol Routing: (06 Hours)

Introduction to Routers and Routing, Structure of a Basic Router, Types of Routing -Static Routing, Dynamic Routing, Distance-Vector, Link State, Hop Count, Metrics and Costs. Routing Protocols, Protocols of Dynamic Routing, Protocol Comparison. The Default Route.

UNIT-V Host to Host Communication and IP Address Translation: (06 Hours)

Transmission Control Protocol (TCP) Concepts, Simple Reliability, TCP Segment, Port Numbers (TCP), Connection Set-up (TCP), Connection Closure (TCP), Protocol of Sliding Windows, User Datagram Protocol (UDP), UDP Segment, UDP vs. TCP.

IP Address Translation :

Network Address Translation, Configuring NAT, Port Address Translation with NAT, Dynamic NAT with Port Address Translation.

UNIT-VI IP Version 6: (06 Hours)

Introduction: What is IPv6? , Comparison of IPv4 VS IPv6, IPv6 Header. Address Representation, Address Types of IPv6, Unicast IPv6, Anycast IPv6, IPv6 extension headers. DNS enhancements for IPv6.

Assignment List:

- 1) Define following 1) Talk 2) Echo 3) Ping Network Commands.
- 2) Describe (RCE) Remote Command Execution.
- 3) Discuss simulating of ARP /RARP.
- 4) Relate how HTTP used for web page upload as well as Download.
- 5) Define TCP module Implementation. (TCP services).
- 6) Define how File Transfer within client-server architecture by subsequent methods.
(a) TCP/IP (b) USING RS232C.
- 7) Illustrate Remote Method Invocation (RMI).
- 8) Explain IPv6 with header format.
- 9) Outline Case study regarding the different routing algorithms to choose the network path by its best possible and economical during data transfer. • Shortest path routing • Flooding • Distance vector.
- 10) Write Case study of building a firewall for BVDUCOEP campus network.

Text Books:

- 1) Douglas E.Comer, “Internetworking with TCP/IP–Principles, Protocols & Architecture”, Pearson education, 4th Edition, 2000.
- 2) Behrouz A. Forouzan, TCP/IP Protocol Suite, Tata McGraw Hill, 4th Edition 2010.

Reference Books:

- 1) *Douglas E.Comer, Internetworking with TCP/IP, 5th Edition Pearson Education Asia 2005.*
- 2) *Behrouz Forouzan, “TCP/IP protocol suite”,Tata Mc Grawhill, Fourth Edition,2012.*
- 3) *Richard Stevens, — TCP/IP Illustrated, Vol 1,2,3 Pearson education India, 1st edition,2001.*
- 4) *Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, 2004.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective IV: 2) Genetic Algorithm

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 2 Hrs/Week	End Semester Examination : 60 Marks	Theory : 02
	Internal Assessment : 40 Marks	

Course Objectives:

- 1) Learn basics of Evolutionary Computation and Genetic Algorithm.
- 2) Understand terminologies and operators of GA.
- 3) Understand Advanced operators and techniques in Genetic Algorithm.
- 4) classify of GA Algorithms.
- 5) Implement Genetic Programming.
- 6) Understand practical approach of Genetic Algorithm Optimization Problems.

Course Prerequisites:

Students should have knowledge of

- 1) A programming language.
- 2) Linear algebra, probability and calculus.

Course Outcome:

Students will be able to:

- 1) Analyze the concept of evolutionary computation.
- 2) Understand the basic concepts of genetic algorithms.
- 3) Understand the result of applying various genetic operators.
- 4) Develop GA problem using different GA operators.
- 5) Understand about the way GA is used and the domain of application.
- 6) Develop a different application using GA Optimization problem.

UNIT-I Evolutionary Computation and Introduction to Genetic Algorithms: (06 Hours)

Introduction to Evolutionary Computation, Historical Development of EC, Features of Evolutionary Computation, Applications of Evolutionary Computation, Introduction to Genetic Algorithm: Biological Background, What is Genetic Algorithm? Conventional Optimization and Search, A Simple Genetic Algorithm, Comparison of Genetic Algorithm with Other Optimization Techniques, Advantages and Limitations of Genetic Algorithm, Applications of Genetic Algorithm. Theoretical Analysis of Evolutionary Algorithms: Schema theorems, convergence of the algorithms, computational time complexity of the algorithms, no free lunch theorem, Evolutionary applications to medicine and public health, Applications of evolutionary biology for veterinarians.

UNIT-II Terminologies and Operators of GA: (06 Hours)

Introduction, Key Elements, Genes, Populations, Data, Search Strategies, Encoding, Breeding, Search Termination (Convergence Criteria), Why do Genetic Algorithms Work?, Solution Evaluation, Search Refinement, Constraints, Fitness Scaling, Example Problems: Maximizing a function, Travelling Salesman Problem.

UNIT-III Advanced Operators and Techniques in Genetic Algorithm: (06 Hours)

Introduction, Diploidy, Dominance and Abeyance, Multiploid, Inversion and Reordering, Niche and Speciation, Few Micro-operator, Non-binary Representation, Multi-Objective Optimization, Combinatorial Optimizations, Knowledge Based Techniques.

UNIT-IV Classification of Genetic Algorithm: (06 Hours)

Introduction, Simple Genetic Algorithm (SGA), Parallel and Distributed Genetic Algorithm (PGA and DGA), Hybrid Genetic Algorithm (HGA), Adaptive Genetic Algorithm (AGA), Fast Messy Genetic Algorithm (Fm GA), Independent Sampling Genetic Algorithm (ISGA).

UNIT-V Genetic Programming: (06 Hours)

Introduction, Comparison of GP with Other Approaches, Primitives of Genetic Programming, Attributes in Genetic Programming, Steps of Genetic Programming, Characteristics of Genetic Programming, Application of Genetic Programming, Haploid Genetic Programming with Dominance.

UNIT-VI Genetic Algorithm Optimization Problems: (06 Hours)

Introduction, Fuzzy Optimization Problems: Fuzzy Multi objective Optimization, Interactive Fuzzy Optimization Method, Genetic Fuzzy Systems. Multi objective Reliability Design: Network Reliability Design, Bicriteria Reliability Design. Combinational Optimization problem: Linear Integral Model, Applications of Combinatorial Optimization Methods. Scheduling Problems: Genetic Algorithm for Job Shop Scheduling Problems (JSSP). Transportation Problems: Genetic Algorithm in Solving Transportation, Location-Allocation Problems with Euclidean Distances. Network Design and Routing Problems: Planning of Passive Optical Networks, Planning of Packet Switched Networks, Optimal Topological Design of All Terminal Networks, Learning with Genetic Fuzzy Systems: An Application, Pittsburgh Approach

Assignment List:

- 1) Define Evolutionary computation? State three fundamental features of biological evolutionary computation.
- 2) Explain difference between Genetic algorithm and Genetic Programming. Describe how evolutionary computation is applied to engineering applications.
- 3) Give a suitable example for the Genetic Algorithm principle “Survival of the fittest”.
- 4) What is Search space? Describe various conventional optimization and search techniques.
- 5) How genetic algorithms work? Explain the building block hypothesis and schema theorem.
- 6) Find the safe light combinations for 8 traffic lights, four of which are vehicle lights having four possible colors (red, yellow/red, yellow and green) and the other four pedestrian lights having only two colors (red and green).
- 7) Describe the various knowledge-based techniques that improve the efficiency of simple genetic algorithm.
- 8) Implement Travelling Salesman Problem using advanced operators and techniques.
- 9) Discuss the operations involved in the Fast messy Genetic Algorithm.
- 10) Build a C program to implement simple genetic algorithm for a multi objective optimization problem.
- 11) Discuss the crossover and mutation operation of GP. Explain with suitable examples, the characteristics of GP.
- 12) Write a computer program to implement GP for a function optimization problem.

Text Books:

- 1) Mitchell Melanie, “An Introduction to Genetic Algorithms”, MIT publications.
- 2) S.Rajasekaran, G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI.

Reference Books:

- 1) *S.N.Sivanandam, S.N.Deepa, “Introduction to Genetic Algorithms”, Springer Publications.*
- 2) *David A, “An Introduction to Genetic Algorithms for Scientists and Engineers”, World Scientific Publishing.*
- 3) *David E. Gold Berg, “Genetic Algorithms in Search, Optimization & Machine Learning”, Pearson Education.*
- 4) *L. D. Davis, Evolutionary algorithms, Springer-Verlag, 1999.*
- 5) *K. Deb, Multi-Objective Optimization Using Evolutionary Algorithms, Wiley and Sons, 2009.*

Syllabus for Unit Test:**Unit Test -1 Unit I, II and III****Unit Test -2 Unit IV, V and VI**

Elective-IV :3) Network Security and Cryptography

Teaching Scheme	Examination Scheme	Credit Allotted
Theory: 02 Hrs/Week	End Semester Examination : 60 Marks	Theory: 02
	Internal Assessment : 40 Marks	

Course Objectives:

- 1) To know the main beliefs of encryption algorithms, public key cryptography.
- 2) To Depth knowledge regarding authentication.
- 3) To understand the application level security mechanisms.
- 4) To be familiar with the network security tools in addition to applications.

Course Prerequisites:

Students should have knowledge of

- 1) Computer Networks & Security associated issues.
- 2) Some understanding of linear algebra as well as statistics.

Course Outcome:

Students will be able to:

- 1) Recognize the methods of conventional encryption.
- 2) Understand the concepts of number theory and public key encryption.
- 3) Learn Hash functions and authentication.
- 4) Understand stream cipher models and various block cipher.
- 5) Learn the system level security used.
- 6) Distinguish the network security tools along with applications.

UNIT-I Introduction to Mathematical Foundation: (06 Hours)

Introduction to Security trends, Attacks along with services, Classical Crypto systems, Types of ciphers – LFSR sequences. Overview on Modern Cryptography. Finite Fields and Number Theory: Groups, Rings, Fields-Modular arithmetic-Euclids algorithm-Finite fields- Polynomial Arithmetic – Prime numbers-Fermats and Eulers theorem-Testing for primality. The Chinese remainder theorem- Discrete logarithms.

UNIT-II Network Security Model: (06 Hours)

The OSI security architecture, Network security Model, Model for CNSS Security, Access and Information Security, Approaches toward Information Security Implementation, The Security Systems Development Life Cycle. Model for Symmetric cipher, techniques of Substitution, Techniques of Transposition, Rotor machines, Steganography, Simplified DES, Principles of Block cipher.

UNIT-III Public Key Cryptography&Block Ciphers: (06 Hours)

Data Encryption Standard (DES) – Principals of Block cipher, Modes of operation for Block cipher. Advanced Encryption Standard (AES), Triple DES, Algorithm for Blowfish-RC5.
Public key cryptography: Public key cryptosystems Principle's, The RSA algorithm, Key management, Diffie Hellman Key exchange, Elliptic curve cryptography, Elliptic curve arithmetic,
Other attacks on RSA and Semantic Security of RSA. Primarily test, Cayley Purser algorithm, Factoring Technique, Probabilistic public key encryption.

UNIT-IV Hash Functions and Authentication: (06 Hours)

Requirements of Authentication, Functions of Authentication. Message Authentication Codes (MAC) - Hash Functions, Security of hash function and MAC, MD5, SHA, HMAC, CMAC, RIPEMD.
Digital signature: Protocols for Authentication, Digital Signature Standard (DSA), Digital signatures -RSA, SecureID, ElGamal, DSA
Quantum Cryptography-Okamoto to Uchiyama cryptosystem.

UNIT-V System Security and Security Practice: (06 Hours)

Introduction to Applications for Authentication, Kerberos – X.509 Authentication services, Internet Firewalls for Trusted System: Roles of Firewalls, Terminology related to Firewall. Types of Firewalls, Secure Electronic Transaction (SET) for E-Commerce Transactions.
Intruder: Intrusion detection system, Virus furthermore related threats, Countermeasures, Principle's of Firewalls design. Trusted systems – Realistic implementation of cryptography along with security.

UNIT-VI Network Security: (06 Hours)

Introduction to Security Services intended for E-mail-attacks possible through E-mail, Establishing privacy of keys, source authentication, Integrity of Message -Non-Repudiation-Pretty Good Privacy (PGP), S/MIME.
Internet Protocol (IP) Security: Abstract of IPSec, IPv4 and IPv6, Authentication Header, Encapsulation Security Payload (ESP), Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding).
Web Security: SSL/TLS Essential Protocol-computing the keys, authentication of client, PKI as deployed by SSL Attacks fixed in v3.

Assignment List:

- 1) Explain Port Scanning via virtual network environment accessible through a VPN connection.
- 2) Extend Network Intrusion Detection via virtual network environment accessible throughout a VPN connection.

- 4) Describe Public Key Security Experimenting with RSA, Encryption as well as Decryption.
- 5) Explain Host - Based Intrusion Detection with virtual network environment accessible through a VPN connection.
- 6) Summarize Man-in-the-Middle Attacks with example.
- 7) Define Remote buffer overflow attack.
- 8) Explain Logic-based Authentication and Authorization.
- 9) State Android security auditing with Genymotion virtual machine and Burp Suite proxy.
- 10) Illustrate Capturing and monitoring android network traffic.

Text Books:

- 1) Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.
- 2) William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
- 3) Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", 2nd ed, Pearson, 2007.

Reference Books:

- 1) *Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.*
- 2) *Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.*
- 3) *Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI 2002.*
- 4) *Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.*
- 5) *Man, Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

Elective: 4) Semantic Web Mining

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 02 Hrs/Week	End Semester Examination : 60 Marks	Theory: 02
	Internal Assessment : 40 Marks	

Course Objectives:

- 1) Understand a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining.
- 2) Understand the basics of Information retrieval and Web search with special emphasis on web crawling.
- 3) Apply the use of machine learning approaches for Web Content Mining.
- 4) Understand the role of hyper links in web structure mining.
- 5) Learn the various aspects of web usage mining.

Course Prerequisites:

Students should have knowledge of

- 1) Concepts of data mining.
- 2) Concepts of Web Technology/Web Engineering.

Course Outcome:

Students will be able to:

- 1) Build a sample search engine using available open source tools.
- 2) Identify the different components of a web page that can be used for mining.
- 3) Apply machine learning concepts to web content mining.
- 4) Implement Page Ranking algorithm and modify the algorithm for mining information.
- 5) Design a system to harvest information available on the web to build recommender systems.
- 6) Analyze social media data using appropriate data/web mining techniques and modify an existing search engine to make it personalized.

UNIT-I Introduction: (06 Hours)

Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rule mining – Sequential Pattern Mining -Information retrieval and Web search – Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing – Inverted Index – Latent Semantic Indexing – Web Search – Meta-Search – Web Spamming. The Syntactic and the Semantic Web, Logics of the Semantic Web. The world of the semantic web-WWW-Meta data-Search engine-Search engine for traditional web-Semantic web-Search engine for semantic web-Traditional web to semantic web.

UNIT-II Semantic Web Technology : (06 Hours)

RDF,- Elements of RDF, Basic Syntax and Fundamental rules of RDF-Aggregation-Distributed information-RDFS-core elements of

RDFS-Ontology-Taxonomy-Inferencing based on RDF schema.
OWL: OWL syntax, OWL and RDF semantics, OWL document, Using OWL to define classes-Set operators-Enumerations-Define propertiesontologymatching-Three faces of OWL-Validate OWL.
Swoogle : FOAF-Semantic markup-Issues-prototype system-Design of Semanticweb search engine-Discovery and indexation-prototype system-case study.

UNIT-III Web Content Mining & Semantic Web Services; (06 Hours)

Web Content Mining – Supervised Learning – Decision tree - Naïve Bayesian Text Classification -Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering - Hierarchical Clustering –Partially Supervised Learning – Markov Models - Probability-BasedClustering - Evaluating Classification and Clustering – Vector Space Model – Latent semanticIndexing – Automatic Topic Extraction - Opinion Mining and Sentiment Analysis – Document Sentiment Classification. Introduction to web services- SOA, Limitations of web services. Semantic web services- OWL-S-Upper ontology-WSDL-S,OWL-S to UDDImapping ,Design of the search engine,implementations.

UNIT-IV Web Link Mining : (06 Hours)

Link mining, common link mining tasks, link-based object ranking
Web Link Mining – Hyperlink based Ranking – Introduction -Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search - Enhanced Techniques for Page Ranking - Community Discovery – Web Crawling -A Basic Crawler Algorithm- Implementation Issues- Universal Crawlers- Focused Crawlers- Topical Crawlers- Evaluation - Crawler Ethics and Conflicts - New Developments

UNIT-V Structured Data Extraction: (06 Hours)

Structured Data Extraction: Wrapper Generation – Preliminaries- Wrapper Induction- Instance-Based Wrapper Learning - Automatic Wrapper Generation: Problems - String Matching and Tree Matching - Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiple pages- Introduction to Schema Matching - Schema-Level Match -Domain and Instance-Level Matching – Extracting and Analyzing Web Social Networks.

UNIT-VI Web Usage Mining & Semantic Web Applications: (06 Hours)

Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and Pre-Processing - Cleaning and Filtering- Data Modeling for Web Usage Mining - The BIRCH Clustering Algorithm -Affinity Analysis and the A Priori Algorithm – Binning. Discovery and Analysis of Web Usage Patterns – Modeling user interests –

Probabilistic Latent Semantic Analysis – Latent Dirichlet Allocation Model– Applications- Collaborative Filtering- Recommender Systems – Web Recommender systems based on User and Item – PLSA and LDA Models . Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

Assignment List:

- 1) Discuss the Meta-Search and Web Spamming concepts in detail.
- 2) Determine the location of a resource with the help of ontologies and reasoning using router.
- 3) What are various steps in designing a search engine? Take a case study of designing your own search engine.
- 4) Design a crawler program to list out the URL's on the page, modify the program for again crawl those founded URL's to find more URL's using High speed computer (Hint : call the **crawl_site** function to **crawl** a **URL**.).
- 5) Write a Script/ program to perform Analysis of User's Browsing Behavior and Their Categorization Using Markov Chain Model.
- 6) What are various applications of semantic web? What are web search agents? Explain in detail.

Text Books:

- 1) Bing Liu, “ Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)”, Springer; 2nd Edition 2009.
- 2) Guandong Xu ,Yanchun Zhang, Lin Li, “Web Mining and Social Networking: Techniques and Applications”, Springer; 1st Edition.2010.
- 3) “Thinking on the Web” - Berners Lee, Godel and Turing, Wiley inter science, 2008.
- 4) “Social Networks and the Semantic Web”, Peter Mika, Springer, 2007.

Reference Books:

- 1) *Zdravko Markov, Daniel T. Larose, “Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage”, John Wiley & Sons, Inc., 2007.*
- 2) *Soumen Chakrabarti, “Mining the Web: Discovering Knowledge from Hypertext Data”, Morgan Kaufmann; edition 2002.*
- 3) *Adam Schenker, “Graph-Theoretic Techniques for Web Content Mining”, World Scientific Pub Co Inc , 2005.*
- 4) *Min Song, Yi Fang and Brook Wu, “Handbook of research on Text and Web mining technologies”, IGI global, information Science Reference – imprint of :IGI publishing, 2008.*

Syllabus for Unit Test:

Unit Test -1 Unit I, II and III

Unit Test -2 Unit IV, V and VI

ITL-V

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 02 Hrs/Week	Practical and Term Work: 50 Marks	Term Work: 01

Course Objectives:

- 1) Understand emerging Web technologies concepts and tools.
- 2) Understand client side and server side scripting languages and validation techniques.
- 3) Learn database access technologies and state management techniques.
- 4) Develop real life Web applications using ASP.NET and PHP.

Course Prerequisites:

Students should have knowledge of

- 1) Knowledge of programming language C, C++.
- 2) Knowledge of application development tool.

Course Outcome:

Students will be able to:

- 1) Design web applications using ASP.NET.
- 2) Use ASP.NET controls in web applications.
- 3) Implement ASP.NET web applications.
- 4) Design database driven ASP.NET web applications and web services.
- 5) Implement Object handling using Collections and Generics.
- 6) Implement Database Connectivity using LINQ and ADO.NET.

UNIT-I	Introduction of .NET: Evolution of .NET, Benefits of .NET framework, Introduction to Visual Studio, Introducing C#, Namespaces, Classes, Objects and Struts, Object-Oriented Programming, Pointers, Delegates and Events	(06 Hours)
UNIT-II	Data Access with ADO.NET and Working with LINQ: Understanding Databases, Understanding SQL, Understanding ADO.NET, Data Reader, Creating Command Object, Working with DataAdapter, Defining LINQ Queries, Exploring standard Query Operators, Introducing LINQ to Objects, Introducing LINQ to ADO.NET	(06 Hours)
UNIT-III	Collections and Generics: System.Collections.Concurrent namespace, SortedSet<T> class, Understanding Collections, Collection classes in .NET, Understanding Generics, Generic Collection Classes in .NET, Creating your own Generic Classes	(06 Hours)

UNIT-IV Threading: (06 Hours)
The Thread Class, Difference between Processes and Threads, Working with Thread, Multithreading, Thread Priorities, Thread States, Thread Synchronization, Joining Threads

UNIT-V Web Applications: (06 Hours)
Developing a Web Application, Application Structure and State, Web Forms: Standard Controls, Navigation Controls: Tree View, Menu and Site Map Path, Validation Controls, Introducing Web Parts Controls, Working with Database Controls.

UNIT-VI Managing Web Applications: (06 Hours)
Managing Web Applications: The ASP.NET Configuration File, The process model Configuration, Configuring ASP.NET Applications in IIS
Working with Login Controls: The Login Control, The LoginView Control, The Login Status Control, The LoginName Control,
Working with User Profiles: Understanding ProfileProvider Class, Creating Authenticated Profiles, Creating Custom Profile Provider

Assignment List:

- 1) Accepting and validating user entered data using ASP.NET.
- 2) Accepting and validating book catalog information using validating controls.
- 3) Write a program to demonstrate session management in ASP.Net.
- 4) Display database contents from SQL server or Oracle database using SQL Command class from ASP.NET.
- 5) Display parameterized data using SqlDataReader and GridView in ASP.NET.
- 6) Database access using DataSet in ASP.NET.
- 7) Displaying data using DataView in ASP.NET.
- 8) Write a program to read, add, update and delete record from database using ADO.Net control SqlDataSource.
- 9) Create a login page in your web application. Login page must have user name and password fields. If user enters correct ID, Password, he must be redirected to the homepage of your website.
- 10) Create a webpage, that allows user to add a new username if user doesn't exist in the database. Also, create a forgot password link, to redirect user to set up his new password on authentication.

Text Books:

- 1) .NET 4.5 Programming 6-in-1, Black Book, *Kogent Learning Solutions Inc.*

Reference Books:

- 1) *ASP.NET 4.5, Covers C# and VB Codes, Black Book; Kogent Learning Solutions Inc.*
- 2) *C# 2012 Programming Black Book Covers .NET 4.5; Kogent Learning Solutions Inc.*
- 3) *Professional ASP.NET 4.5 in C# and VB; Jason N. Gaylord, Christian Wenz, Pranav Rastogi, Todd Miranda, Scott Hanselman, Scott Hunter; Web Platform Team, Microsoft*
- 4) *Beginning ASP.NET for Visual Studio 2015 Paperback – 18 Apr 2016 by William Penberthy*

Project Stage - II

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 04 Hrs/Week	Oral and Term Work : 50 Marks	Term Work : 08
	Practical and Term Work : 50 Marks	

Course Objectives:

- 1) To choose the hardware, software needed according to the proposed in the design.
- 2) To check the quality of work and adherence to the requirements by rigorous testing.
- 3) To implement requirements mentioned in the design.

Course Prerequisites:

Students should have knowledge of

- 1) Platform, programming languages.
- 2) Hardware, drivers and tools required at various phases of SDLC.

Course Outcome:

Students will be able to:

- 1) Implement solution for the given problem.
- 2) Learn various ways to tackle the new problem faced during the development of project.
- 3) Implement the code to minimize time and space required by setting new benchmarks.
- 4) Coordinate with project mates to solve the problem.
- 5) Apply integration of software and/or hardware components, APIs, modules.
- 6) Apply concepts learn in Seminar, In-plant training, Project Stage –I to effectively implement the project.

Guidelines for the project

- 1) Divide the work according to the plan.
- 2) Focus on the solution to excel the research or startup in respective domain.
- 3) Apply deadline, quality checks for every phase of project development.
- 4) Identify novel component to draft patent and copyright accordingly.
- 5) Present the implementation work in research journals and conferences.
- 6) Target to prepare a research proposal to acquire a grant for the institute.

Exam

Parameter	Marks
Implementation of project according to the work and quality.	10
Validation of Results	10
Contribution in terms of novelty	10
Comments received from journals like IEEE, Springer, Elsevier, ACM, WOS and Scopus indexed journals.	10
Patent, copyright, Application for grant.	10

Bharati Vidyapeeth Deemed University
College of Engineering, Pune- 411043
The Structure of the Curriculum: 2014 Course
Choice Based Credit System (CBCS)

B. TECH. MECHANICAL: SEMESTER- I & II



Bharati Vidyapeeth University
College of Engineering, Pune
Department of Mechanical Engineering



Vision: To provide mechanical engineers capable of dealing with global challenges

Mission: Social transformation through dynamic education

Programme Educational Objectives (PEOs):

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

Programme Outcomes (POs):

- a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems
- b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes
- c. To design and develop mechanical systems considering social and environmental constraints.
- d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques
- e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance
- f. To know social responsibilities while doing professional engineering practice.
- g. To become familiar with eco-friendly, sustainable and safe work environment.
- h. To take into account professional ethics while designing engineering systems.
- i. Able to work efficiently as a group leader as well as an individual.
- j. To communicate in written and verbal form with subordinates and supervisors
- k. To apply project and finance management techniques in multidisciplinary environments.
- l. To create interest for higher education and updating the knowledge.

B. TECH. MECHANICAL: SEMESTER- I (2014 Course)

S.N.	Course	Teaching Scheme (Contact Hrs./ week)			Examination Scheme (Marks)						Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment				Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW				
1.	Engineering Mathematics – I	3	-	1	60	20	10	10	-	100	3	1	4
2.	Fundamentals of Civil Engineering	3	2	-	60	20	10	10	25	125	3	1	4
3.	Engineering Graphics *	4	2	-	60	20	10	10	25	125	4	1	5
4.	Engineering Physics	4	2	-	60	20	10	10	25	125	4	1	5
5.	Fundamentals of Electrical Engineering	3	2	-	60	20	10	10	25	125	3	1	4
6.	Professional skill Development – I	2	-	-	50	-	-	-	-	50	2	-	2
7.	Workshop Technology	-	2	-	-	-	-	-	50	50	-	1	1
	Total	19	10	1	350	100	50	50	150	700	19	6	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

* End Semester examination of duration 4 Hours.

B. TECH. (MECHANICAL) SEM.-II (2014 COURSE)

S. N	Course	Teaching Scheme (Contact Hrs./week)			Examination Scheme (Marks)						Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment				Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW				
1.	Engineering Mathematics – II	3	-	1	60	20	10	10	-	100	3	1	4
2.	Fundamentals of Mechanical Engineering	3	2	-	60	20	10	10	25	125	3	1	4
3.	Engineering Mechanics	4	2	-	60	20	10	10	25	125	4	1	5
4.	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1	5
5.	Mechanical Engineering Drawing*	2	4	-	60	20	10	10	25	125	2	2	4
6.	Professional skill Development-II	2	-	-	50	-	-	-	-	50	2	-	2
7.	Production Practice- I	-	2	-	-	-	-	-	50	50	-	1	1
	Total	18	12	1	350	100	50	50	150	700	18	7	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

* End Semester examination of duration 4 Hours.

Total Credits Sem. I - 25

Total Credits Sem. II -25

Grand Total -50

Rules for Conducting Tests

Mode of the test

- In each semester for each subject two tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.
- To calculate these marks following procedure is followed:
 - i) Average marks obtained in two tests shall be considered as provisional marks obtained by the student in the tests.
 - ii) If the candidate appears only for one test during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other test.
 - iii) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; these marks will be final marks obtained by the student. No scaling up is permitted.
 - iv) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.
- Paper pattern for tests
 - i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks
 - ii) There will not be any sub-questions.
- For granting the term it is mandatory to appear for both tests conducted in each semester.
- Roll nos. allotted to students shall be the examination nos. for the tests.

Department of Mechanical Engineering

Syllabus: Semester I

ENGINEERING MATHEMATICS-I

Designation of Course	Engineering Mathematics-I		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 3 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Tutorial: 01
Tutorial : 01 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	4

Course Prerequisites:-	Student should have Basic Knowledge of Algebra
Course Outcomes:-	<ol style="list-style-type: none"> 1. Solve the consistency of any type of systems. 2. Find the roots of equations using DeMoivre's theorem and to locate imaginary points using argand diagram. 3. Apply Leibnitz's rule to find n^{th} derivative. 4. Test convergence and divergence of infinite series. 5. Compute total derivative. 6. Compute maxima and minima of any function of two variables.

Course Contents

Unit 1	Matrices	(8 Hrs.)
Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley - Hamilton Theorem. Application to problems in Engineering.		
Unit 2	Complex Numbers And Applications	(8 Hrs.)
Definition, Cartesian, Polar and Exponential Forms, Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.		
Unit 3	Differential Calculus and Expansion Of Functions	(8 Hrs.)
Successive Differentiation, n^{th} Derivatives of Standard Functions, Leibnitz's Theorem. Taylor's Series and Maclaurin's Series.		
Unit 4	Differential Calculus and Infinite Series	(8 Hrs.)
Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits. Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.		
Unit 5	Partial Differentiation And Applications	(8 Hrs.)

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.		
Unit 6	Jacobian and Maxima And Minima	(8 Hrs.)
Jacobians and their applications, Chain Rule, Functional Dependence. Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.		

Text Books/ Reference Books

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008).
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

FUNDAMENTALS OF CIVIL ENGINEERING

Designation of Course	Fundamentals of Civil Engineering		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Practical: 01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	4

Course Prerequisites:-	Basics of Science, measurements and Mathematics
Course Outcomes:-	<ol style="list-style-type: none"> 1. Different building components and material 2. Classification of surveying 3. Leveling of the ground 4. Planning of building 5. Methods of irrigation and water supply 6. Different methods of transportation

Course Contents

Unit 1	Civil Engineering Scope And Applications.	(6 Hrs.)
Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.		
Unit 2	Surveying	(6 Hrs.)
Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.		
Unit 3	Building Planning And Bye Laws	(6 Hrs.)
Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.		
Unit 4	Foundations and Earthquakes	(6 Hrs.)
Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.		
Unit 5	Irrigation And Water Supply	(6 Hrs.)
Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.		
Unit 6	Infrastructure	(6 Hrs.)
Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of		

railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.

Term Work

Experiments

Any ten experiments from the following:

1. Study and use of prismatic compass and measurement of bearings.
2. Study and use of Dumpy level and reduction of levels by collimation plane method.
3. Area measurement by Digital Planimeter.
4. Drawing plan and elevation of a residential bungalow.
5. Study of features of topographical maps.
6. Assignment on collection of information on Civil Engineering materials.
7. Assignment on types of foundations.
8. Assignment problem on irrigation and hydropower structures.
9. Assignment on study of flow chart of water and sewage treatment.
- 10 Assignments on types of transportation systems.

Text Books/ Reference Books

1. "Surveying- Vol I" - S.K. Duggal, Tata McGraw Hill Publication.
2. "Built Environment" – Shah, Kale, Patki, , Tata McGraw Hill Publication
3. "Building Construction" – Dr. B.C. Punmia , Laxmi Publication
4. "Irrigation and water Power Engineering" - Dr. P.N. Modi, Standard Publishers, New Delhi
5. "Text book of Transportation Engineering "- Arora, Charotar Publishers.
6. Water supply and sanitary engineering-Rangawala, Charotar Publishers.
7. Basic Civil engineering"- M.S. Palanichamy- Tata McGraw Hill Publication

Unit Tests-

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

ENGINEERING GRAPHICS

Designation of Course	Engineering Graphics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	50 Marks	
	Total	150 Marks	05

Course Prerequisites:-	Basic fundamentals of Mathematics
Course Outcomes:-	Different engineering curves and dimensioning. Differentiate I st angle and III rd angle projection Method in orthographic. To interpret views of the object and to draw by using Isometric projection method. Projection of Lines and its traces. Projection of different planes. Projection of solids and its sections.

Course Contents

Unit 1	Lines and Dimensioning in Engineering Drawing and Engineering Curves	(08 Hrs.)
Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.		
Unit 2	Orthographic Projection	(08 Hrs.)
Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.		
Unit 3	Isometric Projections	(08 Hrs.)
Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.		
Unit 4	Projections of Points and Lines	(08 Hrs.)
Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines,		
Unit 5	Projections of planes	(08 Hrs.)
Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP		
Unit 6	Projection of Solids and Section of Solids	(08 Hrs.)
Projection of prism, pyramid, cone and cylinder by rotation method. Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.		

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

Sheets

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points.
3. Projections of Points and Lines and planes.
4. Orthographic Projections.
5. Isometric views.
6. Projection of Solids.

Text Books/ Reference Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India.
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
4. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005.
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005.
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

ENGINEERING PHYSICS

Designation of Course	Engineering Physics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	25 Marks	
	Total	125 Marks	5

Course Prerequisites:-	Basics knowledge of Science and fundamentals Laws
Course Outcomes:-	<ol style="list-style-type: none"> 1. Interpret the properties of charged particles to develop modern instruments and express the mechanism of fusion and fission. 2. Interpret the basics of semiconductors and its uses to develop devices such as diode. 3. Express knowledge of nanoscience to develop new electronic devices. 4. Express the concept of transverse waves. Associate the wave nature of light and apply it to measure stress, pressure and dimension etc. 5. Analyze the problems associated with architectural acoustics and give their remedies and use ultrasonic as a tool in industry for Non Destructive Testing. 6. Define behavior of quantum particles in different types of potentials.

Course Contents

Unit 1	Modern Physics and Nuclear Physics	(08 Hrs.)
Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph. Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron.		
Unit 2	Solid State Physics and Superconductivity	(08 Hrs.)
Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics. Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.		
Unit 3	Thermodynamics And Nanoscience	(08 Hrs.)
Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics. Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles(Physical and chemical), synthesis of		

colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.		
Unit 4	Optics – I, Interference, Diffraction	(08 Hrs.)
Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC. Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.		
Unit 5	Optics – II, Polarization, Lasers	(08 Hrs.)
Introduction, Double refraction and Huygens's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD. Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.		
Unit 6	Architectural Acoustics, Quantum Mechanics	(08 Hrs.)
Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies. Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non-rigid box.		

Term Work

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajous figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Planck's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Text Books/ Reference Books

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

FUNDAMENTALS OF ELECTRICAL ENGINEERING

Designation of Course	Fundamentals of Electrical Engineering		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Practical: 01
Practical:- 02 Hours/Week Tutorials: -- Hours/ Week	Unit Test Assignments Internal Evaluation	20 Marks 10 Marks 10 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	04

Course Prerequisites:-	Students should have knowledge of Physics and Mathematics.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Understand and apply knowledge of basic concepts of work, power, and energy for electrical, mechanical and thermal systems. 2. Understand and apply knowledge of Kirchhoff's laws and network theorems to solve electrical networks. 3. Describe construction, principle of operation, specifications and 4. Applications of capacitors and batteries. 5. Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer. 6. Define basic terms of single phase and three phase ac circuits and supply systems. 7. Know and use electrical safety rules.

Course Contents

Unit 1	Basic concepts	(06 Hrs.)
Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems.		
Unit 2	Network Theorems:	(06 Hrs.)
Voltage source and current sources, ideal and practical, Kirchhoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.		
Unit 3	Electrostatics	(06 Hrs.)
Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.		
	Magnetic Circuit & Transformer	(06 Hrs.)
Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Faraday's law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.		
Unit 5	AC Fundamentals & AC Circuits	(06 Hrs.)

AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.

Unit 6	Electrical Wiring and Illumination system	(06 Hrs.)
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Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.

Term Work:

The term work shall consist of record of minimum eight exercises / experiments

1. Determination of resistance temperature coefficient.
2. Verification of Superposition Theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Kirchhoff's Laws.
5. Verification of Maximum power transfer Theorem.
6. Time response of RC circuit.
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$.
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer.
10. a) Voltage and current ratios
11. b) Efficiency and regulations
12. Study of a Residential (L.T.) Bill.

Text Books/ Reference Books

1. B. L. Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd., New Delhi.
2. V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi.
3. I.J. Nagrath and Kothari - "Theory and problems of Basic Electrical Engineering", Prentice Hall.
4. Edward Hughes - "Electrical Technology"- Seventh Edition, Pearson Education Publication.
5. H. Cotton - "Elements of Electrical Technology", C.B.S. Publications.
6. John Omalley Shawn - "Basic circuits analysis" Mc Graw Hill Publications.
7. Vincent Del Toro - "Principles of Electrical Engineering", PHI Publications.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

WORKSHOP TECHNOLOGY

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- -- Hours/ Week	End Semester Examination	-- Marks	Theory: 00 Practical: 01
Practical:- 2 Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	50 Marks	
	Total	50 Marks	01

Course Prerequisites:-	Basic knowledge of hand tools used in day to day life.
Course Outcomes:-	Students should be able to understand 1. Basic Manufacturing Processes used in the industry. 2. Importance of safety.

Course Contents

<p>Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances</p> <p>Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.</p> <p>Sheet Metal Practice -Introduction to primary technology processes involving bending punching and drawing various sheet metal joints, development of joints.</p> <p>Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.</p> <p>Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.</p> <p>Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.</p> <p>Plumbing- (Demonstration Common for Electrical & Non electrical Group) Types of pipe joints, threading dies, Pipe fittings.</p>
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Term Work

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the above topics.

PROFESSIONAL SKILLS DEVELOPMENT-I

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 2 Hours/ Week	End Semester Examination	50 Marks	Theory: 02 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	50 Marks	02

Course Pre-requisites	
The Students should have knowledge of	
1.	Basic communication in tenses (past, present, future).
2.	Awareness of common words (adjectives used in daily verbal communication).
3.	Basic idea of sentence formation and thereby paragraph building and writing.
4.	Communication according to daily and varied contextual scenarios.
5.	Basic communication model/channel (sender, receiver and feedback), Active and passive listening skills.
6.	Basic social etiquettes and knowledge of group work and communication that will enhance their professional growth.
Course Objectives	
	The Professional Skills Development course aims to augment students overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The English language topics for this semester focus on the development of basic fluency in English, usage of words and also introduce them to the concept and importance of interpersonal skills so as to effectively present their personalities.
Course Outcomes	
The student should be able to	
1.	Speak fluently in English without errors in tenses and hence present themselves as effective English communicators. They will be able to learn the 12 tenses and use them appropriately.
2.	Differentiate between active and passive vocabulary and be able to use the 60 words discussed in class for their daily conversation and 40 words also given as assignments.
3.	The ability to process their ideas and thoughts(verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 100-150 words for paragraph writing.
4.	Present them in a certain manner by using the 50-55 phrases discussed in class appropriately for group discussions, personal interviews during the campus recruitment process/competitive exams.
5.	Enhance their communication skills by acquainting with the 2 important aspects of communication and helping them to overcome the 10 most common barriers of communication. Learn the 7 different types of listening skills; differentiate effective listening skills and understand the importance of it through 5 activities held in class and implement them in professional life.
6.	Understand the importance of team work, team motivation and effective team communication for further implementation in the corporate life. They should also be able to identify concretely between team and group dynamics.

Course Contents		
Unit I	Essential Grammar – I	(4 Hrs.)
	<ul style="list-style-type: none"> • Application of Tenses: Usage of past, present and future according to context. • Activities/games for tenses 	
Unit II	Vocabulary – I	(4 Hrs.)
	<ul style="list-style-type: none"> • Vocabulary building <ul style="list-style-type: none"> ▪ Adjectives- physical attributes, Intellectual qualities, ▪ Words describing vacations. • Application of the vocabularies. • Activities: Story telling/ Poem building (Using those words) 	
Unit III	Written Communication - I	(4 Hrs.)
	<ul style="list-style-type: none"> • Paragraph writing: <ul style="list-style-type: none"> ▪ Structure of paragraphs, ▪ Mnemonics to build Paragraph, ▪ Coherence and Unity of paragraphs. 	
Unit IV	Situational Conversation – I	(4 Hrs.)
	<ul style="list-style-type: none"> • Application of grammar according to context. • Situation based conversation • Activities: Conversation based on context(personal and professional) 	
Unit V	Fundamental Communication Skills - I	(4 Hrs.)
	<ul style="list-style-type: none"> • Importance of effective communication. • Types of communication. • Verbal, Non-verbal communication. • Barriers of communication. • Activities: Extempore • Listening Skills • Importance of listening skills. • Types of listening skills. • Difference between hearing and listening. • Activities: Word ball Game. Chinese Whisper 	
Unit VI	Interpersonal Skills – I	(4 Hrs.)
	<ul style="list-style-type: none"> • Introduction to Interpersonal skills. • Group Dynamics. • Introduction to Team work. • Difference between a group and a team. • Importance of group/team in an organization. • Activities on team and group dynamics. 	
Text Books		
1.APAART: Speak Well 1 (English language and communication)		
2.APAART: Speak Well 2 (Soft Skills)		
Reference Books		
1.English vocabulary in use – Alan Mc’Carthy and O’dell		
2.Business Communication – Dr. Saroj Hiremath		

Department of Mechanical Engineering

Syllabus: Semester II

ENGINEERING MATHEMATICS-II

Designation of Course	Engineering Mathematics-II		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Tutorial: 01
Tutorials: 01Hour/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	04

Course Prerequisites:-	Student must have basic knowledge of calculus.
Course Outcomes:-	<ol style="list-style-type: none"> 1. To develop an ability to solve differential equations of first order and first degree. 2. To develop an ability to form mathematical model of rectilinear motion, electric circuit, Fourier heat conduction, Newton's law of cooling. 3. To develop an ability to transform the Cartesian co-ordinates into spherical polar and cylindrical coordinate systems. 4. To develop an ability to represent periodic function as Fourier Series. 5. To develop an ability to evaluate definite integral by DUIS rules and to trace Cartesian and polar curves. 6. To develop an ability to apply methods to find area and volume by double and triple integration.

Course Contents

Unit 1	Differential Equations (DE)	(08 Hrs.)
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.		
Unit 2	Applications Of Differential Equations	(08 Hrs.)
Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.		
Unit 3	Fourier Series And Integral Calculus	(08 Hrs.)
Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis. Reduction formulae, Beta and Gamma functions.		
Unit 4	Integral Calculus And Curve Tracing	(08 Hrs.)
Differentiation Under the Integral Sign, Error functions. Tracing of Curves, Cartesian, Pola and Parametric Curves. Rectification of Curves.		

Unit 5	Solid Geometry	(08 Hrs.)
Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.		
Unit 6	Multiple Integrals And Their Applications	(08 Hrs.)
Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.		

Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier's Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

Text Books/ Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

FUNDAMENTALS OF MECHANICAL ENGINEERING

Designation of Course	Fundamentals of Mechanical Engineering		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Practical: 01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	4

Course Prerequisites:-	Students should have the basic knowledge of thermodynamics.
Course Outcomes:-	<p>Able to understand-</p> <ol style="list-style-type: none"> 1. The fundamentals of thermal engineering. 2. Working of power producing and absorbing devices. 3. Different energy sources and fundamental laws of heat transfer. 4. The basic properties of fluid and materials. 5. The different mechanical devices and mechanisms. 6. Machine tools and manufacturing processes.

Course Contents

Unit 1	Thermodynamics:	(06 Hrs.)
Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)		
Unit 2	Introduction to I.C. Engines, turbines, refrigeration, compressors & pumps:	(06 Hrs.)
Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, Steam turbines, gas turbines. (Theoretical study using schematic diagrams) Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump.(Theoretical study using schematic diagrams)		
Unit 3	Energy Sources & Heat transfer:	(06 Hrs.)
Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power. (Theoretical study using schematic diagrams) Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.		
Unit 4	Properties of fluids & Properties of Materials and their Applications:	(06 Hrs.)
Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, Regimes in fluid mechanics. Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.		
Unit 5	Mechanical devices & Mechanisms:	(06 Hrs.)
Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, types of friction clutch,		

Power transmission shafts, axles, keys, bush and ball bearings. Slider crank mechanism, Four bar chain mechanism, inversions of single slider crank chain mechanism, Geneva mechanism, Ratchet and Paul mechanism.		
Unit 6	Machine Tools, Introduction to manufacturing processes and Their Applications:	(06 Hrs.)
Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine. Casting, Sheet metal forming, Sheet metal cutting, Forging, Metal joining processes.		

Text Books/ Reference Books

1. Thermodynamics an Engineering Approach, Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6th edition.
2. Applied Thermodynamics for Engineering Technologists, T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. I.C. Engines Fundamentals, J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian.
4. Internal Combustion Engine, V. Ganeshan, Tata McGraw-Hill, 3rd edition.
5. Strength of Materials, H. Ryder, Macmillians, London, 1969, 3rd edition.
6. Mechanics of Materials, Johston and Beer TMH, 5th edition.
7. Mechanisms and Machine Theory, Ambekar A.G., Prentice-Hall of India, 2007.
8. Theory of Machines, S.S. Rattan, Tata McGraw- Hill, 2nd edition.
9. A Textbook of production engineering. P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
10. Fluid Mechanics & Fluid Power. D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit- IV, V, VI

ENGINEERING MECHANICS

Designation of Course	Engineering Mechanics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical: 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	05

Course Prerequisites:-	<p>The Students should have knowledge of</p> <ol style="list-style-type: none"> 1. Scalar and Vector 2. Newton's law of motion 3. Law of friction 4. Concept of physical quantities, their units and conversion of units 5. Concept of differentiation and integration
Course Outcomes:-	<ol style="list-style-type: none"> 1. Calculate resultant and apply conditions of equilibrium. 2. Analyze the truss and calculate friction force. 3. Calculate centroid and moment of inertia. 4. Solve problem on rectilinear motion. 5. Solve problems on curvilinear motion. 6. Use D'alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

Course Contents

Unit 1	Resultant and Equilibrium	(06 Hrs.)
Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.		
Unit 2	Truss and Friction	(06 Hrs.)
Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.		
Unit 3	Centroid and Moment of Inertia	(06 Hrs.)
Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.		
Unit 4	Kinematics of Rectilinear motion of a Particle	(06 Hrs.)
Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.		
Unit 5	Kinematics of Curvilinear motion of a Particle	(06 Hrs.)
Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.		
Unit 6	Kinetics of a Particle	(06 Hrs.)
D'alembert's Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.		

Term Work:

A) The term-work shall consist of minimum five experiments from list below.

1. Determination of reactions of Simple and Compound beam.
2. Study of equilibrium of concurrent force system in a plane.
3. Determination of coefficient of friction for Flat Belt.
4. Determination of coefficient of friction for Rope.
5. Study of Curvilinear motion.
6. Determination of Coefficient of Restitution.

B) The term-work shall also consist of minimum five graphical solutions of the problems on topics.

Text Books/ Reference Books

- 1) “Engineering Mechanics (Statics and Dynamics)”, Hibbeler R. C., McMillan Publication.
- 2) “Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)”, Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.
- 3) “Engineering Mechanics”, Bhavikatti S.S. and Rajashekarappa K. G., New Age International (P) Ltd.
- 4). “Engineering Mechanics (Statics and Dynamics)”, Shames I.H., Prentice Hall of India (P) Ltd.
- 5) “Engineering Mechanics (Statics and Dynamics)”, Singer F.L., Harper and Row Publication.
- 6) “Engineering Mechanics (Statics and Dynamics)”, Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.
- 7) “Engineering Mechanics (Statics and Dynamics)”, Timoshenko S.P. and Young D.H., McGraw Hill Publication.
- 8) “Engineering Mechanics (Statics and Dynamics)”, Tayal A.K., Umesh Publication.
- 9) “Engineering Mechanics-I and II (Statics and Dynamics)”, Mokashi V.S., Tata McGraw Hill Publication.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

ENGINEERING CHEMISTRY

Designation of Course	Engineering Chemistry		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical - 2 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	25 Marks	
	Total	125 Marks	05

Course Prerequisites:-	The Students should have Basics knowledge of Science and fundamentals Laws.
Course Outcomes:-	<p>At the end of the course, a student will be able to,</p> <ol style="list-style-type: none"> Analyze the methods involved in improving quality of water for domestic and industrial purposes. Express the crystal structure through X-ray diffraction technique to examine the internal structure of crystal. Demonstrate the properties and applications of fossil fuels and derived fuels. Define the fundamental principles of corrosion and methods used for minimizing corrosion. Interpret the basic concepts of electrochemical techniques and its applications in society. Develop the skills for correct stereo chemical assignment and interpretation in complex organic molecules.

Course Content

Unit 1	Water	(06 Hrs.)
Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process		
Unit 2	Material Chemistry	(06 Hrs.)
Crystallography: Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical. Cement: Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.		
Unit 3	Fuels	(06 Hrs.)
Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter. Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.		
Unit 4	Corrosion And Its Prevention	(06 Hrs.)
Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment. Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.		

Unit 5	Electrochemistry	(06 Hrs.)
Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions. Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.		
Unit 6	Stereochemistry	(06 Hrs.)
Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules, Conformations :- conformations of ethane, conformations of n-butane		

Term Work

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism:- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books:

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications

13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

MECHANICAL ENGINEERING DRAWING

Designation of Course	Mechanical Engineering Drawing		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 02 Hours/ Week	End Semester Examination	60 Marks	Theory: 02 Practical: 02
Practical - 04 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	40 Marks	
	Term Work/ Oral	25 Marks	
	Total	125Marks	4

Course Prerequisites:-	Students should have the basic knowledge of engineering graphics.
Course Outcomes:-	<ol style="list-style-type: none"> 1. To draw different free hand sketches in machine parts. 2. Representation of dimensions of machine components. 3. Different Auto CAD commands. 4. Orthographic projection using Auto CAD. 5. Isometric projection using Auto CAD. 6. Development of different solids using AutoCAD.

Course Contents

Unit 1	Freehand Sketching	(06 Hrs.)
Free hand sketching -- FV and TV of standard machine parts – Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, screw thread forms, welded joints, riveted joints.		
Unit 2	Dimensioning Practice	(06 Hrs.)
Terms and Notations, Leader, Extension Lines, Terminations and Origin indication, Functional dimension, Non-functional dimension, Datum dimension, Redundant and auxiliary dimension, Chain dimensioning, Running dimensioning, Co-ordinate dimensioning, Symmetrical or equidistant dimensioning, Methods of dimensioning Common features: Diameters, Radii, Hole sizes, chamfers, Screw threads, Chords, Arcs, Angles, Spheres, Cylinders, Squares. Conventional Representation of Machine Components As per SP-46 (1988)		
Unit 3	Introduction to Computer Aided Drafting	(06 Hrs.)
Working Interface of AutoCAD, Drawing Limits, Creating 2-D Drawing in AutoCAD, AutoCAD commands, Editing commands in AutoCAD, Dimensioning in AutoCAD, Creating text in Auto CAD, Changing object properties Scale, Object Snap Mode, Display control in AutoCAD, Layer		
Unit 4	Orthographic Projections [By Using AutoCAD]	(06 Hrs.)
Reference planes, types of orthographic projections – First angle projections, Third angle projections, methods of obtaining orthographic views by First angle method, Sectional orthographic projections – full section, half section, offset section.		
Unit 5	Isometric Projections [By Using AutoCAD]	(06 Hrs.)
Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.		
Unit 6	Development of Lateral Surfaces (DLS) of Solids. [By Using AutoCAD]	(06 Hrs.)
Applications of DLS, method of development, development of lateral surface of above solids, development of lateral surface of cut solids.		

Term Work

1. Sheet (Half Imperial 4sheets)
2. Dimensioning Practices no. of sheets -2
3. Free Hand sketch no. of sheets-2
4. Four AutoCAD Printout
5. Introduction to AutoCAD commands
6. Orthographic by using AutoCAD
7. Isometric Projections by using AutoCAD
8. Development of Lateral surface by using AutoCAD

Text Books/ Reference Books

1. N.D. Bhatt, Elementary Engineering Drawing, Chartor Publishing house, Anand, India.
2. D. N. Johle, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd.
3. P.S. Gill, Engineering drawing S.K.Kataria and sons. Delhi-110006.
4. N.D. Bhatt, Machine Drawing, Chartor Publishing house, Anand, India.
5. Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New
6. Delhi.
7. Fredderock E. Giesecke, Alva Mitchell & others, Principles of Engineering Graphics,
8. Maxwell McMillan Publishing.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit IV, V, VI

Professional Skills Development-II

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 2 Hours/ Week	End Semester Examination	50 Marks	Theory: 02 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	50 Marks	02

Course Pre-requisites		
The Students should have knowledge of		
1.	Basic knowledge of the parts of speech in English.	
2.	Vocabulary covered in the previous semester along with basic knowledge of verbs & adverbs.	
3.	Basic awareness of the need of speaking skills within social circle.	
4.	The elements of team dynamics done during the previous semester with proper application.	
5.	Basic awareness of the concepts of feedback, criticism.	
6.	The various common conflicts that may arise at varied situations.	
Course Objectives		
	The Professional Skills Development course aims to augment students overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The soft skills topics for this semester are intended to develop student's expertise on public speaking skills and to deal positively with criticism and so as to effectively present their personalities.	
Course Outcomes		
The student should be able to		
1.	Speak fluently in English without errors in the sentence construction and hence present themselves as effective English communicators. They will be able to learn 20-25 common errors made in parts of speech and also use 10 modal verbs efficiently during professional communication.	
2.	Differentiate between vocabulary used as adjectives, verbs and adverbs and be able to use the 60-70 words for their daily conversation.	
3.	Overcome the fear of speaking and will be aware of the 3 types of public speaking necessary according to the contemporary requirements. They would be able to deliver a public speech according to the need of the audience and also be aware of positive body language to be manifested during a speech.	
4.	Deal with the deeper parameters of working in teams like team motivation, multicultural team activity and team conflict resolution.	
5.	Analyze themselves relating to their hobbies and strengths and hence set realistic goals in terms of personal and professional growth. They will be able to identify at least 5-7 strengths and a couple of goals to be achieved that will enable their lives to be directed appropriately.	
6.	Apply 5-6 positive strategies to resolve conflicts arising during team work	
Course Contents		
Unit I	Essential Grammar – II	(4 Hrs.)
	<ul style="list-style-type: none"> • Auxiliaries • Importance of auxiliary verb in formal communication. • Group Activities 	

	<ul style="list-style-type: none"> Parts of Speech 	
Unit II	Vocabulary- II	(4 Hrs.)
	<ul style="list-style-type: none"> Vocabulary related to Adjectives Vocabulary related to verbs and adverbs Adjectives, verbs, Adverbial vocabulary –Usage Application of the above taught vocabulary through activities 	
Unit III	Fundamental Communication Skills – II	(4 Hrs.)
	<ul style="list-style-type: none"> Public speaking skills Effective public speaking skills Types of public speaking Overcoming stage fear Do's& Don't's of public speaking Importance of Body language in Public speaking Importance of the audience in Public speaking Activity – Extempore Speaking, Manuscript speech 	
Unit IV	Interpersonal skills-II	(4 Hrs.)
	<ul style="list-style-type: none"> Team Work Team communication. Factors which ensure effective & smooth team communication Team conflict resolution-ways & methods Case studies/activities 	
Unit V	Self-Awareness	(4 Hrs.)
	<ul style="list-style-type: none"> Perceptions, beliefs Analyzing achievements, goals, hobbies Handling criticism Developing positive attitudes 	
Unit VI	Conflict Resolution	(4 Hrs.)
	<ul style="list-style-type: none"> Various conflicts that could be encountered in a work scenario. Causes of conflicts in work scenario. Ways and methods for conflict resolution. Do's and Don'ts for conflict resolution. 	
Text Books		
1.APAART: Speak Well 1 (English language and communication)		
2.APAART: Speak Well 2 (Soft Skills)		
Reference Books		
1.English vocabulary in use – Alan Mc'Carthy and O'dell		
2.Business Communication – Dr. Saroj Hiremath		

PRODUCTION PRACTICE-I

Designation of Course	Production Practice-I		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- -- Hours/ Week	End Semester Examination	-- Marks	Practical: 01
Practical:- 2 Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	50 Marks	
	Total	50 Marks	1

Course Prerequisites:-	Basic knowledge of various machine tools.
Course Outcomes:-	<p>Students should be able to understand</p> <ol style="list-style-type: none"> 1. Understand machine tools, mechanism and accessories used in various production processes 2. Make the job of turning & taper turning operation using lathe 3. Perform Forging and grinding of lathe tool with one knife and other end vee 4. Prepare simple solid pattern involving wood turning 5. Perform Welding using gas/arc welding process 6. Understand Sand Casting process

Course Contents

Each candidate shall be required to complete and submit the following term work:

A. Jobs:

Plain and Taper turning – one job

Forging and grinding of lathe tool with one knife and other end vee – one job

Making a simple solid pattern involving wood turning – one job

Welding (gas or arc) – one job

Sand Molding – one job

B. Journal & Demonstration:

Assignments on machine tools will be in the form of a journal based on demonstrations on machine tools. This should include sketches and relevant descriptions as given below:

1) Block Diagrams (Any Two)

- a) Lathe
- b) Universal milling machine
- c) Radial drilling machine
- d) Cylindrical grinder.

2) Mechanisms (Any Two)

- a) All geared headstock of a center lathe.
- b) Spindle arbor (assembly) drive of milling machine
- c) Crank and slotted lever quick return drive of shaping machine.
- d) Spindle assembly in a drilling machine.

3) Accessories (Any Two)

- a) Taper turning attachment for a center lathe.
- b) Universal dividing head.
- c) Milling cutters.

Rules regarding ATKT, Continuous Assessment and award of Class Standards for Passing

- For all courses, both in UE (University Evaluation) and IA (Internal Assessment) there are constitute separate heads-of-passing (HoP).
 - The student must obtain a minimum grade point of 5.0 (40% marks) at UE as well as at IA.
OR
 - The student failed in IA can also pass in the course provided he/ she obtains minimum of 25% marks in IA, and GPA (Grade Point Average) for the course is at least 6.0 (50% aggregate). The GPA for the course will be calculated only if the student passes in UE.
- The student who fails at UE in a course has to reapply only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

- A student is allowed to carry backlog of courses prescribed for B. Tech. Sem. I, III, V, VII to B. Tech. Sem. II, IV, VI, VIII respectively.
- A student is allowed to keep term of Sem. III, if he/ she has failed in any number of courses in B. Tech. Sem. I and II.
- A student is allowed to keep term of Sem. V, if he/ she has failed in any number of courses in B. Tech. Sem. III and IV but passed in all courses in Sem. I and II.
- A student is allowed to keep term of Sem. VII, if he/ she has failed in any number of courses in B. Tech. Sem. V and VI but passed in all courses in Sem. III and IV.

Award of Class for the Degree Considering CGPA

A student who has completed the minimum credits specified for the program shall be declared to have passed in the program. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of the honors at the end of the program are as given below:

Range of the CGPA	Final Grade	Performance Descriptor	Equivalent range of marks (%)
$9.50 \leq 10.00$	O	Outstanding	$80 \leq 100$
$9.00 \leq 9.49$	A ⁺	Excellent	$70 \leq 79$
$8.00 \leq 8.99$	A	Very Good	$60 \leq 69$
$7.00 \leq 7.99$	B ⁺	Good	$55 \leq 59$
$6.00 \leq 6.99$	B	Average	$50 \leq 54$
$5.00 \leq 5.99$	C	Satisfactory	$40 \leq 49$
Below 5.00	F	Fail	Below 40

Bharati Vidyapeeth Deemed University
College of Engineering, Pune- 411043
The Structure of the Curriculum: 2014 Course
Choice Based Credit System (CBCS)

B. TECH. MECHANICAL: SEMESTER- III & IV



Bharati Vidyapeeth University
College of Engineering, Pune
Department of Mechanical Engineering



Vision: To provide mechanical engineers capable of dealing with global challenges

Mission: Social transformation through dynamic education

Programme Educational Objectives (PEOs):

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

Programme Outcomes (POs):

- a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems
- b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes
- c. To design and develop mechanical systems considering social and environmental constraints.
- d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques
- e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance
- f. To know social responsibilities while doing professional engineering practice.
- g. To become familiar with eco-friendly, sustainable and safe work environment.
- h. To take into account professional ethics while designing engineering systems.
- i. Able to work efficiently as a group leader as well as an individual.
- j. To communicate in written and verbal form with subordinates and supervisors
- k. To apply project and finance management techniques in multidisciplinary environments.
- l. To create interest for higher education and updating the knowledge.

B. TECH. MECHANICAL: SEMESTER- III (2014 Course)

S.N	Course	Teaching Scheme (Contact Hrs./week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
1.	Solid Mechanics	4	-	-	60	20	10	10	-	-	100	4	-	4
2.	Fluid Mechanics	4	2	-	60	20	10	10	-	50	150	4	1	5
3.	Engineering Thermodynamics	3	2	-	60	20	10	10	50	-	150	3	1	4
4.	Engineering Mathematics III	3	-	-	60	20	10	10	-	-	100	3	-	3
5.	Computer Programming and Simulation	3	2	-	60	20	10	10	-	50	150	3	1	4
6.	Professional skill Development-III	4	-	-	100	-	-	-	-	-	100	4	-	4
7.	Production Practice- II #	-	2	-	-	-	-	-	-	50	50	-	1	1
	Total	21	08	0	400	100	50	50	50	150	800	21	4	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

Practical examination of duration 3 Hours.

B. TECH. (MECHANICAL) SEM.-IV (2014 COURSE)

S.N	Course	Teaching Scheme (Contact Hrs./week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/ OR	TW/ PR				
1.	Mechanisms of Machines*	4	2	-	60	20	10	10	50	-	150	4	1	5
2.	Manufacturing Process	3	-	-	60	20	10	10	-	-	100	3	-	3
3.	Material Science	3	2	-	60	20	10	10	-	50	150	3	1	4
4.	Turbomachinery	3	-	-	60	20	10	10	-	-	100	3	-	3
5.	Numerical. Methods. and Optimization Techniques	3	2	1	60	20	10	10	--	50	150	3	2	5
6.	Professional skill Development -IV	4	-	-	100	-	-	-	-	-	100	4	-	4
7.	Production Practice – III #	-	2	-	-	-	-	-	-	50	50	-	1	1
	Total	20	8	1	400	100	50	50	50	150	800	20	5	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

* End Semester examination of duration 4 Hours.

Practical examination of duration 3 Hours.

Total Credits Sem. III– 25

Total Credits Sem. IV – 25

Grand Total - 50

Rules for Conducting Tests

Mode of the test

- In each semester for each subject two tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.
- To calculate these marks following procedure is followed:
 - i) Average marks obtained in two tests shall be considered as provisional marks obtained by the student in the tests.
 - ii) If the candidate appears only for one test during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other test.
 - iii) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; these marks will be final marks obtained by the student. No scaling up is permitted.
 - iv) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.
- Paper pattern for tests
 - i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks
 - ii) There will not be any sub-questions.
- For granting the term it is mandatory to appear for both tests conducted in each semester.
- Roll nos. allotted to students shall be the examination nos. for the tests.

Department of Mechanical Engineering

Syllabus: Semester III

SOLID MECHANICS

Designation of Course	Solid Mechanics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory:- 04 Practical:- 01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	00 Marks	
	Total	100 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Mathematics 2. Engineering Mechanics 3. Engineering Science
Course Outcomes:-	<ol style="list-style-type: none"> 1. Stresses and strains in different materials. 2. Shear force and bending movement of loading elements. 3. Principal stresses and strain. 4. Torsional, bending and axial force on the shaft. 5. Bending stresses and shear stresses in the machine elements. 6. Design of simple machine components.

Course Contents

Unit 1	Simple stresses & strains	(08 Hrs.)
Revision of Concept of stresses & strains (linear, lateral, shear, thermal & volumetric). Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Stress-strain diagrams for ductile & brittle materials. Various strengths of material- Yield strength, Ultimate tensile strength etc, Concept of 3D stress state. Interrelation between elastic constants, Proof stress & True stress & strain. Axial force diagrams, stresses and strains in determinate & indeterminate homogeneous & composite bars under concentrated loads & self-weight. Temperature stresses in simple & composite members. Strain energy due to axial load (gradual, sudden & impact), strain energy due to self-weight.		
Unit 2	Principal stresses & strains	(08 Hrs.)
Normal & shear stresses on any oblique plane. Concept of principal planes derivation of expression for principal stresses & maximum shear stress, position of principal planes & planes of maximum shear, graphical solution using Mohr's circle of stresses, combined effect of axial force, bending moment & torsional moment on circular shafts (solid as well as hollow) Theories of elastic failure: Maximum principal stress theory, maximum shear stress theory, maximum distortion energy theory, maximum strain theory – their applications & limitations.		
Unit 3	Shear Force & Bending Moment Diagrams	(08 Hrs.)
Shear forces & bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads & couples, relation between SF & BM diagrams for cantilevers, Simply supported beam. Maximum bending movement & positions of points of contra flexure, construction of loading diagrams & BMD from SFD & construction of loading Diagram & SFD from BMD. Slope & deflection of beams - relation between		

BM & slope, slope & deflection of determinate beams, double integration method (Macaulay's method), derivation of formula for slope & deflection for standard cases		
Unit 4	Torsion and Buckling of columns	(08 Hrs.)
Stresses, strain & deformations in determinate shafts of solid & hollow, homogeneous & composite circular cross section subjected to twisting moment, derivation of torsion equation, stresses due to combined torsion, bending & axial force on shafts. Concept of buckling of columns, derivation of Euler's formula for buckling load for column with hinged ends, concept of equivalent length for various end conditions. Limitations of Euler's formula, Rankine's formula, safe load on columns		
Unit 5	Stresses in Machine Elements	(08 Hrs.)
Bending stresses : Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections(rectangular, I,T,C) with respective centroidal & parallel axes, bending stress distribution diagrams, moment of resistance & section modulus calculations. Shear stresses : Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange & web		
Unit 6	Design Process	(08 Hrs.)
Machine Design, Traditional design methods, Basic procedure of Machine Design, Forming Design specifications, Design for: 1) functional requirement, 2) customer orientation 3) Safety requirement & 4) Analysis for use. Requisites of design engineer, Design of machine elements, Sources of Design data, Use of Design data book, Use of standards in design, Selection of preferred sizes, Design Synthesis, Creativity in design. Use of internet for gathering information & Consideration of energy requirement, product life cycle & design for environment. Design of Simple Machine parts: Factor of safety, Service factor, Design of simple machine parts - Cotter joint, Knuckle joint and Levers, Eccentric loading , Stresses in curved beams (for circular cross-section only).		

Text Books/ Reference Books

1. Timoshenko & Young, Engineering Mechanics, Tata McGraw Hill Book Publishing co. Ltd. 1981.
2. James Gere, Mechanics of Materials, Thomson Learning
3. S Ramamrutham, Strength of Materials
4. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication
5. J. E. Shigley, Mechanical Engineering Design, McGraw Hill

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

FLUID MECHANICS

Designation of Course	Fluid Mechanics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory:- 03 Practical:- 01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	04

Course Prerequisites:-	Student should have knowledge of <ol style="list-style-type: none"> 1. Fundamentals of Mechanical engineering. 2. Analysis of forces and moments. 3. Laws of motion, kinetics and kinematics.
Course Outcomes:-	Able to understand- <ol style="list-style-type: none"> 1. Behaviour of fluids. 2. Use of appropriate pressure measuring devices. 3. Application of Bernoulli's energy equation. 4. Difference between laminar and turbulent flow. 5. Calculate losses in the piping system. 6. Dimensional analysis results and boundary layer theory.

Course Contents

Unit 1	Fluid Kinematics:	(06 Hrs.)
Types of flow- steady, unsteady, uniform, non-uniform, laminar, turbulent, One, Two and Three dimensional, compressible, incompressible, rotational, Irrotational. Stream lines, path lines, streak lines, velocity components, convective and local acceleration, velocity potential, stream function, continuity equation in Cartesian co-ordinates, flow net.		
Unit 2	Fluid Statics:	(06 Hrs.)
H Hydrostatic law, Pascal's law, Pressure at a point, Total Pressure, Centre of pressure, Liquid pressure on a plane(Horizontal, Vertical, Inclined) & Curved surfaces, Archimedes Principle, Buoyancy and stability of floating and submerged bodies, Metacentric height.		
Unit 3	Fluid Dynamics:	(06 Hrs.)
Introduction to Navier-Stoke's Equation, Euler equation of motion along a stream line, Bernoulli's equation, application of Bernoulli's equation to Pitot tube, Venturimeter, Orifices, Orifice meter, Triangular Notch & Rectangular Notch .(Without considering Velocity of Approach)		
Unit 4	Laminar Flow & Flow around Immersed Bodies:	(06 Hrs.)
Definition, relation between pressure and shear stresses, laminar flow through round pipe, fixed parallel plates. Introduction to CFD Methodology (Elementary Treatment).Lift and Drag, Classification of Drag, Flow around circular cylinder and Aerofoil, Development of lift on Aerofoil.		
Unit 5	Flow Through Pipes:	(06 Hrs.)
TEL, HGL , Energy losses through pipe, Darcy-Weisbach equation, Moody diagram, Minor losses in pipes, pipes in series and parallel, Syphon, Transmission of power, Water hammer in pipes ,		
Unit 6	Turbulent Flow, Boundary Layer & Dimensional Analysis:	(06 Hrs.)

Turbulent Flow, Velocity Distribution, Development of Boundary Layer on a flat plate, Laminar and Turbulent Boundary Layers, Laminar sub layer, Separation of Boundary Layer and Methods of Controlling. Dimensions of physical quantities, dimensional homogeneity, Buckingham pi Theorem, Important dimensionless numbers, Model analysis (Reynolds, Froude and Mach).

Text Books/ Reference Books

1. Dr. P.N. Modi and Dr. S.M. Seth, “Hydraulics and Fluid Mechanics including Hydraulic Machines”, Standard Book House.
2. Dr. R.K. Bansal, “Fluid Mechanics and Hydraulic Machines – I”, Laxmi Publication Pvt. Ltd., New Delhi.
3. Streeter V. L. and Wylie E. B. Fluid Mechanics McGraw Hill International Book Co.
4. Garde R. J. and Mirajgaonkar, Engineering Fluid Mechanics, Nem Chand & Bros, Roorkee, SCITECH, Publication (India) Pvt. Ltd.
5. Cengel & Cimbla Fluid Mechanics, TATA McGraw-Hill.
6. Irving Shames, “Mechanics of Fluid”, McGraw Hill Publication.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit- IV, V, VI

ENGINEERING THERMODYNAMICS

Designation of Course	Engineering Thermodynamics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory:03 Practicals:01
Practical: 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	04

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Knowledge of basic concept of thermodynamics 2. Knowledge of basic gas laws 3. Knowledge of pumps and compressors
Course Outcomes:-	<p>Able to understand-</p> <ol style="list-style-type: none"> 1. The concepts of Carnot theorem to applications such as heat pump and refrigerator. 2. The important phenomenon of heat and work. 3. Various performance parameters and their estimations in respect to trials on Boiler. 4. The knowledge about the phenomenon of steam generation and properties of steam. 5. Basic concepts of thermodynamics and their application to energy conversion device like Compressors. 6. Knowledge of fuels and combustion and availability.

Course Contents

Unit 1	Second Law of Thermodynamic and Entropy:	(06 Hrs.)
<p>Second Law of Thermodynamics: Limitations of first law of thermodynamics, heat engine, refrigerator and heat pump, Kelvin-Planck's statement & Clausius statement, equivalence of Kelvin-Planck's and Clausius statements, perpetual motion machine of second kind, Carnot cycle & Carnot heat engine. Entropy: Entropy as a property, second law analysis for entropy, Clausius inequality, principle of increase of entropy, irreversibility</p>		
Unit 2	Steam Generators:	(06 Hrs.)
<p>Classification, constructional details of process and power boiler, boiler mountings and accessories, equivalent evaporation, boiler efficiency, energy balance, boiler controls, boiler draught.</p>		
Unit 3	Ideal Gas and Properties of Steam and Vapour Power Cycle:	(06 Hrs.)
<p>Ideal Gas definition, Gas Laws: Boyle's law, Charle's law, Avagadro's Law, Equation of State, Specific Gas constant and Universal Gas constant, Ideal gas processes- on P-V and T-S diagrams, Formation of steam, Phase changes, Properties of steam, Use of Steam Tables, Study of P-V, T-S and Mollier diagram for steam., Non flow and steady flow vapor processes, work transfer & heat transfer, use of P-V, T-S, H-S diagrams for steam, determination of dryness fraction, and study of calorimeters. Vapour Power Cycle: Carnot cycle using steam, ideal Rankine cycle, calculation of thermal efficiency, specific steam consumption, work ratio, comparison of Carnot and Rankine cycle, and effect of superheat.</p>		
Unit 4	Single Stage and Multi stage Reciprocating Air Compressor:	(06 Hrs.)

Uses of compressed air, classification, constructional details of single stage compressor, computation of work done, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, FAD, theoretical and actual indicator diagrams, method of improving volumetric efficiency. Need of multi staging, multi stage compressor, work done, volumetric efficiency, condition for maximum efficiency, intercooling, actual indicator diagram.		
Unit 5	Rotary Compressor:	(06 Hrs.)
Introduction, classification and working principles of different types of compressors, comparison between reciprocating and rotary compressors, positive displacement and rotodynamic compressors, static and total head, work done efficiencies, surging, and choking, stalling, characteristics curves for rotodynamic compressors. Selection of compressors for various applications.		
Unit 6	Fuels and Combustion and Availability:	(06 Hrs.)
Mass fraction, mole fraction, combustion equation, theoretical air , excess and deficient air, stoichiometric and actual air to fuel ratio, analysis of products of combustion, gravimetric and volumetric analysis and their conversions, method to determine flue gas analysis - CO, CO ₂ , O ₂ , HC, NO _x , smoke. Availability: High and low grade energy, available and unavailable energy, loss of available energy due to heat transfer through a finite temperature difference.		

Term work

1. Determination of calorific value using bomb calorimeter.
2. Demonstration of exhaust gas analysis by using any commercially available test rig.
3. Test on reciprocating air compressor to determine volumetric efficiency, isothermal efficiency and FAD.
4. Determination of dryness fraction using any commercial available test rig.
5. Study of boiler mounting and accessories
6. Study of package boiler / modern boiler
7. Report on visit to any process industry, which uses boiler.
8. Performance test on rotary air compressor/ blower.
9. Trial on boiler to determine boiler efficiency, equivalent evaporation and energy balance sheet.
10. Study of rotary type positive displacement compressor.

Assignments

Assignment based on each unit

Text Books

1. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications
2. P. L. Ballany, Thermal Engineering, Khanna Publications
3. V. P. Vasandani and D. S. Kumar, Heat Engineering Metropolitan book Company, New Delhi
4. R.K.Rajput, Engineering Thermodynamics, EVSS Thermo Laxmi Publications
5. Y. Cengel & Boles, Thermodynamics -An engineering approach, Tata McGraw Hill Publications
6. Kothandarman & Domkundwar, Thermodynamics & Heat Engines
7. Rayner Joel, Engineering Thermodynamics, ELBS Longman
8. Hawkins G. A., "Engineering Thermodynamics", John Wiley and Sons.

Unit Tests-

Unit Test-I	Unit-I,II ,III
Unit Test-II	Unit-IV,V, VI

ENGINEERING MATHEMATICS –III

Designation of Course	Engineering Mathematics -III		
Teaching Scheme:	Examination Scheme:	Credits Allotted	
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory : 03
Practical:- -- Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	--- Marks	
	Total	100 Marks	03

Course Prerequisites:-	Students should have basic knowledge of: <ol style="list-style-type: none"> 1. Differential calculus 2. Integral calculus 3. Basics of statistics 4. Basics of Probability
Course Outcomes:-	Able to understand- <ol style="list-style-type: none"> 1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient. 2. Apply theorems to compute the Laplace transform, inverse Laplace transforms. Form mathematical modeling of systems using PDE. 3. Apply statistical methods to numerical data. 4. Calculate Correlation and Regression coefficient. 5. Use basics of probability to solve problems.

Course Contents

Unit 1	Linear Differential Equations (LDE)	(06 Hrs.)
LDE with constant coefficients, Method of variation of parameters, Homogeneous Equations, Cauchy's and Legendre's DE. Simultaneous & Symmetric Simultaneous DE. Application to mechanical systems		
Unit 2	Laplace Transform (LT)	(06 Hrs.)
LT of standard functions, properties and theorems, Inverse LT, method of finding Inverse LT , Application of LT to solve LDE. Fourier Transform (FT): Fourier Integral theorem, Fourier transform Fourier Sine & Cosine transform, Inverse Fourier Transform		
Unit 3	Partial Differential Equations (PDE)	(06 Hrs.)
Basic concepts, modeling: Vibrating String, Wave equation. Method of separation of variables, Use of Fourier series, Heat equation: one and two dimensional heat flow equations, Solution by Fourier Transforms, modeling Membrane two dimensional wave equation		
Unit 4	Measures of central value	(06 Hrs.)
Arithmetic mean, median and mode, geometric mean and harmonic mean. Measure of central tendency, dispersion, mean deviation, standard deviation, skewness, Moments and qurtosis.		
Unit 5	Correlation and Regression	(06 Hrs.)
Significance of the study of correlation, types of correlation, coefficient of correlation, difference between correlation and regression. Regression equations, standard error of estimate.		

Unit 6	Probability and Distribution	(06 Hrs.)
Basics of probability, conditional probability, bayes theorem, mathematical expectations, random variable and probability distribution, Poisson, normal distribution. Testing of hypothesis- Z test, chi square test and goodness of fit, F test.		

Term work-

1. Linear Differential Equations
2. Transforms
3. Partial Differential Equations
4. Measures of central value
5. Correlation and Regression
6. Probability and Distribution

Assignments

Assignment based on each unit

Text Books

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Unit Tests-

Unit Test-I	Unit-I,II ,III
Unit Test-II	Unit-IV,V, VI

COMPUTER PROGRAMMING & SIMULATION

Designation of Course	Computer Programming & Simulation		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory : 03 Practical:-01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	04

Course Prerequisites:-	Basic knowledge of statistics and probability MATLAB basics
Course Outcomes:-	Able to understand- <ol style="list-style-type: none"> 1. Concept of model 2. Simulation basics 3. Probability concepts 4. Simulation of mechanical engineering problems 5. Discrete Simulation 6. Simulation Experimentation.

Course Contents

Unit 1		(06 Hrs.)
	Physical model, Mathematical model, Types of mathematical model, Dynamic Versus Static Models, Continuous-Time Versus Discrete-Time, Dynamic Models, Quantitative Versus Qualitative Models, Mechanical system modeling examples.	
Unit 2		(06 Hrs.)
	Simulation Basics, When Simulation Is the Appropriate Tool, when Simulation Is Not Appropriate, Advantages and Disadvantages of Simulation, Areas of Application, Steps in a Simulation Study Simulation and analytical methods, Basic nature of simulation, The simulation process, Types of system simulation, Generation of random numbers .Monte Carlo Simulation.	
Unit 3		(06 Hrs.)
	Basic Probability Concepts, Discrete Random Variable, Expected Value and Variance of a Discrete Random Variable, Measure of Probability Function, Continuous Random Variable, Exponential Distribution, Mean and Variance of Continuous Distribution, Normal Distribution.	
Unit 4		(06 Hrs.)
	Introduction, Simulation of Pure pursuit problem, exponential growth model, simulation of water reservoir system, Trajectory simulation, suspension system, simulation of pendulum.	
Unit 5		(06 Hrs.)
	Discrete Simulation, Continuous System Simulation. Simulation of Queuing Systems, Inventory Control Models	
Unit 6		(06 Hrs.)
	Introduction, development of simulation experiments, principles of verification, validation and accreditation, Simulation experimentation, classical experimental design, validation of simulation experiments, evaluation of simulation experiments.	

Term work

Following assignment using MATLAB

1. Creating a One-Dimensional Array (Row / Column Vector) Creating a Two-Dimensional Array
2. Performing matrix manipulations – Concatenating, Indexing, and Sorting Normal Distribution
3. Simulation of water reservoir system
4. Trajectory simulation
5. Suspension system
6. Simulation of pendulum
7. Simulation of any one Discrete Simulation, Continuous System Simulation, Simulation of Queuing Systems, Inventory Control Models.

Assignments

Assignment based on each unit

Text Books/ Reference Books

1. Robert E. Shannon, “System Simulation The art and science”, Prentice Hall, New Jersey, 1995.
2. D.S. Hira, “System Simulation”, S. Chand and company Ltd, New Delhi, 2001.
3. Geoffrey Gordon, System Simulation; Prentice Hall.
4. Robert E. Shannon ; System Simulation: The Art and Science ;Prentice Hall
5. J. Schwarzenbach and K.F. Gill Edward Arnold; System Modelling and Control
6. M Close and Dean K. Frederick; Modeling and Analysis of Dynamic Systems ;Houghton Mifflin

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

PROFESSIONAL SKILLS DEVELOPMENT-III

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	100 Marks	Theory: 04 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	100 Marks	04

Course Pre-requisites	
The Students should have knowledge of	
1.	Basic math's and reasoning, the rules of English and comprehensive ability
2.	Basic awareness of phrasal verbs used in spoken communication and knowledge of verbs and other words used in professional life.
3.	Basic writing techniques taught to them in the first semester.
4.	The strengths and achievements analyzed during self-awareness session taught in the second semester. They should also be able to identify their long term and short term goals.
5.	Basic knowledge and idea about leaders and leadership qualities.
6.	Basic awareness of PowerPoint presentation and paper presentation and also should be fluent in English.
Course Objectives	
The Professional Skills Development course which is a combination of aptitude and soft skills aims to augment students to face the campus recruitment test and train them on applying short techniques/ tricks to solve questions of Maths, reasoning and English in very less amount of time. The English and soft skills section focuses on the higher aspects of soft skills such as grooming them on leadership, presentation, business communication which would enable them to project themselves as professionals in the corporate sector and/or otherwise.	
Course Outcomes	
The student should be able to	
1.	Solve the aptitude test in the recruitment exam and competitive exam by applying short techniques and solve the question in less amount of time. They would be able to handle around 15-20 topics of math's and reasoning and 50 rules of parts of speech.
2.	Present themselves with finesse by using around 25-20 idioms and phrases relevant to corporate communication as well as spoken English. They will also learn 50-60 words and other words that are specifically used in meetings, group discussions, presentation and other corporate events.
3.	Process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 500-750 words for essay writing along with limited words for technical writing and report writing.
4.	Identify themselves in terms of their strengths. Weaknesses and opportunities available to them for the career growth. They would also learn to overcome their weakness and convert into strengths and also make utilization of the opportunity vis-à-vis their strength. They would also learn to set realistic short/long term goals relevant to them through the SMART goal mnemonic.
5.	Differentiate between the different types of leaders and groom themselves to be potential leaders. Based on their qualities and strengths they would learn 5 types of leadership styles and mould themselves according to that. They would also learn 10-15 leadership traits.

6.	Prepare PowerPoint presentation and paper presentation effectively by focusing on body language, tone of communication and audiences' needs. They would also learn to handle the questions in an effective and smart way.
Course Contents	
Unit I	Aptitude (Maths, Logical Reasoning, English) (18 Hours)
	<ul style="list-style-type: none"> • Maths <ul style="list-style-type: none"> ▪ Enjoy maths + Number system ▪ Number system ▪ Percentage, profit and loss • Logical Reasoning <ul style="list-style-type: none"> ▪ Coding, Decoding, Number series, ▪ Blood relation Directions, cubes & dices • English <ul style="list-style-type: none"> ▪ Vocabulary-1 ▪ Confusing words-1(Homonyms)
Unit II	Essential Grammar - III (6 Hours)
	<ul style="list-style-type: none"> • Idioms and phrases • Usage of Idioms & phrases in daily conversation • Activities • Academic word list- Words to be used in business communication
Unit III	Written Communication- II (4 Hours)
	<ul style="list-style-type: none"> • Essay writing • Mnemonics to develop ideas and write essays • Structure of essays • Technical writing • Report writing
Unit IV	SWOT Analysis (6 Hours)
	<ul style="list-style-type: none"> • Introduction to SWOT • Importance to SWOT • Individual & Organizational SWOT Analysis • Identifying strengths, weaknesses, threats & opportunities • Short term goals& Long term goals, Career planning
Unit V	Interpersonal Skills - III (4 Hours)
	<ul style="list-style-type: none"> • Introduction to leadership skills • Importance of leadership skills • Types of leadership skills • Are leaders born or made?
Unit VI	Presentation Skills (4 Hours)
	<ul style="list-style-type: none"> • Introduction to PowerPoint presentation • Structure & flow of presentation • Importance of body language • Presentation by students-evaluation& feedback by trainers
Text Books	
1. APAART: Verbal Ability	
2. APAART: Logical Reasoning	
3. APAART: Quantitative Aptitude	
4. APAART: Speak Well 1 (English Language and Communication)	

5. APAART: Speak Well 2 (Soft Skills)

1. APAART: Verbal Ability

PRODUCTION PRACTICE-II

Designation of Course	Production Practice-II		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- -- Hours/ Week	End Semester Examination	-- Marks	Practical:- 01
	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
Practical:- 4 Hours/ Week	Term Work	50 Marks	
	Total	50 Marks	01

Course Prerequisites:-	Should have knowledge Production Practice-I
Course Outcomes:-	Students should able to understand <ol style="list-style-type: none"> 1) Welding Techniques, 2) Pattern Making 3) Mould Making

Course Contents

<p>Each candidate shall be required to complete and submit the following jobs:</p> <ol style="list-style-type: none"> 1. Welding-TIG / MIG OR Arc Welding (One Job) 2. Pattern making: <ul style="list-style-type: none"> A solid pattern consisting of wood turning or a core box. (One Job) It should follow the colour code in pattern making 3. Sand Testing.(Any Two) 3. Sand Moulding (One Job) <p>Note Practical examination of 3 hours duration based on above term work will be Conducted at the end of semester.</p>
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Department of Mechanical Engineering

Syllabus: Semester IV

MECHANISMS OF MACHINES

Designation of Course	Mechanisms OF Machines		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	50 Marks	
	Total	150 Marks	05

Course Prerequisites:-	<ol style="list-style-type: none"> 1. Engineering Mathematics 2. Engineering Mechanics
Course Outcomes:-	Learners can - Define various components of mechanisms. <ol style="list-style-type: none"> 1. Construct/Compose mechanisms to provide specific motion. 2. Draw velocity and acceleration diagrams of various mechanisms 3. Carry out force analysis of engine mechanism. 4. Synthesize the mechanism. 5. Analyze engine mechanism for static and dynamic force analysis.

Course Contents

Unit 1	Basic Kinematics:	(08 Hrs.)
	Kinematic link, Types of links, Kinematic pair, Types of constrained motions, Types of Kinematic pairs, Kinematic chain, Mechanism, Machine, Degree of freedom (Mobility), Kutzbach criterion, Grubler's criterion. Four bar chain and its inversions, Grashoff's law, Slider crank chain and its inversions, Double slider crank chain and its inversions. Pantograph, Steering gear mechanisms: Condition for correct steering, Davis steering gear mechanism, Ackermann steering gear mechanism.	
Unit 2	Velocity and Acceleration Analysis of Mechanisms: Graphical Methods-I	(08 Hrs.)
	Relative velocity method: Relative velocity of a point on a link, Angular velocity of a link, Sliding velocity, Velocity polygons for simple mechanisms. Relative acceleration method: Relative acceleration of a point on a link, Angular acceleration of a link, Acceleration polygons for simple mechanisms. Instantaneous center of rotation (ICR) method: Definition of ICR, Types of ICRs, Methods of locating ICRs, Kennedy's Theorem, Body and space centrode.	
Unit 3	Velocity and Acceleration Analysis of Mechanisms: Graphical Methods-II	(08 Hrs.)
	Velocity and acceleration diagrams for the mechanisms involving Coriolis component of acceleration. Klein's construction	
Unit 4	Kinematic Analysis of Mechanisms : Analytical Methods	(08 Hrs.)
	Analytical method for displacement, velocity and acceleration analysis of slider cranks mechanism. Position analysis of links with vector and complex algebra methods, Loop closure equation, Chace solution, Velocity and acceleration analysis of four bar and slider crank mechanisms using vector and complex algebra methods. Hooke's joint, Double Hooke's joint.	

Unit 5	Introduction to Synthesis of Linkages	(08 Hrs.)
Steps in synthesis process: Type, number and dimensional synthesis. Tasks of Kinematic synthesis: Path, function and motion generation (Body guidance). Precision Positions, Chebychev spacing, Mechanical and structural errors, Branch defect and order defect, Crank Rocker mechanisms. Graphical synthesis: Two and three position synthesis using relative pole method and inversion method for single slider crank and four bar mechanism, three position motion synthesis of four bar Mechanism. Analytical synthesis: Derivation of Freudenstein's equation, three position function generation using Freudenstein's equation.		
Unit 6	Static and Dynamic Force Analysis	(08 Hrs.)
Theory and analysis of Compound Pendulum, Concept of equivalent length of simple pendulum, bifilar suspension, Trifilar suspension. Dynamics of reciprocating engines: Two mass statically and dynamically equivalent system, correction couple, static and dynamic force analysis of reciprocating engine mechanism (analytical method only), Crank shaft torque, Introduction to T- θ diagram.		

Term work

Any two of the following experiments shall be performed

1. To determine the mass moment of inertia of a connecting rod using a compound pendulum method.
2. To determine the mass moment of inertia of a flat bar using bifilar suspension method.
3. To determine the angular displacements of input and output shafts of single Hooke's joint for different shaft angles and verification of the results using computer programme.

Drawing Assignments (4 sheets of ½ imperial size)

1. To study and draw (any four) mechanisms for practical applications such as: Straight line mechanisms like Peaucellier Mechanism, Hart's Mechanism, Watt's Mechanism and Grasshopper Mechanism etc., for various link positions.
2. Two problems on velocity and acceleration analysis using Graphical methods i.e., polygons or ICR (Based on Unit 2).
3. Two problems on velocity and acceleration analysis using Graphical methods i.e., polygons involving Coriolis component or Klein's construction (Based on Unit 3).
4. Two problems based on graphical three position function generation, using either relative pole method or inversion method.

Assignments

The following two assignments shall be completed and record to be submitted in the form of journal.

1. Computer programming for velocity and acceleration analysis of slider cranks mechanism.
2. One problem on velocity and acceleration analysis using:
3. Vector algebra and Complex algebra and comparison of results

Text Books/ Reference Books

1. Rattan S. S., "Theory of Machines", Tata McGraw Hill.
2. Ballaney P. L., "Theory of Machines", Khanna Publishers, Delhi.
3. Thomas Bevan, "Theory of Machines", CBS Publishers & Distributors, Delhi.
4. Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw Hill, Inc.
5. Ghosh Amitabh and Malik A.K., "Theory of Machines and Mechanisms", East-west Press.

6. Groover M.P., "Industrial Robotics", McGraw Hill International.
7. Hall A.S., "Kinematics and Linkages Design", Prentice-Hall.
8. Hartenberg and Denavit, "Kinematic Analysis and Synthesis of Mechanisms".
9. Erdman, A. G. & Sandor, G.N., "Mechanism design, Analysis and synthesis", Vol 1, Prentice –Hall of India.
10. Erdman, A. G. & Sandor, G.N., "Advance Mechanism design", Vol 2, Prentice –Hall of India.

Unit Tests-

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

MANUFACTURING PROCESSES

Designation of Course	Manufacturing Processes		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60Marks	Theory: 03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

Course Prerequisites:-	1.Basic knowledge of manufacturing Processes 2.Basic Knowledge of Joining and Castings 3.Basic knowledge of Materials
Course Outcomes:-	1. Understand the pattern, mould, and casting and choose the best casting process for a specific product. 2.Understand the different Hot and Cold working process 3. Choose the proper process for different joining cases. 4.Perform different operations on turning and boring machines 5. Understand and Perform different operations on the drilling and milling machines. 6.Specify and select suitable grinding process for required application

Course Contents

Unit 1	Expendable mould and permanent mould casting processes:	(08 Hrs.)
Sand casting, Types of pattern materials, pattern making allowances, core prints, Moulding sand- properties and testing, Hand and machine moulding, core, core making melting and pouring, Melting furnaces- Cupola, fuel fired, electric arc, Induction furnaces, Defects in casting, lost foam process, Shell moulding, Investment casting. Die casting low pressure permeant mould castings hot and cold chamber processes, Centrifugal casting, Semi-centrifugal casting. Centrifuging, Continuous casting		
Unit 2	Hot working processes, Cold working processes	(08 Hrs.)
A) Hot working processes: Principle, rolling, forging - drops, press, upset. Rolling, forging- extrusion, drawing, spinning, effect of hot working. B) Cold working processes Cold rolling, swaging, forging extrusion- forward backward impact. Roll forging, tube drawing, wire drawing, spinning, shot peening, high energy rate forming, sheet metal, working- types of press, drives, different operations, and types of dies.		
Unit 3	Joining process:	(08 Hrs.)
a) welding process- i) Arc welding – theory SMAW, GTAW, GMAW, FCAW, Submerged arc welding stud welding. ii) Resistance welding- Theory, spot, seam, projection welding processes. iii) Gas welding iv) Friction welding, ultrasonic welding, thermit welding, electron beam and laser welding.		

b) Use of adhesives for joining.		
Classification of adhesives, types of adhesives and their applications, surface preparation and various joints		
Unit 4	Turning , boring related process	(08 Hrs.)
Introduction, function, types, construction accessories operations, thread cutting, single and multi-start thread cutting, different tools, tool materials, Tool Geometry, concept of speed, feed, depth of cut, Introduction to boring machines general arrangement and nature of work done.		
Unit 5	Drilling ,milling machines	(08 Hrs.)
A) Drilling :		
Fundamentals of drilling process, twist drill geometry, tool holders, Types of drilling machines, drilling operations. Types of drills, reaming process.		
B) milling machines:		
Fundamentals of milling process, cutters-types and geometry, Operations performed on milling machines. Dividing head, methods of indexing. Gear train calculations for helical and cam milling		
Unit 6	Abrasive machining processes, Plastics & Plastic Moulding	(08 Hrs.)
A) Abrasive machining processes:		
Abrasive machining, abrasives -types, size and geometry, Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, Grinding faults, Honing, lapping, super finishing, buffing, burnishing process.		
B) Plastics & Plastic Moulding:		
Moulding characteristics of plastic, Moulding process- compression, transfer, and injection blow moulding. Mould design- Materials and construction, bulk factor, shrinkage, moulding parameters, moulding machines, extruders		

Text Books/ Reference Books

1. Chapman W.A.J.: “Workshop Technology” volume I, II, III. ELBS.
2. Hajara Choudhary S. K., Bose S. K.: “Elements of Workshop technology” – Volume I, II.
3. Begman: Manufacturing processes.
4. HMT: production technology. TMH Publishing Co. New Delhi.
5. Roy A. Lindberg: Processes and metables of manufacturing fourth edition practice Hall of India New Delhi.
6. Manufacturing process, P C Pandey

Unit Tests-

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

MATERIAL SCIENCE

Designation of Course	Material Science		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory:03 Practical:01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	04

Course Prerequisites:-	<ol style="list-style-type: none"> 1.Knowledge of basic concept of Physics and chemistry 2. Basic information of engineering materials. 3. Basic knowledge of manufacturing processes.
Course Outcomes:-	<ol style="list-style-type: none"> 1. basics of crystal structure, Mechanism of plastic deformation and Annealing and re- crystallization 2.how to measure different types of mechanical properties 3. Use of equilibrium diagrams in selections of alloys for different applications. 4.details about steels and cast irons its properties and applications 5.how to select nonferrous materials for different components 6.basics of corrosion and Prevention of corrosion by different methods

Course Contents

Unit 1	Study of Engineering materials and Plastic Deformation:	(08 Hrs.)
classification of Engineering materials , Introduction to Nonmetallic materials, Study of crystal structure, Indexing of planes and directions, Imperfections in crystals, Mechanism of plastic deformation, Polycrystalline metals, , Work Hardening ,Cold and hot working, Annealing and re -crystallization.		
Unit 2	Mechanical Testing of Metals:	(08 Hrs.)
Study of destructive testing, Tensile test , Engineering stress and true stress strain, Numerical based on Evolution of properties, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non Destructive testing such as Liquid dye penetrate test, Magnaflux test, Eddy current test , Ultrasonic testing and Radiography testing		
Unit 3	Study of Equilibrium Diagrams	(08 Hrs.)
Related terms and their definitions, Hume Ruther’s rule of solid solubility, Allotropy and polymorphism, Solidification, Dendritic growth, Cooling curves, Plotting of Equilibrium diagrams, Lever rule, Coring, Eutectic system, Partial eutectic and eutectoid system, Non Equilibrium cooling and its effects		
Unit 4	Study of Steel and Cast Irons.	(08 Hrs.)
Production of steel and cast Irons, Allotropy of Iron, Iron and Iron Carbide Equilibrium Diagram, Classification of Steels, Specifications of steels, Plain Carbon steel, Applications and microstructure of steels, Study of cast iron, Classification and applications of cast irons, Properties and manufacturing methods, Effect of alloying elements, Alloy cast irons etc.		
Unit 5	Study of Non Ferrous Materials	(08 Hrs.)
Introduction, Copper and it’s alloy, Alpha and alpha beta brasses, Zinc Equivalent , Copper Nickel alloy, Bronzes,		

Aluminum and its alloy, Precipitation and age hardening, Dispersion strengthening, Nickel and its alloy, Metals at High and Low Temperature, Bearing Materials etc.		
Unit 6	Corrosion and Prevention:	(08 Hrs.)
Introduction, Types of corrosion, Oxide film growth laws, Action of hydrogen, Polarization, Stress corrosion, Season Cracking, Prevention of corrosion, Design of component, Modification of environment, Cathodic Protection, Deposition and coating, Ion Implantation, PVD, CVD, Powder coating etc.		

Term work

List of Experiments: (Any Eight)

1. Tensile test to determine strength and other mechanical properties.
2. Hardness test Brinell and Vickers.
3. Rockwell and Poldi hardness test.
4. Study of Microstructure of plain carbon steel.
5. Study of Microstructure of cast irons.
6. Magnetic Particle test.
7. Liquid penetrate test.
8. Ultrasonic Test.
9. Eddy Current test
10. Visual inspection of casting and welded components.
11. Study of nonferrous material and alloys.

Practical Examinations:

Term work and Practical Examinations will be based on above syllabus.

Assignments

1. Density calculations on crystal structure and miller indices for crystal structure.
2. Draw different types of curves such as, Tensile stress strain, S N curves, Creep curves, brittle transient temperature curves.
3. Draw the equilibrium diagram from given data. Find out the different types of phases.
4. Draw the Fe-Fe₃C equilibrium diagram and microstructure of steels specimens.
5. Draw the microstructures of brasses and bronzes. Give list of some applications of non-ferrous materials.
6. Collect different type of old components and study the corrosion on it also study the prevention processes also.

Text Books

1. "Material Science and Physical Metallurgy", Dr. V. D Kodgere, Everest Publication, Pune.
2. "Physical Metallurgy", S H Avner, McGraw Hill Publication.
3. "Material science and metallurgy", O P Khanna, Khanna Publication, Delhi.
4. "Material Science and Engineering", R K Rajput S K Kataria and Sons Publication, Delhi.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

Turbo Machinery

Designation of Course	Turbo Machinery		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

Course Prerequisites:-	The Students should have 1.Basic knowledge of pumps 2.Basic knowledge of Turbines 3.Knowledge of energy conversion devices
Course Outcomes:-	Able to understand- 1 Introduction of Turbo Machinery and Impulse Water Turbines 2 Reaction Water Turbines 3 Steam Turbines 4 Centrifugal Pumps 5 Centrifugal Compressor 6 Axial Compressor

Course Contents

Unit 1	Introduction of Turbo Machinery	(08 Hrs.)
Impulse-momentum principle ,fixed and moving flat plates, curved vanes , with jet striking at the centre of vane and jet striking tangentially on to the vane, Impact of jet on hinged plates ,Impact of jets on series of flat plates and vanes, water wheels, velocity triangles and their analysis, work done and efficiency calculations. Impulse Water Turbines: Main components and constructional features of Pelton wheel, Concept of centrifugal head, general energy equation for turbine, Velocity diagrams and analysis, Important non-dimensional parameters such as speed ratio, jet ratio, flow ratio, Condition for maximum hydraulic efficiency.		
Unit 2	Reaction Water Turbines	(08 Hrs.)
Classifications, Francis, Propeller, Kaplan Turbines, construction features, velocity diagrams and analysis, DOR, draft tubes- types and analysis, cavitations causes and remedies, specific speed, performance characteristics and governing of reaction turbines, selection of turbines.		
Unit 3	Steam Turbines	(08 Hrs.)
Steam nozzles: types and applications, Equation for velocity and mass flow rate [Elementary treatment only] Steam Turbines: Classifications (Axial and Radial), construction details, compounding of steam turbines, velocity diagrams and analysis of Impulse and reaction turbines (single & multi stage), governing, performance characteristics, selection of turbines.		
Unit 4	Centrifugal Pumps	(08 Hrs.)
Classification, components of centrifugal pump, various terms associated with centrifugal pump, various heads, velocity triangle and their analysis, effect of outlet blade angle, capitation, NPSH, Thomas Cavitations factor,		

priming of pumps, installation, specific speed, Performance characteristics of centrifugal pump, Axial thrust, maintenance, trouble and remedies, series and parallel operation of pumps, system resistance curve, water hammer problem in pumping system, selection of pumps.		
Unit 5	Centrifugal Compressor	(08 Hrs.)
Classification of rotodynamic compressors, blowers, fans. Centrifugal compressor: Construction, flow process on T-S Diagram, velocity diagram and Euler's work, slip factor and its effect on work input, actual work input, dimension parameters, pre-whirl losses, surging, choking, stalling characteristics		
Unit 6	Axial Compressor	(08 Hrs.)
Construction, stage velocity triangles and its analysis, enthalpy entropy diagram, dimensionless parameters, flow through the blade rows, pressure rise across the stage, stage losses and efficiencies, performance characteristics		

Term Work

1. Study and trial on a Pelton wheel and plotting of main / operating characteristics.
2. Study and trial on a Francis turbine and plotting of main / operating characteristics.
3. Study and trial on a Kaplan turbine and plotting of main / operating characteristics
4. Study and trial on a Centrifugal pump and plotting of operating / and variable speed characteristics.
5. Study of different types of nozzles
6. Study of axial flow compressors/ centrifugal air blower
7. Study of multi-staging of steam turbines
8. Trial on centrifugal air compressor
9. Design of a complete pumping system installation using standard tables, charts supplied by pump manufacturers.
10. Visit to Hydroelectric power stations and writing a report based on the visit.
11. Visit to water pumping station and writing a report based on visit.

Assignments

Assignments Six Assignments based on above syllabus

Text Books

- 1 P. N. Modi and Dr. S. M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi.
- 2 R. K. Rajput, "Hydraulic Machines", S.Chand Publishers, New Delhi.
- 3 Turbines, Compressors & Fans, S.M. Yahya, Tata-McGraw Hill.
- 4 Turbomachines, B. U. Pai, Wiley India.
- 5 Fluid Mechanics & Hydraulic Machines S.C. Gupta 1e Pearson Education.
- 6 Thermal Turbo machines, Dr. Onkar Singh, Wiley India.
- 7 Fluid Mechanics and Hydraulic Machines by R.K.Bansal.
- 8 Basic concepts in Turbo machinery by Grant Ingram.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

NUMERICAL METHODS AND OPTIMIZATION TECHNIQUES

Designation of Course		Numerical Methods and Optimization Techniques		
Teaching Scheme:		Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week		End Semester Examination	60 Marks	Theory: 03 Practical:01 Tutorial:01
Practical:- 02 Hours/ Week		Unit Test	20 Marks	
		Assignments	10 Marks	
		Internal Evaluation	10 Marks	
Tutorials:- 01 Hours/ Week		Term Work/ Oral	50 Marks	
		Total	150 Marks	05

Course Prerequisites:-	Students should have basic knowledge of: <ol style="list-style-type: none"> 1. Basics of statistics 2. Basics of Probability
Course Outcomes:-	Able to understand- <ol style="list-style-type: none"> 1. Form mathematical modeling of systems using differential equations 2. Ability to solve linear differential equations with constant coefficient. 3. Apply statistical methods to numerical data. 4. Calculate Correlation and Regression coefficient. 5. Able to do optimization of engineering problems. 6. Able to complete Multivariate Variable Optimization for any problem

Course Contents

Unit 1	Roots of Equations:	(08 Hrs.)
Significant figures, Accuracy and Precision, Error definition, Round-Off errors, Truncation error, Total numerical error. Bracketing methods-Bisection and False position method. Open methods, Newton Raphson method		
Unit 2	Linear Algebraic Equation:	(08 Hrs.)
Navie Gauss elimination, pitfalls of Gauss Elimination, techniques of improving solutions, complex numbers.		
Unit 3	Curve Fitting and Interpolation:	(08 Hrs.)
Least-Square Regression-Linear regression,. Interpolation-Newton's divided difference interpolating polynomial. Lagrange's interpolating polynomial		
Unit 4	Numerical differentiation and Integration:	(08 Hrs.)
Trapezoidal rule, Simson's rules, integration with unequal segment, multiple integral, derivatives of unequally spaced data. Engineering Applications. Ordinary Differential Equations: Euler's method, improvement of Euler's method, Runge-Kutta method, system of equations		
Unit 5	Single Variable Optimization	(08 Hrs.)
Optimum problem formulation, Engineering optimization problem, Optimality Criteria, Bracketing methods, region-Elimination method, Point Estimate Method, Gradient Based method		
Unit 6	Multivariate Variable Optimization	(08 Hrs.)
Optimality criteria, Unidirectional search, Direct search method- Evolutionary optimization, simplex search, Gradient Based Methods- Steepest Descent method, Newton's method.		

Term work

Minimum six program on from each unit using Matlab.

Text Books/ Reference Books

1. Optimization for Engineering Design: Algorithms and Examples By Kalyanmoy Deb, Prentice-Hall of India Private Limited, New Delhi.
2. Introduction to Optimum Design, Jasbir S Arora, Elsevier Academic Press.
3. Numerical Methods for Engineers, Steven Chaptra and Raymond Canale, McGraw Hill.
4. Numerical Methods for Scientific and Engineering Computations, M. K. Jain, S.R.K. Ayengar and R. K. Jain.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-III, IV, VI

PROFESSIONAL SKILLS DEVELOPMENT-IV

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	100 Marks	Theory: 04 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	100 Marks	04

Course Pre-requisites	
The Students should have knowledge of	
1.	Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2.	An overall idea about the difference in personal and professional communication in terms of vocabulary used.
3.	Knowledge of writing skills, importance of professionalism in emails and letters.
4.	They should be aware of concepts of self-esteem, self-assessment and its importance in setting long term and short term goals.
5.	Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6.	Body language and importance of non-verbal communication to maintain professionalism.
Course Objectives	
	The Professional Skills Development 4 is an extension of PSD- 3 with focus on the remaining topics of Maths and Logical reasoning. The further complex concepts of Aptitude and Grammar aims to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-4 focuses on the higher aspects of soft skills such as grooming them on corporate etiquettes and various formats of email/ letter writing so that can present themselves as professionals further both in oral and written communication.
Course Outcomes	
The student should be able to	
1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar relevant from the recruitment point of view.
2.	Use appropriate words in the right context both academically and professionally. Students would have approximately around 80-100 words from the academic word list prescribed in the syllabus.
3.	Understand the importance of email etiquettes and distinguish between the format of formal and informal emails/letters. They would be able to draft professional mails and letters like job application letters, cover letters, and apology emails with proper structure and words which are necessary in the corporate life.
4.	Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
5.	Understand the major concepts of leadership like coaching, mentoring. They would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life.
6.	Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector. They would also learn various strategies and conversational techniques to handle telephonic interviews confidently.

Course Contents		
Unit I	Aptitude (Maths, Logical Reasoning, English)	(18 Hours)
	<ul style="list-style-type: none"> • Maths <ul style="list-style-type: none"> ▪ Simple Interest and Compound Interest ▪ Ratio, Proportion and Average ▪ Mixture and Allegation • Logical Reasoning <ul style="list-style-type: none"> ▪ Data Interpretation ▪ Data Sufficiency • English <ul style="list-style-type: none"> ▪ Grammar I ▪ Vocabulary - Analogies 	
Unit II	Essential Grammar - IV	(4 Hours)
	<ul style="list-style-type: none"> • Vocabulary – Academic word List 	
Unit III	Written Communication- III	(6 Hours)
	<ul style="list-style-type: none"> • Email writing and etiquettes – formal and informal email writing, format of various types of email, do’s and don’ts of email writing • Letter writing – formal letters, job application letter, and cover letter. • Essay writing – mnemonics top develop ideas and write essays, structure of essays 	
Unit IV	Self-Awareness and Conflict Resolution	(4 Hours)
	<ul style="list-style-type: none"> • Self-assessment & Perception & attitudes. • Analyzing skills & weaknesses and habits. • Developing positive attitude & handling criticism positively • Handling conflicts in the personal and corporate sector • Causes of conflicts in work scenario. • Ways and methods for conflict resolution 	
Unit V	Interpersonal Skills - III	(6 Hours)
	<ul style="list-style-type: none"> • Mentoring, Difference between Leadership and Management • Leading with examples • Time management -The Time Management Matrix, Pareto Principle 	
Unit VI	Aptitude (Maths, Logical Reasoning, English)	(4 Hours)
	<ul style="list-style-type: none"> • Maths <ul style="list-style-type: none"> ▪ Simple Interest and Compound Interest ▪ Ratio, Proportion and Average ▪ Mixture and Allegation • Logical Reasoning <ul style="list-style-type: none"> ▪ Data Interpretation ▪ Data Sufficiency • English <ul style="list-style-type: none"> ▪ Grammar I ▪ Vocabulary - Analogies 	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		
1. APAART: Verbal Ability		

PRODUCTION PRACTICE-III

Designation of Course	Production Practice-III		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- -- Hours/ Week	End Semester Examination	-- Marks	Practical: 01
	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
Practical:- 2 Hours/ Week	Term Work	50 Marks	
	Total	50 Marks	01

Course Prerequisites:-	Student should have basic knowledge of welding, soldering, Lathe Machine.
Course Outcomes:-	<ol style="list-style-type: none"> 1. Able to perform different Gear Cutting operations 2. Able to perform different operations on automatic lathe machine. 3. Able to do machining of components covering all operations on Lathe 4. Able to perform CNC Turning

Course Contents

<p>Each Candidate shall be required to complete and submit the following jobs (Any Two)</p> <ol style="list-style-type: none"> 1. One Composite job consisting of 3 to 4 pieces as below Machining of components covering all operations on Lathe (Including Internal and external threading, Taper Matching, Knurling)One Job Grinding operation on Above (Turning) Job 2. Gear Cutting One Job 3. One job on CNC Machine. (Turning). 4. One job on Single Spindle Automate Lathe <p>Note Write a journal/term book based on above syllabus.</p>
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Rules regarding ATKT, Continuous Assessment and award of Class

Standards for Passing

- For all courses, both in UE (University Evaluation) and IA (Internal Assessment) there are constitute separate heads-of-passing (HoP).
 - The student must obtain a minimum grade point of 5.0 (40% marks) at UE as well as at IA.
 - OR
 - The student failed in IA can also pass in the course provided he/ she obtains minimum of 25% marks in IA, and GPA (Grade Point Average) for the course is at least 6.0 (50% aggregate). The GPA for the course will be calculated only if the student passes in UE.
- The student who fails at UE in a course has to reapply only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

- A student is allowed to carry backlog of courses prescribed for B. Tech. Sem. I, III, V, VII to B. Tech. Sem. II, IV, VI, VIII respectively.
- A student is allowed to keep term of Sem. III, if he/ she has failed in any number of courses in B. Tech. Sem. I and II.
- A student is allowed to keep term of Sem. V, if he/ she has failed in any number of courses in B. Tech. Sem. III and IV but passed in all courses in Sem. I and II.
- A student is allowed to keep term of Sem. VII, if he/ she has failed in any number of courses in B. Tech. Sem. V and VI but passed in all courses in Sem. III and IV.

Award of Class for the Degree Considering CGPA

A student who has completed the minimum credits specified for the program shall be declared to have passed in the program. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of the honors at the end of the program are as given below:

Range of the CGPA	Final Grade	Performance Descriptor	Equivalent range of marks (%)
$9.50 \leq 10.00$	O	Outstanding	$80 \leq 100$
$9.00 \leq 9.49$	A ⁺	Excellent	$70 \leq 79$
$8.00 \leq 8.99$	A	Very Good	$60 \leq 69$
$7.00 \leq 7.99$	B ⁺	Good	$55 \leq 59$
$6.00 \leq 6.99$	B	Average	$50 \leq 54$
$5.00 \leq 5.99$	C	Satisfactory	$40 \leq 49$
Below 5.00	F	Fail	Below 40

Bharati Vidyapeeth Deemed University
College of Engineering, Pune- 411043
The Structure of the Curriculum: 2014 Course
Choice Based Credit System (CBCS)

B. TECH. MECHANICAL: SEMESTER- V & VI



Bharati Vidyapeeth University
College of Engineering, Pune
Department of Mechanical Engineering



Vision: To provide mechanical engineers capable of dealing with global challenges

Mission: Social transformation through dynamic education

Programme Educational Objectives (PEOs):

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

Programme Outcomes (POs):

- a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems
- b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes
- c. To design and develop mechanical systems considering social and environmental constraints.
- d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques
- e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance
- f. To know social responsibilities while doing professional engineering practice.
- g. To become familiar with eco-friendly, sustainable and safe work environment.
- h. To take into account professional ethics while designing engineering systems.
- i. Able to work efficiently as a group leader as well as an individual.
- j. To communicate in written and verbal form with subordinates and supervisors
- k. To apply project and finance management techniques in multidisciplinary environments.
- l. To create interest for higher education and updating the knowledge.

B. TECH. MECHANICAL: SEMESTER- V (2014 Course)

S. N.	Course	Teaching Scheme (Contact Hrs. /week)			Examination Scheme (Marks)							Total Credits		
		L	P/ D	T	End Sem. Exam.	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/ OR	TW/ PR				
1.	Machine Design –I*	3	2	-	60*	20	10	10	50	--	150	3	1	4
2	Theory of Machines	4	2	-	60	20	10	10	50	--	150	4	1	5
3.	Advanced Computer Graphics & Solid Modelling	3	2	-	60	20	10	10	--	50	150	3	1	4
4.	Heat and Mass Transfer	4	2	-	60	20	10	10	50	--	150	4	1	5
5.	Advanced Manufacturing Processes	3	--	-	60	20	10	10	--	--	100	3	--	3
6.	Professional skill Development-V	4	--	-	100	-	-	-	--	--	100	4	--	4
	Total	21	08	0	400	100	50	50	150	50	800	21	4	25

* End Semester examination of duration 4 Hours.

B. TECH. MECHANICAL: SEMESTER- VI (2014 Course)

S. N.	Course	Teaching Scheme (Contact Hrs. /week)			Examination Scheme (Marks)							Total Credits		
		L	P/ D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/ OR	TW/ PR				
1.	Machine Design –II*	4	2	--	60*	20	10	10	50	--	150	4	1	5
2.	Refrigeration Air Conditioning	3	2	--	60	20	10	10	50	--	150	3	1	4
3.	Internal Combustion Engines	3	2	-	60	20	10	10	-	50	150	3	1	4
4.	Mechanical Measurement & Metrology	4	2	--	60	20	10	10	--	50	150	4	1	5
5.	Elective -I	3	--	--	60	20	10	10	--	--	100	3	--	3
6.	Professional skill Development-VI	4	--	--	100	-		-	--	--	100	4	--	4
	Total	21	8	--	400	100	50	50	100	100	800	21	4	25

* End Semester examination of duration 4 Hours.

Total Credits Sem. V – 25

Total Credits Sem. VI – 25

Grand Total - 50

Elective-I

- 1) Machine Tool Design
- 2) Energy Audit and Management
- 3) Reliability Engineering
- 4) Design of Pumps, Blowers and Compressors
- 5) Management Information System

MACHINE DESIGN-I

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	04

Course Prerequisite:- Student should have knowledge of

1. Fundamentals of engineering Drawing
2. Analysis of forces
3. Utilizing the principles of drafting and strength of materials.

Course Objective:-

1. Ability to analyze the stress and strain of mechanical components and understand, identify and quantify failure modes for mechanical part.
2. Ability to decide optimum design parameters for mechanical systems.
3. Enhancement in proficiency of CAD software for designing Mechanical systems and to generate production drawing.
4. Ability to understand basics of fluctuating load.

Course Outcomes:- Learner will able to-

1. understand the basics of machine design
2. design of shafts, keys and couplings
3. design of power screws
4. design of springs
5. design of welded and riveted joints
6. understand basics of fluctuating load for static and dynamic loading

Unit 1	Basic Concept of Machine Design	(06 Hrs.)
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Traditional types of design methods, basic procedure of machine design, introduction to use of standards in design, selection of preferred series, introduction to aesthetic and ergonomic consideration in design. Engineering materials- properties, designation, and selection of material. Weighted point method. Castiglione's theorem.

Unit 2	Design of Shafts, Keys & Couplings	(06 Hrs.)
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Shaft design on strength basis, shaft design on torsional rigidity basis, ASME code of shaft design, keys – saddle, sunk, feather, woodruff, square, flat, Kennedy key, key design, design of splines, types of couplings, muff coupling, flange coupling, flexible bush pin type coupling.

Unit 3	Design of Power Screws	(06 Hrs.)
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Forms of threads, differential & compound screw, design of square & trapezoidal threads, self-locking screw, design of power screws, screw jack, recirculating ball screw, design of bolted joint.

Unit 4 Design of Springs (06 Hrs.)

Types, materials, stress & deflection equations for helical, tension & compression spring, torsional and multi leaf springs, styles of ends, nipping of leaf spring, shot peening, spring in series & parallel, concentric springs,

Unit 5 Design of Welded & Riveted Joints (06 Hrs.)

Design of welded joint: advantages, limitations, butt & fillet welds, parallel & transverse fillet welds, axially loaded unsymmetrical welded joint, eccentric loading in plane of weld, welded joint subjected to bending & torsional moment, basic types of riveted joints, different parameters of a riveted joints, uses of riveted joints, failure of riveting joint, strength of riveting joint and efficiency of riveting joints.

Unit 6 Design for Fluctuating Load (06 Hrs.)

Stress concentration - causes & remedies, fluctuating stresses, fatigue failures, S-N curve, endurance limit, notch sensitivity, endurance strength modifying factors, design for finite and infinite life, cumulative damage in fatigue failure, Soderberg, Gerber, Goodman, modified Goodman diagrams, fatigue design of components under combined stresses.

Term Work

Term work shall consist of two design projects by using AutoCAD/manually. Design projects should be in the form of system design comprising of machine elements studied in syllabus. Design data book should be used extensively. Four assignments on remaining topics.

Text Books

- 1) Shigley J. E. and Mischke C. R., "Mechanical Engineering Design", McGraw Hill Publication Co. Ltd.
- 2) Spotts M. F. and Shoup T.E., "Design of Machine Elements", Prentice Hall International
- 3) Bhandari V. B., "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.
- 4) Juvinal R. C., "Fundamentals of Machine Components Design", John Wiley and Sons.

Reference Books

- 1) Black P.H. and O. Eugene Adams, "Machine Design", McGraw Hill Book Co. Inc.
- 2) Willium C. Orthwein, "Machine Components Design", West Publishing Co. and Jaico Publications House.
- 3) Hall A. S., Holowenko A. R. and Laughlin H. G., "Theory and Problems of Machine Design", Schaum's Outline Series.
- 4) Sharma C. S. and Purohit Kamlesh, "Design of Machine Elements", PHI Learning Pvt. Ltd.
- 5) D. K. Aggarwal & Sharma P. C., "Machine Design", S.K Kataria and Sons
- 6) Gope P. C., "Machine Design: Fundamentals and Applications", PHI Learning Pvt. Ltd.
- 7) "Design Data- P. S. G." College of Technology, Coimbatore.

8) Bhandari, V. B. "Machine Design data book", Tata McGraw Hill Publication Co. Ltd.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

THEORY OF MACHINES

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours / Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisite:- Student should have knowledge of

1. Fundamentals of engineering mechanics
2. Analysis of forces and moments
3. Kinematics
4. Algebra and trigonometry

Course Objective:-

1. To acquaint with working principles of clutches and its constructional details.
2. To study working and types of brakes and dynamometers.
3. To acquaint with working principles and applications of gyroscope and governors.
4. To demonstrate different types of gear trains and its applications.

Course Outcomes:- Learner will able to-

1. analyze gears.
2. select gears
3. analyze and select gear trains.
4. apply the working principles of clutches and its constructional details and analyze working of brakes and dynamometers.
5. can decide the shape of cam profile
6. demonstrate working mechanism of different types of governors and analyze gyroscopic effect on various applications

Unit 1 Kinematics of Spur Gears (08 Hrs.)

Classification and applications of gears, terminology of gearing, law of gearing, velocity of sliding, conjugate action, forms of teeth, path of contact, arc of contact, interference, undercutting, methods to avoid interference and undercutting, effect of centre distance variation, friction between gear teeth, involutometry.

Unit 2 Kinematics of Helical, Bevel and Worm Gears (08Hrs.)

Helical gears: Terminology, virtual number of teeth, torque transmitted,

Spiral gears: terminology and efficiency.

Worm gears & bevel gears: Terminology, geometrical relationships, tooth forces, torque transmitted.

Unit 3 Inertia of Geared Systems and Gear Trains**(08Hrs.)**

Inertia of gear systems, types of gear trains - simple, compound, reverted and epicyclic gear trains, analysis of epicyclic gear trains, torque on sun and planet gears, compound epicyclic gear trains, bevel epicyclic gear trains.

Unit 4 Friction, Clutches, Brakes & Dynamometers**(08Hrs.)****Friction:**

Friction and types of friction, laws of friction, Friction in turning pairs, Friction circle, Friction axis, Friction in 4 bars and single slider crank mechanism.

Friction clutches:

Pivot and collar friction, plate clutches, cone clutch, centrifugal clutch, torque transmitting capacity.

Brakes & dynamometers:

Different types of brakes, Shoe brakes, External and internal shoe brakes, Block brakes, Band brakes, Band and block brakes, Braking torques, Different types of absorption and transmission type dynamometers.

Unit 5 Cams & Followers**(08 Hrs.)**

Types of cams and followers, analysis follower, of standard motions to the for a determination of cam profiles analysis of cams given follower motions, circular arc with specified contours- cam, tangent cam,

Eccentric cam, methods of control: pressure angle, radius of curvature and undercutting, kinematically equivalent system, jump phenomenon. Introduction to advanced cam curves.

Unit 6 Gyroscopes and Introduction to Governors**(08Hrs.)**

Gyroscopes, concept of gyroscopic action, gyroscopic couple, effect of gyroscopic couple on ship, airplanes, and vehicles. Introduction to Governors, Types centrifugal governor (Watt, Porter, and Hartnell governor only), controlling force, governor effort and governor power with numerical treatment, sensitivity, stability, isochronism and hunting, friction, insensitiveness. (No Numerical Treatment)

Term Work:

The term work shall consist of the following experiments:

1. To draw conjugate profile for any general type of gear tooth.
2. To generate involute gear tooth profile and to study the effect of undercutting and rack shift using model.
3. To study various types of gearboxes such as: Industrial gear box, Synchromesh gearbox, Differential gearbox, or PIV gearbox.
4. To measure transmitted torque and holding torque of an epicyclic gear train.
5. To study the slip in belt drives.
6. To draw cam profiles for various types of follower motions.
7. To verify gyroscopic couple.
8. To determine the characteristic curves for centrifugal governor and to find its coefficient of insensitiveness and stability.

Text Books

1. Ratan S. S., "Theory of Machines", Tata McGraw Hill
2. Beven T, " Theory of Machines", Longman Publication
3. Ballaney P. L. "Theory of Machines", Khanna Publications

Reference Books

1. Hannah and Stephans, "Mechanics of Machines", Edward Arnolde Publication.
2. Shigley J. E. and Uicker, J. J., "Theory of Machines and Mechanisms", International Edition, MacGraw Hill Inc.
3. Jagdish Lal, "Theory of Machines ", Metrapolitan Book Co. Pvt. Ltd. N. Delhi.
4. Khurmi, R. S. and Gupta, J. K." Theory of Machines", Eurasia Publishing House (Pvt.) Ltd., New Delhi.
5. Ghosh Malik, "Theory of Mechanism and Machines", East-West Pvt. Ltd.
6. Dr.V. P. Singh, "Theory of machine", Dhanpatrai and Son.
7. C. S. Sharma & Kamesh Purohit," Theory of Machine and Mechanism", PHI.
8. David H. Myszka, "Machines and Mechanism", PHI.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV,V and VI

ADVANCED COMPUTER GRAPHICS & SOLID MODELLING

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Pract..	50 Marks	01
	Total	150 Marks	04

- Course Prerequisite:-**
1. Knowledge of basic concept of Engineering Graphics.
 2. Basic knowledge of Mechanical Engineering drawing.
 3. Basic knowledge of Computer Hardware and AutoCAD Software.

- Course Objective:-**
1. To introduce new and exciting field of Intelligent CAD with particular focus on engineering product design.
 2. To develop a holistic view of initial competency in engineering design by modern computational methods.
 3. To expose the student to contemporary computer design tools for mechanical engineers.
 4. To prepare the student to be an effective user of a CAD system.
 5. Model the 3-D geometric information of machine components including assemblies, and automatically generate 2-D production drawings.
 6. Understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program.

- Course Outcomes:-** Able to understand-
1. Algorithms to generate, points, lines, circles ellipse and different polygons
 2. Basic transformations in 2D modelling
 3. Different transformations in 3D modelling
 4. Geometric modelling of curves
 5. Parametric representation of analytic and synthetic surfaces
 6. Basics of solid modelling and data exchange in CAD/CAM

Unit 1	Output primitives	(06 Hrs.)
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Points and Lines, Line Drawing Algorithms-DDA Algorithm, Bresenham's Line Drawing Algorithms, Thick Line Segments. Circle and Ellipse Generation Algorithm. Polygon-Polygon Filling, Flood Fill, Boundary Fill, Scan Line Fill.

Unit 2	Two Dimensional Transformations	(06 Hrs.)
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Basic Transformation – Translation, Rotation, Scaling, Reflection, Shear, Matrix Representation and Homogeneous Co-Ordinates. Composite Transformations.

Unit 3	Three-Dimensional Transformations	(06 Hrs.)
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Introduction to 3D, Translation, Rotation, Scaling, Reflection, Shear, Affine and Perspective Geometry. Orthographic, Axonometric, Oblique Projection.

Unit 4 Geometrical Modeling (06 Hrs.)

Mathematical Representation of Curves, Wire Frame Model, Wire Frame Entities.
Parametric Representation of Analytic Curves- Lines, Circles, Ellipses. Parametric Representation of Synthetic Curves- Hermit, Cubic-Splines, Bezier Curve, B-Spline Curve.
Curve Manipulation: Displaying, Evaluating Points on Curve, Blending Segmentation.
Surface Manipulation: Displaying, Evaluating Points & Curve on Surfaces, Segmentation, Trimming, Intersection, Projection and Transformations.

Unit 5 Surface Modeling (06 Hrs.)

Surface Models, Surface Entities, Surface Representation.
Parametric Representation of Analytic Surfaces- Plan Surfaces, Ruled Surfaces, Surface of Revolution, Tabulated Cylinder.
Parametric Representation of Synthetic Surfaces- Hermit, Bi-cubic Surfaces, Bezier Surfaces, B-spline Surfaces.

Unit 6 Solid Modeling (06 Hrs.)

Solid Models, Solid Entities, Solid Representation, Fundamentals of Solid Modeling, Boundary Representation, Constructive Solid Geometry, Sweep Representation.
CAD/CAM Data Exchange: Evaluation of data exchange formation, IGES data representation & Structure, PDES Data representation, STEP Architecture.

Term Work:

The term work shall consist of record of eight experiments from the following:

1. DDA Line Drawing Algorithm.
2. 2 D Transformation.
3. 3D Transformation.
4. Assignment on 2-D sketching with geometrical and dimensional constraints using any commercially used solid modeling software.
5. Assignment on parametric solid modeling of a machine component using various commands and features of the software.
6. Assignment on solid modeling of the parts of a machine (min. 5 components).
7. Assignment on assembly modeling of the parts modeled in assignment 6 using proper mating conditions and generation of exploded view.
8. Generation of production drawings of the parts and assembly with appropriate tolerancing.

Reference Books

1. Ibrahim Zeid and R. Siva-Subramaniam – “CAD/CAM- Theory and Practice”, Tata McGraw Hill, Publishing Co. 2009.
2. Rao P. N., “CAD/CAM”, Tata McGraw Hill.
3. Foley, Van Dam, Feiner and Hughes, “Computer Graphics Principles and Practice”, Second edition, Addison-Wesley, 2000.
4. Martenson, E. Micheal, “Geometric Modelling”, John Wiley & Sons, 1995.
5. Hill Jr, F.S., “Computer Graphics Using OpenGL”, Pearson Education, 2003.

6. Rao Singeresu S., "Engineering Optimization-Theory and Practice", New Age International Limited Publishers, 2000.
7. Ray C. Johnson. "Optimum Design of Mechanical Elements", Wiley, John & Sons, 1981.
8. Radhakrishnan P., Subramanyam S., "CAD/CAM/CIM", New Age International.
9. Ramamurti V., "Computer Aided Mechanical Design and Analysis", Tata McGraw Hill-1992.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

HEAT AND MASS TRANSFER

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours / Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	05

- Course Prerequisite:-**
1. Knowledge of basic concepts in Physics.
 2. Basic information of Thermodynamics.
 3. Basic knowledge of Fluid Mechanics

- Course Objective:-**
1. The student should understand the scope, objective and application of heat and mass transfer and its applications.
 2. They will also learn the three major modes of heat transfer *viz.*, conduction, convection, and radiation. In addition to these three main modes of heat transfer, students will also learn the phenomena of heat transfer during phase change

- Course Outcomes:-**
- Able to understand-
1. Formulate basic equations for heat transfer problems.
 2. Concept of thermal insulation in one dimensional steady state heat conduction
 3. Analysis of extended surfaces and concept of unsteady heat conduction
 4. Concept of heat transfer by forced and natural convection
 5. Various laws related to thermal radiation and concepts of condensation and boiling
 6. Preliminary analysis of heat exchangers and concept of mass transfer

Unit 1 Introduction and Basic Concepts

(08 Hrs.)

Overview of subject, Modes of heat transfer, Applications of heat transfer in different fields of engineering, Fourier's law of conduction, Newton's law of cooling, Stefan-Boltzmann's law of radiation, Isotropic and anisotropic

materials, Three dimensional heat conduction equation in Cartesian coordinate for anisotropic material for steady state condition, and reduction to Fourier equation, Laplace equation and Poisson's equation, Three dimensional heat conduction equation in cylindrical and spherical coordinates (no derivation), Thermal diffusivity.

One dimensional steady state heat conduction:

One dimensional steady state heat conduction through a plane wall, cylindrical wall and sphere, Analogy between heat flow and electricity, heat conduction through a composite slab, cylinder and sphere, Overall heat transfer coefficient, Concept of thermal resistance and conductance.

Unit 2 Thermal Insulation (08 Hrs.)

Purpose of insulation, critical radius of Insulation, Economic thickness of Insulation, Thermal contact resistance, thermal conductivity and its variation with temperature for metals, non-metallic solids, gases and liquids, one dimensional problems of variable thermal conductivity.

One Dimensional Steady State Heat Conduction with Internal Heat Generation:

Symmetrical boundary condition in plane wall, conduction in solid, hollow cylinder and sphere, practical problems of heat generation.

Unit 3 Extended Surfaces (08 Hrs.)

Heat transfer through extended surfaces, Classification of fins, Derivation of differential equation for fins with constant cross sectional area with insulated tip boundary conditions, Effectiveness and efficiency of a fin, design of thermo well.

Unsteady state heat conduction :

System with negligible internal resistance, Biot & Fourier numbers, Criteria for neglecting internal temperature gradient, Concept of time constant

Unit 4 Convection (08 Hrs.)

Introduction to hydrodynamic and thermal boundary layer, Laminar & turbulent flow over & closed conducts, convection heat transfer coefficients & order of magnitude, Dimensional analysis of free & forced convection, physical significance of the dimensionless parameters, Nusselt's number, Reynold's number, Prandtl's number, Grashoff's number, Stanton number, Rayleigh number.

Forced Convection

Empirical correlations for heat transfer in laminar and turbulent flow over a flat plate and in a circular pipe, Concept of hydraulic diameter, reference temperature.

Natural Convection

Flow patterns, Empirical correlations for free convection, heat transfer over horizontal, vertical plate.

Unit 5 Thermal Radiation (08 Hrs.)

Fundamental concepts, Black body radiation, Kirchoff's law, Planck's distribution law, Wein's displacement law, Stefan Boltzmann law, Surface emission, relative properties of a surface, Grey, black and real surface, solid angle and intensity of radiation, Lambert's Cosine law, Heat exchange by radiation between two finite black surfaces, Radiation shape factor, use of shape factor charts, Irradiation, radiosity, Electrical network, Heat exchange between two infinitely parallel planes and cylinders, Radiation shields.

Condensation and Boiling

Film and drop-wise condensation, heat transfer coefficient for laminar film condensation on vertical and inclined plate (descriptive treatment), Correlations for condensation on and inside tubes, modes of pool boiling, critical heat flux, pool boiling.

Unit 6 Heat Exchangers (08 Hrs.)

Classification, Applications of heat exchangers, Heat exchanger analysis, Logarithmic Mean Temperature Difference for parallel and counter flow heat exchangers, LMTD correction factors, fouling factor. The effectiveness: NTD method for parallel and counter flow heat exchangers, design considerations for heat exchangers

Mass Transfer:

Introduction, modes of mass transfer, analogy between heat and mass transfer, mass diffusion (mass and mole basis), Fick’s law of diffusion

Term Work:

Term work shall consist of any eight experiments

1. Determination of thermal conductivity of insulating powder.
2. Determination of thermal conductivity of metal rod.
3. Determination of thermal conductivity of different materials in composite wall.
4. Temperature distribution along a length of a fin and determination of fin effectiveness and fin efficiencies.
5. Determination of film heat transfer coefficient on a hollow vertical tube heated from inside.
6. Determination of film heat transfer coefficient for turbulent flow inside a pipe.
7. Determination of emissivity of a non-black surface.
8. Determination of Stefan-Boltzmann constant.
9. Performance of a parallel flow and counter flow heat exchanger.
10. Calibration of thermocouple.
11. Demonstration of a heat pipe.
12. CFD simulation of conduction or convection problem.

Text Books

1. Incropera F. P., Dewitt D. P., “Fundamentals of Heat and Mass Transfer”, John Wiley.
2. Cengel Y. A. and Ghajar A. J., “Heat and Mass Transfer – Fundamentals and Applications”, Tata McGraw Hill Education Private Limited.
3. Sukhatme S. P., “A Textbook on Heat Transfer”, Universities Press.
4. Mills A. F., “Basic Heat and Mass Transfer”, Pearson.

Reference Books

1. Venkatesan S. P., “Heat Transfer”, Ane Books Pvt. Ltd.
2. Holman J. P., “Fundamentals of Heat and Mass Transfer”, McGraw – Hill publication.
3. Nag P. K., “Heat & Mass Transfer”, McGraw Hill Education Private Limited.
4. Thirumaleshwar M., “Fundamentals of Heat and Mass Transfer”, Pearson Education India.
5. Sachdeva R.C., “Fundamentals of Engineering Heat and Mass Transfer”, New Age Science

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

ADVANCED MANUFACTURING PROCESSES

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal	10 Marks	
	Evaluation	10 Marks	
	Total	100 Marks	03

Course Prerequisite:- Student should have knowledge of

1. Conventional manufacturing Processes
2. Engineering Drawings and design
3. Engineering materials and its properties

Course Objective:- Provide knowledge of sheet metal working, non-conventional processes, NC/CNC machine, robotics and processing of materials.

Course Outcomes:- Learner will be able to understand

1. Various concepts related to sheet metal working
2. Design of jigs and fixtures
3. Various non-conventional machining processes
4. Concepts of CNC programming and robotic applications in manufacturing industries
5. Concept of various heat treatment processes for altering the mechanical properties of steels and alloys
6. Different methods of manufacturing of components by power metallurgy and composite materials

Unit 1 Sheet Metal Working (06 Hrs.)

Study of various press tools and presses, Study of various processes like Piercing, Notching forming, drawing, coining *etc.* Elements of dies and punches. Types of dies – simple, compound, combination and progressive dies and punches for various press working operations such as punching, blanking, drawing, bending, forming, coining *etc.* Calculations of clearances, centre of pressure, forces, press tonnage, blank size, number of draws, strip layout, sheet utilization, ratio. Methods of reducing forces. Design of simple blanking die, Progressive die, & Deep Drawing die.

Unit 2 Jigs and Fixtures (06 Hrs.)

Definitions, elements, Basic principles and guide lines for design. Location, types of locators and their selection. Clamping, basic principles, types and their selection, indexing methods. Design of drilling jigs. Design of milling & Turning fixtures.

Unit 3 Non-Conventional Machining (06 Hrs.)

Concept of non-conventional machining. Study of processes like, Electrochemical Machining, Electro Discharge Machining, Abrasive Jet Machining, Plasma Machining, LASER Machining, and Ion beam Machining, Ultrasonic Machining, Electron Beam Machining with reference to process capabilities, working principle, Material removal rate, Advantages and limitations.

Unit 4 C. N. C. Machine Tools & Robotics

(06 Hrs.)

Principle of operation of CNC, Types, Features, Direct numerical control (DNC) and its applications. NC part programming, axes nomenclature of CNC machines. Manual part programming using. Computer aided part programming using APT. Types of Robots, construction and operation of robots, robot axes and configuration, robot applications, robot selection and economic justification. FMS, FMC and Adaptive Control.

Unit 5 Heat Treatment of Steels and Alloys

(06 Hrs.)

Iron and Iron Carbide Equilibrium Diagram, Transformation product of Austenite, Martensitic transformation, Time- Temperature. Transformation curve, Heat treatment of steels, Annealing, Normalizing, Hardening and tempering, Hard ability, Jominy End quench test, Surface hardening heat treatments, Carburizing, Nitriding, Carbonitriding, Induction and flame hardening, Tool steels, Classification, Properties and application of tool steels, Heat treatment of tool steels.

Unit 6 Powder Metallurgy , Ceramics and Composite Manufacturing

(06 Hrs.)

Important characteristics and methods of powder production, different techniques - pressing, extruding, isostatic moulding, fiber metal process, sintering and hot pressing.

Introduction to composite materials, basic concepts, constituent materials for composites, advantages, limitations of composites and application of composites. Manufacturing of Composites: Introduction, molding process for polymer matrix composites, metal matrix composites, ceramic matrix composites.

Text Books

1. Kodgere V. D., "Material Science and Physical Metallurgy", Everest Publication, Pune
2. Donaldson, Lacain and Goold, "Tool Design", Tata McGraw Hill
3. Kempster M. H. A., "Introduction to Jigs and Fixtures Design", Viva Books Ltd.
4. ASTME, "Tools Engineering Handbook"
5. Sharma P. C., "Production Engineering", Khanna Publication
6. Hoffman, "Introduction to Jigs and Fixture", Galgotia Publishers
7. Radhakrishnan P. and Subramanyan CAD/ CAM/CIM Wiley Eastern Ltd.
8. Rao P. N., Tiwari N. K. and Kundra T. K., "Computer Aided Manufacturing", Tata McGraw Hill
9. Groover M. P., "Automation, Production System and Computer Integrated Manufacturing",

Reference Books

1. Amstead B. H., Philip F, Ostwald and Myron L, Begeman, "Manufacturing Processes" John Wiley and sons, eighth edition.
2. Benidict G. F., "Advanced Manufacturing Processes": Marcel Dekker Publisher
3. Cook N. "Manufacturing Analysis", Addison- Wesley Publishing Co., 1966.
4. Weller, "Non-traditional Machining Process": SME Publications.
5. Mishra P. K., "Non-Conventional Machining Process", Narosa Publication.
6. "Production Technology: HMT Ltd", McGraw-Hill Pub. 1986.
7. "Machining Data Handbook: 3rd (Third) edition" Machinability Data Center Technical Staff, 1980

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

PROFESSIONAL SKILLS DEVELOPMENT-V

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	100 Marks	Theory: 04 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	100 Marks	04

Course Pre-requisites

The Students should have knowledge of

1. Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2. An overall idea about vocabulary, Public speaking skills taught in the last semester
3. Knowledge of writing skills, importance of professionalism in emails and letters.
4. Knowledge on handling criticism and the concept of conflicts.
5. Awareness of the interpersonal skills like team work and its importance in the corporate sector.

Course Objectives

The Professional Skills Development 5 is an extension of PSD- 4 with focus on the remaining topics of Aptitude, Reasoning and Grammar. The further complex concepts of Aptitude and Grammar aims to acquaint them with the topics and also provide them techniques to solve the question with tricks/methods in a very short period. The English communication and soft skills section of PSD-5 focuses on the higher aspects of soft skills training students on how to handle Group Discussions during placement process and other topics such as grooming them on how to handle conflicts effectively in the corporate scenario and also the correct attitude/approach to solve problems collectively from a team's perspective and also individually.

Course Outcomes

The student should be able to

1. Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics of tenses and Sub- verb agreement relevant from the recruitment point of view.
2. Use Mnemonics, and learn appropriate strategies to handle complex topics in GDs and ways to handle them. Students would learn the appropriate ways of stating opinions, disagreeing or communicating during the Group Discussion Process.
3. Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
4. Students would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life. It would be a continuation of the topic covered during the previous semester PSD-4
5. Learn to handle Case studies effectively and incorporate the right approach towards Case Studies asked during the recruitment process.
6. Apply 5-6 positive strategies to resolve conflicts arising during team work

Course Contents

Unit I	Aptitude (Maths, Logical Reasoning, English)	(24 Hrs.)
	<ul style="list-style-type: none"> • Maths <ul style="list-style-type: none"> ▪ Time, Speed & Distance ▪ Time & Work ▪ Simple Interest & Compound Interest in continuation ▪ Maths Revision • Logical Reasoning <ul style="list-style-type: none"> ▪ Data Interpretation ▪ Data Sufficiency ▪ Set Theory & Syllogisms ▪ Reasoning Revision 	

	<ul style="list-style-type: none"> • English <ul style="list-style-type: none"> ▪ Grammar – II – (Adjective, Verb, Sub- Verb Agreement) ▪ Grammar- (Tenses) ▪ Vocabulary ▪ Verbal Ability- Revision 	
Unit II	Soft Skills & English Communication	(24 Hrs.)
	<ul style="list-style-type: none"> • Situational Conversation • Situational Writing • GD Orientation • Mock GD-1 • Mock GD-2 • Mock GD-3 • Conflict Resolution • Problem Solving Skills • Time- Management Skills • Handling Case Studies • Management Games • Business Meeting Etiquettes 	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		

Department of Mechanical Engineering

Syllabus: Semester VI

MACHINE DESIGN-II

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours / Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	05

Course Prerequisite:-

Student should have knowledge of

1. Fundamentals of engineering Drawing
2. Analysis of forces
3. Utilizing the principles of drafting and strength of materials.
4. Basics of kinematics of gears in transmission system

Course Objective:-

1. Reinforce the philosophy that real engineering design problems are open-ended
2. Give practice in longer open-ended problems using design methodology
3. Enable students to apply engineering tools/techniques to product design
4. Broaden skills in team work, critical thinking, communication, planning and scheduling through design projects
5. Enable students to consider safety, ethical, legal, and other societal constraints in execution of their design projects
6. Enable students to attain the basic knowledge required to understand, analyze, design and select machine elements

Course Outcomes:-

Learner will able to-

1. understand the concept of design for various manufacturing processes in Mechanical Engineering
2. understand the various concepts related to design of spur gears
3. understand the various concepts related to design of helical gears
4. the procedure for selection of different types of rolling contact bearings for different applications
5. understand the various concepts related to sliding contact bearings
6. technical details about belts, ropes and chain drives

Unit 1 Design For Manufacture

(08 Hrs.)

General principles of design for manufacture & assembly (DFM & DFME), Principles of design of casting & forging, Design for machining, Design for powder metallurgy, Design for welding.

Unit 2 Design of Spur Gears

(08 Hrs.)

Gear drives, Classification of gears, Selection of types of gears, Standard system of gear tooth.

Spur Gears: Number of teeth & face width, Types of gear tooth failure, Desirable properties & selection of gear materials, Force analysis, Beam strength, Velocity factor, Service factor, Load concentration factor, Effective load on gear, Wear strength, Estimation of module based on beam

& wear strength, Gear design for maximum power capacity, Estimation of dynamic tooth load by velocity factor, Spott's equation, Buckingham's equation, Methods of gear lubrication. Introduction to Gear design standards like AGMA, IS.

Unit 3 Design of Helical Gears (08 Hrs.)

Transverse & normal module, virtual number of teeth, Force analysis, Beam & wear strength, Effective load on gear tooth, Estimation of dynamic load by velocity factor, Spott's equation, Buckingham's equation.

Unit 4 Rolling Contact Bearing (08 Hrs.)

Equivalent bearing load, Load life relationship, Selection of bearing life, Selection from manufacturer's catalog, Taper roller bearing, Design for cyclic load & speed, Bearing with probability of survival other than 90%, Lubrication & mounting construction materials, Selection of oil seals & gaskets, Pre loading, Types of failure of bearings and its remedies.

Unit 5 Sliding Contact Bearing (08 Hrs.)

Basic modes for lubrication, Viscosity. Effect of temperature on viscosity, Viscosity index, Additives, Greases, Selection of lubricants. Viscous flow through rectangular slot, Load carrying capacity & flow requirement of hydrostatic step bearing, Energy losses, Hydrodynamic lubrication, Reynolds equation, Sommerfield number, Raimondi & Boyd's method, Temperature rise in hydrodynamic bearings, Parameters of bearing design, Length to diameter ratio, Unit bearing pressure, Radial clearance,

Minimum oil film thickness, Constructional details of bearings, Bearing materials & their selection, Sintered metal bearings, Comparison of rolling & sliding contact bearing.

Unit 6 Belts, Ropes and Chain Drives (08 Hrs.)

Materials and construction of flat and V belts, geometric relationships for length of belt, power rating of belts, concept of slip & creep, initial tension, effect of centrifugal tension, maximum power condition, selection of flat and V belts from manufacturer's catalogue, belt tensioning methods, relative advantages and limitations of flat and V belts, construction and applications of timing belts .Wire Ropes (Theoretical Treatment Only): Construction of wire ropes, lay of wire ropes, stresses in wire rope, selection of wire ropes, rope drum construction and design. Chain Drives (Theoretical Treatment Only): Types of power transmission chains, Geometry of chain Polygonal effect of chain, Modes of failure for chain, Lubrication of chains

Term Work:

1. Term work shall consist of two design projects by using Autocad/manually. Design projects should be in the form of system design comprising of machine elements studied in syllabus. Design data book should be used extensively.
2. Four assignments- based on remaining topics.
3. Report- Industrial visit to gear manufacturing unit.

Text Books

1. Shigley J. E. and Mischke C.R., "Mechanical Engineering Design", McGraw Hill

Publication Co. Ltd.

2. Spotts M. F. and Shoup T. E., "Design of Machine Elements", Prentice Hall International
3. Bhandari V. B., "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.
4. Juvinal R. C., "Fundamentals of Machine Components Design", John Wiley and Sons.

Reference Books

1. Black P. H. and O. Eugene Adams, "Machine Design", McGraw Hill Book Co. Inc.
2. William C. Orthwein, "Machine Components Design", West Publishing Co. and Jaico Publications House.
3. Hall A.S., Holowenko A. R. and Laughlin H.G., "Theory and Problems of Machine Design", Schaum's Outline Series.
4. Sharma C. S. and Kamlesh Purohit, Design of Machine Elements, PHI Learning Pvt. Ltd.
5. Aggarwal D. K. & Sharma P.C., "Machine Design", S. K. Kataria and Sons
6. P. C. Gope, "Machine Design: Fundamentals and Applications", PHI Learning Pvt. Ltd.
7. "Design Data - P.S.G." College of Technology, Coimbatore.
8. Bhandari, V. B., "Machine Design data book", Tata McGraw Hill Publication Co. Ltd.
9. Mahadevan K., Balveera Reddy K., "Design Data Handbook for Mechanical Engineers", CBS Publishers

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

REFRIGERATION AND AIR CONDITIONING

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	04

Course Prerequisite:-

1. Knowledge of basic concepts in heat transfer.
2. Basic information of thermodynamics.
3. Basic knowledge of fluid mechanics.

Course Objective:-

1. To study fundamental principles and different methods of refrigeration and air conditioning.
2. Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or Refrigerant property tables.
3. Comparative study of different refrigerants with respect to properties, applications and Environmental issues.
4. Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
5. Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems.

Course Outcomes:-

Able to understand-

1. Different methods of refrigeration systems.
2. Simple vapour compression system and different multi-pressure systems
3. Vapour absorption system and different types of refrigerants
4. Various psychometric processes used in air conditioning
5. Different components of refrigeration and air conditioning systems
6. Details of ducts for air conditioning system

Unit 1 Methods of Refrigeration

(06 Hrs.)

Ice refrigeration, evaporative refrigeration, refrigeration by expansion of air, refrigeration by throttling of gas, vapour refrigeration system, steam jet refrigeration system, refrigeration by using liquid gases, Thermoelectric and ultrasound refrigeration.

Air refrigeration system: Definition, refrigeration load, unit of refrigeration, Reverse Carnot cycle, Bell Coleman cycle, Methods of air refrigeration systems, simple air cooling system, boot strap system, reduced ambient system, regenerative system.

Unit 2 Simple Vapour Compression System

(06 Hrs.)

Limitations of air refrigeration system, development of vapour compressor cycle, effect of operating parameters on VCC, use of P-H charts, actual vapour compression cycle.

Multi Pressure Systems Introduction to multistage compression, two stage compression with flash gas removal, with liquid intercooler, Cascade systems.

Unit 3 Vapour Absorption System

(06 Hrs.)

Introduction, Simple Vapour absorption system, practical vapour absorption system, COP of an ideal vapour absorption system, Water ammonia system, Electrolux refrigerator, Lithium-Bromide absorption System, Comparison between VCC and VAC (no mathematical treatment).

Refrigerants: Desirable properties of refrigerants, classification of refrigerants, secondary refrigerants, alternative refrigerants for CFC's, HCFC'S, ozone depletion potential (ODP), Global warming Potential (GWP).

Unit 4 Psychrometry

(06 Hrs.)

Introduction, Psychrometric terms, Use of Psychrometric charts, Psychrometric processes, adiabatic saturation temperature, evaporative cooling, by pass factor of coil, efficiency of coil, adiabatic mixing of two air streams, Air washers, Thermodynamics of human body with environment effective temperature, comfort chart, factors influencing human comfort.

Unit 5 Air Conditioning Systems

(06 Hrs.)

Definition, factors, equipment used, classification, all air system, all water system, air water system, unitary and central air conditioning, in filtration and ventilation loads, concepts of SHF, RSHF, ERSHF, ADP.

Components of Refrigeration and Air Conditioning System:

Compressors, condensers, evaporators, expansion devices such as capillary tubes, automatic expansion valves, thermostatic expansion valves and controls such as thermostats, humidistat, Solenoid, Installation, charging, testing and maintenance, study of modern trends in RAC

Unit 6 Ducts

(06 Hrs.)

Introduction, classification of ducts, duct material, pressure in ducts, flow through duct, pressure losses in duct, friction losses, dynamic losses, air flow through simple duct system, equivalent diameter, for determination of duct size.

Food Preservation: Cold storage, control and modified atmosphere (CAMA) storages, mobile refrigeration and air conditioning, refrigerant piping selection, pressure drop, valves, fitting, insulating materials.

Term Work:

The term work shall consist of record of any eight experiments from the following:

1. Test on vapour compression test rig.
2. Test on air conditioning test rig.
3. Test on ice plant test rig.
4. Study of non-conventional refrigeration system.
5. Determination of cooling load of air conditioning system (case study).
6. Determination of refrigeration load in cold storage (case study / visit).
7. Study of installation /operation/maintenance practices for refrigeration system.
8. Visit to any refrigeration or air conditioning plant.
9. Trial on heat pump test rig
10. Test on vapour absorption test rig.

11. Market survey of various refrigerating & air conditioning systems which include the equipments with related specifications, manufacturer, cost. (minimum 3 to 4 equipments)
12. Determination of energy efficiency of refrigeration or air conditioning system.

Text Books/ Reference Books

1. Arora C. P., “Refrigeration and Air Conditioning”, Tata McGraw Hill
2. Arora S. C., Domkundwar S., “Refrigeration and Air Conditioning”, Dhanpat Rai and Company
3. Dossat Ray I, “Principal of Refrigeration”, Wiley Eastern Limited
4. Manohar Prasad, “Refrigeration and Air Conditioning”, Wiley Eastern Limited
5. Khurmi R. S. and Gupta J. K., “Refrigeration and Air Conditioning”, Eurasia Publication House (P) Ltd. New Delhi
6. Stocker W. F. and Jones J. W., “Refrigeration and Air Conditioning”, McGraw Hill International Editions

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

INTERNAL COMBUSTION ENGINES

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Pract.	50 Marks	01
	Total	150 Marks	04

Course Prerequisite:-

1. Knowledge of basic concept heat transfer.
2. Basic information of thermodynamics.

Course Objective:- The student should understand the scope, objective and application of internal combustion engines.

Course Outcomes:- Able to -

1. Know constructional Features of I. C. Engine.
2. Understand fuel supply systems of C. I. and S. I. engines.
3. Acquire knowledge of different systems required for running of I.C. engines
4. Test the thermal and emission performance of I. C. Engines
5. Understand the phenomena of combustion in S. I. and C. I. engines
6. Understand norms for measurement of emissions from I. C. engines

Unit 1	Constructional Features of Reciprocating I. C. Engine	(06 Hrs.)
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Engine components, Engine classification

Cycle Analysis of I. C. Engines:

Fuel air cycle analysis, Comparison of P-V diagram of air standard cycles, Fuel air cycle & actual cycle

Unit 2	Fuel Supply Systems	(06 Hrs.)
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S. I. Engines:

Carburetion, Mixture requirements, Essential parts of modern carburetor, Carburetors used on automobiles, Calculation of A/F ratio, M.P.F.I. system for modern automobile engines.

C. I. Engines:

Functional requirements of an injection system, Typical arrangement of solid injection system, Types of fuel injection system, Fuel pump & fuel injectors, Quantity of fuel & size of nozzle orifice.

Unit 3 I. C. Engine Systems (06 Hrs.)**Ignition System:**

Battery & coil ignition system, Magneto ignition system, Electronic ignition system, Advantage over mechanical contact breaker point system.

Engine Cooling System:

Air cooling, Water cooling, Thermostatic radiators

Lubrication System:

Dry sump lubrication, Wet sump lubrication – Fully pressurized, Oil filters

Governing System:

Quality governing, Quantity governing, Hit & miss governing

Unit 4 Testing & Performance of I. C. Engine (06 Hrs.)

Determination of brake power, Indicated power, Friction power, Determination of brake thermal efficiency, Mechanical efficiency, Volumetric efficiency, Energy balance, Performance characteristics.

Supercharging:

Objects of supercharging, Effects on performance, Limits, Methods of supercharging & turbocharging, Limitation of turbocharging.

Unit 5 Combustion in S. I. Engines (06 Hrs.)

Stages of combustion, Effect of engine variables on ignition lag & flame propagation, Abnormal combustion: Theories, Effects & Controlling measures, Combustion chambers for S. I. engines.

Combustion in C. I. Engines:

Stages of combustion, Ignition delay & factors influencing delay period, Diesel knock & its control, Combustion chambers for C. I. engines.

Unit 6 Emissions & Pollution Control (06 Hrs.)

Emissions from S. I. and C. I. engines & their harmful effects, Catalytic converters, Contemporary & proposed emission norms, BHARAT STAGE- I to IV emission norms, EGR system.

Fuels:

Types of fuels for I. C. engines, Rating of S. I. & C. I. engine fuels, Alternative fuels for I. C. engines & future trends, Hybrid vehicles.

Term Work:

1. Study of carburetor / MPFI system
2. Study of fuel pump & injector.
3. Trial on multi cylinder petrol engine – Morse Test.
4. Trial on diesel engine to determine energy balance & variable load performance.
5. Variable speed trial on petrol / diesel engine.
6. Trial on computerized I. C. engine to plot P – è diagram.
7. Trial / demonstration of smoke meter & exhaust gas analyzer.
8. Study of battery, magneto & electronic ignition system.
9. Study of superchargers & turbochargers.
10. Study of combustion chambers in S. I. & C. I. engines.
11. Study of recent hybrid cars in market

Reference Books

1. Ganesan V., Internal Combustion Engines, Tata McGraw Hill Publishing House
2. M. L. Mathur & R. P. Sharma, A Course in I. C. Engines, Dhanpat Rai & Sons
3. V. M. Domkundwar, A Course in I. C. Engines, Dhanpat Rai & Co.
4. Shrinivasan, Automobile Engines, Tata McGraw Hill Publishing House – CBS Publication

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

MECHANICAL MEASUREMENT & METROLOGY

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours / Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Pract.	50 Marks	01
	Total	150 Marks	05

Course Prerequisite:-	<p>Student should have knowledge of</p> <ol style="list-style-type: none"> 1. Students should have Basic knowledge of Mechanical terms Force, Pressure, Temperature, and Electronics terms like as Voltage, Resistance and Current. 2. Students should have Basic knowledge of Measuring Units, Mathematics, and Various Measurement terms.
Course Objective:-	<p>Student should be able to</p> <ol style="list-style-type: none"> 1. Use various precision measuring instruments <i>viz.</i> Vernier caliper, micrometer <i>etc.</i> 2. Acquire knowledge of different sensors and transducers 3. Acquire knowledge of tolerances, gauges and measurement of surface finish
Course Outcomes:-	<p>Learner will be able to...</p> <ol style="list-style-type: none"> 1. Understand static and dynamic characteristics of measurement systems 2. Know different devices used for linear and angular measurement 3. Measure temperature, pressure, strain and fluid flow using different sensors for various applications 4. Using of concepts like limits, fits and tolerances for designing the limit gauges. 5. Use displacement, velocity, position, force, torque, level sensors for specific applications 6. Measure various screw thread or gear tooth parameters using specific equipment.

Unit 1 Introduction to Measurement systems

(08 Hrs.)

Significance of Measurements, Mechanical Measurements, Classification of Measuring Instruments, Generalized Measurements Systems.

Static Characteristics of Measurement Systems: Sensitivity, Calibration, Accuracy, Linearity, Static Error, Precision, Reproducibility, Threshold, Resolution, Hysteresis, Drift, Span, Range.

Dynamic Characteristics of Measurement Systems: Speed of response and measuring lag, fidelity and dynamic error, overshoot, dead time and dead zone. Standard test inputs: Step, Ramp, Impulse and Sinusoidal Inputs.

Errors in Measurements: Types & Sources of Errors and Uncertainty Analysis in Measurements. Probable Errors.

Unit 2 Introduction to Metrology (08 Hrs.)

Meaning of metrology & its Importance.

Linear Measurement :

Standards - line standard, end standard, wave length standard, classification of standards, precision, and non-precision measuring instrument, slip gauges, Different types of Vernier, Micrometer, Dial Gauges. Concept of Magnification.

Angular Measurement:

Sine bar, Sine center, Uses of sine bar, angle gauge, Auto Collimator, Angle Dekkor, angle slip gauges, Constant Deviation Prism.

Unit 3 Sensors and Transducers (08 Hrs.)

Concept of sensors and transducers. Significance of Transducers in Measurement and Instrumentation System. Classification and Selection Parameters of Transducers. Basic components of DAQ, Concept of signal conditioning.

Strain Measurement: Theory & Classification of Strain gauges, Gauge Factor, Temperature compensation, Wheatstone Bridge Circuit.

Temperature measurement: Resistance Temperature Detector(RTD), Thermocouples & Laws of thermocouples, Resistance Thermometers & Thermistors, Optical Pyrometers

Pressure measurement: Diaphragm Pressure Gauge, Bourdon Tube, Bellows, McLeod Gauge, Piezoelectric Sensor, Tactile Sensor

Flow measurement: Hot Wire anemometer, Thermal flow meters, Electromagnetic flow meter, Ultrasonic Flow meter, Turbine Meter

Unit 4 Tolerances and Gauging (08 Hrs.)

Limits, Fits, Tolerances:

Meaning of limit, Fits and Tolerance, Cost-Tolerance relationship, concept of Interchangeability, Indian Standard System (ISS).

Design of Limits Gauges:

Types, Uses, Taylor's principle, Design of limit gauges. Inspection of geometric parameters: Straightness, Parallelism, Concentricity, Squareness and circularity.

Comparators

Uses, types, advantages and disadvantages of various types of comparators.

Advances in Metrology: Introduction of CMM, Types of CMM

Unit 5: Measurement of Velocity, Displacement, Force, Torque, Level and Acceleration (8 Hrs.)

Displacement, Velocity and Position Sensors: Potentiometer, LVDT, Hall Effect Sensor, optical encoders, Proximity Sensors, Tacho-generator.

Force and Torque Measurement: Load Cell and its different types, Torque measurement using strain gauges, Torsion Meter.

Acceleration Sensors: Displacement Seismic Accelerometer, Strain gauge

Accelerometer, Piezoelectric Accelerometer, Potentiometric Accelerometer

Level measurement & Thickness Measurement: Electrical Methods (Resistive & Capacitive), Laser Level Sensor, Ultrasonic Liquid Level Detector. Thickness measurement using contact and non-contact type

devices.

Unit 6 Measurement of Surface finish, Screw Thread, Gear Metrology (08 Hrs.)

Surface Finish Measurement:

Surface texture, Meaning of RMS and CLA values, Tomlinson's Surface meter, Taylor-Hobson surface meter, grades of roughness, specifications

Screw Thread Metrology:

External screw threads terminologies, floating carriage instruments, pitch and flank measurement of external screw thread, application of Tool Makers Microscope, use of profile projector.

Gear Metrology:

Spur gear parameters, gear tooth thickness measurement, gear tooth Vernier caliper, constant chord method, span micrometer, base tangent comparator.

Interferometry:

Introduction, flatness testing by interferometry, NPL flatness interferometer. Study of measuring machines, recent trends in engineering metrology.

Term Work:

1. Study & Calibration of Thermocouples (J & K-Type)/RTD(PT-100)
2. Study & Calibration of Pressure Measurement, & Vacuum Measurement
3. Measurement of Load/Force using Load Cells
4. Displacement & Angle measurement using LVDT & Encoder Sensor
5. Study of Different Switches & Relays
6. Vibration Measurement using Accelerometer.
7. Level Measurement using Capacitive Transducer.
8. Study of Data Acquisition System and Interfacing of sensors with computer using DAQ Cards (NI DAQ Card)
9. Study of Linear and Non Linear Measuring Instruments.
 - i) Measurement of the surface roughness.
 - ii) Measurement of angle by sine bar/sine center.
 - iii) Measurement of optical surface using Interferometer.
 - iv) Measurements of screw tread parameters using Floating Carriage Micrometer.
 - v) Measurement of gear tooth thickness using gear tooth vernier caliper and span micrometer
 - vi) Study and experiment on profile projector/Tool makers microscope
 - vii) Industrial visit to Automation Company and Inspection & Quality control division of any Industry with detail report.

Text Books

1. Ramchandran K. P., Vijayaraghavan G. K., Balasundaram M. S., "Mechatronics: Integrated Mechanical Electronic Systems", John Wiley & Sons, 2008.
2. Bolton W., "Mechatronics - A Multidisciplinary approach", 4th Edition, Prentice Hall, 2009.
3. Kumar D. S., "Mechanical Measurement & Control", Metropolitan Book Co. Pvt. Ltd. New Delhi, 2007
4. Singh M. D. and Joshi J. G., "Mechatronics", 3rd Edition, Prentice Hall, New Delhi, 2009.
5. Beckwith T. G., Marangoni R. D., Lienhard J. H., "Mechanical Engineering Measurements", Pearson Prentice Hall, 2007
6. Jain R. K., "Engineering Metrology", Khanna Publishers

7. Hume K. J., "Engineering Metrology", Macdonald, 1950
8. Sharp K. W. B., "Practical Engineering Metrology", Pitman Publication, 1970
9. Kuber S. S., "Metrology and Quality Control", Nirali Prakashan

Reference Books

1. Doebelin Ernesto, "Measurement Systems", McGraw Hill International Publication Co. New York, 4th Edition, 1990.
2. Sawhney A. K. and Sawhney P., "Mechanical Measurement and Control", Dhanpat Rai and Company Pvt. Ltd., New Delhi, 12th Edition, 2010.
3. Figliola R. S., Beasley D. E., "Theory and design for mechanical measurements", Wiley India Edition.
4. Alciatore & Hestand, "Introduction to Mechatronics and Measurement System", 4th Edition, Mc-Graw Hill publication, 2011.
5. Bishop (Editor), "Mechatronics – An Introduction", CRC Press, 2006.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

MACHINE TOOL DESIGN

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

- Course Prerequisite:-**
1. Basic knowledge of Mechanisms and Mechanical elements.
 2. Well conversant with different types of Machine Tools.
 3. Basic knowledge of Materials.

Course Objective:- To be able to design the various elements of machine tools.

- Course Outcomes:-**
1. Understand the fundamentals of machine tool design.
 2. Select the type of gear box for applications in machine tool and design the sliding cluster gear box.
 3. Understand the design considerations for machine tool structures
 4. Select the guide ways and design the power screws.
 5. Design the spindle, select the spindle bearings and use acceptance test.
 6. Design of cams for single spindle automate and maintenance and repair of machine tool.

Unit 1 Introduction to Machine Tool Drives and Mechanisms (06 Hrs.)

General Principles of Machine Tool Design: Working and Auxiliary Motions in Machine Tools. Parameters Defining. Working Motions of a Machine Tool. Machine Tool Drives. Hydraulic Transmission and its Elements. Mechanical Transmission and its Elements. Techno-Economical Prerequisites for Undertaking the Design of New Machine Tool. General Requirements of Machine Tool Design. Engineering Design Process Applied to Machine Tools. Layout of Machine Tools, Modular Concept of Machine tool design.

Unit 2 Regulation of Speed and Feed Rates (06 Hrs.)

Aim of speed and feed rate regulation. Stepped regulation of Speed: Design of speed box – Design of Feed Box – Machine Tool Drives using Multiple

Speed Motions–Special Cases of Gear Box Design–General Recommendations for Developing the Gearing Diagram–Step less Regulation of Speed and Feed Rates, VFD and VVFD drives-Design Considerations. Motors: three phase induction motors-stepper motor, servo motor and universal motor.

Unit 3 Design of Machine Tool Structures (06 Hrs.)

Functions of Machine Tool Structures and their requirements – Design criteria for machine tool structures – Materials of machines Tools structures
 – Static and Dynamic stiffness – Profiles of machine tool structures – Basic Design procedure of machine tool structures – Design of Beds – Design of Columns – Design of Housings – Design of Bases and Tables – Design of Cross Rails, Arms, Saddles and carriages – Design of Rams.

Unit 4 Design of Guide-ways and Power Screws (06 Hrs.)

Functions and types of Guide-ways – Design of Slide-ways – Design criteria and calculations for slide-ways – Guide-ways operative under liquid friction conditions. Design of Anti-Friction Guide-ways – Combination Guide ways –Protecting devices for slide-ways

Design of power screws (Sliding & Rolling friction), Preloading of power screws.
 Design with reference to advanced machine tools.

Unit 5 Design of Spindles and Spindle Supports (06 Hrs.)

Functions of Spindle Unit and requirements – Materials of Spindles – Effect of machine tool compliance on machining accuracy- Design calculations of spindles
 Anti-friction bearing – Sliding bearings. Preloading of bearings. Bearings selection for machine tools.

Acceptance tests for Machine Tools:

Acceptance tests: Object and Procedure for acceptance test, Instruments required, sequence of acceptance test, standard acceptance test chart.ISO 230-1: 1996, ISO-2:2014.

Unit 6 Automatic Drives for Machine Tools (06 Hrs.)

Principles of automation. Automatic lathes with mechanical control. Design of cams for automatic screw cutting machines. Automatic loading and feeding of work pieces. Transfer devices in automatic machine tool systems. Modular design and unit heads for machine tools. Automatic in- process gauging.

Maintenance and repair of Machine Tools:

Types of Maintenance, Break down and preventive Maintenance, Organization of Maintenance department, Economic aspects of Preventive Maintenance, Restoration techniques.

Text Books / Reference Books

1. Basu S. K., “Design of Machine Tools”, Allied Publisher, 1989.
2. Sen G. S. & Bhattacharya, “Principles of Machine Tools”, New Central Book Agency, Calcutta – 1986.
3. Acherkan N., “Machine Tool Design”, Vol. 2 & 3 Mir publishers, Moscow, 1968.
4. Mehta N. K., “Machine Tool Design”, TMII.
5. Russe W. Henke, “Introduction to Fluid Power Circuits and Systems”, Addison Wesley, 1970
6. Koenigs Berger & Tlusty, “Design of Machine Tools”, Pergaman Press 1970.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

ENERGY AUDIT AND MANAGEMENT

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Total	150 Marks	03

Course Prerequisite:- Student should have knowledge of

1. Basic Physics
2. Basic Electrical Engineering
3. Basic Thermal Engineering
4. Mathematics

Course Objective:-

1. Understand basic energy conversion, conservation and management principles
2. Identify sources of energy loss and target savings
3. Understand design of waste heat recovery systems, efficient power cycles and power generation systems
4. To enable students in carrying out life cycle cost analysis and budgeting

Course Outcomes:-

1. To understand the need for energy conservation and its management
2. To know procedure for balance of energy and material in different processes
3. To conduct economic analysis of energy conservation measures
4. To understand a system of electrical energy management
5. To understand a system of thermal energy management
6. Conduct energy audits and formulate & implement energy conservation strategies

Unit 1 Energy Conservation: (06 Hrs.)

Energy Conservation and its Importance; Energy Strategy for the Future; The Energy Conservation Act, 2001 and its Features

Energy Management:

Definition & Objectives of Energy Management; Importance; Indian need of Energy Management; Duties and responsibilities of energy managers.

Unit 2 Material and Energy Balance (06 Hrs.)

Basic Principles, Sankey diagrams, Material balances for different processes, Energy balances, heat balances, Methods for preparing process flow chart, Procedure to carry out the material and energy balance in different processes.

Unit 3 Economic Analysis of Energy Conservation Measures (06 Hrs.)

Retrofit: Power plant retrofit, Home energy retrofit.

Economics: Fundamentals: Cash flows, Inflation Rates, Time Points and Periods, Discount Rates, Cost of Capital, Present value, Taxes, Uncertainty and Risk Economic Measures: Net Present Value, Total Life-Cycle Cost, Revenue Requirements, Internal Rate of Return, Modified Internal Rate of Return, Simple Payback Period, Discounted Payback Period, Benefit-to-Cost Ratios, Savings-to-Investment Ratios, Profitability index estimation

Unit 4 Electrical Energy Management (06 Hrs.)

Supply side: Methods to minimize supply-demand gap, renovation and modernization of power plants, reactive power management, HVDC, and FACTS. Demand side: conservation in motors, pumps and fan systems; energy efficient motors. Case Studies on Electrical Energy Management

Unit 5 Thermal energy Management (06 Hrs.)

Energy conservation in boilers, steam turbines and industrial heating systems; Application of FBC; Cogeneration and waste heat recovery; Thermal insulation; Heat exchangers and heat pumps; Building Energy Management. Case Studies on Thermal Energy Management

Unit 6 Energy Audit (06 Hrs.)

Energy Audit: Types and Methodology; Scope of Energy Audit , Energy Audit Reporting Format; Understanding Energy Costs; Benchmarking and Energy Performance; Matching Energy Usage to Requirement; Maximizing System Efficiency; Fuel and Energy Substitution; Energy Audit Instruments; Duties and responsibilities of energy auditors. Energy Management of Buildings and Energy Audit of Buildings. - Energy management matrix monitoring and targeting Case Studies

Reference Books

1. Amlan Chakrabarti, "Energy Engineering and Management", PHI Learning, New Delhi 2012
2. Mirjana Golusin, Sinisa Dodic, Stevan Popov, "Sustainable Energy Management", Academic Press
3. Shaligram Pokharel, "Energy Analysis for Planning and Policy", CRC Press, 2014
4. Trivedi P R, Jolka K R, "Energy Management", Commonwealth Publications, New Delhi
5. Y P Abbi, Shashank Jain, "Handbook on Energy Audit and Environment Management", TERI
6. General Aspects of Energy Management and Energy Audit, Buro of Energy Efficiency
7. Frank Krieth, D Yogi Goswami, "Energy Management and Conservation Handbook", CRC Press
8. Alburth Thumann, William J Younger, Terry Niehus, "Handbook of Energy Audits", 9th Ed, Better World Books

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

RELIABILITY ENGINEERING

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

Course Prerequisite:- Student should have knowledge of-
Engineering Mathematics, Probability, Statistics

Course Objective:-

1. Understanding of basic principles of Reliability for ensuring sustainable product design.
2. Application to system requirements, design, manufacturing and testing, with real world examples
3. Understand in detail Asset Management, Maintenance, Quality and Productiveness,

Course Outcomes:- Student should be able to

1. Understand different measures of reliability
2. Know different probability methods used in reliability engineering
3. Calculate MTTF, MTBF, failure rate and hazard rate.
4. To acquire knowledge of methods for evaluation of reliability of different systems.
5. Understand the concepts of maintainability and availability in reliability engineering
6. Understand the reliability design procedure
7. Know different methods to test reliability of the system.

Unit 1 Fundamental Concepts of Reliability and Reliability Measures (06 Hrs.)

Brief history, concepts, terms and definitions, applications, the life cycle of a system, concept of failure, typical engineering failures and their causes

Reliability Measures: Reliability function– $R(t)$, cumulative distribution function (CDF)– $F(t)$, probability density function (PDF) – $f(t)$, hazard rate function– $\lambda(t)$, Mean time to failure (MTTF) and Mean time between failures (MTBF), typical forms of hazard rate function, bathtub curve

Unit 2 Probability Concepts and Failure Data Analysis (06 Hrs.)

Theory of probability, rules of probability, Introduction to independence, mutually exclusive, conditional probability random variables, discrete and continuous probability distributions. Binomial, normal Comparison of probability distributions - , lognormal, Weibull, exponential, Standard deviation, variance, mean, mode and Central Limit Theorem.

Failure Data Analysis: Data collection and empirical methods, estimation of performance measures for ungrouped complete data, grouped complete data, analysis of censored data, fitting probability distributions graphically (Exponential and Weibull) and estimation of distribution parameters.

Unit 3	Reliability Evaluation of Systems	(06 Hrs.)
	Reliability Improvement Redundancy, element redundancy, unit redundancy, standby redundancy -types of stand by redundancy, parallel components single redundancy, multiple redundancies, cut and tie set approach for reliability evaluation. Star and delta method, matrix method (Numerical).	
Unit 4	Maintainability and Availability	(06 Hrs.)
	Concept of maintainability, measures of maintainability, mean time to repair (MTTR), analysis of downtime, repair time distributions, stochastic point processes, maintenance concept and procedures, availability concepts and definitions, important availability measures.	
	Introduction to Reliability allocation or apportionment, reliability apportionment techniques- equal apportionment, AGREE, ARINC, Minimum effort method (Numerical)	
Unit 5	Design for Reliability and Maintainability	(06 Hrs.)
	Reliability design process and design methods, reliability allocation, failure modes, effects and criticality analysis (FMECA), fault tree and success tree methods, symbols used, maintainability design process, quantifiable measures of maintainability, repair versus replacement.	
Unit 6	Reliability Testing	(06 Hrs.)
	Introduction to reliability testing, Stress strength interaction, Introduction to Markov model, Testing for Reliability and Durability - Accelerated Life Testing and Highly Accelerated Life Testing (HALT), highly accelerated stress Screening (HASS)	

Reference Books

1. Ebling C. E., 2004, "An Introduction to Reliability and Maintainability Engineering", Tata McGraw Hill Education Private Limited, New Delhi.
2. Srinath L. S., 1991, "Reliability Engineering", East West Press, New Delhi.
3. Birolini A., 2010, "Reliability Engineering: Theory and Practice", Springer.
4. Parkhi R. M., "Market Leadership by Quality and Reliability", Vidyanand Publications 2012.
5. Roy B. and Allan R. N., 1992, "Reliability evaluation of engineering systems: concepts and techniques", Springer.
6. Patrick D. T. Newton O'Conner, D., Bromley R., 2002, "Practical Reliability Engineering", John Wiley and Sons.
7. Rao S. S., 1992, "Reliability Based Design. McGraw-Hill
8. Andrew Kennedy, Skilling Jardine, Albert H. C. Tsang, 2006, "Maintenance, Replacement and Reliability: Theory and Applications", CRC/Taylor and Francis.
9. Nachlas Joel A., 2005, "Reliability Engineering: Probabilistic Models and Maintenance Methods" Taylor and Francis.
10. Dhillon B. S., Singh C., 1981, "Engineering Reliability – New Techniques and Applications", John Wiley and Sons.
11. Dhillon B. S., 1999, "Engineering Maintainability", Prentice Hall of India.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

DESIGN OF PUMPS, BLOWERS AND COMPRESSORS

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

Course Prerequisite:-	Student should have knowledge of <ol style="list-style-type: none"> 1. Fundamentals of fluid mechanics 2. Fundamentals of turbo machinery 3. Fundamentals of thermodynamics
Course Objective:-	To provide basic concept of design of rotary machines <i>viz.</i> pumps, lowers and compressors.
Course Outcomes:-	Student must be able to understand- <ol style="list-style-type: none"> 1. Efficiency, losses, power requirement and operating characteristics of pumps 2. Theoretical concepts related to pumps 3. Thermal and hydraulic design of pumps 4. Theoretical concepts related to fans and blowers 5. Design principles of fans and blowers 6. Design principles of centrifugal and axial compressors
Unit 1	Review of Principles of Fluid Machinery (06 Hrs.)
	<ul style="list-style-type: none"> • Basic equations of energy transfer between fluid and rotor. • Performance characteristics. • Dimensionless parameters, specific speed, stage velocity triangles, work and efficiency.
Unit 2	Theory of Centrifugal Pumps (06 Hrs.)
	<ul style="list-style-type: none"> • Calculation of tangential and axial thrust methods to minimize axial thrust. Impellers, casings, volutes, vane velocity vector diagrams, work done and head developed by pumps. • Efficiency and losses in pumps (mechanical, hydraulic etc.), specific speed. • Calculation of power requirement, NPSH for pump selection, effects of cavitation on pump performance, operating characteristics.
Unit 3	Design of Pumps (06 Hrs.)
	<ul style="list-style-type: none"> • Introduction to design procedure of pumps. • Thermal design- selection of materials for high temperature and corrosive fluids. • Hydraulic design- selection of impeller and casing dimension using industrial manuals.
Unit 4	Theory of Fans and Blowers (06 Hrs.)

	<ul style="list-style-type: none"> • Classification of blowers, basics of stationary and moving air, Euler's characteristics, velocity triangles and operating pressure conditions. • Equations for blowers, losses and hydraulic efficiency, flow through impeller casing inlet nozzle, volute, diffusers, and mechanical losses. • Rotor design, airfoil theory, vortex theory, cascade effects, degree of reaction. • Blade twist stage design, surge and stall, stator and casing, mixed flow impellers, applications of blowers and fans. 	
Unit 5	Design of Fans and Blowers	(06 Hrs.)
	<ul style="list-style-type: none"> • Design procedure for selection of blowers, stage pressure rise, stage parameters and design parameters. • Design of impeller and casing dimension in aerodynamic design. 	
Unit 6	Theory and Design of Compressors	(06 Hrs.)
	<ul style="list-style-type: none"> • Basic theory, classification and application, working with enthalpy- entropy diagram, construction and approximate calculation of centrifugal compressors. • Impeller flow losses, slip factor, diffuser analysis, performance curves of centrifugal compressors. • Basic design features of axial flow compressors; velocity triangles, enthalpy-entropy diagrams, stage losses and efficiency, work done factor, simple stage of axial flow compressors, applications of compressors. 	

Reference Books

1. Shepherd, D. G., "Principles of Turbomachinery", Macmillan, 1969.
2. Chruch A. H., "Centrifugal pumps and blowers", John Wiley and Sons, 1980.
3. Yahya S. M., "Turbine, Compressors and Fans", Tata Mc-Graw Hill Publishing Company, 1996
4. Labanoff V. S. and Ross R., "Centrifugal Pumps Design and Applications", Jaico P House.
5. Karassik I., "Pump Hand Book", McGraw-Hill International Edition.
6. Sahu G. K. "Pump" New age international publishers.
7. Tuzson J., "Centrifugal Pump Design", Wiley Publication.
8. Stepanff, A. J., "Blowers and Pumps", John Wiley and Sons Inc., 1965.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV,V and VI

MANAGEMENT INFORMATION SYSTEM

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

Course Prerequisite:-	<ol style="list-style-type: none"> 1. A student should be familiar in computer programming. 2. A student should be familiar with concept of database. 3. A student should be familiar with manufacturing sectors- personnel management, financial management, production management, material management, marketing management.
Course Objective:-	<p>Student is able to understand</p> <ol style="list-style-type: none"> 1. Operations management. 2. Role of computers in information systems. Management Information System (MIS) 3. Data management-concept and its need. 4. Application in Manufacturing sectors
Course Outcomes:-	<p>The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.</p> <ol style="list-style-type: none"> 1. To understand various basic concepts related to operations management and information system 2. To understand computer aided information system and the concept of information communication 3. To know the role of decision making in MIS. 4. To acquire knowledge of data base management system 5. To know the applications of MIS in different departments of an industry 6. To use different software for implementation of MIS in industries

Unit 1 Introduction (06 Hrs.)

Operations management: concept, meaning, definition, scope and functions. Optimization: concept, meaning, definition, need and scope. Types of production, their merits and demerits. Types of operations layouts: features, applications. Types of resources (7M). Data-meaning and types. Information-meaning and types.

Information system: need, concept, definition, features, objectives and examples. Need to integrate information systems and optimum utilization of 7M resources.

Unit 2 Information Systems (06 Hrs.)

Role of computers in information systems. Management Information System (MIS); concept, definition, need & applications.

Computer aided information systems: (such as inventory records, operation schedule, consumables issues, tools issues, inspection and quality control reports, failure frequencies with reasons, efficiency and utility reports, maintenance records, produced power units per day, temperature at certain interval, etc.) need, importance, design considerations, software selection criteria, examples.

Information communication: Communication process; computer networks and its types, structures, need and applications, protocols - types, features, applications.

Unit 3 Decision Making (06 Hrs.)

Concept, process behavioral decision making, organizational decision making, MIS and decision making. Building blocks of information system-Input, output, models, technology, database and control blocks. System development life cycle (SDLC) and its approach.

Unit 4 Data Base Management System (06 Hrs.)

Data management-concept, need, basic terminology used.

Data base: definition, meaning, importance, approach and architecture. Objectives of database organizations.

Data models: meaning, relationship and association, drawing schema, bubble chart & tree structure for suitable mechanical engineering application. Data Base Management System (DBMS) - definition, scope, importance, awareness about current software packages & their features, Relational Data Base Management System. (RDBMS) - concept, definition, features and applications. Preparation steps/ procedure for creating, storing, editing & retrieval of database on latest available database management software package.

Unit 5 Applications in Manufacturing Sectors (06 Hrs.)

Application in Manufacturing sectors- Personnel management, financial management, production management, material management, marketing management, supply chain management.

Unit 6 System implementation (06 Hrs.)

Modern software design techniques, verification and validation, methods, performance of software systems, software matrix and models, software standards, introduction to Capability maturity model (CMM), and quality management in software organization.

Text Books/ Reference Books

1. Jawadekar W. S., "Management Information System 4/e".
2. O'Brien J. A., "Management Information System 4/e"
3. Burch and Gruditski, "Information system-Theory and practice 5/e".
4. Ian Sommerville, "Software Engineering 6/e".
5. Turban E., Leidner P., et. al., "Information Technology for Management 6/e".
6. Laudon and Laudon, "Management Information System 11/e"
7. Sadagopan S., "Management information system", PHI publication
8. Charry S. N., "Production and operations management". TMGH publication.
9. Buffa E. S. and Sarin R. K., "Modern production & operations management", John Willy & sons publication

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

PROFESSIONAL SKILLS DEVELOPMENT-VI

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	100 Marks	Theory: 04 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	100 Marks	04

Course Pre-requisites

The Students should have knowledge of

1. Concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2. A basic knowledge of Group Discussion, DO's and Don'ts done in the previous sem.
3. Basic knowledge of writing skills, importance of professionalism in emails and letters.
4. Knowledge on the concepts of criticism, feedback and conflicts.
5. Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6. Brief idea about professional and business meeting etiquettes.

Course Objectives

The Professional Skills Development 6 is an extension of PSD- 5 with focus on the remaining topics of Aptitude and Grammar. The further complex concepts of Permutation and Combination, Probability and grammatical topics such as prepositions etc. would be dealt with. The objective here is to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-6 focuses on the other important aspects of soft skills training students such as techniques of effectively handling Personal Interviews during placement process and understand the dynamics of structured Resume and PIs.

Course Outcomes

The student should be able to

1. Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics such as prepositions, conjunctions etc relevant from the recruitment point of view.
2. Learn to handle vocabulary questions such as synonyms and analogies in recruitment test and other competitive exams
3. Understand and Learn techniques/Strategies of how to handle Personal interviews during recruitment process. Through Mock PIs students would be taught the appropriate ways of answering tricky questions in Interview and would learn the correct body language etc. to be demonstrated in an interview process.
4. They would be acquainted with the differences between CV, Bio- Data and Resume and they would learn the correct format of a Résumé along with methods and styles to make their Resumes interesting.
5. Students would learn to incorporate various rules of written communication in business writing scenario with the appropriate tone and words.
6. Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector.

Course Contents

Unit I	Aptitude (Maths, Logical Reasoning, English)	(24 Hrs.)
	<ul style="list-style-type: none"> • Maths <ul style="list-style-type: none"> ▪ Permutation & Combination ▪ Probability ▪ Maths Revision -1 ▪ Maths Revision - 2 • Logical Reasoning <ul style="list-style-type: none"> ▪ Matching, Selection & Arrangement ▪ Clocks & Calendars, Visual Reasoning 	

	<ul style="list-style-type: none"> ▪ Input, Output & Flow Chart. ▪ Reasoning Revision- 1 ▪ Reasoning Revision-2 • English <ul style="list-style-type: none"> ▪ Grammar – III– (Prepositions& Conjunctions) ▪ Grammar- (Articles & Parallelism) ▪ Verbal Ability Revision- I 	
Unit II	Soft Skills & English Communication	(24 Hrs.)
	<ul style="list-style-type: none"> • Resume-I • Resume- II • Mock GD • Mock GD • Personal Interviews-I • Personal Interviews-II • Mock PI • Mock PI • Extempore Speeches, Group Interviews • Written Skills- Revision • Stress Management • Business Writing Tones. 	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		

Rules regarding ATKT, Continuous Assessment and award of Class

Standards for Passing

- For all courses, both in UE (University Evaluation) and IA (Internal Assessment) there are constitute separate heads-of-passing (HoP).
 - The student must obtain a minimum grade point of 5.0 (40% marks) at UE as well as at IA.
- OR
- The student failed in IA can also pass in the course provided he/ she obtains minimum of 25% marks in IA, and GPA (Grade Point Average) for the course is at least 6.0 (50% aggregate). The GPA for the course will be calculated only if the student passes in UE.
- The student who fails at UE in a course has to reapply only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

- A student is allowed to carry backlog of courses prescribed for B. Tech. Sem. I, III, V, VII to B. Tech. Sem. II, IV, VI, VIII respectively.
- A student is allowed to keep term of Sem. III, if he/ she has failed in any number of courses in B. Tech. Sem. I and II.
- A student is allowed to keep term of Sem. V, if he/ she has failed in any number of courses in B. Tech. Sem. III and IV but passed in all courses in Sem. I and II.
- A student is allowed to keep term of Sem. VII, if he/ she has failed in any number of courses in B. Tech. Sem. V and VI but passed in all courses in Sem. III and IV.

Award of Class for the Degree Considering CGPA

A student who has completed the minimum credits specified for the program shall be declared to have passed in the program. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of the honors at the end of the program are as given below:

Range of the CGPA	Final Grade	Performance Descriptor	Equivalent range of marks (%)
$9.50 \leq 10.00$	O	Outstanding	$80 \leq 100$
$9.00 \leq 9.49$	A ⁺	Excellent	$70 \leq 79$
$8.00 \leq 8.99$	A	Very Good	$60 \leq 69$
$7.00 \leq 7.99$	B ⁺	Good	$55 \leq 59$
$6.00 \leq 6.99$	B	Average	$50 \leq 54$
$5.00 \leq 5.99$	C	Satisfactory	$40 \leq 49$
Below 5.00	F	Fail	Below 40

BHARATI VIDYAPEETH DEEMED UNIVERSITY COLLEGE OF ENGINEERING, PUNE
COURSE STRUCTURE 2014 CBCS

B. Tech. Mechanical Sem.- VII

Sr. No.	Course	Teaching Scheme (Contact Hrs./Week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
1	Mechanical Vibration	3	2	--	60	20	10	10	50	--	150	3	1	4
2	Automatic Control System	3	2	--	60	20	10	10	50	--	150	3	1	4
3	Automobile Engineering	3	--	--	60	20	10	10	--	--	100	3	--	3
4	Industrial Fluid Power	3	--	--	60	20	10	10	--	--	100	3	--	3
5	Elective - II	3	-	--	60	20	10	10	--	--	100	3	--	3
6	Inplant Training	-	--	--	--	--	--	--	50	--	50	--	4	4
7	Project Stage -I	--	2		--	--	--	--	100	--	100	--	4	4
Total		15	06	00	300	100	50	50	250	--	750	15	10	25

Elective-II Courses: a) Computational Fluid Dynamics; b) Industrial Engineering & Management; c) Nanotechnology; d) Production Planning & Control
e) Experimental Methods in Mechanical Engineering

B. Tech. Mechanical Sem.- VIII

Sr. No.	Course	Teaching Scheme (Contact Hrs./Week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
8	Power Plant Engineering	4	2	--	60	20	10	10	50	--	150	4	1	5
9	Industrial Product Design	3	2	--	60	20	10	10	50	--	150	3	1	4
10	Optimum Design*	4	2	--	60	20	10	10	50	--	150	4	1	5
11	Elective-III	3	--	--	60	20	10	10	--	--	100	3	--	3
12	Project Stage -II	-	4	--	--	--	--	--	200	--	200	--	8	8
13	Environmental Sciences	3	--	--	100	--	--	--	--	--	100	3	--	3
Total		14	10	00	240	80	40	40	350	--	750	14	11	25

* End Sem. examination of duration 4 hours

Elective – III Courses: a) Industrial Automation & Robotics; b) Cryogenics; c) Project Management & Ethics; d) Total Quality Management;
e) Finite Element Analysis

1. MECHANICAL VIBRATION

1. MECHANICAL VIBRATION		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Practical: 01
	Continuous Assessment: 40 Marks	Total: 04
	Term Work/ Oral: 50 Marks	
Course Pre-requisites:		
1.	Student should have knowledge of Fundamentals of Engineering Mechanics	
2.	Student should have knowledge of Engineering Mathematics	
3.	Student should have knowledge of Machine Design and Computer Aided Drafting	
4.	Student should have knowledge of Machine Design –I & II	
5.	Student should have knowledge of Theory of Machine	
Course Objectives:		
1.	To study basic concepts of vibration analysis	
2.	To acquaint with the principles of vibration measuring instruments	
3.	To study balancing of mechanical systems	
Course Outcomes:		
Students will be able to understand		
1.	Develop mathematical model to represent dynamic system	
2.	Estimate natural frequency of mechanical element/system	
3.	Analyze vibratory response of mechanical element/system	
4.	Estimate the parameters of vibration isolation system	
UNIT - I	Basic Concepts of Vibration Vibration and oscillation, causes and effects of vibrations, Vibration parameters –spring, mass, damper, Damper models, Motion – periodic, non-periodic, harmonic, non- harmonic, Degree of freedom, static equilibrium position, Vibration classification, Steps involved in vibration analysis.	(06 Hours)
UNIT - II	Free Undamped Single Degree of Freedom Vibration System Longitudinal, transverse, torsion vibration system, Methods for formulation of differential equations by Newton, Energy, Lagrangian and Rayleigh’s Method.	(06 Hours)
UNIT - III	3.1 Free Damped Single Degree of Freedom Vibration System Viscous damped system – under damped, critically damped, over damped; Logarithmic decrement; Coulomb’s damping; Combined	(06 Hours)

	viscous and coulomb's damping. 3.2 Equivalent Single Degree of Freedom Vibration System Conversion of multi-springs, multi masses, multi – dampers into a single spring and damper with linear or rotational co-ordinate system	
UNIT - IV	4.1 Forced Single Degree of Freedom Vibratory System Analysis of linear and torsional systems subjected to harmonic force excitation and harmonic motion excitation (excluding elastic damper) 4.2 Vibration Isolation and Transmissibility Force Transmissibility, Motion Transmissibility Typical isolators& Mounts 4.3 Rotor Dynamics: Critical speed of single rotor, undamped and damped	(06 Hours)
UNIT - V	5.1 Free Undamped Multi Degree of Freedom Vibration System Eigen values and Eigen vectors for linear system and torsional two degree of freedom; Holzer method for linear and torsional unbranched system; Two rotors, Three rotors and geared system; Dunkerley's and Rayleigh's method for transverse vibratory system	(06 Hours)
UNIT - VI	Vibration Measurement -Introduction -Vibration measuring parameters- Displacement, Velocity and acceleration -Vibration measuring devices: Accelerometers, Vibration exciters, FFT analyzer, -Introduction to signal analysis: Time domain & Frequency domain analysis of signals. - Noise measurement	(06 Hours)
Term Work/Practicals:		
1. To determine the natural frequency of damped vibration of single degree freedom system and to find it's damping coefficient		
2. To obtain frequency response curves of single degree freedom system of vibration for different amount of damping.		
3. Free vibration of simply supported beam		
4. Free Vibration of a Two-DOF System		
5. Forced vibration of SDOF system		
6. To determine critical speed of shaft with single rotor.		

7. To verify natural frequency of torsional vibration of two rotor system and position of node.	
8. Noise measurement and analysis using vibration Analyzer	
9. To determine natural frequency of vibration of beam using vibration analyzer.	
10. Vibration analysis of mechanical system using MATLAB	
Assignments:	
1. Use and study MATLAB Code for fundamentals of vibration.	
2. Use MATLAB program for vibration analysis with suitable example.	
3. Longitudinal, transverse, torsion vibration system program in MATLAB.	
4. MATLAB Program for Vibration calculations by Using of differential equations in MATLAB.	
5. Study of Free Damped Single Degree of Freedom Vibration System.	
6. Study of Equivalent Single Degree of Freedom Vibration System.	
7. Study of Forced Single Degree of Freedom Vibratory System	
8. Study of Vibration Isolation and Transmissibility	
9. Finding of Eigen values and Eigen vectors for linear system and torsional two degree of freedom by MATLAB program.	
10. Use FFT Analyzer for lathe machine vibration analysis	
11. Study of Noise measurement	
12. Theoretical study of vibration signal analysis.	
Text Books/Reference Books:	
1	Mechanical Vibrations - G. K. Grover Nem Chand & Bros.
2	Mechanical Vibrations 4th edition- S. S. Rao - <i>Pearson Education</i>
3	Fundamentals of Mechanical Vibration - S.Graham Kelly - <i>Tata McGraw Hill 4.</i>
4	Vibration Analysis - P. Srineevasan - Tata McGraw Hill
5	Mechanical Vibrations - Schaum's outline series - S.Graham Kelly- <i>McGraw Hill</i>
6	Theory and Practice of mechanical vibrations - J. S. Rao, K. Gupta - <i>New Age</i>
7	Mechanical Vibrations, J.P. Den Hartog, Mc Graw Hill Book Company Inc.
8	Leonard Meirovitch, Introduction to Dynamics and Conti'oJ. <i>Wiley, New York</i>
9	Benson H. Tongue, Principles of Vibration. <i>Oxford University Press.</i>
10	W. Thomson, Theory of Vibrations with Applications, Second Edition, <i>Pearson Education</i>
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

2. AUTOMATIC CONTROL SYSTEM

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Practical: 01
	Term Work/ Oral: 50 Marks	Total : 04

Course Pre-requisites:

The Students should have

1.	Knowledge of Mathematics & Science
2.	Knowledge of Basic Electrical Engineering.
3.	Knowledge of Sensors and Measurement System.

Course Objectives:

1.	Familiarization with Control System Principles and Applications of Control System.
2.	Calculate and Estimate the Stability Measures, Time Response Measures from the Analysis of Mathematical Models of Some Simple Engineering Systems.
3.	Develop Ladder Diagrams using PLC and Apply It for Industrial Automation.

Course Outcomes:

Students should be able to,

1.	Determine the (absolute) stability of a closed-loop control system using Routh-Hurwitz's stability criterion.
2.	Obtain an overall transfer function of control system by using block diagram algebra methods.
3.	Determine the time response specifications of a control system.
4.	Use analog and digital signal processing for mechatronics applications.
5.	Use Fundamentals of control systems, mechatronics system and able to improve an existing system's performance by using controller action such as PID controllers.
6.	Develop ladder diagram and select PLCs for industrial applications.

Course Contents

UNIT I	Frequency Domain Modelling and Analysis	(06 Hrs)
	Transfer Function based modeling of Mechanical, Thermal and Fluid System; Concept of Poles & Zeros; Absolute vs Relative Stability; Stability Analysis using Routh Hurwitz Criterion; Mapping of Pole Zero Plot with Damping Factor, Natural Frequency and Unit Step Response.	
UNIT II	Block Diagram Algebra	(06 Hrs)
	Block Diagram Fundamentals, Canonical Form, Rules for Block Diagram Reduction, Reduction of Block Diagram, Reducing to Unity Feedback Systems, Examples on Block Diagram Reduction.	
UNIT - III	System Response	(06 Hrs)
	Introduction of Time Response of Control System, Standard Test Signals, Input-Output Model Equation, Instantaneous, Lagging and Delay Response, Transient Specifications for Unit Step Response,	

	Concept of State, State Variable, State Vector, State Space and State Model.	
UNIT - IV	Signal Conditioning	(06 Hrs)
	Necessity of Signal Conditioning, Passive Circuits, Analog Signal Processing: Operational Amplifiers, Inverting and Non-inverting, Summing, Subtractor, Instrumentation. Digital Signal Processing: Timing Diagrams, Sequential Logic, Flip-Flops, Successive Approximation (SAR) type ADC and R-2R ladder DAC.	
UNIT V	Automatic Control System	(06 Hrs)
	Concept of Automatic Control Systems, Mechatronics System & Its Examples, Mechatronics System Components, Open Loop and Closed Loop System, Effects of Feedback and Basic Characteristic of Feedback Control Systems. Applications of Feedback and Feed-Forward Control System. Basic Control Action and Controllers:-On-Off Control, Proportional, Integral, Derivative and PID.	
UNIT VI	Programmable Logic Controller	(06 Hrs)
	Introduction to PLCs, Basic Structure of a PLC, Principles of Operation, PLC Programming Languages, Ladder diagram, Latching and internal relays, Timers and Counters, Selection of a PLCs for Control System, Application of PLCs for Automatic Control System. Concept of SCADA and its Applications.	

Term Work:

Term work shall consist record of minimum 8 experiments from the following; Out of which Experiment no. 1, Experiment no. 3 and Experiment no. 9 are compulsory.

1. Analysis of following control system parameters using software like MATLAB/SIMULINK
 - a. Plot the pole-zero configuration in s-plane for the given transfer function
 - b. Stability analysis of given control system using Routh-Hurwitz's criterion
 - c. Determine the transfer function for given closed loop system in block diagram representation.
 - d. Plot unit step response of given transfer function and find peak overshoot, peak time, rise time and delay time.
2. Study of applications of Op-Amp Circuits.
3. Study of P, P+I, P+D, P+I+D control actions using any trainer kit / simulation software.
4. Study of XY position control systems.
5. Stabilizing Inverted Pendulum.
6. Study of A/D and D/A Converters.
7. Study the functions and applications of variable frequency drive(VFD).
8. To study AC servomotor and plot its Torque Speed characteristics.
9. Development of applications by using following instructions of the PLC
 - a. Latching
 - b. Timers

c. Counters d. Logic Gates 10. Sequencing of pick and place robot using PLC programming. 11. Identification of different control system components in PLC based mini assembly cell. 12. Development of applications using SCADA system for any automation application.	
Assignments:	
Assignments will be based on above syllabus	
Unit I	1. Numerical based on finding stability of control systems.
	2. Explain the Transfer function based modeling of Mechanical System
	3. Explain the Transfer function based modeling of Thermal System
	4. Explain the Transfer function based modeling of Fluid System
	5. Explain concept of poles and zeros and its importance in stability analysis.
	6. MATLAB based assignments on Routh-Hurwitz's stability criterion
Unit II	1. At least five questions on finding an overall transfer function of control system by using block diagram algebra method.
Unit III	1. What is the meaning of system response?
	2. What do you understand by input-output model equation?
	3. Define instantaneous response, lagging response and delayed response.
	4. Write notes on transient response specifications.
	5. What types of test signals are usually considered for testing a system response.
	6. Define state, state variable, state vector, state space and state model.
Unit IV	1. Why signal conditioning elements are necessary? Explain. What are the applications of signal conditioning elements?
	2. Define an op-amp. Explain with a neat block diagram. List the characteristics of an ideal op-amp.
	3. Write short notes on Inverting and Non-Inverting amplifier.
	4. Describe the significance of an instrumentation amplifier. Explain the operation of an instrumentation amplifier with the help of a circuit diagram.
	5. Define terms timing diagram, sequential logic and flip-flop
	6. Describe the operations of J-K FF with truth table.
	7. Explain working of SAR type ADC
	8. Explain working of R-2R ladder type DAC
Unit V	1. Define mechatronics and appreciate its relevance to contemporary engineering design
	2. Identify five mechatronic systems and its primary elements
	3. Describe the various forms and elements of open-loop and closed-loop control system
	4. Differentiate between feedback and feedforward control system
	5. Explain working of control actions- P, PI, PD and PID
	6. MATLAB based assignments on PID Controller
Unit VI	1. Draw block diagram of PLC and explain working of each block in brief.
	2. What is mean by ladder diagram? State difference between ladder and relay logic
	3. With the help suitable example explain working of latch

	4. Explain working of timer and counter with ladder diagram.
	5. State the criteria for selection of PLCs.
	6. Write five ladder logics for industrial applications.
	7. Write a short note on SCADA System & its use in automation
	8. Mini project based on PLC Programming.
Text Books/Reference Books:	
1.	Control System Engineering: Nagrath L.T. and Gopal. M., Wiley Eastern Lid.
2.	Alciatore and Histan, "Introduction to Measurement and Mechatronics Systems", McGraw Hill.
3.	W. Bolton, "Mechatronics", Pearson Education.
4.	M D Singh and J G Joshi, "Mechatronics", PHI
5.	Gary Dunning, "Programmable Logic Controllers", Cengage Learning.
6.	Mechatronics-Principles, Concepts and Application: Mahalik, McGraw Hill Education Pvt Ltd;
7.	Process Control Instrumentation Technology, 8 th Edition Curtis D. Johnson, University of Houston
8.	Ogata, Katsuhiko: "Modern Control Engineering (5 th Edition)", Prentice-Hall, Inc., 2009 (ISBN: 0-13-615673-8)
9.	Madan Gopal, Control Systems Principles and Design, Tata McGraw Hill, seventh edition, 1997.
10.	Nise, Control System Engineering, John Wiley & sons, 3 rd Edition.
11.	Norman Nise, "Control System Engineering", Prentice Hall India, Fourth Edition .
12.	Anand Kumar, "Control System Theory", Prentice Hall India.
13.	F. H. Raven, "Automatic Control Engineering", Third edition, McGraw Hill, 1983.
14.	Dr. N. K. Jain, "Automatic Control Systems Engineering", Dhanpat Rai Publishing Company.
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

3. AUTOMOBILE ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
	Continuous Assessment: 40 Marks	Total : 03 Credits
	Term Work/ Oral: -- Marks	
Course Pre-requisites:		
The Students should have basic knowledge of		
1.	The Students should have basic knowledge of Elements of Mechanical engineering	
2.	The Students should have basic knowledge of Machine Tools	
3.	The Students should have basic knowledge of Internal Combustion Engine	
4.	The Students should have basic knowledge of Theory of Machine	
Course Objectives:		
	1. Study basic principles of actual automobile systems 2. Study important systems in an automobile 3. Study recent and modern trends in automobile sector	
Course Outcomes:		
Students will be able to understand		
1.	various systems in an automobile	
2.	Importance and features of different systems like steering axle, differential.	
3.	Importance and features of different systems like Transmission, braking System	
4.	Importance and features tyres, wheel and balancing etc.	
5.	Importance of electrical, starting and generating system etc.	
6.	Principle of operation, construction and applications of various sensors used in modern automobile	
UNIT - I		
Classification of Automobiles	Broad classification of Automobiles, Major components & their functions, Types of vehicle layouts, Types of bodies, Body construction & materials, All wheel drive, Types of chassis & their construction.	(06 Hours)

UNIT - II	<p>Steering System Function of steering, Steering system layout, Automotive steering mechanism Ackerman & Davis, Types of steering gear boxes, Condition for true rolling, Steering geometry Camber, Caster, King pin inclination, included angle, Toe-in & Toe-out, Wheel alignment, Under steer & Over steer, Types & working of power steering.</p> <p>Transmissions: Necessity of gear box, Sliding mesh, Constant mesh, Synchromesh and epicyclic gear box, Overdrives and hydrodynamic torque converter, Trouble shooting and remedies.</p> <p>Live axle and differential: Final drive, spiral, bevel, Hypoid and worm drives, Types of live axles, semi, three quarter and full floating axles. Necessity of differential, Conventional and non-slip differential, Trouble shooting and remedies.</p>	(06 Hours)
UNIT - III	<p>Clutch Braking System Requirement of clutch, Types & functions, Single plate, Multiplate, Centrifugal, Cone clutch, Electromagnetic & Fluid clutches, Troubleshooting & automobile clutch.</p> <p>Braking System Function of automotive brake system, Types of braking mechanism Internal, Expanding & Disc brake, Mechanical, Hydraulic & Air brake system, Servo & power brakes, Antiskid braking, Calculation of braking force required, Stopping distance & dynamic weight transfer.</p>	(06 Hours)
UNIT - IV	<p>Suspension Object of suspension, Basic requirement, Air suspension and its features, Independent suspension, Spring & unspring mass, Types of spring, Shock absorber, Torsion bars, Air suspension, Hydro pneumatic suspension, Pitching, rolling and bouncing.</p> <p>Wheels and Tyres Requirements of wheels and tyres, Constructional features, Types of tyres, Types of rim , Inflation Pressure and its importance, Application to ride and stability, Trouble shooting and remedies.</p>	(06 Hours)
UNIT - V	<p>Electrical system Battery: Types of battery, Lead-Acid, Alkaline, ZEBRA, Sodium Sulphur and Swing, Ratings, charging, Maintenance and testing of Lead-Acid battery.</p> <p>Starting system: Requirements, Various torque terms used, Starter motor drives; Bendix, Follo through, Barrel, Rubber compression, Compression Spring, Friction Clutch, Overrunning Clutch, Dyer.</p>	(06 Hours)

	Starter motor solenoids and switches, Glow plugs. Alternator: Principle of operation, Construction, Working, Rectification from AC to DC.	
UNIT - VI	Recent trends in Automobiles Electronic Control module (ECM), operating modes of ECM (closed loop and open loop) Inputs required and output signals from ECM, Electronic Spark control, Air Management system, Idle speed control. Construction, working & application of temperature sensors, inductive sensors, Position sensors (rotary, linear). Hot wire and thin film air flow sensors, vortex flow/turbine fluid sensors, Optical sensor, Oxygen sensors, Light sensors, methanol sensors ,Rain sensor, New developments in the sensor technology.	(06 Hours)
Any Six Assignments from the following:		
1. Study of types of bodies and chassis of automobile.		
2. Report on dismantling and assembly of steering mechanisms.		
3. Report on dismantling and assembly of brakes.		
4. Report on dismantling and assembly of rear axle and differential.		
5. Report on dismantling and assembly of suspension systems.		
6. Study of types of tyres and rims.		
7. Report on battery charging and starting systems.		
8. Study and understanding of different types of sensors used in automobile.		
9. Report on industrial visit to any automobile Manufacturer.		
10. Report on industrial visit to any Two wheeler/ Four Wheeler service station		
Text Books/Reference Books:		
1	Automotive Mechanics, William Cruose & Donald L. Anglin, Tata Mcgraw Hill	
2	Automotive Mechanics , Joseph Heitner, East-West press pvt .Ltd	
3	The Automobile Engineering, T. R. Banga & Nathu Singh, Khanna Publishers	
4	The Automobile, Harbans Singh Reyat, S. Chand & Co.	
5	Automobile Engineering, R. K. Rajput, Laxmi Publication	
6	Basic Automobile Engineering, C.P.Nakra, Dhanpat Rai Publishing CO	
7	Automobile Engineering, Kirpal Singh Vol I & II, Standard publishers Distributors ,Delhi	
8	Automobile Engineering, K. K. Jain & R.B. Asthana, Tata Mcgraw Hill	
9	Automotive Mechanics, S. Srinivasan, Tata Mcgraw Hill	

10	Automobile Engineering, Vol I & II, R.K. Mohanty, Standard Book House	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

4. INDUSTRIAL FLUID POWER

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours/ Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	Total :03
	Term Work/ Oral: -- Marks	

Course Prerequisites: -	<p>The Students should have</p> <ol style="list-style-type: none"> 1. Knowledge of fluid mechanics, turbomachinery. 2. Knowledge of mechanical measurement. 3. Knowledge of Theory of Machine
Course Objective: -	<ol style="list-style-type: none"> 1. Familiarization with fluid power principles and the fluid power industry. 2. To analyse specific problems, design solutions and evaluate fluid power systems in industrial applications. 3. To instil within students a positive safety attitude with regard to the design, construction, operation, and maintenance of fluid power systems. 4. To provide students with knowledge of the applications of fluid power systems in process, construction, robotics and manufacturing industries. 5. To develop within each student a measurable degree of competence in the design, construction, operation and maintenance of fluid power systems. 6. To provide students with an understanding of the properties of hydraulic and pneumatic fluids, as well as components utilized in industrial fluid power systems.
Course Outcomes: -	<p>Students should be able to</p> <ol style="list-style-type: none"> 1. Identify fluid power system and its basic components for practical applications. 2. Select suitable pump, reservoir and accumulators for various industrial applications. 3. Use specific pressure, flow and direction control valves based on applications. 4. Select actuator and develop a simple hydraulic circuit to accomplish the task. 5. Understand basic components of the pneumatic & electro-pneumatic systems and develop pneumatic circuits for industrial automation. 6. Design hydraulic & pneumatic circuit for industrial applications.

Course Contents

Unit 1	Introduction to Fluid Power	(06Hrs)
<p>Fluid power system: Components of fluid power system, advantages and limitations. Difference between electrical, pneumatic and fluid power systems. Applications in the fields of machine tools, material handling, aerospace, mobile and stationary machines, clamping devices and more applications of fluid power.</p> <p>Types of hydraulic fluids, Seals, Conductors: Petroleum based, synthetic and water based. Properties of fluids, Pascal's Law, selection of fluids, additives, effect of temperature and pressure on hydraulic fluid. Seals, sealing materials. Types of pipes, hoses, material. Fluid conditioning through filters, strainers, sources of contamination and contamination control.</p>		
Unit 2	Source of Power	(06 Hrs)
<p>Pumps: Types, classification, principle of working and constructional details of gear pumps, vane pump, piston pump, power and efficiency calculations, characteristics curves, selection of pumps for hydraulic power transmission (Numerical Treatment).</p> <p>Power units and accessories: Types of power units, reservoir assembly, sizing of reservoirs, constructional details, pressure switches, temperature switches. Accumulators: Types, selection procedure, applications of accumulators. ISO symbols for hydraulic and pneumatic Components</p>		
Unit 3	Fluid Power Control	(06 Hrs)
<p>Control of fluid power: Necessity of fluid control through pressure control, directional control and flow control valves.</p> <p>Control valves: i) Principle of pressure control valves, direct operated and pilot operated pressure relief valves, pressure reducing valve, sequence valve. ii) Principle of flow control valves, pressure compensated and non-compensated flow control valves.iii) Principle of directional control valves, types of directional control valves, two-way, three-way, four-way valves, check valve and shuttle valve. Open centre, close centre, tandem centre valves. Actuating devices- manually operated, mechanically operated, solenoid operated, pilot operated, lever operated.</p>		
Unit 4	Actuators and Industrial Circuits	(06 Hrs)
<p>Actuators: (i) Linear and Rotary actuators (ii) Types of cylinders and mountings, Design considerations for cylinders (iii) Types of hydraulic motors- gear, vane & piston. (iv) Methods of control of acceleration, deceleration. (v) Calculation of piston velocity, thrust under static and dynamic applications, considering friction, inertia loads (Numerical Treatment).</p> <p>Industrial circuits: Simple reciprocating, Regenerative, Speed control (Meter in, meter out & bleed off), Sequencing, Synchronization, transverse & feed, automatic reciprocating, fail safe circuit, counter balance circuit, actuator locking, circuit for hydraulic press, unloading circuit, motor breaking circuit.</p>		
Unit 5	Pneumatics	(06 Hrs)
<p>Principle of Pneumatics: (i) Laws of compression, types of compressors, selection of compressors. Pneumatic actuators-rotary, reciprocating (ii) Comparison of pneumatics with hydraulic power transmissions. (iii) Types of filters, regulators, lubricators, mufflers, dryers. (iv) Pressure regulating valves, (v) Direction control valves (vi) Speed regulating methods</p>		

used in Pneumatics.(vii)Basic pneumatic circuits (viii) Introduction to electro-pneumatics. Application of pneumatics in industrial automation.

Introduction to vacuum: Vacuum measurement, vacuum pumps, introduction to vacuum sensors and valves. Industrial applications of vacuum.

Unit 6	System Design	(06 Hrs)
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Design of hydraulic/ pneumatic circuit for practical application, Selection of different components such as reservoir, various valves, actuators, filters, pumps based on design. (Students are advised to refer manufacturer's catalogues.)

Term work

Term work shall consist record of minimum 10 experiments from following; Out of which Experiment no.7, Experiment no. 9 and Experiment no. 13 are compulsory.

1. Study of ISO/JIC Symbols for hydraulic and pneumatic systems.
2. Study of positive displacement pumps and determination of performance characteristics.
3. Study of filters and determination of filtration ratings.
4. Study of pressure control valves and circuits.
5. Study of flow control valves (Meter in, Meter out Circuits).
6. Study of direction control valves and circuits.
7. Following experiments to be done on pneumatic trainer:
 - a) Automatic reciprocating circuit.
 - b) Speed control circuit.
 - c) Pneumatic circuit involving shuttle valve/quick exhaust valve.
 - d) Sequencing circuit.
 - e) Circuits by using logic gates.
8. Following experiments to be done on hydraulic trainer:
 - a) Regenerative circuit.
 - b) Speed control circuit.
 - c) Sequencing circuit.
 - e) Transverse and feed circuit.
9. Design of circuits by using fluid simulation software's such as LVSIM®-HYD & PNEU, AUTOMATION STUDIO.
10. Study of Logic for DELAY Circuit using signal Input device unit & Indicator unit.
11. Design of compressed air distribution in pneumatic systems.
12. Design of simple hydraulic systems used in practice such as hydraulic clamp, jacks, dumper, forklift etc.
13. Industrial visits for applications of hydraulic and pneumatic system and their reports.
14. Study of accumulators/actuators/intensifiers/hydraulic and pneumatic power brakes.

Assignments

Assignments will be based on above syllabus

1. Theory questions based on hydraulic fluids, seal, strainer, conductor and filters.
2. At least five numerical/theory questions on sources of power.
3. Theory questions based on selection of pressure control, flow control and directional control valve for specific application.
4. Develop at least five hydraulic circuits using simulation software like Automation Studio.
5. Develop at least five pneumatic circuits for low cost industrial automation using simulation software like Automation Studio, Fluid SIM®.
6. Design of at least five hydraulic/pneumatic systems which includes components such as reservoir, various valves, actuators, filters, pumps based on design.
7. Theory questions based on sources of contamination, and its control.
8. Theory questions based on fluid power control.
9. Theory questions based on pneumatics and its applications
10. Identify at least five fluid power applications and enlist the fluid power components used in each of these applications.
11. Design of hydraulic/pneumatic circuit for practical application and selection of fluid power components.

Text Books

1. Anthony Esposito, Fluid Power with Applications, Pearson.
2. S.R. Majumdar, Oil Hydraulic systems- Principle and maintenance, Tata McGraw Hill.
3. S. R. Majumdar, Pneumatics Systems Principles and Maintenance, Tata McGraw Hill.
4. H. L. Stewart, Hydraulics and Pneumatics, Taraporewala Publication.
5. Jagadeesha T. and Tahammaiah Gowda, Fluid Power, Generation, Transmission and Control Wiley Publication.

Reference Books

1. J. J. Pipenger "Industrial Hydraulics", McGraw Hill
2. Pinches "Industrial Fluid Power", Prentice hall.
3. D.A. Pease "Basic Fluid Power", Prentice hall.
4. B. Lall "Oil Hydraulics", International Literature Association.
5. Yeaple "Fluid Power Design Handbook".
6. ISO - 1219, Fluid Systems and components, Graphic Symbols
7. Andrew A. Parr, Hydraulics and Pneumatics, Elsevier Science and Technology Books
8. Product Manuals and books from Vickers/ Eaton, FESTO, SMC pneumatics
9. Dr. R K Bansal, Fluid Mechanics, Laxmi Publications (P) Ltd.

Unit Tests-

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

Elective II: 5.1 COMPUTATIONAL FLUID DYNAMICS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH:03 Credits
Practical: - Hours / Week	Continuous Assessment: 40 Marks	Total:03 Credits
	Term Work/ Oral: -- Marks	
Course Pre-requisites:		
The Students should have		
1.	Knowledge of Mathematics & Science	
2.	Knowledge of fluid mechanics and heat transfer	
Course Objectives:		
1.	To introduce Governing Equations of vicious fluid flows	
2.	To introduce numerical modeling and its role in the field of fluid flow and heat transfer	
3.	To enable the students to understand the various discretization methods	
Course Outcomes:		
Students will be able to understand		
1.	Student should able to understand types of flow	
2.	Student should able to understand CFD Analysis	
3.	Student should able to understand numerical methods used in CFD	
4.	Student should able to understand Generate mesh	
5.	Student should able to understand conjugate heat transfer	
6.	Student should able to understand turbulence modeling	
Course Contents		
UNIT - I	Introduction to fluid Dynamics	(06 Hrs)
	Concepts of Fluid Flow, Pressure distribution in fluids, Reynolds transport theorem, Integral form of conservation equations, Differential form of conservation equations, Different Types of Flows, Euler and	

	Navier Stokes equations, Properties of supersonic and subsonic flows, Flow characteristics over various bodies.	
UNIT - II	Mesh Generation	(06 Hrs)
	Surface mesh generation Surface mesh repair, Volume grid generation, Volume mesh improvement, mesh smoothing algorithms, grid clustering and quality checks for volume mesh. Adaptive, Moving and Hybrid Grids, Need for adaptive and, moving grids, Tet, pyramid, prism, and hex grids, using various elements in combination	
UNIT - III	Basic Discretization Techniques	(06 Hrs)
	Need to discretization the domain and governing equations, Finite difference approximation using Taylor series, for first order (Forward Difference Approximation, Backward Difference Approximation, Central difference Approximation) and second order (based on 3 node, 4 node and 5 node points), explicit and Implicit approaches applied to 1D transient conduction equation, Couette flow equation using FTCS and Crank Nicholson's Method, Stability Criteria concept and physical interpretation, Thomas Tri-diagonal matrix solver.	
UNIT - IV	Two Dimensional Steady and unsteady heat conduction	(06 Hrs)
	Solution of two dimensional steady and unsteady heat conduction equation with Dirichlet, Neumann, robbins and mixed boundary condition – solution by Explicit and Alternating Direction Implicit method (ADI Method), Approach for irregular boundary for 2D heat conduction problems	
UNIT - V	Application of Numerical Methods to Convection – Diffusion System	(06 Hrs)
	Convection: first order wave equation solution with upwind, Lax–Wendroff, Mac Cormack scheme, Stability Criteria concept and physical interpretation Convection –Diffusion: 1D and 2D steady Convection Diffusion system – Central difference approach, Peclet Number, stability criteria, upwind difference approach, 1 D transient convection-diffusion system	
UNIT - VI	CFD as Practical Approach	(06 Hrs)
	Introduction to any CFD tool, steps in pre-processing, geometry creation, mesh generation, selection of physics and material properties, specifying boundary condition, Physical Boundary condition types such as no slip, free slip, rotating wall, symmetry and periodic, wall roughness, initialising and solution control for the solver, Residuals, analysing the plots of various parameters (Scalar and Vector contours such as streamlines, velocity vector plots and animation). Introduction to turbulence models. Reynolds Averaged Navier-Stokes equations (RANS), $k-\epsilon$, $k-\omega$. Simple problems like flow inside a 2-D square lid driven cavity flow through the nozzle	
Assignments:		

Assignments will be based on above syllabus	
1.	Reynolds transport theorem, Integral form of conservation equations
2.	Differential form of conservation equations, Different Types of Flows, Euler and Navier Stokes equations
3.	Surface mesh generation Surface mesh repair, Volume grid generation, Volume mesh improvement, mesh smoothing algorithms
4.	Grid clustering and quality checks for volume mesh. Adaptive, Moving and Hybrid Grids
5.	Finite difference approximation using Taylor series, for first order
6.	Explicit and Implicit approaches applied to 1D transient conduction equation, Couette flow equation using FTCS and Crank Nicholson's Method
7.	Solution of two dimensional steady and unsteady heat conduction equation with Dirichlet, Neumann,
8.	Robbins and mixed boundary condition – solution by Explicit and Alternating Direction Implicit method (ADI Method), Approach for irregular boundary for 2D heat conduction problems
9.	Convection: first order wave equation solution with upwind, Lax–Wendroff, Mac Cormack scheme, Stability Criteria concept
10.	Selection of physics and material properties, specifying boundary condition, Physical Boundary condition types such as no slip, free slip, rotating wall, symmetry and periodic, wall roughness
Text Books/Reference Books:	
1.	Versteeg, H.K., and Malalasekera, W., An Introduction to Computational Fluid Dynamics: The finite volume Method, Longman, 1998.
2.	Ghoshdastidar , P.S., computer Simulation of flow and heat transfer, Tata McGraw Hill Publishing Company Ltd., 1998.
3.	Patankar, S.V. Numerical Heat Transfer and Fluid Flow, Hemisphere Publishing Corporation, 2004.
4.	Muralidhar, K., and Sundararajan, T., Computational Fluid Flow and Heat Transfer, Narosa Publishing House, NewDelhi, 1995.
5.	Prodip Niyogi, Chakrabarty .S.K., Laha .M.K. Introduction to Computational Fluid Dynamics, Pearson Education, 2005
6.	Introduction to Computational Fluid Dynamics Anil W. Date Cambridge University Press, 2005.
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Elective II: 5.2 INDUSTRIAL ENGINEERING & MANAGEMENT		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH:03 Credits
Tutorial: 00 Hours / Week	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
Course Pre-requisites:		
The Students should have		
1.	Knowledge of basic concept of Management	
2.	Basic information of Industrial engineering.	
3.	Basic knowledge of human considerations in manufacturing.	
Course Objectives:		
	The student should understand the scope, objective and application of industrial engineering tools and management practices in manufacturing.	
Course Outcomes:		
Students will be able to understand		
1.	Definition, principles and functions of management.	
2.	Types and selection of business organizations.	
3.	Functioning of Personnel, Marketing and Finance Department.	
4.	Method Study tool for standardizing the method.	
5.	Work Measurement tool for standardizing the time.	
6.	Ergonomically accepts in manufacturing.	
UNIT - I	Management-An Introduction: Management- Meaning and Definitions, Management, Administration, and Organization concepts, Management as an Art and Science and a profession, contribution of various thinkers to management thought, Types and Functions of Management. Different approaches to management – scientific, operational, human and system approach.	(06 Hours)
UNIT - II	Organization: Different forms of business Organization –Individual proprietorship, Partnership, Joint stock company, Co-Operative enterprise, Public Sector, Undertakings, organizational structures in Industries, Line,	(06 Hours)

	Functional ,Line and functional , Project, Matrix Organization and Committees	
UNIT - III	<p>Financial, Marketing and Personnel Management:</p> <p>Personnel Management-Definitions Recruitment, Selection and training of the employees, Job valuation and Merit rating, wage administration different methods of wage payments, incentives.</p> <p>Marketing Management-Definitions, Marketing and Selling concept, market segmentation, distribution channels, Market Research, Advertising and sales promotion and Sales forecasting.</p> <p>Financial Management-Capital structure, Fixed capital, working capital, sources of finance, cost analysis, Break even analysis, Depreciation and Financial statement.</p>	(06 Hours)
UNIT - IV	<p>Method Study:</p> <p>Steps in method study, tools and techniques used, process chart symbols, flow diagrams, two handed chart, multiple activity chart, use of motion pictures and its analysis. SIMO charts, chorno & cycle graph, developing, presentation, installation and maintenance of improved methods.</p>	(06 Hours)
UNIT - V	<p>Work Measurement :</p> <p>Time Study: Aim and objectives , terminology and tools, use of stop watch procedure in making a time study, elements, selection of operations time study forms, handling of foreign elements. Performance rating. Allowances: Personal, Fatigue and other allowances. Analysis and calculation of Standard Time. Determination of number of cycles time study for indirect functions such as Maintenance , Marketing etc., MOST Technique.</p> <p>Works Sampling: Definition, Objectives, theory of Work Sampling. Other applications of work sampling, errors in work sampling study.</p> <p>Synthetic and Standard data Methods: Concepts, introduction to PMTS, MTM-1, WF, Basic motion time, MTM-2, and other second – generation methods timing of group operations.</p>	(06 Hours)
UNIT - VI	<p>Ergonomics and Industrial Safety:</p> <p>Definitions, importance in industry, basic anatomy of human body, anthropometrics, measurement of physical work and its techniques, work and rest cycles, bio mechanical factors environment effects.</p> <p>Importance of safety, planning, training, safety precautions, safety</p>	(06 Hours)

	Equipments, Government regulations on safety.	
Assignments:		
1.	Management: Types, Functions, Principles	
2.	Study of organization Structure	
3.	Study of Business organizations	
4.	Study of Financial, Marketing and Management	
5.	Study of Personnel Management	
6.	Study of Method Study methods and procedure	
7.	Study of Method Study charts	
8.	Study of Work Measurement methods and procedure	
9.	Study of Time study procedure and problems	
10.	Study of Work sampling and problems	
11.	Study of Ergonomics	
12.	Study of Industrial Safety	
Text Books/		
1.	O. P. Khanna, Industrial Engineering & Management, Dhanapat Rai & Sons.	
2.	M. C. Shukla, Business Organization and Management, S. Chand & Co. Ltd, New Delhi.	
3.	Harold Koontz & Heinz Enrich, Essentials of Management, McGraw Hill International.	
4.	M. N. Mishra, Organizational Behavior, Vikas publishing New Delhi.	
5.	Dale Yoder, Personnel Management.	
6.	Work Study, ILO.	
7.	S. S. Patil, Industrial Engineering & Management, Electro tech Publication.	
8.	Mansoor Ali & Dalela, Industrial Engineering & Management System, Standard Publisher distributions.	
9.	R. M. Currie, Work Study, ELBS.	
10.	Management by James A. F. Stoner, R. Edward Freeman, PHI	
11.	Management Today: Principles and Practice by Gene Burton and Manab Thakur, TMH	
12.	Organizational Behavior by Keith Davis, TMH	
13.	Management (Tasks, responsibilities and Practices) by Peter Drucker, Harper Business	
14.	Production Management by Lockyer, ELBS	
15.	Modern Production Management by E. S. Buffa (John Wiley)	
16.	Financial Management by Vanhorne, PHI	
17.	Financial Management (Theory and Practice) by Prasanna Chandra, TMH	
18.	Marketing Management by Philip Kotler, Pearson Edition	

19.	Marketing Management by Rajan Saxena, TMH
20.	Personnel Management by Edward Flippo, TMH
21.	Industrial Engineering and PPC” by A.K Bewwor and V.A.Kulkarni.
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV,V and VI

ELECTIVE II: 5.3 NANOTECHNOLOGY

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: 00 Hours / Week	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
Course Pre-requisites:		
The Students should have		
1.	Material Science	
2.	Physical properties of Material	
3.	Chemical properties of Material	
Course Objectives:		
	To know the history, synthesis, characterization and application of Nanotechnology	
Course Outcomes:		
Students will be able to understand		
1.	The basic of nano science and nanotechnology	
2.	Properties of nanomaterials	
3.	Synthesis process of the nanomaterials	
4.	Characterization tools of nanomaterial	
5.	Applications of nano science e and nanotechnology	
6.	Safety parameters while implementing nanotechnology	
UNIT - I	Basics of Nanoscience	(06 Hours)
	Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphenes and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials.	
UNIT - II	Properties of Nano materials	(06 Hours)

	Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties. Carbon nanostructures -Fabrication, structure, electrical properties and mechanical properties	
UNIT - III	Synthesis of Nonmaterial's	(06 Hours)
	Bottom up-Ball Milling, Melt mixing, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Electric arc deposition, Gas evaporation. Chemical methods: Hydrothermal combustion, bath deposition with capping techniques and top down, Chemical vapour deposition, Synthesis of metal & semiconductor nanoparticles by colloidal route, Microemulsions, Sol-gel method, Combustion method, Wet chemical method	
UNIT - IV	Nanomaterials characterization	(06 Hours)
	Nanomaterials characterization XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Scanning electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy, Atomic force microscopy, Nuclear magnetic resonance spectroscopy, Electron spin resonance spectroscopy, Raman spectroscopy	
UNIT - V	Applications of Nanotechnology	(06 Hours)
	Industrial applications of nanomaterials, in the areas of electronics, photonics, biology, nano biomaterials, health and environment, medicine, defence, chemicals, catalysts, textiles, etc. Application of nanotechnology in remediation of pollution, photocatalysis and other nanocatalysts, greenhouse gases, global warming. Monitoring nanoparticles at work place and sensors used for this.	
UNIT - VI	Nanotechnology and Safety	(06 Hours)
	Assessment of human health risks associated with the use of nanotechnologies and nanomaterials in the food and agriculture sectors, safety, current risk assessment approaches used by FAO/WHO, environmental, ethical, policy and regulatory issues. Toxicity of nanoparticles, exposure to nanoparticles and CNTs and influence on respiratory systems.	
Term Work/Practical's:		
1. Study of nanoscience and nanotechnology structures		
2. Synthesis of nanofibers by electrospinning processes		
3. Synthesis of nonmaterial's by sol gel process		

4. Study of Atomic Force Microscope	
5. Study of nano particle analyzer	
6. Study of Electrospinning Process	
7. Study of FTIR	
Assignments:	
1. Study of nano science and nanotechnology structures	
2. Properties :Mechanical, Thermal, Electrical, Optical, Magnetic and Structural	
3. Properties: Carbon nanostructures	
4. Synthesis of Nonmaterial's: Bottom up	
5. Synthesis of Nonmaterial's: Chemical methods	
6. Surface electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy	
7. UV-VIS spectroscopy, X-ray fluorescence, Atomic force Microscope, Raman spectroscopy	
8. Applications in electronics, photonics, biology, health and environment, medicine, defence, chemicals, catalysts, textiles	
9. Application of nanotechnology in remediation of pollution, photocatalysis and other nanocatalysts, greenhouse gases, global warming	
10. Nanotechnology and Safety	
Text Books/Reference Books:	
1	Edward L. Wolf (2nd Ed.), Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEYVCH, 2006
2	H.S.Nalwa, Hand book of Nanostructure materials and nanotechnology; (Vol.1-5), Acad. Press, Boston, 2000
3	C.P.Poole Jr., F.J.Owens; Introduction to Nanotechnology, John Wiley and sons, 2003
4	C. Furetta, Hand book of thermoluminescence; World Scientific Publ.
5	5.T.J.Deming, Nanotechnology; Springer Verrlag, Berlin, 1999
6	C. Delerue, M.Lannoo; Nanostructures theory and Modelling
7	Fausto, Fiorillo, Measurement and Characterization of Magnetic materials
8	Janos H, Fendler; Nanoparticles and Nanostructured Films

9	Liu,Hand Book of Advanced Magnetic Materials (4 Vol.)
10	Banwong, Anurag Mittal; Nano CMOS Circuit and Physical Design
11	S. Sakka,Sol-gel science and technology processing, characterization and applications; Kluwer Acad. Publ.
12	Goser et al, “Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices”
13	A. A. Balandin and K. L. Wang, “Handbook of Semiconductor Nanostructures & Nanodevices”
14	Cao Guozhong, “Nanostructures & Nanomaterials -Synthesis, Properties & Application
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Elective II: 5.4 PRODUCTION PLANING AND CONTROL		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: - Hours / Week	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
Course Pre-requisites:		
The Students should have		
1.	Knowledge of basic concept of Industrial Engineering & Management	
2.	Knowledge of statistics.	
3.	Basic knowledge of resources of production Man, Machine Material.	
Course Objectives:		
1.	The student should understand the scope, objective and application of Production Planning And Control manufacturing Industries.	
Course Outcomes:		
Students will be able to understand		
1.	The importance of PPC in industry.	
2.	The Forecasting by using different techniques.	
3.	Different ideas and concept to improve PPC in industry.	
4.	Different techniques for material requirement planning	
5.	Different techniques used for PPC in industry.	
6.	Computer Aided Process Planning.	

Course Contents		
UNIT I	Introduction to PPC : Role and stages of PPC, PPC as an integrated function, Product Life Cycle Analysis, Types of Production systems.	(06 Hrs)

UNIT II	Forecasting Techniques: Use and types of forecasting, Methods of forecasting and comparison, Verification and control.(Numerical Treatment)	(06 Hrs)
UNIT - III	Techniques And Production Control: Process sheet, Routing, Scheduling- Gantt Chart, Machine Loading Chart, Line of Balance, Line Balancing, Dispatching rules, Sequencing - Johnson's rule, Loading, Follow- up, Evaluation, PERT, CPM. .(Numerical Treatment)	
		(06 Hrs)
UNIT - IV	Materials Planning And Purchasing: Scope and requirement of MRP, MRP I and MRP II, Master Production Schedule, Bill of Materials, Capacity Requirement Planning, Introduction to ERP, Purchasing - Documentation, Make or Buy decisions, Vendor Development.	
		(06 Hrs)
UNIT - V	a) Inventory Control: Types of Inventory Cost of Inventory, EOQ, Selective Inventory Control, Replenishment Systems. b) Stores Management: Types of stores, Storage layout and storage systems, Stores Documentations, Stores Control and Control of Wastage and surplus, JIT, KANBAN, KAIZEN, Value Stream Mapping	
UNIT - VI	Computer aided production planning and control applied to : a) Machine capacity planning and utilization. b) Productivity measurement. c) Material Requirement Planning. d) Scheduling Techniques. Hands on experience of Computer aided Production Planning and Control. Case studies from Industries.	(06 Hrs)
Assignments:		
1.	Introduction of PPC	
2.	Techniques of Forecasting used in PPC	
3.	Different Techniques used in PPC to improve the production and to reduce the cost of production	
4.	Use and application applications of material planning and purchasing	
5.	Use of inventory control	

6.	Computer aided production planning and control (CAPP)
Text Books/Reference Books:	
1.	J.L. Riggs, "Production Systems - Planning Analysis and Control ", JhonWiley & Sons.
2.	J.B. Dilworth, "Operations Management - Design, Planning & Control for Manufacturing and Services ", McGraw Hill.
3.	S N Charry, "Production and Operation Management" Tata McGraw- Hill
4.	Samuel Elion, Elements of PPC ", Universal Book Company.
5.	Martand Telsang, "Industrial Engineering and Production Management" S. Chand and Co. Ltd.
6.	Moore, "Production Control ".
7.	Mager and Boodman," Production Planning And Inventory Control"
8.	Martin Star, "Production Management ".
9.	Erry Johnson, "Process Engineering ".
10.	E. EL. Buffa, "Production Management ".
11	A.K. Bewoor and V.A. Kulkarni "Production planning and Control"
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Elective II: 5.5 Experimental Methods in Mechanical Engineering

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory:-03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical:--- Hours / Week	Continuous Assessment: 40 Marks	PR: -- Credits
	Term Work/ Oral: -- Marks	Total: 03 Credits

Course Prerequisite:-	Student should have knowledge of: <ol style="list-style-type: none"> 1. Basic concepts in core courses in Mechanical Engineering. 2. Basic concepts in Engineering Mathematics. 3. Mechanical Measurements.
Course Objective:-	The student must be able to: <ol style="list-style-type: none"> 1. Understand the concepts of probability and statistics. 2. Understand application of curve fitting techniques in engineering. 3. Understand methods of design of experiments. 4. Understand need of uncertainty analysis 5. Understand advanced measurement techniques. 6. Select a data acquisition system for a given application.
Course Outcomes:-	Learner will be able to- <ol style="list-style-type: none"> 1. Understand characteristics of measurement system 2. Apply various techniques of curve fitting. 3. Apply basic concepts of design of experiments. 4. Use techniques of uncertainty analysis. 5. Use advanced measurement techniques in experimentation 6. Use data acquisition system (DAS) in experimentation.

Course Contents

Unit 1	Introduction to Experimental methods	(06 Hrs.)
<p>Probability and Statistics: Statistical Measurement Theory, Mean Value and Uncertainty, Probability-Density Function, Histogram-Frequency distribution, Mean value and Variance, Infinite Statistics, Normal-Gaussian distribution, Normal-Gaussian distribution,</p> <p>Characteristics of measurement systems: Dynamic characteristics of first order (liquid in glass thermometer) and second order instruments (U tube manometer). Response of first order and second order systems.</p>		
Unit 2	Curve Fitting	(06 Hrs.)
<p>Engineering application of curve fitting. Least squares approach, Polynomial curve fitting, Overfit and underfit. Multivariable regression analysis. Correlation coefficient. Power law and exponential curve fitting. Numericals based on practical engineering problems.</p>		

Unit 3	Planning of Experiments	(06 Hrs.)
Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. 2^K factorial design. Taguchi method. Response surface methodology.		
Unit 4	Uncertainty in Measurements	(06 Hrs.)
Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method.		
Unit 5	Advanced Measurement Techniques	(06 Hrs.)
Shadowgraph, Schlieren, Interferometer, Laser Doppler Anemometer, Telemetry in measurement, Orsat apparatus, Gas Analyzers, Smoke meters, gas chromatography, spectrometry, FFT analyzer.		
Unit 6	Data Acquisition System (DAS)	(06 Hrs.)
Data Acquisition Systems: Basic and automated versions of DAS. Characteristics of DAS: analogous input, sample speed, accuracy, linearity and resolution. A/D and D/A converters, Signal conditioning equipments. Case studies on selection of DAS for different experimentations. Introduction to data acquisition softwares.		

Reference Books

1. Coleman H. W. and Steele W. G., Experimentation, Validation, and Uncertainty Analysis for Engineers, 3rd ed.: John Wiley & Sons Inc., New Jersey, 2009.
2. Grewal, B. S. Higher engineering mathematics. Khanna Publisher, New Delhi, 1996.
3. Montgomery, Douglas C. Design and analysis of experiments. Vol. 6. New York: Wiley, 2002.
4. Kumar D. S., Mechanical Measurement & Control, Metropolitan Book Co. Pvt. Ltd. New Delhi, 2007.
5. Beckwith T. G., Marangoni R. D., Lienhard J. H., Mechanical Engineering Measurements, Pearson Prentice Hall, 2007

Assignments-

1. Problems on uncertainty analysis
2. Theory questions on introduction to experimental methods
3. Problems on practical engineering based on curve fitting
4. Theory questions on curve fitting
5. Theory questions on design of experiments
6. Practical engineering problems based on design of experiments
7. Questions based on transducers, sensors and actuators

8. Questions based on static and dynamic characteristics of instruments
9. Questions based on data acquisition system
10. Two practical oriented problems using any coding language.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

6. INPLANT TRAINING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: -- Hrs. / Week	End Semester Examination: -- Marks	TH: -- Credits
Practical: -- Hrs. / Week	Continuous Assessment: -- Marks	TW/OR: 04 Credits
	Term Work/ Oral: 50 Marks	Total: 04 Credits

Course Prerequisites:-	1. Students should have basic idea about engineering fundamentals
Course Objective: -	<ol style="list-style-type: none"> 1. Able to understand company organization and products manufactured. 2. Able to understand economic considerations for a specific product 3. Able to understand safe working environment in the company. 4. Able to communicate with workers and supervisors. 5. Able to understand various aspects of industrial practices and ethics. 6. Able to understand exposure for real life work and internships, carrier options with different work environments.
Course Outcomes: -	<ol style="list-style-type: none"> 1. Factory layout and workflow 2. List of in-house manufactured and bought out parts and the economic considerations for a specific product. 3. Component wise product manufacturing process chart. 4. Your training learning, deficiencies and lapses and suggestions for improvements

In plant training for 45 days:

Before the VII semester, students are required go through in-plant training for 45 days in a manufacturing company. The students will show their interest of training to the faculty coordinator who will arrange their training. In case a student wishes to undergo training in a specific company, he will indicate the same to the training coordinator who after ensuring the suitability of the company will take suitable action. During the training period student will be required to strictly follow the company rules and regulations about timings and other matters will work on the assigned project. During training period the students are required to go the company daily. Their attendance record verified by the factory training in charge of the factory will be part of their project report.

Report:

On completion of training, students are required to write a technical report about their training. In general the report should not exceed 50 pages of typed material. The report should cover following: Introduction-organization, its short history, products manufactured, competitors and organization's position in the market and its growth potential, production planning & control, material management, delivery of orders, off loading of work to third party cost saving or energy saving proposals, qualitative feedback from expert, study of tool room .

7. PROJECT STAGE -I

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 00 Hrs. / Week	End Semester Examination: -- Marks	TH: -- Credits
Practical: 02 Hrs. / Week	Continuous Assessment: -- Marks	TW/OR: 04 Credits
	Term Work/ Oral: 100 Marks	Total: 04 Credits

Course Pre-requisites:

The Students should have

1.	Knowledge of Mathematics & Science
2.	Knowledge of basic concepts in heat transfer.
3	Basic information of thermodynamics.
4	Basic knowledge of design
5	Knowledge of basic concepts in mechanical engineering.

Course Objectives:

1.	To identify problem for a specific need of an organization
2.	To review literature on specific research topic
3.	To make feasible, sustainable design
4.	To work sincerely as a member of a team
5.	.To communicate ideas to supervisors as well as subordinates
6.	To develop new equipment or make modifications in existing one

Course Contents

1	The formation of a project team with members having similar interest.
2	Discuss the ideas within the team members and choosing a faculty member interested in similar activity with the consent of the HOD. The projects can be on new equipment development, on industry sponsored problems or on research oriented subjects.
3	Discuss the project with the Faculty with the idea that projects selected are suitable for design and fabrication with the available resources.
4	<p>First presentation must include following points:</p> <ul style="list-style-type: none"> • Project Aim • Feasible design and alternatives considered • Estimation of approximate cost of the project • Activities bar chart • Internal Lab resources required <p>External resources required and their availability.</p>
5	<p>Second presentation consists of:</p> <ul style="list-style-type: none"> • Collection of reference material and • Design of the equipment with working drawings

	Stage of work completed through activities bar chart.
6	Third presentation includes complete work with suggested modifications.

8. Power Plant Engineering

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory:-04 Hrs. / Week	End Semester Examination: 60 Marks	TH: 04 Credits
Practical:- 02 Hrs. / Week	Continuous Assessment: 40 Marks	PR: 01 Credit
	Term Work/ Oral: 50 Marks	Total : 05 Credits

Course Prerequisite:-	Student should have knowledge of: <ol style="list-style-type: none"> 1. Basic concepts in Fluid Mechanics, Engineering Thermodynamics and Turbo-machinery. 2. Basic concepts in Engineering Mathematics.
Course Objective:-	The student must be able to: <ol style="list-style-type: none"> 1. Understand present status of power generation in India. 2. Understand various aspects of steam power plant. 3. Understand details of steam condensers, cooling towers and noozels. 4. Understand details of renewable and hybrid power systems. 5. Perform analysis of power plant for specific application 6. Understand various energy storage techniques.
Course Outcomes:-	Learner will be able to understand- <ol style="list-style-type: none"> 1. Brief overview of different types of power plants 2. Details of non-renewable power systems. 3. Performance of condensers, cooling towers and nozzles. 4. Performance of renewable and hybrid power systems. 5. Economics of power generation. 6. Procedures for safe operation and maintenance of power plants.

Course Contents

Unit 1	Introduction to Power Engineering	(08 Hrs.)
Different types of power plants–Thermal, Hydro, IC Engine, Gas Turbine, Nuclear and their characteristics, Combined Cycle, Pumped storage, Compressed air storage power plants and their characteristics. Comparison of Power plants with respect to various parameters. Issues in Power plants. Resources and development of power in India, NTPC, NHPC and their role in Power development in India. Power generation in Private sector, Power distribution, National Grid, Indian Electricity Grid Code. Regulation Structure of IEGC, Operating Policies and Procedures, Present Power position in India.		

Unit 2	Non-Renewable Power Systems	(08 Hrs.)
<p>High pressure and Super Critical Boilers – Fluidised bed boilers.</p> <p>Steam power cycles- Rankin cycle with reheat, regeneration. Numerical based on different combinations. Performance of boilers.</p> <p>Fuel and ash handling, Combustion equipment for burning coal, Mechanical Stokers. Pulveriser, Electrostatic Precipitator, Draught- Different types</p> <p>Gas Turbine Power Plants: Fuels, Gas turbine material, open and closed cycles, reheating, Regeneration and intercooling, combined cycle. Turbojet, Ramjet, Turboprop, Rocket engine.</p> <p>Diesel Power Plants: Types of diesel plants, components, Selection of Engine type, applications.</p> <p>Nuclear Power Plants: Nuclear reactors-PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal.</p>		
Unit 3	Condensers, Cooling Towers and Steam Nozzles	(08 Hrs.)
<p>Steam Condensers: Function of condenser in thermal power plant, Classification of condensers: Jet, Surface and Evaporative. Air leakage in condenser: sources and its effects. Condenser vacuum, Estimation of quantity of cooling water, Dalton’s law of partial pressure, Vacuum efficiency, Condenser efficiency.</p> <p>Cooling Towers: Cooling water system, types of cooling towers. Performance assessment of cooling towers, Energy saving opportunities.</p> <p>Steam nozzles: General forms of nozzles, Flow through steam nozzles, Velocity of steam leaving nozzle. Mass of steam discharged, Critical pressure ratio, Areas of throat and exit for maximum discharge, Length of nozzle. Efficiency of a nozzle. Effect of friction in a nozzle.</p>		
Unit 4	Renewable and Hybrid Power Systems	(08 Hrs.)
<p>Solar Power System: Types of Solar Collectors, Collection efficiency, Testing of Solar collectors – IS code, Applications of solar energy. Solar Pond, Solar Energy storage and types. Photovoltaic and fuel cells.</p> <p>Wind power: Power from wind, Site selection, Wind energy conversion systems and their classification, construction and working of typical wind mill, Design considerations for wind mills, present status.</p> <p>Biomass power: Energy plantation, Combustion and fermentation, Anaerobic digester, Biomass gasification, Pyrolysis, various applications of Biomass energy, Bio-fuel – Relevance, types, and applications.</p> <p>Hybrid Power Systems: Need for Hybrid systems, Range and type of hybrid systems, Case studies of Diesel-PV, Wind-PV, Micro-hydel-PV, Biomass-Diesel systems, hybrid electric vehicles, etc.</p>		
Unit 5	Analysis of Power Plants	(08 Hrs.)

Load Curves, Load duration curves, Performance and operational characteristics of power plants, Peak load, Intermediate load and Base load plants and their characteristics, Input output characteristics of power plants, Economic division of between Base load plant and peak load plants. Cost of energy generation, Tariff methods. Economics of load sharing, comparison of various power plants. Numericals based on the syllabus contents.		
Unit 6	Energy Storage Technologies, Plant Safety and Maintenance	(08 Hrs.)
<p>Energy Storage Technologies: Pumped Hydroelectric Storage, Compressed Air Energy Storage, Battery Technologies - Traditional and Advanced, Flow Batteries, Flywheels, Superconducting Magnetic Energy Storage, Super-capacitors/Ultra-capacitors, Energy Storage Technology Comparisons, Functional Comparison, Cost Comparison.</p> <p>Plant Safety and Maintenance: Operation and Maintenance procedures of power plants, Operator training, Safety during selection of power plant equipment –safety in commissioning of thermal power plant equipments, hydrostatic and air leakage test, acid and alkali cleaning, safety in auxiliary plants. Cooling water system, Safety in maintenance of power plants.</p>		

Reference Books

1. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.
2. John V Grimaldi and Rollin H Simonds, Safety Management
3. M. M. El Wakil, Power Plant Technology –Mc Graw Hill. Int. Edition.
4. Domkundwar and Arora, Power Plant Engineering, Dhanpatrai and Sons.
5. Grainger John J, and Stevenson Jr. W.D. Power System Analysis, McGraw Hill 1994
6. L. K. Kirchmeyer, Economic Operation of Power Systems, John Wiley and Sons, 1993.
7. C. A. Gross, Power System Analysis, John Wiley and Sons, Inc.1986.
8. John Weisman & L.E. Eckart, Modern Power Engineering, Prentice Hall, 1985
9. A course on Power Plant Engineering Ramlingam SCITECH Publication
10. S. P. Sukhatme, Solar Energy, Tata McGraw Hill, 3rdEdition 1996.
11. G. D. Rai, Non-Conventional Energy Sources, Khanna Publishers, 2011
12. P. K. Nag, Power plant Engineering, TMH, 3rd Edition 2002

Assignments-

1. Theory questions on different types of power plants.
2. Problems on performance of steam power plant based on Rankin cycle
3. Theory questions on components of steam power plant.
4. Theory questions on gas turbine, diesel and solar power systems.
5. Theory questions on wind, biomass and hybrid power systems.
6. Practical engineering problems based on analysis of power plants.
7. Questions based on various terms related to economics of power generation.

8. Questions based on energy storage technologies.
9. Case study on electricity terrify calculation both for industry as well as household purpose.
10. Questions based on plant safety and maintenance.

Term Work (Any EIGHT experiments from the list below)

1. Study of National & International Grid, Indian Electricity Grid Code
2. Study of combined cycle gas based and coal based Power plant.
3. To perform analysis of a thermal power plant.
4. To perform analysis of gas turbine/ diesel/ solar power system.
5. To perform analysis of wind/ biomass power system.
6. Study of Power plant Instrumentation.
7. Visit to a thermal power plant.
8. Study of Heat Exchangers used in Power Plant
9. To study different energy storage technologies.
10. To study different types of hybrid power plants.

Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

9. INDUSTRIAL PRODUCT DESIGN

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	PR: 01 Credit
	Term Work/ Oral: 50 Marks	Total: 04 Credits
Course Pre-requisites:		
The Students should have knowledge of:		
1.	Machine Drawing	
2.	Machine Design	
3.	CAD software viz. CATIA/ ProE/ SolidWorks/ UniGraphics	
Course Objectives:		
Students should be able to understand		
1.	Various aspects of product design and development	
2.	Concept generation and selection	
3.	Aesthetic and Ergonomic considerations in product design	
Course Outcomes:		
Students should be able to		
1.	Understand characteristics of successful product development.	
2.	Understand different product design methods	
3.	Estimate manufacturing cost, assembly and support costs.	
4.	Understand the concept of prototyping	
5.	Understand steps to establish the product specifications & concept generation,	
6.	Understand ergonomic considerations in product design	
Course Contents		
UNIT - I	Introduction to Product Design and Development	(06 Hrs.)
	Market survey. Identify customer needs and product planning processes. Product architecture: Implication of architecture, establishing the architecture, related system level design issue. Overview of industrial design, Successful product, development of quality aspect of product design; Challenges of product development.	
UNIT - II	Product Design Methods	(06 Hrs.)
	Creative and rational, clarifying objectives - the objective tree method, establishing functions- the function analysis method, setting requirements–the performance specification method, determining characteristics–the QFD method, generating alternatives – morphological chart method, evaluating alternatives – the weighted objective method, improving details – the value engineering method and	

	design strategies.	
UNIT - III	Product Specifications and Concept Generation	(06 Hrs.)
	Product specification, steps to establish the target specifications, Concept generation, five step concept generation method, concept selection, concept screening, concept testing, product architecture	
UNIT - IV	Industrial Design and Prototyping	(06 Hrs.)
	Its need, impact and quality, industrial design process and its management, legal issues in product design, design resources, economics and management of product development projects. Prototyping: Basics and principles of prototyping, Rapid prototyping technologies, planning for prototypes.	
UNIT - V	Ergonomics and Industrial Safety	(06 Hrs.)
	Introduction-General approach to the man-machine relationship-workstation design working position and posture. An approach to industrial design - elements of design structure for industrial design in engineering applications in manufacturing systems. Environmental Application of ergonomics in industry for safety, health and environment control. Safety and ISO 14000 Systems.	
UNIT - VI	Design for Manufacture	(06 Hrs.)
	Estimating manufacturing cost, reducing component, assembly and support costs, design for assembly, design for disassembly, design for environment, design for graphics and packaging, effective prototyping-principle and planning. Product data management. Innovation and creativity in product design. Product costing, value engineering, aesthetic concepts.	
Assignments:		
1.	At least FIVE questions on market survey, concept generation and product architecture	
2.	At least FIVE questions on various product design methods	
3.	At least FIVE questions on various concepts related to design for manufacture	
4.	At least FIVE questions on industrial design and prototyping	
5.	At least FIVE questions on product specifications	
6.	At least FIVE questions on ergonomic considerations in product design	
7.	At least FIVE questions on safety considerations in product design	
8.	At least FIVE questions on concept generation	
Term Work: Use of different CAD software viz. CATIA/ ProE/ SolidWorks/ UniGraphics while doing following case studies:		

1.	A case study on market study to identify costumer needs
2.	A case study on use of morphological analysis
3.	A case study on Quality Function Development (QFD)
4.	A case study of one aesthetic considerations in product design
5.	Failure Modes and Effects Analysis (FMEA) in product design
6.	A case study on Design for Manufacturing
7.	A case study on Product Lifecycle Management (PLM)
8.	A case study of one ergonomic considerations in product design
9.	A case study of one industrial safety considerations in product design
Text Books/Reference Books:	
1.	Product Design and Development: Karl T. Ulrich, Steven G. Eppinger; Irwin McGraw Hill
2.	Product design and Manufacture: A.C. Chitale and R.C. Gupta; PHI Chitale & Gupta, "Product Development", Tata McGraw Hill
3.	New Product Development: Tim Jones, Butterworth, Heinemann, Oxford, 1997.
4.	Product Design for Manufacture and Assembly: Geoffrey Boothroyd, Peter Dewhurst and Winston Knight.
5.	Product Design : Otto and Wood; Pearson education.
6.	Industrial Design for Engineers: Mayall W.H, London, Hiffee books Ltd, 1988
7.	Introduction to ergonomics – R.C. Bridger, McGraw Hill Pub.
8.	Product Design – Kevin Otto, Kristin Wood Pierson Education
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

10. OPTIMUM DESIGN

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hrs. / Week	End Semester Examination: 60 Marks	TH: 04 Credits
Practical: -02 Hrs. / Week	Continuous Assessment: 40 Marks	PR: 01Credits
	Term Work/ Oral: 50 Marks	Total: 05 Credits

Course Pre-requisites:

The Students should have basic knowledge of

- | | |
|-----------|---|
| 1. | Student should have knowledge of Fundamentals of Engineering Mechanics |
| 2. | Student should have knowledge of Machine Design and Computer Aided Drafting |
| 3. | Student should have knowledge of Machine Design –I & II |
| 4 | Student should have knowledge of Theory of Machine |

Course Objectives:

To develop competency for system visualization and design.

To enable student to design pressure vessels and to use IS code.

To enable student, select materials and to design internal engine components.

To introduce student to optimum design and use optimization methods to design mechanical components.

To enable student to design machine tool gearbox.

Ability to apply the statistical considerations in design and analyze the defects and failure modes in components

Course Outcomes:

Students will be able to understand

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|-----------|--|
| 1. | The student will understand the difference between component level design and system level design. |
| 2. | Ability to design various mechanical systems like pressure vessels, machine tool gearboxes, etc. |
| 3. | Ability to learn optimum design principles and apply it to mechanical components. |

4.	Ability to handle system level projects from concept to product	
UNIT - I	<p>Design of Bevel Gear and Worm gears</p> <p>Introduction, classification of bevel gears, terms used in bevel gears, formative or equivalent number of teeth for bevel gears, forces acting on a bevel gear, strength of bevel gears</p> <p>worm and worm wheel: Introduction, terms used in worm gearing, forces acting on worm gears, strength of worm gear teeth, wear tooth load for worm gear, efficiency of worm gearing, thermal rating of worm gearing</p>	(06 Hours)
UNIT - II	<p>Design of Machine Tool Gearbox</p> <p>Introduction to machine tool gear boxes, design and its applications, basic considerations in design of drives, determination of variable speed range, graphical representation of speed and structure diagram, ray diagram, selection of optimum ray diagram, deviation diagram, difference between numbers of teeth of successive gears in a change gear box.</p>	(06 Hours)
UNIT - III	<p>Statistical Considerations in Design.</p> <p>Frequency Distribution-Histogram and frequency polygon, normal distribution-units of central tendency and dispersion – standard deviation- population combinations – design for natural tolerances – design for assembly- statistical analysis of tolerances, mechanical reliability and factor of safety.</p>	(06 Hours)
UNIT - IV	<p>Pressure Vessels</p> <p>Introduction, Classification of Pressure Vessels, Stresses in a Thin Cylindrical Shell due to an Internal Pressure, Circumferential or Hoop Stress, Longitudinal Stress, Thin Spherical Shells Subjected to an Internal, Thick Cylindrical Shell Subjected to an Internal Pressure, Compound Cylindrical Shells, Stresses in Compound Cylindrical Shells, Cylinder Heads and Cover Plates, Autofrettage.</p>	
UNIT - V	<p>Optimum Design</p> <p>Objectives of optimum design, adequate and optimum design, Johnson's Method of optimum design, primary design equations,</p>	(06 Hours)

	subsidiary design equations and limit equations, optimum design with normal specifications of simple machine elements- tension bar, transmission shaft and helical spring, Pressure vessel. Introduction to redundant specifications (Theoretical treatment).	
UNIT - VI	<p>Product Design Processes and Design Economics</p> <p>Technological innovation, product and process cycles, designing to codes and standards, design for manufacture and assembly, importance of economic decision making, value engineering, legal and ethical issues in design. Introduction to Design of Experiment.</p> <p>Mathematics of time value of money, cost comparison, depreciation, profitability of investments, benefit-cost analysis</p>	(06 Hours)
Term Work/Practical's:		
Assignments:		
<p>1. One design project</p> <p>The design project shall consist of two imperial size sheets (Preferably drawn with 3D/2D CAD software)-one involving assembly drawing with a part list and overall dimensions and the other sheet involving drawings of individual components, manufacturing tolerances, surface finish symbols and geometric tolerances must be specified so as to make it working drawing. A design report giving all necessary calculations of the design of components and assembly should be submitted. Projects shall be in the form of design of mechanical systems including pressure vessel, multispeed gear box, etc.</p>		
<p>2. Collect information about gear manufacturer along with catalog and identify designation, standards.</p>		
<p>3. Write a brief note on Statistical Considerations in Design with reference to any case study.</p>		
<p>4. Collect detailed information about pressure vessels types, uses, advantages, disadvantages with photos.</p>		
<p>5. Discuss different modern software tools used for design optimization.</p>		
<p>6. Write assignment on Digital Manufacturing.</p>		
Text Books /Reference Books:		
1	Bhandari V.B.— Design of Machine Elements, Tata McGraw Hill Pub. Co. Ltd.	
2	Juvinal R. C, Fundamentals of Machine Components Design, Wiley, India	
3	Black P. H. and O. Eugene Adams, —Machine Design, McGraw Hill Book Co. Inc.	

4	Johnson R. C., —Mechanical Design Synthesis with Optimization Applications, Von Nostr and Reynold Pub
5	S. K. Basu and D. K. Pal,—Design of Machine Tools Oxford and IBH Pub Co.
6	Rudenko, Material Handling Equipment, M. I. R. publishers, Moscow
7	P. Kanniah, Design of Transmission systems, SCIETCH Publications Pvt. Ltd
8	Pandy, N.C.and Shah, C. S.,—Elements of Machine Design—,Charotar Publishing House.
9	Singiresu S. Rao, Engineering Optimization: Theory and Practice, ,John Wiley & Sons.
10	M. V. Joshi, Process Equipment Design, Mc-Millan.
11	Design Data—,P.S.G.College of Technology, Coimbatore
12	I.S. 2825: Code for unfired pressure vessels
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Elective III: 11.1. INDUSTRIAL AUTOMATION AND ROBOTICS		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: - Hours / Week	Continuous Assessment: 40 Marks	PR: -- Credits
	Term Work/ Oral: -- Marks	Total: 03 Credits
Course Pre-requisites:		
The Students should have		
1.	Knowledge of Mathematics & Theory of Machines	
2.	Knowledge of Automatic Control Systems	
3.	Knowledge of Sensors and Transducers	
Course Objectives:		
1.	To inculcate the basic concepts, parts of robots and types of robots	
2.	To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming languages of robots	
3.	To create manpower for working on robot	
Course Outcomes:		
After the successful completion of this course, the student will be able,		
1.	To identify potential areas for automation and justify need for automation.	
2.	To do line balancing of an automation system.	
3.	To explain the basic principles of robotic technology, configurations, control and programming of robots.	
4.	To select suitable sensor & design robotic gripper for different applications.	
5.	To analyze robots through kinematic and dynamic study.	
6.	To explain the basic principles of robot programming language and Identify typical robot applications.	
Course Contents		
UNIT I	Introduction to Industrial Automation	(06 Hrs.)

	Automation and Robotics, Historical Development, Basic concept of automation, Building Blocks of Automation Systems- Sensors, Analyzers, Actuators, Drives. Types of automation: fixed, flexible and programmable and their comparative study. Concept of Mechanization of Parts Handling.	
UNIT II	High Volume Manufacturing System	(06 Hrs.)
	Transfer Lines, Detroit type automation-Design and fabrication considerations. Analysis of automated flow lines- technology, analysis of transfer lines without storage, partial automation and automated flow lines with storage buffers, computer simulation of automated flow lines. Assembly system and line balancing- computerized line balancing methods.	
UNIT III	Fundamentals of Robot Technology	(06 Hrs.)
	<p>Fundamentals of Robotics: Robot Definitions, Laws of Robotics, Basic Structure of Robots, links and Joints, types of Joints, types of links, types of end effectors, Wrist configuration: concept of: yaw, pitch and roll. Robot Anatomy, work volume, work envelope, robot manipulator. Specifications of robot: degrees of freedom (DOF), accuracy, repeatability, spatial resolution, compliance, loads carrying capacity, speed of response.</p> <p>Classification of Robots- 1) Co-ordinate system: Cartesian, cylindrical, spherical, SCARA, articulated 2) Control Method: Servo controlled and non-servo controlled, their comparative study 3) Form of motion: P-T-P (point to point), C-P (continuous path), pick and place etc. and their comparative study 4) Drive Technology: Hydraulic, Pneumatic, Electric (stepper motor, D.C. servo motor) in detail with selection criteria. Motion conversion: Rotary to rotary, rotary to linear and vice versa.</p>	
UNIT IV	Sensors and End-Effectors in Robotics	(06 Hrs.)
	Sensors and Transducers in Robotics: Uses of Sensors in Robotics, type of sensors in robot systems, non-optical and optical position sensors, Touch Sensors-Tactile sensor, Pressure sensors, colour sensor, gas sensor and flexible force sensor, Torque sensors, Light sensors, Voice Communication.	

	End-Effectors in Robotics: Classification of End Effectors, Drive system for end effectors, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, adhesive Grippers, Hooks, Scoops, Tools as end effectors. Gripper force analysis and gripper design- Simple problems, Active and Passive Grippers.	
UNIT V	Robot Kinematics and Dynamics	(06 Hrs.)
	Introduction to manipulator kinematics, position representation, forward and reverse transformation of two degree of freedom robot arm, four degree of freedom manipulator in three dimensions. Robot Dynamics, D Alembert's Equations of Motion.	
UNIT VI	Robot Programming Languages and Industrial Applications	(06 Hrs.)
	Robot Programming Languages: Concept of on-line and off line programming, concept of teach pendant. Methods of robot programming- Lead through methods, Textual robot languages and their Features. Applications of Robots: Robot applications based on surveillance system, machining, material handling, house hold and service sector. Applications of Telechiric robots.	
Assignments:		
1.	At least five theory questions based on identifying the industrial applications of robotics & automation.	
2.	At least five theory questions on identifying the industrial applications of automation with building blocks.	
3.	At least five theory questions on identifying the fixed, flexible and programmable automation.	
4.	At least five theory questions on high volume manufacturing system.	
5.	At least five theory questions on study of line balancing of an automation system.	
6.	At least five PLC programs based on pick and place robot.	
7.	At least five theory questions based on fundamentals of robotics.	
8.	At least five theory questions based on selection of sensors.	
9.	At least five theory /numerical questions based on selection of end effectors of robot.	

10.	At least five theory /numerical questions based on robot kinematics and dynamics.
11.	At least five theory questions based on robot programming language and robot applications.
12.	At least five theory questions on identifying the industrial applications of robots.
Text Books/Reference Books:	
1.	“Industrial Robotics”, Groover, Weiss, Nagel, McGraw Hill International
2.	Automation, Production Systems and Computer Integrated Manufacturing M.P.Groover, Pearson Education.5th edition, 2009
3.	Introduction to Robotics- John J. Craig, Addison Wesley Publishing, 3rd edition, 2010
4.	Robotics Technology and Flexible Automation, Second Edition, 2010 McGraw Hill Education (India) Private Limited
5.	P.A. Janaki Raman, Robotics and Image Processing an Introduction, Tata McGraw Hill Publishing company Ltd., 1995.
6.	Stuart A Boyer: SCADA supervisory control and data acquisition, International Society of Automation, 2010.
7.	A Robot Engineering Textbook “– Mohsen Shahinpoor – Harper & Row publishers, New York
8.	“Anatomy of Automation”- Amber G.H & P. S. Amber, Prentice Hall. Principles of CIM by Vajpayee, PHI.
9.	R. K. Mittal, I. J. Nagrath, "Robotics and Control", Tata McGraw Hill Publishing Company Ltd., New Delhi.
10.	Robert J. Schilling, "Fundamentals of Robotics: Analysis and Control", Prentice Hall of India, New Delhi
11.	Arthur J. Critchlow, "Introduction to Robotics", Macmillan Publishers Limited, 1985
12.	Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, "Industrial Robotics: Technology, Programming and Applications", McGraw Hill Book Company
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Elective III: 11.2 CRYOGENICS

Elective III: 11.2 CRYOGENICS		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: - Hours / Week	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
Course Pre-requisites:		
The Students should have		
1.	Knowledge of heat transfer.	
2.	Knowledge of refrigeration and air conditioning.	
Course Objectives:		
1.	To introduce Governing Equations of vicious fluid flows	
2.	To introduce numerical modeling and its role in the field of fluid flow and heat transfer	
3.	To enable the students to understand the various discretization methods	
Course Outcomes:		
Students will be able to understand		
1.	Student should able to understand cryogenic systems	
2.	Student should able to understand Behavior of materials at low temperature	
3.	Student should able to understand Gas Liquification Systems	
4.	Student should able to understand Gas Separation And Purification Systems	
5.	Student should able to understand Measurement Systems For Low Temperatures , Fluid Storage And Transfer Systems	
6.	Student should able to understand Application Of Cryogenic Systems	
Course Contents		
UNIT - I	Introduction to Cryogenic and properties of materials	(06 Hrs.)
	History and development it's importance, cryogenic temperature scale. Low temperature properties of materials, Mechanical properties Thermal properties, electric and magnetic properties, Properties of cryogenics& fluids.	
UNIT - II	Gas Liquification Systems	(06 Hrs.)
	Introduction- production of low temperature , Liquefaction systems for N ₂ , Neon, Hydrogen, He etc.(Numerical Treatment)	
UNIT - III	Cryocoolers	(06 Hrs.)
	Regenerative systems – Overview of regenerative coolers, Introduction to Pulse Tube Coolers, Stirling Coolers, G-M Coolers, J-T Coolers, Cryocooler applications.	

UNIT - IV	Gas Separation And Purification Systems	(06 Hrs.)
	Thermodynamically ideal separation systems- properties of mixtures , principles of gas separation Rectification column- Linde single and double column system of air separation.	
UNIT - V	Fluid Storage And Transfer Systems	(06 Hrs.)
	Dewar vessel, insulation types and importance. Components of transfer system with importance. Importance of vacuum and it's measurement.	
UNIT - VI	Application Of Cryogenic Systems	(06 Hrs.)
	Applications in mechanical, electrical, food preservation, biological and medical, space technology etc.	
Assignments:		
Assignments will be based on above syllabus		
1.	History and development it's importance, cryogenic temperature scale.	
2.	Low temperature properties of materials, Mechanical properties Thermal properties, electric and magnetic properties	
3.	Introduction- production of low temperature , Liquefaction systems for N2	
4.	Liquefaction systems for Neon, Hydrogen, He	
5.	Regenerative systems – Overview of regenerative coolers, Introduction to Pulse Tube.	
6.	Stirling Coolers, G-M Coolers, J-T Coolers, Cryocooler applications.	
7.	Thermodynamically ideal separation systems- properties of mixtures , principles of gas separation Rectification column- Linde single	
8.	Dewar vessel, insulation types and importance.	
9.	Components of transfer system with importance. Importance of vacuum and it's measurement	
10.	Applications in mechanical, electrical, food preservation, biological.	
Text Books/Reference Books:		
1.	Cryogenics systems – Randall Barron – Mc Graw Hill Book Co	
2.	Cryogenic Engineering – R. B. Scott – Van Nosfrand Co.	
3.	Cryogenic Engineering –J. H. Bell – Prentice Hall	
4.	Cryogenic Engineering – R. W. Vance – John Welley	
5.	Cryocoolers - Walkers – Prentice Hill Publication	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

Elective III: 11.3 PROJECT MANAGEMENT & ETHICS		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
	Continuous Assessment: 40 Marks	
	Term Work/ Oral: -- Marks	Total: 03 Credits
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of general management.	
2.	Basic knowledge of statistics	
3.	Basic knowledge of industrial management	
Course Objectives:		
	The objective of the course is to create awareness of the concept of project management and its components to students	
Course Outcomes:		
Students will be able to understand		
1.	Project management and its importance.	
2.	Various techniques used to analyze a project.	
3.	Methods for cost estimation of a project.	
4.	Methods for planning and scheduling of a project.	
5.	Methods for monitoring and control of projects.	
6.	Project management and business ethics.	
UNIT - I		
Introduction to Project Management		(06 Hours)
	Project, Project Management, Management by projects, Project Management Associations, Benefits of Project Management, Project management Process, Role of Project Manager. Project Lifecycle	

UNIT - II	Project Management Techniques and Risk Management	(06 Hours)
	<p>Feasibility Studies, Numerical Models (Payback Period, Return on Investment, Net Present Value, Internal rate of Return), Scoring Models, Break Even Analysis</p> <p>Project Risk Management: Introduction, Risk, Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Reducing Risks.</p> <p>Use of excel and MS project for feasibility studies and risk management.</p>	
UNIT - III	Project Cost Estimating	(06 Hours)
	<p>Estimating terminology, Project Costs, Estimating Methods (Jobbing, Factoring, Inflation, Economies of Sales, Unit Rates, Day Work), Analogous Estimating, Parametric Estimating, Bottom-Up Estimating, Three-Point Estimates, Monte Carlo Simulation, Project Budgeting, Resource Allocation, Cost Forecasts</p> <p>Use of excel and MS project for project cost estimating</p>	
UNIT - IV	Project Planning and Scheduling	(06 Hours)
	<p>Project Planning: Introduction, Need of Project Planning, Project Life Cycle, Roles, Responsibility and Team Work, Project Planning Process, Work Breakdown Structure (WBS)</p> <p>Scheduling: Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model, Measures of variability, CPM Model, Network Cost System</p> <p>Use of MS project Project Planning and Scheduling</p>	
UNIT - V	Project Monitoring and Control	(06 Hours)
	<p>Project Execution and Control: Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control</p> <p>Project Management Information System: Introduction, Project Management Information System (PMIS), Planning of PMIS, Design of PMIS</p> <p>Project Performance Measurement and Evaluation: Introduction, Performance Measurement, Productivity, Project Performance Evaluation, Benefits and Challenges of Performance Measurement</p>	

	and Evaluation, Controlling the Projects	
UNIT - VI	Professional Responsibility (Ethics)	(06 Hours)
	Ensuring Integrity and Professionalism, Project Management Knowledge Base, Enhancing Individual Competence, Balancing Stakeholder Interests, Interactions with Team Members and Stakeholders, Templates, Tools and Techniques	
Assignments:		
1.	At least five questions based on the introduction to project management	
2.	Case study involving various aspects of project.	
3.	Case study involving various techniques used for project selection.	
4.	At least five Numericals on various techniques used for project selection.	
5.	Case study of project cost estimation	
6.	At least five Numericals on project cost estimation	
7.	Case study of project scheduling	
8.	At least five Numericals on project scheduling	
9.	Case study based on project scheduling	
10.	At least five questions based on project monitoring	
11.	At least five questions based on ethics	
12.	Industrial case study of project ethics	
Text Books/Reference Books:		
1	Project Management Institute; "A Guide to the Project Management Body of Knowledge (PMBOK Guide)"; 5th Revised edition (1 January 2013)	
2	Harold Kerzner; "Project Management: A Systems Approach to Planning, Scheduling and Controlling Paperback"; Wiley; tenth edition (20 November 2012)	
3	Erik Larson, Clifford Gray; "Project Management: The Managerial Process"; McGraw Hill Education; Sixth edition (1 July 2014)	
4	Panneerselvam R; "Project Management"; Prentice Hall India Learning Private Limited; 1 Edition (2009)	

5	Samuel J. Mantel, Jack R. Meredith; "Project Management: A Managerial Approach"; Wiley; Eighth edition (6 August 2012)
6	Gupta R; "Project Management"; Prentice Hall India Learning Private Limited; Second edition (2014)
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Elective III: 11.4. TOTAL QUALITY MANAGEMENT		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	TH: 03 Credits
	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
Course Pre-requisites:		
The Students should have		
1.	Basics of Quality Control	
2.	Basics of Measurements and measuring Instruments	
3.	Knowledge of Statistics.	
Course Objectives:		
To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management and to understand the statistical approach for quality control.		
Course Outcomes:		
1.	Implement the principles of total quality management.	
2.	Apply six sigma concepts and increase the quality of product.	
3.	Make use of TQM techniques	
4.	They will be able to implement TQM Tools.	
5.	Execute Quality standards in companies	
6.	Make use of Advanced Techniques of Total Quality Management like Design of experiments, Failure mode effect analysis, Taguchi method Taguchi's quality engineering	
UNIT-I: Quality & Total Quality Management		(06 Hrs)
Quality, Definitions of Quality, New philosophy of quality, Product quality, & its prospects. Overview of TQM : Concept & definition, Fundamentals, Principles of TQM, Elements of TQM, Approaches of TQM, Models of TQM, Zero defect concept, Benefits of TQM. Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits,		
UNIT-II: Quality Assurance		(06 Hrs)
Basic concepts, Quality assurance input – process – output. Significance of feedback for Quality assurance, Process capability analysis, Concept of Six Sigma. Internal customer approach, Customer – Satisfaction, data collection & complaint, Redressal mechanism.		
UNIT-III: TQM Tools		(06 Hrs)

Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure, Just – in- Time, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA., FMEA, TPM.	
UNIT-IV: TOYOTA Production System and Lean Manufacturing	(06 Hrs)
History of TPS. History, Scope, What is lean production? – Introduction, background, and lean thinking. Lean production preparation – System assessment, process and value-stream mapping – Sources of waste. Lean production processes, approaches and techniques. —Importance of focusing upon flow. Tools include: a. Workplace organization – 5S. b. Stability. c. Just-In-Time – One piece flow – Pull. d. Cellular systems. e. Quick change and set-up reduction methods. f. Total productive maintenance. g. Poka-Yoke – mistake proofing, quality improvement. h. Standards. i. Leveling. j. Visual management. Employee involvement – Teams – Training – Supporting and encouraging involvement – Involving people in the change process -- communication -- Importance of culture	
UNIT-V: Quality Systems	(06 Hrs)
Policy & objectives, Quality standards, Concept of quality system standards, Relevance & origin of ISO 9000–2000 standard & certification, Benefits. Elements of ISO 9001, 9002, 9003 series–Clauses, contents, interpretations & implementation. TS - 16949, QS-9000, ISO 14000, OHSAS	
UNIT-VI: Advanced Techniques of Total Quality Management	(06 Hrs)
Design of experiments, Failure mode effect analysis, Taguchi method Taguchi's quality engineering –Loss function, orthogonal arrays, Signal to noise ratio, parameter design & tolerance design. Total Quality in service sector. S. S. Technique, Kanban (Little's Law for KANBAN system)	
Term work: Detail Study and Presentations on Above topics to be submitted.	
Assignments	
<ol style="list-style-type: none"> 1. Assignment on TQM 2. Assignment on Six sigma concept. 3. Assignment on TQM principles. 4. Assignment on TQM tools. 5. Assignment on Quality Systems 6. Assignment on Advanced Techniques of Total Quality Management 	

Text Books/ References

1. Sundar Raju, "Total Quality Management", Tata McGraw Hills.
2. M. Zairi, "Total Quality Management for Engineers", Aditya Books.
3. ISO 9000 Quality System", Dalela& Saurabh, Standard Publishers.
4. R.C. Gupta, "Statistical Quality Control".
5. Grant E. L. & R. Leavenworth, "Statistical Quality Control", Tata McGraw Hills
6. TapanBagchi, "Taguchi Methods Management", Pearson Education.
7. Feigenban, "Total Quality Control", Tata McGraw Hills.
8. Total Quality Management Handbook, J. K. Hradeskym, Tata McGraw Hills.

Unit Test

Unit Test 1	Units I, II and III
Unit Test 2	Units IV, V, VI

Elective III: 11.5. FINITE ELEMENT ANALYSIS

Teaching Scheme:	Examination Scheme:	Credits Allotted:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
	Continuous Assessment: 40 Marks	Total :03 Credits
	Term Work/ Oral: -- Marks	

Course Pre-requisites: Students should have knowledge of Engineering Mathematics-I, Strength of Machine Elements, Numerical Methods, Machine Design and Heat Transfer.

Course Objectives:

- To develop the finite element formulation for a model one-dimensional problem like axially loaded bar for the case of simplest approximation (i.e., linear approximation).
- Develop the Shape Functions for Various Elements.
- To discuss the possible refinements of the simplest approximation.
- To develop the frame work of a finite element code to solve the one-dimensional problem.
- To extend the finite element formulation to other one-dimensional problems like the beam problem.
- To develop the two-dimensional finite element formulation for a model 2-D problem like 2-D steady-state heat conduction problem.

Course Outcomes:

- Students will be able to understand Formulation of Finite Element Method.
- Students will able to solve 1 D Problems.
- Students will be able to solve 2 D Structural and Thermal Problems.
- Students will be able to analyze Mechanical Engineering real life problems.
- Students will be able to solve Mechanical Engineering Problems subjected to Heat Transfer.
- Students will be able to solve Mechanical Engineering Problems subjected to Mechanical Vibration.

UNIT – I (6 Hrs.)	Introduction Basic Steps in FEM Formulation, Error Analysis P & h formulation; Stress Equilibrium equation; Strain displacement equation; Stress-Strain equation; Introduction to Solvers; Variational Approach, Ritz Method. Derivation of Elemental Equations, Assembly, Imposition of Boundary Conditions, Solution of the Equations. Computer implementation: Pre-processor, Processor, Post-processor.
UNIT – II (6 Hrs.)	One Dimensional Problem 1 -D Elements, Relationship between Global and Natural coordinate system; Formulation of Element Stiffness Matrix and Load Vector by Potential Energy approach; Shape Functions using LAGRANGE Polynomials for Two noded Bar Element, Rectangular Element, hexahedron Brick Element; Convergence Criteria, Temperature effect.
UNIT – III (6 Hrs.)	Two Dimensional Problem Plain Stress , Plain Strain; Types of 2 D Element, Formulation of Element Stiffness matrix and Load Vector for Constant Strain Triangles, Formulation of Element Stiffness matrix and Load Vector for 2D Trusses; Introduction to Higher Order Elements.
UNIT – IV (6 Hrs.)	Axisymmetric Formulation: Stress calculation and Temperature effect on Flywheel using Galerkin Approach; Isoparametric Elements; Element Quality Criterion; Full and Reduced integration; Sub Modelling and Sub Structuring.
UNIT – V (6 Hrs.)	1D Steady State Heat Transfer: Governing Differential Equation; Steady State Heat transfer Formulation of 1 D Element for Conduction and Convection; Boundary Conditions and Solving for Temperature Distribution; 1D Heat Transfer Steps involved in Processing Steps.
UNIT – VI (6 Hrs.)	Dynamic Analysis: Lumped mass and Consistent Mass Matrices; Free Vibration Problems, Formulation of Eigen Value and Eigen Vector Problem by Power Method, Step wise solution of Problems on Vibration in Bar Element; FEM Formulation. Time-dependent Problems.
Term Work/Practicals:	
1. Structural Analysis of Corner Bracket, Truss Structure and Spring.	
2. Static and Dynamic Analysis of Cantilever Beam.	
3. Modal analysis of Simple Pendulum.	
4. Steady State Heat Transfer through a Plate with Hole.	
5. Analysis of Connecting Rod.	

6. Analysis of Composite Leaf Spring.	
7. Analysis of Piston.	
8. Analysis of Burnished Components.	
9. Analysis of Knuckle Joint.	
10. Analysis of Screw Jack.	
Assignments:	
1. Introduction to Finite Element method.	
2. Derivations and Numerical on Variational Approach and Ritz Method.	
3. Derivations and Numerical on Potential Energy Approach.	
4. Determination of Shape Functions for Various Elements.	
5. Derivations and Numerical on CST Elements.	
6. Derivations and Numerical on Trusses.	
7. Stress calculation and Temperature effect on Flywheel using Galerkin Approach.	
8. Isoparametric Elements: Full and Reduced integration methods Numerical.	
9. Derivation and Numerical on Steady State Heat transfer Formulation of 1 D Element for Conduction and Convection by Differential Equation.	
10. Analysis of any one Mechanical Component subjected to Heat transfer.	
11. Determination of Eigen value and Eigen vector for any Mechanical component.	
12. Analysis of Time Dependent problem.	
Text Books/Reference Books:	
1	S. S. Rao, The Finite Element Methods in Engineering, Pergomon Press Oxford, 2nd edition, 1989
2	Sagarlind L. J, Applied Finite Element Analysis, John Wiley, 1984
3	Chandrupatla & Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall, 1999
4	Reddy. J.N, An Introduction to Finite Element Methods, Tata McGraw Hill, 1997
5	Cook, Robert, Davis Etal, Concept & Applications of Finite Element Analysis, John Wiley & Sons, 1999

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

12. PROJECT STAGE -II

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 00 Hours / Week	End Semester Examination: -- Marks	TH: -- Credits
Practical: - 04 Hours / Week	Continuous Assessment: -- Marks	TW/OR: 08 Credits
	Term Work/ Oral: 200 Marks	Total: 08 Credits

Course Pre-requisites:

The Students should have

1	Knowledge of basic concepts in heat transfer.
2	Basic information of thermodynamics
3	Basic knowledge of fluid mechanics.
4	Knowledge of basic concepts in mechanical engineering
5	Basic knowledge of design

Course Objectives:

1.	To fabricate the designed equipments
2.	To conduct laboratory and field testing of the new equipment
3.	To analyze performance of the equipment with different performance parameters
4.	To make changes in design if necessary based on the performance analysis
5.	To prepare project report and deliver presentation
6.	To work sincerely as a member of team

Course Contents

The project taken in the First semester will be continued as far as possible. In case after the training, the students wish to change their project, the same may be allowed after discussion with the faculty. The new project should be based on the training taken and should utilize the training experience.

In Semester II concentration will be on

1. Hard ware fabrication
2. Testing of equipment
3. Preparing a project report

The work will be evaluated through three presentations with aim of watching the progress and suggesting modifications for completing the project.

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B. Tech. (Production) - 2014 Course

SEM-I

S. N	Course Title	Scheme of Teaching Contact Hrs/week			Examination Scheme-Marks								Total Credit							
					End Sem Exam	Continuous Assessment			TW	TW / OR	TW / Pr	Total					T H	T	P r	Total
						UT	Att .	As s												
1.	Engineering Mathematics – I	3	1	-	60	20	10	10	-	-	-	100	3	1		4				
2.	Fundamentals of Civil Engineering	3	-	2	60	20	10	10	25	-	-	125	3		1	4				
3.	Engineering Graphics	4	-	2	60	20	10	10	25	-	-	125	4		1	5				
4.	Engineering Physics	4	-	2	60	20	10	10	25	-	-	125	4		1	5				
5.	Fundamentals of Electrical Engineering	3	-	2	60	20	10	10	25	-	-	125	3		1	4				
6.	Professional skill Development	2	-	-	30			20	-	-	-	50	2		-	2				
7.	Workshop Technology	-	-	2	-	-	-		50	-	-	50	-		1	1				
	Total	19	1	10	330	100	50	70	150	-	-	700	19	1	5	25				

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B. Tech. (Production) - 2014 Course

SEM-II

S. N	Course Title	Scheme of Teaching Contact Hrs/week			Examination Scheme-Marks								Total Credit			
		L	T	P	End Sem Exam	Continuous Assessment			TW	TW / OR	TW / Pr	Total	T H	T	P r	Total
						UT	At t	As s								
1.	Engineering Mathematics – II	3	1	-	60	20	10	10	-	-	-	100	3	1		4
2.	Fundamentals of Mechanical Engineering	3	-	2	60	20	10	10	25	-	-	125	3		1	4
3.	Engineering Mechanics	4	-	2	60	20	10	10	25	-	-	125	4		1	5
4.	Engineering Chemistry	4	-	2	60	20	10	10	25	-	-	125	4		1	5
5.	Mechanical Engineering Drawing	2	-	4	60	20	10	10	25	-	-	125	2		2	4
6.	Professional skill Development	2	-	-	30			20	-	-	-	50	2		-	2
7.	Production Practice- I	-	-	2	-	-	-	-	50	-	-	50	-		1	1
	Total	18	1	12	330	100	50	70	150			700	18	1	6	25

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ENGINEERING MATHEMATICS-I

Teaching Scheme:

Lectures: 3Hrs/Week

Tutorials: 1Hr/Week

Examination scheme:

Semester Examination: 60 marks

Continuous Assessment: 40 marks

Credits Allotted:

Theory : 03

Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

(08 Hours)

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Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Civil Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Concepts of units and conversions of units.	
2.	Basic knowledge of Chemistry	
3.	Basic knowledge of geography, concept of latitude and longitude.	
Course Objectives:		
	To make student understand the scope and application of Civil Engineering	
Course Outcomes:		
Students will be able to understand		
1.	Different building components and material	
2.	Classification of surveying	
3.	Levelling of the ground	
4.	Planning of building	
5.	Methods of irrigation and water supply	
6.	Different methods of transportation	
UNIT - I	Civil Engineering Scope And Applications.	(06 Hours)
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.	
UNIT - II	Surveying	(06 Hours)
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.	
UNIT - III	Building Planning And Bye Laws	(06 Hours)
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures	

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	and Intelligent buildings.	
UNIT - IV	Foundations and Earthquakes	(06 Hours)
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.	
UNIT - V	Irrigation And Water Supply	(06 Hours)
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
UNIT - VI	Infrastructure	(06 Hours)
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
<u>Term Work:</u>		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		

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1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication
Reference Books:	
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

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ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: - 40Marks	
	Term Work: 25 Marks	

Unit I	<p>Lines and Dimensioning in Engineering Drawing Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p>Curves used in Engineering Practice Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p>Orthographic Projection Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p>Isometric Projections Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p>Projections of Points and Lines and planes Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p>Projection of Solids Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p>Section of Solids Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.
Assignment 05 Problems on each unit in A3 size Drawing Book

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SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
	Term Work: 25marks	

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

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UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of J by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

(08 hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

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UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

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Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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02: Fundamentals of Electrical Engineering		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Mathematics	
2.	Physics	
Course Objectives:		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
Course Outcomes:		
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
5.	Define basic terms of single phase and three phase ac circuits and supply systems	
6.	Know and use electrical safety rules	
UNIT - I	Basic concepts	(06 Hours)
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	Network Theorems	(06 Hours)
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	Electrostatics	(06 Hours)
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction& working.	

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UNIT - IV	Magnetic Circuit & Transformer	(06 Hours)
	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.</p>	
UNIT - V	AC Fundamentals & AC Circuits	(06 Hours)
	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
UNIT - VI	Electrical Wiring and Illumination system	(06 Hours)
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

Term Work:

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
 - a) Voltage and current ratios.
 - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books:

- 1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi
- 2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi
- 3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of

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India Pvt. Ltd	
Reference Books:	
1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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Workshop Technology

TEACHING SCHEME:

Theory: -
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -
Continuous Assessment: -
Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

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ENGINEERING MATHEMATICS-II

Teaching Scheme:

Lectures: 3Hrs/Week

Tutorials: 1Hr/Week

Examination scheme:

End Semester Examination: 60 marks

Continuous Assessment: 40 marks

Credits Allotted:

Theory : 03

Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

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Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

(08 Hours)

Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

Syllabus for Unit Test:

Unit Test I :- Unit I, II, III

Unit Test II :- Unit IV, V, VI

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FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Thermodynamics- Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p>Introduction to I.C. Engines and turbines- Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p>Introduction to refrigeration, compressors & pumps- Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p>Energy Sources - Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p>Heat transfer- Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

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UNIT-IV	<p>Properties of fluids- Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p>Properties of Materials and their Applications- Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p>Mechanical devices - Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p>Mechanisms- Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p>Machine Tools- Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p>Introduction to manufacturing processes and Their Applications- Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines

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7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

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10: Engineering Mechanics		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
Course Pre-requisites:		
The Students should have knowledge of		
1.	Scalar and Vector	
2.	Newton's law of motion	
3.	Law of friction	
4.	Concept of physical quantities, their units and conversion of units	
5.	Concept of differentiation and integration	
Course Objectives:		
	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.	
Course Outcomes:		
The student should be able to		
1.	calculate resultant and apply conditions of equilibrium.	
2.	analyze the truss and calculate friction force.	
3.	calculate centroid and moment of inertia.	
4.	solve problem on rectilinear motion.	
5.	solve problems on curvilinear motion.	
6.	use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.	
UNIT - I	Resultant and Equilibrium	(06 Hours)
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
UNIT - II	Truss and Friction	(06 Hours)
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	Centroid and Moment of Inertia	(06 Hours)
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	

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UNIT - IV	Kinematics of Rectilinear motion of a Particle	(06 Hours)
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	Kinematics of Curvilinear motion of a Particle	(06 Hours)
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	Kinetics of a Particle	(06 Hours)
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	
Term Work:		
A) The term-work shall consist of minimum Five experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
B) The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.		
Text Books:		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
Reference Books:		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
Syllabus for Unit Test:		

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Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VI

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ENGINEERING CHEMISTRY

Teaching Scheme:

Lectures: 4Hrs/Week

Practical: 2Hr/Week

Examination scheme:

End Semester Examination: 60 marks

Continuous Assessment: 40 marks

Term Work: 25marks

Credits Allotted:

Theory: 04

Practical: 01

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process

(08 Hours)

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

(08 Hours)

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

(08 Hours)

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

(08 Hours)

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

(08 Hours)

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Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

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Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

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MECHANICAL ENGINEERING DRAWING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -02Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 04Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p>Introduction to Computer Aided Drafting: Working Interface of AutoCAD, Drawing Limits, Creating 2-D Drawing in AutoCAD, AutoCAD commands, Editing commands in AutoCAD, Dimensioning in AutoCAD, Creating text in Auto CAD, Changing object properties Scale, Object Snap Mode, Display control in AutoCAD, Layer</p>	(06)
UNIT-II	<p>Dimensioning Practices: Terms and Notations, Leader, Extension Lines, Terminations and Origin indication, Functional dimension, Non-functional dimension, Datum dimension, Redundant and auxiliary dimension, Chain dimensioning, Running dimensioning, Co-ordinate dimensioning, Symmetrical or equidistant dimensioning, Methods of dimensioning Common features: Diameters, Radii, Hole sizes, chamfers, Screw threads, Chords, Arcs, Angles, Spheres, Cylinders, Squares. Conventional Representation of Machine Components As per SP-46 (1988)</p>	(06)
UNIT-III	<p>Orthographic Projections [By Using AutoCAD] Reference planes, types of orthographic projections – First angle projections, Third angle projections, methods of obtaining orthographic views by First angle method, Sectional orthographic projections – full section, half section, offset section.</p>	(06)
UNIT-IV	<p>Isometric Projections [By Using AutoCAD] Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Sphere.</p>	(06)
UNIT-V	<p>Development of Lateral Surfaces (DLS) of Solids. [By Using AutoCAD] Applications of DLS, method of development, development of lateral surface of above solids, development of lateral surface of cut solids.</p>	(06)

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UNIT-VI	Freehand Sketching Free hand sketching -- FV and TV of standard machine parts – Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, screw thread forms, welded joints, riveted joints.	(06)
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Term Work

First sheet based on dimensioning practice, convention and symbols in machine drawing

Second sheet based on free hand sketches.

Four AutoCAD drawing assignments

Text Book/ Reference Books :

N.D. Bhatt, Elementary Engineering Drawing, Chartor Publishing house, Anand, India.

D. N. Johle, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd..

P.S. Gill, Engineering Graphics.

N.D. Bhatt, Machine Drawing, Chartor Publishing house, Anand, India.

Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi.

Fredderock E. Giesecke, Alva Mitchell & others, Principles of Engineering Graphics, Maxwell McMillan Publishing

SP 46:1988, Engineering Drawing Practice for School and Colleges

J. D. Bethune, Engineering Graphics with Auto CAD 2002, Pearson Education, 2003

**BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE**

PRODUCTION PRACTICE I

TEACHING SCHEME:

Theory: -
Practical: 02 Hours / Week

EXAMINATION SCHEME:

End Semester Examination: -
Continuous Assessment: -
Term Work: 50 Marks

CREDITS ALLOTTED:

01 Credit

Course Pre-requisites: Basic knowledge of various machine tools.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. Understand machine tools, mechanism and accessories used in various production processes
2. Make the job of turning & taper turning operation using lathe
3. Perform Forging and grinding of lathe tool with one knife and other end vee
4. Prepare simple solid pattern involving wood turning
5. Perform Welding using gas/arc welding process
6. Understand Sand Casting process

Each candidate shall be required to complete and submit the following term work:

A. Jobs:

Plain and Taper turning – one job

Forging and grinding of lathe tool with one knife and other end vee – one job

Making a simple solid pattern involving wood turning – one job

Welding (gas or arc) – one job

Sand Molding – one job

B. Journal & Demonstration:

Assignments on machine tools will be in the form of a journal based on demonstrations on machine tools. This should include sketches and relevant descriptions as given below:

1) Block Diagrams (Any Two)

- a) Lathe
- b) Universal milling machine
- c) Radial drilling machine
- d) Cylindrical grinder.

2) Mechanisms (Any Two) a) All geared headstock of a center lathe.

- b) Spindle arbor (assembly) drive of milling machine
- c) Crank and slotted lever quick return drive of shaping machine.
- d) Spindle assembly in a drilling machine.

3) Accessories (Any Two)

- a) Taper turning attachment for a center lathe.
- b) Universal dividing head.
- c) Milling cutters.

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Production) Sem – III (2014 Course)

S.N	Course Title	Scheme of Teaching				Scheme of Examination										Total Credit			
		L	T	P	Total	IE	Ass	UT	ESE	Total	TW	TW/ OR	TW/ Pr	Total	TH	T	Pr	Total	
1	Welding and Foundry Technology	3	-	2	5	10	10	20	60	100	-	50	-	150	3		1	4	
2	Basic Electronics and Communication Engineering	3		2	5	10	10	20	60	100	-	50	-	150	3	-	1	4	
3	Industrial Engineering and Management	3	1	-	4	10	10	20	60	100	-	-	-	100	3	1		4	
4	Strength of Machine Elements	3	-	2	5	10	10	20	60	100	-	50	-	150	3		1	4	
5	Applied Thermodynamics	3	-	-	3	10	10	20	60	100	-	-	-	100	3		-	3	
6	Professional skill Development	4	-	-	4		20	-	30	50	-	-	-	50	4		-	4	
7	Production Practice-II	-	-	4	4	-		-	-	0		-	50	50	-		2	2	
	Total	19	1	10	30	50	70	100	330	550	0	150	50	750	19	1	5	25	

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Production) Sem – IV (2014 Course)

S.N	Course Title	Scheme of Teaching				Scheme of Examination										Total Credit			
		L	T	P	Total	IE	Ass	UT	ESE	Total	TW	TW/OR	TW/Pr	Total	TH	T	Pr	Total	
1	Machining Technology	3	-	2	5	10	10	20	60	100	-	50	-	150	3		1	4	
2	Material Science	3	-	2	5	10	10	20	60	100	-	50	-	150	3	-	1	4	
3	Design of Machine Elements	3	-	2	5	10	10	20	60	100	-	50	-	150	3		1	4	
4	Engineering Mathematics III	3	1	-	4	10	10	20	60	100	-	-	-	100	3	1	-	4	
5	Production Planning and Control	3	-	-	3	10	10	20	60	100	-	-	-	100	3		-	3	
6	Professional skill Development	4	-	-	4		20	-	30	50	-	-	-	50	4		-	4	
7	Production Practice-III	-	-	4	4	-		-	-	0		-	50	50	-		2	2	
	Total	19	1	10	30	50	70	100	330	550	0	150	50	750	19	1	5	25	

WELDING AND FOUNDRY TECHNOLOGY		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Manufacturing Processes	
2.	Basic knowledge of Joining.	
3.	Basic knowledge of Casting.	
Course Objectives:		
The student should understand the scope, objective and application of welding and foundry technology		
Course Outcomes:		
Students will be able to understand		
1.	Describe the advantages and disadvantages of the different classes of manufacturing processes.	
2.	Understand the different casting process	
3.	Know the pattern making and mold making	
4.	Choose the best casting process for a specific product.	
5.	Understand the different Welding process	
6.	Choose the proper process for different joining cases	
UNIT-I	Introduction Of Welding Processes Classification of welding processes. Advantages and disadvantages of welding processes Arc welding processes-Carbon arc, Submerged arc, Tungsten inert gas (TIG), Metal inert gas (MIT), Plasma arc, Stud welding and related arc welding processes –Theory, Comparison on merits, limitation and applications, Fluxes used in arc welding. Gas welding – Processes and equipment used, Types of flames, Gas cutting– Merits, demerits and applications	(06)
UNIT-II	Resistance Welding Resistance welding –, Spot, Seam, Projection, Butt, Percussion welding, Tube	(06)

	welding, Electric resistance welding process, its merits, demerits and application. Solid-State Welding Solid-State Welding- Pressure, Diffusion, Ultrasonic, Explosive, Friction, Forge, Principle, Equipment used, Flux used, Merits demerits and application of the above process.	
UNIT-III	Other Welding Processes ThermitWelding,Laser beam welding, Electron beam welding, Braze welding, Welding of dissimilar metals, Welding of polymers, Welding of Cast Iron, Welding of Tool Steel, Welding of Aluminium and its Alloys, Welding inspection, Welding defects and their Classification. Welding Symbols.Importance of ASME codes, ISO standards on joiningprocesses.	(06)
UNIT-IV	Pattern And Mould Making Foundry Layout, Foundry departments and sections, Pattern and pattern making, Design and allowances for patterns, Colour codes for patterns, Storage of patterns, Moulding sand and core sands, Sand control Test, Core and core making – Introduction, Core making Procedure, Types of cores, Core print, Core boxes. Mould and mould making-Moulding Methods, Moulding processes, Gating System, Software available	(06)
UNIT-V	Melting And Pouring Practice: Melting furnaces and their selection, Cupola and its operation, Advantages and limitations, applications, Induction melting furnaces, Advantages, Limitations, applications, Pouring practice and equipments, Ladle technology, Solidification of castings, Strike out, Fettling, Cleaning and Surface preparation of castings, Inspection and testing of castings, Defects in castings.	(06)
UNIT-VI	Die Casting Process: Pressure and gravity die casting, Shell mould casting, Investment casting, Continuous casting, centrifugal casting, Applications, Merits and limitations of all, Use of robots in foundry, Production of iron Casting, Copper alloy foundry practice, Aluminium alloy foundry practice, Export potentials for cast products in Indian context.	(06)

<p>Term work: List of Experiments:</p> <ul style="list-style-type: none"> • Mechanical test on weldment (weld) - Tension bend, drop weight, tear test. • Moulding and core sand testing (Clay content test, moisture content test etc). • Fluidity test using fluidity spiral pattern • Permeability test. • Green strength mould and Green strength core. • Mould and core hardness test. 					
<p>Assignments:</p> <ul style="list-style-type: none"> • Six Assignments based on above syllabus & Industrial visit <p>Oral/Practical Term work and oral will be based on above syllabus</p> <p>Text Books / References</p> <ul style="list-style-type: none"> • O. P. Khanna, A text book of Welding Technology, Dhanpat Rai and Sons • O. P. Khanna, A text book of Foundry Technology, Dhanpat Rai and Sons • P. N. Rao, Manufacturing Technology- Vol 1, McGraw Hill Education (India) Private Limited • Md. Ibrahim Khan, Welding science and technology, New Age International (P) Ltd. • G.R.Nagpal, Tool Engineering and Design, Khanna Publishers • B.S.Raghuwanshi, Workshop Technology, Vol-I, Dhanpat Rai & Co. • P L Jain, Principles of Foundry Technology, Tata Mc Graw-Hill, New Delhi • Steel Casting ASM Hand book, Vol. No. I. 					
<p>Syllabus for Unit Test</p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Unit Test 1</td> <td>Units I , II and III</td> </tr> <tr> <td>Unit Test 2</td> <td>Units IV, V and VI</td> </tr> </table>		Unit Test 1	Units I , II and III	Unit Test 2	Units IV, V and VI
Unit Test 1	Units I , II and III				
Unit Test 2	Units IV, V and VI				

BASIC ELECTRONICS AND COMMUNICATION ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students have completed a course in Physics and have the knowledge of laws of Dynamics		
Course Objectives:		
Students will get basic knowledge of electronic components, devices, microcontroller, digital electronics and communication.		
Course Outcomes:		
Students will be able to understand		
1.	The basic components of electronics	
2.	Working of rectifiers.	
3.	Basic of Microprocessor.	
4.	Basics of Digital electronics	
5.	Basics of analog communication.	
6.	Basics of digital communication.	
UNIT - I	Electronic components: Resistors, Inductors and Capacitors and their types, Construction and characteristics of PN junction diode Zener Diode Tunnel diode Bipolar junction transistors CB,CC,CE circuits Field Effect transistors	(06)
UNIT - II	Electronic Devices and Linear ICs: Rectifiers: Half wave, Full wave and Bridge rectifiers capacitor filter wave forms, ripple factor regulation characteristics. Special semiconductor devices: FET SCR LED VI characteristics, applications. Introduction to Op -Amp and Timers.	(06)
UNIT - III	Digital electronics: Number system: Binary system, Decimal to Binary, Octal system, Hexadecimal system, binary addition, subtraction, multiplication and division. Logic gates: OR, AND, NOT, Exclusive OR, NOR, NAND gates, Logic	(06)

	networks, Gate Standardization, Introduction to Logic Circuit Combinational and Sequential Circuits	
UNIT - IV	Analog Communication: Communication System diagram, need of modulation, amplitude modulation, frequency modulation, phase modulation.	(06)
UNIT - V	Digital Communication: Sampling process, pulse code modulation, delta modulation adaptive delta modulation.	(06)
UNIT - VI	Microprocessor: Architecture, Block Diagram, Instruction set, Interrupts, Timing Diagrams, Stacks, Subroutines, Serial I/O. Memory Design Concepts: Decoding, Memory Types, Design of Microprocessor based system, Interfacing Techniques; (I/O Mapping & Memory Mapping) with eg. of 8255 IC.	(06)
Assignment: Assignment based on above syllabus.		
Any 8 practical's should be conducted from the following list: <ol style="list-style-type: none"> 1. To study various electronics components: Resistors, Inductors, Capacitors, diodes and transistors. 2. Binary - BCD & BCD – Binary conversion 3. Study of CRO and Different modes of operation. 4. To plot VI characteristics of PN junction diode. 5. To plot regulation characteristics of half wave rectifier with and without capacitor filter. 6. To plot regulation characteristics of Full wave rectifier with and without capacitor filter. 7. To plot input-output characteristics of CE configuration of BJT. 8. To study basic logic gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR. 9. To realize the Boolean expression using basic gates. 10. Study of amplitude & frequency modulation. 11. Pulse code modulation. 		
Text Books/Reference Books:		
1	Mottershed Allen, Electronic Devices & Circuits, PHI	
2	R. P. Jain, Modern Digital Electronics, Mc Graw Hill	
3	Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)	
4	Millman&Halkis, Electronic Devices & Circuits, PHI	
5	Malvino Leach, Digital Principles & Applications, Mc Graw Hill	
6	Millman&Halkis, Integrated Electronics, MGH	
7.	John Keneddy"Electronics communication System" Mc Graw Hill	
8.	TaubSchilling"Digital Communication System" Mc Graw Hill	
Syllabus for Unit Test:		
Unit Test -1	Unit I, II and III	
Unit Test -2	Unit IV, V and VI	

INDUSTRIAL ENGINEERING & MANAGEMENT		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Tutorial: 01 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Knowledge of basic concept of Management	
2.	Basic information of Industrial engineering.	
3.	Basic knowledge of human considerations in manufacturing.	
Course Objectives:		
	The student should understand the scope, objective and application of industrial engineering tools and management practices in manufacturing.	
Course Outcomes:		
Students will be able to understand		
1.	Definition, principles and functions of management.	
2.	Types and selection of business organizations.	
3.	Functioning of Personnel, Marketing and Finance Department.	
4.	Method Study tool for standardizing the method.	
5.	Work Measurement tool for standardizing the time.	
6.	Ergonomically accepts in manufacturing.	
UNIT - I	Management-An Introduction: Management- Meaning and Definitions, Management, Administration, and Organization concepts, Management as an Art and Science and a profession, contribution of various thinkers to management thought, Types and Functions of Management. Different approaches to management – scientific, operational, human and system approach.	(06)
UNIT - II	Organization: Different forms of business Organization –Individual proprietorship, Partnership, Joint stock company, Co-Operative enterprise, Public Sector, Undertakings, organizational structures in Industries, Line, Functional ,Line and functional , Project, Matrix Organization and Committees	(06)

UNIT - III	<p>Financial, Marketing and Personnel Management: Personnel Management-Definitions Recruitment, Selection and training of the employees, Job valuation and Merit rating, wage administration different methods of wage payments, incentives.</p> <p>Marketing Management-Definitions, Marketing and Selling concept, market segmentation, distribution channels, Market Research, Advertising and sales promotion and Sales forecasting.</p> <p>Financial Management-Capital structure, Fixed capital, working capital, sources of finance, cost analysis, Break even analysis, Depreciation and Financial statement.</p>	(06)
UNIT - IV	<p>Method Study: Steps in method study, tools and techniques used, process chart symbols, flow diagrams, two handed chart, multiple activity chart, use of motion pictures and its analysis. SIMO charts, chorno & cycle graph, developing, presentation, installation and maintenance of improved methods.</p>	(06)
UNIT - V	<p>Work Measurement : Time Study: Aim and objectives , terminology and tools, use of stop watch procedure in making a time study, elements, selection of operations time study forms, handling of foreign elements. Performance rating. Allowances: Personal, Fatigue and other allowances. Analysis and calculation of Standard Time. Determination of number of cycles time study for indirect functions such as Maintenance , Marketing etc., Most Technique.</p> <p>Works Sampling: Definition, Objectives, theory of Work Sampling. Other applications of work sampling, errors in work sampling study.</p> <p>Synthetic and Standard data Methods: Concepts, introduction to PMTS, MTM-1, WF, Basic motion time, MTM-2, and other second – generation methods timing of group operations.</p>	(06)
UNIT - VI	<p>Ergonomics and Industrial Safety: Definitions, importance in industry, basic anatomy of human body, anthropometrics, measurement of physical work and its techniques, work and rest cycles, bio mechanical factors environment effects.</p> <p>Importance of safety, planning, training, safety precautions, safety Equipments, Government regulations on safety.</p>	(06)
Assignments:		
Six Assignments based on above syllabus.		
Text Books/		

1.	O. P. Khanna, Industrial Engineering & Management, Dhanapat Rai & Sons.
2.	M. C. Shukla, Business Organization and Management, S. Chand & Co. Ltd, New Delhi.
3.	Harold Koontz & Heinz Enrich, Essentials of Management, McGraw Hill International.
4.	M. N. Mishra, Organizational Behavior, Vikas publishing New Delhi.
5.	Dale Yoder, Personnel Management.
6.	Work Study, ILO.
7.	S. S. Patil, Industrial Engineering & Management, Electro tech Publication.
8.	Mansoor Ali & Dalela, Industrial Engineering & Management System, Standard Publisher distributions.
9.	R. M. Currie, Work Study, ELBS.
10.	Management by James A. F. Stoner, R. Edward Freeman, PHI
11.	Management Today: Principles and Practice by Gene Burton and Manab Thakur, TMH
12.	Organizational Behavior by Keith Davis, TMH
13.	Management (Tasks, responsibilities and Practices) by Peter Drucker, Harper Business
14.	Production Management by Lockyer, ELBS
15.	Modern Production Management by E. S. Buffa (John Wiley)
16.	Financial Management by Vanhorne, PHI
17.	Financial Management (Theory and Practice) by Prasanna Chandra, TMH
18.	Marketing Management by Philip Kotler, Pearson Edition
19.	Marketing Management by Rajan Saxena, TMH
20.	Personnel Management by Edward Flippo, TMH
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

STRENGTH OF MACHINE ELEMENTS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: -03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50Marks	
Course Pre-requisites:		
The Students should have		
1.	Fundamentals of engineering mechanics	
2.	Analysis of forces and moments	
3.	Laws of motion, kinetics, kinematics	
4.	Algebra and trigonometry	
Course Objectives:		
	To provide basic concepts of stresses and strains in machine elements.	
Course Outcomes:		
Students will be able to understand		
1.	Stresses and strains in different materials.	
2.	Shear force and bending movement of loading elements.	
3.	Principal stresses and strain.	
4.	Torsional, bending and axial force on the shaft.	
5.	Bending stresses and shear stresses in the machine elements.	
6.	Design of simple machine components.	
UNIT - I	Simple stresses & strains Revision of Concept of stresses & strains (linear, lateral, shear, thermal & volumetric). Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Stress-strain diagrams for ductile & brittle materials.. Axial force diagrams, stresses and strains in determinate & indeterminate homogeneous & composite bars under concentrated loads & self weight. Strain energy due to axial load (gradual, sudden & impact), strain energy due to self weight Introduction to thermal stresses (Theory)	(06)

UNIT - II	<p>Principal stresses & strains Normal & shear stresses on any oblique plane. Concept of principal planes derivation of expression for principal stresses & maximum shear stress, position of principal planes & planes of maximum shear, graphical solution using Mohr's circle of stresses, combined effect of axial force, bending moment & torsional moment on circular shafts (solid as well as hollow)</p> <p>Theories of elastic failure: Maximum principal stress theory, maximum shear stress theory, Maximum distortion energy theory, maximum strain theory – their applications & limitations.</p>	(06)
UNIT - III	<p>Shear Force & Bending Moment Diagrams Shear forces & bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads & couples, relation between SF & BM diagrams for cantilevers, Simply supported beam. Maximum bending movement & positions of points of contra flexure, construction of loading diagrams & BMD from SFD & construction of loading Diagram & SFD from BMD.</p>	(06)
UNIT - IV	<p>Torsion Stresses, strain & deformations in determinate shafts of solid & hollow</p> <p>Slope & deflection of beams - relation between BM & slope, slope & deflection of determinate beams, double integration method (Macaulay's method), derivation of formula for slope & deflection for standard cases.</p>	(06)
UNIT - V	<p>Stresses in Machine Elements.</p> <p>Bending stresses : Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections(rectangular, I,T,C) with respective centroidal& parallel axes, bending stress distribution diagrams, moment of resistance & section modulus calculations.</p> <p>Shear stresses : Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange & web.</p>	(06)
UNIT - VI	<p>Design of Simple Machine parts: Machine Design, Traditional design methods, Basic procedure of Machine Design, Factor of safety, Service factor, Design of simple machine parts - Cotter joint, Knuckle joint and Levers, Eccentric loading , Stresses in curved beams.</p>	(06)

	<p>Term work: The Journal containing the record of following:</p> <ul style="list-style-type: none"> i) Experiment on Tension test on M.S. bar. ii) Experiment on Compression test on M.S. bar. iii) Experiment on Shear test on M.S. bar. iv) Experiment on Torsion test on M. S. bar. v) Experiment on Impact test. <p>Drawing file containing two half imperial sheets:</p> <ul style="list-style-type: none"> i) Drawing sheet of SFD – BMD of shafts using computer. ii) Drawing sheet of Mohr's circle. 	
	<p>Oral : Based on above term work.</p>	
<p>Assignments : Assignments based on each unit. (Each assignment consist of 5 problems)</p>		
<p>Text Books/</p>		
1.	Timoshenko & Young, Engineering Mechanics, Tata McGraw Hill Book Publishing Co. Ltd. 1981.	
2.	James Gere, Mechanics of Materials, Thomson Learning	
3.	S Ramamrutham, Strength of Materials	
4.	V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication	
5.	J. E. Shigley, Mechanical Engineering Design, McGraw Hill	
<p>Syllabus for Unit Test:</p>		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV,V and VI	

APPLIED THERMODYNAMICS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Course Pre-requisites:		
The Students should have		
1.	Knowledge of basic concept of thermodynamics	
2.	Knowledge of pumps and compressors	
3.	Basic knowledge of I.C.Engine	
Course Objectives:		
	The student should understand the scope and application of Applied Thermodynamics	
Course Outcomes:		
Students will be able to understand		
1.	to apply the concepts of Carnot theorem to applications such as heat pump and refrigerator	
2.	basic concepts of thermodynamics and their application to energy conversion device like Compressors	
3.	basic concept of refrigeration and air conditioning system	
4.	Concept of air standard cycle	
5.	Concept of Internal Combustion system	
6.	Heat Transfer performance	
UNIT - I	Second Law of Thermodynamics: Limitations of first law, Heat engine, refrigerator & heat pump, Kelvin-Planks and Clausius statement, Equivalence of Kelvin -Planks and Clausius statement, Perpetual motion machine of second kind, Carnot cycle & Carnot heat engine, Entropy. Steam Generators: Classification, Constructional details of Process & Power boilers, boilers mountings & accessories, equivalent evaporation, boiler efficiency, energy balance, boiler draught.	(06)
UNIT - II	Refrigeration Unit of refrigeration, reversed Carnot cycle, Bell Coleman cycle, Vapour compression cycle, C. O. P , TR Capacity, Use of p-h charts, Desirable properties of refrigerants, & alternative refrigerants Air conditing Factors affecting human comfort, Dalton's law, psychrometry, DBT,WBT, Specific humidity, relative humidity, degree of saturation, study of	(06)

	psychrometric chart, psychrometric process uchasensible heating, cooling, humidification & dehumidification, Different Air conditioning systems, Applications of air conditioning.	
UNIT - III	<p>Reciprocating Air Compressors: Introduction, Use of compressed air, construction & working of reciprocating air compressors, P-V diagrams of single stage air compressor, Effect of clearance, Volumetric efficiency , Power required to drive the compressor, Isothermal efficiency, Mechanical efficiency, Multi-staging of air compressor ,perfect inter cooling, Advantages of Multi-staging</p> <p>Rotary Compressor: Introduction, classification and working principles of different types of compressors, comparison between reciprocating and rotary compressors, positive displacement and roto dynamic compressors,</p>	(06)
UNIT - IV	<p>Air Standard Cycles Introduction to Air Standard cycle, assumptions,AirStandardottocycle,Diesecycle,Dualcombustioncycle,comparisonofabovecycles,Actualcycle</p>	(06)
UNIT - V	<p>Internal Combustion Engine Systems: Fuel Feeding Systems: Introduction of carburetor S.I. engines, Mixture requirements, Solex carburetor, Fuel injection systems in C.I. engines, Bosch fuel injection pump, fuel injectors, Type of nozzles. Ignition Systems: Battery ignition, magneto ignition, Electronic ignition systems. Cooling and Lubrication Systems: Necessity of cooling, Cooling systems, Types of cooling and lubrication system Engine Testing & Performance: Measurement of I.P, B.P, Rope brake dynamometer, Hydraulic dynamometer, Eddy current dynamometer ,Measurement of F.P, Willian's line method, Morse Test, Measurement of fuel & air, Measurement of speed, Heat balances heat.</p>	(06)
UNIT - VI	<p>Heat transfer and applications Extended surfaces: Heat Transfer through extended surfaces, derivation of differential equation for fins, Solution of differential equation for different boundary conditions having constant cross-section area, Effectiveness and efficiency of a fin.</p>	(06)

	Heat Exchangers: Classification, heat exchanger analysis, use of Log Mean Temperature Difference (LMTD) and effectiveness NTU method for parallel and counter flow heat exchangers.	
Assignment: Assignment based on above syllabus.		
Text Books/ Reference Books:		
	P.L.Ballany, “Thermal Engineering”, Khanna Publications	
	C.P.Arora, “Engineering Thermodynamics”, Tata Mc Graw Hill Publications	
	Ganesan V., “Internal Combustion Engine”, Tata McGraw Hill Publications	
	Arora C. P., “Refrigeration& Air-Conditioning”, Tata McGrawHill Publications, New Delhi	
	V. M. Domkundwar, “Thermal Engineering”, Dhanpat Rai & Co.(P)Ltd	
	R. K. Rajput, Engineering Thermodynamics ,EVSS Thermo Laxmi Publications	
	Y.Cengel&Boles,Thermodynamics-Anengineeringapproach,TataMcGrawHill Publications	
	Hawkins G. A., “Engineering Thermodynamics”, John Wiley and Sons.	
Syllabus for Unit Test:		
Unit Test -1	Unit I, II and III	
Unit Test -2	Unit IV, V and VI	

PRODUCTION PRACTICE - II		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: - Hours / Week		
Practical: 04 Hours / Week	Term Work and Practical Examination: 50 Marks	04 Credits
Course Pre-requisites:		
The Students should have		
1.	Basic Knowledge of Welding.	
2.	Basic Knowledge of engineering components.	
3.	Basic Knowledge of materials.	
Course Objectives:		
	The student should understand the processes in casting and welding..	
Course Outcomes:		
Students will be able to understand		
1.	Welding processes	
2.	Pattern making process.	
3.	Sand Testing methods	
4.	Sand Moulding techniques.	
5.	Casting process	
	<p>Term Work</p> <p>Each candidate shall be required to complete and submit the following jobs:</p> <ol style="list-style-type: none"> 1. Welding-TIG / MIG / Arc Welding (One Job) 2. Pattern making: A solid pattern consisting of wood turning or a core box. (One Job) 3. Sand Testing.(Five test) 4. Sand Moulding. (One Job) 5. Casting. 	

SEMESTER IV

MACHINING TECHNOLOGY		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of cutting tools	
2.	Basic knowledge of machining processes	
3.	Basic knowledge materials.	
Course Objectives:		
The student should understand the scope, objective and application of Machining Technology		
Course Outcomes:		
Students will be able to understand		
1.	To Suggest different cutting tool materials for different work piece materials according to their properties	
2.	Use dynamometer for measuring the cutting forces during various cutting operations.	
3.	Perform different operations on lathe machine	
4.	Perform different operations on Milling machine	
5.	Explain, analyzed, predict and prevent material failures in primary manufacturing processes	
6.	Indicate which types of manufacturing process are suited to producing different shapes of product.	
UNIT-I	Process of Metal Cutting Metal cutting - Introduction, principle, classification of cutting tools, Types of metal cutting process, Mechanism of chip formation, Types of chips, Concept of speed, feed & depth of cut, Cutting tool materials	(06)
UNIT-II	Theory of Metal Cutting Single point cutting tool, Tool geometry, Tool signature, selection of tools from catalogue. Systems of defining cutting angles of a single point cutting tool, Cutting forces in Orthogonal cutting, Merchant's circle of forces, Measurement of cutting forces, Tool failure - its classification, Tool wear & its types .Types of cutting Fluids.	(06)

UNIT-III	<p>Lathe Introduction, function, types, specification of lathe machines, construction accessories, attachments, operations. Difference between capstan and turret and engine lathe, Automatic Machines Automatic Lathes-Introduction, function, Classification of automatic machines.</p>	(06)
UNIT-IV	<p>Drilling machines Drilling-Introduction, Classifications of Drills. Twist drills. Types of drilling machines, operations, cutting speed, feed and depth of cut. Milling machines Milling- Introduction, Types of milling machines, operations, Milling cutters, Dividing head, methods of indexing.</p>	(06)
UNIT-V	<p>Abrasive Machining Processes Abrasive machining, abrasive-types, size and geometry. Specifications of Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, Grinding faults. Surface Finishing Processes Honing, lapping, super finishing, buffing, burnishing process. Electroplating, phosphating, metal spraying, anodizing, shot Peening. Effects of surface treatment processes.</p>	(06)
UNIT-VI	<p>Broaching Broaching-Introduction, broach geometry, Types of broaching machines, Broach design. Broaching applications. Numerical control and CNC Introduction to NC, basic principles of NC machine, classifications of NC system. Introduction to CNC, CNC controllers, Introduction to DNC machines, machining centers.</p>	(06)
Term Work:		
List of Experiments: (Any Five)		
<ul style="list-style-type: none"> • Effect of tool geometry on cutting speed, feed, depth of cut on cutting processes • Measurement of cutting forces in turning, drilling & milling with the help of tool dynamometers • Study and demonstration of Automate Lathe • Study of dividing indexing mechanism on milling machine. • Study and demonstration of Grinding Machines. • Study and demonstration of NC and CNC machine program. 		
Assignments		
<ul style="list-style-type: none"> • Six Assignments based on above syllabus & Industrial visit 		

Text Books / References		
<ul style="list-style-type: none"> • G.R.Nagpal, Tool Engineering and Design, Khanna Publishers • B.S.Raghuwanshi, Workshop Technology, Vol-II, Dhanpat Rai & Co. • P. N. Rao, Manufacturing Technology , Vol- II, McGraw Hill Education (India) Private Limited • HajraChaudhari, Workshop Technology, Vol.-II • Roy A. Lindberg, Process & Materials of Manufacture, PHI • P. C. Sharma, Production Engineering, S. Chand Publications • R. K. Jain, Production Technology, Khanna Publishers • E. P. DeGrmo, J. T. Black and A. Kosher, Material and processes in manufacturing, PHI • HMT Handbook, Production Technology, TMH 		
Syllabus for Unit Test		
Unit Test 1	Units I , II and III	
Unit Test 2	Units IV, V ,VI	

MATERIAL SCIENCE		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW and Oral: 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Knowledge of basic concept of Physics and chemistry	
2.	Basic information of engineering materials.	
3.	Basic knowledge of manufacturing processes.	
Course Objectives:		
	The student should understand the scope, objective and application of material, engineering properties, practices in material testing and selections of materials as per industrial requirements.	
Course Outcomes:		
Students will be able to understand		
1.	basics of crystal structure, Mechanism of plastic deformation and Annealing and re-crystallization	
2.	how to measure different types of mechanical properties	
3.	Use of equilibrium diagrams in selections of alloys for different applications..	
4.	Concept of powder metallurgy and manufacturing of components by powder metallurgy	
5.	How to manufacture composite components	
6.	Basics of corrosion and Prevention of corrosion by different methods	
UNIT - I	Study of Engineering materials and Plastic Deformation: Study of Engineering materials Study of crystal structure, Indexing of planes and directions, Imperfections in crystals, Mechanism of plastic deformation, Critical resolve shear stress, Deformation of single crystal and polycrystalline metals, Work Hardening , Cold and hot working, Annealing and re-crystallization	(06)
UNIT - II	Mechanical Testing of Metals; Study of destructive testing Tensile test, Engineering stress and true stress strain, evolution of properties, Numerical based Tensile test, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non	(06)

	Destructive testing such as Liquid dye penetrate test, Magnaflux test, Eddy current test , Ultrasonic testing and Radiography testing.	
UNIT - III	Study of Equilibrium Diagrams: Related terms and their definitions, Hume Ruther’s rule of solid solubility, Allotropy and polymorphism, Solidification, Dendritic growth, Cooling curves, Plotting of Equilibrium diagrams, Lever rule, Coring, Isomorphs system, Eutectic system, Partial eutectic and eutectoid system, Non Equilibrium cooling and it’s effects	(06)
UNIT - IV	Processing of metal powder and ceramics: Introduction, Advantages and limitations of powder metallurgy, Production of metals powder, Characteristics of powder, Powder conditioning, Powder Compacting, Sintering and sintering furnaces, Ceramic, Properties and applications of ceramics. Manufacturing of ceramics Production of powder metallurgical parts such as self lubricating bearings, ferrites, electric contact materials, Carbide cutting tools etc.	(06)
UNIT - V	Study of Composite Materials: Introduction, Classification of composites, Types of composite, Properties, Metal matrix composite, Ceramic matrix composite, Fiber Reinforced plastic, Manufacturing methods, Applications in Different field.	(06)
UNIT - VI	Corrosion and Prevention: Introduction, Types of corrosion, Oxide film growth laws, Action of hydrogen, Polarization, Stress corrosion, Season Cracking, Prevention of corrosion, Design of component, Modification of environment, Cathodic Protection, Deposition and coating, Ion Implantation, PVD, CVD, Powder coating etc.	(06)
List of Experiments:		
	<ol style="list-style-type: none"> 1.Tensile test to determine strength and other mechanical properties 2.Hardness test Brinell and Vickers 3.Rocwell and Poldi hardness test 4.Micro-Hardness test 5.Erichsen Cupping test 6.Magnetic Particle test 7.Liquid penetrate test 8.Utrasonic Test 9. Visual inspection of casting and welded components. 	
	Assignments <ol style="list-style-type: none"> 1. Density calculations on crystal structure and miller indices for crystal structure . 2. Draw different types of curves such as , Tensile stress strain , S N curves , Creep curves , brittle transient temperature curves 3. Draw the equilibrium diagram from given data. Find out the different types of phases. 4. Collect list of components which are made from powder metallurgical technique 	

	and write flow chart for production processes.. 5. Find out ten different composite parts and its composite classifications. 6. Collect different type of old components and study the corrosion on it also study the prevision processes also
	Text Books/Reference Books:
	<ol style="list-style-type: none"> 1. "Material Science and Physical Metallurgy", Dr.V.DKodgere , Everest Publication, Pune. 2. "Physical Metallurgy", S H Avner, Tata Micro hill Publication , Delhi 3. "Material science and Metallurgy", O P Khanna, Khanna Publication ,Delhi. 4. "Material Science and Engineering", R K Rajput ,S K Kataria and Sons Publication, Delhi
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

DESIGN OF MACHINE ELEMENT		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Knowledge of basic concept of Design	
2.	Basic information of Mechanical Elements	
3.	Basic knowledge of design consideration into different Mechanical/Machine Elements	
Course Objectives:		
	The student should understand the scope, objective and application of Design of Machine Element.	
Course Outcomes:		
Students will be able to understand		
1.	Definition, principles and functions of Design	
2.	Design and selection of shafts, keys, splines and couplings	
3.	Working principal of brakes and clutches	
4.	Design and selection of bearings.	
5.	Design and selection of joints	
6.	Design and selection of power screws and springs	

UNIT - I	Introduction: Concept of machine design, general design considerations, design procedure; factor of safety for different types of loading its significance and selection; theories of failures, Selection of engineering materials for a component considering functionality, raw material generating process, strength, cost, quantity and aesthetics, use of IS codes	(06)
UNIT - II	Design of shafts, keys, splines and couplings: Design of solid and hollow shafts for strength and rigidity against pure torsion, pure bending, combined bending, torsion and axial loads; design of keys and splines; design of rigid and flexible couplings.	(06)
UNIT - III	Clutch & Brake: Types, classification, selection of different type of clutch Design of multiplate clutch. Introduction: different types of clutch(cone, centrifugal clutch).Energy absorbed by brake, Design consideration of block brake ,Introduction: internal expanding shoe brake, disk brake.	(06)
UNIT - IV	Rolling Contact Bearing: Types, static and dynamic load carrying capacities, stibek's equation used, Equivalent bearing load, load life relationship, selection of bearing life, selection of rolling contact bearing from manufacture's catalogue. Bearing with probability of survival other than 90%, lubrication and mounting of bearings	(06)
UNIT - V	Design of joints: Design of bolted joint subjected under transverse and eccentric loading, materials for bolts, initial tightening loads on bolts, effect of washer and gasket, uniform strength bolts. Adhesive joints	(06)
UNIT - VI	Power screw : Power Screws: Forms of threads, Torque analysis of power screw self locking screw, stresses in power screw, collar friction, Design of Screw Jack.	(06)
TERM WORK		
1) Study of Engineering Materials, their applications and selection as per different standards used in practice. 2) Design of Coupling and Detailed Working drawings with assembly. 3) Design of bolted, riveted and welded joints for transverse and eccentric loading. 4) Working drawing of shafts, keys, splines and couplings. 5) Design of spring and power screw. 6) Types of bearing. 7) Types of brakes and clutches.		
Text Books/Reference Books:		
1.Design of Machine Elements, V. B. Bhandari, (Tata McGraw-Hill Publishing		

Company Ltd.)

2. Elements of Machine Design, N. C. Pandya and C. S. Shaha, (Charotar Publishing House)
3. Mechanical Engineering design, J. E. Shigley, Mitchell, (McGraw-Hill Publishing Co. Ltd)
4. Machine Tool Design, N. K. Mehta, (Tata McGraw-Hill Publishing Company Ltd.)
5. Design of Machine Elements, Drobvalsky (MIR Publisher)
6. A Text Book of Machine Design, R. S. Khurmi, (S. Chand)
7. Design of Machine Elements by M. F. Spoots, T.E.Shoup (PHI)
8. Machine Design, R. K. Jain, (Khanna Publishers.)
9. Engg. Design, a Materials & Processing Approach, G. Dieter, (Tata McGraw-Hill Publishing Company Ltd.)
10. Computer Aided Analysis and Design of Machine Elements by Dukki Patti, Rao, Bhat , (New Age, Delhi)
11. CMTI Machine Tool Design Handbook (TMH)
12. Design of Machine Elements, An Integrated Approach by Robert and Norton, (Pearson)
13. Machine Design by Black and Adams (McGraw-Hill Publishing Company Ltd)

Syllabus for Unit Test:	
Unit Test -1	Unit I, II and III
Unit Test -2	Unit IV, V and VI

ENGINEERING MATHEMATICS - III		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Tutorial: 01 Hour / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of arithmetic calculations and engineering applications.	
2.	Knowledge of basic concept of statistics	
3.	Basic information of probability	
Course Objectives:		
	The student should understand the scope, objective and application of statistical tools	
Course Outcomes:		
Students will be able to understand		
1.	The use of statistical methodology and tools in the engineering problem solving process.	
2.	The use of different measures of central value	
3.	The use of correlation analysis	
4.	The use of regression analysis	
5.	The concept of probability, random variable and probability distribution.	
6.	The concept of testing of hypothesis and experimental design.	
UNIT - I	Introduction to Statistics- Origin and growth of statistics, statistical methods Vs experimental methods. Collection of data, primary and secondary data, sampling and sample designs, methods of sampling, merits and limitations of sampling, sampling and non-sampling errors. Diagrammatic and graphic presentation of data.	(06)
UNIT - II	Measures of central value- Arithmetic mean, median and mode, geometric mean and harmonic mean. Measures of dispersion, mean deviation, standard deviation, skewness moments and kurtosis.	(06)

UNIT - III	Correlation analysis Significance of the study of correlation, types of correlation, coefficient of correlation, coefficient of determination, rank correlation	(06)
UNIT - IV	Regression analysis- Uses of regression analysis, difference between correlation and regression analysis. Regression equations, standard error of estimate, limitations of regression analysis.	(06)
UNIT - V	Probability Basics of probability, conditional probability, bayes' theorem, mathematical expectations, random variable and probability distribution, binomial, Poisson, normal distribution.	(06)
UNIT - VI	Testing of hypothesis- Z test, chi square test and goodness of fit, F test and analysis of variance. Applications of Statistics- Experimental designs, SQC, business forecasting.	(06)
Assignments- 5 Assignments based on above syllabus These assignments may preferably completed and verified using software's.		
Text Books/Reference Books:		
<ol style="list-style-type: none"> 1. S. P. Gupta: Statistical methods – S Chand and sons 2. Bhat B. R.(1981) : Modern Probability Theory –IIIrd edition :New age international (P)limited, 3. Alan Karr,(1993) : Probability Theory – Springer Verlag. 4. Billingsley P.(1986) : Probability & Measure –John Wiley and sons 5. S. J. Morrison, Statistics for Engineers an Introduction, John Wiley and Sons, 2009 6. R. E. Walpole, Essentials of Probability and Statistics for Engineers and Scientists , Pearson, 2011 7. R. L. Scheaffer, Probability and statistics for Engineers, Cengage Learning, 2011 8. Sukhatme P. V., Sukhatme S. & Ashok C : Sampling Theory of surveys and applications – Piyush publications 9. Irwin Miller and John E. Freund, Probability and Statistics for Engineers, Prentice-Hallof India 10. W. J. DeCoursey, Statistics and Probability for Engineering Applications, Newnes,2003 		
Syllabus for Unit Test:		
Unit Test -1	Unit I, II and III	
Unit Test -2	Unit IV, V and VI	

PRODUCTION PLANNING AND CONTROL		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Course Pre-requisites:		
The Students should have		
1.	Knowledge of basic concept of Industrial Engineering & Management	
2.	Knowledge of statistics.	
3.	Basic knowledge of resources of production Man, Machine Material..	
Course Objectives:		
	The student should understand the scope, objective and application of Production Planning And Control manufacturing Industries.	
Course Outcomes:		
Students will be able to understand		
1.	The importance of PPC in industry.	
2.	The Forecasting by using different techniques.	
3.	Different ideas and concept to improve PPC in industry.	
4.	Different techniques for material requirement planning	
5.	Different techniques used for PPC in industry.	
6.	Computer Aided Process Planning.	
UNIT - I	Introduction to PPC: Role and stages of PPC, PPC as an integrated function, Product Life Cycle Analysis, Types of Production systems.	(05)
UNIT - II	Forecasting Techniques: Use and types of forecasting, Methods of forecasting and comparison, Verification and control.	(05)
UNIT - III	Techniques and Production Control: Process sheet, Routing, Scheduling- Gantt Chart, Machine Loading Chart, Line Balancing, Dispatching rules, Sequencing - Johnson's rule, Loading, Follow- up, Evaluation, PERT, CPM.	(06)

UNIT - IV	Materials Planning and Purchasing: Scope and requirement of MRP, MRP I and MRP II, Master Production Schedule, Bill of Materials, Capacity Requirement Planning. Introduction to ERP, Purchasing - Documentation, Make or Buy decisions, Vendor Development.	(08)
UNIT - V	Inventory Control: Types of Inventory, Cost of Inventory, EOQ, Selective Inventory Control, Replenishment Systems. Stores Management: Types of stores, Storage layout and storage systems, Stores Documentations, Stores Control and Control of Wastage and surplus, JIT, KANBAN, KAIZEN, Value Stream Mapping.	(08)
UNIT - VI	Computer Aided Production Planning and Control: a) Machine capacity planning and utilization. b) Productivity measurement. c) Material Requirement Planning. d) Scheduling Techniques. Hands on experience of Computer aided Production Planning and Control	(04)
Assignments: Six Assignments based on above syllabus.		
Text Books/Reference Books:		
1	"Production Systems - Planning Analysis and Control, J. L. Riggs, " , JhonWiley& Sons.	
2	"Operations Management - Design, Planning & Control for Manufacturing and Services, J.B. Dilworth " , McGraw Hill	
3	"Production and Operation Management S N Charry " Tata McGraw Hill	
4	Elements of PPC, Samuel Elion " , Universal Book Company	
5	"Industrial Engineering and Production Management MartandTelsang " S. Chand and Co. Ltd.	
6	" Production Planning And Inventory Control" Mager and Boodman	
7	S. S. Patil, Industrial Engineering & Management, Electrotech Publication.	
8	. "Production Management " Martin Star,	
9	Process Engineering " Erry Johnson	
10	"Production Planning and Control, A. K. Bewoor, " Satya Publication	
11	"Production Planning and Cost Control Jain and Arrawal", Khanna Publisher	
Syllabus for Unit Test:		
Unit Test -1	Unit I,III & II	
Unit Test -2	Unit IV,V & IV	

PRODUCTION PRACTICE - III		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Lectures: NIL		
Practical: 04 Hours / Week	Term Work and Practical Examination: 50 Marks	04Credits
Course Pre-requisites:		
The Students should have		
1.	Basic Knowledge of manufacturing processes.	
2.	Basic Knowledge of engineering graphics.	
3.	Basic Knowledge of materials.	
Course Objectives:		
	The student should understand the machining processes by lathe milling and grinding.	
Course Outcomes:		
Students will be able to understand		
1.	Turning process.	
2.	Taper turning process.	
3.	Threading process.	
4.	Gear cutting process..	
5.	Milling process.	
6.	Grinding process.	
	<p>Term Work Each Candidate shall be required to complete and submit the following jobs: (Any Two) One assembled job consisting of 2 to 3 pieces as below</p> <ol style="list-style-type: none"> 1. Operations on lathe machine (3 assembled parts) 2. Operations on milling machine 3. Operations on grinding. machine 	

Syllabus
for
B.Tech.ProductionSem V
&VI

Programme: B. Tech. (Production) Sem. V – 2014 Course

S.N	Course	Teaching Scheme (Contact Hrs/week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
1.	Metal Forming	3	2	-	60	20	10	10	50	-	150	3	1	4
2.	Kinematics and Design of Manufacturing Machine	3		-	60	20	10	10		-	100	3		3
3.	Metrology & Quality Control	3	2	-	60	20	10	10	-	50	150	3	1	4
4.	Engineering Metallurgy	3	2	-	60	20	10	10	50	-	150	3	1	4
5.	Numerical Methods	3	2	1	60	20	10	10	-	-	100	3	2	5
6.	Professional skill Development – V	4	-	-	100	-	-	-	-	-	100	4	-	4
7.	Production Practice- IV	-	2	-	-	-	-	-	-	50	50	-	1	1
	Total	19	10	1	400	100	50	50	100	100	800	19	5	25

Programme: B. Tech. (Production) Sem. VI – 2014 Course

S.N	Course	Teaching Scheme (Contact Hrs/week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
1.	Jig Fixture and Die Design *	3	2	-	60	20	10	10	50	-	150	3	1	4
2.	Production Management	3	2	-	60	20	10	10	-	-	100	3	1	4
3.	Computer Aided Design and Manufacturing	3	2	-	60	20	10	10	50	-	150	3	1	4
4.	Fluid Mechanics and Machine Tool Control	3	2	1	60	20	10	10	50	-	150	3	2	5
5.	Elective- I	3	2	-	60	20	10	10	50	-	150	3	1	4
6.	Professional skill Development – VI	4	-	-	100	-	-	-	-	-	100	4	-	4
	Total	19	10	1	400	100	50	50	200	0	800	19	5	25

* End Semester examination of duration 4 Hours.

Total Credits Sem. I – 25

Total Credits Sem. II – 25

Grand Total - 50

Subject :METAL FORMING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of conventional and non conventional manufacturing processes.	
2.	Knowledge of material science.	
3.	Knowledge engineering drawing.	
Course Objectives:		
	To study the metal forming processes i.e wire drawing, rolling, forging, extrusion, sheet metal working etc.	
Course Outcomes:		
Students will be able to understand		
1.	To select wire drawing machine and understand its defects and remedies.	
2.	To select proper forging process and understand its defects and remedies.	
3.	To select type of rolling mills and understand its defects and remedies.	
4.	To select various sheet metal working processes and advance sheet metal processes.	
5.	To design simple and progressive and deep drawing die.	
6.	To select extrusion die and extrusion proper process and understand its defects and remedies.	
UNIT - I	Fundamentals of Material Forming: Introduction of forming processes. Concept of Formability, formability limits and formability diagram. Wire and Tube Drawing: Introduction rod and wire drawing machines - construction and working. Preparation of stock for wire drawing. Wire drawing dies, material and design. Heat treatment, variables in wire drawing, Maximum reduction in wire in one pass, forces required in drawing. Multiple drawing, defects in drawing and remedies, work hardening, lubrication in wire drawing. Tube drawing: Methods, force calculations, stock penetration. Lubrication in tube drawing.	(06 Hours)
UNIT – II	Forging: Introduction, classification of forging processes. Forging equipment-	(06 Hours)

	Hammers, presses, furnaces etc. construction working capacities and selection of equipment. Basic forging operations such as drawing, fullering edging, blocking etc. Forgability tests, design of forging as a product, friction in forging. Forging defects and the remedies. New technologies: Liquid metal forging, Isothermal forging, No draft forging, P/M forging, Rotary swaging, Roll forging, lubrication in forging.	
UNIT - III	Rolling of Metals: Scope and importance of rolling. Effect of grain direction in rolling Types of Rolling Mills- construction and working. Deformation in rolling and determination forces required. Process variables, redundant Deformation, Roll bite and friction. Roll flattening, Roll camber - its effect on rolling process, mill spring. Defects in rolling. Automatic gauge control- Roll pass classification & design. Lubrication in rolling.	(06 Hours)
UNIT - IV	Sheet Metal Working: Sheet Metal properties, gauges and surface conditions. various cutting and forming operations, types of dies used, force requirement, theory of shear, methods of force reduction, defects, lubricants used. Miscellaneous sheet metal working operations: Metal spinning, fine blanking, coining, embossing, rubber forming, stretch forming. Coining Embossing, Curling, Spinning and fine blanking. Advanced Metal Forming Processes: Introduction to High velocity forming- principles, comparison of high velocity and conventional forming processes. Explosive forming, Magnetic pulse forming, Electro hydraulic forming. Stretch forming, , Flow forming advantages, limitations and application of the process.	(06 Hours)
UNIT - V	Design of Press Tools: General classification and components of press tools, types of dies simple, compound, combination dies, various press working operations such as punching, blanking, deep drawing, bending, forming etc. Design and calculations for above press working dies.	(06 Hours)
UNIT - VI	Extrusion: Types: Direct, reverse, impact, hydrostatic extrusion. Dies for extrusion, stock penetration. Extrusion ratio of force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants. Manufacture of seam-less tubes.	(06 Hours)
Term Work/Practical's:		
1. Design & working drawing of simple blanking die.		
2. Design & working drawing of progressive/compound/combination die.		

3. Design & working drawing of a deep drawing die.	
4. A report on factory visit, comprising of product range, processes, plant layout, Auxillary equipment, process parameters etc.	
Assignments:	
1. Assignment based on each unit of syllabus.	
Text Books/Reference Books:	
1	Dieter, "Mechanical Metallurgy"
2	P. N. Rao, "Manufacturing Technology", Tata McGraw Hill
3	G.W. Rowe, "Principles of Industrial Metal Working Process", Edward Arnold
4	Dr. R. Narayanswamy, "Metal Forming Technology", Ahuja Book Co.
5	Surender Kumar, "Principles of Metal Working"
6	"ASM Metal hand book Vol: 4 forming"
7	P.C.Sharma, "Production Engineering", S. Chand
8	Masleror and Berkvasky, "Theory of Plastic Deformation and Metal Working", MIRPublications
9	J. N. Harris, "Mechanical Working of Metals", Pergmon Press
10	Aviter, "Fundamental of Metal Working", McGraw Hill Publisher
11	Schilles, "Press Working"
12	R.G.W. Pye; "Injection Moulding", EWP.
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject : KINEMATICS & DESIGN OF MANUFACTURING MACHINES		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 00 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	00 Credit
Course Pre-requisites:		
The Students should have		
1.	Students should have Basic knowledge of Measuring Units, Mathematics, and Various terms like as displacement, Velocity, Acceleration.	
2.	Students should have Basic knowledge of various Machine Structures and drives.	
3.	Students should have Basic knowledge of Design Tolerance, Allowance and other related terms	
Course Objectives:		
1	To study the kinematics design for various products, its aesthetics, ergonomics, statistical techniques and reliability.	
Course Outcomes:		
Students will be able to understand		
1.	The analytical ability of students in synthesis of mechanism.	
2.	The knowledge of gear design.	
3.	Element of product design.	
4.	To set familiarization of Aesthetic and Ergonomic consideration in design	
5.	Importance of statistical consideration in design.	
6.	Basic vibration modules, tribology of material.	
UNIT - I	Computer Aided Analysis and Synthesis of Mechanisms and Kinematics Structure of Machine Tools: Computer Aided Analysis and coupler curves for four bar mechanism and. Slider crank mechanism, dimensional synthesis of mechanisms, three position synthesis of slider crank mechanism, Over lay method, Bloch Synthesis, Least square technique, Machine tool motion and their Transmissions, Kinematic balancing equation for motion transmitting elements, Kinematic structure of machine tool.	(06 Hours)
UNIT - II	Spur Gears: Design considerations based on Beam Strength, tangential loading, gear standards, types of gear tooth failures, Calculations of modules, teeth number . Helical Gears: Normal Module, Virtual no. of teeth, force analysis, Beam and wear	(07 Hours)

	strength, Introduction to Design of Helical Gears.	
UNIT - III	<p>Design for Manufacture: General Principles for Design for Manufacture, Principles of design for casting, Forging, Machining, Welded Joints, etc., Design for Manufacturing & Assembly.</p> <p>Product Design: Aesthetics: Aim, basic forms of elements, contribution of factors like structure, elegance, rhythm, proportions, harmony, use of curves, joints, materials, surface finish & color. Ergonomics: Aim, man-machine relationship, use of anthropometrical data related with machine tool & control elements, design of controls & display.</p>	(05 Hours)
UNIT - IV	<p>Friction and Lubrication: Dry friction, friction between screw and nut, friction in turning pairs, friction circle and friction axis, friction in mechanism, principles of thick and thin film lubrication methods, principles of hydrodynamic and hydrostatic lubrication.</p>	(05 Hours)
UNIT - V	<p>Fundamentals of Vibration: a) Un-damped Free Vibration, Equilibrium method, Energy method, Rayleigh's method. b) Damped Free Vibrations of single degree freedom system, types of damping, free vibration with viscous damping, over damped system, critically damped system, under-damped system, logarithmic decrement, viscous dampers, dry friction or coulomb damping, frequency of damped Oscillations. c) Vibration measuring instrument, measurement of displacement, velocity, acceleration, frequency and damping of vibrating systems</p>	(07 Hours)
UNIT - VI	<p>Statistical considerations in Design and Optimum Design: Statistical Considerations in Design: Analysis of Tolerances, Design and Natural Tolerances, Factor of safety and reliability. Optimum Design: Objectives of Johnson's Method of optimum design, design for normal specification and redundant and incompatible specification.</p>	(06 Hours)
Assignments:		
1. Assignment based on above six units.		
Text Books/Reference Books:		
1	Bhandari V.B:” Design of Machine Elements”, Tata McGraw Hill Publication	
2	Shigly “Mechanical Engineering Design”, Tata McGraw Hill Publication	

3	M.F.Spott” Design of Machine Elements”, Prentice Hall
4	Thomas Bevan” Theory of Machines”, CBS Publisher & Distributors
5	J.E. Shigly” Theory of Machines & Mechanisms”, McGraw Hill
6	Bhargave. S.R.” Theory of Machines-II”, Technova Publishing House .
7	P.L.Ballany “Theory of machines”, Khanna Publishing, New Delhi
8	R.S.Khurmi, J. K. Gupta, “Theory of Machines”, E P H
9	G.K.Grover, Mechanical Vibrations
10	Sen and Bhattacharya, ”Machine Tool Design
11	Phakatkar, ”Theory of Machine-II”
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject :METROLOGY AND QUALITY CONTROL		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks	01 Credit
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/PR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Measuring Units, Mathematics, and Various terms like as displacement, Velocity, Acceleration.	
2.	Basic knowledge of Design Tolerance, Allowance and other related terms.	
3.	Familiarity with elements of mechanical components like gear, screw thread, bearings etc.	
Course Objectives:		
	To make students have the basic principles of measuring methods and, have hands on experience on Measuring equipments and quality theories.	
Course Outcomes:		
Students will be able to understand		
1.	Make use of equipment like sine bar, angle gauge, Autocollimator, and angle dekkor to carry out angular measurement	
2.	Use of concepts like limits, fits and tolerances for designing the limit gauges	
3.	Read the symbols on drawing for surface finish and measure surface finish by instruments like Tomlinson surface meter, surftester etc	
4.	Measure the various screw thread parameters by using equipments like floating carriage micrometer, tool makers microscope and profile projector	
5.	Measure the gear tooth parameters with equipment like gear tooth vernier calliper, constant cord method, span micrometer, base tangent comparator etc	
6.	Familiarity with various TQM models	
UNIT - I	Introduction: Meaning of metrology, precision, accuracy, errors in measurement, calibration. Linear Measurement: Standards- line standard, end standard, wave length standard, classification of standards, precision and non precision measuring instrument, slip gauges. Angular Measurement: Sine bar, Sine center, Uses of sin bar, angle gauges, Auto Collimator & Angle Dekkor, Constant Deviation Prism Interferometry: Introduction, flatness testing by interferometry, NPL flatness interferometer. Laser interferometry.	(04 Hours)
UNIT - II	Limits, Fits and Tolerances and Gauge design: Meaning of limit, Fits and Tolerance, Cost-Tolerance relationship, concept of Interchangeability, Indian Standard System (ISS). Design of limits gauges: Types, Uses, Taylors principle, Design of	(07Hours)

	<p>limit gauges.</p> <p>Inspection of geometric parameters: Flatness, Straightness, Parallelism, Concentricity, Squareness, circularity and Cylindricity.</p> <p>Comparators: Uses, types, advantages and disadvantages of various types of comparators.</p> <p>Recent trends in Metrology: Introduction to CMM, Measuring geometrical parameters with CMM. techniques for automated inspection – contact and non-contact inspection methods – in processes automated measuring methods-machine vision, optical inspection methods.</p>	
UNIT - III	<p>Surface finish measurement: Surface texture, Meaning of RMS and CLA values, Tomlinson's Surface meter, Taylor- hobson surface meter, grades of roughness, specifications.</p> <p>Screw Thread Metrology: External screw threads terminologies, floating carriage instruments, pitch and flank measurement of external screw thread, application of Tool Makers Microscope, use of profile projector.</p> <p>Gear Metrology: Spur gear parameters, gear tooth thickness measurement, gear tooth verniercaliper, constant chord method, span micrometer, base tangent comparator, lead and profile measurement.</p>	(07 Hours)
UNIT - IV	<p>Introduction to Quality: Meaning of quality, Approaches-Deming's Approach, Juran's Approach, quality of product, quality of service, cost of quality, value of quality, difference between inspection, quality control, quality circle, quality policy.</p> <p>Introduction to quality control: Meaning of Quality Control, 100% inspection and Sampling inspection, Statistics in selective inspection Introduction to statistical quality control: Control chart:- Attribute (P, np, C, U) and variable (X & R chart), sampling inspection, Operating Characteristic curves and sampling plans.</p>	(06 Hours)
UNIT - V	<p>Quality Assurance Systems: Total quality management (TQM): 7 tools of problem solving, cause and effect diagram, Pareto analysis etc, Quality Function Deployment (Q.F.D), Kaizen, Introduction to Six sigma, process capability index (Cp, Cpk) concept, methods of determining Cp and Cpk .</p> <p>Reliability, availability and maintainability; Distribution of failure and repair times; determination of MTBF and MTTR, reliability models; determination of system reliability; preventive maintenance and replacement. Design of Experiments</p>	(07 Hours)

	(DOE).	
UNIT - VI	Quality Management Systems: History and evaluation of ISO9000 series, importance and over view of ISO9000-1998 series standards, structure of ISO9000-2000 series standards, clauses of ISO9000 series standards and their interpretation and implementation, quality system documentation, BIS standards ,ISO/TS 16949 and audit ISO14000: Environmental management concept, and requirement of ISO14001, benefits of environmental management systems. OH and AS standards.	(05 Hours)
Term Work/Practical's:		
1. Measurement bearing Parameters by using Vernier Calliper and Micrometer Screwgauge		
2. Measurement of Ovality Using Johanson Mikrokator.		
3. Measurement of angle by sine bar/sine center.		
4. Measurement of optical surface using Interferometer.		
5. Study and experiment on profile projector / Tool makers microscope		
6. Measurement of screw thread parameters using Floating Carriage Micrometer		
7. Measurement of the surface roughness		
8. Measurement of gear tooth thickness using gear tooth vernier caliper and span micrometer		
9. Machine tool Alignment test on lathe/drilling/milling machine.		
10. Experiment to measure Process Capability using Statistical Process Control Or Minitab Software		
Assignments:		
1. Quality and Quality Control		
2. Quality Assurance syaytem and reliability		
3. ISO 9000		
Text Books/Reference Books:		
1	R. K. Jain, "Engineering Metrology", Khanna Publication	
2	I.C.Gupta, "A Text book of Engineering Metrology", Dhanpat Rai and Sons.	
3	K. J. Hume, "Engineering Metrology"	
4	K. W. B. Sharp, "Practical Engineering Metrology", Pitman Publication	
5	Grant, "Statistical Quality Control", McGraw Hill	
6	"Hand Book of Industrial Metrology", A.S.T.M.E. Prentice Hall	
7	J. M. Juran, "Hand Book of Quality Control", McGraw Hill Publication	
8	Kaoru Ishikawa, "Guide to Quality Control", Asian Productivity Organisation, Series,	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

Subject : ENGINEERING METALLURGY		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Student should have knowledge of material science and mechanical properties of materials	
2.	Student should know about study of equilibrium diagrams ,phase ,crystal structures and microstructures .	
3.	Student should know about forging ,rolling and some manufacturing processes such as casting , machining etc.	
Course Objectives:		
	Student will understand different heat treatment for steel and select the materials as per requirement of industries .	
Course Outcomes:		
Students will be able to understand		
1.	The manufacturing of steel and will be able to identify different steels as per classifications	
2.	Different heat treatment that is to be carried out for steel as per requirement	
3.	Surface and core heat treatment for different applications	
4.	Types of tool steels and alloy steels and able to suggest as per requirement	
5.	Types of cast irons and able to choose different cast irons as per applications	
6.	Non ferrous material and their applications .	
UNIT - I	Study of Metallography and steels. Study of metallography & microscopes, Etching methods, macroscopic examination methods. Brief idea about iron & steel making, blast furnace, sponge iron, cast irons, Wrought irons, pig iron, Study of Iron-Iron carbide equilibrium diagram, different types of reactions & phases, critical temperatures, cooling of different steels, Classification & specifications of steels, Structure – property relationship, microstructures of plain carbon steels, Measurement of grain size.	(06 Hours)
UNIT - II	Cast Irons : Classification of Cast irons, effect of cooling rate and alloying elements on cast irons , Types of cast irons, Manufacturing methods, Properties, applications of each cast irons, alloy cast irons , Comparison of steels & cast irons, Heat treatments of cast irons.	(06 Hours)
UNIT - III	Alloy Steels & Tool Steels : Classification of alloying elements, Effect of alloying elements on properties, Various alloy steels,	(06 Hours)

	Stainless steels – Classification, Applications & properties, Tool Steels – Classification, Applications & properties, heat treatment of tool steels, mold tool steel.	
UNIT - IV	Heat Treatment of steels : Transformation products of austenite, Martensite transformation & characteristics of martensite, Time – Temperature Transformation curve, Critical Cooling rate, Heat treatment of steels - Annealing, Normalizing, Hardening , Hardenability, Martempering, Austempering, Retained austenite, Tempering, Ausforming, Secondary hardening, Quench cracks,	(06 Hours)
UNIT - V	Surface treatments and furnaces : Necessity of surface hardening, Carburizing & its types, nitriding& its types, Carbonitriding, Tuffriding, Flame & Induction hardening, Heat treatment furnaces, Atmospheres used in heat treatment, Defects in heat treatments.	(06 Hours)
UNIT - VI	Study of Non-ferrous metals and its alloys: Study of copper and it's alloys, equilibrium diagram of Cu-Zn system, Brasses , Bronzes, Study of Aluminum and its alloys, Al-Si equilibrium diagram, applications and properties of non ferrous alloys, Nickel and magnesium alloys, Materials for Bearings. Recent developments in materials like smart materials, magnetostrictive materials etc.	(06 Hours)
Term Work/Practical's:		
<ol style="list-style-type: none"> 1. Study of metallurgical microscope and etching technique 2. Specimen preparation for metallography 3. Macroscopic examination tests. 4. Study of plain carbon steels and its microstructures. 5. Study of cast irons and its microstructures 6. Study of Non ferrous metals and its microstructures 7. Heat treatment for plain carbon steels. 8. Jominy End Quench test for hard ability measurements 9. Any one surface Hardening Heat treatment. 		
Assignments:		
1. Describe in briefly the manufacturing of steels from ore ,list out the steel manufacturing industries		
2. Collect the different component made from steels find out there heat treatment done on it describe in details and submit the component.		
3. Visit the industries that do heat treatment on component and submit the report		
4. Do collection of some tools write the chemical compositions ,manufacturing and supporting treatment etc. and submit the report		
5. take any one cast iron component and write the details about it that is chemical composition ,manufacturing methods and properties		
6. List out the nonferrous materials and its applications , properties and chemical composition.		
Text Books/Reference Books:		

1	“Material Science and Physical Metallurgy”, Dr.V.DKodgire , Everest Publication, Pune.
2	“Physical Metallurgy”, Vijendra Singh, Standard Publishers Distributors, Delhi.
3	“Physical Metallurgy”, S H Avner, Tata Micro hill Publication , Delhi
4	“Heat Treatments of Metals ” R K Rajput ,S K Kataria and Sons Publication, Delhi.
5	“Mechanical Metallurgy”, Ditter
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

NUMERICAL METHODS		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Tutorial : 01 Hour/ Week		01 Credit
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Mathematics	
2.	Basic knowledge of Differentiation and Integration	
3.	Basic knowledge of Interpolation	
Course Objectives:		
The student should recognize the difference between analytical and Numerical Methods and effectively use Numerical Techniques for solving complex Mechanical engineering Problems		
Course Outcomes:		
Students will be able to		
1.	Use appropriate Numerical Methods to solve complex mechanical engineering problems	
2.	Find the roots of equations by various methods.	
3.	Find the solutions to simultaneous equations by various methods	
4.	Use the appropriate method of curve fitting for the given data.	
5.	Use Numerical differentiation and Integration to solve the real time problems	
6.	Write the program on ordinary differential equations	
UNIT-I	Introduction MATLAB fundamentals, MATLAB graphics, simple matlab demonstration programs. Error Analysis Significant figures, Accuracy and Precision, Error definition, Round-Off errors, Truncation error, Total numerical error, Blunders, Formulation error and Data Uncertainty.	(06 Hours)
UNIT-II	Roots of Equation Bracketing methods-Bisection and False position method. Open methods-Simple fixed-point iteration, Newton Raphson method and Secant method. Engineering Applications.	(06 Hours)
UNIT-III	Solutions of Simultaneous Equations Navier Gauss elimination, pitfalls of Gauss Elimination, techniques of improving solutions, complex numbers. Gauss Jordan, Gauss seidal and LU Decomposition. Engineering application-spring mass system.	(06 Hours)
UNIT-IV	Curve Fitting Least-Square Regression-Linear regression, polynomial regression and multiple linear regressions. Interpolation -Newton's divided	(06 Hours)

	difference interpolating polynomial. Lagrange's interpolating polynomial, coefficients of interpolating polynomials. Inverse interpolation spline interpolation. Engineering Applications.	
UNIT-V	Numerical Differentiation and Integration Trapezoidal rule, Simson's rules, integration with unequal segment, multiple integral, romberg integration, Gauss Quadrature. Richardson Extrapolation, derivatives of unequally spaced data. Engineering Applications. Numerical Differentiation using Forward, backward and central difference.	(06 Hours)
UNIT-VI	Ordinary Differential Equations Euler's method, improvement of Euler's method, Runge-Kutta method, system of equations, Adaptive Runge Kutta method. Stiffness and multistep method. Engineering Applications.	(06 Hours)
<p>Term work: List of Experiments:</p> <ol style="list-style-type: none"> 1. Program on Roots of Equation (Validation by suitable solver) Bisection Method, False position Method, Newton Raphson method and Successive approximation method 2. Program on Simultaneous Equations (Validation by suitable solver) Gauss Elimination Method, Partial pivoting, Gauss-Seidal method, Gauss Jordan method 3. Program on Numerical Integration(Validation by suitable solver) <ol style="list-style-type: none"> a) Trapezoidal rule, b) Simpson`s Rules (1/3rd, 3/8th) 4. Program on Curve Fitting using Least square technique (Validation by suitable solver) 5. Program on Interpolation (Validation by suitable solver) 6. Program on Ordinary Differential Equations 		
<p>Assignments:</p> <p>Six Assignments based on above syllabus</p> <p>Text Books / References</p> <ul style="list-style-type: none"> • S. S. Sastry, Introductory Methods of Numerical Analysis, PHI. • Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, (2007). • Grewal, B.S. and Grewal, J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, (2004). • Sankara Rao, K. "Numerical methods for Scientists and Engineers", 3rd Edition Prentice Hall of India Private Ltd., New Delhi, (2007). • M. K. Jain, S.R.K. Iyengar and R.K.Jain, (2003), Numerical Methods for Scientific and Engineering, • Brian Bradie, "A friendly introduction to Numerical analysis", Pearson Education Asia, New Delhi, (2007). • Gerald and Wheatley, Applied Numerical Analysis, Pearson Education Asia • E. Balagurusamy, Numerical Methods, Tata McGraw Hill 		

<ul style="list-style-type: none"> • P. Thangaraj, Computer Oriented Numerical Methods, PHI • Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientist, Tata Mc-GrawHill Publishing Co-Ltd. • Rao V. Dukkupati, Applied Numerical Methods using Matlab, New Age International Publishers. 	
Syllabus for Unit Test	
Unit Test 1	Units I, II and III
Unit Test 2	Units IV, V and VI

PRODUCTION PRACTICE – IV		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Practical: 04 Hours / Week		01 Credit
Course Pre-requisites:		
The Students should have		
1	Basic knowledge of handling the Lathe machine.	
2	Basic knowledge of handling the Milling machine.	
3	Basic knowledge of handling the Grinding machine.	
Course Objectives:		
The students should able to manufacture the job on lathe, Milling and Grinding Machine		
Course Outcomes:		
Students will be able to performed		
1	Different operations on lathe machine.	
2	Gear Cutting on Milling machine.	
3	Finishing operation on Cylindrical grinding machine and Surface grinding machine.	
Term Work		
Each Candidate shall be required to complete and submit the following jobs:		
1. One Composite job consisting of 3 to 4 pieces as below: Machining of components covering all operations on Lathe (Including Internal and external threading, Taper Matching, Knurling)		
Grinding operation on Above (Turning) Job		- One Job
2. Gear Cutting on milling machine.		-One Job
Note: Practical examination of 6 Hours duration shall be conducted at the end of Sem.-II based on the process and practical conducted in production practice-III		

B.Tech.Production

Sem-VI

Subject :JIG FIXTURE AND DIE DESIGN		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks	01 Credit
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of conventional and non conventional manufacturing processes.	
2.	Knowledge of casting processes.	
3.	Knowledge plastic processes methods.	
Course Objectives: To design jig, fixtures and dies for manufacturing system.		
Course Outcomes:		
Students will be able to understand		
1.	To understand the concept of jigs and fixture and its principles.	
2.	To design jigs with use of standard components.	
3.	To design fixture with use of standard components.	
4.	To select plastic processes methods.	
5.	To understand the concept of injection moulding and able to design the injection molding die.	
6.	To design dies for the pressure die casting.	
UNIT - I	Fundamentals of Jigs And Fixtures: Significance and purpose of jigs and fixtures and their functions in manufacturing processes. Classifications of Jigs and Fixtures. Design features of main elements of Jigs and Fixtures such as locating, clamping and guiding elements and their integrations. Indexing, locking and auxiliary elements. Bodies and bases or frames of Jigs and fixtures. Economics of Jigs and fixtures, Pneumatics & Hydraulics for Jig & Fixtures.	(06 Hours)
UNIT - II	Design of Jigs: General guidelines & procedures for design of Jigs. Design & selection of standard elements, Analysis of clamping force required & their magnitude, Design of drilling jigs.	(06 Hours)
UNIT - III	Design of Fixtures: General guidelines & procedures for design of fixtures. Design & selection of standard elements, Analysis of clamping force required & their magnitude, concept of modular fixtures & tool presetting fixtures. Design of milling, turning fixture and fixture for assembly. Economic analysis .	(06 Hours)

UNIT - IV	Plastics Processing: Materials used for plastic processing, Compression, transfer, injection & blow moulding processes - its working, construction, types & advantages and limitations.	(06 Hours)
UNIT - V	Design of Injection Molds: Specifications and elements of injection molding machine, Injection molding feed system: runner and gates, ejection methods, ejection force calculation, parting surface selection, cooling systems, Defects & remedies.	(06 Hours)
UNIT - VI	Design of Die Castings Dies: Die casting machines-Hot & cold chamber, metals for die casting, die locking methods, interlocks & safety devices, specific details of die constructions, casting, ejection, cores, slides, loose die pieces, types of cores, directional solidification, types of feeders, die venting, water cooling, classification of dies- single, combination, multi impression. General details of die design, Gating system, inserted impressions, die casting defects and remedies, die lubrication & rules for die lubrication.	(06 Hours)
Term Work/Practical's:		
1. Design & working drawing of one drilling jig.		
2. Design & working drawing of one fixture.		
3. Design & working drawing of a die casting die.		
4. Design & drawing of a injection molding die.		
Assignments:		
1. Six Assignment based on the syllabus.		
Text Books/Reference Books:		
1	Donaldson, Lecain&Goold, "Tool Design", Tata McGrw Hill	PRODUCTION
2	Doebler H. H., "Die Casting", McGraw Hill	
3	P. N. Rao, "Manufacturing Technology", Tata McGraw Hill	
4	Wilson, "Fundamentals of Tool Design", A. S. T. M. E.	
5	M. H. A. Kempster, "Introduction to Jigs and Fixtures Design"	
6	P. H. Joshi, "Press Tools", A.H. Wheeler	
7	P. C. Sharma, "Production Engineering", S. Chand	
8	Dr. Surender Kumar, "Production Engg. Design (Tool Design)", Satya Prakashan	
9	R. G. W. Pye, "Injection Mould Design", EWP	
10	A. S. Athalye, "Plastic Processing Handbook", Multitech	
11	Richard Kibbe, John E. Neely, Meyer, White, "Machine Tool Practices"	
12	Hoffman, "Introduction to Jigs and Fixtures"	
13	"Tool Engineering Handbook", A. S. T. M. E.	
14	R. K. Jain, "Production Technology", Khanna Publishers	
15	Dr. Surender Kumar, "Production Engineering Design"	
16	"Metals Handbook", Vol II ASME	

17	"Toll and Die Design Handbook", McGraw Hill
18	Hiram and Grant, "Non Conventional Clamping Devices"
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject :PRODUCTION MANAGEMENT		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Knowledge of Industrial Engineering.	
2.	Knowledge of Industrial Management.	
3.	Knowledge of Production Planning and Control.	
Course Objectives:		
	The student should understand the scope, objective and application of Production Management tools and practices in manufacturing.	
Course Outcomes:		
Students will be able to understand		
1.	To understand the evolution of Production Management, its scope, operations, organization.	
2.	To understand the factors deciding location of plant, Layout of facility and objectives of material handling.	
3.	To understand manpower planning and capacity planning techniques based on technology and objective of material, handling.	
4.	To understand the organization and administration of maintenance function- it's types, principles, operations policies etc.	
5.	To understand the concept of World-Class-Manufacturing, it's elements, problems and various contributors to develop World-Class-Manufacturing.	
6.	To understand topics in Production Management such as Green/Agile and Lean manufacturing and energy conservation and energy efficiency manufacturing with knowledge based system (IT) application	
UNIT - I	Scope of Production Management The evolution of Production management / Operations Management. Different production eras - Mass, Batch, Job production customization. Relationship of Production/Operations Management with materials, maintenance, quality control, design production engineering and sales. Scope, Definition and its relationship with other management functions such as marketing, finance and personal management. Production organizations for single product, multi product, single location, multilocation. Product Design Product life cycle, Relationship between product design and product cost. Stage of Product Design & Development, Functional, Economic, manufacturing and marketing aspects in product design, Concept of Concurrent engineering, 3S, House of Quality.	(06 Hours)

UNIT - II	<p>Location Facility-location: Objectives, factors affecting site selection, , center of gravity method, profit volume rating and hub and scope model.</p> <p>Layout Layout types, material flow pattern.</p> <p>Material handling Material handling: Its relation with layout, Objectives, principles and types of material handling. AGV'. Unit load concept.</p>	(06 Hours)
UNIT - III	<p>Manpower Planning and Capacity Planning Manpower forecasting, manpower inventory, capacity and level strategies, aggregate capacity planning.</p> <p>Productivity Productivity : Factor productivity, Total productivity, Labor productivity, measurement of productivity, techniques of productivity Toyato Production System (TPS) ,Total Productivity Management(TPM) and Mangement Information System (MIS).</p>	(06 Hours)
UNIT - IV	<p>Industrial Maintenance Organization, Administration of maintenance function, types of maintenance, principles, operating policies, scope of maintenance management, budget and Total productive maintenance.</p>	(06 Hours)
UNIT - V	<p>World Class Management: Concept of World Class manufacturing, Emergence of information age, Manufacturing challenges of Information age, elements of business turbulent environment, Problems in manufacturing sector, Evolution of WCM, Contribution of Hall, Schoenberger, Gunn, Maskel, WCM practices in industries and WCM scenario in India.</p>	(06 Hours)
UNIT - VI	<p>Recent Techniques of Production Management Concept, implementation, applications, advantages and disadvantages of following tools and techniques: Energy conservation and Energy audit, Green Production, Waste heat treatment, Energy efficient manufacturing system, Lean and agile manufacturing, Knowledge Based System, Manufacturing Information System.</p>	(06 Hours)
Assignments:		
1.Six Assignment based on above syllabus.		
Text Books/Reference Books:		
1	H. B. Maynard and others, “Modem manufacturing”, IV edition - McGraw Hill Publications, ISBN 0-07-041084-4.	
2	H. B. Maynard and others, “Industrial Engineering Handbook”, IV edition- McGraw Hill Publications, ISBN 0-07-041084-4.	
3	L. R. Hignis, R. K. Mobley, Smith Ricky, “Maintenance Engineering Handbook”, McGraw Hill Publications, ISBN 0-07-028819-4.	

4	Kanter Jerome, "Management Information System", Prentice Hall, ISBN 0-87692-358- 9.
5	H. Noori and R. Radford, "Production and Operation Management", Total Quality and Responsiveness international Edition - 1995 - McGraw Hill Inc.
6	B.S. Sahay, K B C. Saxena, Ashish Kumar, "World Class Manufacturing-A Strategic perspective",McMillan India Ltd.
7	F. L. Francis, J. A. White, L. F. McGinnis, "Facilities Layout and Location", Prentice Hall of India Pvt. Ltd., ISBN 81-203-1460-3.
8	T. E. Vollmann, W. L. Bery, "Manufacturing Planning and control Systems", Galgotia Publication New Delhi, ISBN 81-7515-084-X.
9	Richard Muther, "Systematic Layout Planning"
10	J. L. Riggs, "Production Systems", John Wiley and Sons.
11	Mayer, "Production Management", Tata McGraw Hill Publications.
12	M. Telsang, "Industrial Engineering and Production Management", S.Chand Publication
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

COMPUTER AIDED DESIGN AND MANUFACTURING		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR: 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of drawing.	
2.	Basic knowledge of standards	
3.	Basic knowledge of manufacturing processes.	
Course Objectives:		
To understand the basics of CAD/CAM and to learn about the geometric issues concerned to the manufacturing and its related areas.		
Course Outcomes:		
Students will be able to		
1.	Understand the concepts of CAD and computer graphics system.	
2.	Understand the curves and the concept of geometric modeling.	
3.	Understand the concept of part families and cellular manufacturing	
4.	Understand the concept of CIM and its models.	
5.	Write the manual and APT part program for various machining operations	
6.	Understand the process of computer aided process planning and various approaches.	
UNIT-I	Introduction: Product Life Cycle, Design Process, Application of Computers for Design, Benefits of CAD, Computer configuration for CAD Applications, Grover's	(06)

	<p>Model of Product life Cycle for Selection of CAD/CAM.</p> <p>Configuration of graphics workstations, Fundamentals of 2D graphics, Menu design and Graphical, User Interface (GUI), Homogeneous coordinate systems, Geometric transformations, graphics standards.</p>	
UNIT-II	<p>Space Curve design -Analytical and Synthetic approaches, parametric equations, modeling of cubic spline, Bezier curve, B-spline curve and NURBS and their manipulation techniques.</p> <p>Geometric modeling techniques- Wireframes, B-Rep, CSG and Hybrid modelers, Feature based, Parametric and Variation modeling.</p>	(06)
UNIT-III	<p>Group Technology and FMS</p> <p>Group Technology: Part families, Part Classification and coding, Cellular manufacturing and composite part concept.</p> <p>Concept of manufacturing systems and automation, automation strategies, concept of machine cell and CMS, Building blocks of FMS Planning and implementations of FMS.</p>	(06)
UNIT-IV	<p>CIM:</p> <p>Introduction, ESPRIT - CIM OSA model, The NIST - AMRF Hierarchical Model, The siemens model of CIM, The CIM model of Digital Equipment Corporation, IBM concept of CIM, Present Scenario, Rapid product development and manufacture, Extended Enterprises.</p>	(06)
UNIT-V	<p>Advanced Manufacturing Techniques:</p> <p>Principles of Numerical control, Types of CNC Machine Tools, Features of CNC Systems, Direct numerical control (DNC), Elements of CNC viz. Ball screws, rolling guide ways, structure, drives and controls, standard controllers, Virtual machining. Machining Centers and Interpolators.</p> <p>CNC Programming: Types, Manual Part Programming, Canned Cycle, Offset, APT.</p> <p>Introduction to Rapid prototyping, introduction to additive manufacturing</p>	(06)

	techniques.	
UNIT-VI	<p>Computer Aided Process Planning:</p> <p>Process Planning and Production Planning, manual experience based planning, Decision table and decision trees, Process capability analysis, Variant and Generative process planning approach, Process planning systems like CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO,CPMP</p> <p>Introduction to total integrated process planning systems</p>	(06)
<p>Term work:</p> <p>List of Experiments:</p> <ol style="list-style-type: none"> 1. Manual part programming using G and M codes for Turning, Step turning, Taper turning, multiple turning, Facing, Multiple facing, thread cutting and radius turning on cylindrical components. 2. CNC Milling program involving linear motion and circular interpolation. 3. CNC Milling program involving contour motion and canned cycles. 4. CNC Milling program involving Pocket milling 5. CNC code generation using any CAM software. 6. Simulation of machining operations using any CAM software. 7. Route sheet generation using CAM software. 8. Study on Rapid Prototyping Technologies. 		
<p>Assignments:</p> <p>Six Assignments based on above syllabus.</p> <p>Oral/Practical</p> <p>Term work and oral will be based on above syllabus</p> <p>Text Books / References</p> <ul style="list-style-type: none"> • RadhaKrishnan P and Subramanyam, “CAD/CAM/CIM”, Wiley Eastern Ltd • M. Groover, E. Zimmers, “CAD/CAM: Computer-Aided Design and Manufacturing”, Prentice Hall of India Pvt Ltd, 1995 		

<ul style="list-style-type: none"> • Mikell P. Grover, “Automation, Production System and Computer Integrated Manufacturing”, Prentice Hall of India Pvt Ltd, 1995. • Zeid Ibrahim, CAD/CAM theory and practices, McGraw Hill international edition. 2009. • Rogers D. F. and Adams A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989. • Faux I. D. and Pratt M. J., Computational Geometry for Design and Manufacture, John Wiley & sons, NY, 1979 • Mortenson M. E., Geometric Modeling, John Wiley & sons, NY, 1985 • Choi B.K., Surface Modeling for CAD/CAM, John Wiley & Sons, NY, 1991. 			
Syllabus for Unit Test			
<table border="1"> <tr> <td>Unit Test 1</td> <td>Units I, II and III</td> </tr> </table>	Unit Test 1	Units I, II and III	
Unit Test 1	Units I, II and III		
<table border="1"> <tr> <td>Unit Test 2</td> <td>Units IV, V and VI</td> </tr> </table>	Unit Test 2	Units IV, V and VI	
Unit Test 2	Units IV, V and VI		

Subject : FLUID MECHANICS AND MACHINE TOOL CONTROL SYSTEM		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Tutorial : 01Hours / Week		01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have knowledge of		
1.	Fluids and its properties	
2.	Fundamentals of engineering mechanics	
3.	Basics of electrical and electronics component	
Course Objectives:		
	The student should understand the scope, objective and application of industrial circuits in hydraulic and pneumatic.	
Course Outcomes:		
Students will be able to understand		
1.	Used for fluid mechanics fundamentals, including concepts of mass and momentum conservation.	
2.	An ability to apply the Bernoulli's equation to solve problems in fluid mechanics.	
3.	An ability to apply control volume analysis to problems in fluid mechanics.	
4.	Knowledge of laminar and turbulent boundary layer fundamentals.	
5.	An exposure to recent developments in fluid mechanics, with application to industries.	
6.	An ability to apply the concepts developed for fluid flow analysis to issues in industrial design.	
UNIT - I	Fluid Properties and Fluid Statics: Definition of fluid, Newtonian and non Newtonian fluids. properties of fluids, Types of fluids, Viscosity, specific gravity, Compressibility, Surface tension, Capillarity etc. effect of temperature and pressure on hydraulic fluid. Pressure at a point, Pascal's law, measurement of pressure, methods, manometers, liquid pressure – horizontal, vertical plane surface.	(06 Hours)
UNIT - II	Fluid Dynamics: Types of flow, steady and unsteady, uniform and non uniform, streamline flow, laminar and turbulent flow, Use of Reynolds's number in flow through pipes. Continuity equation, energy equation, momentum equation. Euler's equation of motion along a stream line, Bernoulli's equation, Application of Bernoulli's equation to pitot tube, Venturimeter, Orifices, Orifice Meter, Triangular & Rectangular notch. Calculations of flow, friction and work done by fluid under pressure	(06 Hours)

UNIT - III	<p>Fluid power: Introduction to fluid power: Classification, general feature and application in various fields, hydraulic and pneumatic ISO symbols in fluid power applications</p> <p>Fluids for hydraulic power: functions, properties and conditioning of hydraulic fluids.</p> <p>Sources of fluid power: classification, types and selection of pumps: positive displacement pumps and negative displacement pumps, types of compressors.</p> <p>Distribution of fluid power: selection of conductors for system considering various factors, sealing and packing devices</p>	(06 Hours)
UNIT - IV	<p>Control of fluid power: Pressure control valves- direct acting type, pilot operated, sequence, counter balancing, unloading, pressure reducing, construction and working:</p> <p>Direction control valves- types, construction and working, spool actuation methods, spool centre positions.</p> <p>Flow control valves- compensated and non compensated type, construction and working. Actuators: types, applications and selection</p>	(06 Hours)
UNIT - V	<p>System components and circuits: Study of various accumulators, intensifiers, hydraulic jack, power jack, etc. Linear and regenerative circuits with accumulators and intensifiers. Study of various hydraulic and pneumatic circuits for machine tools: components, working and applications. Performance of system (descriptive treatment only).</p> <p>Fluid power maintenance and safety.</p> <p>Introduction to fluidics, maintenance and study of simple logic gates, Use of hydraulics V/s Pneumatics in industry.</p>	(06 Hours)
UNIT - VI	<p>Pneumatic system Elements: Piping materials and pressure ratings, piping layout, calculation of pressure drop in pneumatic line; Air compressors, types, working, selection criteria; FRL unit, construction and working; pneumatic cylinders and air motors, construction and working; types, calculation of force and air consumption of air, hydraulic and electric motor</p> <p>Hydro pneumatic system: concept, working and applications (Descriptive treatment only).</p>	(06 Hours)
Term Work/Practical's:		
A journal containing record of any eight experiments of the following:		
1. Verification of modified Bernoulli's equation.		
2. flow through orifice/ Venturimeter		
3. At least two experiments on Hydraulic Trainer.		
4. Practical performance using Automation Studio Software		

Assignments:	
1. study of symbols used in fluid power	
2.) study of different types of valves used in fluid circuits	
3. Study of actuators / Intensifier/ Accumulators	
4. Design of control circuit for a machine tool.	
5. study of power pack unit	
6. Design of hydraulic and pneumatic circuits.	
Text Books/Reference Books:	
1	Modi, Seth: 'hydraulics and fluid mechanics': standard book house, Delhi
2	Dr. j. Lal: 'Fluid mechanics & hydraulics with computer application'. Metropolitan Book co. pvt. Ltd. Delhi
3	Garde, mirajgaonkar : 'Engineering fluid mechanics': Nemchand& bros. Roorkee
4	D. A. Pease : 'Basic fluid power': Prentice hall
5	H. L. Stewart : 'pneumatic & hydraulics': Industrial Press
6	A. Esposito : 'Fluid power with application': Prentice hall
7	A. B. Goodwin: 'Power hydraulics'.
8	A. B. Goodwin: ' Fluid Power system'
9	Eatons Vickers: 'Industrial Hydraulic manual'.
10	Festo's 'manual on pneumatic principle, Applications'
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Subject :ELECTIVE I MARKETING MANAGEMENT		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic Management Concept.	
2.	Functions of Management.	
3.	Principles of Management.	
Course Objectives: The objective of this course is to facilitate understanding of the conceptual framework of marketing and its applications in decision making under various environmental constraints.		
Course Outcomes:		
Students will be able to understand		
1.	Structure, functions and strategies of Marketing department.	
2.	Design the product marketing and cost for the product marketing.	
3.	The distribution channels and their selection.	
4.	Importance of Market Segmentation.	
5.	Implementation of Marketing Information System & Marketing Research.	
6.	Advance tools in marketing and their implementation.	
UNIT - I	Marketing – Definition, Concepts Significance & functions of Marketing, Approaches to the study of Marketing, Relevance of Marketing in a developing economy. Role & functions of Marketing Manager Marketing mix; Strategic marketing planning – an overview. Introduction to 8P for marketing.	(06 Hours)
UNIT - II	Product Decisions: Concept of a product; Classification of products; Major product decisions; Product line and product mix; Branding; Packaging and labeling; Product life cycle – strategic implications; New product development and consumer adoption process. Pricing Decisions: Factors affecting price determination; Pricing policies and strategies; Discounts and rebates.	(06 Hours)
UNIT - III	Distribution Channels and Physical Distribution Decisions: Nature, functions, and types of distribution channels; Distribution channel intermediaries; Channel management decisions; Retailing and wholesaling.	(06 Hours)

	Factors influencing channels, Elements of Promotion Mix – Sales Promotion System. Recent Trends in Promotion Sale. Advertising – Role of Advertising, Advertising Media, B to B and online marketing.	
UNIT - IV	Market Segmentation Meaning, Definition, Different ways to Segmentation, Essential of effective Market Segmentation, Distinction between Differential Marketing & Concentrated Marketing.	(06 Hours)
UNIT - V	Marketing Information System & Marketing Research. Concept & components of a Marketing Information System – Marketing Research – Meaning & scope – marketing research procedure – types & techniques of Marketing Research – Managements use of Marketing Research.	(06 Hours)
UNIT - VI	Issues and Developments in Marketing: Social, ethical and legal aspects of marketing; Marketing of services; International marketing; Green marketing; Cyber marketing; Relationship marketing and other developments of marketing.	(06 Hours)
Assignments:		
1. Six Assignment based upon above syllabus		
Text Books/Reference Books:		
1	Kotlar, Philip, Marketing Management, Prentice Hall, New Delhi.	
2	Stanton, Etzel, Walker, Fundamentals of Marketing, Tata-McGraw Hill, New Delhi.	
3	Saxena, Rajan, Marketing Management, Tata-McGraw Hill, New Delhi.	
4	McCarthy, E.J., Basic Marketing: A managerial approach, Irwin, New York.	
5	John Fraun., Principles and practice of Marketing	
6	Kanuk , Consumer Behavior By Schiffman	
7	Davis – Olsan , Marketing Information System	
8	Gandhi , Marketing – A Managerial Introduction	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

Subject :ELECTIVE I DESIGN FOR MANUFACTURING AND ASSEMBLY		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic Knowledge of Manufacturing processes.	
2.	Knowledge of Materials and its properties.	
3.	Knowledge of Casting and metal extrusion.	
Course Objectives:		
	To make the student well conversant with the relations between design for manufacturing and design for assembly.	
Course Outcomes:		
Students will be able to understand		
1.	The steps in DFMA.	
2.	Carry out sand castings and manufacture powder metallurgy products.	
3.	The process of design for machining.	
4.	The process for metal extrusion and forging	
5.	The process for assembly	
6.	The use of CAD in DFMA	
UNIT - I	Introduction to DFMA: History of DFMA, Steps for applying DFMA during product design, Advantages of applying DFMA during product design, Reasons for not implementing DFMA, Introduction to Manufacturing Process: Classification of manufacturing process, Basic manufacturing processes, Mechanical properties of material: Tensile properties, Engineering stress-strain, True stress strain, Compression properties, Shear properties, Introduction to materials and material selection: Classification of engineering materials, Material selection for product design	(06 Hours)
UNIT - II	Sand casting: Introduction to sand casting, Typical characteristics of a sand cast part, Design recommendation for sand casting, Investment casting: Introduction, Steps in investment casting, Design consideration of Investment casting, Typical characteristics and applications, Die casting: Introduction to die casting, Advantages of the die casting process, Disadvantages of the die casting process, Applications, Suitable material consideration, General design consideration, Specific design recommendation, Injection moulding: Introduction	(06 Hours)

	to injection moulding, Typical characteristics of injection moulded parts, Effect of shrinkage, Suitable materials, Design recommendations, Design for powder metal processing: Introduction to powder metal processing, Typical characteristics and applications, Limitations, Design recommendations.	
UNIT - III	Design for machining: Introduction to machining, Recommended materials for machinability, Design recommendations, Design for tuning operation: Process description, Typical characteristics and applications, Suitable materials, Design recommendations, Design for machining round holes: Introduction, Suitable materials, Design recommendations, Recommended tolerances, Parts produced by milling: Process description, Characteristics and applications of parts produced on milling machines, Design recommendations for milling, Dimensional factors and tolerances, Parts produced by planning, shaping and slotting: Process description, Design recommendation planning, Design for broached parts: Process description, Typical characteristics of broached parts, Suitable materials for broaching, Design recommendations.	(06 Hours)
UNIT - IV	Metal Extrusion: Process, Suitable material for extrusion, Design recommendation for metal extrusion, Metal stamping: Process, Characteristics and application of metal stamping, Suitable materials for stamping, Design Recommendations for metal stamping, Fine blanked parts: Fine blanking process, Material suitable for fine blanked parts, Design recommendations for piece parts, Rolled formed section: Process, Design recommendations rolled section, Impact or cold extrusion: Process, Design recommendations for backward extrusion, Forward extrusion: Process, Design recommendations for forward extrusion, Design for Forging: Forging processes, Forging nomenclature, Suitable materials for forging, Design recommendations, Metal injection moulded parts: Process, Materials suitable, Design recommendations for metal injectionmolded parts.	(06 Hours)
UNIT - V	Introduction to Assembly: The assembly process, Characteristics and applications, Example of common assembly, Economic significance of assembly, General taxonomies of assembly operation and systems, Assembling a product, Design for Assembly: Introduction, Design consideration, Design for Fasteners: Introduction, Design recommendation for fasteners.	(06 Hours)
UNIT - VI	Introduction to CAD: Geometric Representation in CAD, Extraction of part feature	(06 Hours)

	information from CAD Model: Introduction, Feature recognition techniques, Free Form Features, Hybrid Techniques, Reference, Extraction of assembly feature information from CAD Model: Introduction, Assembly features, Definition of assembly feature attributes, Characterization of assembly feature, Examples of Assembly feature, Overview of procedure to extract assembly features from CAD model of Assembly, Description of steps in the assembly feature extraction procedure, Examples of assembly feature extraction: Aircraft wing and automotive chassis assembly.	
Term Work/Practical's:		
	1. Introduction to DFMA	
	2. Sand casting and Powder metallurgy	
	3. CAD	
Assignments:		
	1. Design for Machining	
	2. Metal Extrusion and Forging	
	3. Design for Assembly	
Text Books/Reference Books:		
1	A.K. Chitale and R.C. Gupta, (1999) Product design and Manufacturing, Prentice Hall of India, New Delhi.	
2	J. Lesko, (1999) Industrial Design, Materials and Manufacture Guide, John Willy and Sons, Inc	
3	George E. Dieter and Linda C. Schmidt (2009), Engineering Design, Fourth edition, McGraw-Hill companies, New York, USA	
4	Geoffrey Boothroyd, Peter Dewhurst and Winston Knight (2002) Product Design for Manufacture and Assembly, Second Edition, CRC press, Taylor & Francis, Florida, USA	
5	O. Molloy, S. Tilley and E.A. Warman (1998) Design for Manufacturing and assembly, First Edition, Chapman &Hall, London, UK.	
6	D. E. Whitney, (2004) Mechanical Assemblies: Their Design, Manufacture, and Role in Product Development, Oxford University Press, New York	
7	A.K. Chitale and R.C. Gupta, (1999) Product design and Manufacturing, Prentice Hall of India, New Delhi.	
8	James G. Bralla (1998) Design for Manufacturability Handbook, Second Edition, McGraw-Hill companies, New York, USA	
9	Geoffrey Boothroyd (2005) AssemblyAutomation and Product Design, Second Edition, CRC press, Taylor & Francis, Florida, USA	
10	G. Q. Huang (1996) Design for X, Concurrent Engineering Imperatives, First Edition, Chapman &Hall, London, UK A joint venture by IISc and IITs, funded by MHRD, Govt of India	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

Subject : ELECTIVE I NON TRADITIONAL MANUFACTURING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks	01 Credit
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Conventional manufacturing Processes	
2.	Engineering materials and its properties	
3.	Basics of electrical, thermal and chemical energy.	
Course Objectives:		
	To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications	
Course Outcomes:		
Students will be able to understand		
1.	Appreciate use of nonconventional machining methods	
2.	The working principles and working parameters of mechanical processes.	
3.	Electrochemical and electro chemical grinding processes.	
4.	Various techniques in chemical machining process	
5.	Terminology used in (EDM) nontraditional manufacturing industries.	
6.	Various techniques in laser beam machining.	
UNIT - I	INTRODUCTION: Non Traditional machining, Definitions of various processes. Classification of NCMP, Historical background of New - Technological processes.	(06 Hours)

UNIT - II	MECHANICAL PROCESSES: Processes principles, equipment process Parameters and applications. Examples of Abrasive jet machining, Ultrasonic machining, Abrasive flow machining, water jet machining, magnetic abrasive machining. Evaluation of material removal rate (MRR) in AJM	(06 Hours)
UNIT - III	ELECTRO CHEMICAL MACHINING (ECM): Background of ECM process, Classification of ECM processes introduction to ECD fundamental principles of ECM. Electrochemistry of ECM, Equipment required in ECM. Process capabilities processes parameters and application examples. Trouble shootings. Evaluation of MRR of pure metal in ECM. ELECTRO CHEMICAL GRINDING: Process principles, process parameters, Applications.	(08 Hours)
UNIT - IV	CHEMICAL MACHINING: Introduction, Fundamental principles, process parameters, classification and Selection of etchant resistant materials, Photo chemical machining	(04 Hours)
UNIT - V	ELECTRICAL DISCHARGE MACHINING (EDM): Fundamental principle of EDM, Equipments required for EDM process Parameters, process capabilities. Application example trouble shooting, Introduction to wire EDM, Process principle and parameters, process Capacities and its applications.	(06 Hours)
UNIT - VI	LASER BEAM MACHINING (LBM): Introduction, Background of laser action, production of photon cascade in solid optical laser. Machining applications of laser wire drilling, cutting, marking, welding, heat treating, cladding. Introduction and process principle of thermal energy method, EBM. PLASMA ARC CUTTING (PAC): Process principles, equipment, applications, and examples	(08 Hours)
Term Work/Practical's: List of Practical (Any Eight)		
1) study and demonstration of ECM		
2) Study and demonstration on EDM		
3) study and demonstration of ECDM		

4) study and demonstration of ECM with ultrasonic vibrations	
Assignments: - Six assignments based on above syllabus	
Text Books/Reference Books:	
1	Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi, 2007
2	Benedict. G.F. “Nontraditional Manufacturing Processes” Marcel Dekker Inc., New York (1987).
3	Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi (2007).
4	Mc Geough, “Advanced Methods of Machining” Chapman and Hall, London (1998).
5	Paul De Garmo, J.T.Black, and Ronald.A.Kohser, “Material and Processes in Manufacturing” Prentice Hall of India Pvt. Ltd., New Delhi ,8th Edition, 2001.
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

PRODUCTION ENGINEERING SYLLABUS AND STRUCTURE

B. Tech (Production) Syllabus Structure

PRODUCTION ENGINEERING- SEM-VII

S. N	Course Code	Course Title	Scheme of Teaching Contact Hrs/week			Examination Scheme-Marks							Total Credit				
			L	T	P	End Sem Exam	Continuous Assessment			TW	TW/OR	TW/Pr	Total	TH	T	Pr	Total
							UT	Att	Ass								
1.		Operations Research	3	-	-	60	20	10	10	-	-	-	100	3	-	-	3
2.		Machine Tool Design	3	-	2	60	20	10	10		50	-	150	3		1	4
3.		Mechatronics and Automation	3	-	2	60	20	10	10		50	-	150	3		1	4
4.		Elective II	3	-	-	60	20	10	10		-	-	100	3		-	3
5.		Total Quality Management	3			60	20	10	10				100	3	0	0	3
6.		Computer Aided Manufacturing	-	-	2	-	-	-	-		50	-	50	-		1	1
7.		Inplant Training	-	-	-	-	-	-	-	-	50	-	50	-		3	3
8.		Project Stage I	-	-	2	-	-	-	-	-	50	-	50	-		4	4
		Total	15	0	8	300	100	50	50	0	250	0	750	15	0	10	25

List of Elective II

1. Powder Metallurgy
2. Materials Management
3. Manufacturing system and simulation

PRODUCTION ENGINEERING SYLLABUS AND STRUCTURE

B. Tech (Production) Syllabus Structure

PRODUCTION ENGINEERING- SEM-VIII

S. N	Course Code	Course Title	Scheme of Teaching Contact Hrs/week			Examination Scheme-Marks							Total Credit				
			L	T	P	End Sem Exam	Continuous Assessment			TW	TW/OR	TW/Pr	Total	TH	T	Pr	Total
							UT	Att	Ass								
1.		Process Planning and Tool Design	3	-	2	60	20	10	10	-	50	-	150	3		1	4
2.		Industrial Robotics	3	-	2	60	20	10	10	-	50	-	150	3		1	4
3.		Financial management and Cost Control	3	1		60	20	10	10	-		-	100	3	1		4
4.		Elective III	3	-	2	60	20	10	10	-	50	-	150	3		1	4
5.		Computer Aided Engineering	-	-	2	-	-	-	-		50	-	50	-		1	1
6.		Project Stage II	-	-	4	-	-	-	-	-	150	-	150	-		8	8
		Total	12	1	12	240	80	40	40	0	350	0	750	12	1	12	25
		Environmental Studies	3			100							100	3			3

List of Elective II

1. Human Resource Management
2. Manufacturing of Composite Material
3. Design and Analysis of Experiments
4. Finite Element Analysis
5. Computer Integrated Manufacturing
6. Knowledge Based Systems

B Tech Prod
SEM VII

OPERATIONS RESEARCH		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: --	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	--
Tutorial : --		03 Credits
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Mathematics.	
2.	Basic knowledge of inventory control.	
3.	Basic knowledge of project management.	
Course Objectives:		
The student should understand and apply the correct operation research model Engineering Problems to satisfy the objective function.		
Course Outcomes:		
Students will be able to		
1.	Identify and develop operational research models from the verbal description of the real system and solve optimization problems using linear programming.	
2.	Use the acquired knowledge to design a transportation and assignment model.	
3.	Use the acquired knowledge to select and apply the proper inventory control system for industry.	
4.	Apply the correct sequence for sequencing problems as well as identify the queuing system and analyze it from the given data.	
5.	Use the acquired knowledge to decide the replacement policy and solve the game theory problems for different cases.	
6.	Use the network technique (PERT/CPM) to find the project costing and its duration.	
UNIT-I	Introduction to Operation Research and Linear Programming: Basics definition, scope, objectives, phases, models, advantages, limitations and applications of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Big-M method, duality in linear programming problem.	(06 Hours)
UNIT-II	Transportation and Assignment Models: Transportation: Formulation, Finding initial basic feasible solution by different methods, Optimality test: MODI method, unbalanced Transportation problem. Assignment: Formulation, Hungarian method for optimal solution. Solving unbalanced problem, restrictions on assignments and Traveling salesman problem.	(06 Hours)
UNIT-III	Inventory Control:	(06 Hours)

	<p>Introduction to inventory, cost associated with inventory, stock out inventory models, probabilistic models, price-break models, inventory models under uncertainty and risk. Methods of selective inventory control.</p> <p>Introduction, application, Different problems solved by dynamic programming,</p>	
UNIT-IV	<p>Sequencing and Queuing Models:</p> <p>Sequencing models: Solution of Sequencing Problem – Processing n Jobs through 2 Machines, Processing n Jobs through 3 Machines, Processing 2 Jobs through m machines, Processing n Jobs through m Machines.</p> <p>Queuing Models: Operating characteristics, Poisson single and multi-channel queuing system (M/M/1): (∞/∞/FCFS), (M/M/1): (∞/∞/SIRO), (M/M/1): (N/∞/FCFS), (M/M/c): (N/∞/FCFS)</p>	(06 Hours)
UNIT-V	<p>Replacement models and Games Theory:</p> <p>Replacement models: Replacement of capital equipment that deteriorates with time, Time value of money. Cases in which time value of money remains same and changes with constant rates during period. Group and individual replacement.</p> <p>Games Theory: Introduction, Two -person zero sum game, Minimax and Maximin principle, Saddle point, Methods for solving game problems with mixed strategies.</p>	(06 Hours)
UNIT-VI	<p>Network Modelling:</p> <p>Fundamentals of CPM and PERT networks, CPM: Construction of networks, Critical paths, Forward and backward pass, Floats and their significance, crashing for optimum and/or minimum duration and the cost, PERT: Time estimates, Construction of networks, Probability of completing projects by given date.</p>	(06 Hours)
Term work: NA		
<p>Assignments:</p> <ol style="list-style-type: none"> 1. Assignment on formulation of LPP and its solution. 2. Assignment on formulation of transportation problem. 3. Assignment on Assignment model. 4. Assignment on inventory control. 5. Assignment on price break models. 6. Assignment on Sequencing models. 7. Assignment on queuing models. 8. Assignment on replacement models. 9. Assignment on game theory. 10. Assignment on calculation of the total cost and duration of the project. <p>The typical softwares are to be used for any of the 3 assignments.</p>		

Text Books / References

- Sharma S.D., "Operations Research", Kedarnath Ramnath and company publications.
- Gupta P.K., Hira D.S., "Operations Research", S Chand and Co. Ltd., New Delhi.
- Taha H.A., "Operations Research - An introduction", Prentice Hall Pvt. Ltd.
- J. K Sharma., "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
- Panneerselvam R., "Operations Research", Prentice Hall of India Ltd., New Delhi.
- N. D. Vora, "Quantitative Techniques and Management", Tata McGraw-Hill Education.
- Kanthi Swarup and others, "Operation Research", S Chand and Co. Ltd.
- Basu S.K., Pal D.K., and Bagchi H., "Operations Research for Engineers", Oxford and IBH Publishing Co. Pvt. Ltd.,

Syllabus for Unit Test

Unit Test 1	Units I , II and III
Unit Test 2	Units IV, V and VI

MACHINE TOOL DESIGN		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Practical: 02 Hrs / Week	TW/OR : 50 Marks	01 Credits
Course Pre-requisites:		
1. Basic knowledge of conventional and non conventional Machines.		
2. Knowledge of material science.		
3. Knowledge of Strength of Material.		
Course Objectives:		
The students should be able to understand the design methodology of machine tools.		
Course Outcomes:		
Students will be able to		
1.	Understand the fundamentals of machine tool design.	
2.	Select the type of gear box for applications in machine tool and design the sliding cluster gear box.	
3.	Understand the design considerations for machine tool structures.	
4.	Select the guideways and design the power screws.	
5.	Select the spindle bearings	
6.	Design cams for single spindle automate.	
UNIT-I	Introductions to Machine Tools General Principles of Machine Tool Design: Working and Auxiliary Motions in Machine Tools. Parameters Defining Working Motions of a Machine Tool. Techno-Economical Prerequisites for Undertaking the Design of New Machine Tool. General Requirements of Machine Tool Design. Engineering Design Process Applied to Machine Tools. Layout of Machine Tools, Modular Concept of Machine tool design.	(06 Hrs)
UNIT-II	Drives: Design considerations for drives based on continuous and intermittent requirement of power, Types and selection of motor for the drive, Regulation and range of speed based on preferred number series, geometric progression. Design of speed gear box for spindle drive and feed	(06 Hrs)

	gear box. Stepless drives: Design considerations of Stepless drives, electromechanical system of regulation, friction, and Kopp variators, Toroidal and Reeves Mechanisms , PIV drive, Epicyclic drive, principle of self locking, VFD and VVFD drives-Design Considerations.	
UNIT-III	Design of Machine Tool Structures: Functions of Machine Tool Structures and their requirements – Design criteria for machine tool structures – Materials of machines Tools structures – Static and Dynamic stiffness – Profiles of machine tool structures – Basic Design procedure of machine tool structures Analysis of forces on machine tool structure, static & dynamic stiffness. Design of beds, columns, housings, bases and tables.	(06 Hrs)
UNIT-IV	Design of Guideways & Power Screws : Functions & types of guideways, design criteria & calculation for sideways, design of hydrodynamic ,hydrostatic and aerostatic slideways , Design of Anti-Friction Guideways – Combination Guideways –Protecting devices for slideways Stick-Slip motion in slideways. Design of power screws: Distribution of load & rigidity analysis.	(06 Hrs)
UNIT-V	Design of Spindles and Spindle Supports: Functions of Spindle Unit and requirements – Materials of Spindles – Effect of machine tool compliance on machining accuracy- Design calculations of spindles– Anti friction bearing – Sliding bearings. Preloading of bearings. Bearings selection for machine tools.	(06 Hrs)
UNIT-VI	Automatic Drives for Machine tools: Principles of automation. Automatic lathes with mechanical control.Design of cams for automatic screw cutting machines.Automatic loading and feeding of workpieces. Transfer devices in automatic machine tool systems. Modular design and unit heads for machine tools. Automatic in-process gauging.	(06 Hrs)
	Term work: Term work shall consist of record of assignments on following topics. 1. Design and working drawing of speed gear box 2. Design and working drawing of feed gear box 3. Study of stepless drives 4. Design of bed or column. 5. Design for spindle or power screw. 6. Design for guide ways and sideways. 7. Internet assignment based on any one of the topics above.	
	Assignments 1. Assignment on Introductions to Machine Tools	

<ol style="list-style-type: none"> 2. Assignment on Drives. 3. Assignment on Design of Machine Tool Structures. 4. Assignment on Design of Guideways & Power Screws 5. Assignment on Design of Spindles and Spindle Supports. 6. Assignment on Automatic Drives for Machine tools. 					
<p>Text Books:</p> <ol style="list-style-type: none"> 1. N. K. Mehta, "Machine Tool Design", Tata McGraw Hill, ISBN 0-07-451775-9. 2. A. Bhattacharya and S. G. Sen., "Principles of Machine Tool", New central book agency Calcutta, ISBN 81-7381-1555. 3. D. K Pal, S. K. Basu, "Design of Machine Tool", 4th Edition. Oxford IBH 2005, ISBN 81-204-0968. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. N. S. Acherkan, "Machine Tool", Vol. I, II, III and IV, MIR publications. 2. F. Koenigsberger, "Design Principles of Metal Cutting Machine Tools", The Macmillan Company New York 1964. 					
<p>Syllabus for Unit Test</p> <table border="1"> <tr> <td>Unit Test 1</td> <td>Units I , II and III</td> </tr> <tr> <td>Unit Test 2</td> <td>Units IV, V ,VI</td> </tr> </table>	Unit Test 1	Units I , II and III	Unit Test 2	Units IV, V ,VI	
Unit Test 1	Units I , II and III				
Unit Test 2	Units IV, V ,VI				

MECHATRONICS & MANUFACTURING AUTOMATION		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks	01 Credits
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/OR: 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Mechatronics systems.	
2.	Basic knowledge of sensors and system response.	
3.	Basic knowledge of automation.	
Course Objectives:		
The student should understand the scope, objective and application of finite element analysis.		
Course Outcomes:		
Students will be able to understand		
1.	Identify the suitable sensor and actuator for a Mechatronics system	
2.	Develop the skill required for interfacing the electromechanical system.	
3.	Illustrate basic aspects of design and development of a Mechatronics system	
4.	Apply automation techniques to manufacturing set-ups.	
5.	Design and develop pneumatic and hydraulic control circuits of medium complexity.	
6.	Illustrate the use of PLC in control systems and Model the system and check the stability of a mechanical system.	
UNIT-I	Introduction to Mechatronics and Measurement Systems: Introduction, concepts of Mechatronics, Principles, Objectives and applications. Elements of Mechatronics System. Sensors: Position and speed Measurement: Proximity sensors and Switches, Potentiometer, LVDT, Digital optical Encoder. Stress and Strain Measurement: Electrical Resistance Strain Gauge, Measuring Resistance Changes With a Wheatstone Bridge, Measuring Different States of Stress With Strain Gauges, Force Measurement With Load Cells Temperature Measurement: Liquid –in Glass Thermometer, Bimetallic Strip, Electrical Resistance Thermometer, and Thermocouple. Vibration and Acceleration Measurement: Piezoelectric Acceleration, Pressure and Flow Measurement, Semiconductor Sensors & Microelectromechanical Devices.	(06 Hrs)
UNIT-II	System Response: Introduction, Amplitude linearity, Fourier Series representation of signals, Bandwidth and Frequency response, Phase linearity, Distortion of signals , Dynamic characteristics of systems, Zero order system, First order system:- Experimental testing of a first order system. Second order system, step response of a second order system, frequency response of a system, System modeling and analogies.	(06 Hrs)
UNIT-III	Signal Conditioning:	(06 Hrs)

	Introduction, The operational amplifier, Filtering, Wheatstone bridge, Digital signals, Multiplexers, Data acquisition, Digital signal processing, and Pulse modulation. Data Acquisition: Introduction, Quantizing theory, Analog to Digital conversion, Digital to Analog conversion, Virtual Instrumentation, Data acquisition and control.	
UNIT-IV	Basics of Automation: Definition, Automation in Production systems, Basic elements of automated systems, Types of Automation, Need, Advantage And Disadvantages of automation, Levels of Automation. Special purpose machine, High speed machines.	(06 Hrs)
UNIT-V	High Volume Manufacturing System: Transfer lines, Material handling systems, Manufacturing cell, Group technology, Cellular manufacturing, Flexible manufacturing systems, Automated quality control and inspection systems, Automated assembly systems and line balancing, Automated flow lines and its technology.	(06 Hrs)
UNIT-VI	Programmable Automation And Control Systems: Programmable logic controller, Ladder diagram, Microprocessor, PIC 16F84 OR 8085 Microprocessor, Logic gates and control, Electrical drives, Thermal relays, PID, Industrial control devices, Computer based industrial controls.	(06 Hrs)
<p>Term work: List of Experiments: (Any Five)</p> <ul style="list-style-type: none"> • Study of Switches and relays. • Study and experiment of different types of sensors. • Study and experiment of ADC and DAC. • Study and experiment of PLC • Study and experiment of 8085 Microprocessor • Study and experiment of PID. 		
<p>Assignments:</p> <ul style="list-style-type: none"> • Different types of Sensors and Transducers. • Assignment on system response of mechatronics systems. • Assignment on signal conditioning and data acquisition. • Basics of automation. • High volume automation. • PLC, PID, 8085 Microprocessor. • Industrial Visit. 		
<p>Oral/Practical Term work and oral will be based on above syllabus. Text Books / References</p> <ul style="list-style-type: none"> • Vickers manual on hydraulics. 		

- W. Bolten, "Mechatronics Electronics Control system in Mechanical and electrical Engineering", Person Education (Singapore) Pvt. Ltd. ISBN 81-7808-339-6
- "HMT Mechatronics", HMT ISBN- 0-07-462147-5
- Ramesh Gaonkar, "Microprocessor", Penram International Publication Pvt. Ltd. ISBN 81-900-828-7-6
- David G.Alcitore, B.H. Histon, "Introduction to mechatronics and measurement systems", Tata McGraw Hill, ISBN-0-07-052910-8
- Peter Rohne, "Industrial hydraulic control".
- Werner Deppert and Kurt Stol, "Mechanization by Pneumatic Control", Vol-1, Vol-2.
- Mikell P. Groover; "Automation, Production systems, and computer integrated Manufacturing", Prentice Hall.

Syllabus for Unit Test

Unit Test 1	Units I, II and III
Unit Test 2	Units IV, V ,VI

Elective II: Powder Metallurgy		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: N A	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of conventional manufacturing processes.	
2.	Knowledge of material science.	
3.	Knowledge of engineering Metallurgy.	
Course Objectives:		
	Student will understand the concepts of Powder Metallurgy and also able to understand Manufacturing of components by Powder metallurgy.	
Course Outcomes:		
Students will be able to understand		
1.	To select the manufacturing of metal powders by different methods .	
2.	To select proper process and understand characteristics of Metal powder .	
3.	To select different methods of compacting of metal powders .	
4.	To select various design of dies for compacting of metal powders.	
5.	Mechanism of Sintering .	
6.	To select advance processes and understand its defects and remedies in powder metallurgy.	
UNIT - I	Fundamentals of Metal Powder productions : Introduction of Powder Metallurgy processes. Advantages and limitations of processes, production of metal powder by Machining, milling, atomization, electrodeposition, reduction from oxide, carbonyl process, production of alloy powders, New development etc..	(06 Hours)
UNIT - II	Characteristics of metal powder: Particle size, shape and size distribution, Characteristics of powder mass such as apparent density, tap density, flow rate, friction conditions. Properties of green compact and sintered compact; Powder conditioning, Mixing and blending, processes details.	(06 Hours)
UNIT - III	Fundamentals of powder compaction; Types of compaction presses, compaction tooling and role of lubricants, Single and double die compaction, isostatic pressing,	(06 Hours)

	hot pressing, Powder rolling, powder forging, powder extrusion and explosive forming technique, pressure less compacting .	
UNIT - IV	Design of Press Tools in compacting: General classification and components of press tools, types of dies simple, compound, combination dies, various press working operations. Design and calculations for above press working dies. Extrusion ratio of force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants, hot dies for compacting. Tooling materials	(06 Hours)
UNIT - V	Sintering Definition, Theories of sintering: Sintering mechanism, Roll of diffusion, Recrystallization, Pore-growth and coalescence. Liquid phase sintering and related processes. Effect of compacting pressure, sintering temperature and time on sintered properties stages, effect of variables, sintering atmospheres and furnaces, infiltration process.	(06 Hours)
UNIT - VI	Production Methods for typical components : Study of sintered bearings, cutting tools, and metallic filters, Study of friction and antifriction parts and electrical contact materials, hard metals, refractory metals, magnetic materials, structural parts, dispersion strengthened materials.	(06 Hours)
Assignments:		
1. Write the production of metal powder by carbonyl processes in details , Write the production of metal powder by Electrolysis method.		
2. Write different methods for measurement of particle size ,shape and size distributions.		
3. Explain in details advantages of Isostatic compacting , Slip casting ,and powder rolling .		
4. Design tooling system for powder compacting for given shape of components.		
5. Give the sintering temperatures and atmospheres used for different metallic components.		
6. Write complete Flow chart of productions of few components by powder metallurgy, such as Tungsten carbide tools. Clutch, etc.		
Text Books/Reference Books:		
1	Gopal S. Upadhayay. Powder Metallurgy “ Science ,Technology and Materials” -University press	
2	P. N. Rao, Manufacturing Technology, Tata McGraw Hill	
3	Powder Metallurgy ASM Metal hand book Vol: 7	
4	A K Shinna Powder Metallurgy ; Dhanpatrai Publications	

5	Gopal S. Upadhayay. Cemented Tungsten carbide Production, properties and testing- University press	
Syllabus for Unit Test:		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

Elective II: Materials Management		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: --	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	--
Tutorial : --		03 Credit
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of management	
2.	Basic knowledge of purchasing	
3.	Basic understanding for stores operations	
Course Objectives:		
The students should be able to apply different materials management techniques for the maximization of the profit and minimization of the production cost.		
Course Outcomes:		
Students will be able to		
1.	Understand various types of values and value analysis techniques.	
2.	Use the proper inventory control system for the industry	
3.	Take correct decision for make or buy for a situation.	
4.	Understand the various techniques of logistic management	
5.	Understand the various warehousing techniques	
6.	Understand and apply import export substitutions in given situation	
UNIT-I	Introduction to Materials Management Functions of Materials Management – Sourcing/Procurement, Inventory, Stores, Vendor Development, value analysis and value engineering. Classification and Costs of Inventories: Types, Objective of holding inventories, Different types of Inventories, Costs Associated with Inventory - Carrying cost, Procurement cost. EOQ - Concept, Assumptions of EOQ Model, Practical Constraints – Numerical Analysis, Quantity Discounts. EMQ Model - Carrying cost, Set up cost. EOQ Special Considerations – Spares, Bought-outs, etc. Organization of Materials Management Function	(06 Hours)
UNIT-II	Replenishment Systems and Inventory Management A. Replenishment Systems: Introduction, Concept of lead time and its effects on Inventory, Components of Lead Time - Internal and External. Variability in demand and lead time. Safety Stock Evaluation and ways to minimize lead time, Different types of replenishment systems like Fixed order quantity system, Fixed order interval system, Combination of fixed order interval and quantity system, Two Bin System. Forecasting - Methods of forecasting - Moving Average Method, Regression Analysis, Exponential Smoothing Method	(06 Hours)

	B. Probabilistic Replenishment System. Selective Inventory Control - VED analysis, HML analysis, SDE analysis, SOS analysis, FSN analysis, GOLF analysis.	
UNIT-III	<p>Procurement Management</p> <p>A. Procurement Management: Responsibilities of Purchase Department. Procurement Procedure, Documents in Procurement, Types of Buying, Methods of Buying, Legal Aspects of Buying, Vendor Selection, Vendor Development, Vendor Rating.</p> <p>B. Documentation – Bin Cards, Stores Ledger, Goods Receipt Note, Material Requisition, Purchase Order – Format, Terms & Conditions. Documentation in Imports</p>	(06 Hours)
UNIT-IV	<p>Logistics Management</p> <p>A. Definition, Logistics Function: Transportation – Significance, Modes of Transportation, Warehousing – Objectives, Warehousing Functions, Types of Warehouses, Inventory Management, Order Processing – Role of IT, Material Handling Transportation: Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages & Disadvantages, Concept of TL, LTL, FTL. Selections of Appropriate Modes of Transportation B. Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages & Disadvantages</p>	(06 Hours)
UNIT-V	<p>Stores Management and Warehouse Management</p> <p>A. Warehouse Management: Concept of SKUs, Warehousing Principles & Best Practices in Receiving, Shipping, Order Picking, Storage & Put away, Warehouse Activity Profiling, Warehouse Layout Planning. Stores Management: Functions of Stores, Stores Procedure – Documentation. Need of physical stock taking, method of stock taking like annual, continuous, reorder point stock taking, Inventory records. Surplus and Obsolete stocks: Introduction, Genesis of surplus materials. Disposal of surplus and obsolete materials</p> <p>B. Stores Documentation – Bin Cards, Stores Ledger. WMS Systems in Practice</p>	(06 Hours)
UNIT-VI	<p>Import Export and supply chain management:</p> <p>Factors affecting National and International markets, Import procedure and documents, current EXIM policies, import substitution, E-procurement.</p> <p>Supply chain management:</p> <p>Basic concepts of SCM, design considerations, role of safety inventory, planning and managing inventories, order processing, economic considerations.</p>	(06 Hours)
Term work: NA		
<p>Assignments:</p> <ol style="list-style-type: none"> 1. Assignment on materials management 2. Assignment on replenishment systems 3. Assignment on inventory control 4. Assignment on procurement and documentation 5. Assignment on logistic management 		

<ol style="list-style-type: none"> 6. Assignment on material handling 7. Assignment on stores management 8. Assignment on warehouse management 9. Assignment on import exports 10. Assignment on supply chain management <p>Students are required to present case studies on any two topics.</p>					
<p>Text Books / References</p> <ol style="list-style-type: none"> 1. K S Mennon, "Purchasing management and inventory control", Wheeler Publication, ISBN 81-85814-10-4. 2. P Gopal Krishnan, "Purchasing and materials management", Tata McGraw-Hill Education. 3. L. D. Miles, "Techniques of Value Analysis and Engineering", Tata McGraw-Hill. 4. L.C. Jhamb, "Inventory management", Everest Publishing House. 5. Tony Arnold, "Materials Management", Pearson Publication. 6. L. Lee, D. Dobler, "Purchasing and Material Management", McGraw-Hill. 					
<p>Syllabus for Unit Test</p> <table border="1"> <tr> <td>Unit Test 1</td> <td>Units I , II and III</td> </tr> <tr> <td>Unit Test 2</td> <td>Units IV, V and VI</td> </tr> </table>	Unit Test 1	Units I , II and III	Unit Test 2	Units IV, V and VI	
Unit Test 1	Units I , II and III				
Unit Test 2	Units IV, V and VI				

Elective II: MANUFACTURING SYSTEM AND SIMULATION		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Manufacturing System.	
2.	Basic knowledge of advance manufacturing system .	
3.	Basic knowledge of Simulation.	
Course Objectives:		
The student should understand the scope, objective and application of modeling, simulation and analysis of advanced manufacturing systems.		
Course Outcomes:		
Students will be able to understand		
1.	The basics of manufacturing system.	
2.	Discuss the information system about manufacturing machine tools.	
3.	The modeling and analysis of manufacturing system.	
4.	Describe the continuous path of simulation process.	
5.	The simulation and programming languages.	
6.	Develop the simulation process in industry.	
UNIT-I	Manufacturing Systems: Definition of systems, basic concepts and problems concerning systems. Systems design: Decision making procedures, Structural, Transformational and procedural aspects of manufacturing, Modes of production. Process systems for manufacturing, logistic systems, material flow & technological information flow. Management and information systems for manufacturing: Managerial information flow in manufacturing systems.	(06 Hrs)
UNIT-II	Information Systems: Fundamentals of information technology, information systems, information networking, and parts oriented production information systems, and computerized production scheduling, online production control systems. Computer based production management systems. Automation systems for manufacturing: Industrial automation, kinds of automation, principles of CIM, effectiveness of CIM, factory automation, automatic machine tools for mass production, NC machine tools, and computer controlled manufacturing systems, FMS, automated assembly, automatic material handling, automatic inspection and testing, computer integrated automation systems unmanned factory.	(06 Hrs)
UNIT-III	System Models: Concepts, continuous and discrete systems, systems modeling, type of models, subsystems, corporate model, and system study. System	(06 Hrs)

	simulation, Techniques, comparison of simulation and analytical methods, types of simulation, distributed log model, cobweb models.	
UNIT-IV	Continuous System Simulation: Numerical solution of differential equation, analog computers, hybrid computers, continuous system simulation languages CSMP, system dynamic growth models, logistic curves. Discrete systems simulation: Events generation of arrival patterns, simulation programming tasks, analysis of simulation output. Queuing theory: Arrival pattern distribution, service times, queuing disciplines, and measure of queues.	(06 Hrs)
UNIT-V	GPSS and SIMSCRIPT: General description of GPSS and SIMSCRIPT, programming in GPSS Simulation Programming Techniques: Data structures, implementation of activities, event and queues, event scanning, simulation algorithms in GPSS and SIMSCRIPT.	(06 Hrs)
UNIT-VI	Application of Simulation: Flow shop system, Job shop system, M/M/1 Queues with infinite and finite capacities, Simple fixed inventory system, Output data analysis, steady state analysis, Building of simulation validation.	(06 Hrs)

Assignments:

- Basic concepts of manufacturing system.
- Advanced manufacturing system.
- Modeling and simulation of any manufacturing system.
- Assignment on continuous simulation process used in manufacturing system.
- GPSS and SIMSCRIPT programming techniques.
- Application of simulation in automated industry.
- Industrial visit

Text Books / References

- David Bedworth & James Bailey, Integrated production control system management, analysis & design, 2nd ed., John Wiley & Sons Ltd.
- Katsundo Hitomi, Manufacturing System Engineering.
- Y Narahari and N Vishwanadhan, Performance Modeling and Automated Manufacturing System, Prentice hall India 1994.
- Stanley B Gershwin, Manufacturing Systems, Engineering PHI latest Edition.
- Ronald Zskin & Charles Standridge, Modeling and Analysis of Manufacturing Systems, John Wiley & Sons Ltd.
- Geofery Gordan, Systems Simulation, Prentice Hall, 1980.
- Deo. N., System Simulation with Digital Computers, Prentice Hall, 1980.

Syllabus for Unit Test

Unit Test 1	Units I , II and III
Unit Test 2	Units IV, V ,VI

TOTAL QUALITY MANAGEMENT		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits *
	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basics of Quality Control	
2.	Basics of Measurements and measuring Instruments	
3.	Knowledge of Statistics.	
Course Objectives:		
To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management and to understand the statistical approach for quality control.		
Course Outcomes:		
1.	Implement the principles of total quality management.	
2.	Apply six sigma concepts and increase the quality of product.	
3.	Make use of Advanced Techniques	
4.	They will be able to implement TQM Tools.	
5.	Execute Quality standards in companies	
6.	Make use of Advanced Techniques of Total Quality Management like Design of experiments, Failure mode effect analysis, Taguchi method Taguchi's quality engineering	
UNIT-I	Quality & Total Quality Management: Quality, New philosophy of quality, Product quality, & its prospects. Overview of TQM: Concept & definition, Fundamentals, Principles of TQM, Elements of TQM, Approaches of TQM, Models of TQM, Zero defect concept, Benefits of TQM.	(06 Hrs)
UNIT-II	Quality Assurance: Basic concepts, Quality assurance input – process – output. Significance of feedback for Quality assurance, Process capability analysis, Concept of Six Sigma. Internal customer approach, Customer – Satisfaction, data collection & complaint, Redressal mechanism.	(06 Hrs)
UNIT-III	TQM PRINCIPLES:	(06 Hrs)

	Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure, Just – in- Time.	
UNIT-IV	TQM TOOLS Benchmarking - Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA.	(06 Hrs)
UNIT-V	Quality Systems : Policy & objectives, Quality standards, Concept of quality system standards, Relevance & origin of ISO 9000–2000 standard & certification, Benefits. Elements of ISO 9001, 9002, 9003 series–Clauses, contents, interpretations & implementation. TS - 16949, QS-9000, ISO 14000, OHSAS	(06 Hrs)
UNIT-VI	Advanced Techniques of Total Quality Management: Design of experiments, Failure mode effect analysis, Taguchi method Taguchi's quality engineering –Loss function, orthogonal arrays, Signal to noise ratio, parameter design & tolerance design.Total Quality in service sector. S. S. Technique, Kaizen.	(06 Hrs)
Term work:	Detail Study and Presentations on Above topics to be submitted.	
Assignments		
	<ol style="list-style-type: none"> 1. Assignment on TQM 2. Assignment on Six sigma concept. 3. Assignment on TQM principles. 4. Assignment on TQM tools. 5. Assignment on Quality Systems 6. Assignment on Advanced Techniques of Total Quality Management 	

Text Books/ References

1. Sundar Raju, "Total Quality Management", Tata McGraw Hills.
2. M. Zairi, "Total Quality Management for Engineers", Aditya Books.
3. ISO 9000 Quality System", Dalela & Saurabh, Standard Publishers.
4. R.C. Gupta, "Statistical Quality Control".
5. Grant E. L. & R. Leavenworth, "Statistical Quality Control", Tata McGraw Hills
6. Tapan Bagchi, "Taguchi Methods Management", Pearson Education.
7. Feigenban, "Total Quality Control", Tata McGraw Hills.
8. Total Quality Management Handbook, J. K. Hradeskym, Tata McGraw Hills.

Syllabus for Unit Test

Unit Test 1	Units I , II and III
Unit Test 2	Units IV, V ,VI

Computer Aided Manufacturing		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory:	End Semester Examination: Nil	
Practical: -- 02 Hrs/Week	Internal evaluation: NIL Assignments : Nil Unit Test : NIL	01 Credit
Tutorial : --	TW/OR – 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of mechanical drawing	
2.	Knowledge of various symbols of dimensioning and tolerancing	
3.	Basic knowledge of process planning and programming	
Course Objectives:		
To provide proper interfacing between theoretical aspects and the practical aspects of computer aided manufacturing.		
Course Outcomes:		
Students will be able to		
1.	Students will describe basic concepts of CAM application and understand CAM wheel	
2.	Students will prepare CNC programs for manufacturing of different geometries on milling and lathe machines.	
3.	Students will classify different components using different techniques of group technology	
4.	Students will select layouts of FMS for industrial applications	
5.	Students will classify different components using different techniques of group technology	
6.	Students will prepare Process planning for different components	
Term Work		
	1. Cim Model For Any Industry: Term work assignment based on background theory of CIM System, actual visit to any industry to see and study the different aspects of CIM system	
	2. Simulation on CNC lathe and CNC mill enabling the learning of following points, 1. Simulation on CNC lathe -Description of codes, Description of codes, Directives, programs covering basics operations 2. Simulation on CNC Mill- Description of M codes, Description of codes, Directives, programs covering basics operations, Liner Interpolation, Circular Interpolation	
	3. Manual part programming on CNC lathe, milling And drilling enabling learning of a) NC technology, CNC components, Part programming techniques, Manual part programming technique, Interpretation of codes, Usage of codes, Formulation of part program, Compete sketch with Dimensions b) Execution of complete part program on CNC machine.	

	<p>4. Study and demonstration on robots:</p> <p>a. Term work assignment based on Introduction to Cybernetics, Robot Anatomy, Joints and Links, Common Robot configurations, Drive System, End Effectors, Types of sensors, Robot Economics, Robot applications in manufacturing</p> <p>b. Robot programming – actual execution of the programme on the robot</p>	
	<p>5. Computer aided process planning:</p> <p>a. Term work assignment based on Traditional Process plan, Introduction to Computer Aided Process Plan (CAPP), Types of CAPP, Algorithm for process planning software.</p> <p>b. One recent paper or Case Study of CAPP.</p>	
	<p>6. Exercise on group technology, part coding enabling learning of</p> <p>Introduction to GT, Concept of Part Family, Methods of grouping part into part family, Parts classification and Coding, Opitz classification and coding system, Two Examples on FORM code.</p>	
	<p>7. Computer aided quality control:</p> <p>a. Term work assignment based on Quality control, Concept of 100% inspection, Automated Inspection principles and methods, On Line inspection system, Off Line Inspection System.</p> <p>b. Actual measurement of any standard component on Coordinate Measuring Machine (CMM).</p>	
	<p>8. Introduction to CAM software:</p> <p>a. Term work assignment based on Fundamentals of CAM, applications.</p> <p>b. Use of CAM software for specific application.</p>	
	<p>9. Study of computer controlled business functions:</p> <p>Term work assignment based on Purchase order receiving, Sales and marketing, Job costing, Bill of Material, Financial control, Inventory management</p> <p>b. One recent paper or Case Study of computer controlled business functions.</p>	
	<p>10. Generation of any one simple model using Any CAM software:</p> <p>1) simulate the process</p> <p>2) tool path generation</p>	
Assignments: NA		

Text Books / References

1. Computer Aided Manufacturing by Tien Chien Chang, Pearson Education
2. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P Groover, Pearson Education
3. Robotics Technology and Flexible Automation, by S R Deb, S Deb, McGraw Hill Education Private Limited.
4. Flexible Manufacturing Cells and System -William. W. Luggen Hall, England Cliffs, Newjersy
5. P. Radhakrishnan, " Computer Numerical Control ", New Central Book Agency, 1992.
6. Computer integrated manufacturing -S. Kant Vajpayee – Prentice Hall of India.
7. System Approach to Computer Integrated Manufacturing. Nanua Singh, Wiley and sons Inc, 1996.
8. Computer Aided Manufacturing- Rao, Tewari, Kundra, McGraw Hill, 1993
9. CAD/CAM, Principles and Applications –P N Rao, McGraw Hill, 2010
10. CAD/CAM, Introduction, -Ibrahim Zeid, Tata McGraw Hill, 2007

Syllabus for Unit Test

NA

INPLANT TRAINING		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: -		
Practical: -	Term Work and Oral Examination: 50Marks	03 Credits
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of theoretical subjects of Production Engineering	
2.	Basic knowledge of Industrial Management	
3.	Basic knowledge of Manufacturing Processes	
Course Objectives:		
To help to correlate the lessons learnt in theory and actual practices followed in the industries, expose to an industrial environment, make aware of the psychology of the workers, their habits, attitudes and to prepare them to approach the problems.		
Course Outcomes:		
Students will be able to		
1.	Get an opportunity to apply their knowledge in problem solving and eventually develop that skill.	
2.	Demonstrate understanding of various constraints of time and cost within which goods are produced and services rendered in a specified quantum.	
3.	Get familiarized with various technological trends, approaches and applications along with managerial exposure.	
4.	Develop a positive attitude, which will bring in a visible change in their approach while dealing with technical and interpersonal issues.	
5.	Describe the scope, functions and job responsibilities in various departments of an organization.	
6.	Appreciate and realize the size and scale of operations in Industry.	
Training:		
The student shall undergo training programme prepared by the industry in following manufacturing and functional areas:		
<ol style="list-style-type: none"> 1. Industrial Engineering: Method Study, Work Measurement, Ergonomics and Productivity Improvement Technique. 2. Production Planning & Control, Quality Assurance. 3. Material Management: Inventory Control, Vendor Development, Vendor Rating, Raw Material and Finished Goods stores. 4. Plant Engineering: Plant Layout, Plant Maintenance, Housekeeping, Material Handling & safety. 5. Costing and Cost Control. 6. Management Information System (M.I.S.). 7. Incentive Schemes, Labour Laws. Factory Acts. 8. Import Export Procedures. 9. Incentive schemes, labour laws, factory laws. 		

10. Machine / Process Diagnosis.
11. Quality Assurance, Quality Improvement.
12. Improvement in tool layout, tool selection machine selection.
13. Maintenance of machines, housekeeping, safety precautions.
14. Computer based information study for stores, purchase wastage of material.

Term Work

Term work will consist of a comprehensive report based on his observation, training received and assignments completed during 45 Days of training. The report shall also include good drawing figure, process sheets, machine and product specifications.

Some instructions for Inplant Training Report:

Language	The report should be written in English
Printing	<ul style="list-style-type: none"> • Report must be printed single sided. • Printing must be of high quality. Text and figures must be clear and legible
Number of Copies	Final Report (3 copies)
Page Margin	Left, Right, Top, Bottom margins: 2.5 cm
Title / Paragraph Margin	<ul style="list-style-type: none"> • Chapter number and title should be centered. • Subsection number should align with the left margin • Subsection title should be indented 1.5 cm from the left margin. • The first paragraph in a subsection should align with left margin. • The subsequence paragraphs should be indented 1.27 cm from the left margin. • General alignment for texts in paragraph should be "justified".
Numbering the Chapters and Subsections	<p>All chapters and their subsections must be numbered and titled. Example:</p> <p>Chapter 2 Title of Chapter 2.1 Title of the subsection (second level) 2.1.1 Title of the sub-subsection (third level) 2.1.1.1 Title of the sub-sub-subsection (fourth level)</p>
Typesetting	<ul style="list-style-type: none"> • Font Type : Times New Roman • Font Size : 12 pt • Chapter Title : Uppercase, Bold, Centered • Chapter Sub-section : Title Case, Bold, Align left
Page Numbering	Page numbering should start from chapter-1 in number format (1,2,3,4 etc)
Report Submission	The report to be submitted within fifteen days from completion of the training.

Examination

Oral Examination shall be conducted after training by appointing one internal examiner and one external examiner from industry .45 Days Industrial Inplant Training successful completion certificate is essential for granting the term of student.

PROJECT STAGE-I		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 02 Hours / Week	TW/OR : 50 Marks	04 Credits
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of conventional and non-conventional Machines.	
2.	Knowledge of material science.	
3.	Knowledge of Strength of Material.	
Course Objectives:		
To prepare the students to carry out a comprehensive study of any design or process or phenomenon, to encourage the process of independent / creative thinking and working in groups and to expose them to industrial atmosphere of accountability.		
Course Outcomes:		
Students will be able to		
1.	Work in Team	
2.	Allocate work among students according to expertise in specific field	
3.	Break the Project into Tasks.	
4.	Develop Leadership quality	
5.	Carry out Purchasing activity	
6.	Carry out fabrication and assembly of components.	
Term Work		
<p>While selecting the projects preference should be given to industrial projects, social impact projects, productivity improvement and renewable energy resources or development of manufacturing technique. The students in a group of not more than FOUR will work under the guidance of the faculty member on the project work undertaken by them. The work started in Semester VII will be continued in the Semester VIII. There will be an end semester University Exam on work done in semester VII. Different tools should be used for Project Management like PERT technique or use of software for analysis of data etc. Three reviews will be conducted throughout the semester and the reference of these reviews will be considered during final assessment. An interim report of the work completed in Semester VII in the form of report and yellow card shall be submitted for the term work along with the synopsis. The report will be assessed by the Project Guide and External faculty member appointed by the Head of the Department / concerned responsible official of the sponsoring industry (Co-guide). The synopsis shall be endorsed by the Head of Department.</p> <p>The work to be completed in Semester VII shall include,</p> <ol style="list-style-type: none"> a) Literature Review b) Problem Identification/Definition c) Design and Methodology / CAD simulation of component or Mechanism d) Activity planning for the time frame and division of responsibility to each student. 		

The oral examination shall be based on the work planned and completed in Semester VII.

CERTIFICATE

This is to certify that Mr. /Ms

(Seat No.)..... has carried out a Project entitled ,..... (Project Stage –I) for partial fulfillment of the requirement of the B.Tech. Production Engineering Course during the academic Year

Date:

Place:

(Guide)

(Project Co-Ordinator)

(Examiner)

(Head of Department)

B Tech Prod

SEM VIII

Subject: Process Planning and Tool Design		
<u>EACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Practical: 02 Hours / Week	TW/OR : 50 Marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Knowledge of Machines and Processes	
2.	Knowledge of Tooling's used in Machine shops	
3.	Knowledge of using Machining data.	
Course Objectives:		
	The students should be able to do Prepare process sheets.	
Course Outcomes:		
Students will be able to		
1.	Perform part print analysis for Establishing general characteristics of work piece, Auxiliary methods for visualizing part print, Functional surfaces, nature of Work piece, finishing and identifying operations, relating the part to assembly.	
2.	Perform dimensional and tolerance analysis	
3.	Identify operations for classification based on importance.	
4.	Carry out Selection of Equipment and toolings from manufacturers catalog	
5.	Select and plan the process and carryout process planning with holistic approach.	
UNIT - I	Product and Process Engineering General Manufacturing processes, Product Engineering, Process Engineering, communications, relation with other departments, classification of processes, manufacturing operations. Part Print analysis-Establishing general characteristics of work piece,Auxiliary methods for visualizing part print, Functional surfaces, nature of work piece, finishing and identifying operations, relating the part to assembly.	(06 Hours)
UNIT – II	Dimensional and tolerance analysis Types of dimensions, concept of straightness, squareness, roundness, and concentricity symmetry, surface quality and surface integrity, surface finish affecting product properties and product cost, base lines, direction of specific dimensions. Tolerance analysis-causes of work piece variations, to express limits and tolerance, tolerance stack, purpose of tolerance chart,	(06 Hours)

	balancing the Tolerance Chart, Rules for adding and subtracting tolerances , layout of tolerance chart.	
UNIT - III	Work piece Control & Classifying operations Work piece control theories, Causes of Work piece variation, shape of part affecting processing, Mechanical, Geometric and Dimensional Control Variables influencing Work piece control, Classifying operations: Basic process operations, principal process operations, major operations, qualifying and requalifying operations, auxiliary process operations.	(06 Hours)
UNIT - IV	Selection of Equipment and tooling's Process capability of Equipments, prime accuracies and producible accuracies of Equipments, Factors influencing make or buy decisions, relation between Process selection and Machine selection, sources for selection , General purpose, special purpose machines, factors in machine selection in terms of cost and design factors, cost analysis, operating cost, comparative cost analysis. Classification of tooling: Factors affecting selection of Tooling, sources of tooling, tool holders, work piece holders, jigs fixtures, moulds, pattern, core boxes, dies, templates, gauges.	(06 Hours)
UNIT - V	Selecting and planning the process Function, Economy and appearance, fundamental rules for manufacturing process, Engineering approach, basic design of product, influence of process engineering on product design, specifications, materials and its cost analysis, eliminating operations, combined operations, availability of equipment, effect of operations speed on performance of economy, Computer aided process planning	(06 Hours)
UNIT - VI	Process sheet design Determining manufacturing sequence, Factors affecting operation sequence, major process sequence, combining operations, Operation routing, routing uses routing description, process picture, process picture sheet, processing dimensions and views	(06 Hours)
Term Work/Practical's (All the assignments include time estimation of processes):		
1. Part print analysis of one industrial component drawing		
2..Process design of one component on GPM/CNC for batch production.		
3. Process design of one component for mass production		
4. Time estimation for one component on GPM / CNC for batch production		
Assignments:		
1. Assignment on Product and Process Engineering.		
2. Assignment on Dimensional and tolerance analysis		

3. Assignment on work piece control and classifying operations.
4. Assignment on Selection of equipment and toolings.
5. Assignment on selecting and planning the process
6. Assignment on process sheet

Text Books/Reference Books:

1	D.F.Eary, G.E.Johnson, "Process Engineering for Manufacturing", Prentice-Hall
2	P.W.Wang, J.Kelly, " Computer Aided Process Planning".
3	Nanua singh, "System Approach to Computer Integrated Design and Manufacturing"
4	H.W.Wage, "Manufacturing Engineering", McGraw hill
5	"Manufacturing catalogues for cutting tools and inspection equipments" P.Radhakrishnan, S.Subrmaniyum, V.Raju, "CAD\CAM\CIM", New Age Interanational Pvt. Ltd.
6	K.Hitomi , "Manufacturing Systems Engg", John Willey
7	Groover Mikell. P. "Fundamentals of Modern Manufacturing", Materials, Processes and Systems", 2nd edition, Willey 2002.
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

INDUSTRIAL ROBOTICS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credits
	TW/OR: 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Industrial robotics	
2.	Basic knowledge of Sensors and Grippers and Vision system.	
3.	Basic knowledge of Programming.	
Course Objectives:		
The student should understand the scope, objective and application of industrial robotics.		
Course Outcomes:		
Students will be able to understand		
1.	The basic concepts of mechatronics and robots.	
2.	Develop skills in understanding various sensors, robot peripherals and their use & deployment in manufacturing system.	
3.	Acquire skills in understanding robot language and programming.	
4.	The concept of kinematics and dynamics equations.	
5.	Acquire skill in robot task planning for problem solving.	
6.	Develop skills in identifying areas in manufacturing where robotics can be deployed for enhancing productivity.	
UNIT-I	Basic concept in Robotics: Automation and robotics, robot anatomy, basic structure of robots, resolution, accuracy and repeatability. Classification and structure of robotics system Point to point and continuous path system control loops of robotics system, manipulators, wrist motions and grippers.	(06 Hrs)
UNIT-II	Drives Control Loops, Basic Control System Concepts & Models, Control System Analysis, Robot Activation & Feedback Components, Position & Velocity Sensors, Actuators and Power Transmission system. Robot & its Peripherals End Effectors: Type mechanical and other grippers, Tool as end effector. Sensors: Sensors in Robotics, Tactile Sensors, Proximity & Range Sensors, Sensor Based Systems, Vision systems and Equipment.	(06 Hrs)
UNIT-III	Machine vision Introduction, Low level & High level Vision, Sensing & Digitizing, Image Processing & analysis, Segmentation, Edge detection, Object Description & recognition, interpretation and Applications. Programming for Robots	(06 Hrs)

	Method, Robot Programme as a path in space, Motion interpolation, motion & task level Languages, Robot languages, Programming in suitable languages and characteristics of robot.	
UNIT-IV	Robot Kinematics and Dynamics Forward, reverse & Homogeneous Transformations, Manipulator Path control and Robot Dynamics. The direct kinematics problem, the inversion kinematics solution, Lagrangian –Euler formation, generalized D'Ambert equations of motion. Denavit Hartenberg convention and its application.	(06 Hrs)
UNIT-V	Root Intelligence & Task Planning Introduction, State space search, Problem reduction, use of predictive logic, Means. Ends Analysis, Problem solving, Robot learning and Robot task planning. Implementation Principles and Issues An Approach for implementing robotics, Safety, Training, Maintenance and Quality. And Social issues and The future of Robotics.	(06 Hrs)
UNIT-VI	Robot application in manufacturing Material transfer, machine loading & un loading, processing operation, Assembly & inspectors, robotic Cell design & control, Social issues & Economics of Robotics. Interfacing robot with PC, handshaking, hardware handshaking, RS232C serial interface.	(06 Hrs)

Term work:

List of Experiments: (Any Five)

- Study of elements of industrial robots.
- Study of model a work space for robot application.
- Design a robot gripper.
- Study of vision systems in industrial robots.
- Design a pick and place robot.
- Programming of pick and place robot.
- Make individual model of robot.

Assignments:

- Assignment on basic concepts of robots.
- Drives and control systems for robot application.
- Different types of sensors and grippers used in robots.
- Advances in robot programming
- Robot applications in manufacturing systems.
- Industrial visit

Oral/Practical

Term work and oral will be based on above syllabus

Text Books / References

- S. R. Deb. "Robotics", Tata McGrawHill Publishing Co. Ltd., ISBN 0-07-460090-7.

- Yoren Koren, “Robotics for Engineers”, McGraw Hill Book Co., ISBN 0-07-035341-7.
- M. P. Grover, M. Weiss, R. N. Nagel, N. G. Odrey, “Industrial Robotics Technology”, ISBN 0-07-100442-4.
- K. S. Fu, C. G. S. Lee, R. C. Gonzaler, “Robotics Control, Sensing, Vision and Intelligence”, Tata McGraw Hill, ISBN 0-07-100421-4.
- H. Asada John, “Robot Analysis and Control”.
- M. W. Thring, “Robots and Telechirs”, Ellis Horwood Limited, ISBN 0-85312-274-1.
- Hall A. S., “Kinematics and Linkage Dynamics”, Jr. Prentice Hall.
- J. Hirchhorn,, “Kinematics and Dynamics of Machinery”, McGraw Hill Book Co.
- Kafler, “Robotics Engineering”, Prentice Hall India Pvt. Ltd., ISBN 81-203-0842-5.
- Jankiraman, “Image Processing and Analysis”

Syllabus for Unit Test

Unit Test 1	Units I , II and III
Unit Test 2	Units IV, V ,VI

FINANCIAL MANAGEMENT & COST CONTROL		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: --	Attendance: 10 Marks	01 Credit
Tutorial - 01 Hrs/Week	Assignments : 10 Marks Unit Test : 20 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Mathematics.	
2.	Basic knowledge of Production Planning And Control	
3.	Basic knowledge of Manufacturing Process And Inventory Control	
Course Objectives:		
The student should understand the scope, objective and application of financial management & costing control		
Course Outcomes:		
Students will be able to understand		
1.	Function, scope, goals and tools used for financial management & costing control	
2.	Control of Capital Expenditure.	
3.	Concept and design of Working Capital.	
4.	Methods of costing and Depreciation cost.	
5.	Budgetary control and variance Analysis.	
6.	Concept, development & use of standard costing.	
UNIT-I	Financial Management Financial function, Scope, goals and tools. Sources of finance, corporate planning and financial management. Financial Statements: Balance sheet, profit and loss account. Ratio Analysis: Classification, Ratio Analysis and its limitations. Operating and Financial Leverage.	(06 Hrs)
UNIT-II	Capital Budgeting Control of Capital Expenditure, Evaluation Process-Payback approach, Accounting of Rate of Return, Present Value Method Vs Internal Rate of Return. Replacement cost and discounted cash flow.	(06 Hrs)
UNIT-III	Working Capital Management Concept and design of Working Capital, types of working capital, sources of working capital, time value of money, cost and capital, cost of capital. Funds Flow Analysis: Concepts, Objectives, and Techniques of Funds Flow Statement, cash flow statement.	(06 Hrs)
UNIT-IV	Costing And Cost Accounting Methods of costing and elements of cost. Type of cost, Material Cost: Different methods of pricing of issue of materials. Material losses - Wastage and its consideration. Labour Cost: Different methods wages and incentive plans. Principles of good remunerating system, labour turnover and its methods.	(06 Hrs)

	Job And Process Costing: Job costing, Factory job costing, Contract cost a) Unit costing:, output and operating cost b) Process costing; Normal and abnormal losses, abnormal gains, waste, scrap, by-products	
UNIT-V	Standard Costing And Marginal Costing: Standard Costing: Material, Labour, Overhead, Sales. Profit, Product-mix and Yield Variance. Capital cost control repetitive operating cost, standard costs, cost reporting and corrective action. Advantages and disadvantages. Marginal Costing: Concept ,Profit Volume relationship, Breakeven chart, contribution, breakeven point, Margin of Safety, Advantages and disadvantages	(06 Hrs)
UNIT-VI	Depreciation And Overheads: Depreciation: Concept, importance and different methods of depreciation. Estimation of material, machining and labour cost machining. Overheads: Classification, collection of overheads, Primary and Secondary apportionment of overheads, absorption of overheads. Machine hour and labour hour rate. Under and over absorption of overheads. Estimation of overheads	(06 Hrs)
Assignments:(Any six)		
<ul style="list-style-type: none"> • Assignment on Financial Management • Assignment on Capital Budgeting. • Assignment on Working Capital Management.. • Assignment on Costing Cost Accounting • Assignment on Standard Costing And Marginal Costing • Assignment on Depreciation And Overheads • Case Study 		
Text Books		
1. N. K. Prasad, "Principles and Practice of Cost Accounting", Syndicate Pvt. Ltd., Calcutta		
2. M. Pandey, "Financial Management", New Delhi Vikas Publication House Pvt. Ltd., ISBN 81-259-0638-X		
3. M. Y. Khan, P. K. Jain, "Financial Management", Tata McGraw Hill Publishing Ltd.		
4. B. K. Bhar, "Cost Accounting Methods and Problems", Academic Publishers, Calcutta		
5. P.C.Tulsian "Cost Accounting" Sultan Chand & Co.,		
6. P.C.Tulsian "Financial Management" Sultan Chand & Co.,		
Reference Books:		
1. Henry M. Steiner, "Engineering Economics Principles", McGraw Hill Publication.		
2. C.B. Gupta, "Fundamentals of Business", Sultan Chand & Co.,		
3. P. A. Samuelson, "Economics", McGraw Hill International.		
4. K. K. Dewett, "Modern Economic Theory", Sultan Chand & Co., ISBN 81-219-0331-1		
5. Colin Drury, "Management and Cost Accounting", English Language Book Society, Chapman & Hall London.		
Syllabus for Unit Test		
Unit Test 1	Units I, II and III	
Unit Test 2	Units IV, V ,VI	

Elective III - Human Resource Management		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hrs/Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Tutorial: --	TW/OR: 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of business management	
2.	Knowledge of employee welfare	
3.	Basic knowledge of factory acts and labour laws	
Course Objectives:		
The student should be able to understand and apply the principles of human resource management.		
Course Outcomes:		
Students will be able to		
1.	Understand the concept of human resource management	
2.	Use proper HR forecasting techniques for successful planning	
3.	Understand the concept of training and development	
4.	Understand the concept of performance appraisal and compensation	
5.	Use the various methods of job evaluation, analysis and design	
6.	Understand the grievance procedure and employee welfare	
UNIT-I	Introduction to Human Resource Management: Introduction, Concept of Human Resource Management, Scope of Human Resource Management, History of Human Resource Management, Function of Human Resource Management, Role of HR Executives Changing Role of Human Resource in India, Globalization, Its Impact on HR.	(06 Hours)
UNIT-II	Human Resource Planning: Process of Human Resource Planning, Need for Human Resource Planning, HR Forecasting Techniques, Successful Human Resource Planning Recruitment and Selection: Concept of Recruitment, Factors Affecting Recruitment, Sources of Recruitment, Recruitment Policy, Selection, Selection Process, Application Forms, Selection Test, Interviews, Evaluation, Placement, Induction	(06 Hours)
UNIT-III	Training and Management Development: Meaning of Training, Area of Training, Methods of Training, Concept of Management Development, Management Development Methods, Differences Between Training and Development, Evaluation of Training and Management Development	(06 Hours)

	Employee Career Planning and Growth: Concept of Employee Growth, Managing Career Planning, Elements of a Career Planning Programme, Succession Planning.	
UNIT-IV	Performance Appraisal: Concept and Need for Performance, Reviews, Overview of Performance Appraisal, Types of Appraisal Methods, 360 degree appraisal, Benefits Compensation Management: Wage and Salary Administration, Managing Wages, Concept of Rewards and Incentives, Managing Benefits in Organisations Labour Laws: introduction to labour laws and factory act.	(06 Hours)
UNIT-V	Job Evaluation: Concept of Job Evaluation, Objectives, Techniques, Advantages and Limitations, Introduction to Competency Job Analysis and Design: Concept of Job Analysis and Design, Process of Job Analysis, Methods of Job Analysis, Job Analysis Information, Concept of Job Design, Human Resource Information System: Introduction, Concept, Components, Types, Application, Implementation, Benefits, Impact,	(06 Hours)
UNIT-VI	Employee Welfare and Working Conditions: Concept of Employee Welfare, Welfare Measures, Types, Employee Welfare Responsibility, the Business Benefits of Employee Welfare Activities Grievance and Grievance Procedure: Concept of Grievance, Causes of Grievances, Forms and Effects of Grievance, the Grievance Handling Procedure, Need for Grievance Redressal Procedure Emerging Trends in HRM: Competency Mapping, Business Process Outsourcing, Right Sizing of Workforce, Flexi time, Talent Management, Employee Engagement	(06 Hours)
Term work:		
<ol style="list-style-type: none"> 1. Introduction to Human resource management 2. Exercise covering human resource planning, recruitment and selection. 3. Exercise on training and development 4. Assignment on employee career planning and growth 5. Exercise on career planning and compensation. 6. Exercise on job evaluation, analysis and design. 7. Assignment on employee welfare and working conditions. 8. Exercise on grievance procedure and emerging trends in HRM. 		
Assignments:		
<ol style="list-style-type: none"> 1. Assignment on cost effective recruitment 2. Assignment on use of portals for recruitment. 3. Assignment on training need analysis. 4. Assignment on compensation benchmarking. 5. Assignment on mandatory requirements of factories act. 6. Assignment on design of appraisal system. 7. Assignment on employee satisfaction survey. 		

Text Books / References

1. Aswathappa, "Human Resource and Personnel Management", Tata McGraw Hill.
2. C.B. Mammoria, "Personnel Management",
3. Dessler, "Human Resource Management", Prentice Hall India.
4. DeCenzo & Robbins, "Personnel/Human Resource Management: "Prentice Hall India.
5. D. K. Bhattacharya, "Human Resource Management", Excel Books; 2nd edition
6. V. S. P. Rao, "Human Resource Management", Excel Books.
7. Gomez, "Managing Human Resource", Prentice Hall India.
8. Dr P Jyothi and Dr D.N Venkatesh, "Human Resource Management", Oxford Publications.

Syllabus for Unit Test

Unit Test 1	Units I, II and III
Unit Test 2	Units IV, V and VI

Elective III: Manufacturing of Composite Materials		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credits
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of conventional manufacturing processes.	
2.	Knowledge of material science.	
3.	Knowledge of engineering Metallurgy.	
Course Objectives:		
	Student will understand the concepts of Composite and also able to understand the Manufacturing of Composite Materials .	
Course Outcomes:		
Students will be able to understand		
1.	Different types of composite and its classification .	
2.	To select proper process and understand characteristics of fibers .	
3.	To select different methods of reinforcement of materials .	
4.	To select various design of dies for manufacturing .	
5.	Mechanism of curing.	
6.	To select advance processes and understand its defects and remedies in Manufacturing of Composite Materials	
UNIT - I	Introduction: Definition of composite material, Classification based on matrix and topology, Constituents of composites, Interfaces and Interphases, Distribution of constituents, Nano-composites,	(06 Hours)
UNIT - II	Performance of Structural Composites: Combination effects Fabrication and processing of metal matrix (MM), polymer Matrix (PM) and ceramic matrix (CM) composites and their characterization; Fabrication of nano-composites; Secondary processing and joining of various composite materials for structural applications and their fracture behaviour and safety.	(06 Hours)
UNIT - III	Strengthening mechanisms, Stress distribution in fibre and the matrix (shear stress and axial tensile stress in the fibre along its length), critical length of fibre for full strengthening, Analysis of uniaxial tensile stress-strain curve of unidirectional continuous and short fibre composites, Estimation of the required minimum amount of fibre and critical amount of fibre to gain a composite strength, Analysis of strength of a composite during loading at an angle to the fibres,	(06 Hours)

UNIT - IV	Characterisation Composites :Control of particle/fibre and porosity content, particle/fibre distribution, Interfacial Reaction of matrix-reinforcing component, Coating of reinforcing component, Strength analysis Performance of Composite in Non-structural Applications :Composites in Electrical, Superconducting and Magnetic Applications, Nano-composite devices	(06 Hours)
UNIT - V	Fabrication Composites :Fabrication of Metal Matrix Composites: Commonly used Matrices, Basic Requirements in Selection of constituents, solidification processing of composites - XD process ,Spray processes - Osprey Process, Rapid solidification processing, Dispersion Processes - Stir-casting & Compocasting, Screw extrusion, Liquid- metal impregnation technique - Squeeze casting, Pressure infiltration, Lanxide process), Pinciple of molten alloy infiltration, rheological behaviour of melt -particle slurry, Synthesis of In situ Composites;	(06 Hours)
UNIT - VI	Fabrication of Polymer Matrix Composites - Commonly used Matrices Basic Requirements in selection of Constituents, Moulding method, Low pressure closed molding, pultrusion, Filament winding, Fabrication of ceramic matrix composites - Various techniques of vapour deposition, Liquid phase method and Hot pressing etc. Fracture & Safety of Composite : Fracture behavior of composites, Mechanics and Weakest link statistics,Griffith theory of brittle fracture and modification for structural materials, Basic fracture mechanics of composite	(06 Hours)
Term work:		
List of Experiments: (Any six)		
<ul style="list-style-type: none"> • Manufacturing of Fibres on Electrospin Machine • Study of different binders • Manufacturing of composite by Hand Lay up processes . • Manufacturing of composite by VARTUM • Study of MMC . • Study of CMC. • Study of different Matrix Materials and reinforced materials • Testing of composite component 		
Assignments:		
<ol style="list-style-type: none"> 1. Explain the different types of composite ,Interfaces and Interphases. 2. Discuss the Fabrication of nano-composites in details 3. Explain the Stress distribution in fiber and the matrix. 4. How the carbon and glass fiber are manufactured. 5. What is Liquid- metal impregnation technique? 6. Explain the basic requirements in selection of Constituents in composite . 		

Text Books/Reference Books:	
1	Composite materials, K.K. Chawala, 2nd ed., (1987) Springer-Verlag, New York. 2
2	Nanocomposite Science and Technology, P.M. Ajayan, L.S. Schadler, P. V. Braun, (2003), Wiley-VCH Verlag GmbH Co. KGaA, Weinheim.
3	Ceramic matrix composites, K.K. Chawala, 1sted., (1993) Chapman & Hall, London
4	Advances in composite materials, G. Piatti, (1978) Applied Science Publishers Ltd., London.
Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

Elective III: KNOWLEDGE BASED SYSTEMS		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic Knowledge of Information Technology	
2.	Introductory computer course.	
3.	Information systems course.	
Course Objectives:		
The basic purpose of the course is to discuss the application of artificial intelligence techniques and more specifically knowledge based systems, in information processing and information systems design. Discuss methodological and project management approaches to developing knowledge based systems.		
Course Outcomes:		
Students will be able to		
1.	Understand the knowledge-based systems representation.	
2.	Understand automatic reasoning.	
3.	Understand inductive and deductive learning.	
4.	Implement a small knowledge- based system.	
5.	Understand Methodologies for building knowledge based systems	
6.	Understand Organizational and Managerial Issues	
UNIT-I		(06 Hrs)
Artificial Intelligence and Information Systems:		
Fourth & fifth generation languages, Nonprocedural Paradigms, Data and Knowledge.AI, knowledge based systems, Expert Systems. Basic architecture of knowledge based systems		
UNIT-II		(06 Hrs)
Knowledge representation and the knowledge base:		
First-Order Logic, Production Rules, Horn Clauses, Frames, Semantic Networks, Objects. Metaknowledge, Conceptual modelling.		

UNIT-III	(06 Hrs)
Interfaces: User interface: explanation facilities, unknown values. Systems interface: language and database hooks. Developer interface: knowledge acquisition, testing & debugging	
UNIT-IV	(06 Hrs)
Methodologies for building knowledge based systems: Development lifecycle, structured development and prototyping. Knowledge acquisition techniques, protocol analysis, repertory grid. Integration with databases, data processing and information systems methodologies	
UNIT-V	(06 Hrs)
Expert system building tools: AI-Languages, Knowledge representation languages, E.S.-shells, products and environments .Knowledge base management systems	
UNIT-VI	(06 Hrs)
Organizational and Managerial Issues: Knowledge as a strategic asset in the organization, knowledge problems and management. Applications, pitfalls and successes.	
Term work: List of Experiments: (Any Five) <ol style="list-style-type: none"> 1. Study of Artificial Intelligence 2. Study of Basic architecture of knowledge based systems 3. Conceptual modelling. 4. Study of Developer interface. 5. Data processing and information systems methodologies. 6. Knowledge base management systems. 7. Study of knowledge problems and management. 	
Assignments: (Any Six) <ol style="list-style-type: none"> 1. Study of Expert Systems. 2. Knowledge based systems. 3. Study of Production Rules. 4. Study of Semantic Networks. 5. Study of Systems interface. 6. Study of protocol analysis. 	

<p>7. Study of AI-Languages. 8. Different Knowledge acquisition techniques. 9. Study of Knowledge representation languages. 10. Study of products and environments. 11. Knowledge as a strategic asset in the organization</p>					
<p>‡ Text Books / References</p> <ul style="list-style-type: none"> • VANTHIENEN J., Knowledge Based Systems (Wouters Bookstore) • HARMON, P., HALL, C., <i>Intelligent Software Systems Development</i> , Jojn Wiley & Sons, Inc., 1993, 472 pp. • LUGER, G., STUBBLEFIELD, W., <i>Artificial Intelligence</i> , Second edition, Benjamin/Cummings, 1993. • TURBAN, E., LIEBOWITZ, J. (Eds), <i>Managing Expert Systems</i> , Idea Group Publishing, 1992. • PATTERSON, D., <i>Introduction to Artificial Intelligence and Expert Sytems</i>, Prentice-Hall, 1990. • Peter Jackson, <i>Introduction to Expert Systems</i>, Addison-Wesley (3rd Ed), 1998 					
<p>Syllabus for Unit Test</p> <table border="1"> <tr> <td>Unit Test 1</td> <td>Units I , II and III</td> </tr> <tr> <td>Unit Test 2</td> <td>Units IV, V ,VI</td> </tr> </table>	Unit Test 1	Units I , II and III	Unit Test 2	Units IV, V ,VI	
Unit Test 1	Units I , II and III				
Unit Test 2	Units IV, V ,VI				

Elective III: Design And Analysis of Experiments.

Elective III: Design And Analysis of Experiments.		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW &OR :50Marks	
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Introduction to Statistics or a similar basic statistics course	
2.	Basic knowledge of Graphical Representation.	
3.	Basic knowledge of some Software's such as statease and Minitab.	
Course Objectives:		
This course provides an introduction to designing experiments and analyzing their results.		
Course Outcomes :		
Students will be able to understand		
1.	Design of Experiments	
2.	Selection of Levels and Parameters.	
3.	Factorial Design. The 2 ^k Factorial Design	
4.	Analysis of Variance (ANOVA)	
5.	Model building using the method of least squares.	
6.	Performing hypothesis tests,	
UNIT-I	Introduction to design of experiments: Strategy of Experiment, Basic Principles, Guide Lines for designing Experiment, Brief History of Stastical Design. Using Stastical Techniques in Experimentation. A typical application of Experimental Design.	(06 Hrs)
UNIT-II	Simple Comparative Experiments.: Introduction, Basic Stastical Concepts, Sampling and Sampling distributions, difference in means, hypothesis testing, choice of sample size, confidence intervals, comparing single mean to Specified value, difference in means, paired comparison designs.	(06 Hrs)
UNIT-III	Design of Experiments: Introduction to Factorial Designs. The 2 ^k Factorial Design, The 2 ² Factorial Design, The 2 ³ Factorial Design, General 2 ^k design, Single replicate of the 2 ^k design, Taguchi Method and addition of center points to the 2 ^k design.	(06 Hrs)
UNIT-IV	Analysis of Variance :(ANOVA)	(06 Hrs)

	Analysis of the fixed effects Model, decomposition of the Total Sum of Squares, Stastical Analysis, Estimation of the Model Parameters, Unbalanced Data.	
UNIT-V	Regression Analysis: Regression Model, Comparison among Means, Regression Approach to the Analysis of Variance Least Squares, Estimation of the Model Parameters, General Regression Significant Test,	(06 Hrs)
UNIT-VI	Result Analysis: Fitting Regression Models, Linear Regression Models, Estimation of the Model Parameters in Linear Regression Models, Hypothesis Testing in Multiple Regression, Test for Significance of Regression, Test on Individual Regression Coefficient and group of Coefficients, Confidence intervals on the individual Regression Coefficient, Confidence intervals on the Mean Response, Prediction the new response observation F-Test, Matching the Calculated value with standard value, Use of Software's, Statease, Systat, Minitab ,Predict analysis	(06 Hrs)
Term work: Students have to write the assignments as well as perform the experiment and prepare the journal for the same.		
Assignments: (Any Six) <ul style="list-style-type: none"> • Assignment on Introduction to design of experiments • Assignment on Simple Comparative Experiments • Assignment on Design of Experiments. • Assignment on Analysis of Variance (ANOVA) • Assignment on Regression Analysis • Assignment on Result Analysis. • Case Study (Perform the experiments by selecting at least 2 levels and 3 parameters.) 		
Oral/Practical Term work and oral will be based on above syllabus		
Text Books <ol style="list-style-type: none"> 1) George E. P. Box, William G. Hunter, J. Stuart Hunter, Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building, Second Edition, John Wiley & Sons, New York, 2005 2) Douglas C. Montgomery, Design and Analysis of Experiments, Sixth Edition, John Wiley & Sons, New York, 2004. 		
Syllabus for Unit Test		
Unit Test 1	Units I , II , III	
Unit Test 2	Units IV, V ,VI	

Computer Aided Engineering		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: --	End Semester Examination: --	
Practical: -- 02 Hrs/Week	Internal evaluation: -- Assignments : -- Unit Test : --	01 Credit
Tutorial : --	TW/OR – 50 marks	01 Credit
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of computer aided design and analysis	
2.	Basic knowledge of manufacturing	
3.	Basic knowledge of numerical methods	
Course Objectives:		
The students should understand the scope, objectives and applications of Computer Aided Engineering.		
Course Outcomes:		
Students will be able to		
1.	Solve ordinary and partial differential equations using Galerkin method.	
2.	Analyse the 2D problems by using software.	
3.	Solve the problems related to heat transfer by using software.	
4.	Design and analyse the connecting rod.	
5.	Design and analyse the burnished components.	
6.	Analyse the screw jack.	
Term work:		
1.	Structural analysis of a corner bracket.	
2.	Structural analysis of Truss structure.	
3.	Modal analysis of Simple Pendulum.	
4.	Steady state heat transfer through a plate with hole.	
5.	Analysis of a connecting rod.	
6.	Analysis of Leaf spring	
7.	Analysis of burnished components	
8.	Analysis of piston	
9.	Analysis of camshaft	
10.	Analysis of Screw jack.	
Assignments: NA		
Text Books / References		
<ol style="list-style-type: none"> 1. S. S. Rao, " Finite Element methods in Engineering", Pergomon press Oxford, 2nd edition 1989 2. Sagarlind L J, Applied Finite Element Analysis, John Willey, 1984 3. Chandrupatla & Belegundu, Introduction to Finite Element Engineering, Prentice Hall, 1999. 4. David Hutton, "Fundamentals of Finite Element Analysis", Mcgraw-Hill 5. Saeed Moaveni, "Finite Element Analysis Theory And Application With ANSYS", Prentice Hall. 6. Sham Tickoo," Ansys Workbench 14.0 for Engineers and Designers (MISL-DT), Dreamtech Press. 		
Syllabus for Unit Test		
NA		

PROJECT STAGE-II		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 04 Hours / Week	TW/OR :150 Marks	08 Credits
Course Pre-requisites:		
The Students should have		
1.	Basic knowledge of Machines.	
2.	Knowledge of material science.	
3.	Knowledge of Strength of Material.	
Course Objectives:		
To prepare the students to carry out a comprehensive study of any design or process or phenomenon, to encourage the process of independent / creative thinking and working in groups and to expose them to industrial atmosphere of accountability.		
Course Outcomes:		
Students will be able to		
1.	Work in Team	
2.	Allocate work among students according to expertise in specific field	
3.	Break the Project into Tasks.	
4.	Develop Leadership quality	
5.	Carry out Purchasing activity	

6.	Carry out fabrication and assembly of components.

Term Work

The students will complete their project work started in B.Tech. (Production Engineering) – Semester VII and will submit the report in a prescribed format as given below at the end of Semester VIII. The report will be assessed by the Project Guide and External faculty member appointed by the Head of the Department / concerned responsible official of the sponsoring industry (Co-guide). A publication of work in national conference or journal is compulsory. The report shall be submitted, typed on A4 size sheets and hard bound.(One copy for the department and one copy for each student). The contents of the report shall include the following in a broad sense.

Detailing may be done according to the problem undertaken.

- a) Problem identification and statement
 - b) Review of relevant literature / present practices regarding the problem
 - c) Methodology followed to carry out the work
 - d) Inputs for the project design
 - e) Processing / conversion of these inputs
 - f) Outputs testing / validation
 - g) Results, conclusion, future scope, references, acknowledgement
 - h) **Review of initial plan and deviations in it.**
- 1) Term work will be assessed by the project guide along with Co-guide from sponsoring industry **or** one more faculty member appointed by the Head of Department for in-house projects; based on the work done and the report submitted.
- 2) The students will be examined orally by the examiner appointed by the university and the project guide as the internal examiner.

Marks will be awarded on the basis of the work done and performance in the oral examination.

Format of the project report should be as follows:

1. Paper: The Project report should be typed/printed on white paper of A-4 size.
2. Typing: The typing shall be with one and half spacing and on one side of the paper.
3. Binding: The Industrial Implant Report should be submitted with front and back cover in black
Hard bound, with golden embossing.
4. Margins: Left - 1.25", Right - 1". Top and Bottom 1"

5. Sequence of Pages:
 1. Title page
 2. Certificate form Institute
 3. Completion Certificate form Industry, if sponsored.
 4. Acknowledgement
 5. Abstract
 6. Index
 7. Nomenclature and Symbols
 8. Actual Content
 9. Conclusion
 10. References.

6. Front cover: The front cover shall have the following details in block capitals
 - i. Title at the top.
 - ii. Name of the candidate in the centre, and
 - iii. Name of the Institute, Name of Industry, if sponsored and the year of submission on separate

lines, at the bottom.

CERTIFICATE

This is to certify that Mr. /Ms

(Seat No.)..... has carried out a Project entitled ,.....for partial fulfillment of the requirement of the B.Tech. Production Engineering Course during the academic Year

Date:

Place:

(Guide)

(Project Co-Ordinator)

(Examiner)

(Head of Department)



Bharati Vidyapeeth

(Deemed to be University)

Pune, India

Founder Chancellor: Dr. Patangrao Kadam

COLLEGE OF AYURVED, PUNE

★ Accredited with 'A' Grade (2017) by NAAC. ★

★ Category-I University status by UGC ★

★ NIRF Ranking -66 ★

"Social Transformation Through Dynamic Education"

Prof. Dr. Shivajirao Kadam

M.Sc., Ph.D.

Chancellor

Prof. Dr. M. M. Salunkhe

M.Sc., Ph.D., F.R.S.C.

Vice Chancellor

Dr. Vishwajeet Kadam

B.Tech., M.B.A., Ph.D.

Pro Vice Chancellor


Dr. Abhijit B. Patil

B.A.M.S., D.T.F.M., Ph.D.

Principal

1.1.3- Total no. of courses having focus on Employability/ entrepreneurship/ skill development offered by the University during the year

Course	Code	Employability	Entrepreneurship	Skill development
I BAMS	637	√	√	√
II BAMS	637	√	√	√
III BAMS	637	√	√	√
IVBAMS	637	√	√	√
PG	638	√	√	√
DNYS	13016	√	√	√
PG Diploma	639	√	√	√
Ph.D	636	√	√	√


PRINCIPAL
Bharati Vidyapeeth
(Deemed to be University)
College of Ayurved
Pune-Satara Road, Pune-411 043.

CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI

SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE

INDEX

1ST PROFESSIONAL

1.1	PADARTHA VIGYAN AND AYURVED ITIHAS	2-6
1.2	SANSKRIT	7-8
1.3	KRIYA SHARIR	9-14
1.4	RACHANA SHARIR	15-18
1.5	MAULIK SIDDHANT AVUM ASHTANG HRIDAYA	19

1.1 PADARTHA VIGYAN EVUM AYURVEDA ITIHAS
(Philosophy and History of Ayurveda)

Theory- Two papers– 200 marks (100 each paper)
Total teaching hours: 150 hours

PAPER-I Padartha Vigyanam 100marks

PART A 50 marks

1. Ayurveda Nirupana

- 1.1 Lakshana of Ayu, composition of Ayu.
- 1.2 Lakshana of Ayurveda.
- 1.3 Lakshana and classification of Siddhanta.
- 1.4 Introduction to basic principles of Ayurveda and their significance.

2. Ayurveda Darshana Nirupana

- 2.1** Philosophical background of fundamentals of Ayurveda.
- 2.2** Etymological derivation of the word "Darshana". Classification and general introduction to schools of Indian Philosophy with an emphasis on: Nyaya, Vaisheshika, Sankhya and Yoga.
- 2.3** Ayurveda as unique and independent school of thought (philosophical individuality of Ayurveda).
- 2.4** Padartha: Lakshana, enumeration and classification, Bhava and Abhava padartha, Padartha according to Charaka (Karana-Padartha).

3. Dravya Vigyaniam

- 3.1 **Dravya:** Lakshana, classification and enumeration.
- 3.2 **Panchabhuta:** Various theories regarding the creation (theories of Taittiriyanopanishad, Nyaya-Vaisheshika, Sankhya-Yoga, Sankaracharya, Charaka and Susruta), Lakshana and qualities of each Bhoota.
- 3.3 **Kaala:** Etymological derivation, Lakshana and division / units, significance in Ayurveda.
- 3.4 **Dik:** Lakshana and division, significance in Ayurveda.
- 3.5 **Atma:** Lakshana, classification, seat, Gunas, Linga according to Charaka, the method / process of knowledge formation (*atmanah jnasya pravrittih*).
- 3.6 **Purusha:** as mentioned in Ayurveda - Ativahikapurusha/ Sukshmasharira/ Rashipurusha/ Chikitsapurusha/ Karmapurusha/ Shaddhatvatmakapurusha.
- 3.7 **Manas:** Lakshana, synonyms, qualities, objects, functions, dual nature of mind (*ubhayaatmakatvam*), as a substratum of diseases, penta-elemental nature (*panchabhutatmakatvam*).
- 3.8 Role of Panchamahabhuta and Triguna in Dehaprakriti and Manasaprakriti respectively.
- 3.9 Tamas as the tenth Dravya.
- 3.10 Practical study/application in Ayurveda.

PART B**50 marks****4. Gunavigyaniyam**

- 4.1 Etymological derivation, classification and enumeration according to Nyaya-Vaisheshika and Charaka, Artha, Gurvadiguna, Paradiguna, Adhyatmaguna.
- 4.2 Lakshana and classification of all the 41 gunas.
- 4.3 Practical / clinical application in Ayurveda.

5. Karma Vigyaniyam

- 5.1** Lakshana, classification in Nyaya.
- 5.2** Description according to Ayurveda.
- 5.3** Practical study/ application in Ayurveda.

6. Samanya Vigyaniyam

- 6.1 Lakshana, classification.
- 6.2 Practical study/ application with reference to Dravya, Guna and Karma.

7. Vishesha Vigyaniyam

- 7.1** Lakshana, classification.
- 7.2** Practical study/ application with reference to Dravya, Guna and Karma.
- 7.3** Significance of the statement "*Pravrittirubhayasya tu*".

8. Samavaya Vigyaniyam

- 8.1 Lakshana
- 8.2 Practical study /clinical application in Ayurveda.

9. Abhava Vigyaniyam

- 9.1 Lakshana, classification
- 9.2 Clinical significances in Ayurveda.

PAPER II**Padartha Vigyan and Ayurveda Itihas****100 marks****PART A - Pramana/ Pariksha- Vigyaniyam****75 marks****1. Pariksha**

- 1.1. Definition, significance, necessity and use of *Pariksha*.
- 1.2. Definition of *Prama*, *Prameya*, *Pramata*, *Pramana*.
- 1.3. Significance and importance of *Pramana*, Enumeration of *Pramana* according to different schools of philosophy.
- 1.4. Four types of methods for examination in *Ayurveda* (Chaturvidha-Parikshavidhi), *Pramana* in Ayurveda.
- 1.5. Subsudation of different *Pramanas* under three *Pramanas*.
- 1.6. Practical application of methods of examination (Parikshavidhi) in treatment (Chikitsa).

2. Aptopdesha Pariksha/ Pramana

- 2.1. Lakshana of Aptopadesha, Lakshana of Apta.
- 2.2. Lakshana of Shabda, and its types.
- 2.3. Shabdavritti-Abhidha, Lakshana, Vyanjana and Tatparyakhya. Shaktigrahahetu.
- 2.4. Vaakya: Characteristics, Vaakyarthagyanahetu- Aakanksha, Yogyata, Sannidhi.

3. Pratyaksha Pariksha/ Pramana

- 3.1. Lakshana of Pratyaksha, types of Pratyaksha- Nirvikalpaka- Savikalpaka with description, description of Laukika and Alaukika types and their further classification.
- 3.2. Indriya-prapyakaritvam, six types of Sannikarsha.
- 3.3. Indriyanam lakshanam, classification and enumeration of Indriya. Description of Panchapanchaka, Penta-elemental nature of Indriya by Panchamahabhuta (*Panchabhautikatwa* of Indriya) and similarity in sources (*Tulyayonitva*) of Indriya.
- 3.4. Trayodasha Karana, dominance of Antahkaran.
- 3.5. Hindrances in direct perception (*pratyaksha-anupalabdihikaaran*), enhancement of direct perception (Pratyaksha) by various instruments/ equipments, necessity of other Pramanas in addition to Pratyaksha.
- 3.6. Practical study/ application of Pratyaksha in physiological, diagnostic, therapeutics and research grounds.

4. Anumanapariksha/Pramana

- 4.1. Lakshana of Anumana. Introduction of Anumiti, Paramarsha, Vyapti, Hetu, Sadhya, Paksha, Drishtanta. Types of Anumana mentioned by Charaka and Nyayadarshana.
- 4.2. Characteristic and types of Vyapti.
- 4.3. Lakshana and types of Hetu, description of Ahetu and Hetwabhasa.
- 4.4. Characteristic and significance of Tarka.
- 4.5. Practical study/ application of Anumanapramana in physiological, diagnostic, therapeutics and research.

5. Yuktipariksha/ Pramana

- 5.1. Lakshana and discussion.
- 5.2. Importance in Ayurveda.
- 5.3. Practical study and utility in therapeutics and research.

6. Upamana Pramana

- 6.1 Lakshana.
- 6.2 Application in therapeutics and research.

7. Karya- Karana Siddhanta (Cause and Effect Theory)

- 7.1. Lakshana of Karya and Karana. Types of Karana.
- 7.2. Significance of Karya and Karana in Ayurveda.
- 7.3. Different opinions regarding the manifestation of Karya from Karana: Satkaryavada, Asatkaryavada, Parinamavada, Arambhavada, Paramanuvada, Vivartavada, Kshanabhangurvada, Swabhavavada, Pilupaka, Pitharpaka, Anekantavada, Swabhavoparamavada.

PART B - Ayurved Itihas

25 marks

1. Etymological derivation (Vyutpatti), syntactical derivation (Nirukti) and definition of the word Itihas, necessity of knowledge of history, its significance and utility, means and method of history, historical person (Vyakti), subject (Vishaya), time period (Kaal), happening (Ghatana) and their impact on Ayurveda.
2. Introduction to the authors of classical texts during Samhitakaal and their contribution: Atreya, Dhanwantari, Kashyapa, Agnivesha, Sushruta, Bhela, Harita, Charaka,

Dridhabala, Vagbhata, Nagarjuna, Jivaka.

3. Introduction to the commentators of classical Samhitas – Bhattaraharicchandra, Jējjata, Chakrapani, Dalhana, Nishchalakara, Vijayarakshita, Gayadas, Arunadutta, Hemadri, Gangadhara, Yogindranath Sen, Haranachandra, Indu.
4. Introduction to the authors of compendiums (Granthasamgrahakaala) – Bhavmishra, Sharngadhara, Vrinda, Madhavakara, Shodhala, Govinda Das (Author of Bhaishajyaratnawali), Basavraja.
5. Introduction to the authors of Modern era –Gana Nath Sen, Yamini Bhushan Rai, Shankar Dajishastri Pade, Swami Lakshmiram, Yadavji Tikramji, Dr. P. M. Mehta, Ghanekar, Damodar Sharma Gaur, Priyavrat Sharma.
6. Globalization of Ayurveda – Expansion of Ayurveda in Misra (Egypt), Sri Lanka, Nepal other nations.
7.
 - a) Developmental activities in Ayurveda in the post-independence period, development in educational trends.
 - b) Establishment of different committees, their recommendations.
 - c) Introduction to and activities of the following Organizations :- Department of AYUSH, Central Council of Indian Medicine, Central Council for Research in Ayurvedic Sciences, Ayurvedic Pharmacopeia commission, National Medicinal Plants Board, Traditional Knowledge Digital Library (TKDL)
 - d) Introduction to the following National Institutions :
 - National Institute of Ayurved, Jaipur.
 - IPGT&RA, Gujrat Ayurved University, Jamnagar.
 - Faculty of Ayurved, BHU, Varanasi.
 - Rashtriya Ayurveda Vidyapeetha, New Delhi.
 - e) Drug and Cosmetic Act.
8. Introduction to national & international popular journals of Ayurveda.
9. Introduction to activities of WHO in the promotion of Ayurved.

Reference Books:-

A). Padartha Vigyan:-

- | | |
|--|--------------------------------|
| 1. Padarthavigyan | Acharya Ramraksha Pathak |
| 2. Ayurvediya Padartha Vigyana | Vaidya Ranjit Rai Desai |
| 3. Ayurved Darshana | Acharya Rajkumar Jain |
| 4. Padartha Vigyana | Kashikar |
| 5. Padartha Vigyana | Balwant Shastri |
| 6. Sankhyatantwa Kaumadi | GajananS hastri |
| 7. Psycho Pathology in Indian Medicine | Dr. S.P. Gupta |
| 8. Charak Evum Sushrut ke Darshanik Vishay ka Adhyayan | Prof. Jyotirmitra Acharya |
| 9. Ayurvediya Padartha Vigyana | Dr. Ayodhya Prasad Achal |
| 10. Padartha Vigyana | Dr. Vidyadhar Shukla |
| 11. Padartha Vigyana | Dr. Ravidutta Tripathi |
| 12. Ayurvediya Padartha Vigyana | Vaidya Ramkrishna Sharma Dhand |
| 13. Ayurvediya Padartha Vigyan Parichaya | Vaidya Banwarilal Gaur |
| 14. Ayurvediya Padartha Darshan | Pandit Shivhare |

15. Scientific Exposition of Ayurveda Dr. Sudhir Kumar
16. Relevant portions of Charakasamhita, Sushrutasamhita.

B) History of Ayurveda:-

- | | |
|---|--------------------------------|
| 1. Upodghata of Kashyapasamhita
Paragraph of acceptance of Indian medicine | Rajguru Hem Raj Sharma |
| 2. Upodghata of Rasa Yogasagar | Vaidy Hariprapanna Sharma |
| 3. Ayurveda Ka Itihas | KaviraSuram Chand |
| 4. Ayurveda Sutra | Rajvaidya Ram Prasad Sharma |
| 5. History of Indian Medicine (1-3 part) | Dr. GirindrNath Mukhopadhyaya |
| 6. A Short history of Aryan Medical Science | Bhagwat Singh |
| 7. History of Indian Medicine | J. Jolly |
| 8. Hindu Medicine | Zimer |
| 9. Classical Doctrine of Indian Medicine | Filiyosa |
| 10. Indian Medicine in the classical age | AcharyaPriyavrata Sharma |
| 11. Indian Medicine (Osteology) | Dr. Harnley |
| 12. Ancient Indian Medicine | Dr. P. Kutumbia |
| 13. Madhava Nidan and its Chief
Commentaries (Chapters highlighting history) | Dr. G.J. Mulenbelt |
| 14. Ayurveda Ka BrihatItihasa | Vaidya Atridev Vidyalankara |
| 15. Ayurveda Ka VaigyanikaItihasa | Acharya Priyavrata Sharma |
| 16. Ayurveda Ka PramanikaItihasa | Prof. Bhagwat Ram Gupta |
| 17. History of Medicine in India | Acharya Priyavrata Sharma |
| 18. Vedomein Ayurveda | Vaidya Ram GopalS hastri |
| 19. Vedomein Ayurveda | Dr. Kapil Dev Dwivedi |
| 20. Science and Philosophy of Indian Medicine | Dr. K.N. Udupa |
| 21. History of Indian Medicine from
Pre-Mauryan to Kushana Period | Dr. Jyotirmitra |
| 22. An Appraisal of Ayurvedic Material in
Buddhist literature | Dr. Jyotirmitra |
| 23. Mahayana Granthon mein nihita
Ayurvediya Samagri | Dr. RavindraNathTripathi |
| 24. Jain Ayurveda Sahitya Ka Itihasa | Dr. Rajendra Prakash Bhatnagar |
| 25. Ayurveda- Prabhashaka Jainacharya | Acharya Raj Kumar Jain |
| 26. CharakaChintana | Acharya Priyavrata Sharma |
| 27. Vagbhata Vivechana | Acharya Priyavrata Sharma |
| 28. Atharvaveda and Ayurveda | Dr. Karambelkara |
| 29. Ayurvedic Medicine Past and Present | Pt. Shiv Sharma |
| 30. Ancient Scientist | Dr. O.P. Jaggi |
| 31. Luminaries of Indian Medicine | Dr. K.R. Shrikanta Murthy |
| 32. Ayurveda Ke Itihasa Ka Parichaya | Dr. RaviduttaTripathi |
| 33. Ayurveda Ke Pranacharya | Ratnakara Shastri |
| 34. Ayurveda Itihasa Parichaya | Prof. Banwari Lal Gaur |

1.2 संस्कृतम्

THEORY - ONE PAPER - 100 marks

TEACHING HOURS - 90 hours

PART-A

50 marks

संस्कृतव्याकरणाध्ययनम्

- 1- संज्ञाप्रकरणम्
- 2- विभक्त्यर्थाः
- 3- सन्धिप्रकरणम् (सन्धिविच्छेदः, सन्धिकरणम्)
- 4- षड्लिंगप्रकरणम् (षड्भूतव्ययेषु)
- 5- धातुप्रकरणम् (धातुरूपाण्येव)
(भ्वादिगण्य धातूनां पञ्च लट् लोट् लृट् विधिलिङ् लकारेषु रूपाणि)
- 6- वाच्यप्रयोगाः (कर्तरि कर्मणि भाववाच्यप्रयोगाः)
- 7- समासप्रकरणम्
- 8- प्रत्ययाः
(णिच्, क्त, क्तवत्, शतृ, शानच्, तुमुन्, तव्यत्, तृच्, क्त्वा, ल्यप्, ल्युट्, अनीयर्, मतुप्, इनि, तन्, इतच्, अण्, इञ्, इक्, त्व, ता, षन्, इम्, निच्, तः, त्र, दा, धा, तरप्, तमप्, टाप्, डाप्)
- 9- अनुवादः
 - A) From English / Hindi / regional language to Sanskrit
 - B) From Sanskrit to English / Hindi / regional language
 - C) Identification and correction of grammatical errors in the given sentences

The sentences for translation should be selected from the under mentioned reference books-

- 1) Laghusiddhanta Kaumudi- Acharya Varadaraja (Commentary by Shri Dhananand Shastry)
- 2) Brihatrayee- (Charaka Samhita, Sushruta Samhita, Ashtanga Hridayam)
- 3) Anuvada Chandrika-Chakradhara Hansa Nautiyal
- 4) Sanskruta Ayurved Sudha- Dr. Banwari Lal Gaur
- 5) Rachananuvada Kaumudi- Dr. Kapildev Dwivedi
- 6) Bhasha Sopanam- Published by Rashtreeya Samskruta Samsthanam, New Delhi

PART- B**50 marks****भाषाध्ययनम्**

- 1.) आयुर्वेदार्थग्रन्थाध्ययनायुः—जमचूपेम उमजीवक वऱजनकल वऱलनतअमकं ।तीं छतंदर्जी ;नौतनजौं डीपजंए
नौतममतौ जीदंडए ढेचजमत.4द्व 25 marks
- 2.) वैद्यकीय—सुभाषितसाहित्यम् (अध्यायाः 1—10) 15 marks
- 3.) पंचतन्त्रम्—अपरीक्षितकारकम् (क्षपणक कथातः मूर्खपण्डितकथापर्यन्तम्
पंचकथाः) 10 marks

REFERENCE BOOKS-

- 1.) Sushruta Samhita, Shareera Sthanam, Chapter-4
- 2.) Prabhashanam Work Book, Su.sam.chap.4
Published by-AYURVEDA ACADEMY@ BANGALORE;
Email-ayuacademy@gmail.com
- 3.) Vaidyakeeya Subhashita Sahityam - Dr. Bhaskara Govinda Ghanekar
- 4.) Panchatantra-(Apareekshitakarakam) -Pt. Vishnu Sharma

**1.3 KRIYA SHARIR
(PHYSIOLOGY)**

**Theory-Two Papers-200 Marks (100 marks each)
Teaching hours-180 hours**

PAPER- I

100 marks

PART- A

50 marks

1. Conceptual study of fundamental principles of Ayurvediya Kriya Sharir e.g - Panchamahabhuta, Tridosha, Triguna, Loka-Purusha Samya, Samanya-Vishesha. Description of basics of Srotas.
2. Definition and synonyms of the term Sharir, definition and synonyms of term Kriya, description of Sharir Dosha and Manasa Dosha. Mutual relationship between Triguna-Tridosha & Panchmahabhuta. Difference between Shaarir and Sharir. Description of the components of Purusha and classification of Purusha, role of Shatdhatupurusha in Kriya Sharira and Chikitsa.
3. Dosha- General description of Tridosha. Inter relationship between Ritu-Dosha-Rasa-Guna. Biological rhythms of Tridosha on the basis of day-night-age-season and food intake. Role of Dosha in the formation of Prakriti of an individual and in maintaining of health. Prakrita and Vaikrita Dosha.
4. Vata Dosha: Vyutpatti (derivation), Nirukti (etymology) of the term Vata, general locations, general properties and general functions of Vata, five types of Vata (Prana, Udana, Samana, Vyana, Apana) with their specific locations, specific properties, and specific functions.
Respiratory Physiology in Ayurveda, Physiology of speech in Ayurveda.
5. Pitta Dosha: Vyutpatti, Nirukti of the term Pitta, general locations, general properties and general functions of Pitta, five types of Pitta (Pachaka, Ranjaka, Alochaka, Bhrajaka, Sadhaka) with their specific locations, specific properties, and specific functions. Similarities and differences between Agni and Pitta.
6. Kapha Dosha: Vyutpatti, Nirukti of the term Kapha, general locations, general properties and general functions of Kapha, five types of Kapha (Bodhaka, Avalambaka, Kledaka, Tarpaka, Śleshaka) with their specific locations, specific properties, and specific functions.
7. Etiological factors responsible for Dosha Vriddhi, Dosha Kshaya and their manifestations.
8. Concept of Kriyakala.
9. Prakriti:
 - a) Deha- Prakriti: Vyutpatti, Nirukti, various definitions and synonyms for the term 'Prakriti'. Intra-uterine and extra-uterine factors influencing Deha-Prakriti, classification and characteristic features of each kind of Deha-Prakriti.
 - b) Manasa- Prakriti: Introduction and types of Manasa- Prakriti.
10. Ahara: Definition, classification and significance of Ahara, Ahara-vidhi-vidhana, Ashta Aharavidhi Viseshayatana, Ahara Parinamkar Bhava.

11. Aharapaka (Process of digestion): Description of Annavaha Srotas and their Mula. Role of Grahani & Pittadhara Kala.
12. Description of Avasthapaka (Madhura, Amla and Katu). Description of Nishthapaka (Vipaka) and its classification. Separation of Sara and Kitta. Absorption of Sara. Genesis of Vata-Pitta-Kapha during Aharapaka process. Definition of the term Koshtha. Classification of Koshtha and the characteristics of each type of Koshtha.
13. Agni – Definition and importance, synonyms, classification, location, properties and functions of Agni and functions of Jatharagni, Bhutagni, and Dhatvagni.

PART- B

50 marks

Modern Physiology

- a) Definition and mechanisms of maintenance of homeostasis. Cell physiology. Membrane physiology. Transportation of various substances across cell membrane.
- b) Resting membrane potential and action potential.
- c) Physiology of respiratory system: functional anatomy of respiratory system. Definition of ventilation, mechanism of respiration, exchange and transport of gases, neural and chemical control of respiration, artificial respiration, asphyxia, hypoxia. Introduction to Pulmonary Function Tests.
- d) Physiology of Nervous System: General introduction to nervous system, neurons, mechanism of propagation of nerve impulse, physiology of CNS, PNS, ANS; physiology of sensory and motor nervous system, Functions of different parts of brain and physiology of special senses, intelligence, memory, learning and motivation. Physiology of sleep and dreams, EEG. Physiology of speech and articulation. Physiology of temperature regulation.
- e) Functional anatomy of gastro-intestinal tract, mechanism of secretion and composition of different digestive juices. Functions of salivary glands, stomach, liver, pancreas, small intestine and large intestine in the process of digestion and absorption. Movements of the gut (deglutition, peristalsis, defecation) and their control. Enteric nervous system.
- f) Acid-base balance, water and electrolyte balance. Study of basic components of food. Digestion and metabolism of proteins, fats and carbohydrates. Vitamins & Minerals- sources, daily requirement, functions, manifestations of hypo and hypervitaminosis.

PAPER- II

100 marks

PART- A

50 marks

1. Dhatu:

Etymology, derivation, definition, general introduction of term Dhatu, different theories related to Dhatuposhana (Dhatuposhana Nyaya)

2. Rasa Dhatu:

Etymology, derivation, location, properties, functions and Praman of Rasa-dhatu. Physiology of Rasavaha Srotas, Formation of Rasa Dhatu from Aahara Rasa, circulation of Rasa (Rasa-Samvahana), role of Vyana Vayu and Samana Vayu in Rasa Samvahana. Description of functioning of Hridaya. Ashtavidha Sara (8 types

of Sara), characteristics of Tvakasara Purusha, conceptual study of mutual interdependence (Aashraya-Aashrayi Bhaava) and its relation to Rasa and Kapha. Manifestations of Kshaya and Vriddhi of Rasa.

3. Rakta Dhatu:

Etymology, derivation, synonyms, location, properties, functions and Praman of Rakta Dhatu. Panchabhautikatva of Rakta Dhatu, physiology of Raktavaha Srotas, formation of Raktadhatu, Ranjana of Rasa by Ranjaka Pitta, features of Shuddha Rakta, specific functions of Rakta, characteristics of Raktasara Purusha, manifestations of Kshaya and Vriddhi of Raktadhatu, mutual interdependence of Rakta and Pitta.

4. Mamsa Dhatu :

Etymology, derivation, synonyms, location, properties and functions of Mamsa Dhatu, physiology of Mamsavaha Srotasa, formation of Mamsa Dhatu, characteristics of Mamsasara Purusha, manifestations of Kshaya and Vriddhi of Mamsa Dhatu .Concept of Peshi.

5. Meda Dhatu :

Etymology, derivation, location, properties, functions and Praman of Meda Dhatu, physiology of Medovaha Srotas, formation of Medo Dhatu, characteristics of Medasara Purusha and manifestations of Kshaya and Vriddhi of Meda.

6. Asthi Dhatu:

Etymology, derivation, synonyms, location, properties, functions of Asthi Dhatu. Number of Asthi. Physiology of Asthivaha Srotas and formation of Asthi Dhatu, characteristics of Asthisara Purusha, mutual interdependence of Vata and Asthi Dhatu, manifestations of Kshaya and Vriddhi of Asthi Dhatu.

7. Majja Dhatu :

Etymology, derivation, types, location, properties, functions and Praman of Majjaa Dhatu, physiology of Majjavaha Srotas, formation of Majja Dhatu, characteristics of Majja Sara Purusha, relation of Kapha, Pitta, Rakta and Majja, manifestations of Kshaya and Vriddhi of Majja Dhatu.

8. Shukra Dhatu:

Etymology, derivation, location, properties, functions and Praman of Shukra Dhatu, physiology of Shukraravaha Srotas and formation of Shukra Dhatu. Features of Shuddha Shukra, characteristics of Shukra-Sara Purusha, manifestations of Kshaya and Vriddhi of Shukra Dhatu.

9. Concept of **Ashraya-Ashrayi** bhava i.e. inter-relationship among Dosha, Dhatu Mala and Srotas.

10. Ojas: Etymological derivation, definition, formation, location, properties, Praman, classification and functions of Ojas. Description of Vyadhikshamatva. Bala Vriddhikara Bhava. Classification of Bala. Etiological factors and manifestations of Ojavisramsa, Vyapat and Kshaya.

- 11. Upadhatu:** General introduction, etymological derivation and definition of the term Upadhatu. Formation, nourishment, properties, location and functions of each Upadhatu.
- Stanya: Characteristic features and methods of assessing Shuddha and Dushita Stanya, manifestations of Vriddhi and Kshaya of Stanya.
 - Artava: Characteristic features of Shuddha and Dushita Artava. Differences between Raja and Artava, physiology of Artavavaha Srotas.
 - Tvak: classification, thickness of each layer and functions.
- 12. Mala:** Etymological derivation and definition of the term Mala. Aharamala: Enumeration and description of the process of formation of Aharamala.
- Purisha: Etymological derivation, definition, formation, properties, quantity and functions of Purisha. Physiology of Purishavaha Srotas, manifestations of Vriddhi and Kshaya of Purisha.
 - Mutra: Etymological derivation, definition, formation, properties, quantity and functions of Mutra. Physiology of Mutravaha Srotas, physiology of urine formation in Ayurveda, manifestations of Vriddhi and Kshaya of Mutra.
 - Sveda: Etymological derivation, definition, formation and functions of Sveda. Manifestations of Vriddhi and Kshaya of Sveda. Description of Svedvaha Srotas
 - Dhatumala: Brief description of each type of Dhatumala.
- 13. Panchagyanendriya:** Physiological description of Panchagyaanendriya and physiology of perception of Shabda, Sparsha, Rupa, Rasa and Gandha. Physiological description of Karmendriya.
- 14. Manas:** Etymological derivation, definition, synonyms, location, properties, functions and objects of Manas. Physiology of Manovaha Srotas.
- 15. Atma:** Etymological derivation, definition, properties of Atma. Difference between Paramatma and Jivatma; Characteristic features of existence of Atma in living body.
- 16. Nidra:** Nidrotpatti, types of Nidra, physiological and clinical significance of Nidra; Svapnotpatti and types of Svapna.

PART –B

50 marks

Modern Physiology

- Haemopoetic system – composition, functions of blood and blood cells, Haemopoiesis (stages and development of RBCs, and WBCs and platelets), composition and functions of bone marrow, structure, types and functions of haemoglobin, mechanism of blood clotting, anticoagulants, physiological basis of blood groups, plasma proteins, introduction to anaemia and jaundice.
- Immunity, classification of immunity: Innate, acquired and artificial. Different mechanisms involved in immunity: Humoral (B-cell mediated) and T-Cell mediated immunity. Hypersensitivity.
- Muscle physiology – comparison of physiology of skeletal muscles, cardiac muscles and smooth muscles. Physiology of muscle contraction.
- Physiology of cardio-vascular system: Functional anatomy of cardiovascular system. Cardiac cycle. Heart sounds. Regulation of cardiac output and venous

return. Physiological basis of ECG. Heart-rate and its regulation. Arterial pulse. Systemic arterial blood pressure and its control.

5. Adipose tissue, lipoproteins like VLDL, LDL and HDL triglycerides.
6. Functions of skin, sweat glands and sebaceous glands.
7. Physiology of male and female reproductive systems. Description of ovulation, spermatogenesis, oogenesis, menstrual cycle.
8. Physiology of Excretion – functional anatomy of urinary tract, functions of kidney. Mechanism of formation of urine, control of micturition. Formation of faeces and mechanism of defecation.
9. Endocrine glands – General introduction to endocrine system, classification and characteristics of hormones, physiology of all endocrine glands, their functions and their effects.

PRACTICAL

100 marks

Teaching hours-180

Ayurvedic practical

1. Assessment of Prakriti
2. Assessment of Dosha (Features of Vriddhi- Kshaya)
3. Assessment of Dhatu (Features of Vriddhi- Kshaya)
4. Assessment of Agni
5. Assessment of Koshtha
6. Assessment of Sara
7. Nadi pariksha

Modern physiology practical

1. Introduction to laboratory instruments- Simple & Compound Microscope, Scalp vein set, bulbs for blood collection, Sahli's Haemometer, Haemocytometer, pipettes, Urinometer, Albuminometer, Stethoscope, B.P. Apparatus, Harpenden's caliper, Clinical Hammer, Tuning Fork, Stop Watch, Thermometer, Centrifuge machine, ECG Machine
2. Collection of blood sample – prick, vene-puncture method, use of anticoagulants
3. Preparation of blood smear and staining
4. Estimation of Hemoglobin
5. Microscopic examination of blood
 - a. Total RBC count
 - b. Total WBC count
 - c. Differential leucocyte count
6. Packed cell volume (PCV) demonstration
7. ESR demonstration
8. Bleeding time, Clotting time
9. Blood grouping and Rh typing
10. Examination of Cardio-Vascular system
 - a. Pulse examination
 - b. Arterial blood pressure measurement
 - c. Examination of heart sounds
 - d. ECG demonstration
11. Examination of Respiratory system
 - a. Respiratory rate
 - b. Breath sounds
 - c. Spirometry
12. Examination of Nervous System- Sensory & Motor.

13. Urine examination –Physical examination, chemical examination. Test for normal constituents of urine. Detection of specific gravity and reaction of urine.

Distribution of Practical marks

1. Laboratory Practical	- 20
2. Human Experiment	- 15
3. Spotting	- 15
4. Prakriti Saradi pariksha	- 20
5. Practical Record	- 10
6. Viva- voce	- 20

REFERENCE BOOKS:-

- Ayurvediya Kriyasharir - Ranjit Rai Desai
- Kayachikitsa Parichaya - C. Dwarkanath
- Prakrit Agni Vigyan - C. Dwarkanath
- Sharir Kriya Vigyan - Shiv Charan Dhyani
- Abhinava Sharir Kriya Vigyana - Acharya Priyavrata Sharma
- Dosha Dhatu Mala Vigyana - Shankar Gangadhar Vaidya
- Prakrita Dosha Vigyana - Acharya Niranjana Dev
- Tridosha Vigyana - Shri Upendranath Das
- Sharira Tatva Darshana - Hirlekar Shastri
- Prakrita Agni Vigyana - Niranjana Dev
- Deha Dhatvagni Vigyana - Vd. Pt. Haridatt Shastri
- Sharir Kriya Vigyana (Part 1-2) - Acharya Purnchandra Jain
- Sharir Kriya Vigyana - Shri Moreshwar Dutt. Vd.
- Sharira Kriya Vijnana (Part 1 and 2) – Nandini Dhargalkar
- Dosha Dhatu Mala Vigyana - Basant Kumar Shrimal
- Abhinava Sharir Kriya Vigyana - Dr. Shiv Kumar Gaur
- Pragyogik Kriya Sharir - Acharya P.C. Jain
- Kaya Chikitsa Parichaya - Dr. C. Dwarkanath
- Concept of Agni - Vd. Bhagwan Das
- Purush Vichaya - Acharya V.J. Thakar
- Kriya Sharir - Prof. Yogesh Chandra Mishra
- Sharir Kriya Vigyana - Prof. Jayaram Yadav &Dr. Sunil Verma.
- Basic Principles of Kriya-Sharir (A treatise on Ayurvedic Physiology) by Dr. Srikant Kumar Panda
- Sharir Kriya – Part I & Part II – Dr. Ranade, Dr. Deshpande & Dr. Chobhe
- Human Physiology in Ayurveda - Dr Kishor Patwardhan
- Sharirkriya Vignyan Practical Hand Book– Dr.Ranade, Dr.Chobhe, Dr. Deshpande
- Sharir Kriya Part 1 – Dr.R.R.Deshapande, Dr.Wavhal
- Sharir Kriya Part 2 – Dr. R.R.Deshapande, Dr.Wavhal
- Ayurveda Kriya Sharira- Yogesh Chandra Mishra
- Textbook of Physiology - Gyton & Hall
- A Textbook of Human Physiology – A.K.Jain
- Essentials of Medical Physiology - Sembulingam, K.
- Concise Medical Physiology - Chaudhari, Sujit K.
- Principals of Anatomy & Physiology - Tortora & Grabowski
- Textbook of Medical Physiology- Indu Khurana

1.4 RACHNA SHARIR (ANATOMY)

**Theory- Two Papers-200 Marks-(100 marks each)
Teaching Hours-180 hours**

PAPER-I

100 marks

PART-A

50 marks

1. Shariropkramaniya Shaarira

Sharira and shaarira vyakhya (definitions of sharira and shaarira), shadangatvam (six regions of the body), anga pratyanga vibhaga (sub divisions). Mrita sharir samshodhan. Shaarira shastra vibhaga, shaarira gyan prayojana . Constitution of purusha according to dhatubheda, panchabhautikatvam, trigunatmakatvam, tridoshamayatvam, karma purusha, and doshadhatumala-mulakatvam.

2. Paribhasha Shaarira

Kurcha, kandara, jala, asthisanghat, seemanta, seevani, rajju, snayu and lasika.

3. Garbha Shaarira

Garbha definitions, explanation of shukra, artava, garbhadhana. Role of tridosha and panchmahabhuta in the fetal development. Beeja, beejabhaga and beejabhagavayava, linga vinischaya, masanumasika garbha vriddhi-krama, garbhottpadakbhava, garbhavridhdikara bhava, garbha poshana, apara nirmana , nabhinadi nirmana. Aanga pratyanga utpatti.

4. Pramana Shaarira: Anguli pramana.

5. Asthi Shaarira

Asthi vyakhya, number, types, asthi swaroota, vasa, meda and majja.

6. Sandhi Shaarira

Sandhi vyakhya, numbers, types of asthi sandhi.

7. Sira, Dhamani, Srotas Shaarira

- Definition, types and number of sira and dhamani.
- Description of Hridaya.
- Srota shaarira: Definition, types of srotas and srotomula.

8. Peshi Shaarira

- Peshi vyakhya, structure, types, number and importance.
- Description of Peshi.

9. Koshtha Evam Ashaya Shaarira

- Definition of koshta and number of koshtanga.
- Types and description of ashaya.

10. Kalaa Shaarira

Kalaa: definition and types.

11. Uttamangiya Shaarira

Shatchakra, ida, pingala and sushumna nadi - brief description.

12. Marma Shaarira

Marma: definition, number, location, classification, clinical importance with viddha lakshana. Explanation of trimarmas. Detail description of marmas.

13. Indriya Shaarira

Definition of indriya, indriya artha and indriya adhisthan, their number and importance. Description of gyanendriya, karmendriya and ubhayendriya (manas).

PART-B

50 marks

1. Definition and branches of anatomy. Preservation methods of the cadaver.

2. Anatomical Terminologies

Anatomical position, Planes, and explanation of anatomical terms related to skin, fasciae, bones, joints and their movements, muscles, ligaments, tendons, blood vessels, nerves,.

3. Embryology

Definitions and branches of embryology. Embryo and fetus. Sperm and ovum, fertilization. Cleavage. Germ layers formation and their derivatives. Laws of heredity, Sex determination and differentiation, Month-wise development of embryo. Foetal circulation, placenta formation, Umbilical cord formation.

4. Osteology

Bone: Definition, ossification, structure and types. Description of bones with clinical anatomy.

5. Arthrology

Joints: Definition, structure types and movements. Description of joints of extremities, vertebral joints and temporomandibular joint with their clinical anatomy.

6. Cardiovascular system

- a. Definition, types and structure of arteries and veins.
- b. Description of heart and blood vessels with their course and branches.
- c. Pericardium with applied aspect.

7. Lymphatic system

Definition, types and structure of lymph vessels, lymph glands with their clinical aspect.

8. Myology

- a) Structure and types of muscles.
- b) Description of muscles; their origin, insertion, actions, nerve supply and clinical anatomy.

Paper II

100 marks

Part A

50 marks

1. Respiratory System

- a. Bronchial tree and lungs with their clinical aspects.
- b. Respiratory tract: nasal cavity, pharynx, larynx, trachea, bronchial tree.
- c. Pleura with its clinical aspects.
- d. Diaphragm.

2. Digestive system

- a. Organs of digestive tract (alimentary tract) with their clinical aspects.
- b. Digestive glands: liver, spleen and pancreas.
- c. Description of peritoneum with its clinical aspects.

3. Urinary System

Urinary tract: kidney, ureter, urinary bladder and urethra with their clinical aspects.

4. Reproductive system

- a. Male Reproductive system: reproductive organs, tract and glands (prostate and seminal vesicles) with their clinical aspects.
- b. Female reproductive system: reproductive organs, tract and glands with their clinical aspects.

5. Endocrinology

Definition, classification & description of endocrine glands (pituitary, thyroid, parathyroid, thymus and suprarenal glands) with clinical aspects.

PART B

50 marks

6. Nervous System

Nervous system: definition, classification and its importance. Description of brain and spinal cord.

Description of peripheral nervous system: cranial and spinal nerves, nerve plexuses, and autonomic nervous system, formation and circulation of cerebrospinal fluid and blood supply of brain and spinal cord.

7. Sensory organs

Description of structures of eye, ear, nose, tongue and skin with their clinical aspects.

8. Surface and radiological anatomy

- a. Study of radio-imaging of limbs, abdomen, pelvis and vertebral column with its clinical application.
- b. Surface anatomy of thoracic and abdominal viscera.

PRACTICAL

100 marks

Teaching hours: 180

Content of practical

1. Practical study of bones
2. Practical study of organs
3. Practical study of surface and radiological anatomy.
4. Shava vichhedana – detailed dissection of the whole body.
5. Practical study of location of marma
6. Demonstration of histology slides (10 slides)

Distribution of marks

- | | |
|--|----------|
| 1. Spotting - | 20 marks |
| 2. Dissected organs and histology slides - | 20 Marks |
| 3. Bones, joints, marma - | 20 Marks |
| 4. Surface & radiological anatomy - | 10 Marks |
| 5. Practical records - | 10 Marks |
| 6. Viva-Voce - | 20 Marks |

Total

100 Marks

Reference Books :-

S. No.	Name of Book	Author
1.	Brihat Shariram Vaidyaratna-	P.S. Varrier
2.	Abhinava Shariram-	Acharya Damodar Sharma Gaur
3.	Manava Sharir (Revised Edition)-	Prof. Dinkar Govind Thatte
4.	Manava Bhruna Vigyana -	Prof. Dinkar Govind Thatte
5.	Manava Anga Rekhankan Vikrian -	Prof. Dinkar Govind Thatte
6.	Sharir Rachana Vigyan (English)-	Vaidya P.G. Athawale
7.	Manual of Practical Anatomy Cunnigham	Practical Manual Vol-1, Vol-2, Vol-3
8.	Clinical Anatomy in Ayurveda -	Prof. D.G. Thatte & Prof. Suresh Chandra
9.	Sharir Rachna Vigyan (English)-	Prof. D.G. Thatte
10.	Ayurvedic Human Anatomy -	Prof. Dr. Giridhar M. Kanthi
11.	Regional Anatomy -	B. D. Chaurasia
12.	Rachana Sharir Vigyana -	Dr. Mahendra Sing
13.	relevant chapters of Brihtrayee and Laghuthrayee	
14.	Gray's Anatomy	
15.	Text Book of Human Anatomy-	Inderbir Singh
16.	Clinical Anatomy-	Richard S Snell
17.	Fundamentals of Human Anatomoy-	Dr. Chakraborty
18.	Human Osteology -	Poddar

1.5 Maulik Siddhant avum Ashtang Hridaya
(Basic Principles and Ashtang Hridaya- An ancient text of Ayurveda)

Theory- One Paper- 100 marks
Teaching Hours -120 hours

Part A **60 marks**

Ashtang Hridaya Sutrasthana Adhyaya 1 to 15

Part B **40 marks**

1. Ashtang Hridaya Sutrasthana Adhyaya 16 to 30
2. Description of Ashta Prakriti
3. Shastra Lakshan (Tantra), Tantraguna, Tantradosha, Tachitalya, Arthasraya, Kalpana

Reference Books:

1. Astang Hridaya : Hindi commentary by Lalchanda Vaidya
2. Astang Hridaya : Hindi commentary by Vd. B.L. Gaur
3. Astang Hridaya : English commentary by Dr. T. Sreekumar
4. Astang Hridaya : English commentary by Dr. Vishwavasud Gaur
5. Astang Hridaya : Sanskrit commentary by Hemadri
6. Astang Hridaya : Sanskrit commentary by Arunadatta

CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI

SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE

INDEX

2ND PROFESSIONAL

1.1	DRAVYAGUNA VIGHYAN	2-9
1.2	ROGA NIDAN	10-14
1.3	RASASHATRA	15-23
1.4	CHARAK SAMHITA	24

2.1 DRAVYAGUNA VIGYAN
(PHARMACOLOGY & MATERIA MEDICA)

Lectures: 200 Hrs.

Practicals: 200 Hrs.

Total Marks -400

Theory Two Papers– 100 Marks Each

Practical/Viva voce – 200 Marks

Paper I

100 Marks

Part A

50 Marks

1- Dravyaguna Shastra Paribhasa- Lakshana of Sapta Padartha of Dravyaguna Vijnana viz Dravya- Rasa-Guna- Virya- Vipaka- Prabhava and Karma.

2- Dravya:

Etymological derivation, definition, panchbhoutikatwa.

Classification of Dravya according to Samhitas and Nighantus Taxonomical classification.

3- Guna:

Etymological derivation, definition and Classification of Guna.

Detailed knowledge of Gurvadi Guna & Paradi gunas.

4- Rasa:

Etymological derivation, definition, Meaning of "Rasa" in various contexts. Shad Rasas (Madhura, Amla, Lavana, Katu, Tikta, and Kashaya), Panchabhautik constitution of Rasas, Nirvrittivisheshakrama (manifestation in general and particular), Ritu and shad rasa Rasanurasayoh bheda (Difference between rasa and anurasa), Lakshana (characteristics),Guna and Karma of shad Rasas, Kopana and Shamana of Dosha and dushya by Shad rasas. Effects of excess usage of Rasa. Rasopalabधि, Rasaskandha.

5- Vipaka:

Etymological derivation and definition, difference between Avasthapaka and Vipaka, Types of Vipaka, (Dvidha-Trividha,Panchavidha) Guna and karma of Vipaka.

Grades of Vipaka (taratamya), Vipakopalabधि hetu (Factors to determineVipaka).

6- Veerya:

Etymological derivation, definition and Swarupa of Virya, Number of Virya.

(Dvidha & Ashtavidha), Panchabhauthikatva

Virya karmani (Effects of Virya), General principles in determination of virya along with exceptions.

7- Prabhava:

Definition, Effects of Prabhava.

8- Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava with respect to their strength (balabal nirupana). Samanapratyayarabdha and Vichitrapratyayarabdha dravyas.

9- Karma:

Lakshana, swarupa and bheda of karma (Definition, nature and types of action).

Explanation of the following Karmas with examples:

- | | | |
|-----------------|----------------|-----------------|
| 1. Deepana | 2. Pachana | 3. Samshodhana |
| 4. Samshamana | 5. Anulomana | 6. Sransana |
| 7. Bhedana | 8. Rechana | 9. Chhedana |
| 10. Lekhana | 11. Grahi | 12. Sthambhana |
| 13. Madakari | 14. Pramathi | 15. Abhishyandi |
| 16. Vyavayi | 17. Vikashi | 18. Rasayana |
| 19. Vajeekarana | 20. Jeevaneeya | 21. Balya |
| 22. Brimhana | 23. Langhana | 24. Medhya |

10. Brief information on Karmas of dashemani gana of Charak Samhita.

11- Mishraka Gana:

11a)- Audbhida Gana (Vegetable origin) Brihatpanchamoola, Laghupanchamoola, Vallipanchamoola, Kantakapanchamoola, Trinapanchamoola, Madhyamapanchamoola, Jeevaneeya panchamoola, Panchapallava, Panchavalakala, Triphala, Trikatu, Trimada, Chaturusana, Panchakola, Shadusana, Chaturbeeja, Jeevaniya gana, Ashtavarga, Trijataka, Chaturajataka, Katuchaturjataka Panchatikta, Amlapanchaka, Chaturbhadra, Trikarshika, Swalpatriphala, Madhuratriphala, Mahavisha, Upavisha, Agrya aushadh varga- Knowledge of Agrayaushadha Varga with example.

11 b)- Jangama Gana (Animal origin)- Ksheerashtaka, Mutrashtaka, Pitta panchaka.

11 c)- Parthiva Gana (Mineral origin) - Lavana Panchaka, Kshara dvaya, Kshara Ashtaka.

12- Basis of nomenclature:

Basis of nomenclature of dravya, Basis and Derivation of synonyms.

13. Bheashaja Pariksha vidhi (as described in Charaka samhita vimana sthana 8), Dravya Sangrahana (collection of dravya)- Ecology- Classification of desha (geographical area) and bhumi (soil), swarupa of sangrahaniya dravya of (Nature and quality of drug to be collected). Sangrahana vidhi (Method of collection) -Vegetable and Animal origin drugs according to part used. Period of collection according to virya, samrakshana vidhi (preservation of collected dravyas), bheshajagara (Storehouse), study on different prayojyanga (useful plant parts).

Part B**50 Marks****(I)****20 Marks**

14 a) Concept of dravya shodhan (purification of dravya).

14 b) Brief knowledge of Apamishran (adulterants)

14 c) Concept of Abhava pratinidhi dravya (substitutes)

15- Prashasta bhesaja (ideal drug), plant extracts. Concept of viruddha Dravya (incompatibility of the dravya).

16- Introduction to Nighantu Vigyan - Dhanwantari Nighantu, Bhavaprakashanighantu, Rajanighantu.

17- Brief knowledge of cultivation, conservation of medicinal plants and information about endangered species.

(II)**30 Marks**

18. - Introduction, Definition & scope of Pharmacology and Principles of general Pharmacology. Brief Knowledge about pharmacology of the following - Anaesthetics, CNS depressants, Sedatives, Hypnotics, Tranquilisers, Antipyretics, Analgesics, Antiepileptics, Antihypertensive, Antianginal, Antiplatelet, Hypolipidaemic, Haemopoetic, Coagulants, Bronchodilators, Aerosols/ Inhalants, Expectorants, Digestants, Carminatives, Antacids, Antiulcer, Laxatives, Antidiarrhoeals, Antiemetic, Hepatoprotective, Diuretic, Antidiuretic, Lithotriptic, Antiinflammatory, Hormonal therapy, Antiobesity, Antidiabetic, Antithyroid, Oxytocic. Galactagogues, Contraceptives, Styptics, Antihistamines, Antimicrobial, Antibiotics, Antimalarial, Amoebicidal, Antifilarial, Anthelmintic, Antifungal, Vitamins, Minerals, Water imbalance and IV fluids, Vaccines, antivenom, antirabies serum, Local anti septics, drugs in ophthalmic practice, Anti cancer drugs and immunomodulators.

Paper II**100 Marks****Part A****70 marks****1-Detailed Knowledge of Following Dravya –**

- 1- Detailed knowledge of following drugs with respect to Basonym of drug, Main Synonyms, Regional Name, Botanical Name, Family, Classification of Dravya (Gana) as described in Charak and Sushrut, External morphology, Useful parts, Important phytoconstituents, Rasa panchaka, Action on Dosha, Dhatu, Mala, Prayogarha vyadhi (therapeutic indications), Amayikaprayoga and Matra (Therapeutic administration and Dose), Vishishta yoga (names of important formulations), Vishakta Lakshan (adverse effects), Chikitsopachara (remedial measures) and Shodhana (as required)

[Alphabetical order and Botanical names to all the drugs are to be added]

Agaru	Guggulu	Pashanabheda
Agnimantha	Haridradvaya	Patala
Agnimantha	Haritaki	Pippali-Pippalimula
Ahiphena	Hingu	Prishniparni
Amalaki	Jambu	Punarnava
Apamarga	Jatamansi	Pushkarmoola
Aragvadha	Jatiphal	Rasna
Aragvadha	Jeerakadvaya	Rasona
Ardraka-Sunti	Jyotishmati	Rohitaka
Arjuna	Kalamegha	Saireyaka
Arjuna	Kampillaka	Sarivadvaya
Arkadvaya	Kanchanara	Sarpagandha
Ashvagandha	Kantakari	Shalaparni
Asoka	Kapikacchu	Shallaki
Ativisha	Karkatakshringi	Shalmali
Bakuchi	Karpura	Shankhapushpi
Baladvayam.	Katuki	Shatavari
Bhallataka	Khadira	Shigru
Bharangi	Kiratatikta	Shirisha
Bhrungaraj	Kumari	Shyonaka
Bibhitaka	Kumkum Kesara	Talisa Patra
Bijak/ Vijaysar	Kupilu	Tila
Bilva	Kushta	Trivrut
Brahmi	Kutaja	Tulasi
Bruhati	Lavanga	Tvak
Chandanadvaya,	Lodhra	Ushira
Chitraka	Madanaphala	Vacha
Dadima	Mandukaparni.	Varahi
Devadaru	Manjishtha	Varahi
Dhataki	Maricha	Varuna
Durva	Musta	Vasa
Eladvayam	Nagakeshara	Vatsanabha
Eranda	Nimba	Vidanga
Gambhari	Nirgundi	Vidari
Gokshura	Palasha	Yastimadhu
Guduchi	Parpata	Yavani

Part B-

II- Brief Knowledge of following dravyas with Respect to Sanskrit Name, Botanical Name, Family, Habit (Samanya Swarupa), Parts Used and Indications.

Agastya	Jati	Palandu
Ajamoda	Jayapala	Parasika Yavani
Akarkarabh	Jeevanti	Parijata
Amlavetasa	Kadali,	Parisha
Amra	Kadamba	Parnabija

Amragandhiharidra	Kaidarya	Parnayavani
Ankola	Kakamachi	Parpataka
Aparajita	Kamala	Parushaka
Ashvagol	Kankola	Patalagarudi
Ashvattha	Karanja	Patha
Asthishrunkhala	Karavellaka	Patola
Atasi	Karavira	Patranga
Avartaki	Karira	Pilu
Avartani	Karpasa	Plaksha
Babbula	Kasamarda	Prasarani
Badara	Kasha	Priyala
Bakula	Kasni	Priyangu
Bhumyamalki	Kataka	Puga
Bijapoor	Katphala	Putiha
Bola	Kebuka	Putranjivaka
Chakramarda	Kharjura	Rajika/Sarshapa
Champaka	Kitmari	Rohitaka
Chandrashura	Kokilaksha	Saptachakra
Changeri	Koshataki	Saptaparna
Chavya	Kulatha	Saral
Chirbilva	Kumuda	Sarja
Chopachini	Kusha	Shala
Danti	Kusmanda	Shara
Darbha	Lajjalu	Sharapunkha
Dattura	Langali	Shatahwa
Dhanvayasa	Latakaranja	Shati
Dhanyaka	Latakasturi	Snuhi
Draksha	Madayantika	Sringataka
Dronapushpi	Mahanimba	Svarnakshiri
Gandhaprasarini	Mandukaparni	Tagara .
Garjara	Markandika	Tailaparni
Gojihva,	Masha	Talmuli
Gorakshaganja	Mashaparni	Taruni
Gunja	Matulunga	Tavakshira
hinsapa	Mayaphala	Teja Patra
Hinstra	Meshashrungi	Tuvaraka
Hribera	Methika	Udumbara
Hrutpatri	Mudgaparni	urana
Ikshu	Mulaka	Vamsha
Indravaruni	Murva	Vata
Ingudi	Nagabala	Vatada
Irimesa	Nala	Vrudhadaru
Ishvaku	Narikela	Vrukshamla
Isvari	Nili	
Japa	Padmaka	

III .-Introduction, Guna, Karma and Uses of following Jantava Dravya (Drugs of Animal Origin).

1. Kasturi

2. Goroohana

3. Mrigasringa

IV- Introductory Knowledge of Following Annapana Varga:

- | | | |
|----------------|---------------------|----------------------|
| 1. Jala Varga | 2. Dugdha Varga | 3. Madhu Varga |
| 4. Taila Varga | 5. Sukadhanya Varga | 6. Shamidhanya Varga |
| 7. Phala Varga | 8. Shaka Varga | 9. Mamsa Varga |
| 10. Aharayogi | | |

PRACTICALS

1. A. Study of Macroscopic, Microscopic characters and Demonstration of organoleptic characteristics and grahya-agrahyatva of following plants and their useful parts.
 - i. Kanda (stem) - Guduchi or Ashtishrinkhala
 - ii. Patra (leaves) - Vasa or Kumari
 - iii. Pushpa (flower and Parts of flower)- Dhataki or Japa
 - iv. Phala (fruit) – Maricha or Madanaphala or Vidanga
 - v. Beeja (seeds) – Eranda or Kapikacchhu
 - vi. Twak (bark) – Kutaja or Arjuna or Ashwattha
 - vii. Moola(Root)- Punarnava or Chitraka
 - viii. Nirayasa (exudate) – Guggulu or Mocharasa
 - ix. Jangama dravya - Madhu or Ghrita.
2. Records of Herbarium sheets of 50 medicinal plants Compulsory study tour other state/s for field knowledge and procurement of plant species.

PRACTICAL MARKS DIVISION

1	Herbarium	20 Marks
2	Practical record	20 Marks
3	Drug identification- spotting –Raw/crude drugs	30 marks
4	Plant identification spotting –fresh	30 marks
5	Practical	40 marks
6.	Viva-Voce	60 Marks
Total		200 marks

Reference Books

- | | | | |
|-----|---|---|--|
| 1. | Abhinav Buti Darpan (Vol.1-2) | - | Vd. Roop Lal Vaishya |
| 2. | Aushadna Vigyana Shastra | - | Acharya Pt. Vishvanatha Dwidevi |
| 3. | Ayurvediya Aushadnkarma vigyana | - | Acharya V.J. Thakur |
| 4. | Bedi Vanaspati Kosha | - | Prof. Ramesh Bedi |
| 5. | Bhaishajyaguna Vigyana | - | Dr. Alakhnarayan Singh |
| 6. | Bhav Prakash Nigantu (English) | - | Shreekanthamurti |
| 7. | Bhav Prakash Nighantu | - | With Vd. Krishna Chandra
Chunekar commentary |
| 8. | Bhrinad dravyagunadarsha | - | Mahendra Kumar Shastri |
| 9. | Classical Uses of Medicinal Plants | - | Acharya Priyavrata Sharma |
| 10. | Controversial Medicinal Plants | - | Vd. G. Bapa Lal |
| 11. | Dalhana Ka Dravyaguna Shastra Ke
Kshetra Me Yogadana | - | Vd. Shiv Kumar Vyas |
| 12. | Dravyaguna Kosha | - | Acharya Priyavrata Sharma |
| 13. | Dravyaguna Sutram | - | Acharya Priyavrata Sharma |
| 14. | Dravyaguna Vigyana | - | Dr. Gyanendra Pandey |
| 15. | Dravyaguna Vigyana(Vol. 1-2) | - | Acharya Yadavji Tikram Ji |
| 16. | Dravyaguna Vijyana | - | Dr. V.M. Gogate |
| 17. | Dravyaguna Vigyana (Vol. 1-5) | - | Acharya Priyavrata Sharma |
| 18. | Dravyaguna Shastrum | - | Vaidya G.A. Phadake |
| 19. | Dravyaguna Vijyana | - | Dr. A.P. Deshpande |
| 20. | Dravyagunavijnana basic Principles | - | Prof.D.S.Lucas |
| 21. | Forgotten Healers (Indian Medicinal
Plants) | - | Dr. Prakash Pranjape |
| 22. | Glossry of Vegetable Drugs in
Bhritrtrayis | - | Thakur Balwant Singh & Vd.
Krishna Chandra Chunekar |
| 23. | Introduction to Dravyaguna | - | Acharya Priyavrata Sharma |
| 24. | Kriyatamka Aushadi Parichaya | - | Acharya Pt. Vishvanath Dwidevi |
| 25. | Materia Medica | - | Acharya Ghosh |
| 26. | Nighantu Adarsh (Vol. 1-2) | - | Vd. Bapa Lal |
| 27. | Pharmacological basis of Medical
Practice | - | Goodman & Gillman |
| 28. | Pharmacology and
Pharmacotherapeutics | - | Satoskar Bhandarkar & Ainapure |
| 29. | Prayogatamaka Dravyaguna Vigyana | - | Dr. Maya Ram Uniyal |
| 30. | Priya nighantu | - | Acharya Priyavrata Sharma |
| 31. | Raspanchaka/Dravyaguna Siddhanta | - | Prof. Shivcharan Dhyani |
| 32. | System of Plant Nomenclature in
Ayurveda | - | Dr. Gyanendra Panday |
| 33. | Text Book of Pharmacognosy | - | Trees & Valis |
| 34. | Textbook of Dravyaguna | - | Dr.K.Nishteswar |
| 35. | Unani Dravyaguna Vigyana | - | Hakim Daljeet Singh |

- | | | |
|---|---|---------------------------|
| 36. Useful parts of Charaka, Sushurut,
and Vagbhata. | - | |
| 37. Uttarakand Ki Vanaspatiya | - | Dr. Gyanendra Pandey |
| 38. Vanoaushadi Darshika | - | Thakur Balwant Singh |
| 39. Vanoaushadi Nidarshika | - | Dr. Ram Sushil Singh |
| 40. Vedic Vanaspatiyam | - | Dr. Dinesh Chandra Sharma |

*

2.2 ROGA NIDANA

Theory Two Papers – 100 Marks Each
Practical/Viva voce – 100 Marks

PAPER -1

100 Marks

Part A

50 Marks

I. Dosha Dushyadi Vigyan

1. Definition and importance of Roganidana.
2. Samanya Nidana and Samanya Lakshana of Dosha Vriddhi, Kshaya and Prakopa.
3. Dosha Dhatu Ashraya Ashrayi Bhava.
4. Dhatu Kshaya Vriddhi Lakshana.
6. Mala Kshaya Vriddhi Lakshana.
7. Hetu, Bheda and Lakshana of Agni Dushti.
8. Definitions and Samanya Lakshana of Ama.
9. Sama and nirama Dosha, Dushya Lakshana.
10. Dosha Paka and Dhatu Paka Lakshana.
11. Concept, classification, diagnosis and general complications of Avarana.
12. Doshagati and Rogmarga.
13. Detailed study of Srotomoola and Srotodushti Samanya and Vishishta Hetu Lakshana of all Srotas. Differences between Sroto Dushti and Kha Vaigunya.

II. Vyadhi Vigyan

1. Definition, synonyms and classification of Vyadhi & Vyadhi Ghatak.
2. Criteria for nomenclature of Diseases in Ayurveda (Vyadhinamakarana).
3. Bija, Bija Bhaga and Bija Bhaga Avayava Dushti.
4. Basic knowledge of Hereditary, Congenital, Acquired, Multifactorial, Traumatic and Environmental disorders.
5. Introduction to ICD Classification of Diseases of WHO and DSM classification.
6. Samanyaja and Nanatmaja Vikara. NidanarthakaraVyadhi, Hetu Sankara, Lingasankara, Vyadhisankara, Vyadhi Awastha.
7. Dhatu, Updhatu, Mala and Indriya Pradoshaj Vikara.
8. Concept of AshtaMahagada .
9. Introduction to Ashta Nindita.
10. Definition and classification of Vyadhikshamatva.
11. Ojas – types of Ojo Dushti- Visrimsa- Vyapad & Kshaya & It's Diseases.

III. Basic Pathology

1. Introduction to pathology and its sub-divisions.
2. Introduction to Cell Injury and Cellular adaptations.
3. Definition and brief description of inflammation – Healing/repair.
4. Definition and brief description of edema – shock – hemorrhage, Thrombosis , embolism, Ischemia and Infarction.
5. Types of Immunity – different types of immune responses in the body – Basic knowledge of auto immune diseases, Acquired immune deficiency disease and hypersensitivity.
6. Nomenclature and classification of tumors - difference between benign and malignant tumors.
7. Introduction to Nutritional disorders – disorders of macro and micro nutrients.
8. Introduction to infections.

9. Introduction and classification of microorganisms such as virus- bacteria-fungus.

Part B

50 Marks

IV. Nidana Panchaka Vigyana

1. Difference between Roga and Rogi Pariksha.
2. Importance of Nidan Panchaka.
3. Hetu - Definition, Synonyms and Classification.
4. Purva Rupa – Definition, Synonyms, Samanya and Vishishta Purvarupa.
5. Rupa - Definition, Synonyms, Samanya and Pratyatma Lakshana. Difference between Vyadhi and Lakshana.
6. Upashaya / Anupashaya– Definition, Types and its importance in diagnosis.
7. Samprapti – Definition, Synonyms and Type and Samprapti Ghataka.
8. Shat Kriyakaala. Relationship between Nidana Panchaka and Shat Kriyakaala.
9. Upadrava and Udarka.
10. ArishtaVigyan – Definition, Types and its importance.
11. Sadhyasadhyatwa – Types, their parameters and importance.
12. General diagnostic principles of AnuktaVyadhi (Ch. Vi. 4).

V. Pariksha Vigyana

1. Importance and knowledge of Aptopadeshadi & Darshanadi Trividha, Chaturvidha, and Shadvidha Pariksha.
2. Importance and Knowledge of Ashtasthana Pariksha.
3. Importance and Knowledge of Karanadi Dashavidha Parikshya Bhava.
4. Importance and Knowledge of Dashavidha Pariksha.
5. Basic knowledge of ECG, USG, X Ray, CT Scan, MRI.

Paper II

100 Marks

Part A

50 Marks

Systematic study of Nidana Panchaka of following diseases (Including Upadrava, Arishta and Sadhyasadhyata).

I. Diseases of Rasavaha Srotas

- 1(a) Jwara(Jwarabheda-Ama, Pachyamana and Nirama Jwara,Agantukajwara, Punaravartaka Jwara,Vishama Jwara, Dhatugata Jwara, Charakokta Sannipata Jwara.
- 1(b) General mechanism of Fever, Introduction to the Aetiopathogenesis of Malaria,Typhoid, Dengue fever, Influenza and Chikungunya.
- 2(a) Pandu, Amavata, Hridroga, Shotha.
- 2(b) Introduction to Anaemia & its Classification, Rheumatic fever, Rheumatoid Arthritis, Hypertension, Angina, Ischaemic Heart Disease, Myocardial Infarction and CCF.

II. Diseases of Raktavaha Srotas

1. Kamala - Raktapitta - Vatarakta – Kroshtuksheersha - Shitapitta – Maha Kushtha – Visarpa – Shwitra and Introduction to Kshudra Kushtha.
2. Introduction to Hepatomegaly, Spleenomegaly, Leukaemia, Thalessemia, Sickle cell Anaemia.
3. Introduction to Urticaria, Psoriasis, Eczema, Pemphigus.

III. Diseases of Mamsavaha Srotas

- (a) Galganda
- (b) Introduction to Thyroid disorders

IV. Diseases of Medovaha Srotas

1. Sthoulya - Karshya – Prameha.
2. Introduction to Obesity and Diabetes Mellitus.

V. Diseases of Asthi – Majjavaha Srotas

1. Vatavyadhi - Akshepaka - Apatanaka - Ardita - Pakshaghata – Gridhrasi –Vishwachi, Avabahuka, - Manyasthambha ,Katigraha,Pangutwa
2. Sandhigatavata, Asthi-Majjagata vata.
3. Introduction to Osteo- Arthritis, Osteoporosis.
4. Introduction to Parkinson’s disease, Stroke, Lumbago- Sciatica syndrome, Bell’s Palsy, Cervical- Lumber & Ankylosing Spondylitis.

VI. Diseases of Shukravaha Srotas

1. Introduction to Klaibya and Vandhyatva.
2. Introduction to male and female infertility.

Part B

50 Marks

VII. Diseases of Pranavaha Srotas

- 1(a). Kasa - Shwasa - Hikka – Urahkshata – Shosha – Rajayakshma.
- 1(b). Introduction to the aetiopathogenesis of Pneumonia, Pleural effusion, Bronchitis, Bronchiectasis, Bronchial Asthma.

VIII. Diseases of Annavaha- PureeshavahaSrotas

1. Agnimandya - Ajirna - Aruchi- Chhardi - Amlapitta- Shoola – Parinama Shoola – AnnadravaShoola- Atisara – Pravahika - Grahani –Gulma- Udara Roga.
2. Introduction to Anaha, Adhmana, Atopa, Visuchika Alasaka, Vilambika.
3. Introduction to Peptic Ulcer, Irritable Bowel Syndrome (IBS) Diarrhoea, Dysentery, Constipation, Inflammatory Bowel Diseases.

IX. Diseases of Udakavaha Srotas

- 1(a) Introduction to Trishna, Daha.
- 1(b) Introduction to water and electrolyte imbalance disorders.

X. Diseases of Mutravaha Srotas

- 1(a) Mutrakrichha – Mutraghata.
- 1(b) Introduction to Urinary Tract Infection, Nephropathies.

XI. Diseases of Swedavaha Srotas

- 1(a) Introduction to Khalitya, Palitya.

XII. Diseases of Manovaha Srotas

- 1(a) Apasmara, Unmada, Atatwabhinivesha-Vishada, Anidra, Mada, Murchha, Sanyasa.
- 1(b) Introduction to Epilepsy, Depression, Anxiety neurosis.

XIII. Upasargjanya Vyadhi (Communicable diseases)

- 1(a) Romantika – Masurika – Upadamsha – Phiranga.
- 1(b) Introduction to Measels, Chickenpox, Leprosy, Tuberculosis and AIDS.

XIV. Krimi Vigyana

- 1) Definition, classification of Krimi and features of Krimiroga
- 2) Snayuka, Shleepada.
- 3) Introduction of Filariasis and classification of common parasites.

PRACTICAL

(100 Marks)

i) Fundamental Principles of Laboratory Tests

Introduction to laboratory, Sterilization, glass wares, solutions reagents and safety procedures, Disposal of biomedical wastes.

ii) Haematology

- 1 Haemoglobin estimation.
- 2 Blood cells counting - WBC, RBC, platelets.
- 3 Hematocrit /Packed cell volume (PCV).
- 4 Erythrocyte indices - MCV, MCH, MCHC.
- 5 Peripheral blood smear, staining technique and differential leucocyte count.
- 6 Peripheral blood film examination in Anemia, Leukemia, Malaria, Filariasis (Demonstration).
- 7 ESR.
- 8 Screening test for bleeding disorders- bleeding time (BT), Clotting time (CT), Demonstration of Prothrombin time (PT).
- 9 Blood grouping - ABO system, Rh typing (Rhesus system).

iii) Urine Examination

1. Ayurveda anusara mutrapariksha.
2. Physical Examination - Volume, Reaction (Ph) & Specific Gravity.
3. Chemical Examination for - Proteins, Glucose, Phosphate, Ketone, Bile salts, Bile pigment.
4. Dipstick examination
5. Demonstration of Microscopic Examination.

iv) Stool Examination

- 1 Ayurveda anusara purishapariksha.
- 2 Physical examination, Sama-Nirama Pariksha.
- 3 Microscopic examination of ova & cyst (Demonstration)
- 4 Occult Blood Test.

v) Demonstration of Sputum Examination

- 1 Ayurveda anusara sthivanapariksha.
- 2 Physical, Chemical and Microscopic Examination of the sputum.
- 3 Sample collection and Demonstration of AFB.

vi) Demonstration of Semen examination

- 1 Ayurveda anusara Retaspariksha.
- 2 Semen examination.

vii) Biochemical Examination – (Demonstration)

Blood Glucose, Serum Bilirubin, Blood Urea, Lipid Profile, Serum Creatinine, Serum Uric acid etc.

viii) Demonstration of different staining techniques in microbiology.

ix) Demonstration of Sero-immunological Investigations: RA and Widal.

x) Laboratory record – maintenance of laboratory record book.

Bed side Practical (Clinical Methods)

1. Introduction and demonstration of clinical methods (General and Systemic Examination).
2. Practical demonstration of examination of Roga based on Pancha Nidana.
3. Demonstration of instruments used for clinical examination.
4. Practical records of clinical examination of at least 20 long cases in I.P.D including Aturbala-pramana pareeksha.
5. Practical records of clinical examination of at least 20 short Cases based on Ashta vidha pariksha in O.P.D.

6. Demonstration of ECG, USG and Radio imaging techniques.

Distribution of Marks for final Practical Examination

1. Daily Record -10 Marks
2. Identification of Instruments -10 Marks
3. Laboratory Experiments -20 Marks
4. Short Case -10 Marks
5. Long Case -20 Marks
6. Viva - Voce -30 Marks

Total 100 Marks

Reference Books

1. Madhava Nidana (Madhukosha Pt. Yadunandan Upadhyay Commentary) Part 1 – 2
2. Doshakaranatwa Mimamsa - Acharya P.V. Sharma
3. Nadi Darshan - Vd. Tara Shankar Mishra
4. Nadi Vigyana Vidyotini Hindi Tika
5. Nadi Vigyan- Shri Satya Dev Vashisht
6. Nadi Vigyan- Gangadhar Tika
7. Rogi Pariksha vidhi Acharya- Priyavrata Sharma
8. Ayurvediya Roga Vargikaran- Vd. Ramanath Dwivedi & Vd. Gurdip Singh.
9. Ayurvediya Nidan Evum Chikitsa Ke Siddhanta - Prof. Ram Harsh Singh.
10. Relevant portions of Charak Samhita, Sushrut Samhita and Vagbhata.
11. Text Book of Pathology- William Boyds.
12. Text Book of Pathology- Harsh Mohan.
13. Text Book of Pathology- Dey and Dey.
14. Text Book of Parasitology -Ramnik Sood.
15. Clinical Pathology and Bacteriology- S.P. Gupta.
16. Clinical methods in Ayurveda- K. R . S. Murthy.
17. Parameswarappa's Ayurvediya Vikriti Vigyan and Roga Vikriti Vigyan-Dr. P.S. Byadgi.
18. Oxford Handbook of Clinical Examination Oxford Handbooks and Practical Skills.
19. Advanced Clinical Evaluation System for Practical Assessment of Clinical Examination Skills.
20. Symptoms & Signs in Clinical Medicine - Chamberlains.
21. Clinical Methods- Hutchison's.
22. Bedside Clinics in Medicine Part- I & II-Kundu.
23. Common Medical Symptoms- Mehta.
24. Advances in Pathology & Lab Med- Weimstean, Gralem, Anderson, Cortan, Wick, Zumwelt.
25. Clinical Laboratory medicine Edited by Kenneth D Mc. Chately.
26. General Pathology- Walter & Israel Churchill Living stone.
27. A Comprehensive Dictionary of Pathology- Chris Newann.
28. Practical Pathology- Dr. K. Uma Chaturvedi.
29. Clinical examination- Douglas/Macleod's.
30. Pathology Practical book for Undergraduates- Harsh Mohan.
31. Medical Laboratory Technology - R. Sood.
32. Clinical Diagnosis and Management by Todd, Sanford and Davidson Laboratory methods
33. Clinical Hematology In Medical Practice- Degruchy's.
34. Robbins Basic Pathology- Kumar, Abbas, Fausto et al.

2.3. Rasashastra Evam Bhaishajyakalpana

(IATROCHEMISTRY AND AYURVEDIC PHARMACEUTICS)

Theory -Two Papers

Total Marks- 200

Teaching hours-200

Practical :-

Total Marks-200

Teaching hours-200

RASASHASTRA

Paper 1

100 Marks

Part A

50 Marks

1. Definition and etymology of Rasa, History of Rasashastra, Importance of Rasaushadhi, Concept of Rasa-Rasayana, Concept of Raseshwar Darshana. Concept of Rasashala and Rasamandap.
2. Brief Description and Application of Technical terminologies (Paribhasha): Avapa, Nirvapa, Dhalana, Bhavana, Jarana, Murchana, Shodhana, Marana, Amrutikarana, Lohitikarana, Mruta Loha, Satwa Patana, Druti, Apunarbhava, Niruttha, Rekhapurna, Varitara.
3. Dravya Varga: Amlavarga, Panchamrittika, Panchagavya, Panchamrita, Ksharashtaka, Dravakagana, Mitra panchaka, Rakta varga, Lavanapanchaka.
4. Brief description of Yantras and their application Ulukhala Yantra, Khalwa Yantra, Kachhapa Yantra, Damaru Yantra - Vidhyadhara Yantra- Urdhwapatan, Addhapatan & Tiryakpatana Yantra, Jaranartha Tulayantra, Dolayantra, Patalayantra, Palika Yantra, Baluka Yantra, Bhudhara Yantra, Sthali Yantra, Swedana Yantra.
5. Brief description & application of Musha (Crucible): Samanya Musha, Gostani musha, Vajra Musha, Maha musha, Yoga musha, Vrintaka Musha, Malla / Pakwa musha. Different types of crucibles e.g. Silica crucible, platinum crucible. Mudra and Sandhi Bandhana.
6. Brief description & applications of Chullika, Satwapatana Koshti, Patala Koshti, Gara Koshti, Angarakoshti and knowledge of various heating appliances viz. Gas stove, Hot plate, Heating mantle, Induction Stove, Hot Air Oven.
7. Concept, definition and types of Puta: Suryaputa, Chandraputa, Gomayaputa, Lawakaputa, Kukkutaputa, Kapotaputa, Varahaputa, Gajaputa, Mahaputa, Kumbhaputa, Valukaputa, Bhudharaputa, Applications of Electric muffle furnace and fuel (diesel) dependent furnace. Brief introduction to thermocouple and pyrometer.
8. Knowledge of Parada: Synonyms, Occurrence, natural and artificial sources of Parada, Hingulottha parada, Types of Parada, Parada Dosha: Naisargika, Yougika, Aupadhika

(Kanchuka). Grahya-Agrahya Parada, Parada gati, Parada bandha, Shodhana of Parada. Parada sanskara and brief description of Ashtasamskara.

9. Concept of Murchhana and Jarana of Parada, Preparation of Kajjali, Classification of Rasaushadhi: Khalvi rasa e.g. Tribhuvana Keerti Rasa, Parpati Rasa- Rasa Parpati, Kupipakva Rasa- Rasa sindur, Pottali rasa - Hemagarbha pottali. Rasa sevana vidhi and pathya and apathya.
10. Brief introduction of quality control , standardization and GMP of Rasaoushadhies.

Part B

50 Marks

Occurrence, Synonyms, Minerological identification, Sources, Types, Grahya and Agrahyata, Shodhana, Marana and other processing techniques. Properties, dose, anupan and therapeutic uses, pathya – apathya and ashuddha, apakwa and avidhee sevanyanya dosha and its management, important formulations of the following:

1. **Maharasa** –Abhraka (Biotite Mica), Vaikrantha, Makshika (Chalco-pyrite), Vimala (Iron Pyrite), Shilajatu, Sasyaka (Peacock ore), Chapala and Rasaka (Sphalerite).
2. **Uparasa** – Gandhaka (Sulfur), Gairika (Red Ochre), Kasisa (Green Vitriol), Kankshi (Alum), Haratala (Orpiment), Manahshila (Realgar), Anjana and Kankustha.
3. **Sadharana Rasa** – Kampillaka, Gauri pashana (Arsenic oxide), Navasadara (Ammonium chloride), Kaparda (Cowry), Agnijara, Giri Sindura (Red oxide of Hg), Hingula (Red Cinnabar) and Mriddara shringa (Litharge).
4. **Dhatu** -Swarna (Gold), Rajata (Silver), Tamra (Copper), Loha (Iron), Vanga (Tin), Naga (Lead), Yashada (Zinc), Kamsya (Bronze), Pittala (Brass), Vartaloha. Dhatu -graha sambandha.
5. **Ratna** - Manikya (Ruby), Mukta (Pearl), Pravala (Coral), Tarkshya (Emerald), Pushparaga (Topaz), Vajra (Diamond), Nilam (Sapphire), Gomeda (Zircon or Cinnamome stone), Vaidurya (Cats eye). Ratnapariksha, Ratnadosha, Ratna-graha sambandha.
6. **Uparatna**- Vaikranta (Tourmaline), Suryakanta (Sun stone), Chandrakanta (Moon stone), Rajavarta (Lapis lazuli), Perojaka (Turquoise), Sphatikamani (Quartz), Trinakanta, Palanka, Putika, Rudhir.
7. **Sudha varga** – Sudha (Lime stone), Kaparda (Cowries), Shukti (Oyster Shell) , Shankh (Conch Shell), Mriga shringa (Stag horn), Khatika, Godanti (Gypsum) and Samudraphena (Cattle Fish bone), Kukkutanda twak (Hen's Egg Shell).
8. **Sikata varga** - Sikata (Silica), Dugdhapashana (Talc), Nagapashana / Jaharmohara (Serpentine), Badarshama (silicate of lime), Vyomashma (Sangeyashab - Jade), Kousheyashma (Asbestos) and Akika (Agate).

9. Kshara varga - Sarja kshara (Sodium bicarbonate), Yava kshara, Tankana kshara (Borax), Surya Kshara (Potassium Nitrate).

10. Miscellaneous - Mandura, Bola, Dam-ul Akhawayan (Raktabandhini), Kasturi, Bhoonag, Mayurpiccha, Sarjarasa, Madhoochishta.

11. Visha and Upavisha-Introduction, collection and storage, classification, synonyms, shodhana, antidote, therapeutic and toxic doses, anupan, therapeutic uses, and formulations of following Visha and Upavisha-Vatsanabha, Kuchala, Jayapala, Dhattura, Bhanga, Bhallataka, Gunja, Arka, Snuhi. Langali, Karaveera, Ahiphena and Chitrakmool.

12. Aushadhi Yoga Gyanam- ingredients, manufacturing process, and bhesajprayogvidhi. Arogya Vardhini Gutika, Kasturibhairava Rasa, Kumara Kalyana Rasa, Garbhapala Rasa, Chandraprabha Vati, Chandramrita Rasa, Pratapalankeshwara Rasa, Pravalapanchamrita Rasa, Anandbhairava Rasa, Yogendra Rasa, Laxmivilas Rasa, Vasantakusumakara, Vasantamalati Rasa, Brihat Vata Chintamani Rasa, Shankha vati, Shwaskuthara Rasa, Hinguleswara Rasa, Hemagarbhapottali, Hridyarnava Rasa, Swarnavanga, Makaradhwaja, Putapakwavaisham Jwarantaka Loha, Vatvidhvamsan Rasa, Kamadugha Rasa, Laghusutshekhar Rasa, Navayasa Loha, Saptamrita Loha, Tamra Parpati, Panchamrita Parpati, Sveta Parpati.

13. Introduction to pharamcovigilance and its status in India, with reference to Ayurvedic drugs.

- A) Necessary to know - From part A and B : S. No. 1 to 9
B) Desired to know - From part B : S. No. 10

Practical

100 Marks

Minimum Twenty five practicals to be performed

- | | |
|-------------------------|---|
| 1. Rasa [Parada] | Samanya Shodhana of Parada
Kajjali
Mugdha rasa |
| 2 Maharasa varga | Shodhana of Abhraka
Dhanyabhraka nirmana
Shodhana of Makshika
Shodhana of Shilajatu
Shodhana of Sasyaka. |
| 3. Uparasa varga | Shodhana of Gandhaka
Shodhana of Gairika
Shodhana of Kasisa
Shodhana of Kankshi
Shodhana of Haratala
Rasa manikya nirman
Shodana of Manashila |

- | | |
|--------------------------------|---|
| 4. Sadharana rasa varga | Shodhana of Hingula
Shodhana of Navasadar |
| 5. Sudha Varga | Shodhana of Kapardika
Shodhana of Shankha
Shodhana of Shukti
Shodhana of Pravala mula
Shodhana of Godanti |
| 6. Dhatu varga | Samanya Shodhana of Lauha
Shodhana of Mandura
Samanya Shodhana of Tamra
Shodhana of Naga
Shodhana of Vanga
Shodhana of Yashada |
| 7. Kshara Varga | Shodhana of Tankana |
| 8. Parpati | Preparation of Rasaparpati, Bola
Parpati and Swetaparpati |
| 9. Visha varga | Shodhana of Vatsanabha,
Bhallataka, Kupilu, Dhattura beeja,
Jayapala, Gunja, Chitrakamoola. |

PRACTICAL FOR DEMONSTRATION / GROUP PRACTICALS

- 1.** Hingulad rasakrishti (Hingulottha Parada).
- 2.** Bhasma: 4 (One from each group)
 - i. Abhraka bhasma, Swarna Makshika bhasma, Tamra bhasma
 - ii. Vanga bhasma, Naga bhasma, Yashada bhasma
 - iii. Mandura bhasma, Kasisa bhasma
 - iv. Shankha bhasma, Kapardika bhasma, Godanti bhasma.
- 3.** Pishti : 1 Pravala pishti, Jaharmohara / Akika pishti,
Trina kantha mani pishti, Mukta pishti.
- 4.** Druti : 1 Gandhaka druti.
- 5.** Formulations 4 (one from each group)
 - i. Rasasindura, Swarna vanga, Sameer pannaga rasa
 - ii. Saptamruta lauha, Punarnava mandura, Navayasa lauha
 - iii. Agnitundi vati, Tribhuvana kirti rasa, Sootshekhara rasa,
Laghusutashekhara Rasa
 - iv. Arogyavardhini vati, Laghumalinivasanta rasa, Hinguleshwar rasa,
Anandbhairav rasa, Rajapravartini vati

BHAISHAJYAKALPANA

Paper II

100 Marks

Part A

50 Marks

- 1. History and Chronological (kramika vikasa) development** of Bhaishajyakalpana. Concept of Aushadha and Bhesaja.
- 2. Fundamental principles of Bhaishajya Kalpana.**
- 3. Study of Ancient and Contemporary systems of 'Maana' (Units of measurement), Shushka -ardra -drava- dravya grahan niyam** (Rules of measures of dry, fresh, liquid drugs); Grahyagrahyatva, Nava Puran dravya grahan niyam.
- 4. Guidelines and Methods of collection, storage, preservation of Aushadhi dravya.** Concept of Saviryatavadhi (shelf life) and stability in ancient and contemporary science.
- 5. Bhesajprayogavidhi : Aushadha Matra, Anupana and sahapan and Aushadh sevana kaala. (Posology).**
- 6. Panchavidha kashaya kalpana and Other kalpana :** Kashaya Yoni, Swarasa, Kalka, Kwatha, Hima and Phanta, Pramathya, Aushadha siddha paniya, Tandulodaka, Laksha rasa, Mantha, Panaka, Arka, Churna, Rasakriya, Ghana, Phanita, Avaleha, Prasha, Gudapaka, Sharkara, Syrups, Ksheerapaka, Satva, Guggulu kalpana, Vati, Gutti, Pinda, Modaka, Varti Preparation of Tablets, pills, capsule and Suppositories. Masi kalpana, Lavana kalpana, Kshara kalpana and Kshara sutra.
- 7. Introduction and general knowledge of useful instruments/ Equipments -** Disintegrator, Mixer, Grinder, End Runner, Edge Runner, Sieve-Shaker, Granulator, Tableting machine, Pill making machines, coating and polishing pan, capsule filling machine, sieves and mesh.
- 8. Sneha kalpana :** Sneha yoni, Types of Sneha, Sneha murchana vidhi, Sneha paka vidhi, patra paka, types and their use. Sneha siddhi lakshana, dose, Preparation and uses of Triphala Ghrita, Bramhighrita, Narayana taila, Anutaila.
- 9. Sandhana Kalpana and its types:** Madya Kalpana, Asava, Arishta, Sura (Prasanna - Kadambari - Medaka - Jagala - Bakkasa), Maireya, Surasava, Shukta, Kanjika, Sauvira, Tushodaka, Sidhu kalpana their methods of preparation, siddhi lakshana, properties, uses, doses. Takrarishta, Draksharishta, Ashokarishta, Dashamoolarishta, Kumaryasava, Chandanasava.

- 10. Kritanna and Aushadhisiddha anna Kalpana:** Definition of Kritanna, Concept of Pathya and Apathya, Yavagu –types of yavagu, Manda, Peya, Vilepi, Anna, Bhakta, Odan, Yush –types, Krishara, Mansa rasa, Vesavara, Khad Kamblika, Raga, Shadava, Dadhi and Takra Varga – Takra, Udasvita, Katvar, Mathita, Chhachika.

PART B

- 1. Bahyopacharartha kalpana (External Applications)-Lepa** -Types of Lepa, methods of preparation and mode of application. Udvertan and Avachurnan, Method of preparation of Siktha Taila, Malahara – Sarjarasa Malahara, Gandhak Malahara, Upanaha, Atasi upanaha, Shatadhouta and Sahastradhouta Ghrita. Brief introduction of semi solid dosage forms- Ointments, Creams, Emulsions, Gels, Lotions.
- 2. Principles and precautions for preparation of formulations for following:**
- 2.1 Netraupacharartha kalpana (Ophthalmic preparations)** – Seka, Drava, Pindi, Anjana - Ashchyotana - Tarpana - Putapaka and Vidalaka, Methods of preparation of eye drops, eye ointments.
- 2.2 Nasyopachararth Kalpana** - Classification of Nasya, Navana, Avapidana, Pradhaman, Marsha and Pratimarsha nasya.
- 2.3 Dhumapanarth kalpana** - Classification of dhumpaana, Method of preparation of dhumvarti and it's therapeutic uses. Dhupan: Vranadhupan, arshodhupan.
- 2.4 Mukhaprayogarth kalpana** - Gandoosha - Kavala - Pratisaran, Tooth paste, Tooth powders and Mouth wash.
- 2.5 Basti kalpana-** Classification, Method of preparation of Niruha and Anuvasana, Basti Therapeutic properties and uses of Basti.
- 3** Brief knowledge of Standardization of Ayurvedic formulations- Kastaushadhi.
- 4** Brief introduction of Drug and Cosmetics Act 1940 and Rules 1945.
- 5** Concept of, Aushadhi Nirmanshala, with respect to Good Manufacturing Practices (GMP) in accordance to Schedule T.

Practical Bhaishajya Kalpana

50 Marks

Following practicals to be performed- (Minimum one from each category)

Method of preparation, therapeutic uses, dose and anupana of the following

- 1.** Swarasa- Ardraka swarasa, Tulasi swarasa, Kumari Swarasa, Vasa putapaka swarasa
- 2.** Kalka- Nimba kalka, Rasona kalka.
- 3.** Kwatha- Punarnavasthaka kwatha, Rasna Saphthaka kwatha, Kulattha kwath.
- 4.** Hima- Dhanyaka hima, Sarivadi hima .
- 5.** Phanta- Panchakola phanta, Yastimadhu Phanta.

6. Pramathya- Mustadi pramathya
7. Mantha- Kharjuradi mantha
8. Aushadh siddha paniya- Shadanga paniya
9. Laksha Rasa.
10. Arka - Yavani arka, Gulab arka, Misreya arka
11. Panaka- Chinchā panaka, Chandan panaka.
12. Sharkara- Banapsha sharkara, Nimbu sarkara.
13. Churna- Sitopaladi Churna, Hinguwashtaka Churna.
14. Gutika- Chitrakadi Gutika, Sanjivani Vati.
15. Guggulu-Triphala Guggulu, Kaishora Guggulu.
16. Avaleha- Chyavanaprashavaleha, Vasavaleha, Vyaghri Haritaki avaleha, Manibadra avaleha.
17. Rasa kriya - Darvi Rasakriya, Guduchi Ghana, Kutaja Ghana.
18. Khanda- Haridra khanda, Narikela khanda, Sowbhagya shunti paka
19. Satva- Amruta satva,
20. Varti- Phala varti, Chandrodaya varthi
21. Lavana- Arka lavana, Narikela lavana
22. Masi- Triphala masi, Mayurpiccha Masi
23. Ksheerapaka- Arjuna ksheerapaka, Rasona ksheerapaka, Shunthi Ksheerpaka
24. Kshara- Apamarga kshara, Snuhi kshara, Ksharasutra. .
25. Manda, Peya, Vilepi, Yavagu, Krishra, Vesavara
26. Yusha - Mudga yusha, Saptamushtika yusha, Kulattha yusha
27. Aristha- Kutajarishta, Takrarishta .
28. Asava - Kumaryasava, Kanakasava
29. Sukta kalpana- Kanji
30. Udaka- Tandulodaka
31. Upanaha- Atasi Upanaha
32. Siktha Taila Nirmaan
33. Malahara- Sarjarasa malahara, Gandaka malahara, Cream, Emulsion. Sneha Kalpana
Sneha Murchhana - Ghrita Murchana, Taila Moorchhana, Ghrita kalpana: Jatyadi ghrita, Triphala ghrita, ksheerashatphala ghrita- Taila kalpana-Panchaguna taila, Arka taila, Bala taila, Jatyadi taila
35. Taila patana- Bhallataka taila patana, Jayapala taila patana
36. Shodhana- Guggulu, Hingu.

II. Visit of minimum three GMP approved Ayurvedic manufacturing units.

Distribution of Practical Marks: Total 200 Marks

Rasashastra - 100

- | | | |
|----------------|---|----------|
| 1. Record Book | - | 10 Marks |
| 2. Experiment | - | 30 Marks |
| 3. Spotting | - | 20 Marks |
| 4. Viva-voce | - | 40 Marks |

Bhaishajyakalpana - 100

- | | | |
|----------------|---|----------|
| 1. Record Book | - | 10 Marks |
| 2. Experiment | - | 30 Marks |
| 3. Spotting | - | 20 Marks |
| 4. Viva-voce | - | 40 Marks |

Reference Books

1. Adyatan Rasa Shastra
2. Abhinav Rasa Shastra
3. Asava Arishta Vigyanam
4. Ayurvediya Rasa Shastra (Sachitra)
5. Ayurvediya Rasa Shastra
6. Rasa Bhaishajya Paribhasa
7. Ayurvediya Rasa Shastra
8. Ayurved Prakash
9. Drugs and Cosmetic Act - 1940
10. Paka Darpana
11. The Paka-darpana of King Nala
12. Parada Vigyaniam
13. Pratyaksha Aushadh Nirmanam
14. Bhaishjyakalpana Vigyanam
15. Rasa Tarangini
16. Rasa Darpan
17. Rasa Bindu
20. Rasa Bhaishajya Kalpana Vigyan Vaidya
21. Rasa Mitra
22. Rasa Ratna Samuchchaya (Hindi)
23. Rasaratna samuchchaya-
24. Rasaratna samuchchaya -
25. Rasa Shastra Prayogiki Srivastava,
26. Rasamritam
25. Rasayan Sara

- R.K. Goyal
Vaidya Somadev Sharma
Dr. Pakshdhar Jha
Chandrabhusan Jha
Badrinarayan Pandey
Sureshananda Thapaliyal
Prof. Siddhi Nandan Mishra
Vaidya Gujrat Mishra
- Dr. Indradev Tripathi
Dr. Madhulika critical study
Vasudev M. Dwivedi
Acharya VishwanathDwivdei
Dr. Agnihotri
Sadanand Sharma
Prof. Bhajan Das Swami
Dr. Sanjay Sharma
Santosh Kumar Khandal
Dr. Tryambak Nath Sharma
Dattatreya Ananta Kulkarni.
Ambikadatta shastri
Damodar Joshi
Yadav and Prof. Ramesh Saxena
Vaidya Yadavji Tirkramji Acharya
Vaidya Shyam Sunderacharya

26. Rasendra Sampradaya
27. Rasendra Sara Sangraha
29. Vaidyak Paribhasha Pradeep (Hindi Translation)
30. Sharangadhara Samhita
31. Bharatiya Bhaishajya Kalpana Vigyana
32. Bhaishajya Kalpana Vijnanam
33. Rasa Shastra (English)
34. Rasa Ratna Samuchchaya (English)
35. Rasendra Chintamani (Hindi)
36. Ayurvedic formulary of India
38. Ayurvedic Pharmacopiea of India , CCRAS
39. Bhaishjya Kalpana Vigyan
40. Textbook of Rasashasra
41. Ashadhayoga Vigyanam
42. Vaidyaka Paribhasha Pradipa (English Translation)
43. Relevant parts of Brihatrayee
44. Text book of Bhaishjya Kalpana -
45. Text Book of Rasa Shastra
46. Rasa Chandashu
47. Bhaishjya Ratnawali
48. Yoga Ratnakar

Vaishya

Vaidya Hajari Lal Sukul
 Vaidya Gopal Krishna
 Dr. Indradev Tripathi
 Dr. Radhakrishna Parashar
 Ganath Vishwanath Dwivedi
 Dr. K Ramachandra Reddy
 Prof. Damodar Joshi
 Prof. Damodar Joshi
 Prof. Siddhinandan Mishra

Siddhi Nandan Mishra
 Dr. K Ramachandra Reddy.
 Dr. K. Ramachandra reddy
 Dr. K. Ramachndra Reddy &
 Dr. P. Suresh

Dr Shobha G Hiremath
 Dr P H C Murthy
 Prof S S Savirkar (CCRAS Publication)
 Prof S N Mishra

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2.4 CHARAKASAMHITA -PURVARDHA

(Sutrasthana, Nidanasthana, Vimanasthana, Sharirasthana and Indriyasthana)

**Theory- One Paper- 100 Marks
Lectures – 200 Hours**

Part A

- | | | |
|------------------|---|----------|
| 1. Sutrasthana | - | 40 Marks |
| 2. Indriyasthana | - | 10 Marks |

Part B

- | | | |
|------------------|---|----------|
| 1. Nidanasthana | - | 15 Marks |
| 2. Vimanasthana | - | 20 Marks |
| 3. Sharirasthana | - | 15 Marks |

Reference Books

1. Charakasamhita –Ayurveda Dipika commentary by Chakrapani.
2. Charakasamhita (Hindi Commentary): Vaidya Jayadev Vidyalankar or Vd. Atridev Vidyalankar or Prof. Gorakha Nath Chaturvedi & Kashinath Shastri or Dr. Brahmanand Tripathy or Dr. Ravi Dutta Tripathy
3. Charakasamhita (English Commentary): Dr. Ram Karan Sharma & Vd. Bhagwan Dash or Acharya Priyavrata Sharma.
4. Charakasamhita-Ayurveda Dipika Commentary-Hindi Translation by Dr. B L Gaur, published by Rashtriya Ayurved Vidyapeeth.

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CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI

SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE

INDEX

3RD PROFESSIONAL

3.1. AGADTANTRA	02-04
3.2. SWASTHAVRITTA	05-12
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3.4. KAUMARBHRITYA PARICHAYA	18-21
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AGADTANTRA, VYAVAHAR-AYURVED EVUM VIDHIVAIIDYAK
(TOXICOLOGY, FORENSIC MEDICINE AND MEDICAL JURISPRUDENCE)

Theory One Paper – 100 Marks

Practical/Viva voce -50 Marks

Theory -200 hrs

Practical - 100 hrs

Part- A

50 Marks

- 1** Derivation, definition of Visha and Agadatantra. Scope of Agadatantra. Visha Utpatti, Visha Prabhava, Visha Pranaharana Kriya, Visha Guna, Visha Gati, Visha Vega Visha Sankata, Shanka Visha.
- 2** Definition of toxicology, Definition of poison, suicidal and homicidal poisons, classification of poisons, their action and route of administration, absorption, excretion, metabolism, diagnosis and general principles of treatment, duties of a medical practitioner in case of suspected poisoning.
- 3** Origin and Classification of Visha:-Its sources, Difference between Visha, Madya and Oja guna, Visha Upadrava and Visha Mukta Lakshana.
- 4** Tests for detection of Visha, and Modern Toxicological Techniques of detection of poisons
Visha Data Lakshana, Visha Peeta Lakshana, Signs and symptoms of Visha afflicted organs and personal effects. (Poisoning with Anjana, Lepa paduka, Abharana etc.
- 5** Introduction to Environmental Toxicology- Samuhika Vishaprayoga- effect of chemical and nuclear warfare.
- 6** Vishopakrama described by Charak, General principles of Management of poisoning.
- 7** Manifestation of poisoning due to poisons of plant origin their fatal Dose, fatal period, management of poisoning, post mortem appearance and its medico legal importance.
Visha and Upavisha- Arka, Snuhi, Langali, Karaveera, Gunja, Ahiphena, Dhattura, Bhallataka, Vatsanabha, Kupeelu, Jayapala, Bhanga & Tobacco, Parthenium hysteriphorus, Chitraka, Eranda, Digitalis and Cerebra Odallam.
- 8** Garavisha, Dooshivisha, Viruddhahara. Food adulteration and poisoning–classification, diagnosis, management and contemporary significance.
- 9** Jangama Visha – Detailed study of Sarpa, Keeta, Loota, Vrischika, Mooshika, Alarka – Visha; Lakshana, Bheda, Chikitsa and their Sadhyasadhyata (contemporary and classical views).
- 10** Introduction to poisoning due to Acids, Alkalis, metals, Non-metals, Asphyxiants and others, their Fatal Dose, Fatal period, Manifestation, management, medico legal importance and postmortem appearance of poisoning due to:
 - a) Acid and Alkalis– Sulphuric acid, Hydrochloric acid, Nitric acid, Hydrocyanic acid, Oxalic acid, Carboic acid, Formic acid, alkalis in general.
 - b) Asphyxiants – Carbon monoxide, Carbon dioxide, Hydrogen sulphide
 - c) Nonmetallic poisons – Phosphorous, Iodine
Metallic poisoning – Arsenic, Mercury, Lead, Copper, Zinc, Tin.
 - d) Others - Petroleum – Kerosene Organo phosphorus compounds -Aluminum

phosphate, Organo Chlorinated Compounds, Household poisons.

11 Madya and Madatyaya. Alcohol poisoning (Ethanol and Methanol).

12 *Introduction to Narcotic drugs and Psychotropic substances Act 1985.*

Part –B

50 Marks

- 1.** Definition of Vyavahara Ayurveda (Forensic medicine) and Vidhivaidyaka (Medical jurisprudence), concise history of Vyavahara Ayurveda (Forensic medicine) and Vidhivaidyaka (Medical jurisprudence). Introduction to Indian Penal Code, Indian Evidence Act and Criminal Procedure Code.
- 2.** Legal Procedures:- Inquest, Evidence, Witness, Courts and their powers.
- 3.** Personal identity and its Medico legal aspects, forensic odontology, Introduction to Forensic Serology and DNA profiling.
- 4.** Death and its Medico Legal Aspects, Medico Legal autopsy and *exhumation*.
- 5.** Injuries and thermal injuries, their medico Legal aspects, general introduction of weapons.
- 6.** Dowry deaths (Domestic Violence), their Medico Legal importance and laws in relation to it.
- 7.** Asphyxial deaths and its Medico Legal importance.
- 8.** Medico Legal importance of Pregnancy, Delivery; Impotence & Sterility, Abortion, Infanticide, battered baby. Virginity, Artificial Insemination, Legitimacy.
- 9.** Sexual offences, and their Medico Legal aspects. Sexual perversions.
- 10.** Introduction to Forensic psychiatry.
- 11.** Introduction to forensic laboratory.
- 12.** Ethics as in classical Texts. Types of Vaidya, Pranabhisara and Rogabhisara Vaidya, Qualities of Vaidya, Responsibilities of Vaidya, Chaturvidha Vaidyavrutti, Duties of Vaidya to his patient, Vaidya Sadvrittam, Apujya Vaidya, Code of conduct.
- 13.** Laws in relation to Medical practitioners: Indian Medicine Central Council Act.
- 14.** Maintenance of medical record.
- 15.** Physician's responsibility in criminal matters, Professional negligence, Civil negligence, Criminal negligence, Medico Legal aspects of Acquired Immune Deficiency Syndrome, Rights of an unborn child, Medical Termination of Pregnancy Act Transplantation of human organs Bill 1994, Pre Natal Diagnostic Testing Act, Malingering of feigned diseases, International Code of Medical Ethics for Doctors. Clinical establishment Act.

Consumer Protection Act 1986.

PRACTICAL

Practical Training

1. Post Mortem examination
2. Evidence in the court
3. Demonstrations in the Forensic & Toxicology museum
(Toxic & Anti toxic substances, medico legal specimens & Charts)
4. Clinical postings
5. Library Hours for compilation

Distribution of Practical Marks

- | | |
|--|----------|
| 1. Post Mortem examination and Court posting – Case Record | 10 Marks |
| 2. Practical/Clinical Record Book | 10 Marks |
| 3. Identification (spotting) | 10 Marks |
| 4. Viva – voce | 20 Marks |

Total

50 Marks

Reference Books

- | | |
|---|--|
| 1. Topics related to Agada Tantra from Charak Samhita, Sushrut Samhita, Ashtanga Hridaya, Ashtanga Samgraha, Kasyapa Samhitha, Yogaratnakara, Bhavaprakasha and Madhava Nidana. | |
| 2. Vidhivaidyaka (Vyavahar Ayurveda Vijnan) | Dr.Charuchandra Pathak |
| 3. Medical Jurisprudence and Toxicology | Modi |
| 4. Basavarajeeyam | Edited by Vd.Govardhan |
| 5. Agada Tantra | Sh. Ramanath Dwivedi |
| 6. Text book of Agada Tantra | Edited by Dr Huparikar, Dr.Joglekar |
| 7. Agadatantra ki Pathyapustaka | Edited By Dr Huparikar,
Dr.Joglekar |
| 8. Agad Tantra | Dr. Shekher Namboodri |
| 9. Vishachikitsa
(Ayurveda Toxicology English Translation) | Vaidya Balakrishnan Nair, Kerala |
| 10. Medical Ethics and Medical Laws in India | Dr. H.S. Mehta |
| 11. Toxicology Ayurvedic Perspective | VPSV Ayurveda college Kottakkal |
| 12. Kautilya Arthashastra (English) | Prof. Kangle |
| 13. Kautilya Arthashastra (Hindi) | Dr. Raghunath Singh |
| 14. Vyavahar Ayurveda | Dr.Ayodhya Prasad Achal |
| 15. Vyavahar Ayurveda Vigyanam | Dr.Indramohan Jha (Sachchan) |
| 16. Textbook of Forensic Medicine and Toxicology | Dr. V.V.Pillay |
| 17. Forensic Medicine | Dr. B. Umadathan |
| 18. Relevant Acts | Govt. of India |
| 19. Relevant topics from Manu Smriti | |

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3.2 SWASTHAVRITTA

Theory- Two papers - 100 marks each

Practical / Viva voce -100 marks

Lectures –200 Hrs

Practicals and demonstration – 100 Hrs

Paper-I

PART A- VAIYAKTIKA SWASTHAVRITTA

50 marks

Introduction

Definition of swastha & swasthya and swasthavritta. Arogya lakshana, swasthavritta prayojanam, WHO definition of health.

Dimensions of health-Physical, Mental, Social.

Concept of wellbeing- objective, subjective, standard of living, quality of life.

Dinacharya

1. Definition of Dinacharya
2. Aims and importance of dinacharya
3. Brahma Muhurta evam Utthana
4. Usha Jalapana
5. Sharirachinta
6. Malatyaga
7. Mukha prakshalan
8. Dantadhavana and preparation of Ayurvedic tooth powder and paste
9. Jihvanirlekhanavidhi
10. Anjana
11. Pratimarsha Nasya
12. Gandusha and Kavala
13. Tambulasevana
14. Dhoomapana
15. Abhyanga
16. Udvartana
17. Utsadana
18. Vyayama
19. Chankramana
20. Snana
21. Anulepana
22. Vastra dharana
23. Danda dharana
24. Padatra dharana
25. Chatra dharana
26. Ushnisha dharana
27. Ratnabharana dharana
28. Madhyahna charya
29. Cosmetic effect of Dinacharya procedures

Rathricharya

1. Sandhya charya
2. Rathri bhojana vidhi
3. Shayanavidhi according to Bhavamishra

Ritucharya

1. Importance of ritucharya
2. Ritu presentation as per different acharyas
3. Adana kala & visarga kala
4. Sanchaya-Prakopa-Prashamana of Dosha according to ritu
5. Doshashodhana in Ritu Charya
6. Relation of Agni bala and Ritu
7. Pathya and Apathya Ahara and Vihara in different ritus
8. a) Ritusandhi
b) Yamadamsthra
c) Rituharitaki
d) Rituviparyaya

Sadvritta

Description of Sadvritta and Achara Rasayana their role in Prevention and control of diseases.

Trayopastambha

i) Ahara- Nirukti, Swarupa, Pramukhatva, Ahara dravya Vargikaranam, Aharavidhividhana, Dwadashashana pravicharana, Ashtaharvidhivisheshayatanani, Pathyahara, Apathyahara, Samashana, Adhyashana, Vishamashana, Ahara dushparinama & tajjanya vyadhaya, Santarpanajanya evam Apatarpanajanya vyadhi, Viruddhahara and its effects, Shadrasabhojanasya mahatwam.

Dietetic standards, Proximate principles of Food, Nutritional requirements, Sources and deficiency diseases of Protein, Carbohydrate, Fat, Vitamins and Minerals.

Concept of balanced diet in Ayurveda, Nitya sevaneeya dravya, Balanced diet for different sections of people in the society, Social aspects of nutrition.

Aharavarga - Dhanya varga(Cereals and millets), Shaka and Harita varga (Leafy and Non leafy vegetables), Kanda varga (roots and tubers), Phala varga (Fruits), Taila varga(Fats and Oils), Ikshu varga & Madhya varga(Alcoholic Beverages), Dugdha varga (Milk and Milk products), Masala and vyanjana dravyas (Spices & Condiments), Kritanna varga(Prepared Food), Mamsa varga (Meat types).

Food hygiene

Milk hygiene-Milk composition, Source of infection (for Milk), Milk borne diseases, Clean and Safe milk, Pasteurization of milk.

Meat hygiene-Meat inspection, Slaughter house, Freshness of fish and egg. Fruits and Vegetables hygiene

Sanitation of eating places, Preservation of food, Food handlers, Food borne diseases, Food fortification, and Food adulteration, Food toxicants, Properties of Vegetarian and Non- vegetarian diet, Effects of spices and condiments

Consumption of Alcohol and its effects on personal and social health. Effects of pathya-apatya in life style disorders-Diabetes, Hypertension, Obesity and Coronary heart Disease.

ii) Nidra- Nirukti and Utpatti, Types , Nidra – Swasthya sambandha, Properties of Yukta Nidra, Effects of Ratri Jagarana, Diwaswapna, Anidra, Atinidra, Ahara and Vihara causing disturbed sleep , Ahara and Vihara Causing sound sleep. Duration of sleep according to age, Sleep in healthy and diseased persons.

iii) Brahmacharya – Brahmacharya and Abrahmacharya, Importance of Bharmacharya and Abrahmacharya, Vyavaya sambandhi niyama, Effects of Ativyavaya. Methods of Virya Raksha, Surataspriha(Libido) through Vajikarana, Viryanasa phala.

Roganutpadaniya- Concept of Vega- Adharaniya Vega and Dharaneeya Vega, Diseases due to vegadharana and their chikitsa, sharir shodhan.

Rasayana for Swastha-Nirukti, paribhasha(definition), classification and examples

Ashta nindita purusha

Menstrual hygiene

Part B (YOGA AND NISARGOPACHARA)

50 marks

YOGA

Introduction

Yoga shabda utpatti, definitions, Different schools of Yoga – Rajayoga, Hathayoga, Mantrayoga, Layayoga, Jnanayoga, Karmayoga, Bhaktiyoga.

Yoga prayojana

Ayurveda yoga sambandha, swasthya rakshane yogasya mahatvam

Yogabhyasa pratibhandhaka & siddhikara bhavas as per Hathayoga.

Mitahara and Pathyapathyani during Yogabhyasa.

Panchakosha Theory

Astanga yoga

Yama, Niyama

Asana and its importance

Standing Postures

Ardhakatichakrasana, Padahastasana, Ardhaachakrasana, Trikonasana.

Sitting postures

Swasthika, Gomukhasana, Padmasana, Vajrasana, Bhadrasana, Shashankasana, Ushtrasana, Pashchimottanasana, Suptavajrasana, ardhmatsyendrasana, Siddhasana.

Supine Postures

Pavanamuktasana, Sarvangasana, Matsyasana, Halasana, Chakrasana,

Shavasana, Setubandhasana.

Prone postures

Bhujangasana, Shalabhasana, Dhanurasana, Makarasana.

Suryanamaskara – procedure and benefits.

Pranayama

Benefits of pranayama, time of practice, avara-pravara-madhyama lakshana, yukta-ayukta lakshana

Nadishudhi Pranayama .

Kumbhakabheda – suryabhedana, ujjayi, sheetali, Sitkari, Bhastrika, Bhramari

Murcha, Plavini.

Nadishudhilakshana

Shatkarma

Dhauti, Basti, Neti, Trataka, Nauli, Kapalabhati

Bandhas and Mudras

Shad chakras, Ida-pingala-sushumna nadis.

Pratyahara, Dharana, Dhyana, Samadhi

Description of Yoga in Ayurveda

Moksha and Muktatma lakshana and upaya, Naishthiki chikitsa, Satyabuddhi, Tatvasmriti, Ashta Aishwarya, Ashta siddhis.

NISARGOPACHARA (Prakritika chikitsa)

Definition, history, aims and objectives

Theories as per Western school of Naturopathy

Indian school – Panchabhutopasana

Relation of Ayurveda and Naturopathy

Importance of Naturopathy in present era.

Jalachikitsa(hydrotherapy) – Hot water treatment, Cold water treatment, foot and arm bath, Spinal bath, hip bath, abdominal wet pack, Steam bath, enema and whirl pool bath.

Mrittika chikitsa (Mud therapy)

Types of soil, doctrine of mud selection, mud bath.

Suryakirana sevana (sun bath - heliotherapy)

Mardana (Massage) – different methods and effects.

Diet types – Soothing, Eliminative, Constructive, Positive and negative diet, Acidic and alkaline diet

Upavasa chikitsa(Fasting therapy) – Importance, types, therapeutic effects of fasting.

Visrama chikitsa upayoga

PAPER II – SAMAJIKA SWASTHAVRITTA

Part A

50 marks

Janapadodhwamsa

Causes, Manifestations and control measures, importance of Panchakarma and Rasayana.

Vayu (Air)

Vayu guna according to sushruta samhita, Properties of Vayu as per different directions, Vayu shudhi prakara – Ayurvedic aspect.

Composition of air.

Air of occupied room- Thermal discomfort and comfort zone, indices of thermal comfort.

Air pollution – health and social aspects, Prevention and control of air pollution ,Global warming.

Ventilation and its types.

Mountain air & High altitude – Health problems

Jala (Ayurvedic and modern aspects)

Importance of water , safe and wholesome water, water requirements, properties, types and sources of water,water pollution and health hazards, Methods of water purification.

Hardness of Water.
Examination, Tests and analysis of water.
Rain water harvesting and water recycling

Bhumi and nivasa sthana(Land and housing)

Types of soil, soil & health, Land pollution, Bhumi shodhana, Nivasa yogya bhoomi, Social goals of housing, Housing standards, Mahanasa (Kitchen) standards, Rural housing, Housing and health, Overcrowding.

Prakasha(lightning)

Requirement of good lighting, natural lighting, artificial lighting, biological effects of lighting.

Dhwani pradooshana(Noise pollution) -Noise, Sources, effects,& control

Vikirana(Radiation)- sources, effects and control

Apadravya Nirmulana (Disposal of solid waste)

Different types of solid waste
Storage and collection of refuse
Methods of disposal of solid waste (Rural & urban)
Bio-medical waste management

Malanishkasana Vyavastha (Excreta Disposal)

Methods for Unsewered area and Sewered area
Latrines for camps, fairs and festivals
Disposal of dead body – Burial, Burning, Electric cremation.

Meteorology (Ritu evam Vatavarana jnanam)

Definition of weather and climate, factors influencing weather and climate.

Disaster management

Definition, natural and man-made disasters, epidemiologic surveillance and disease control.

Occupational Health

Occupational Hazards, Occupational Diseases, Prevention of Occupational Diseases, Health & precautionary measures, ESI Act, Indian factories Act.
Offensive Trades- Effects on health and precautionary measures .

School health services

Health problems of school children, aspects of school health service, duties of school medical officers, Maintenance of healthy environment

Epidemiology

Concept of Epidemiology, Dynamics of disease transmission, concept of diseases, concept of causation, Epidemiological triad, natural history of disease, concept of control, concept of prevention, Risks factor, modes of intervention, incidence and prevalence. Susceptible host, host defenses, Immunizing Agents, Disease prevention and control, investigation of epidemic.

Disinfection – definition, types.

Ayurvedic concept of Vyadhikshamatva and sankramaka rogas.

Epidemiology of communicable Diseases

Chicken Pox, Measles, Diphtheria, Pertussis, Mumps, Tuberculosis, SARS, Influenza, Pneumonia, Cholera, Polio, Viral Hepatitis , Typhoid, Leptospirosis, Dengue Fever, Chikungunia, Malaria, Filariasis , Leprosy, Rabies , Tetanus, Emerging and re-emerging diseases

Kuprasangaja vyadhi (STDs)

AIDS, Syphilis, Gonorrhoea, Chanchroid

Non-communicable disease epidemiology

Diabetes, Obesity, Hypertension, Coronary Heart Diseases, Rheumatic Heart Disease, Cancer

Chikitsalaya Bhavana (Hospital Building)

Part B

50marks

Prathamika swasthya samrakshana(Primary Health Care)

Definition, principle, elements,levels of health care.

Structure at village, sub centre, PHC,CHC, Rural hospital levels.

Health insurance, Private agencies, Voluntary health agencies, NGOs and AYUSH sector.

Role of Ayurveda in Primary Health Care.

Parivara kalyana Yojana (Family welfare Programmes)– Demography, demographic cycle, life expectancy.

Family planning, methods of family planning.

Matru sishu kalyana Yojana – MCH programme

Ante natal, intra natal, post natal, neo natal care. Child health problems and indicators of MCH care.

Preventive geriatrics–Problems of elderly,prevention and control measures.

World Health Organisation-Objectives,structure and functions.

International health agencies-United Nations agencies,Health work of bilateral agencies.

Alma Ata declaration

National Health Policy

Health statistics- Definition, Sources, uses Data collection, Classification, Presentation.

Vital statistics-Morbidity rates,Mortality rates ,Fertility rates.

Health survey

Swasthya prashasana(Health Administration) – Health administration at Central including AYUSH, state, district, village levels.

National health programmes

Tuberculosis(RNTCP), Leprosy(NLEP), AIDS (NACP), Blindness (NPCB), Polio(PPI),Diabetes (NDCP), Cancer (NCCP) , Guinea worm, Vector born disease control programme, NRHM, all the upcoming national health programmes, RCH programme, Universal Immunization Programme.

National Nutritional Programmes - IDD, Vitamin A prophylaxis, Mid day meal, anemia control programmes.

PRACTICALS

Demonstration of Dinacharya procedures- anjana, nasya, kavala, gandoosha dhoomapana, abhyanga, udvartana.

Parichaya of aharadravya, immunization agents, disinfectants and family planning devices

Practical demonstrations of Asanas mentioned in the syllabus
Pranayama (Suryabhedana, Ujjayi, Shitali, Sitkari, Bhastrika, Bhramari and Nadishuddhi) and Shad karmas(Jala dhauti, Jalaneti, Sutraneti, Trataka, Kapalabhati).

Preparing and delivering of a health educational talk on health related issues.
A short compilation on any topic on environmental health.

Educational Visits

Observe the functioning of the Milk Dairy, Water purification unit, Sewage treatment unit, MCH/Family welfare centre, Leprosy hospital and industrial unit.

Visit to Primary Health Centre for knowledge of actual implementation of National health programmes including knowledge of rural health.

Visit of rural Ayurvedic dispensary.

Visit to naturopathy centre to observe naturopathic treatment modalities.

Health survey- Minimum 5 families of rural and urban areas.

There should be 3 case sheets for Yoga Naturopathy & pathya apathya together and 3 case sheets for communicable diseases.

Proformas for Case sheets/practical records/survey/Dinacharya projects etc should be prepared by the respective universities.

Practical and Viva Voce examination

Marks distribution

	100 marks
1. Vaiyaktika Swasthavritta	20
2. Samajik swasthavritta	20
3. Demonstration of Yoga	10
4. Naturopathy	10
5. Journal and compilation work	10
6. Viva voce	30

Reference Books:

Relevant portions of Charaka, Sushruta, Vagbhata, Sarngadhara, Bhavaprakasha, Yogaratnakara, Madhavanidana and Bhelasamhita.

Swasthavritta Samucchaya

- Pandit Rajeshwar dutt Shastri

Swasthya Vigyan

- Dr. Bhaskar Govind Ghanekar

Swasthya Vigyan

- Dr. Mukund swarup Varma

Swasthavritta

- Vaidya Sakad

Swasthavritta

- Dr. Ranade and Dr. Firke

Ayurveda Hitopadesh	- Vaidya Ranjit Rai Desai
Yoga and Ayurved	- Acharya Rajkumar Jain
Swasthavritta vighyan	- Dr. Ramharsha Singh
Swasthavrittam	- Dr. Brahmanand Tripathi
Swasthavrittam	- Dr. Shivkumar Gaud
Ayurvediya Swasthavritta	- Vaidya Jalukar Shastri
Patanjala yogasutra	- Patanjali Maharshi
Hathayogapradipika	- Swatmaram Yogendra
Gheranda samhita	- Gherand Muni
Yoga Paddhati	- Bharatiya Prakritik Chikitsa Parishad
Yogik Chikitsa	- Shri. Kedar Nath Gupta
Sachitra Yogasan darshika	- Dr. Indramohan Jha
Yoga deepika	- Shri. B.K.S. Iyengar
Light on Yoga	- Shri. B.K.S. Iyengar
Light on Pranayama	- Shri. B.K.S. Iyengar
Yoga and yoga chikitsa	- Dr. Ramharsha Singh
Foundations of Contemporary Yoga	- Dr. Ramharsha Singh
Yoga Sidhant evam Sadhana	- Harikrishna Shastri datar
Prakritik chikitsa Vidhi	- Sharan Prasad
Prakritik chikitsa vighyan	- Verma
Preventive and Social Medicine	- J. Park
Preventive and Social Medicine	- Baride and kulkarni
Janasankhya Shiksha Sidhanta	- Dr. Nirmal Sahani
Evam upadesya	
Health Administration in India	- S.C.Seel
Health and family welfare	- T.L.Devaraj
Positive Health	- L.P. Gupta
Biogenic Secrets of food in Ayurveda	- L.P.Gupta
Smriti granthon mein nihit	- Dr. Smt. Nigam Sharma
Swasthaprakara samagri	
Dr. Reddy's comprehensive guide to Swasthavritta	- Dr.P.sudhakar Reddy
Nutritive value of Indian foods	- ICMR
Yoga and Nisargopachar	- Vd. Prama Joshi
Prachin Vangmay mein prakritik chikitsa	- swami Anant Bharati, CCRYN
Swasthavritta	- Vd Yashwant Patil and Vd. Vhawal
Food and nutrition	- Swaminathan
Organology and sensology in yoga	-Prashant S Iyengar
Yoga-A game for Women	-Geeta S Iyengar
Yoga-A game for Women(hindi translation)-Madhu Pandey	

3.3 PRASUTI TANTRA & STRIROGA

Marks 200 (100marks each paper)
Practical-100 marks
HOURS Theory-200 Hrs
Practical-100 Hrs

PAPER-1 PRASUTI TANTRA

PART-A

INTRODUCTION TO SUBJECT

STRI SHARIRAVIJNAN

Etymological origin of the word Stri. Artava vaha and Stanyavaha strotamsi. Tryavarta yoni Stri Vishishta, Peshi Marmani.

Anatomy of female reproductive system.(External and internal genital organs) Soft & Bony Pelvis and its obstetrical importance.

DESIRABLE (non detail)

Vayobhedena Stri sangnya

RAJO VIGYANA

Description of Raja, Artava and Prathama Rajo Darshana, Rajasvala Charya. Ritumati Lakshana, Ritumaticharya, Ritukala

Menarche, Menstrual cycle and their regulation by endocrine glands,

Ovulation –Importance in conception

DESIRABLE (non detail)

Concept of Stri Sukra

GARBHA VIGYANA

- a) Garbhasya paribhasha, Garbhadhanavidhi, Garbhavakranti, Garbha Sambhava samagri, Garbhakara bhava, Panchabhautikatwa of Garbha, Masanumasika Vridhi of Garbha, Garbha Poshana , Garbhasayasthe Garbhasthiti

Foetal attitude, lie, position, presentation

- b) Apari, GarbhaNabhinadi, Jarayu, Ulba

Formation, Development, Function of Placenta, Umbilical cord, Amniotic fluid

Foetal membranes -Abnormalities of Placenta

DESIRABLE (non detail)

Garbhalingotpatti, Garbhasya Avayavotpatti, Garbha Varnotpatti, Garbha Vikriti

GARBHINI VIGYANA

- a) Lakshana of Sadhyograhita Garbha, Lakshana of Vyakta Garbha, Pumsavana vidhi
Diagnosis of Pregnancy
- b) Garbhini vyavastha: Garbhini Paricharya, Garbha Upaghatakara Bhava, Dauhrida
Ante Natal care-Examination, Investigation and Management
- c) Garbha Vyapada: Nidana, Samprapthy and Chikitsa Garbhasrava and Garbhapata-
Garbha shosha-Upavishtaka, Nagodara, Upashushka, Leena garbha,
Antarmrita garbha, Raktagulma, Bahugarbhatha
- d) Abortions, Rh-incompatability-
Causes, clinical features, complications and management.

Gestational trophoblastic neoplasias, Ectopic pregnancy, IUGR, Intrauterine foetal death, Multiple pregnancy

GARBHINI VYAPAD

- a) Hrillasa, Chardi, Aruchi, Atisara, Vibandha, Arsa, Udavarta, Sotha, Parikarthika, Vaivarnya, Kandu, Kikkisa, Pandu, and Kamala, makkala
- b) Common ailments of Pregnancy-High Risk Pregnancy, Emesis gravid arum, Gestational Anemia, Gestational Hypertension, Gestational Diabetes, Toxemias of Pregnancy, Jaundice, AIDS,

Ante Partum Hemorrhage causes, clinical features complications and Management

PART B

PRASAVA VIGYANA

- a) Prasava Paribhasha, Prasavahetu, Prasavkaala, Sutikagaranirman, Sangrahaniya Dravyani, Sutikagara pravesavidhi.
- b) Prasavavastha; Prajayani/ Upasthita Prasava/ Asannaprasava lakshana, Aavi. Prasavaparicharya, Jatamatraparicharya
- c) Normal Labour:-Definition of Labour, Physiology & Mechanism of Labour, Monitoring of Labour and management, Pictogram, Episiotomy, care and resuscitation of newborn.

PRASAVA VYAPAD

- a) Garbhasanga, Yonisamvarana, Aparasanga, Mudagarbha-defenition, Nidana, Types & Management
- b) Induction and augmentation of labour, Cervical dystocia, Cephalopelvic disproportion, Prolonged labour, Preterm labour, Post term labour, foetal distress, Assisted Labour, Caesarian
- c) Retention of Placenta, PPH - causes, clinical features and management, Genital tract Injuries during labour

DESIRABLE (non detail)

Uterine Inversion, Amniotic Fluid Embolism, Garbhashthithi parivarthan(Version), Forceps Delivery, Ventouse Delivery.

SUTIKA VIGYANA

- a) Sutika Paribhasha, Sutika Kaal, Sutika paricharya. Changes during sootika avastha(Sareerika&Manasika)
Normal and abnormal Puerperium and its Management
- b) Sutika Roga – Number of Sutika Roga, Sutika Jwara, Shotha and Makkala.
- c) Stanyavijnan- Sthanyadushti, Sthanyakshaya, Sthanyavidhi -their causes, clinical features and treatment
- d) Emergency care in obstetrics

DESIRABLE(non detail)Stana stanya –Pareeksha, Stanya sampat.

PART-2 STRI ROGA

PART-A

ARTAVA VYAPAD

- a) Artava-kshaya vridhi, Ashtartavadushti lakshana chikitsa
Asrigdara lakshana samprapti Chikitsa
- b) Menstrual disorders-Amenorrhoea, hypomenorrhoea, Oligomenorrhoea, Dysmenorrhoea, Abnormal uterine Bleeding

YONI VYAPAD

Sankhya, Nidana, Lakshana, Upadrava evam Chikitsa

Endometriosis, Fibroid uterus, Genital Prolapses, Retroverted Uterus, Pelvic infections, Cervical erosion, Pelvic Inflammatory Diseases

VANDHYATWA – Prakar, Nidana, Chikitsa

Infertility – Causes, Types, Investigations and Management.

Yoni Kanda, Yoni Arsa, Granthi, Arbud,

Pelvic Infections including Sexually Transmitted Infections, HIV, AIDS, Preventive measures.

MENOPAUSE-changes during menopause ,menopause syndrome, management.

DESIRABLE (non detail)

Congenital malformations of female genital tract.

Sukra vijnan –kshaya,vridhi, dushti hetu lakshana and chikitsa

Benign and Malignant tumours of Genital Tract

PART-B

STANA ROGA

- a) Stanakeela- nidana lakshana chikitsa, Stanagranthi, Stanavidradhi, Stanashoph Mastitis, Breast abscess, Galactocele -Etiopathology, clinicalfeatures, diagnosis, prognosis and complications
- b) Sthanik Chikitsa
Snehana, Swedana, Uttarabasti, Pichu, Varti, Lepana, Dhupana, Dhavana, Dahana, Ksharakarma -. Practical knowledge of all these procedures along with indications, complications and management.

Shastra Karma

Surgical procedures their Indications, Contraindications of cauterization of cervix, cervical dilatation and curettage, female surgical sterilization

Knowledge of indication and procedure of PAP smear. Endometrial biopsy and interpretation of the reports

Stri roga Sambandhita Pramukha Aushadhyai, Prasuti & Stri Roga Chikitsa Upayogi
Yantra Shastra Parichaya and Vyadhivinishchaya Upaya (Investigative and Diagnostic Aids)

Garbhanirodhaka Upaya.

Parivar Niyojana, Reproductive and Child Health Care, AIDS/HIV control Programme, MCH, PNDT Act, MTP Act, and importance of current National Programme

Knowledge of important Commonly used Ayurvedic and Allopathic drugs used in Prasutitantra and Streeroga. Pharmacotherapeutics of allopathic drugs in obstetrics and Gynaecology

Record keeping,ethical and medicolegal issues in Streeroga and prasutitantra

DESIRABLE (non detail)

Laprosopy, hysteroscopy, hysterosalpingography, USG, X-RAY, Colposcopy, Cervical Biopsy. Granthi evum Granthi nirharan samanyajnan (Myomectomy, hysterectomy)

CLINICAL TRAINING-OBSTETRIC SKILLS

To perform independently

1. History taking and examination of antenatal and gynaecological cases
2. Diagnosis of Pregnancy, assessing of gestational period, to diagnose onset of labour
3. To monitor labour progress, able to plot Partogram
4. Observation of 10 labours
5. To diagnose abnormalities of labour and decide about the referral of the patient
6. Able to provide first aid for obstetric emergencies
7. Recognition of post partum complications
8. Counselling and promoting of breast feeding
9. Record 5 antenatal cases, 5 intrapartum and 5 post partum cases

To observe/assist-D&C, D&E, Caesarean section, Repair operations, Resuscitation of new born.

GYNAECOLOGICAL SKILLS -To perform independently

1. History taking and examination of gynaecological cases
2. Recording 10 gynaecological cases, 5 gynaecological procedures
3. Taking vaginal smear, high vaginal swab
4. Practical knowledge of sthanika chikitsa
5. Observation and practical knowledge of minor gynaecological procedures
6. Observation of Surgical procedures
7. Identification, uses., Demonstration of surgical instruments
8. Observation of Method of sterilization, MTP, Surgical procedures Hysterectomy, Oophorectomy

DISTRIBUTION OF PRACTICAL MARKS

1. Case taking-2cases –one Gynec,one obstetric- 30marks

2.Instruments ,Drugs, &Models-	20 marks
3.General Viva-	40 marks
4.Record -2-(one Prasuti, one streerog)-	10 marks
Total	100 marks

3.4. Kaumarbhritya (Ayurvedic Pediatrics)

Theory One Paper – 100 Marks
Practical Viva Voce - 50 Marks

Paper I

100 Marks

Kaumarbhritya Parichaya Evum Balaka Paricharya (Introduction to Ayurvedic Pediatrics and Child Care)

Part A

50 Marks

1. General introduction and scope of Kaumarbhritya (Ayurvedic Pediatrics), Definitions and terminologies used in Kaumarbhritya.
2. Scientific contribution of Kashyapa Samhita in Kaumarbhritya.
3. Vayobheda (Classification of age): Garbha, Bala, Kumara; Kshirada, Kshirannada & Annada etc. and modern classification of childhood period.
4. Prana Pratyagamanam (Neonatal Resuscitation): Methodology; complications and their management (Ayurvedic and modern view). Assessment of gestational age.
5. Navajata Shishu Paricharya (Neonatal Care): Care of the Jatmatra (Newly born child) and the Sadyojata, Care of the Samaya-purvajata Shishu (Preterm), Purnakalika Shishu (Full term), and Samaya-Paschatjata Shishu (Post term neonate), Nabhinala Chhedana (Cutting of umbilical cord), Complications of improper cutting of umbilical cord and its treatment, Rakshoghna Karma (Protective measures- Ayurvedic and modern view).
6. Navajata Shishu Parikshana (Examination of newborn): Ayu-Parikshana, Modern approach to Neonatal Examination
7. Navajat Shishu Poshana (infant feeding): Specific feeding schedule as per Ayurvedic texts and modern concept; Stanya-Sampat (Properties of normal breast milk) Stanyotpatti (Physiology of lactation), Stanya Sangathana (Composition of breast milk), Stanya Parikshana (Examination of breast milk), Stanya-Piyusha (Colostrum); Stanya-Pana-Vidhi (Techniques of breast feeding), Stanyakshaya-Stanyanasha (Inadequate production and absence of breast milk), Dhatri (wet nurse)- Stanyabhava dugdh Vyavastha (alternative feeding in the absence of breast milk), Various other milk feeding methods.
8. Stanyadosha (Vitiation of Breast milk), Stanya Shodhana (Purification of breast milk), Stanya Janana and Vardhanopakrama (Methods to enhance breast milk formation).
9. Garbha Vridhi Vikasa Krama: Samanya Parichaya (brief monthwise development of

fetus), Milestones of development during infancy and childhood including concepts of various Samskaras.

10. Poshana (Nutrition): Normal requirements of nutrients and common food sources.
11. Dantotpatti evum Danta Raksha Vidhi (Dentition and dental care): Danta-sampat (Characteristics of healthy teeth), Danta Nisheka evum Dantodbheda (Eruption of teeth), Dantodbhedjanya Vikara (Dentition disorders).
12. Vyadhikshamatva: General concepts of Bala (Immunity) and methods of Bala Vriddhi.
13. Prashan & Lehana: Indications, contra-indications, different drugs used in lehana
14. Knowledge of National Programs related to Child Health Care: Reproductive and Child Health (RCH) Program, Community Child Health Programs, Nutritional Programs, National Immunization Program and other programs incorporated by Govt. of India from time to time

Part B

50 Marks

Samanya Chikitsa Siddhanta and Balaroga (General Principles of Treatment and Management of Pediatric Disorders)

1. Bala Pariksha-vidhi Evam Shishu Vedana Parigyan (Examination of sick child and Diagnostic methods-Ayurvedic and modern). Samanya Chikitsa Siddhanta (General principles of treatment in children).
2. General Aushadhi Matra Nirdharana - for Ayurvedic and modern drugs preparations (drug doses according to age, weight and drug contents)
3. Specific therapeutic panchakarma procedures in children with special emphases on snehan, swedan and basti.
4. Prasava Kaleena Abhighata (Birth injuries): Shwasavrodha (Asphyxia neonatorum), Ulvaka, Upashirshaka (Caput Succidanum and Cephalohaematoma), Facial Paralysis, Erb's Paralysis, Bhagna (fractures).
5. Brief description of Sahajavyadhi (Congenital disorders): Sahaja Hridaya Vikara (Congenital Cardiac Disorders) Jalashirshaka (Hydrocephalus), Khandaoushtha (cleft lip), Khanda-Talu (cleft palate) Sanniruddha Guda (Anal stricture / imperforated anus), Pada Vikriti (Talipes equinovarus and valgus), Spina bifida, Meningocele, Meningomyelocele.
6. Brief knowledge of genetic disorders): Down syndrome, Turner Syndrome, Muscular dystrophy, Sickle-Cell Anemia, Thalassaemia, Sahaja Madhumeha (Juvenile diabetes).
7. Prasavottara Vyadhi (Neonatal disorders): Navajata Kamala (Neonatal Jaundice), Navajata Netrabhishyanda (Neonatal conjunctivitis), Nabhiroga (Umbilical disorders), Navajatshishu-raktavishmayata (Neonatal Septicemia)
8. Dushta Stanyapanajanya Vyadhi (Disorders due to Vitiated Milk): Lactose intolerance, Kshiralasaka, Kukunaka, Ahiputana (Napkin Rashes)
9. Kuposhanajanya Vyadhi (Nutritional disorders): Karshya, Phakka, Balashosha and Parigarbhika (Protein Energy Malnutrition), Vitamin and Micro-nutrient deficiency

disorders, Hyper-vitaminosis, failure to thrive.

10. Aupasargika Vyadhi (Infectious Diseases): Karnamula Shotha (Mumps), Romantika (Measles), Rubella, Masurika (Chicken Pox), Rohini (Diphtheria), Kukkura-Kasa (Whooping Cough), Dhanurvata (Tetanus), Krimiroga (Worm Infestations), Antrika Jwara (Typhoid), Mastisakavarnashotha (Meningitis), AIDS, Dengue, Malaria, Rajajakshma (Tuberculosis), Jivanujanya Yakrit Shotha (Hepatitis)
1. Srotas Vikara:
 - a) Pranavaha Srotas: Pratishtyaya (common cold), Kasa (Cough), Shwasa (Respiratory distress syndrome), Tamaka Shwasa (Bronchial Asthma), Utphuliika, Swasanaka Jwara (Pneumonia/Pneumonitis, Bronchiolitis), Gala shotha (Pharyngitis, Laryngitis), Talukantaka (Tonsillitis)
 - b) Annavaha_ Srotas: Ajirna (Indigestion), Atisara (Diarrhoea), Chhardi (Vomiting), Vibandha (Constipation), Mukhapaka (Stomatitis), Gudapaka (Proctitis), Parikartika (Anal fissure), Udarshula (Infantile Colic), Pravahika (Dysentry), Gudabhransa (Rectal Prolapse). Ama and its disorders like Ama vata jwara (Rheumatic fever).
 - c) Rasavaha Srotas: Jwara (Fever), Pandu (Anemia), Mridbhakshanajanya Pandu (Anemia associated with clay eating/Pica).
 - d) Raktavaha Srotas: Kamala (Jaundice), Raktapitta (Haemorrhagic disorders), Yakritodara (Hepatomegaly).and Pieehodara (Splenomegaly)
 - e) Mamsa-Medovaha Srotas: Apachi (Lymphadenitis), Galaganda (Goitre), Gandamala (Cervical Lymphadenopathy).
 - f) Mutravaha Srotas: Shopha in Vrikka (Glomerulonephritis and Nephrotic syndrome)
2. Anya Bala Vikara (Miscellaneous Pediatric Disorders), Apasmara (Epilepsy), Akshepa (Convulsions), Nirudhaprakasha (Phimosis), Cerebral palsy.
3. Behavioral Disorders of Children, their management and counseling: Breath holding spell, Shayyamura (Bed wetting), Pica, Unmada, Autism, ADHD (Attention Deficit and Hyperactive Disorders), Jadatwa (Mental retardation).
4. Pran raksha vidhi (Life saving measures in children): Principles of management of Shock and Anaphylaxis, Poisoning, Foreign body in respiratory tract, Status epilepticus, Hemorrhage, Acute Renal Failure, Febrile Convulsion, Status Asthmaticus, Fluid and Electrolyte Management.
5. Balagraha: General description, classification, clinical features and management.

PRACTICAL

Content of Practical / demonstration

1. Clinical training of above mentioned disorders of children.
2. Exposure to -
 - a) Navajata Shishu Paricharya (Care of the newborn)
 - b) Pranapratyagamana Vidhi (Resuscitation procedure of new born)
 - c) Vaccination
 - d) Panchakarma Vidhi (Panchakarma procedures) especially Snehana, Swedana, Basti.
3. Knowledge of various equipments such as phototherapy unit, overhead radiant

- warmer, resuscitation equipments, Panchakarma equipments and their application
4. Knowledge of IV fluid administration, blood sampling
 5. Anthropometry measurements and their interpretation
 6. Various Ayurvedic & modern Procedures and investigations in pediatric practice

Distribution of Marks

Clinical work: Pediatric and neonatal case records [1.0 case sheets of each]	10 Marks
Patient Examination	20 Marks
Spotting	05 Marks
Viva – voce	15 Marks
Total	50 Marks

Reference Books

1. Kashyapa Samhita Complete Hindi translation by Satyapal Vidhyalankara English translation by Prof. Premvati Tiwari
 2. Principles & practice of Pediatrics in Ayurveda: Dr. CHS Shastry
 3. Child Health Care in Ayurveda: Prof. Abhimanyu Kumar
 4. Ayurvedic Concepts of human Embryology: Prof. Abhimanyu Kumar
 5. Kaumarbhritya by Prof. D.N. Mishra
 6. Kaumarbhritya Ke Antargata Balgraho Ka Kramika Evam Vaigyanika Adhyana by Prof. Chanchal Sharma
 7. Notes on Kaumarbhritya-by Dr. Dinesh K S
 8. Pran - Pratyagannanann-by Dr. B.M. Singh
 9. Ayurveda Dwara Matra Evam Shishu Paricharya by Dr. KS Patel,V.K.Kori & Raigopal
 10. Kaumarbhritya related references from Charaka Samhita, Sushruta Samhita Vagbhata etc.
 11. Clinical Methods in Paediatrics by Meharban Singh
 12. Pediatrics Emergencies by Meharban Singh
 13. Essential Pediatrics O,P. Ghai
 14. Text Book of Pediatrics Nelson
 15. Care of New Born by Meharban Singh
 16. Panchakarma in Pediatrics Dr. Yogita Srivas
-

3.5. CHARAK SAMHITA- UTTARARDHA

(Uttarardha: Chikitsa – Kalpa - Siddhi Sthana)

Theory- One Paper – 100 Marks

The marks of theory examination are distributed as follows:

- | | |
|--------------------|----------|
| 1. Chikitsa sthana | 60 Marks |
| 2. Kalpa sthana | 15 Marks |
| 3. Siddhi sthana | 25 Marks |

Reference Books

1. Charak Samhita -Chakrapani Tika (Sanskrit Commentary)
2. Charak Samhita (Hindi Commentary) Vd. Jayadev Vidyalankar or Vd. Atridev Vidyalankar or Prof. Gorakh Nath Chaturvedi & Kashinath Shastri or Dr. Brahmanand Tripathy or Dr. Ravidutta Tripathy
3. Charak Samhita (English Commentary): Dr. Ram Karan Sharma & Vd. Bhagwan Dash or Acharya Priyavrata Sharma.

CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI

SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE

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4TH PROFESSIONAL

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4.1 KAYACHIKITSA

Theory Two Papers – 100 Marks Each
Practical/Viva voce – 100 Marks

Paper I

100 Marks

Part - A

50 Marks

- 1 Derivation of the terms 'Kaya', 'Chikitsa' and their definitions and synonyms. Definition of 'Kayachikitsa, Definition of 'Bheshaja'. Types and detailed description of Bheshaja and Chikitsa, Knowledge about Chikitsa Chatushpada, Rogi Roga Pariksha Siddhantha, Astasthan Pariksha.
- 2 Importance of Kriya Kaala according to stages of Dosha and their management.
- 3 Chikitsa sutra and Management of vriddhi (increased) and kshaya (decreased) of Dosha, Dhatu and Mala, Ojo Vyapat (Kshaya, Visramsas and Vyapat) and its management. Chikitsasutra and Management of Sama-Nirama states, Roga-Anutpattikara Chikitsa, Roga Prashamana Chikitsa (Doshapratyanika, Vyadhipratyanika, Ubhayapratyanika), Doshopakrama, Chikitsa sutra and Management of Sthanantara Dosha (Ashayapakarsha, Anuloma/Pratiloma gati of Dosha, Vimarga gamana of Dosha), Knowledge of Lina Dosha & its management, Diagnosis, Chikitsa Sutra and Management of Avarana and of Dhatu Pradoshaja diseases, Importance of Dosha, Dushya, Bala, Kaala, Agni, Prakriti, Vaya, Sattva Satmya, Desha, Ahara and stage of diseases in treating them. Chikitsa Sutra and Management of 'Samanyaja and Nanatmaja' diseases.
- 4 Detailed description of Dvidividhopakrama (Santarpana and Apararpana) and Shadavidhopakrama (Rookshana, Snehana, Swedana, Sthambhana, Langhana and Brimhana). Detailed description of Shodhana, Shamana and Nidana Parivarjana. Knowledge of Aushadha matra, Sevan kaala and Anupana, Definition and Knowledge of Pathya-Apathya with examples of diseases of various systems.
- 5 Derivation of the term 'Manas', its sthana (place), Guna (qualities) and Karma (functions). Samanya Chikitsa Siddhanta of Manasa Roga.
- 6 Principles & Management of Nutritional deficiency disorders.
- 7 Management of Vardhakyajanita vikara, Indriyapradoshaja vikara, Alzhiemer's Disease, Sleep disorders, General debility.

- 8 General introduction and principles of Management of diseases produced by Genetic, Environmental and Iatrogenic factors. Disorders due to drug and Food allergy and their management and other allergic conditions.

Part B

50 Marks

1. Detailed description of Chikitsa Sutra and Management of Jwara and its types. Etiopathogenesis & relevant Ayurvedic and Modern management of following types of Fevers-Typhoid, Pneumonia, Pleurisy, Influenza, Mumps, Meningitis, Encephalitis, Tetanus, Yellow fever, Plague, Dengue Fever, Chikun Guniya, Leptospirosis, Viral Fever, Anthrax, Masurika (Small pox), Laghu Masurika (Chicken pox), Romantika (Measles).
1. Chikitsa sutra and Management of the diseases of Rasavaha Srotas such as – Pandu, Amavata, Madatyaya, Hridroga, Hridshoola, Hypotension, Hypertension, Anaemia, Rheumatoid arthritis.
2. Chikitsa sutra and Management of the diseases of Raktavaha Srotas such as - Raktapitta, Kamala, Kumbhakamala, Halimaka, Daha, Mada, Murcha, Sanyasa, Vatarakta, Plihadosha, Yakrut dosha, Haemolytic disorders, Hepatitis, Cirrhosis of Liver, Leukaemia, Kushta, Shvitra, Visarpa, Sheetapitta, Uarda, Kotha and Kshudra Roga.
3. Knowledge of National Health Programmes and the relevant Ayurvedic Management of the following diseases enlisted by World Health Organisation- Malaria, Filaria, Kala Azar, Leprosy, Tuberculosis, AIDS.
4. Introduction of general principles of maintenance of health and management of diseases of following systems of Medicine- Yoga, Naturopathy, Unani, Siddha, Physiotherapy and Rehabilitation.
5. Diseases of different Endocrine Glands- such as Thyroid, Parathyroid, Pituitary, Pancreas and Adrenal glands and their management.
6. General introduction, types and Management of diseases caused by Vyadhi Kshamatwa Hinata (Immuno deficiency disorders), Auto Immune Disorders.
7. Description and Management of following Emergency Conditions- Acute Haemorrhage, Hypertensive Emergencies, Acute abdominal pain (Renal colic, Biliary colic, Gastritis, Pancreatitis, Peritonitis and Appendicitis), Acute Abdomen, Anuria/ Oliguria, Congestive Heart Failure, Myocardial Infarction/Angina, Shock, Syncope, Convulsions, Hyperpyrexia, Hyperglycaemia, Hypoglycaemia, Status Asthmaticus, Acute Respiratory distress Syndrome, Drowning and Electric shock.

PAPER II

100 Marks

Part A

50 Marks

1. Chikitsa sutra and Management of the diseases of Pranavaha Srotas such as - Kasa, Shwasa, Hikka, Rajayakshma, Urakshata, Parshwashoola, Bronchitis, Bronchiectasis, Emphysema and COPDs.
2. Chikitsa sutra and Management of the diseases of Udakavaha Srotas such as- Shotha, Jalodara, Trishna, Water & Electrolyte Imbalance.
3. Chikitsa sutra and Management of the diseases of Annavaha Srotas such as – Agnimandya, Aruchi, Ajirna, Anaha, Atopa, Adhmana, Alasaka, Vilambika, Visuchika, Chardi, Grahani, Amlapitta, Gulma, Shoola, Bhasmaka, Acid peptic disorders.
4. Principles of treatment and management of Vata Vyadhi such as - Pakshavatha, Ekgavata, Sarvangavata, Ardita, Avbahuka, Kati Graha, Manyastambha, Gridhrasi, Vishwachi, Khalli, Khanja, Pangu, Padaharsha, Padadaha, Vatakantaka, Kroshtukashirsha, Udavarta, Kampavata, Dhatugata and Ashayagata Avarana Vata, other Vata Rogas, Parkinsonism.
5. Nidana and Chikitsa of Urusthambha, Gullian Barrie syndrome, Muscular Dystrophy, Myasthenia Gravis, Motor Neuron Diseases and Neuralgia.

Part B**50 Marks**

1. Chikitsa Sutra and Management of Mamsavaha Srotas and Medovaha Srotas such as- Gandamala, Galaganda, Mamsashosha, Arbuda, Apachi, Prameha, Sthaulya, Karshya, Diabetes Mellitus, Dyslipidaemia.
2. Chikitsa Sutra and Management of 'Asthi and Majjavaha Srotas such as Asthimajja Vidradhi, Asthisoushriya, Asthi kshaya, Sandhigata Vata, Osteo Arthritis, Osteomyelitis, Osteoporosis, Osteopenia.
3. Chikitsa sutra and management of Shukravaha srotas such as Klaibya, shukralpata, shukradosha, kshina shukra, dhvajabhanga.
4. Chikitsa Sutra and Management of diseases of Mutravaha Srotas such as -Mutrakricha, Mutraghata, Ashmari, Cystitis, Nephritis, Nephrotic Syndrome, BPH, Renal Failure.
5. Chikitsa Sutra and Management of diseases of Purishavaha Srotas such as - Atisara, Pravahika, Arsha, Purishaj Krimi, IBS and Ulcerative Colitis.
6. Chikitsa Sutra and Management of Sexually Transmitted Diseases such as - Phiranga, Puyameha, Upadamsha, lymphogranuloma inguinale, Syphilis, Gonorrhoea.
7. Introduction, Definition and Management of Kama, Krodha, Lobha, Moha, Mada, Matsarya, Shoka, Bhaya, Vishada, Dainya, Harsha and Pragyaparadha.
8. Manas and Manovahasrotas, Nidana and Chikitsa of the following disorders - Unmada- Apasmara-Atattvabhinivesha, Chittodvega, Vishada, Anxiety disorders, Depression, Somatoform and Mood disorders, Stress induced disorders, Psychosexual Disorders. Importance of Daivavyapashraya, Sattwavajaya, Adravyabhuta Chikitsa. Medhya Rasayana in the management of Manasa Roga. Bhuta Vidya diagnosis and management of graha disorders.
9. Derivation, definition and synonyms of Rasayana, importance of Rasayana and its benefits. Indications of Rasayana therapy. Classification of Rasayana. Kutipravesika and Vatatapika Rasayana. Indications of Vatatapika Rasayana. Knowledge of Kayakalpa, Achara Rasayana. Procedures of Kutipravesika, Poorvakarma and specific schedules to be followed after Kutipravesha, benefits of Kutipravesika Rasayana, duration of process, Rasayana yoga and directions for their use. Determination of dose of Rasayana according to age. Rules and regulation after Rasayana therapy, Importance of Immunomodulators and antioxidants in Rasayana therapy.
10. Vajikarana- Derivation, definition, synonyms, necessity, benefits, importance of fertility, Symptoms of Shûkra (Semen), Vajikaran Dravya and Aushadhi. Properties, doses, methods of administration, ingredients and methods of formation of Rasayana & Vajikarana formulation. Classification and importance of Vajikarana Dravya

Distribution of practical Marks 100

- | | |
|--------------------------------|------------|
| 1) Daily case record/ 20 cases | - 20 marks |
| 2) Patient examination | |
| a) 1 Long case | - 20 marks |
| b) 1 short case | - 10 marks |
| 3) Viva -voice | |
| a) Paper I | - 25 marks |
| b) Paper II | - 25 marks |

Reference books:

1. Charak Samhita, Sushrut Samhita, Ashtanga Samgraha and Ashtanga Hridaya with their commentaries. Madhav Nidana with Madhukosha Commentary.
2. Ayurvediya Vyadhi Vigyana - Yadavji Trikamji
3. Roga Pariksha Vidhi - Priyavrat Sharma

4. Panchakarma Vigyan -Haridasa Sridhar Kasture
5. Cikitsadarsha -Pandit Rajesvardutta Shastri
6. Kayachikitsa I-IV -Ramaraksha Pathaka
7. Ayurved Nidan Chikitsa Siddhanta -Prof. R.H.Singh.
8. Kayachikitsa Vol. I-IV. -Prof. Ajay Kumar
9. Davidson's Principles and Practice of Medicine.
10. API Text Book of Medicine.
11. Harrison's Text Bok of Medicine.
12. Cecil Text Book of Medicine.
13. Panchkarma Illustrated by Dr. G.Srinivasacharya.
14. Other relevant publications on subjects concerned

4.2. PANCHAKARMA

Theory One Paper – 100 Marks

Practical Viva-voce – 50 Marks

Hours of teaching Theory – 100

Clinical training: 3 months

I. Introduction

1. Introduction to Panchakarma, Panchakarma and Shodhana, its importance for promotion of health, prevention and treatment of diseases.
2. Trividha Karma- Purva, Pradhana and Pashchat Karma in relation to Shodhana and their importance.
3. Indications of Shodhana, Shodhana according to Ritu
4. General Principles of doshagati from Koshta to Shaka and vice versa
5. General precautions (Pariharya Vishaya) for Panchakarma
6. Specifications of Panchakarma theatre and necessary equipments
7. Importance of Koshta and Agni Parikshan

II. Snehana

1. Etymology and Definition of Sneha and Snehana
2. Snehayoni- Sthavara and Jangama: Properties of Sneha dravyas, Snehopag Dravyas
3. General knowledge of Ghrita, Taila, Vasa and Majja with their specific utility and actions ,Yamaka, Trivrit and Maha Sneha
4. Metabolism of fat
5. Achcha and Pravicharana of Sneha
6. Snehapaka and its importance in Panchakarma
7. **Types of Snehana:** i) Bahya and ii) Abhyantara Snehana

i) Bāhya Snehana :

Methods, indications and contraindications of the following types of Bahyasnehana; Mardana, Unmardana, Pādāghāta, Samvāhana, Karna Purana & Akshi Tarpan, Lepa, Talam,

Murdhni Taila: Siro-Abhyanga, Shiro Seka/dhārā, Siro Pichu and Siro-Basti

ii) Ābhyantara Snehana

Three Types of Ābhyantara Snehana: Shodhanārtha, Shamanārtha and Brimhanārtha Snehana, Indications and contraindications for Snehana

Shodhanārtha Snehana

- a. Importance and method of Deepan Pāchan and Rookshana in Shodhanārtha Snehana. Properties of Rookshana Dravya. Samyak Rookshana Lakshana
- b. Consideration of Agni and Koshtha in Snehana
- c. Indication of Different Matra, Various dose schedules for Shodhanārtha Snehana; Hraseeyasi, Hrasva, Madhyama and Uttama Mātrā, Ārohana Mātrā
- d. Methods of Shodhanārtha Snehana,
- e. Anupāna of Sneha

- f. Jeerna and Jeeryaman Lakshana
- g. Samyak Yoga, Ayoga and Atiyoga of Snehana, Sneha Vyāpat & their management according to Ayurveda & Modern Medicine
- h. Diet and regimen during Snehana

Sadyo Sneha: Method of administration, dose fixation and utility

Shamanārtha Snehana, Method of administration, dose fixation and utility

Bronhanarth Senhana: Method of administration, dose fixation and utility

Avapeedak Sneha: Method of administration, dose fixation and utility

8. Snehana Kārmukata (mode of action)

9. Special Procedures:

Takradhara, Udvartanam, Putpāka, Aschotana, Anjana, Gandusha, Kavala, Dhoompāna, Udvartana, Utsādana, Udgharshana, Talapothichil

III. Svedana

1. Etymology and Definition of Sveda and Svedana
2. Classifications of Sveda/Svedana
3. General Sweda dravya, Properties of Sweda dravyas, Swedaopag dravyas ,
4. Indications and contraindications of Svedana
5. Ten Types of Niragni Svedana
6. Knowledge of 13 types of Sagni Svedana and Chaturvidh Svedan
7. Detailed Knowledge with their Utility of the following Svedana procedures:
Sankara/Pinda Sveda-Ruksha and Snigdha Sveda
Patrapinda Sveda, Jambir Pinda Sveda, Vāluka Sveda, Churna Pinda Sveda, Kukkutand
Pinda Sveda, Shashtika Shalipinda Sveda, Nadi Sveda, Bashpa Sveda Ksheer
dhooma ,Ksheer Seka, Kwath Seka, Avagaha Sveda, Dhanymla Dhara
Parisheka Sveda, Pizichil, Upanaha Sveda, Annalepa
8. Local Basti such as Kati Basti, Janu Basti, Greeva Basti and Urobasti
9. General precautions during Sagni Svedana and Methods to protect vital during svedana
10. Samyak Yoga, Ayoga and Atiyoga of Svedana
11. Complications of Svedana and their Management according to Ayurveda & Modern Medicine
12. Diet and management during and after Svedana
13. Parihār Vishaya
14. Svedana Kārmukata (Mode of action)
15. General Knowledge about current Sudation techniques like Sauna bath, Steam bath

IV. Vamana Karma

1. Etymology, definition and importance of Vamana Karma
2. Utility of Vamana Karma in health and disease
3. Indications and Contraindications for Vamana
4. Knowledge of Koshta and Agni
5. General knowledge of Vamana and Vamanopaga drugs; properties, actions, preparations, preservation with special reference to Madanphala, Kutaj, Nimba, Yashti, Vacha
6. Purva Karma of Vamana: Deepan-Pāchana, Abhyantara Snehana and diet

7. Management of one gap day-Abhyanga & Svedana, diet, special Kapha increasing diet
8. Preparation of the patient on Morning of Vamana day
9. Vamaka Yoga, Anupana, fixation of dose and method of administration
10. Administration of Vamanopaga Dravya such as milk, sugarcane juice, Yashtimadhu decoction
11. Lakshana indicating Doshagati during the process
12. Management during Vamana Karma & observations
13. Symptoms of Samyak Yoga, Ayoga and Atiyoga of Vamana Karma
14. Post Vamana management
15. Types of Shuddhi-Hina, Madhya and Pravara
16. Peyadi Samsarjana Krama and Tarpanadi Kram with their specific indications
17. Complication of Vamana and their management with Ayurveda and modern drugs
18. Pariharya Vishaya
19. Vamana Karmukata (Mode of action).

V. Virechana Karma

1. Etymology, definition and importance of Virechana Karma
2. Utility of Virechana Karma in health and disease
3. Indications and Contraindications for Virechana
4. Knowledge of Koshta and Agni
5. Classification of Virechana Drugs, General properties of Virechana dravya
6. General knowledge of single and compound Virechana drugs; properties, actions, preparations, preservation with special reference to Trivrutta, Aragvadha, Eranda, Katuki, Jaipal
7. Purva Karma of Virechana: Deepan- Pachana, Abhyantara Snehana and diet
8. Management of 3 gap days-Abhyanga, Svedana & diet
9. Management on Morning of Virechana day
10. Preparation of Virechana Kalpa, Anupana, dose and method of its administration
11. Method of Virechana Karma and management during Virechana Karma & observations
12. Symptoms of Samyak Yoga, Ayoga and Atiyoga of Virechana Karma
13. Post Virechana management
14. Types of Shuddhi-Hina, Madhya and Pravara and accordingly Samsarjana Krama
15. Complications of Virechana and their management with Ayurveda and modern drugs
16. Pariharya Vishaya
17. Virechana Kārmukatā (Mode of action)

VI. Basti Karma

1. Etymology, definition and importance of Basti as Ardha-Chikitsa
2. Utility of Basti Karma in health and disease
3. Basti Yantra- Putaka & Netra, Detailed study of traditional Basti Yantra and their Doshas
Knowledge of alternative Basti Yantra-enema can, enema syringe, modified plastic/rubber bag for Putaka, modified plastic netra.
4. Classifications of Basti

5. Karma, Kāla and Yoga Basti schedules along with their utility.
6. **Niruha Basti:** Its etymology, synonyms, definition, classifications, sub-classifications & indications and contraindications.
 - a. Dose fixation of Niruha Basti according to age
 - b. Contents and Method of preparation of Niruha Basti dravya
 - c. Diet
 - d. Administration of Niruha Basti
 - e. Pratyāgamana Kāla, Post Niruha Basti management
 - f. Samyak Yoga, Ayoga and Atiyoga of Niruha.
 - g. Complication of Niruha Basti and its management according to Ayurved and Modern Medicines
 - h. Pariharya Vishaya and kala
7. **Anuvasana Basti:** Its etymology, synonyms, definition, classifications, sub-classifications & indications and contraindications.
 - a. Dose fixation of Anuvasan Basti according to age
 - b. Contents and Method of preparation of Anuvasan Basti dravya
 - c. Diet
 - d. Administration of Anuvasan Basti
 - e. Pratyāgamana Kāla, Post Anuvasan Basti management
 - f. Samyak Yoga, Ayoga and Atiyoga of Anuvasana.
 - g. Complication of Anuvasan and its management according to Ayurved and Modern Medicines
 - h. Pariharya Vishaya and kala
8. Basti Kārmukatā (Mode of action).
9. Knowledge of following types of Basti:

Madhutailika Basti, Erandmuladi Basti, Yāpana Basti, Pichchha Basti, Kshira Basti, Kshara Basti, Vaitarana Basti, Panchaprasutik Basti, Lekhan Basti, Krumighna Basti, Tiktashir Basti, Ardhamātrika Basti
10. **Uttara Basti:** its definition, indications and contraindications, Detailed study of traditional Basti Yantra and their Doshas Knowledge of alternative Basti Yantra
 - a. Preparation of patient,
 - b. Preparation of Trolley for Uttarbasti,
 - c. drug preparation and Fixation of dose,
 - d. method of administration in male and females,
 - e. observations,
 - f. complications and their management

VII. Nasya

1. Etymology, definition, Significance of Nasya Karma.
2. Classifications and sub-classifications
3. Knowledge of general Dravya used for Nasya Karma, Shirovirechan Gana, Shirovirechanopag dravyas
4. Indications and contraindications of Nasya
5. Time of administration of Nasya
6. Dose fixation of different types of Nasya
7. Diet and regimen before and after Nasya Karma
8. Administration of Marsha, Pratimarsha, Avapeedaka, Dhoomapana and Dhuma Nasya
9. Symptoms of Samyak-yoga of Nasya,

10. Complication of Nasya and their management
11. Parihār Vishaya
12. Nasya Karmukata (mode of action)

VIII. Raktamokshana

1. Definition, importance and Types of Raktamokshana
2. General Principles and rules of Raktamokshana
3. Classification of Raktamokshan
4. General Indication and Contra indication of Raktamokshan
5. **Jalaukavacharana:** Knowledge of different types of Jalauka (Leech) , Indications and contraindications of Jalaukavacharana, various types of Jalauka. Method of Application, Samyak Lakshan, Complication of Jalaukavacharana and their management with Ayurveda and Modern medicines.
6. **Pracchāna:** Indications and contraindications of Pracchana. Method of Application, Samyak Lakshan, Complication of Pracchana and their management with Ayurveda and Modern medicines
7. **Sirāvedha:** Indications and contraindications of Siravedha. Method of Application, Samyak Lakshan, Complication of Siravedha and their management with Ayurveda and Modern medicines
8. Knowledge of emergency management of complications such as water & electrolyte imbalance, shock, bleeding per rectal, hematemesis, epistaxis

IX. Physiotherapy

1. Definition, Utility and Importance of Physiotherapy.
2. Basic Knowledge of Static exercise, Infrared, Short wave diathermy, Electromagnetic therapy, Wax bath therapy, Ultrasonic therapy.

PRACTICALS / CLINICAL TRAINING –

Total Duration of 3 Months posting

OPD (for 1-Month): observation of OPD patients, selection of the patients, observation of OPD base Panchakarma procedures

IPD (Panchakarma) and Panchakarma Unit – Observation of different procedures of Panchakarma, Assistance to the procedure under guidance of Panchakarma specialist

Under clinical posting, each student has to study and write 15-long Cases and 10 short cases in prescribed format

Long case Paper- minimum 1 Vaman , 1 Virechan, 1Niruha & Anuvasan Basti, 1Nasya, 1 Raktamokshan

Short case paper –Minimum one each of Pinda sweda, Shirodhara, Abhyanga, Netra Tarpan, Bahya Basti, Nadi Sweda etc.

Distribution of Marks

- | | |
|--------------------------------------|----------|
| 1. Practical Record of 25 procedures | 05 Marks |
| 2. Long Procedure | 10 Marks |

3. Long Procedure Viva	05 Marks
4. Short Procedure	08 Marks
5. Viva on Short Procedure	02 Marks
6. General Viva-voce	20 Marks
Total	50 Marks

Reference Books

1. Charak Samhita with Commentary of Ayurveda Dipika by Chakrapanidatta & Jalpakalpataru by Gangadhara
2. Sushrut Samhita with the Sushruta Nibhandha Samgraha Commentary of Dalhana & Nyayachandrika Panjika of Gayadasa on Nidana Sthana
3. Ashtanga Hridaya with Sarvanga Sundara & Ayurveda Rasayana Commentaries
4. Ashtanga Sangraha with Shashilekha Commentaries
5. Ayurvediya Panchakarma Chikitsa Dr Mukundilal Dwivedi
6. Panchakarma Vigyan Dr Haridas Shreedhar Kasture
7. Illustrated Panchakarma Dr.G Srinivasa Acharya
8. Clinical Panchkarma (English) Dr. P.Yadaiah
9. Prayogika Panchkarma (Hindi) Dr. P. Yadaiah
10. Vivida Vyadhiyome Panchkarma (Hindi) Dr. P. Yadaiah
11. The Panchkarma Treatment of Ayurveda with Kerala Specialtie Dr. T.L. Devaraj
12. Panchkarma Therapy Dr. R.H. Singh
13. Ayurveda-Principles and Panchakarma Practice Dr Mandip R. G. & Prof. Gurdip Singh
14. Principles and Practice of Basti Dr. Vasudevan & Dr. L. Mahadevan
15. Panchakarma Sangraha Dr. Manoj Shamkuwar
16. Essential of Panchakarma Therapy Dr.Pulak Kanti Kaur
17. Principles and Practice of Panchakarma Vaidya Vasant Patil
18. Harrison's Principle of Internal Medicine
19. Guyton's Physiology

4.3 SHALYA TANTRA

Theory Two Papers – 100 Marks Each
Practical - Viva voce – 100 Marks

PAPER –I

100 Marks

Part – A

50 Marks

Definition of Shalya, Shalya Tantra and its importance. Introduction to Shalya Tantra: Historical background and progress made.

- **Target** - Fluency in textual reading and comprehension.
- Preferable targets - Know recent developments and controversies.

Description of Yantra, Shastra, Anushastra: Definition, number, types, uses, Dosh, Guna, Karma. Relevant modern instruments.

- Target - Basic understanding of the concepts of Yantra and Shastra. Acquaintance with commonly used surgical instruments. Knowledge of textual descriptions.
- Preferable targets - Knowledge about currently used surgical instruments, their specifications, procurement sources etc.

Nirjantukarana / Sterilization: Methods, types and its role in surgical practice.

- Target - Basic surgical discipline of maintaining asepsis.
- Preferable targets- Knowledge of recently developed chemicals, instruments for sterilization.

Sangyahan / Anaesthesia: Definition and Types.

- Local anaesthesia** – Drugs, Techniques, Indications, Contraindications, Complications and their Management.
- Regional and General anaesthesia**- Drugs, Techniques, Indications, Contraindications, Complications and their Management.
 - Target-Basic knowledge of the drugs and instruments of anaesthesia. To observe the process of induction, monitoring and recovery.
 - Preferable targets- Assisting and handling anaesthesia.

Trividha Karma – Purva Karma, Pradhana Karma and Paschat Karma.

- Target- Capability to identify conditions which can affect the outcome of surgery in pre, intra and post- operative period.
- Preferable targets- Experience of handling incidents.

Ashtavidha Shastra Karma - Surgical procedures.

- Targets- Appreciation and comprehension of concepts and indications of different procedures.
- Preferable targets –Hands on experience of surgical procedures.

Yogya - Experimental Surgery.

- Target –Appreciation and comprehension of concepts of Yogya. Idea of patient's safety in experimental training.
- Preferable targets- Hands on training on mannequins.

Marma: Nirukti, types, description and importance.

- Target –Clinical application of concepts of marma.
- Preferable targets- Study of relevance of marma in the light of current anatomical and surgical knowledge.

Kshara and Kshara Karma:

- Nirukti, Pradhanyata, Guna, Dosha, Karma, Prakara, Yogya, Ayogya, Procedure, Upadrava and Chikitsa.**
- Kshara nirmana vidhi, knowledge of Kshara Varti, Taila and Pichu.
- Kshara Sutra – Preparation, Indications, Contraindications and Method of application, Complications and their Management.**
 - Target – Capability to identify and practice the use of kshara, kshara sutra in common clinical conditions.
 - Preferable targets – Broader knowledge of current trends and ongoing researches in kshara application.

Agnikarma: Mahatva, Upakarana, Vidhi, Akrti bheda, Yogya, Ayogya and Upadrava Chikitsa.

Contemporary techniques and tools of Agnikarma.

- Target - Capability to appreciate the clinical indications and comprehend Agnikarma procedure.
- Preferable targets - Hands on experience of use of cautery in surgical practice.

Raktamokshana: Mahatva, Prakara - Siravyadha, Pracchanna, Shringa, Alabu, Jaloukavacharana – Yogya, Ayogya, Procedure, Upadrava and Chikitsa.

- Target- Capability to appreciate and comprehend clinical indications of Jaloukavacharana and other Raktamokshana procedures.
- Preferable targets - Uses of bloodletting in current therapy.

Bandha Vidhi – Prayojana, Dravya, Indications, Contraindications, Prakara, Upadrava, Pichu, Plota, Kavalika and Vikeshika.

- Target- Hands on experience of techniques of bandaging.
- Preferable targets - New generation of bandaging and splintage tools.

Pranasta Shalya and Nirharana Upaya.

- Target – Importance of concepts of Sushruta in the management of Shalya and concerns of patient safety. Identification and management of foreign bodies.
- Preferable targets - Current concepts and diagnostic tools of dealing with foreign bodies.

Fluid, Electrolyte, Acid Base Balance and Nutrition:

- i. Introduction of physiology of fluids and electrolytes.
- ii. Dehydration and over hydration.
- iii. Specific electrolyte loss, Acidosis, Alkalosis, Symptomatology and Management.
- iv. Electrolyte changes in specific diseases like pyloric stenosis, intestinal obstruction and anuria.
- v. Various replacement fluids in surgery, mode of administration and complications.
- vi. Nutrition.
 - Target – Capability to identify and manage fluid and electrolyte imbalance. Ability to administer parenteral fluid.
 - Preferable targets - Advanced techniques of fluid and electrolyte assessment and management.

Rakta Mahatwa, Raktasrava / Haemorrhage: Prakara and Lakshana.

- i. Raktastambhana – Haemostasis.
- ii. Blood Transfusion –Blood groups, Compatibility, Indications, Contraindications and Complications with Management.
- iii. Component therapy.
 - Target-Knowledge of achieving haemostasis in haemorrhage.
 - Preferable targets - Detailed knowledge of blood bank techniques.

Antibiotics, analgesics, anti-inflammatory and emergency drugs in surgical practice.

- Target – Working knowledge of commonly used drugs.
- Preferable targets - Advanced pharmacological study of the above drugs.

Diagnostic techniques – X-ray, Imaging techniques, Ultrasonography, CAT Scan, MRI, Biopsy / Cytological study.

- Target- Knowledge of proper indications for optimum investigational tools and their interpretation.
- Preferable targets - Capability to work independently in the field of diagnostic techniques.

Part - B**50 Marks****Shat Kriyakala in surgical practice.**

- Target- Clinical utility of the concepts.
- Preferable targets - Applied aspects of Kriyakalas in the light of current concepts of pathogenesis.

Nirukti, Nidana, Samprapti, Prakara, Lakshana, Sadhya-asadhyata, Upadrava and Chikitsa of the following disorders.

- i. Vranashotha - Inflammation
- ii. Vidhradi - Abscess
- iii. Pidika - Boils
- iv. Nadi Vrana - Sinus / Fistulae
- v. Vrana Granthi - Keloid / Hypertrophic scar

- vi. Marmagata - Shock
- vii. Kotha – Gangrene and Principles of Amputation.
- viii. Granthi - Cyst
- ix. Arbuda - Tumour
 - Target-Clinical application of the concepts.
 - Preferable targets - Hands on experience of management of different conditions.

Vrana – Nirukti and Prakara

- i. Nija Vrana – Nidana, Samprapti, Vrana Vasthu, Prakara, Lakshana, Vrana Pariksha – Sthana, Vrana Akrti, Srava, Gandha, Vedana. Vrana Avastha- Dustavrana, Shuddha Vrana, Ruhyamana Vrana, Samyak Roodha Vrana, Vrana Sadhya-asadhyatha and Vrana Upadrava.
- ii. Vrana Chikitsa – Pathya-apathya and Shashti Upakrama, Vranitagara and Rakshakarma.
- iii. Agantuja Vrana :
 - a. Sadyo Vrana - Traumatic wounds – Nidana, Prakara, Lakshana, Upadrava and Chikitsa.
 - b. Management of bites and stings.
- iv. Dagdha Vrana – Burns and scalds.
- v. Ulcer - Types and their management.
- vi. Wound healing stages and their management.
- vii. Pramehapidaka - Diabetic carbuncle and wounds.
 - Target - Clinical application of the concepts.
 - Preferable targets - Hands on experience of management of different conditions.

Twak Vikara - Nidana, Samprapti, Lakshana and Chikitsa of Chippa – Paronychia, Kadara – Corn and Kshudra rogas.

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Manya Vikara – Nidana, Samprapti, Lakshana and Chikitsa of Galaganda – Goitre, Gandamala, Apachi –Lymphadenitis, Pashanagardhabha – diseases of parotid gland.

- Target-Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Sira Vikara - Venous disorders – Superficial and Deep venous thrombosis, Haemangioma, Varicose veins - Diagnosis and their Management.

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Dhamani Vikara - Arterial disorders – Nidana, Samprapti, Lakshana and Chikitsa of Aneurysm, Buerger’s disease, Atherosclerosis, Raynaud’s disease.

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Snayu Vikara - Diseases of tendons and ligaments – Tennis elbow, Ganglion and their Management.

- Target - Clinical application of the concepts.

- Preferable targets - Hands on experience of management of different conditions.

Care of AIDS - HIV and hepatitis infected patients.

- Target - *Knowledge of safety precautions.*

PAPER - II

100 Marks

Part - A

50 Marks

Bhagna – Skeletal injuries: Prakara including pathological fracture, Samanya Lakshana, Upadrava and Chikitsa.

Description of fracture of following bones with Clinical features, Diagnosis, Complications and Management – scapula, clavicle, humerus, radius, ulna, femur, patella, tibia and pelvis bones.

Sandimoksha - Dislocation: Dislocation of following joints with Clinical features, Diagnosis, Complications and Management of shoulder, elbow and hip.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of bone: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Osteomyelitis, Cysts, Tumours and Tuberculosis.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Cranio-cerebral injuries: Mechanism, Pathology, Classification, Investigations, Complications and primary management.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Spine: Mechanism, Pathology, Classification, Investigations, Complications and primary management of Tuberculosis, Ankylosing Spondylitis and Disc prolapse.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of breast: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Sthana Vidradhi - Breast abscess and Sthana Arbuda - Breast tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of chest: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Chest injury, Pleural effusion, Pleurisy and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of esophagus: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Oesophagitis, Varices, Ulcer and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Gulma Roga - Nidana, Prakara, Lakshana, Upadrava and Chikitsa.

Shoola vyadhi - Nidana, Prakara, Lakshana, Upadrava and Chikitsa.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of acute abdomen.

Udara Roga: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Jalodara - Ascites, Chidrodara – Perforation, Peritonitis and Badhagudodara-Intestinal obstruction.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of stomach and duodenum: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pyloric Stenosis, Peptic Ulcer and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of small intestine: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Tuberculosis, Obstruction and Perforation.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of large intestine - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Tuberculosis, Obstruction, Perforation, Tumours, Appendicitis, Crohn's disease and Ulcerative Colitis.

- Target - Clinical utility of the concept.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Rectum and Anal Canal – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital disorders, Arshas - Haemorrhoids, Parikartika - Fissure-in-ano, Bhagandara - Fistula-in-ano, Guda Vidradi - Anorectal abscesses, Gudabhramsa - Rectal prolapse, Sanniruddaguda - Anal stricture, Incontinence, Rectal Polyp and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Abdominal injuries and their management.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Part – B

50 Marks

Diseases of Liver: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Yakrit Vidhradi - Abscess, Neoplasia, Portal hypertension and Yakritdalyodar –Hepatomegaly.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Gallbladder: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Cholecystitis, Cholelithiasis, Obstructive jaundice and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Pancreas: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pancreatitis, Cysts of Pancreas and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Spleen – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pleehodara – Splenomegaly and Splenic rupture.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Kidney and Ureters - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Polycystic kidney, Injuries, Perinephric abscess, Calculus and Neoplasms.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Urinary bladder – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Injuries, Ashmari - Vesical Calculus, Cystitis and Neoplasms.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Mutraghata and Mutrkrichra - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management. Retention of urine.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Prostate - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Prostatitis, Prostatic abscess, Benign Enlargement of Prostate and Carcinoma of Prostate.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Urethra – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Urethritis, Stricture and Rupture.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Penis: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Niruddhaprakasha -Phimosis, Parivartika -Paraphimosis, Avapatika - Prepuceal ulcer, Arbuda- Tumours and Lingarsha - Penile Warts.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Scrotum and Testis: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Epididymo-orchitis, Epididymal cyst, Scrotal filariasis, Shukrashmari - Seminal calculus, Torsion of testis, Ectopic testis, Undescended testis and Tumours.

Vridhhi Roga: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Mutravridhhi – Hydrocele.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Antra Vridhhi – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Hernia - Inguinal, Femoral, Epigastric, Umbilical, Incisional and rare forms of Hernia.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

PRACTICALS

Content of Practicals:

1. Identification, uses, demonstration of surgical instruments and methods of sterilization.
2. Training of case taking, bed side clinicals and case presentation.
3. Demonstration and Practical training in Anaesthesia.
4. Training to develop skills in following Parasurgical and other procedures
 - i. Kshara Karma
 - ii. Agnikarma
 - iii. Kshara Sutra
 - iv. Raktamokshana
 - v. Application of bandages and splints
 - vi. Catheterization
 - vii. Wound management procedures like Parisheka and Patradana
 - viii. Ryle's tube aspiration
 - ix. Injections -Intramuscular / Intravenous / Subcutaneous / Intradermal
 - x. Incision and drainage of abscess
 - xi. Suturing of open wounds
5. **Observation of following procedures**

- i. Circumcision
- ii. Hydrocele
- iii. Hernial repair
- iv. Vasectomy
- v. Haemorrhoidectomy
- vi. Fistulectomy
- vii. Fissurectomy
- viii. Appendectomy
- ix. Cholecystectomy

6. Training of Surgical Emergencies and Management.

Clinical Training (Indoor and Outdoor)

- Shalya (Samanya)
- Shalya (Kshara and Anushastra Karma)
- Asthi and Sandhi Chikitsa (Orthopaedics and Trauma)
- Anaesthesia
- Radiology

09 Months

03 Months (atleast one month in OT)
 03 Months (atleast one month in OT)
 02 Months
 15 days
 15 days

Distribution of Marks

1) Daily records	- 10 Marks
2) Instruments	- 20 Marks
3) Short case	- 10 Marks
4) Long case	- 20 Marks
5) Viva – voce	- 40 Marks
Total	- 100 Marks

Reference Books

1. Sushruta Samhita
2. Ashtanga Sangraha
3. Ashtanga Hridaya
4. Charaka Samhita
5. The Surgical instruments of the Hindus - Girindranath Mukhopadhyaya
6. Shalya Tantra Samuchchaya - Pandit Ramadesh Sharma
7. Shalya Vigyan (Part 1-2) - Dr. Surendra Kumar Sharma
8. Shalya Samanvaya (Part 1-2) - Vd. Anantaram Sharma
9. Shalya Pradeepika - Dr. Mukund Swaroop Verma
10. Sushruti - Dr. Ram Nath Dwivedi
11. Clinical Shalya Vigyan - Dr. Akhilanand Sharma
12. Bhagna Chikitsa - Dr. Prabhakar Janardhan Deshpande
13. Kshara sutra management in anorectal ailments - Dr. S.K. Sharma, Dr. K.R.Sharma and Dr. Kulwant Singh.
14. Anorectal diseases in Ayurveda - Dr. Sijoria and Dr. Praveen Kumar Chowdary.
15. Adhunik Shalya Chikitsa Siddanta - Dr. Katil Narshingham Udupa
16. Agnikarma Technology Innovation - Dr. P.D. Gupta
17. Shalya Tantra Ke Siddhant - Dr. K.K.Takral
18. Recent advances in the management of Arshas / Haemorrhoids - Dr. P. Hemantha

- | | |
|--|--|
| 19. Arsha Evum Bhagander Mein sutra Avacharan | Kumar |
| 20. Kshara Sutra | - Vd. Kanak Prasad Vyas |
| 21. Surgical ethics of Ayurveda | - Dr. S.N.Pathak |
| 22. Bailey and Love's Short Practice of Surgery | - Dr. D.N. Pande |
| | - Norman.S. Williams, Charles.V. Mann and R.C.G. Russell |
| 23. Clinical methods in surgery | - S. Das |
| 24. Textbook of Operative Surgery | - S. Das |
| 25. Shalya Vigyan (Sachitra) | - Anantram Sharma |
| 26. Anushastra Karma | - Dr. D.N. Pande |
| 27. Concept of Vrana is Ayurveda | - Dr. Lakshman Singh |
| 28. Significance for Poorva Karma in Surgical Patient | - Dr. Lakshman Singh |
| 29. Sangyahan Prakash | - Dr. D.N. Pande |
| 30. A concise Text Book of Surgery | - S. Das |
| 31. A manual on Clinical Surgery | - S. Das |
| 32. A System of Surgical Diagnosis | - T.N. Patel |
| 33. A Practical Guide to Operative Surgery | - S. Das |
| 34. Drugs and Equipment for Anaesthesia | - Arun kumar |
| 35. Manual of Surgical Instruments | - M.M. Kapur |
| 36. Ward Procedures | - Patel Mansukh. B |
| 37. Recent trends in the management of Arshas / Haemorrhoids | - Dr. P. Hemantha Kumar |
| 38. Primary Anaesthesia | - Maurice King |
| 39. Synopsis of Anaesthesia | - Lee |
| 40. Clinical Anatomy/ Surgical Anatomy | - John E.Skandalakis |
| 41. Surgical Instruments of the Hindus | - Girindharnath Mukopadyay |
| 42. Outline of Orthopedics | - John Crawford Adams and David Hamblen. L |
| 43. Outline of Fracture | - John Crawford Adams |
| 44. Recent trends in the management of Bhagandara / Fistula-in-ano | - Dr. P. Hemantha Kumar |
| 45. Principles and Practice of Agnikarma | - Dr. Anand Kumar and Dr. Kanchan Shekokar |
| 46. Manipal Manual of Surgery | - Dr. Rajgopal Shenoy |

4.4 SHALAKYA TANTRA

**Theory Two Papers – 100 Marks Each
Practical/Viva voce – 100 Marks**

NETRA ROGA VIGYAN

Paper I

Marks

100

I. Introduction

- Shalakyatantra nirukti, Parichayam, Ithihasam
- Netra rachana shariram (Mandala, Patala, Sandhi, Drushti Vichara) and Netra Kriya Sharira alongwith modern anatomy of Eye.
- Eye examination and knowledge of basic instruments/equipments required for examination of Eye.
- Netrarognanam – Samanya Hetu (Nija and agantuja), Purvarupa, Samprapti, Rupa and Chikitsa.
- Classification of Netraroga and its importance.

II. Netra Samanya and Vishishta Chikitsa - Kriya Kalpa

- Netra and Chakshu swasthya hitkara Dinacharya, Ritucharya, Aahara evam Vihara.
- Kriya-kalpa-Seka, Aschyotana, Pindi, Vidalaka, Tarpana, Putapaka, Anjana and importance of Panchkarma in Netra Chikitsa.
- Basic fundamentals of Netra Shastra Chikitsa e.g. Purva – Pradhana - Paschat karma, Ama-Pachyaman-Pakva Vrana shotha, Vranitopasana, Pranashashalya, & Vranbandhana. Methods and concepts of sterilization, asepsis and antisepsis as per ancient and modern point of view.
- Basic applied knowledge of Ashtavidha shastrakarma, agni, kshara, raktamokshana in Netra rogas.
- Essential diagnostic and therapeutic modern pharmacological agents required in Netra Chikitsa

III. Sandhigata Roga(Diseases of junctional areas of eye)

- Number of sandhigata rogas, detailed etiology, pathology, clinical features and management of Pooyalasa and Srava Rogas.
- Brief Study of krimi granthi, Parvani and Alaji Rogas.
- Study of Acute and Chronic Dacryocystitis, Epiphora, Blepharitis including their aetiology, pathology, signs & symptoms, differential diagnosis and medical & surgical management.

IV. Vartmagata Roga(Diseases of Lids)

- Number of vartmagata rogas, and detailed knowledge of etiology, pathology, clinical features and management of Anjananamika, Utsangini, Lagana, Vatahata vartma, Pakshma kopa, Sikta vartma, Pothaki, Klinna vartma, Krichhronmeelana and Kukunaka diseases of Vartma.
- Brief Knowledge of Vartmarbuda, Utklishta vartma, Nimesh, Pakshmashata, Vartmarsha
- Knowledge of Hordeolum, Ptosis, Trachoma, Trichiasis, Entropion, Ectropion including their Etiology, signs and symptoms differential diagnosis and medical & surgical management.

V. Shuklagata Roga(Diseases of sclera and conjunctiva)

- Number of Shuklagata rogas, detailed knowledge of etiology, pathology, clinical features

- and management of Arma, Arjuna and Shuktika
- b) Brief Knowledge of Sira pidika, Sira jala, Pishtaka, Balasgrathita.
 - c) Study of Pterygium, Scleritis, Episcleritis, Sub-Conjunctival Hemorrhage including their Etiology, signs and symptoms, differential diagnosis and medical & surgical management.

VI. Krishnagata Roga (Diseases of cornea and uvea)

- a) Number of krishnagata rogas, detailed knowledge of Etiology, Pathology, Clinical features, differential diagnosis, complications and Management of Savrana /kshata Shukla (Shukra), Avrana shukra (Shukla)
- b) Brief knowledge of Sira shukla, Akshipakatyaya and Ajakajata.
- c) Knowledge of Corneal ulcer, Corneal Opacity, Uveitis, Acute Iridocyclitis, Staphyloma, their aetiology, pathology, symptoms, differential diagnosis, complications and management.

VII. Sarvagata Roga (Diseases effecting all parts of eye)

- a) Number of Sarvagata rogas, detailed knowledge of etiology, pathology, clinical features, complications, differential diagnosis and Management of Abhishyanda, Adhimantha, Hatadhimantha and Shushkakshipaka.
- b) Brief Knowledge of Amloshit, Vata paryaya, Anyato vata, Sashopha & Ashophakshipaka- Pilla roga, Sirotpata and Siraharsha.
- c) Knowledge of Conjunctivitis, Glaucoma, Dry Eye Syndrome including their etiology, pathology, clinical features, differential diagnosis, complications and their management.

VIII. Drishtigata Roga (vision disorders)

- a) Number of Drishtigata rogas detailed knowledge of - etiology, pathology, clinical features, differential diagnosis and management of Timira, Kacha and Linga nasha.
- b) Brief Knowledge of Abhighataja lingnasha, sanimittaja & Annimittaja Lingnasha Doshandhya/Kaphavidagdha drishti, Naktandhya, Ushna vidagdha drishti, Pittavidagdha drishti, Dhumadarshi, Hriswajadya, Gambhirika, Nakulandhya, Nayanabhighata.
- c) Knowledge of Refractive errors, Cataract including their etiology, pathology, clinical features, differential diagnosis, complications and their management.
- d) Study of Eale's disease, Hypertensive & Diabetic Retinopathies, Age related Macular degeneration, Strabismus, Retinitis pigmentosa, Night blindness, Amblyopia, Central serous retinopathy, Optic Neuritis and Optic atrophy

IX. Miscellaneous Diseases

- a) Xerophthalmia and other malnutritional eye disorders.
- b) Knowledge of ocular trauma and their management.
- c) Introduction to Eye bank, Eye donation, Corneal Transplantation
- d) Preventive Ophthalmology and Community Ophthalmology

SHIRA - KARNA- NASA- MUKHA ROGAS

PAPER II

100 Marks

I Samanya Chikitsa

- a) Study of therapeutic procedures like Sveda, Kavala, Gandusa, Dhuma, Murdhni Taila, Nasya, Pratisarana, Karna Purana, karna prakshalana, nasa prakshalana Mukha Lepa.
- b) Ashtavidha shastrakarma and anushastrakarma used in the treatment of Shira, Karna, Nasa evam Mukha Rogas.

II Shiro Roga

- a) Importance and Superiority of Shira.
- b) Number, general etiology, pathology and cardinal features of shiro rogas and kapalgata rogas along with their common line of management/treatment.
- c) Detailed study of Vataja, Pittaja, Kaphaja shirashoola, Suryavarta, Ardhavabhedaka, Khalitya, Palitya.
- d) Brief Knowledge of Raktaja shiraha shoola, Krimija shiraha shoola, Kshayaja shiraha shoola & Sannipataja shiraha shoola, Ananta vata, Indralupta, Darunaka.
- e) Detailed study of Headache, Migraine its differential diagnosis and treatment.

III Karna Roga

- a) Detailed study of Rachana and Kriyasharir of Karna (Ear) & Shravanendriya as per Ayurvedic and modern view, Examination of Ear along with instruments/equipments required in Ear examination.
- b) Detailed study of etiology, pathology, classification, clinical features and management of diseases of Karna – karna shool, karna nada & shweda, Badhirya, karnastrava, karna pratinaha, pootikarna, karnagoothaka, karnavidradhi.
- c) Brief Knowledge of karna kandu, karnapaka, karnarsha, karnarbuda, krimikaran & karnapali rogas, Karna sandhana (Auroplasty), fundamentals, method and Vaikritpaham
- d) Detailed study of Otagia, ASOM, CSOM, Deafness, wax including their etiology, pathology, clinical features, differential diagnosis, complications and medical & surgical management
- e) Brief Knowledge of Otomycosis, Otosclerosis, Tinnitus, Vertigo, Foreign body in ear and Noise pollution.

IV Nasa Roga

- a) Detailed study of Rachana and Kriyasharir of Nasa (Nose and paranasal sinuses) & Ghranendriya as per Ayurvedic and modern view, Examination of Nose. along with instruments/equipments required in Nose examination.
- b) Detailed study of Pratishyaya, Dushta pratishyaya, Nasanaha, Kshavathu, Nasagata raktapitta & Nasarsha.
- c) Brief Knowledge of Putinasa, Bhranshathu, Peenasa, Apeenasa, Nasarbuda, Nasashotha, Dipta, Nasa Sandhana.
- d) Detailed study of Rhinitis & Sinusitis Epistaxis, Nasal Polyp, DNS, Foreign body including their Etiology, pathology, clinical features differential diagnosis and medical & surgical management.
- e) Brief Knowledge of Nasal trauma, Tumours of nose and Para nasal sinuses.

V Mukha Roga (Diseases of Oral Cavity)

- a) Detailed study of Rachana and Kriyasharir of Mukha Rogaadhithana- oshtha, dantamoola, danta, jivha, talu, gal, sarvasara (Oral cavity) as per Ayurvedic and modern view along with their Basic examination including instruments/equipments required for the examination
- b) Mukha and Danta Swasthya as per ancient and modern concepts including prevention of malignancy of oral cavity.
- c) Number and general aetiology, pathology, cardinal features of Mukha rogas along with their common line of management/treatment.

Oshtha Roga (Diseases of Lips)

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - Oshtha prakopa, khandoshtha
- b) Brief Knowledge of Gandalaji, Jalarbuda, Kshataja Oshthaprakopa
- c) Knowledge of cleft lip.

Dant Mula Gata Roga (Diseases of Periodontia)

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - Shitada, Dantaveshta, Upakush, Danta Nadi, Danta Vidradhi, Adhimansa
- b) Brief Knowledge of dantapupputaka, Saushira, Mahasaushira, Danta Vaidarbha , Paridara, Vardhana.
- c) Detailed study of Etiology, pathology, classification, clinical features and management of Gingivitis, Apical abscess, Periodontitis (Pyorrhoea).

Danta Roga (Dental Diseases)

- a) Detailed study of Etiology, pathology, classification, clinical features and management of Daalan, Krimidanta, Dantaharsha, Danta sharkara, Hanumoksha
- b) Brief Knowledge of karala, Bhanjanak , Kapalika, Shyava Danta, Danta bheda,
- c) Danta chaal, Adhidanta, Danta Utpatana including Jalandhar bandha method and Danta Purna.
- d) Knowledge of Dental Caries, Dental Tartar & Tooth extraction.

Jihwa Gata Roga (Diseases of Tongue)

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - jivha kantaka (vataja, pittaja and kaphaja)
- b) Brief Knowledge of Upajihva, Adhijihva, Alasa.
- c) Knowledge of Glossitis, Tongue Tie, Ranula, Benign and Malignant Tumors of tongue.

Talu Roga (Diseases of Palate)

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - Gala shundika, Talushosha, Talupaka
- b) Brief Knowledge of Talupupputa, Adhrusha, Kacchapa, Talvarbuda, Mamsasanghata.
- c) Knowledge of Cleft palate, palatitis, uvulitis and tumours of the palate.

Kantha and Gala gata Roga (Diseases of Pharynx & Larynx)

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - Tundikeri, Kantha shaluka, Gilayu, Galaganda,

- Swrabhedha , Galavidradhi.
- Brief Knowledge of Rohini, Galashotha, Kantharbuda, Kanthavidradhi, Galarbuda Galaugham, Vrindam, Ekavrindam, Valaya, balasa , Shataghni, Swaraghna.
 - Detailed study of Etiology, pathology, classification, clinical features and management of - Pharyngitis, Laryngitis, Tonsillitis & Adenoiditis
 - Brief Knowledge of foreign body in the throat, Carcinoma of Larynx & Pharynx, Dysphagia Diphtheria & diseases of salivary glands.

Sarvasara Mukha Roga (Generalised mucosal affections of the oral cavity)

- Detailed study of Etiology, pathology, classification, clinical features and management of Sarvasar mukhapaka
- Brief Knowledge of urdhvaguda, putivaktrata, mukharbuda
- Detailed Knowledge of Stomatitis.

VI Miscellaneous Diseases

National Programme for Prevention and Control of Deafness.

PRACTICAL

Content of Practical

Identification, Uses, Demonstration of surgical/non-surgical equipment/ instruments, materials used in shalaky chikitsa. Method of sterilization. Training of case taking, bedside clinics and case presentation.

Training in para- surgical procedures-

- Kshara karma
- Agnikarma
- Raktamokshana
- Training of ward procedures. Application of bandages, wound management
- Training of minor procedures (ashtavidha)
- Observation of surgical procedures in Shalaky

Clinical Training	04 Months (OPD, IPD OT and kriya kalpa)
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Distribution of marks

- | | |
|---|----------|
| 1) Long Case | 30 Marks |
| 2) Short Case | 20 Marks |
| 3) Identification of instruments
quipments,medicines,etc | 10Marks |
| 4) Viva – voce | 30 Marks |
| 5) Daily Record (Case record) | 10 Marks |

Total	100 Marks
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Reference Books:-

- | | |
|-------------------|--------------------------------|
| 1. Shalaky Tantra | Dr. Rama Nath Dwivedi |
| 2. Shalaky Vigyan | Dr. Ravindra Chandra Choudhary |

3. Abhinava Netra Chikitsa
 4. Netra Chikitsa Vigyan
 5. Netra Roga Chikitsa
 6. Netra Roga Vigyan
 7. Parson's Diseases of Eye
 8. Diseases of ENT Log and Turner
 9. Shalakya Tantra
 10. A text book of ophthalmology in Ayurveda
 11. Shalakya Kriya Kalpa Vigyan
- Useful portions of Charak, Sushrut, Vagbhata

Acharya Vishva Nath Dwivedi
Dr. Ravindra Chandra Choudhary
Dr. Munje
Dr. Hans Raj

Shiv Nath Khanna
Dr. P.K.Shantha kumara
Prof. K. S. Dhiman

4.5 Research methodology and Medical statistics

Total Marks 50 (Part A-30 and Part B- 20)

PART – A –Research Methodology

1. Brief historical background of research in Ayurved and contemporary medical science
Evidences of researches in ayurvedic classics
2. Etymology, definitions and synonyms (Anveshana, Gaveshana, Prayeshana, Anusandhan and Shodha) of the word Research
3. Research in Ayurved - Scope, need, importance, utility
4. Types of Research (familiarization of the terms)
 - a) Pure and Applied
 - b) Qualitative , Quantitative and Mixed
Observational and interventional.
5. Research process (Importance of each steps in brief)
 - a. Selection of the topic
 - b. Review of the literature
 - c. Formulation of Hypothesis
 - d. Aims and Objectives
 - e. Materials and methods
 - f. Observations and results
 - g. Methods of communication of Research
6. Research tools – Role of the pramanas as research tools
7. The concept and importance of ethics in research
8. Concept of Evidence Based Medicine and Scientific Writing
9. Importance of IT in data mining and important research data portals concerned with Ayurved and contemporary medical science (DHARA , PubMed, Ayush Research Portal, Bioinformatics Center, Research Management Informatic System etc.)

Part – B Medical-Statistics

1. Definition, scope and importance of the Medical statistics
2. Common statistical terms and notations
 - a. Population
 - b. Sample
 - c. Data
 - d. Variable
 - e. Normal distribution
3. Collection and Presentation of data
 - a. Tabular
 - b. Graphical
 - c. Diagrammatical
4. Measures of location
 - a. Average
 - b. PercentileMeasures of Central Tendency
 - a. Arithmetic mean
 - b. Median

- c. Mode
- 5. Variability and its measurement
 - a. Range
 - b. Standard deviation
 - c. Standard error
- 6. Introduction to probability and test of significance
- 7. Parametric and non parametric tests
- 8. Introduction to commonly used statistical soft-wares.

Reference books for Research methodology :

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers' Distributors
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd.ed), Singapore, Pearson Education
4. Students guide to research methodology – Undergraduates. Alexandria Medical Students Association.
5. Health research methodology. A guide for training in research methods. 2nd edition. Manila, World Health Organization Regional Office for the Western Pacific, 2001.

Reference Books for statistics :

1. Health research methodology. A guide for training in research methods. 2nd edition. Manila, World Health Organization Regional Office for the Western Pacific, 2001.
2. Statistical methods in medical research. P.Armitage (Ed) Oxford Blackwell
3. Statistical methods . Snedecor GW and Cochran, WG
4. Altman, D. G. (1991). Practical statistics for medical research. London: ChapmanPrinciples of Medical Statistics by A. Bradford Hill
5. Interpretation and Uses of Medical Statistics by Leslie E Daly, Geoffrey J Bourke, James MC Gilvray.
6. Research in Ayurveda-M S Baghel
7. research methodology in ayurveda-V.J.Thakar,Gujarat Ayurved University
8. Ayurveda anusandhan paddhati-P.V.Sharma
- 9.Research methodology methods and statistical techniques- Santosh Gupta. Greenhouse SW.
- 10.The growth and future of biostatistics: (A view from the 1980s). Statistics in Medicine 2003; 22:3323–3335.
- 11.Knapp GR & Miller MC. Clinical epidemiology and Biostatistics, NMS series Antonisamy B, Christopher S & Samuel PP. Biostatistics : Principles and practice
- 12.Sundara Rao PSS & Richard J. An introduction to Biostatistics, PHI
- 13.Senn S (1997). Statistical Issues in Drug Development. Chichester: John Wiley & Sons.
- 14.Methods in Bio-statistics for Medical Students- BK Mahajan
- 15.Vaidyakeeya Sankhiki Shastra- Dr.S.S.Savrikar

CENTRAL COUNCIL OF INDIAN MEDICINE NEW DELHI

SYLLABUS FOR POST – GRADUATE DIPLOMA COURSE

NAME OF THE SPECIALITY	PAGE No.
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AYURVEDIC PHARMACEUTICS
D. Rasa Shastra and Bhaishajya Kalpana
First year

Theory (Two papers) - Maximum Marks -100 (each)
Practical (one) - Maximum Marks-100

Paper – I
Raw Materials Science
Part-A

1. Definition and categories of raw materials from plant, animal, metallic and mineral origin.
2. Plant concentrates, extracts and exudates, resins, excipients, sweetening agents, volatile oils, perfumes, flavours and colours.
3. Collection, shelf-life and storage of raw materials.
4. Study of plant material derived from prioritized medicinal plants.
5. Study of nomenclature, synonyms, description-macro and micro, identification, purity and strength, constituents, assay, properties – pharmacological activity, important formulations, therapeutic uses and dose of raw materials as given in the pharmacopoeia as applicable for following plants.

- | | | |
|-----------------------|--------------------|------------------|
| 1) Ahiphena | 2) Agnimantha | 3) Agar |
| 4) Amalaki | 5) Apamarga | 6) Aragvadha |
| 7) Ardraka-Shunthi | 8) Arjuna | 9) Arka |
| 10) Ashvagandha | 11) Ashvagola | 12) Ashoka |
| 13) Ativisha | 14) Bakuchi | 15) Baladvayam. |
| 16) Bharangi | 17) Bhallataka | 18) Bibhitaka |
| 19) Bijaka/Vijayasara | 20) Bilva | 21) Brahmi |
| 22) Bringaraj | 23) Brihati | 24) Chandandvaya |
| 25) Chitraka | 26) Dadima | 27) Danti |
| 28) Daruharidra | 29) Dhanyak | 30) Dhatki |
| 31) Draksha | 32) Durva | 33) Ela |
| 34) Eranda | 35) Gambhari | 36) Gokshura |
| 37) Guduchi | 38) Guggulu | 39) Haridra |
| 40) Haritaki | 41) Hingu | 42) Jambu |
| 43) Jatamamsi | 44) Jatiphal | 45) Jeerakdvaya |
| 46) Jyotishmati | 47) Kalmegh | 48) Kampillak |
| 49) Kanchar | 50) Kantakari | 51) Kapikacchu |
| 52) Karkatashringi | 53) Karpur | 54) Katuki |
| 55) Khadira | 56) Kiratatikta | 57) Kumari |
| 58) Kupilu | 59) Kumkum/Keshara | 60) Kushmanda |

61) Lavang	62) Kutaja	63) Lodhra
64) Madanaphal	65) Manjishtha	66) Marich
67) Markandika	68) Mushali	69) Musta
70) Nagakeshar	71) Nimba	72) Nirgundi
73) Palasha	74) Palandu	75) Pashanabheda
76) Patala	77) Patola	78) Pippali-Pippalimula
79) Punarnava	80) Rasna	81) Rasona
82) Saireyaka	83) Shallaki	84) Saptaparna
85) Sarpagandha	86) Sariva	87) Shalparni
88) Shalmali	89) Shankhapushpi	90) Shatavari
91) Shatapushpa	92) Shigru	93) Shirish
94) Shyonaka	95) Talisa patra	96) Tila
97) Trivrit	98) Tulsi	99) Tvak
100) Ushira	101) Vacha	102) Varun
103) Vasa	104) Vata	105) Vatsanabha
106) Vidari	107) Vidanga	108) Yashtimadhu
109) Yavani	110) Devadaru	

Part-B

1. Short introduction to minerology - including the process of mineral origin and formation, classification of minerals, their geographical distribution, as well as their utilization. Physical, chemical and minerological properties, identification, classification, categorization, pharmacological properties and uses of minerals.
2. Brief introduction to metallurgy, including the physical and chemical behavior of metallic elements, extractive metallurgy, properties of metals, important common alloy systems, general principles of metal working process, various heat treatments and chemical properties of metals.
3. Definition, classification, scientific and classical nomenclature, synonyms, characteristic features, physico-chemical properties of Rasa, Maharasa, Uparasa, Sadharanrasa, Ratna-Uparatna, Vishopavisha, Dhatu and Upadhatu (Metals and mineral containing drugs) along with their properties, pharmacological activity, important formulations, therapeutic uses and dose.
4. Brief introduction to animal products used in therapeutics, their physical and chemical properties, pharmacological activity, therapeutic uses and dose.
5. Storage and shelf life of metal, mineral and animal origin raw materials.

Paper – II

Drug Standardization and Regulations

Part-A

1. Methods of drug standardization in relation to drugs prepared from plant, mineral, metal and animal products.
2. Concept of evaluation of Plant drugs as per WHO guidelines.
3. Review of general methods of evaluation of drugs and foods.
4. Morphological, Microscopical, Cytomorphological examination of finished products.
5. Determination of physical and chemical constituents and its extractive values.
6. Techniques of separation, identification, estimation and characterization of various chemical components of drug.
7. Determination of Physical, Chemical and Biological adulterants and contaminants.

Part-B

Indian Statutory Regulations applicable to Ayurvedic products

1. Good Manufacturing Practices related to Ayurvedic Drug Industry.
2. Laws Governing Pharmacy
 - a) Relevant regulatory provisions of Ayurvedic drugs in Drug and Cosmetic Act 1940 and Rules 1945
 - b) Laws pertaining to Drugs and Magic remedies (objectionable advertisement) Act-1954.
 - c) Prevention of Food Adulteration (PFA) Act.
 - d) Laws pertaining to Narcotics
 - e) Factory and Pharmacy Acts
 - f) Consumer Protection Act -1986
 - g) Standards of Weights and Measures (Enforcement) Act 1985
3. Regulatory Affairs related to International Trade and Practices of Ayurvedic Drugs.
4. Introduction to Ayurvedic Pharmacopeia of India, Ayurvedic Formulary of India.
5. Introduction to Indian Pharmacopeia, British and United States Pharmacopeia, Pharmacopeial Codex.
6. Introduction to Traditional Knowledge Digital Library.

Patent and product registration

1. Intellectual property, importance and types of intellectual property.
2. Paris convention, World Trade Organization and GATT.
3. The Indian Patents Act 1970 and Indian Patents (Amendments) Act 2005.
4. Concepts of patentability – issue of novelty, inventive steps and industrial application with special reference of differences in Indian, United States and European patents.
5. Knowledge of US FDA and statutory regulations as applicable to plant drugs in U.S.
6. Introduction to European Union. Traditional Health Medicinal Product Directive (THMPD) and other directives and regulations related to plant drugs, Nutraceuticals applicable in European Union.

7. Introduction to product registrations in many countries such as - Natural Health Products of Canada, Traditional Medicine Registration of Malaysia, EMEA's Human Herbal Medicines, etc.
8. New Drug Application (NDA) and Abbreviated New Drug Application (ANDA).

Second Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) – Maximum Marks -100

Paper - I

Pharmaceutical Technology of Kashtaushadhi

Part-A

1. Introduction to Pharmaceutical technology, standard operating and manufacturing procedures.
2. Dosage forms of drugs- liquids, semi-solids and solids.
3. Size reduction- disintegrator, hammer mill, ball mill, fluid energy edge runner, roller mill.
4. Size separation, mixing and homogenization.
5. Filtration- various devices and methods.
6. Extraction- percolation and maceration, infusion, decoction, soxhlet extraction.
7. Distillation- Double and triple distillation, fractional distillation (rectification), molecular distillation, vacuum distillation.
8. Heat processes- fusion, calcination, ignition, exsiccation, sublimation.
9. Drying process– knowledge of current and advanced technologies of drying.
10. Freeze drying (Lipholization).
11. Tablet making- types of tablets, binders, adhesives, lubricants, colorants etc., compression- single, multiple station machines, coating, polishing.
12. Capsules– types of capsules, hard and soft gelatin, granulation, capsule filling technology.
13. Introduction to Stability studies and use of preservatives, anti-oxidants and other material with reference to shelf life of drug material.
14. Syrups, elixirs, ointments, emulsion, pastes, dental and cosmetic preparations.
15. Packaging technology, strip packing, blister packing, aerosols, labeling.
16. Marketing of Pharmaceutical products

Part-B

1. Introduction to technical terminologies used in Bhaishajya Kalpana.
2. Definition, composition, method of preparation of following dosage forms:
 - a) Liquid dosage forms - Svarasa, Kvatha, Hima, Phanta, Taila, Asava-Arista and Basti kalpa, etc.
 - b) Semi Solid Dosage forms – Avaleha, Ghrita, Kalka, etc.
 - c) Solid dosage forms – Churna, Gutika, Vati, Varti, Guggulu, Kshara, Lavana, Tablet, Capsules, etc.
 - d) Pathya / Aahara kalpana- Krita- akrita and Aushadh Siddha.

- e) Topical dosage forms – Malahara, Upanaha, Lepa, Udvardana, Karnapurana, Anjan, Ascchyotanadi Netra Kalpa, Nasya Kalpa and Mukha Kalpa.
- f) Preparation of Ksharasutra.
- 3. Study of organoleptic and physico-chemical characteristics, determination of heavy metal content and microbial load in different formulations.
- 4. Study of therapeutic uses, dosage and method of applications of different dosage forms described in Bhaishajya Kalpana.
- 5. Introduction to methods of packing and storage of drugs.
- 6. Introduction to new dosage forms –
 - a) Neutraceuticals and food supplements.
 - b) Concept of Organic food and Genetically Modified Food
 - c) Cosmeceuticals / Cosmetics – Study of ingredients used in various cosmetic products such as creams, powders, lotions, hair oils, toiletries, etc.
 - d) Introduction to raw materials of plant origin like fixed oils, waxes, gums, hydrophilic colloids, colours, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents.
 - e) Plant Products – Evaluation of plant products using physico-chemical studies in whole form and identification of chemical components.

Paper – II
Pharmaceutical Technology of Rasaushadhi

Part-A

1. Introduction to technical terminologies used in Rasashastra
2. Knowledge and application of yantra, puta, musha, chullika, koshthi etc. used in preparation of Rasaushadhis.
3. Introduction to current technology and equipments such as heating appliances like furnaces, boilers, drying chambers, heating mantles, hot plates, gas stoves, mixers, grinders, edge and end runners, mills, shifters, sieves used in pharmaceutical processing, manufacture and quality control of Rasaushadhi.
4. Concept of pharmaceutical engineering and instrumentation technology.

Part-B

1. Knowledge and application of processing techniques in Rasashastra.
 - a) Shodhana of raw materials like Rasa, Maharasa, Uparasa, Sadharanarasa, Ratna-Uparatna, Vishopavisha, Dhathu and Upadhatu. (Metals and mineral containing drugs).
 - b) Marana, Satvapatana, Amritikarana, Lohitikarana, Druti Nirmana of Rasa, Maharasa, Uparasa, Sadharanarasa, Ratna-Uparatna, Vishopavisha, Dhatu and Upadhatu.
2. Definition, composition, method of preparation of following dosage forms:
 - a) Pishti
 - b) Khalvi Rasa
 - c) Parpati Rasa
 - d) Kupipakva Rasa
 - e) Pottali Rasa

3. Study of organoleptic and physico-chemical characteristics
4. Determination of microbial load and heavy metal content (wherever relevant) in different formulations.
5. Study of therapeutic uses, dosage and method of applications of different dosage forms described in Rasashastra.
6. Introduction to methods of packing and storage of Rasaushadhi.

PRACTICALS

Contents of Practical

1. Preparation of minimum two formulation of each class (Total 50).
2. Work experience in every pharmaceutical process.
3. Visit to two GMP certified pharmacies.

Pattern of Practical Examination

1. Practical Records	10 marks
2. Practical (Rasa Shastra)	20 marks
3. Practical (Bhaishajya Kalpana)	20 marks
4. Project Work	20 marks
5. Viva - voce	30 marks
Total	100 marks

Text Books for Reference

- | | | |
|---------------------------------|---|--------------------------|
| 1. Aushadhi Guna Dharma Shastra | : | Vd.Gune |
| 2. Aushadhikaran | : | Vd.Dhamankar |
| 3. Ayurved Prakash | : | Madhav Upadhyaya |
| 4. Ayurvediya Rasashastra | : | Dr.C.B.Jha |
| 5. Bhaishajya Kalpana Vigyan | : | Dr S K Mishra |
| 6. Bhaishajya Kalpana Vigyan | : | Dr.K.R.C. Reddy |
| 7. Bhaishajya Kalpana Vigyan | : | Dr.S G Hiremath |
| 8. Bharat Bhaishajya Ratnakara | | |
| 9. Bhavaprakasha Nighantu | : | Bhavamishra |
| 10. Bhaishajya Ratnavali | : | Govind Das |
| 11. Kashyapa Samhita | : | Kashyapa |
| 12. Paribhasha Khanda | : | Yadavji Trikamji Acharya |
| 13. Ras – Tarangini | : | Sadanand Sharma |
| 14. Rasaratnasamucchya | : | Rasa Vagbhata |
| 15. Rasashastra | : | Dr.V.A.Dole (English) |
| 16. Rasayogasagara | : | Hariprapanna Sharma |
| 17. Rasendrachintamani | : | Dundukanath |
| 18. Sharangadhar Samhita | | |

19. Relevant portions from Charak Samhita, Sushrut Samhita, Ashtanga Hridaya, Ashtanga Samgraha.
20. Bentley's T.B. of Pharmaceutics : Rawllins
21. Compendium of Medicinal Plants : Orient Longmann
22. Drugs & Cosmetic Act, 1940 and Rules 1945
23. Industrial Pharmacy : Lachmann
24. Indian Pharmacopoeia : Govt. of India
25. Pharmacognosy of Ayurvedic Drugs : Govt. of Kerala
26. Pharmacognosy of Ayurvedic Drugs : CCRAS
27. Pharmacopoeial standards of Ayurvedic Formulations – CCRAS, 1978, 1984.
28. Quality Standards of Indian Medicinal Plants: ICMR
29. Textbook of Clinical Practice of Pharmacy : Remington
30. Textbook of Mineralogy : Dana
31. Textbook of Pharmacognosy : Kokate
32. Textbook of Pharmacognosy : Trease & Evans
33. The Ayurvedic Formulary of India : AYUSH
34. The Ayurvedic Pharmacopoeia of India : AYUSH
35. Vogel's quantitative in Organic analysis : G.Svehla
36. Vogel's Text Book for Quantitative Chemical Analysis : G.H.Jeffery, J.Bassett, O.Mendham. R.C.Denny

AYURVEDIC DIETETICS
[Diploma in Nutrition - Ay.] (D.N. (Ay.))

First Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) - Maximum Marks-100

Paper - I
Maulika Siddhanta
Part-A

Ahara (आहार)

1. Its व्युत्पत्ति (etymology), निरूक्ति एवम् परिभाषा।
2. History of the evolution of the Ahara Shastra from primitive times to today's era – From the use of raw food in the primitive times to the gradual change in the dietary habits according to time and invention of various Ahara Kalpana. The relevant references of Ahara Dravya and its kalpana in the ancient texts like Veda, Upanishada, etc.
3. Vaidyakiya Subhashita Sahityam (वैद्यकीय सुभाषित साहित्य)– Chapters 13, 14 and 36
4. Understanding the Ahara and Sharir relationship based on-
 - a) Loka-Purusha Samya Siddhanta (लोकपुरुषसाम्यसिद्धान्त)
 - b) Samanya Vishesha Siddhanta (सामान्यविशेषसिद्धान्त)with examples.
 - c) Panchamahabhuta Siddhanta (पंचमहाभूतसिद्धान्त)
 - d) Tridosha Siddhanta (त्रिदोष सिद्धान्त)
5. Classification of Ahara based on its Prabhava:
 - a) Sukhakar (सुखकर) – Dukhakar (दुःखकर) - Psychological concept
 - b) Satmya (सात्म्य) – Asatmya (असात्म्य) - Physiological concept
 - c) Pathya (पथ्य) – Apathya (अपथ्य) - Physio-pathological concept
 - d) Hitkara (हितकर) – Ahitkara (अहितकर) - (Ekantika Hitkar, Ekantika Ahitkar)
6. Role of Avastha-
7. Classification of Ahara according to its mode of intake- Bhakshya (भक्ष्य), Bhojya (भोज्य), Lehya (लेह्य), Chooshya (चूष्य), etc.
8. Classification of Ahara based on Source (Yoni) – Sthavara, Jangama, Khanija.
9. Classification of Ahara as Samisha (सामिष) and Niramisha (निरामिष) and their individual properties and effect on the body.
10. Understanding of this classification in context with social and health status, opinion of contemporary medicine for this classification.

Part-B

Ahara and Physiological Study (आहार और शारीर क्रिया)

1. Detailed understanding of Ahara Dravya on the basis of Shadrasa (6 tastes)
2. Effect of Desh on Ahara
3. Effect of Kaal on Ahara
4. Effect of Ahara on self (आहार विज्ञानम्)
5. Ahara and Sharir Sambandha: (आहार-शरीर संबन्ध)
 - a) The concept of Panchabhautikatva of Ahara as well as Sharir
 - b) Dosha, Dhatu, Mala and Oja vigyana. (Prakrita Sthana, Guna, Karma, Prakara, Vriddhi, Kshaya, Pradoshaja Vikar, Sama, Nirama and Dhatu Sara Lakshnanani)
 - c) Effect of Ahara Dravya on Tridosha and Triguna
 - d) Interrelation between Ahara and Agni.
 - e) Agni vinyan (अग्नि विज्ञान) – Types of Agni, Prakrit Agni (प्राकृत अग्नि) and Vikrit Agni (विकृत अग्नि).
 - f) Inter relation between Ahara and Srotas.
 - g) Srotasvinyan (स्रोतस् विज्ञान) – Description of the Srotas according to Charak and Sushrut Samhita and effect of Ahara Dravya on these Srotas.
6. Prakriti Vinyan (प्रकृति विज्ञान): Understanding of Prakritiyadi Dasha Pariksha Vidhi.
 - a) Body constitution, mental constitution, the dominant Guna and the status of Agni in different Prakriti and their importance in the selection of appropriate Ahara.
 - b) Understanding of the Manasik Prakriti of a person on the basis of the diet preferred by the person.
7. Pachanakriya and Dhatu Poshana:
 - a) Pachana Samsthana - A brief review of the organs which take part in the process of Ahara Pachana- Amashaya, Grahani, Pakwashaya, Yakrita, Agnyashaya, etc.
 - b) Trividha Awasthapaka (त्रिविध अवस्थापाक)
 - c) Aharaparinamakara Bhava (आहारपरिणामकरभाव)
 - d) Dhatu Poshankrama (धातु पोषणक्रम)- Trividha Nyaya (त्रिविधन्याय) - Kshiradadhinyaya (क्षीरदधिन्याय), Kedarikulyanyaya (केदारीकुल्यान्याय), Khalekapotanyaya (खलेकपोतन्याय)
 - e) Effect of Dravya, Matra and Kaal on Annapachana Kriya (अन्नपाचनक्रिया)
 - f) Role of Tridosha along with their subtypes in the process of Ahara Parinama or Pachana.
 - g) Sarakitta Vibhajana (सारकित्ट विभजन)
 - h) Samyaka Pachana Lakshnanani (सम्यक पचन लक्षणानि)
 - i) Dhatu Utpatti Krama (धातु उत्पत्ति क्रम)
 - j) Saarata Nirmana (सारता निर्माण)
 - k) Oja Utpatti (ओजोत्पत्ति)

Paper - II
Ahara- Dravya – Guna Kalpana Evam Sanskara Gyana
(आहार द्रव्यगुण कल्पना एवं संस्कार ज्ञान)

Part-A

1. Classification of the Ahara Dravya on the basis of Gurvadi (गुर्वादि) and Paradi (परादिगुण) Guna with Rasa panchaka and their utility particularly of Paradi Guna in the preparation and Gurvadi Guna in the selection and administration of Ahara Dravya.
2. Prakritisamasamaveta Dravya (प्रकृतिसमसमवेतद्रव्य), Vikritivishamasamaveta Dravya (विकृतिविषमसमवेतद्रव्य)
3. Samanapratyarabdha dravya (समानप्रत्यारब्धद्रव्य), Vichitrapratyarabdha Dravya (विचित्रप्रत्यारब्धद्रव्य)
4. Study of single dravya
5. Ahara Dravya– 14 Ahara Varga (आहार वर्ग)–
 - a) शूकधान्यवर्ग
 - b) शिंबीधान्यवर्ग
 - c) शाकवर्ग/पत्रशाक
 - d) हरितवर्ग
 - e) लवणवर्ग
 - f) गोरसवर्ग
 - g) मांसवर्ग
 - h) तैलवर्ग
 - i) फलवर्ग
 - j) इक्षुवर्ग
 - k) मधुवर्ग
 - l) मद्यवर्ग
 - m) जलवर्ग
 - n) आहार योगि वर्ग
6. All the classifications of Ahariya and Paniya Dravya in Brihatrayi (Varga Gyana)

Part-B

Ahara Kalpana (आहार कल्पना)

1. Introduction and Importance of Ahara kalpana.
2. Use of Paradi-Guna in Ahara kalpana, Methods of processing of various Ahara Dravya including water (both in the ancient times and present era) with respect to following Processes with examples-
3. Types of Samsakara (Processes)-
 - a) Roasting - भूनना / भर्जित
 - b) Boiling - उबालना
 - c) Baking
 - d) Fermenting - सन्धान
 - e) Mixing - मिश्रण
 - f) Wet Mixing - घोल
 - g) Dry Mixing - शुष्क मिश्रण
 - h) Churning - मंथन
 - i) Preserving / Pickling - संरक्षण उपाय/अचार

j)	Smoking	-	धूपन
k)	Frying	-	तलना
l)	Rubbing	-	घिसना / पीसना / मसलना
m)	Heating	-	गर्म करना
n)	Soaking	-	भिगोना
o)	Pounding / Crushing	-	कूटना
p)	Garnishing	-	प्रक्षेप
q)	Temperature regulation	-	ताप नियन्त्रण
r)	Washing	-	धोना
s)	Doughing	-	पीडन एवं पिण्डीकरण
t)	Chopping	-	काटना
u)	Sprouting	-	विरूढ

4. Understanding the action of samskara individually and also in combination.
5. Indications, contraindications and role of each samskara during preparation of recipe.
6. Alterations in Guna of Krita and Akrita Kalpana of Dravya with examples as Kritanna Varga – Manda, Peya, Vilepi, Yusha (Krita and Akrita), Yavagu, Odana, Siddhodana, Mantha, Khada, Kambalika, Kulmasha, Ladduka, Apupa, Modaka, Veshavara, Parpat, Dugdha vikriti, Payasam, Lapsika, Takra kalpana, Vatakam, Shadava, Saktu, Ghratapura, Phenika, Samyava (गुड़िया), Shulyadi mansa prakara alongwith other Sneha pravicharna, their use and effect on body.
7. Samisha and Niramisha Kalpana and their comparative effect on the body.
8. Guna of the Ahara Dravya traditionally used in day to day diet e.g. Roti of the various cereals available (Wheat, Maida, etc.), Dals, Vegetable preparations, Chutneys, Pickles, Papad, Salad, etc.
9. Food value of Virudha Ahara prevailing in the society traditionally.
10. Ahara Dravya and Kalpana commonly used in the present era. e.g. bread, pizzas, burgers, chats, cold drinks, coffee, tea, canned food, etc. and their effect on the body.
11. The Bhakshya, Lehya, Chushya and other Kalpana with their criteria of selection and effect on the body.
12. Ancient system and Contemporary Sanskara and effect of Ancient and Modern tools used for various Ahara Kalpana on Ahara Dravya e.g. kandookadi (तन्दूर), cookers, mixers, gas stoves, ovens, microwave, choolah, etc.
13. Preservation techniques of various Krita as well as Akrita Ahara Dravya (both ancient and modern kriya), their effect on Guna and Karma of Ahara Dravya.
14. Samyogkarna, Sayogvidhi Sayogakaal of Ahara Yogi Dravya.
15. The Dravya used as flavouring agents in the Ahara recipes. eg. Haridra, Sarshapa, Methika, Jeeraka, Hingu, Maricha, etc. Changes in the Guna of the Kalpana by their addition and manner and time of addition during the preparation of the Kalpana (e.g. addition of Haridra during the time of boiling of the uncooked Dal or after it is properly cooked changes the properties of the Kalpana) and their effect on the body.

16. Paryushita Ahara (पर्युषित आहार) –Definition, Guna and its effects on the body. The specific time after which the particular Kalpana can be called as Paryushita e.g. Mamsa, Odana, Dugdha, etc. Kalpana have shorter time span but pickles, fried or dried foods have a longer time span.
17. Savishakta Lakshanani (सविषाक्त लक्षणानि) - Garavisha Lakshanani (गरविष लक्षणानि) – The factors like nature of dravya, their specific samyoga with other substances, their Kalpanas, specific Patra, Kaal and Agni Samskar which add to Vishaktata of Ahara Dravya.
18. Siddha Annpariksha (सिद्धान्तपरीक्षा) - (पक्व अपक्व अन्न परीक्षा) Ancient methodology of cooked food.
19. Viruddha Ahara- 18 types.
20. Modern food analysis methods- Adulteration, Pesticides, Insecticide, Fertilizers and Soil therapy, understanding of organic and inorganic food items.
21. PFA (Prevention of Food Adulteration Act).

Second Year

Theory (Two papers) - Maximum Marks -100 (each)
Practical (one) – Maximum Marks-100

Paper – I

Health Promotive Dietetics

(स्वास्थ्यवर्धक आहार विहार)

Part-A

Swasthya (स्वास्थ्य)

1. Swastha – Paribhasha and Vyutpatti.
2. Trayopasthambha (त्रयोपस्तम्भ) – Ahara, Nidra and Brahmacharya.
3. The preventive and promotive aspect of Ahara. The same Ahara which is responsible for the Sharir Poshana, if used against the rules and regulations of Ahara Vidhi is the cause of Vyadhi.
4. Ahara and its selection according to the norms of Dinacharya, Ritucharya, Desh, Prakriti, Kaal, Vaya, Agni, etc.
5. Ahara Vidhivisheshayatanani (आहार विधिविशेषायतनानि), Aharamana Vikalpa Vishesha (Kashyapa- Khilasthana), Ahara vidhi vidhana (च.वि.1), Dwadasha Ashana Pravicharana.
6. Concept of Trividha Kukshi. (च.वि.2).
7. Concepts of Samashana, Adhyashana, Atyashana, Anashana, Vishamashana. Samkirna Bhojana and their effect on health.
8. Method of serving Ahara Dravya– Ancient and Modern methodology .

9. Ahara Vidhi (आहार विधि)- Bhojana Vidhi (प्रधानकर्म), Bhojana Purva (पूर्वकर्म) and Paschata Karma(पश्चातकर्म) e.g. use of Lavana and Ardraka before meal, walking of a hundred steps after meals (शतपदचंक्रमणं), sleeping on the left side (वामपार्श्व शयन) etc. after meals.
10. Tambula sevana and its utility and unhealthy aspect.
11. Changes in the Bhojana Vidhi in present era and its effects on the body.
12. Effect of disturbed meal and sleeping timings (working in shifts) on health and its dietary management.
13. Sahapana - Anupana (Use of liquids in the diet - analysis based on their quantity, quality and mode of administration).
14. The various types of vessels or utensils used for cooking, storing, serving and eating and their effects on the Ahara components - (ancient as well as modern aspect).

Part-B

Pathya

1. The definition of Pathya, Apathya, Upashaya and Anupashaya
2. Pathyapathya according to Prakriti, Desha, Kaal and Agni.
3. Ekantatah Ahita and Hita Ahara
4. Abhyasa Yogya Ahara Dravyaani, Abhyasa Ayogya Ahara Dravyani.
5. Concept of Satmya and Asatmya. Methodology of leaving Asatmya Ahara and adapting Satmya Ahara in one fourth parts of the total Ahara quantity. (पादांश परित्यागतः आहार त्याग विधि)
6. Study of Desh Satmya, Deha Satmya.
7. As per Ayurveda and Modern dietetics - signs and symptoms of optimum, under and over nutrition.
8. Balanced diet, food counseling and budgeting and meal planning.

Rasayan and Vajikaran (रसायन-वाजीकरण)

1. Nitya Hita Rasayan Ahara Dravya
2. Nitya Ahita Ahara Dravya
3. Importance of Ahara in Apunarbhava Chikitsa
4. Ahara Dravya and their Kalpana which aid in Vajikaran e.g. Dugdha, Masha, Modaka, Rasala, etc.

Modern approach

Concepts in Modern dietetics-

1. Classification of dietary products as carbohydrates, proteins, etc.
2. Daily dietary chart.
3. Rules and regulations followed during eating.

4. Nutrition Education
 - a) Nutrition and Health Status of Community
 - b) Learning and working with Community
 - c) Factors influencing Community Nutrition
 - d) Themes and messages in Nutrition Education
 - e) Method of communication in Nutrition Education
5. Nutrition Programme -
Past and Present Programme - ICDS (Integrated Child Development Services) etc.
6. Nutrition Education Programme - Planning, Implementation, Evaluation etc.

Paper - II
Therapeutic Dietetics
(रोगानुसार आहार)

Part-A

Ahara as a cause of disease

1. Ahara Dravya responsible for Agni dushti, Dosha dushti, Mano dushti, Indriya dushti, Dushya Daurbalyakar, Khavaigunya, Srotodushti, Amotpadaka and Ama Pradoshaja Vikar and Dhatu Pradoshaja Vikar
2. Ahara Kaal Diseases – Akaal Bhojana –Atitkaal Bhojana
3. Avidhi Bhojana – Disease due to not following the code and conduct of food like Dwadasha Anna Pravicharana
4. Manoabhighatkara Bhava and their effect on food intake, digestion and diseases
5. Nutrition related disorders- Santarpanajanya and Aptarpanajanya Diseases
6. Food borne diseases- Diseases due to sankramita, vishakta and paryushita ahara
7. Food, facts and misconceptions.

Part-B

Chikitsa

1. Ahara as Maha Aushadha.
2. Shadavidhopakrama Anuroopa Ahara (षडविधोपक्रमानुरूप आहार)
3. Importance of Pathyapathya in the treatment of following diseases-
 - a) प्राणवह स्रोतस – प्रतिश्याय, श्वास, कास, हिक्का, राजयक्ष्मा।
 - b) अन्नवह स्रोतस – अम्लपित्त, अजीर्ण, ग्रहणी।
 - c) उदकवह स्रोतस – उदर रोग, शोथ।
 - d) रसवह स्रोतस – हृद्रोग, ज्वर, पांडु।
 - e) रक्तवह स्रोतस – अर्श, कामला, रक्तपित्त, विसर्प।
 - f) मांसवह स्रोतस – अर्बुद, ग्रन्थि, अपतर्पणोत्थ विकार – काश्यादि।
 - g) मेदोवह स्रोतस – संतर्पणोत्थ विकार – स्थौल्य, प्रमेह।
 - h) अस्थिवह स्रोतस – संधिगतवात, वातव्याधि।
 - i) मज्जावह स्रोतस – भ्रम।
 - j) शुक्रवह स्रोतस – क्लैब्य, वंध्यत्व, गुह्यरोग।

- k) पुरीषवह स्रोतस - अतिसार, प्रवाहिका।
 l) मूत्रवह स्रोतस - अश्मरी, मूत्रकृच्छ्र।
 m) स्वेदवह स्रोतस - कुष्ठ।
 n) मनोवह स्रोतस - उन्माद, अपस्मार, अतत्वाभिनिवेश।
 o) संज्ञावह स्रोतस - सन्यास, मूर्च्छा, मदात्यय ।
4. Guidelines for dietary causativity (आहार कारणता) and dietary treatment (आहार चिकित्सा) of contemporary prevalent diseases - e.g. Hypertension, Angina, Diabetes Mellitus, Obesity, HIV , Cancer, Liver disorders, Stress, Musculo-skeletal disorders, Arthritis, Polio, Auto immune disorders, etc.
 5. Awastha Sapeksha Pathyapathya, importance of Ahara before, during and after Shodhana Karma, and surgical procedures.
 6. Use of liquids in Chikitsa as Anupana, their mode of action and specificity in relation to particular diseases with medicines and conditions where liquids are prohibited in diet e.g. Udararoga, Shotha, etc.
 7. Dietary Regimen according to Medicine and Rasayan.
 8. Ajirna Nashaka Gana (Bhaishajya Ratnavali and Yogaratnakara)

PRACTICALS

Contents of Practical

1. Selection of Ahara according to the occupation.
2. Selection of Ahara in specific conditions:
 - a) According to age – Bala (Infants, Preschool, School, Adolescent) Madhya evam Vriddhavastha
 - b) Pregnancy (Antenatal and Postnatal)
3. Effect of the changes in the method of Ahara intake in present era.
4. Case studies - 25 cases (Planning Dietary regimen for contemporary diseases mentioned in syllabus)

Pattern of practical

1. Case Record in respect to pathyapathya in various conditions of the diseases	10 Marks
2. Diet prescription for given cases	20 Marks
3. Spotting	20 Marks
4. Project Work	20 Marks
5. Viva-voce	30 Marks
Total	100 Marks

Text Books for Reference

1. Charak Samhita:
 - Sutrasthana – Chapter 1, 5, 6, 11, 13, 21, 22, 23, 25, 26, 27, 28 and 30;
 - Vimanasthana – Chapter 1, 2, 5 and 8;
 - Sharirsthana – Chapter 4 and 6;
 - Chikitsasthana – Chapter 1, 2, 15 and 23;
2. Sushrut Samhita:
 - Sutrasthana – Chapter 14, 15, 21, 40, 42, 45 and 46;
 - Sharirsthana – Chapter 1, 4 and 9;
 - Chikitsasthana – Chapter 26, 27 and 28;
 - Kalpasthana – Chapter 1;
 - Uttarasthana – Chapter 64;
3. Ashtanga Samgraha:
 - Sutrasthana – Chapter 3, 4, 6, 7, 8, 9 and 10
4. Ashtanga Hridaya:
 - Sutrasthana – Chapter 2, 3, 5, 6, 7, 8, 9, 10, 11, 13, 14 and 18;
 - Sharirsthana – Chapter 3;
 - Uttarasthana – Chapter 39 and 40;
5. Triskandha Kosh Especially : Tilak Ayurved Vidyapeeth, Pune, M.S.
Hetu and Chikitsa Kosha
6. Bhava Prakash
7. Kshemakutuhel : Indradeva Tripathi.
8. Yogaratnakar : Sadashiva Shastri
9. Chakradatta : Indradeva Tripathi
10. Siddha Bhaishajya Manimala
11. Bhojana Kutuhel : Raghunath Bhatta
12. Kaideva Nighantu : Acharya Priyavrat Sharma
13. Aartha Shastra (Food poisoning)
14. Nighantu Ratnakara : Panshikar
15. Pathya Apathya Adhikar : Shivadas

BALROGA

[Diploma in Paediatrics -Ay.] D.CH. (Ay.)

First Year

Theory (Two papers) - Maximum Marks -100 (each)

Practical (one) – Maximum Marks-100

Paper - I

Kaumarbhritya- Siddhanta (Fundamentals of Kaumarbhritya)

Part-A

Kaumarbhritya Paribhasha and Parichaya (Definition and Introduction), Pratishedha evam Samudayika Bal-Swasthya (Preventive and Community Paediatrics) and Bal-Panchkarma (Paediatric Panchkarma)

1. Definitions, Vaya vibhajan (classification of age), Raksha Karma, Lehan, Vyadhikshamatva and Vardhanopaya (concept of Immunity, Immunization), National Programme on child health care, role of Ayurveda in National Programme, Bheshaja and Bheshaja-Matra (Brief about the drugs and drugs dosages in children)
2. Bal-Panchkarma (Paediatric Panchkarma): Fundamentals of Purvakarma, Pradhan Karma and Paschata Karma in relation to Children. Panchkarma management of various paediatric disorders like Mashtishkaghat (Cerebral Palsy), Pakshaghat (Hemiplegia) Mamsagatvata (Muscular Dystrophy), Ardita (Facial Palsy), Ekangaghata (Monoplegia), Adharangaghat (Diplegia), Apasmara (Epilepsy), and Mastishka-shotha and Mastishkavarana-shotha janya updrava (Encephalitis and Post Meningitis Sequele) Aamvata (Rheumatoid Arthritis), Shwasgata Roga (Respiratory Disorders) and Twak Vikar (Skin Disorders)

Part-B

Balroga Nidan (Paediatrics Diagnostic Techniques) and Chikitsalaya Prabandhan (Hospital Management)

1. Vedanadhyaya, clinical examination of children, Roga and Rogi Pariksha Vidhi, common laboratory investigations including biochemical, haematological, urine and stool tests, use of X-ray, USG.
2. Chikitsalaya Prabandhan (Hospital Management) – Hospital function, staff pattern and their utilization, work load, maintenance of medical records, equipments and standards, evaluation of clinical services specific to paediatric hospital services and financial management in Hospital.

Paper - II
Kaumarbhritya-Samanya Vivechana (General Paediatrics)

Part-A

Vridhhi evam Vikasakram-Samanya evam Vikriti (Growth and Development along with related disorders), Poshana evam Kuposhanajanya Vyadhi (Nutrition and Nutritional disorders)

1. Important milestones in Infancy and early Childhood in the areas of gross motor, fine motor, language and personal-social development.
2. Anthropometry: Measurement and interpretation of weight, length/height, head circumference, mid arm circumference.
3. Dwarfism and other common genetic disorders related to growth and development.
4. Poshana evam Kuposhanajanya Vyadhi (Nutrition and Nutritional disorders)
5. Nutrition, nutritional requirements, nutritional disorders- Parigarbhika, Bal-Shosha, Karshya, Phakka.
6. Protein Energy Malnutrition: Definition, classification, clinical features of Marasmus and Kwashiorker. Etiology and management of PEM.
7. Vitamins-Diagnosis of vitamin deficiencies, hypervitaminosis and their management.

Part-B

Bal-Manovigyan evam Vyavaharajanya Vikar (Child psychology and behavioral disorders) and Atyayika Chikitsa (Emergency Management)

1. Mental development, ADHD, Pica, Nocturnal Enuresis, Learning Disability, Autism, etc.
2. Atyayika Chikitsa (Emergency Management), Visha-Chikitsa: Principles of Management of common poisons.
3. Anya Atyayika Avastha evam Chikitsa (Other emergency conditions and their management) - Status Asthmaticus, Status Epilepticus, Shock and Anaphylaxis in children, Fluid and Electrolyte management, Epistaxis, etc.
4. Different paediatric emergency procedures e.g. venepuncture, pleural tap, ascitic tap, blood transfusion and monitoring, lumbar puncture and blood sampling, etc.

Second Year

Theory (Two papers) - Maximum Marks -100 (each)
Practical (one) – Maximum Marks-100

Paper - I

Navjata Shishu Paricharya (Neonatal Care)

Part-A

Garbha Vigyaniya (Embryology) and Navjata Shishu Paricharya (Neonatal Care):

1. Garbha Vriddhi evam Vikasa (fetal growth and development), Garbha Poshana (fetal circulation, changes in fetal circulation after birth). Garbhopaghatakar Bhava (factors affecting fetal growth and development), Congenital Anomalies, Beejabhagavayava Vikriti (Genetic disorders)
2. Navjata Shishu Paricharya (Neonatal Care)
3. Sadyojat Shishu Paricharya: Definition – Live birth, neonate, neonatal period, classification according to weight and gestation, mortality rate, delivery room management, care of newborn, normal variations and clinical signs in the neonate, temperature regulation and transport of sick neonates.
4. Navjat Shishu Ahara (Neonatal feeding): Principles of feeding, Stanya (Breast milk) and their properties, Stanya Pariksha (examination of milk), Breast feeding, Problems in breast feeding.

Part-B

Navjata Shishu Vyadhi (Neonatal Disorders) and Navjata Shishu Kaksha Prabandhan (Nursery Management)

1. Pranapratyagaman (Neonatal resuscitation), Knowledge of traumatic disorders including perinatal injuries, Ulvaka (Aspiration pneumonia), Navjat Shvasavarodha (Asphyxia neonatorum): Clinical features, principles of management and prevention of Birth Asphyxia, Kamala (Neonatal Jaundice); Neonatal infections- Superficial infections, Sepsis, Hypoglycemia, Hypocalcaemia, Anemia, Necrotizing Enterocolitis, Akshepaka (Seizures), Raktavaishamyata (Rh and ABO Incompatibility), Sadhyojata Atyayaika Chikitsa (Management of Neonatal emergencies)- Diagnosis of life threatening conditions in neonates, management of common minor paediatric surgical disorders, hemorrhagic diseases of newborn.
2. Navjata Shishu Kaksha Prabandhan (Nursery Management) - Nursery plan, staff pattern, maintenance of medical records, Visanukramikarana (Sterilization), knowledge of equipments used in nursery such as resuscitation equipments, open care system, phototherapy, etc.

Paper - II
Balroga (Paediatric Disorders and their Management)
Part-A

1. Annavaha Srotasa Vikar (Gastrointestinal disorders)- Atisara (Diarrhoea), Assessment of dehydration, ORT/ ORS. Jirnatisara (Persistent/ Chronic Diarrhoea), etc.
2. Pranavaha Srotasa Vikar (Respiratory disorders)- Pratishyaya, Kasa (ARI), Pneumonia, Tamaka Swasa (Bronchial Asthma), etc.
3. Rasavaha and Raktavaha Srotovikar (Haemopoietic, Cardiovascular disorders)- Yakrita Shotha, Yakritodar (Hepatitis/Hepatomegaly), Pandu (Anemia), CHF, Thalassemia, etc.
4. Mutravaha Srotasa Vikar (Urinary disorders)- Acute post streptococcal glomerulonephritis, Nephrotic syndrome (Vrikka-shotha), Mutrakriccha (Dysuria), Mutraghata (Acute Renal Failure), etc.

Part-B

Aupsargika Roga, Krimi and Tvak Vikar (Infection, infestation and skin disorders) and Anya-Vikar (Miscellaneous Disorders)

1. Common bacterial, viral and parasitic infections with special reference to vaccine-preventable disease: Rajyakshma Roga (Tuberculosis), Rohini (Diphtheria), Kukkur Kasa (Whooping cough), Aptanaka (Tetanus including neonatal tetanus), Romantika (Measles, Mumps, Rubella and Chickenpox), Antrika Jwar (Typhoid and Viral hepatitis), Pravahika (Amoebiasis), Krimi Roga (Giardiasis and Intestinal helminthiasis); Vishama Jwar (Malaria, Kala Azar and Dengue Fever), Ahiputana (Napkin rashes), Shakuni (Impetigo), Sidhma, Pama, Vicharchika, Charmadal (Infantile atopic dermatitis).
2. Anya-Vikar (Miscellaneous Disorders): Jwar (Fever), rational management of PUO, clinical features, diagnosis, investigations, treatment and prevention of Aam-Vatik Jwara (Acute rheumatic fever), Basic concepts of Bal graha (specific syndromes).
3. Vata/Nadivaha Samsthan (CNS Disorders): Clinical diagnosis, investigations and treatment of pyogenic meningitis, encephalitis and tubercular meningitis. Apasmara (Seizural disorder) - causes and types of convulsion at different ages, diagnosis, categorization and management of epilepsy.
4. Antahsravi Granthi Vikar (Endocrinal disorders).

PRACTICALS

Contents of Practical

1. Kaumarbhritya- History taking, Clinical examination and complete record keeping – 10 cases
2. Navjata Shisu- History taking, Clinical examination and complete record keeping – 15 cases
3. Exposure of various Panchkarma Procedures in Balroga Practice – Minimum 50 procedures
4. Exposure to Neonatal Intensive Care Unit - The candidate should be posted in Neonatal Intensive Care Unit for atleast 150 hours per year.
5. Exposure to Pranapratyagaman Vidhi (Resuscitation Techniques) - The student should have exposure of Resuscitation Techniques on newborn “Mankin” and Live.
6. Exposure to use various instruments used in Neonatal Care Unit like Incubator, Radiant Warmer, Phototherapy, Bag and Mask etc.
7. Exposure to Immunization practices

Note: The Logbook and Case Record to be maintained and duly signed by teacher and Head of the department.

Pattern of Practical Examination:

1. Case Record	10 Marks
2. Case Taking	
a) Short Case	10 Marks
b) Long Case	20 Marks
3. Identification of instruments	10 Marks
4. Project Work	20 Marks
5. Viva-voce	30 Marks
Total	100 Marks

Text Books for Reference

1. Kashyap Samhita or Vridhajivakiya Tantra; with english translation and commentary : Prof. (Km.) P. V. Tewari with Dr. Neeraj Kumar, Dr. R. D. Sharma and Dr. Abhimanyu Kumar
2. Kashyapa Samhita (Hindi translation with commentary) : Nepal Raj Guru Pandita Hemaraja Sharma commentary by Shri Satyapal Bishagacharya
3. Charak Samhita : Pt. Kashi Nath Shastri, Dr. Gorakh Nath Pandey; Vishvabharti
4. Sushrut Samhita Commentary : Ambikadutta Shastri
5. Ayurvedic concepts of Human Embryology : Prof Abhimanyu Kumar
6. Ashtanga Samgraha (Part-I &II), Hindi commentary : Atrideva Vidyalankar
7. Madhava Nidan
8. Bhava Prakasha
9. Harita Samhita
10. Clinical Methods : Meharban Singh
11. Child Health Care in Ayurveda : Prof Abhimanyu Kumar
12. Care of the Newborn : Meharban Singh
13. Text book of Paediatrics : Nelson
14. Principles and Practice of Paediatrics in Ayurveda : Prof CHS Shastri
15. Bal Chikitsadarsh : Dr. RD Sharma
16. Kaumarbhritya : Dr. D.N. Mishra

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MANASIK SWASTHYA VIGYAN
[Diploma in Psychiatry - Ay.] D.P.M. (Ay.)
First Year

Theory (Two papers) - Maximum Marks -100 (each)
Practical (one) - Maximum Marks-100

Paper - I
Manovigyan
Part-A

1. A brief history of Manovigyan and Manasik Roga Vigyan from vedic period to modern psychology and psychiatry highlighting Ayurvedic contribution.
2. Synonyms, qualities, functions and Bhoutikatva and Ahankarikatva of Mana.
3. Satva and Sharir relationship, relationship between Tridosha and Mana.
4. Trigunatmakatva of mana.
5. Vata and Mana relationship - applied aspects.
6. Mana, Indriya and Oja relationship.
7. Jnanotpatti Prakriya- Sensory process and perception.
8. Atma and Mana relationship - applied aspects.
9. Knowledge and application of concept of Shatchakra.

Part-B

1. Manovaha srotas and its karma with sub classifications.
2. Psycho-anatomy and physiology of brain and related nervous system, psychoneuroendocrinology.
3. Behaviour, attitude and emotions.
4. Manas Prakriti – Personality.
5. Essential elements of Child psychology, Developmental psychology of child, adolescence and adult.
6. Assessment of Dhee, Dhriti and Smriti.
7. Assessment of cognition, intelligence and memory.

Paper - II
Manas Swasthya Vigyan
Part-A

1. Definition of Manas Swasthya.
2. Manasik Bhava, Satva assessment and examination of mind.
3. Nidra (sleep) – normal and abnormal.
4. Manovighatakara Bhavas.
5. Classification of Manasik Roga.
6. Etiology and patho-physiology of Manasik Vikar.
7. Psychiatric and psychometric tools for diagnosis.

Part-B

1. General line of treatment of Manasik Vikar.
2. Ayurvedic and modern principles of management of Manovikar
3. Preventive aspects of Manovikar – Achara Rasayan, Sadvritta, Shodhana, Rasayan
4. Oorjaskara and Manaskar Dravya
5. Psychological rehabilitation
6. Forensic psychiatry
7. Research and recent development in Manas Swasthya.

Second Year

Theory (Two papers) - Maximum Marks -100 (each)
Practical (one) - Maximum Marks -100

Paper – I

Manasik Roga Vigyan Part-A

1. Introduction to Bhutavidya and Graha Chikitsa.
2. General Etiopathogenesis of Unmada, classification and its modern correlation.
3. Nija Unmada and its management.
4. Agantuja Unmada and its management.
5. Chittodvega, Vishada, Atatvabhinivesha, Bhaya, Krodha, Kama, Lobha, Moha, Shoka, Maana, Dambha, etc. and their management.
6. Mood and effective disorders - Bipolar mood disorders, major depressive disorder, mania and their Ayurvedic correlation and management.

Part-B

1. Madatyaya (Alcoholism), other addictions related disorders and their management.
2. Substance abuse related disorders and their management.
3. Delusional disorders: Mano - Buddhi – Sangyajanana – Smriti Vibhrama and their management.
4. Sensorial disorders: Tandra – Murcha - Sanyasa and their management.
5. Apasmara (Epilepsy) and its management along with modern perspective.
6. Nidra vikar (Sleep disorders) and their management.
7. Sex related mental disorders and their management.
8. Altered life style and stress related disorders and their management.

Paper - II

Manas Swasthya Upakrama Vigyan Part-A

1. Childhood psychiatric disorders and their management (behavioural, learning and developmental disorders).
2. Jarajanya Manasik Vikar (senile psychiatric disorders) – Dementia, Alzheimer's disease and their management.
3. Importance of Panchkarma and allied procedures in the management of Manas Roga
4. Satvavajaya Chikitsa – Definition, relevance in manasik and manodaihika vikara.

5. Applied aspect of Ashtanga Yoga in Manovikar.
6. Daivavyapashraya and Adravya Bhuta Chikitsa in Manovikar.

Part-B

1. Schizophrenia and its Ayurvedic correlation and management
2. Somatoform and dissociative disorders and their Ayurvedic correlation and management
3. Importance and utility of Medhya Rasayan and Vajikaran drugs in Manas Swasthya.
4. Essentials of modern psychoneuropharmacology
5. A detailed study of Ayurvedic single and compound drugs for Manas Roga:
Single Drugs: Bramhi, Mandukaparni, Vacha, Sarpagandha, Shankhapushpi, Ashwagandha, Yashtimadhu, Guduchi, Jyotishmati, Kushtha, Tagara, Kooshmanda, Jatamansi, Swarna, Rajata, Pravala, Mukta and other useful medicines, etc.
Compound Drugs: Manasmitravati, Smritisagararasa, Unmadagajankhusharasa, Apatantrakarivati, Kumarakalyanarasa, Yogendrarasa, Kalyanakaghrita, Brahmighrita, Mahapaishachikaghrita, Panchagavyaghrita, Hingwadighrita, Kooshmandaghrita, Saraswatarishta, Ashwagandharishta, Himasagarataila, Brahmi Taila, Tungadrumadi Taila, Chandanadi Taila and other useful yoga, dhoopa, nasya and anjana yoga mentioned in the context of Apasmara and Unmada
6. Psychiatric Emergencies and their management

PRACTICALS

Contents of Practical

S.No.	Topic	No. of Cases	
1.	Hypnotherapy techniques	25	
2.	Case study-	a) Unmada	20
		b) Apasmara	20
		c) Atatvabhinivesh	10
		d) Chittodvega	20
		e) Vishada	20
		f) Madatyaya	20
		g) Sexual disorders	05
		h) Psychogenic headache	05
		i) Nidra vikar	10
		j) Stress related disorders	10
3.	Examination of Manasik Bhava in psychosomatic illness	25	
4.	Yogasana Pranayama and Meditation Techniques	25	
5.	Panchkarma Procedures in Manas Roga	25	
6.	Anjana, Dhoopanadi Karma	25	
7.	Instruments (GSR Biofeedback, EST, ECT, EEG, etc.)	25	
8.	Counselling on the pattern of Satvavajaya	25	

Pattern of Practical Examination

1. Case Record	10 Marks
2. Case Presentation	10 Marks
3. Assessment of Scales and Inventories (Modern and Ayurvedic aspect)	10 Marks
4. Project Work	20 Marks
5. Viva-voce	50 Marks
Total	100 Marks

Text Books for Reference

1. Charak Samhita
2. Sushrut Samhita
3. Ashtanga Samgraha
4. Ashtanga Hridaya
5. Kashyapa Samhita
6. Harita Samhita
7. Bhagavadgeeta
8. Yogavasistha
9. Comprehensive Text book of Psychiatry : Kaplan and Saddock
10. Text Book of Child and Adolescent Psychiatry : Wiener
11. Bourne Psychology
12. Carlon Abnormal Psychology and Modern Life
13. Ayurvediya Manas Vigyan : Rama Harsha Singh
14. Concept of Mind published at Ayurveda College, Kottakkal.
15. The Mind in Ayurveda and other Indian Tradition : Dr A.R.V.Murthy
16. Psychopathology in Indian Medicine : Satypal Gupta
17. A Text Book on Medical Jurisprudence and Toxicology : Modi
18. DSM IV and ICD 10
19. Other relevant textbooks

NETRA ROGA VIGYAN
[Diploma in Ophthalmology-Ay.] D.O.(Ay.)
First Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) –Maximum Marks-100

Paper - I

Netra Chikitsa Vigyan – Maulika Siddhanta and Samanya Parichaya (Basic principles and General considerations in Ayurvedic Ophthalmology), Anusandhana evam anya Vishishta Vigyan (Research Methodology, Medical Statistics and Ethical Considerations)

Part-A

1. Etymological aspects- Shalakyia Tantra Nirukti, Parichaya and scope.
2. Historical considerations in Shalakyia Tantra (Itihasa, vikasa and contribution from ancient to modern era)
3. Importance of Shalakyia Tantra (Shalakyia Tantrasya Ayurveda Pradhanyam)
4. Importance of Head (Shiropadhanta) and organ of Vision (Sarvaendriyanam Nayanam Pradhanam)
5. Important texts of Shalakyia and contributors (Ancient ,medieval and modern period)
6. Netra Vyutpatti, Paryaya, Parichaya and Netra Panchabhautikata.
7. Netra Sharir Rachana and Embryological, anatomical considerations in Ophthalmology- basic and applied aspects

Part-B

1. Netra Sharira Kriya , Chakshurendriya Kriya and Physiological considerations in Ophthalmology- Basic and applied aspects
2. Shirogata Marma Vichara (Anatomical and clinical aspects of vital points of head and neck).
3. General methodologies of Research and Evaluation in Ayurveda and traditional medicine (drug development comprising of standardisation, quality control of drugs, pre clinical safety and toxicity and clinical evaluation, etc.)
4. Guidelines on Good Clinical Practices (GCP) and Good Laboratory practices (GLP)
5. Ethical considerations in clinical and biomedical research and practice alongwith medico legal aspect in Netra Chikitsa.
6. Current trends and Contemporary developments in Ophthalmology.

Paper - II

Netra roga Nidan evam Chikitsa Samanya Parichaya (General Principles of Clinical Diagnosis and Management in Ophthalmology)

Part-A

1. General examination of eye.
2. Subjective and objective examination and clinical methods in Ophthalmology.
3. Latest instruments, diagnostic tools, technology and its utility in diagnosis and evaluation.
4. Other advanced diagnostic techniques and imaging technology.
5. General aetiological considerations (Netra Roga Samanya Nidan).
6. Pathological considerations in Ophthalmology (Hetu, Samprapti).
7. General principles of management (Chikitsa Sutra)

Part-B

1. Preventive Ophthalmology (Preventive or Netrasanrakshanopaya)
2. Pathyapathya in Netra roga (Diet and practices in eye diseases)
3. Introduction to Ophthalmic surgical instruments and equipments (Netra sambandhi Yantra, Shastra Parichaya) and asepsis and sterilization methods - Ayurvedic and modern aspects
4. Classification of Eye diseases (Netra Roga Bheda) and its significance.
5. Community Ophthalmology.
6. Essential modern drugs and anaesthetic agents of diagnostic and surgical importance.

Second Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) - Maximum Marks-100

Paper - I

Clinical Ophthalmology (Sandhi, Vartma, Shukla, Krishna, Drishti, Sarvagata, Mandalagata Roga Vishesha Nidan evam Chikitsa)

Part-A

Sandhigata Roga, Vartmagata Roga, Shuklagata Roga

1. Introduction, aetiopathogenesis, clinical features and treatment.
2. Understanding and interpretations of diseases with a comparative study of contemporary knowledge of modern Ophthalmology.
3. Congenital, developmental, neoplastic and degenerative disorders, other ocular problems and their management.

Part-B

Krishnagata Roga, Drishtigata Roga and Sarvagata Roga

1. Introduction, aetiopathogenesis, clinical features and treatment.
2. Malnutritional ocular disorders.
3. Understanding and interpretations of diseases with a comparative study of contemporary knowledge of modern Ophthalmology and its management.
4. Eye donation, Eye Bank and Keratoplasty.
5. Basics of refraction and refractive errors.
6. Orthoptics and Neuro Ophthalmology.
7. National Programme for Control of Blindness.
8. Geriatric Ophthalmology(Jaravastha Janya Netra Vikar)
9. Ocular manifestation of systemic diseases
10. Ocular trauma and emergencies in Ophthalmology (Netra Abhighata and Atyayika chikitsa)
11. Congenital, developmental, neoplastic and degenerative disorders of Krishna, Drishti gata roga and other ocular problems.

Paper – II

Netra Kriya Kalpa, Netra Chikitsa Sambandhi Dravyaguna Evam Bhaishajya Kalpana Gyanam. Shastra, Anushastra and Other Vishishta Chikitsa Prayoga Gyanam

Part-A

Kriya Kalpa

1. Introduction, development of topical Ophthalmic therapeutic procedures (Netra rogeshu kriyakalpadi vishishtopakramascha parigyanam, vikas-krama cha)
2. Rational use and relevance of selection of Kriya Kalpas in the management of ocular diseases(based on inflammatory status of eye ,seat of origin of disease etc.)
3. Netra Kriya Kalpa procedures, Seka, Ashchytana, Pindi, Bidalaka, Tarpana, Putapaka, and Anjana and their practical aspects.
4. General introduction, types, indications, contraindications, dose, Kaal, Purva Karma, Pashchat Karma, Pradhan Karma, Complication, their management, drugs used for Seka, Ashchytana, Pindi,Bidalaka, Tarpana, Putapaka and Anjana.
5. Standard operative procedure in respect of application of Kriya Kalpa as well as preparation of the dosages used in the procedures.
6. Critical interpretation of Kriya Kalpa procedure based on the fundamentals of modern pharmacology viz. routes of administration, compliance, disposal , absorption, drug vehicles and bioavailability, duration and quantum of bioavailability and physical measures, Pharmaceutical dosage forms, etc.
7. Important Ayurvedic drugs/ formulations used in Ophthalmology (Netraroga chikitsa upayogi vishishtayoganam parigyanam).

Part-B

Lekhana, Chedhanadi Ashtavidh Shashtra Karma

1. Basic principles of Ophthalmic surgery (Shastra sadhya vyadhi parichaya)
2. Rational use and relevance of selection of surgical procedures in the management of ocular diseases
3. Modern ocular surgical techniques of the surgical diseases related to eye and its appendages.
4. General introduction, Poorva, Pradhan & Paschat karma, complications with management of Lekhana, Chedhana, Bhedhana, Vedhana, Eshana, Aaharana, Visravana and Seevana procedures with special Netra Roga Chikitsa.
5. Standard Operative Procedures to be adopted in above mentioned surgical procedures.

Raktamokshan (Therapeutic bloodletting)

1. Shuddha Raktalakshana, Dustarakta Lakshana
2. General introduction to Raktamokshan (Therapeutic blood letting), Jalaukavacharana (different types of Jalauka, collection and identification of Jalauka, Purva, Pradhan and Paschat Karma of Jalauka)
3. Procedure of Prachhanna (bloodletting by incision), Sira Vedha (bloodletting by venepuncture)
4. Complications and their management
5. Standard Operative Procedures

Agnikarma & Kshara Karma

1. Agnikarma and Kshara Karma applications in Netra Chikitsa and Utility of Lasers in Ophthalmology
2. Research and development (R&D) update on Ophthalmic drugs and surgical procedures

PRACTICALS

Contents of Practical

1. Application of Shadviddha parikshoupakrama in clinical Ophthalmology.
2. Clinical application of Asthaviddha shastrakarma and Ksharadi anushastra karma in Ophthalmic practice.
3. Retinoscopy followed by refractive corrections.

4. Diagnostic procedures
 - a) Anterior Segment – Gonioscopy, A scanning, B scanning, Pachymetry
 - b) Posterior Segment – Knowledge of Indirect Ophthalmoscopy and other aids for posterior segment examination
5. Therapeutic procedures
 - a) Observation, assistance and performance of parasurgical and kriyakalpa procedures.
 - b) Practical hands on modern Ophthalmic surgical procedures.
6. The candidate should fulfill the participation of compulsory regular In House Clinical postings at attached hospital of teaching institute, Postings at Exclusive Eye Hospitals, centres of excellence and other national and regional institutes of Ophthalmology supported by submission of Case Documentation throughout the two academic years.

Pattern of Practical Examination

1. Short case	10 Marks
2. Long Case	20 Marks
3. Procedures (Practical demonstration of Kriyakalpa/parasurgical/surgical procedures)	10 Marks
4. Project work	20 Marks
5. Viva-voce	40 Marks
Total	100 Marks

Text Books for Reference

1. Charak Samhita with commentaries
2. Sushrut Samhita with commentaries
3. Ashtanga Hridaya and Ashtanga Samgraha with commentaries
4. Madhava Nidan with commentaries
5. Bhavaprakasha with commentaries
6. Sarangadhara Samhita with commentaries
7. Sahashrayoga Samgraha
8. Chakradatta
9. Shalaky Tantra : Ramanath Dwivedi Chowkhambha Sanskrit Prathisthan, Delhi
10. Shalaky Tantra : R.C. Chaudhary, Chowkhambha Sanskrit Prathisthan, Delhi
11. The actions and uses of Indigenous Ophthalmic Drugs : N.Srikanth, Chowkhambha Sanskrit Prathisthan, Delhi
12. Ayurvedic Formulary of India (AFI) and Ayurvedic Pharmacopoeia of India (API), All Volumes : Dept. of AYUSH, Govt.of India
13. Clinical Examination of Ophthalmic Cases : Agarwal and Gupta, CBS publishers, Delhi

14. Alder's Physiology of the Eye and Clinical: Cotlier, St. Louis.
Applications
15. Disease of the Lens and Vitreous, : Duke-Elder, St. Louis, Mosby.
Glaucoma and Hypotony
16. A Text Book of Ophthalmology : Ahmed E. Oxford University Press,
Calcutta.
17. A Text book of Clinical Ophthalmology : Dhanda et al. Galgoti Publishers,
New Delhi
18. Modern Ophthalmology : Dutta, L.C. Jaypee Brothers,
Medical Publishers New Delhi.
19. Manual of the Diseases of the Eye : May C. and Worth, C. Bailliere
Tindal and Castell, London.
20. Ophthalmology – Principles and Concepts : Newell, F.W.C.V. Mosby Co. St.
Louis.
21. Ocular Differential Diagnosis : Roy Fedrick Hamptn Lea & Febiger
22. Clinical Ophthalmology : Smith, R. Verghese Company,
Bombay.
23. Abrahm Manual of Refraction : Duke and Elder
24. Hand Book of Ophthalmology : B.M. Chaterjee
25. Hand Book of Ophthalmology : Khurana
26. Clinical Ophthalmology : Kanski
27. Parsons Diseases of Eye
28. Stallard's Eye Surgery

PRASUTI TANTRA AND STRI ROGA
[Diploma in Obstetrics and Gynaecology-Ay.] D.G.O. (Ay.)

First Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) –Maximum Marks-100

Paper - I

Prasuti Tantra - Garbha Garbhini Prasava Vigyan

Part-A

1. Importance of Ayurvediya Prasuti Tantra evam Stri Roga in women health care
2. Epocs of woman's life
3. Stri vishishta sharir rachana (applied anatomy of female reproductive system, pelvis and pelvic floor)
4. **Garbha Vigyan**
 - a) Garbha paribhasha, Garbhadaana samskara (prenatal counselling), Garbhavakranti, Garbha Sambhava Samagri, Garbhasya Shadghatak, Garbhasya Panchabhautikatwa.
 - b) Garbhasya Masanumasika Vriddhi, Garbhasya Avayavotpatti, Garbhasya Poshana (Physiology of conception, implantation and embryology)
 - c) Jarayu, Apra, Nabhinala evam Garbhodak Nirmaan evam Karya (Formation and functioning of Placenta, Umbilical cord and Amniotic fluid)
5. **Garbhini Vigyan**
 - a) Sadyograhit Garbha Lakshan, Vyakt Garbha Lakshan, Pumsavan Vidhi, Garbhini Masanumasik Lakshan (Signs, symptoms, diagnosis and differential diagnosis of pregnancy)
 - b) Garbhini Paricharya (Anatomical and physiological changes during pregnancy, nutrition during pregnancy).

Part-B

1. Prasav Kaal, Sutikagaar, Prasav Paribhasha, Prasava Hetu, Prasav Kaleen Garbhashayantar Garbha Sthiti, Prasavasya Vividh Awastha, Aavi, Prasav Paricharya.
2. Intrapartum maternal and foetal monitoring, Partogram, CTG.
3. Prasav Purva Raktasrav (Ante partum haemorrhage)
4. Kritrim Prasav Arambh (Augmentation of Labour)
5. Sutika Vigyan, Sutikaki Paribhasha, Sutika Kaal, Sutika Paricharya, Sutika Kaleen Sarvadaihiik Parivartan
6. Stana, Stanya Sampat evam Stanya Dushti
7. Jatmatra Shishu Paricharya, Navjaat Shishu Paricharya.
8. Knowledge regarding writing research papers.

Paper - II
Stri Roga Vigyan
Part-A

1. Description of Raja, Artava and concept of Shukra in Stri Prathama Rajo Darshan (Menarche), Rituchakra (Menstrual cycle).
2. Ashta Artav Dushti, Shukra Dushti, Rajah Kshaya, Anartava including scanty menstruation and Amenorrhoea.
3. Asrigdar including abnormal uterine bleeding.
4. Rajo Nivritti (Menopause).

Part-B

1. Striroga vishishta sthanik chikitsa—Uttar Basti, Pichu, Yonidhavan, Dhoopan, etc.
2. Prasuti Tantra evam Stri Rogopayogi Aushadhasya Matra, Ghatak evam Upadeyata, (Pharmacology of selected Modern medicine used in Obstetrics and Gynaecology).
3. Stri evam Matru Kalyan Karyakram (National Programme related to Women Health Care), Parivar Niyojan evam Santati Nirodhasya Upaya evam Shalya Vidhi (Medical and Surgical methods of Female Contraception and Sterilisation)
4. Yogasya prasuti evam Stri Roga chikitsakeeya upayogita.
5. Chikitsiya upyogita of Rasayan in Prasuti evam Stri Roga.
6. Prasuti evam Stri Rogaya naidanikiya parikshana (Diagnostics in Obstetrics and Gynaecology)
7. Shock and its management, Raktadana, Fluid and Electrolyte imbalance, Fluid therapy.

Second Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) –Maximum Marks-100

Paper - I
Garbha Garbhini Evam Prasav Vyapad
Part-A

1. **Garbhavyapad** - Garbhasraav, Garbhapaat (Abortion), Garbhashosh, Upvishtak, Upashushka (IUGR), Leen Garbha, Mrit Garbha (IUD), Jarayu dosh (Abnormalities of Amniotic fluid, Placenta and Umbilical cord), Rakta Gulma Bahuapatyata (Multiple Pregnancy), Ectopic Pregnancy, Molar Pregnancy, Rh incompatibility.
2. **Garbhanga Vikriti** - Clinical aspects of genetics and teratology. Prenatal diagnosis of foetal abnormalities and its management.
3. **Garbhini Vyapad** - Kikkis, Makkal, Hrillas, Emesis and Hyperemesis gravidarum, Jwar, Pandu, Kamala, Garbha janya Vishmayata (Toxaemia in pregnancy), Infections during pregnancy, Hridroga, Prameha (Diabetes) etc.
4. High Risk Pregnancy, management of pregnancies complicated by medical, surgical or Gynaecological diseases.

Part-B

1. Kashta Prasav, Garbhasang, Vilambit Prasav, Distocia with its management, Garbha evam Matru Shroni Asamanjasya (CPD).
2. Malpresentations and their management
3. Aparasanga (Retention of Placenta and its management)
4. Prasavottar Raktasraav (PPH) and its management.
5. Complications during Labour and their management
6. Purva Kalik evam Kalateet Prasav (Preterm and post term labour)
7. Mudh Garbha (Obstructed Labour)
8. Sutika roga - Number, causes, clinical features, prognosis and treatment of Sutika Jwara, Shotha, Makkala and other complications.

Paper - II Part-A

1. Detailed study of Yoni Vyapad mentioned by different Acharya and their possible modern correlations
2. Yoni-Kand, Yoni-Arsha, Yoni-Arbud (Benign and malignant cysts and tumors of female genital organ) and PCOS
3. Stri Vandhyatva (Female infertility) and its management with Ayurvedic and Modern techniques.
4. Sexually transmitted disease AIDS, etc.
5. Stan Roga evam Chikitsa –Stan Vidradhi (Mastitis and Breast abscess).

Part-B

Shastra Karma

1. General principles of Gynaecological and Obstetric surgeries, analgesics and anesthesia in Gynaecology and Obstetrics, Nirjantukikaran (sterilisation), suturing materials and methods.
2. Muladhar Chhedan, Yantra Shastrena Garbhasya Aaharan, Udarpatan poorvak Garbha Nirharana.
3. Garbhashayamukh vistritikaran evam garbhashaya lekhan, Garbhashaya mukha samvritikaran, Garbhashayamukh dahan, Pap smear, Cervical biopsy, Swasthane garbhashaya sthapan, Yoni-arsh nirharan, Gulma Nirharan, Vidradhi Patan and Vrana Chikitsa.
4. Garbhashaya nirharana
5. Provision of safe abortion services.
6. Medico legal aspects in Prasuti Tantra including PNDT and MTP Act.
7. Record keeping of Gynaecological and Obstetrics cases.
8. Conditions and norms of referral cases in Gynaecology and Obstetrics.

PRACTICALS

Contents of Practical

A. Kriyatmaka

1. O.P.D and IPD duties	06 months
2. Labour Room duties	06 months
3. Ultrasound Unit	01 months
4. Casualty related to the subject	15 Days

B. Case records – Total 20 cases

1. Prasuti Tantra (Obstetrics)	10 cases
2. Stri Roga (Gynaecology)	10 cases

Pattern of Practical Examination

1. Case Record	10 Marks
2. Case Study	
a) Long Cases	20 Marks
b) Short Cases	10 Marks
3. Identification of Instrument	10 Marks
4. Project Work	20 Marks
5. Viva - voce	30 Marks
Total	100 Marks

Text Books for Reference

1. Abhinava Prasuti Tantra	:	Vaidya Damodar Sharma Gaur
2. Prasuti Vigyana	:	Dr. Acharya Ramanath Dwivedi
3. Prasuti Vigyana	:	Dr. Mrinmayi Mukherjee
4. Prasuti Vigyana	:	Dr. Alakh Narayan Singh
5. Prasuti Vigyana	:	Dr. Manjari Dwivedi
6. Prasuti Vigyana	:	Vaidya Nirmala Tai Rajwade
7. Prasuti Tantra and Stri Roga	:	Dr. Premvati Tiwari
8. Abhinava Prasuti Vigyana	:	Dr. Ayodhya Prasad Achal
9. Striroga Vigyana	:	Vaidya Ramanath Dwivedi
10. Abhinava Striroga Vigyana	:	Dr. Rajendra Bhatnagar
11. Abhinava Striroga Vigyana	:	Dr. Ayodhya Prasad Achal
12. Stri Roga Chikitsa	:	Dr. J.S. Chauhan
13. Janasankhya Siddhanta aur Upadeyata	:	Dr. Nirmal Sahani
14. Theory of Population in Outline	:	Dr. D.I. Vallentev
15. Text Book of Gynaecology	:	Dr. C.S. Dawn
16. Text Book of Obstetrics	:	Dr. C.S. Dawn

17. Clinical Obstetrics and Gynaecology : Dr. Williams
18. Shaw's Textbook of Gynaecology : Shaw
19. Shaw's Textbook of Obstetrics : Shaw
20. Text Book of Obstetrics : Dr. Dutta
21. Textbook of Gynaecology : Dr. Dutta
22. Notes on Obstetrics : Dr. Sachedeva
23. Ayurvedic Concepts in Gynaecology : Vaidya Nirmala Joshi
24. Useful parts of Charak, Sushrut, and Vagbhata and Sharangdhara.

g # f

DRAVYAGUNA (PHARMACOGNOSY AND STANDARDIZATION)

D. Pharmacognosy (Ay.)

First Year

Theory (Two papers) - Maximum Marks -100 (each)

Practical (one) –Maximum Marks-100

Paper - I

Namaroopa Vigyan

Part-A

1. Historical background of Dravyaguna from Vedic era, Samhita and Nighantu periods till modern times.
2. Introduction to Pharmacognosy, methods of classification of crude drugs- morphological, microscopical, chemical, taxonomical, pharmacological, therapeutical, chemotaxonomical, etc.
3. Brief knowledge regarding nomenclature, identification and classification of drugs in Ayurveda based on Samhita and in various Nighantu.
4. Organized and unorganized drugs and their methods of evaluation.
5. Cultivation, collection, storage and preparation for the market of ASU Drugs. Introduction to Good Agricultural Practices (GAP), Good Field Collection Practices (G.F.C.P.) and Good Storage Practices (G.S.P.), etc.
6. Environmental (Desh, Kaal, Ritu, etc.), genetic and gender factors affecting qualities of crude drugs.

Part-B

1. Introduction of tissue culture techniques used for Ayurvedic Drugs.
2. Anukta dravya (extra Pharmacopeial Drugs).
3. Controversial aspects of Ayurvedic Drugs.
4. Adulteration and substitutes of crude drugs and methods for detection of adulterants.
5. Standardization of crude drugs as per Ayurvedic Pharmacopeia of India (API) and WHO guidelines.

Paper – II

Guna Karma Vigyan

Part-A

1. Fundamental principles of Dravyaguna
2. Detailed study on the Rasa, Guna, Virya, Vipaka, Prabhava and Karma with their applied aspects.
3. Evaluation of karmas (Deepana, Pachana, Grahi, Stambhana, Mutrala, Mutrasangrahaniya, Anulomana, Rechana, Jwaraghna, Vedanahara).
4. Introduction to general pharmacology.
5. Knowledge on procedure, equipments and instruments used in pharmacological evaluation.
6. Introduction to phytochemistry, chemical analysis and chromatography.

Part-B

1. Detail study of 50 Medicinal Plants and 25 Ahara Dravya according to therapeutic classification e.g. Rasayan Vajikaran, Medhya, Jvarahara, Kasahara, Shvasahara, Shothahara, Kushtghna, Krimighna, etc.
2. Biological Screening methods including animal experiments.
3. Safety evaluation of drugs (Toxicological evaluation) and their guidelines for evaluation for example OECD guidelines, WHO guidelines, etc.

Second Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) –Maximum Marks-100

Paper – I

Aushadha Prayoga Vigyan

Part-A

Aushadha prayoga marga (routes of drug administration) of Dravya, its Prayoga Vidhi, Matra-Anupana (Drug delivery regimen), etc.

1. Consideration of Samyoga-Virodha (Drug incompatibility).
2. Principles of Clinical pharmacology.
3. Introduction to Reverse pharmacology.
4. ADR in Ayurveda and conventional system of medicine.
5. IPR, Regulations pertaining to Import and Export of Drugs.

Part-B

1. Knowledge of Therapeutic Administration (Amayika prayoga) of plants mentioned as follows:

- | | | |
|-----------------------|----------------|-------------------|
| 1) Ahiphena | 2) Agnimantha | 3) Agar |
| 4) Amalaki | 5) Apamarga | 6) Aragvada |
| 7) Ardraka-Shunthi | 8) Arjuna | 9) Arka |
| 10) Ashvagandha | 11) Ashvagola | 12) Ashoka |
| 13) Ativisha | 14) Bakuchi | 15) Baladvayam |
| 16) Bharangi | 17) Bhallataka | 18) Bibhitaka |
| 19) Bijaka/Vijayasara | 20) Bilva | 21) Brahmi |
| 22) Bringaraj | 23) Brihati | 24) Chandanadvaya |
| 25) Chitraka | 26) Dadima | 27) Danti |
| 28) Daruharidra | 29) Dhanyak | 30) Dhatki |
| 31) Draksha | 32) Durva | 33) Ela |
| 34) Eranda | 35) Gambhari | 36) Gokshura |
| 37) Guduchi | 38) Guggulu | 39) Haridra |
| 40) Haritaki | 41) Hingu | 42) Jambu |

43) Jatamamsi	44) Jatiphal	45) Jeerakdvaya
46) Jyotishmati	47) Kalamegh	48) Kampillak
49) Kanchanara	50) Kankari	51) Kapikacchu
52) Karkatashringi	53) Karpur	54) Katuki
55) Khadira	56) Kiratatikta	57) Kumari
58) Kupilu	59) Kumkum/Keshara	60) Kushmanda
61) Lavang	62) Kutaja	63) Lodhra
64) Madanaphal	65) Manjishtha	66) Marich
67) Markandika	68) Mushali	69) Musta
70) Nagakeshar	71) Nimba	72) Nirgundi
73) Palasha	74) Palandu	75) Pashanabheda
76) Patala	77) Patola	78) Pippali-Pippalimula
79) Punarnava	80) Rasna	81) Rasona
82) Saireyaka	83) Shallaki	84) Saptaparna
85) Sarpagandha	86) Sariva	87) Shalparni
88) Shalmali	89) Shankhapushpi	90) Shatavari
91) Shatapushpa	92) Shigru	93) Shirish
94) Shyonaka	95) Talisa patra	96) Tila
97) Trivrit	98) Tulsi	99) Tvak
100) Ushira	101) Vacha	102) Varun
103) Vasa	104) Vata	105) Vatsanabha
106) Vidari	107) Vidanga	108) Yashtimadhu
109) Yavani	110) Devadaru	

2. Clinical trial- protocol designing, stages of Clinical Research and data management.
3. Bioethics in Clinical Research.
4. Introduction of Pharmaco epidemiology/observational study

Paper – II
Aushadha Yoga Vigyan
Part-A

Importance and principles of formulations as per Ayurveda

1. Introduction to relevant portions of Drugs and Cosmetic Act, Magic remedies Act, Intellectual Property Right (IPR), regulations pertaining import and export of drugs.
2. Good manufacturing practices (GMP).
3. Quality control procedures of formulations prescribed by Drug Regulatory Authorities.
4. General awareness about nutraceuticals, cosmoceutical, food additives, excipients, etc.

Part-B

1. Detail study of five formulations from each kalpana of Ayurvedic Formulary of India (AFI)
2. Knowledge about herbal extracts, colours, flavours and preservatives
3. Standardization of various Ayurvedic Kalpana, eg- Churna, Vati, Avaleha, Siddha Sneha, Asava, Arishta, etc.

PRACTICALS

Contents of Practical

1. Survey of Adverse Drug Reaction (ADR) in prescribed format of national pharmacovigilance programmes of ASU Drugs (Minimum 2)
2. Shodhana methods of Visha Dravya.
3. Preparation of two Yoga from each kalpana of Ayurvedic Formulary of India.
4. Microscopical evaluation of certain Churna formulation e.g. Sitopaladi, Hingvashtak, Trikatu, Triphala etc.
5. Chemical evaluation of Asava and Arishta.

Pattern of Practical Examination-

1. Herbarium File	10 Marks
2. Experiment related to Macroscopical, Microscopical, Organoleptic evaluation, Extraction and Phytochemical Evaluation	30 Marks
3. Spotting of Dravya	10 Marks
4. Project Work	20 Marks
5. Viva-voce	30 Marks
Total	100 Marks

Text Books for Reference

1. Abhinav Buti Darpan (Vol.1-2) : Vd. Roop Lal Vaishya
2. Aushadha Vigyana Shastra : Acharya Pt. Vishvanath Dwivedi
3. Ayurvediya Aushadhkarma Vigyana : Acharya V.J. Thakur
4. Bedi Vanaspati Kosha : Prof. Ramesh Bedi
5. Bhaishajyaguna Vigyana : Dr. Alakhnarayan Singh
6. Bhav Prakash Nigantu (English) : Shreekanthamurti
7. Bhav Prakash Nighantu : Vd. Krishna Chandra Chunekar with commentary
8. Bhrihad Dravyagunadarsha : Mahendra Kumar Shastri
9. Classical Uses of Medicinal Plants : Acharya Priyavrata Sharma
10. Controversial Medicinal Plants : Vd. G. Bapa Lal
11. Dalhana Ka Dravyaguna Shastra : Vd. Shiv Kumar Vyas
Ke Kshetra Me Yogadana
12. Dravyaguna Kosha : Acharya Priyavrata Sharma

13. Dravyaguna Sutram : Acharya Priyavrata Sharma
14. Dravyaguna Vigyana : Dr. Gyanendra Pandey
15. Dravyaguna Vigyana(Vol. 1-2) : Acharya Yadavji Trikam Ji
16. Dravyaguna Vigyana : Dr. V.M. Gogate
17. Dravyaguna Vigyana (Vol. 1-5) : Acharya Priyavrata Sharma
18. Dravyaguna Shastram : Vaidya G.A. Phadake
19. Dravyaguna Vigyana : Dr. A.P. Deshpande
20. Dravyagunavigyana Basic Principles : Prof.D.S.Lucas
21. Forgotten Healers (Indian Medicinal : Dr. Prakash Paranjape
Plants)
22. Glossary of Vegetable Drugs in : Thakur Balwant Singh & Vd. Krishna
Brihatrayi Chandra Chunekar
23. Introduction to Dravyaguna : Acharya Priyavrata Sharma
24. Kriyatmaka Aushadi Parichaya : Acharya Pt. Vishvanath Dwidevi
25. Materia Medica : Acharya Ghosh
26. Nighantu Adarsh (Vol. 1-2) : Vd. Bapa Lal
27. Pharmacological basis of Medical : Goodman & Gillman
Practice
28. Pharmacology and : Satoskar Bhandarkar & Ainapure
Pharmacotherapeutics
29. Prayogatamaka Dravyaguna : Dr. Maya Ram Uniyal
Vigyana
30. Priya Nighantu : Acharya Priyavrata Sharma
31. Raspanchaka/Dravyaguna : Prof. Shivcharan Dhyani
Siddhanta
32. System of Plant Nomenclature in : Dr. Gyanendra Pandey
Ayurveda
33. Text Book of Pharmacology : Trees & Valis
34. Textbook of Dravyaguna : Dr.K.Nishteswar
35. Unani Dravyaguna Vigyana : Hakim Daljeet Singh
36. Useful parts of Charak, Sushrut, :
and Vagbhata.
37. Uttarakhand Ki Vanaspatiya : Dr. Gyanendra Pandey
38. Vanoaushadi Darshika : Thakur Balwant Singh
39. Vanoaushadi Nidarshika : Dr. Ram Sushil Singh
40. Vedic Vanaspatiyan : Dr. Dinesh Chandra Sharma

PANCHKARMA
D.Panchkarma
First Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) –Maximum Marks-100

Paper – I
Introduction to Snehana, Swedana, Vamana and Virechana Karma
Part-A

Introduction

1. Basic Principles of Ayurveda and Kayachikitsa.
2. Derivation, Definition, History, Origin and scope of Panchkarma.
3. Panchkarma in Ashtanga Ayurveda.
4. Indication for Shodhana and Shamana Therapy.
5. Qualities of Panchkarma Vaidya.

Snehana

1. Etymology and definition of Sneha and Snehana.
2. Introduction and General consideration about Snehana.
3. Snehashrayas.
4. Properties of Snehana Dravya.
5. Classification of Snehana.
6. Quality and utility of Uttama Sneha.
7. Snehapaka vidhi with their varieties and uses.
8. Indications and contraindications of Snehana.
9. Abhyantara Snehana – Acchapanas, Snehavicharana, Sadyasnehana and Avapidaka Sneha.

Swedana

1. Etymology and definition of Swedana.
2. General consideration about Swedana.
3. Properties of Swedana and Swedopaga Dravya.
4. Classification of Swedana therapy.
5. Indications and contraindications.

Upakalpana

1. Knowledge about the materials, equipments and instruments used in Panchkarma and physical medicine.
2. Knowledge of technical modification of equipments to be used in Panchkarma.
3. Knowledge of Ahara and Aushadhi Kalpana used in Panchkarma.

Part-B

Sharir Vivechana in relation with Panchkarma

1. Concept of Twacha, Kaal, Ashaya, Kostha, Shakha, Srotas, Nasa Sharir Pranayatana, Shatchakra, Nadi, Peshi, Snayu, Sandhi, Marma and their implication in the practice of bio-purificatory and rehabilitative procedures of Panchkarma.
2. Concept of 'Gut Brain', its relevance to Vata System and Basti Therapy.

Vamana Karma

1. Etymology and definition
2. General consideration
3. Properties of Vamaka and Vamanopaga Dravya.
4. Vamaka dravya according to various Samhita.
5. Vamana Yoga and their different ways of administration.
6. Sadyo Vamana and its utility.
7. Indications and contra-indications (general and specific) in various diseases and their stages.
8. Dose fixation- general and specific.

Virechana Karma

1. Etymology and definition
2. General consideration
3. Properties of Virechaka and Virechanopaga Dravya
4. Virechana Dravya according to various Samhita
5. Types of Virechana and administration method
6. Indications and contra-indications (general and specific) in various diseases and their stages
7. Dose fixation- general and specific.

Paper – II

Introduction to Basti, Nasya, Raktamokshan and Physiotherapy

Part-A

Basti Karma

1. Etymology and definition
2. General consideration and introduction
3. Classification of Basti
4. Drugs useful in Basti
5. Indications and contraindications (General and Specific) of Basti Kalpana in various diseases and their stages
6. Description of Basti Yantra - Basti Netra and Basti Putaka
7. Dose fixation of Niruha and Anuvasana Basti

Uttar Basti

1. Definition of Uttar Basti
2. Uttar Basti Netra and Basti Putaka
3. Dose of Uttar Basti both in Male and Female / Sneha and Kashaya Basti

Part-B

Nasya Karma

1. Etymology and definition
2. General consideration and introduction
3. Nasya Dravya according to various Samhita
4. Classification of Nasya
5. Indications and contraindications
6. Dose fixations of different Nasya
7. Detailed study of different Nasya formulations like Ksheerabala/Anutaila/Shadbindu, etc.

Raktamokshan

1. Definition
2. General principles of Raktamokshan
3. Classification of Raktamokshan
4. Indications and contra - indications
5. General and specific indications of different Raktamokshan techniques

Physiotherapy

1. Definition
2. Introduction to physiotherapy
3. Basic principles of physiotherapy
4. Utility of physiotherapy vis a vis Ayurveda
5. Indication and contra-indications of physiotherapy in various disorders.

Second Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) –Maximum Marks-100

Paper – I

Applied aspects of Snehana, Swedana, Vamana and Virechana Karma

Part –A

Snehana

1. Abhyantar Snehana
Poorva karma - Rogipariksha (Examination of Patient), Koshtapariksha, Agnipariksha (Fixation of dose Diet)
Pradhana karma - Administration of Sneha
Jeeryamana (observation) – Jeerna, Ajeerna, Asnigdha, Atisnigdha Lakshana-Samyak Yoga/ Ayoga/ Atiyoga Lakshanas, Sneha Vyapat and treatment.
Pashchat karma - Pariharavishaya (Planning of shodhana).
2. Bahya Snehana
Detailed description of Lepana, Samvahana, Udvartana, Mardana, Padaghata, Murdhni taila, Gandusha, Kavala, Abhyanga– Marma and massage, Karna poorana, Akshi tarpana, Taila dharana, Kati Basti (Tarpan), Janu Basti (Tarpan), Prishtha Basti (Tarpan), Hridaya Basti (Hridaya tarpan) etc.

3. Proper understanding of digestion and metabolism of fat.
4. Karmukatva of Snehana
5. Prescription of different Sneha Yoga in different disorders
6. Knowledge of new Sneha dravya used at present time like olive oil, groundnut oil, etc.

Swedana

1. Kerala specialities of Swedana like Churna, Pinda Sweda, Jambheera/Patrapottali/ Shastikashali Pinda Swedana/ Kayaseka/ Ksheera Bhaspa Sweda, etc.
2. Administration of Swedana chikitsa- Poorvakarma
3. Samyak Yoga/Ayoga/Atiyoga lakshana
4. Swedana complications and management.
5. Karmukatva of Swedana.

Part-B

Vamana Karma

Poorva karma –

1. Collection of medicine and materials
2. Examination of Patient
3. Preparation of patient

Pradhana karma –

1. Administration of vamana dravya
2. Observation of Samyakyoga/Ayoga/Atiyoga lakshana and their management.

Pashchat karma –

1. Dhumapana
2. Samsarjana and Santarpana karma
3. Parihara vishaya
4. Vyapat and its management

Physiology and pharmaco-dynamics of Vamana Karma.

Virechana Karma

Poorva karma-

1. Collection of medicines and materials
2. Examination of patient
3. Preparation of patient

Pradhana karma –

1. Administration of Virechana dravya
2. Observation of Samyakyoga/Ayoga/Atiyoga lakshana and treatment

Pashchat karma –

1. Samsarjana and Santarpana karma
2. Parihara vishaya
3. Planning of next shodhana
4. Vyapat and its management

Physiology and pharmaco-dynamics of Virechana Karma.

Paper – II
Applied aspects of Basti, Nasya Karma, Raktamokshan and Physiotherapy
Part-A

Basti Karma

Administration of Basti

Niruha Basti

Poorva karma-

1. Examination of the patient according to Dosha, Aushadha, Desh, Kaal etc.
2. Preparation of medicine
3. Preparation of patient

Pradhana karma-

1. Administration of Basti
2. Observation of expulsion
3. Samyakyoga /Ayoga/Atiyoga lakshana

Pashchat karma-

1. Follow up
2. Parihara vishaya, Kaal Diet
3. Vyapat and its management.

Anuvasana Basti

Poorva karma-

1. Preparation of medicine
2. Preparation of patient

Pradhana karma-

1. Administration of Basti
2. Samyakyoga /Ayoga/Atiyoga lakshana

Pashchat karma-

1. Basti pratyagamana
2. Diet
3. Vyapat and its management

Matra Basti

Detailed study of different Basti formulations like Ksheera Basti, Vaitarana Basti, Vrishya Basti, etc.

Uttar Basti

Administration of Uttar Basti-

- a) Poorva karma
- b) Pradhana karma
- c) Pashchat karma

Physiology, pharmaco-dynamics of Uttar Basti karma

Part-B

Nasya Karma

Administration of Nasya-

Poorva karma-

1. Collection of medicine and materials
2. Examination of patient
3. Preparation of patient

Pradhana karma -

1. Administration
2. Observation and follow up
3. Samyakyoga /Ayoga/Atiyoga lakshana
4. Vyapat and its management

Pashchat karma -

1. Immediate follow up
2. Dhumapana , kavala, gandusha
3. Diet
4. Parihara vishaya
5. Nasyottara karma

Physiology, pharmaco-dynamics of Nasya Karma

Raktamokshan

Administration of Raktamokshan-

Poorva karma- Collection of Jalauka (Leeches) and materials Examination of Patient, preparation of patient, preparation of Jalauka

Pradhana karma- Administration of Raktamokshana by different techniques
Observation of Samyakyoga/Ayoga/Atiyoga lakshana and Management

Pashchat karma- Management of patient
Parihara vishaya and Parihara kaal
Vyapat and its Management

Karmukatva of Raktamokshan (pharmacodynamics)

Physiotherapy

Knowledge and administration of below mentioned Physiotherapy techniques / instruments-

1. Ultrasound
2. Magneto therapy
3. Nerve conduction therapy
4. Diathermy
5. Laser therapy
6. Ultraviolet therapy
7. Wax therapy, etc

PRACTICALS

Contents of Practical

1. The student should undertake the responsibility in the management and treatment of patients independently through Panchkarma and Upadrava of Panchkarma.
2. Students should have to go through exposure to all the physiotherapy procedures.
3. Student should acquire self experience of the Panchkarma procedure according to the seasons.
4. Assesment of the Vega.
5. Knowledge of Samsarjana Krama.

Pattern of Practical Examination

1. Case record	10 marks
2. Upakarma (Minor procedures)	10 marks
3. Pradhan karma (Major procedures)	20 marks
4. Identification of drugs useful in Panchkarma	10 marks
5. Project work	20 marks
6. Viva-voce	30 marks
Total	100 Marks

Text Books for Reference

1. Charak Samhita with Ayurveda Dipika by Chakrapani and Jalpakalpataru by Gangadhara
2. Sushrut Samhita with Nibhandha Samgraha by Dalhana and Nyayachandrika by Gayadasa and Panjika by Swami Kumar
3. Ashtanga Hridaya with Sarvanga Sundara and Ayurveda Rasayan commentaries
4. Ayurvediya Panchkarma Chikitsa : Dr Mukundilal Dwivedi
5. Panchkarma Vigyan : Dr Haridas Shreedhar Kasture
6. Illustrated Panchkarma : Dr G Srinivasa Acharya
7. Clinical Panchkarma (English) : Dr P. Yadaiah
8. Prayogika Panchkarma (Hindi) : Dr P. Yadaiah
9. Vividha Vyadhiyome Panchkarma (Hindi) : Dr P. Yadaiah
10. The Panchkarma Treatment of Ayurveda with Kerala Specialities : Dr T.L. Devaraj
11. Panchkarma Therapy : Dr R.H. Singh
12. Principles and practice of Basti : Dr Vasudevan Namboodri, Dr. L. Mahadevan

SWASTHAVRITTA AND YOGA
[Diploma in Public Health-Ay.] D.P.H.(Ay.)

First Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) – Maximum Marks-100

Paper – I

Vaiyaktika and Samajika Swasthavritta

Part-A

Vyaktigata Swasthyam (Individual health)

1. Definition of Swastha, Swasthavritta and Health.
2. Swasthavritta Prayojana and Mahatwam.
3. Swasthapurusha lakshana - Signs of Health.
4. Introduction to Preventive Medicine and its Terminologies.
5. Detail knowledge of Dinacharya, measures such as Danta Dhavana, Jihva Nirlekhana, Gandusha-Kavala, Pratimarsha Nasya, Anjana, Vyayama, Abhyanga, Dhumapana, Udvardana, etc and their physiological effects in terms of modern knowledge.
6. Ritucharya and its importance in Swastha Paripalana
7. Importance of Vega and their role in Health & Disease.
8. Description of Sadvritta and Achara Rasayan and their role in Prevention of psychosomatic diseases. (Satvavajaya chikitsa)
9. Concept of Nindita & Anindita purusha.
10. Introduction to Trayopastambha- Ahara, Nidra and Brahmacharya and their role in maintenance of health and their clinical importance.
11. Role of Pragyaparadha in producing diseases and Sharir Rakshanatmaka Karya- Preventive measures - Roga anutpadaniya vigyan.
12. Concept of Vyadhikshamatwa – Sahaja, Kalaja and Yuktikrit.

Ahara Vichara (Food and Nutrition)

1. Nirukti, Vivechan of Ahara; Definition of food, diet and nutrition.
2. Aharasya Swaroopam, Shadrasatvam, Panchabhautikatvam and Chaturvidhatvam.
3. Ahara mahatvam (Importance of food).
4. Aharadravya Parichaya, Vargeekarana, advantages and disadvantages of Vegetarian and Non - Vegetarian food.
5. Ahara Vidhi Vishesha Ayatana.
6. Ahara Poshana (Nutrition) - Food proximate principles - Carbohydrates, Proteins, Fats, Vitamins etc., their functions, deficiency disorders and prevention. Diet in different types of diseases.
7. Balanced diet

Nidra (Sleep)

Definition, physiology, types, proper way of sleep and its relation to Health and Disease.

Brahmacharya (Celibacy)

1. Vyakhya, Lakshana (Characteristic)
2. Importance and Utility of Brahmacharya
3. Abrahmacharya Vyakhya
4. Vyavaya Sambandhi Niyama
5. Effect of Ativyavaya
6. Veeryotpatti
7. Veerya Naasha Phala
8. Veerya Rakshanopaya
9. Menstrual Hygiene (Stri Ritucharya)

Part-B**Samajika Swasthavritta (Social Hygiene)**

1. Concept of Health, Health for all (H.F.A.) (Sarvesham Krute Arogyam).
2. Concept of Disease
3. Concept of Prevention

Introduction to Public Health

1. Definition of Hygiene, Public Health, Sanitation etc.
2. Health systems and Health Services in India.

Environment and Health

1. Water
2. Air and ventilation
3. Soil and residential dwellings (Healthful Environment of Housing).
4. Light, sound and radiation
5. Disposal of waste products (solids and liquids) [sewerage system].
6. Hospital waste management (Biomedical waste management)
7. Sanitation of fairs, festivals and villages.
8. Methods of disposal of dead body
9. Medical entomology

Industrial Health

1. Ergonomics
2. Health hazards of Industries.
3. Prevention and controlled measures of occupational diseases.
4. Measures of health protection in Industries.
5. ESI Act
6. Indian Factory Act.

School Health

1. Construction of school/college building
2. Arrangement of light, ventilation, water supply

Aturalaya bhavan nirmana (Hospital building construction)

Paper – II

Janapadodhwamsa and Yoga – Nisargopachara

Part-A

Janapadodhwamsa (Epidemiology)

1. Janapadodhwamsa- causes, manifestation and measures of its control.
2. Introduction to Basic epidemiology
3. Selected definition of infectious disease epidemiology like - infection, contamination etc.
4. Epidemiological Triad - Agent, Host and Environment.
5. Dynamics of disease transmission.
6. Screening for disease.
7. Classification of infectious diseases.
8. Disease prevention and control- notification, isolation, quarantine, etc.

Disinfection/Visankramana - Definition and types

Immunity - Definition, types of Immunity, Immunizing agents, Immunization schedule and hazards of Immunization

Health Statistics / Vital Statistics

1. Definition of statistics/ health statistics
2. Sources and uses of health statistics
3. Collection, classification, presentation and interpretation of data
4. Mortality, morbidity and fertility rate

Part-B

Yoga – Nisargopachara

Yoga

1. Introduction to Yoga.
2. History, Nirukti, Vyutpatti and Paribhasha of Yoga.
3. Aims and Objectives of Yoga in relation to Ayurveda.
4. Different schools of Yoga.
5. Scriptural basis of Ashtanga Yoga according to Patanjali Yoga Sutra, Bhagavad Geeta and Yoga Vashishta.
6. Introduction to Meditation and its techniques
7. Introduction to Yogic diet and behaviour.
8. Description of Hatha Yoga and Shatkarma - Neti, Dhauti, Nauli, Trataka, Basti and Kapalabhati; Kundalini Yoga.
9. Description of Bandha, Mudra, Shatchakra, Panchakosha and Nadi.

Nisargopachara (Naturopathy)

1. Definition, history and basic principles of Naturopathy.
2. Concept of Naturopathy in disease manifestation and diagnosis
3. Aims and objectives of Nisargopachara
4. Relation of Ayurveda and Naturopathy
5. Schools of Naturopathy- Indian and Western
6. Importance of Naturopathy
7. Treatment modalities of Naturopathy.
8. Vishranti – Role of rest and relaxation.

Second Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) –Maximum Marks-100

Paper – I

Applied aspects of Vaiyaktika and Samajika Swasthavritta in Swasthya Rakshan Part-A

Vaiyaktika Swasthavrittam (personal hygiene)

1. Description and Applied aspects of regimens of Dinacharya, Ratricharya, Ritucharya with practical knowledge of preventive aspects.
2. Shodhana therapy in Swastha Purusha
3. Garbhini, Sutika Paricharya and Balopachara (preventive O.B.G and paediatrics)
4. Malnutrition and its preventive measures
 - a) Santarpana apatarpana janya vikar and its preventive measures
 - b) Assessment of nutritional status and Nutritional surveillance
 - c) Nutritional problems in public health.
 - d) National Nutritional Programmes.
 - e) Food Hygiene and food poisoning.
5. Concept of Rasayan/Jara (Preventive Geriatrics)

Part-B

Samajika Swasthavritta (Community Health Care)

1. Health Care Management
 - a) Health Administration at International, Central, State and Local level.
 - b) Health schemes programmes in India
 - c) National eradication and control programmes of declared communicable diseases
 - d) Community development programmes.
 - e) Health Education and communication.
 - f) Laws related to Health (Medical Legislation).
 - g) Primary Health Care in India.
 - h) International Health Organizations - WHO, UNICEF etc.
 - i) Disaster management.
 - j) Hospital management

2. Family Welfare Programmes (Parivara Kalyana Karyakrama)
 - a) Demography
 - b) Definition and scope of family planning.
 - c) Family planning methods (both Modern and Ayurveda).
 - d) Family planning services.
 - e) National family planning programmes including R.C.H. programme.
 - f) Establishment of MCH centre, urban family welfare centre and their role in community health.
 - g) School health programmes.
 - h) Care of handicapped children.
 - i) Care of senior citizen.
3. Concept of Mental health- Manasika swasthya – Ayurvedic perspective.

Paper – II

Aupasargika - Anoupasargika Roga Pratishedha and Applied Aspects of Yoga – Nisargopachara

Part-A

Aupasargika evam Anoupasargika Roga Pratishedha

1. Communicable disease prevention and their management
 - a) Ayurvedic aspect of Kuprasangaja roga and Aupasargika roga.
 - b) Laboratory investigations for detection of various infectious diseases.
 - c) Description and preventive measures of viral, bacterial, vector borne and other communicable diseases.
 - d) Description and preventive measures of various STD's (HIV/ AIDS)
 - e) Emerging and re-emerging infectious diseases like SAARS, Chikungunya, Bird-flu etc.
 - f) Hospital acquired infections
2. Non-communicable diseases and their management– Hypertension, Cancer, Obesity, Blindness, Diabetes, etc.
3. Health promotive nutrition in Ayurveda like Balya, Urjaskara, Hridya, Chakshushya Dravya etc.
4. Disaster management in Natural calamities

Part-B

Yoga

1. Practical application of Ashtanga Yoga
2. Practising of Asana with precautions.
3. Individual Yoga practice- procedures, indications, contraindication and their effect on various organs and Dosha
 - a) Standing Position Asana- Tadasana, Vrikshasana, Chakrasana, Ardhakati Chakrasana, Trikonasana, Parivrittatrikonasana and Ardachakrasana.
 - b) Sitting position Asana (Meditative Asana)- Padmasana, Vajrasana, Siddhasana etc.

- c) Cultural Asana- Ardhamatsyendrasana, Gomukhasana, Yogamudrasana, Pashchimottanasana, Janushirshasana, Baddhakonasana, Ushtrasana, Kukkutasana, Kurmasana.
 - d) Supine Asana- Pavanamuktasana (Purna and Ardha), Ekapada Uttanasana, Halasana, Matsyasana, Viparitakarani, Sarvangasana, Chakrasana, Suptavajrasana, Ekapadasana and Shavasana.
 - e) Prone position Asana - Bhujangasana, Naukasana, Shalabhasana, Dhanurasana, Mayurasana, Makarasana.
4. Practice of Pranayama – Bhastrika, Ujjayi, Suryabhedhi, Chandrabhedhi, Anuloma-Viloma, Bhramari, Sheetali and Sheetkari.
 5. Shatkriya practice - Neti, Nauli, Dhouti, Trataka, Kapalabhati, Shankhaprakshalana, Agnisara.
 6. Practice of Bandha and Mudra.
 7. Practices of meditation and its importance in maintenance of health.
 8. Therapeutic application of yoga for various diseases and conditions.
 9. Researches conducted for management of diseases by Yoga and their results.

Nisargopachara

1. Jala Chikitsa (Hydrotherapy) –
Different types of water used in treatment.
Different types of baths and their indications and contra indications.
Steam bath- indications and contra indications
2. Surya Rashmi Chikitsa (Solar therapy) - Mahatwa and methods of sun bath.
3. Mrittika Majjana- Mud therapy
4. Diet therapy
5. Upavasa (fasting) - techniques and benefits
6. Mardanam (massage)-Techniques and therapeutic effects

PRACTICAL

Content of Practical

1. Family planning appliances like condom, copper-T, oral pills, etc.
2. Educational visits – P.H.C, Family Welfare Centre, Leprosy sanatorium, Rural Ayurvedic dispensary, M.C.H centre.
3. Health survey and field work in rural community.
4. Participation in National Health Programmes like immunization programmes and such other programmes, active participation in various health event days i.e. WHO day, AIDS day, etc.
5. Clinical Suggestion-Field Study-Case taking, recording and discussion of-
 - a) Non-infectious diseases
 - b) Infectious disease
 - c) Rugnapatrika regarding Yoga and Naturopathy
 - d) Antenatal cases
 - e) Vaccination report and Malnutrition - each of 10 cases
6. Applicability and management of the Janpadodhvansa in present era.
7. Applied aspect of the Pathyapathya, Dincharya, Ritucharya and Yoga.

Pattern of Practical Examination

1. Case Record in respect to Pathyapathya, Dincharya, Ritucharya and Yoga	10 Marks
2. Therapeutic application of Yoga and Naturopathy	20 Marks
3. Spotting	20 Marks
4. Project Work	20 Marks
5. Viva-voce	30 Marks
Total	100 Marks

Text Books for Reference

1. Brihatrayee - Laghutrayee - related portion
2. Hatha Yoga Pradeepika
3. Patanjalyogapradeep
4. Yogavashistha
5. Gherand Samhita
6. Swasthavritta Samucchaya : Vd Pandit Rajeshwardatta Shastri
7. Swasthya Vigyan : Dr. B.G. Ghanekar
8. Yoga aur Ayurveda : Acharya Rajkumar Jain
9. Swasthavritta Vigyan : Ram Harsh Singh
10. Preventive and Social Medicine : K. Park
11. Preventive and Social Medicine : Yashpal Bedi
12. Preventive and Social Medicine : Kulkarni
13. Preventive and Social Medicine : Mahajan
14. Dr. Reddy's Comprehensive guide to Swasthavritta : Dr.P. Sudhakar Reddy (Chowkhamba Sanskrit Pratishtan) New Delhi
15. Food and Nutrition Part I & Part II : M. Swami Nathan
16. WHO publications on preventive and social medicine
17. Kashyapa Samhita
18. Yogaratnakara

RASAYAN AND VAJIKARAN

D. Geriatrics (Ay.)

First Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) – Maximum Marks-100

Paper – I

Rasayan and Vajikaran Siddhanta

Part-A

1. Fundamentals of Rasayan
 - a) Historical evolution and concept of Rasayan (from Vedic to contemporary)
 - b) Source material related to Rasayan in various classics
 - c) Synonyms, utility, scope, etymology and definition of Rasayan.
 - d) Present scenario and future prospect in practice of Rasayan
2. Anatomy and applied physiology in context to Rasayan
 - a) Triguna, Mahabhuta, Dosha, Dhatu, Mala, Srotas, Agni, Ojas, Indriya and Mana.
 - b) Brief Introduction to Ahara Rasa Nirman, Dhatu Poshanakrama- Kedari Kulya, Kshiradadhi, Khale Kapota Nyaya and their role in Dhatu formation.
 - c) Concept of nutrition, preservation & promotion of tissue health. Role of various nutrients like vitamins, proteins, fats, micronutrients and trace elements in preservation and promotion of tissue health.
 - d) Metabolism: General and pertaining to ageing
 - e) Endocrinology: General, growth related and ageing.
 - f) Immunity: Antigen antibody reactions, cell mediated and humoral immunity, immune responses, immune deficiency states, hypersensitivity and autoimmunity.
3. Classification and application of Rasayan alongwith their types and examples
 - a) Kutipravesnik, Vatatapika, Droni pravesnik
 - b) Kamyā, Naimittika, Ajasrika, Medhya
 - c) Indriyanusari, Dhatvanusari
 - d) Lekhan-Brimhanusari
 - e) Samshodhan-Samshamananusari
 - f) Swasthyanuvartaka Rasayan- Achara Rasayan, Sadvritta, Brahmacharya.
 - g) Rasayan adhikaritva-Indications and contraindications.
 - h) Optimum time for the use of Rasayan as per age, season, day/night, etc.
 - i) Pathyapathya during and after the use of Rasayan
 - j) Methods of using Rasayan- Poorva, Pradhana and Pashchat Karma.
4. Preservation and Promotion of health by Rasayan
5. Prevention of recurrence of Physical and Mental disorders by Rasayan
6. Kutipravesnik Rasayan
 - a) Concept of Trigarbha Kuti and its descriptions
 - b) Scope and limitation of Kuti Pravesnika Rasayan
 - c) Standard Operative Procedures for Kutipravesnika Rasayan in general and specific to different Rasayan usage.

- d) Duration of Kutipravesik Rasayan and rules for termination of Kutipravesha
- e) Benefits of Kutipravesika Rasayan.

Part-B

1. Fundamentals of Vajikaran
 - a) Historical evolution and concept of Vajikaran (from Vedic to contemporary era)
 - b) Source material related to Vajikaran in various classics
 - c) Etymology, definition, synonyms, utility and scope of Vajikaran
 - d) Epidemiology of sexual disorders and infertility – Indian and global scenario.
 - e) Present scenario and future prospects in practice of Vajikaran
 - f) Cross cultural perspectives of sexuality and fertility.
2. Applied Anatomy and Physiology in context of Vajikaran
 - a) Triguna, Mahabhuta, Dosha, Dhatu, Mala, Srotas, Agni, Oja, Indriya and Mana.
 - b) Srotas with special reference to Sukravaha Srotas and Artavavaha Srotas Shukradhara kala.
 - c) Study of Beeja, Shukra, Veerya, Retasa and Rupadravya
 - d) Dhatuposhan Krama with special reference to Shukra formation
 - e) Reproductive anatomy and physiology- spermatogenesis, oogenesis
 - f) Shuddha Shukra Lakshana, Falavata Shukra Lakshana, Shudha Artava Lakshana.
 - g) Process of fertilization, Factors responsible for Garbhotpatti
3. Sexual behavior and response
 - a) Physiology of erection, ejaculation and orgasm
 - b) Hormonal regulation of human sexuality and fertility
 - c) Metabolism: general and pertaining to sexuality and fertility
4. Types and Methods of Vajikaran.
 - a) Classification of Vajikaran.
 - b) When and which Vajikaran is to be used.
 - c) Methods of using Vajikaran – Poorva, Pradhan and Pashchatkarma.
 - d) Dietetic, physical and behavioural code for using Vajikaran.
 - e) Contraindications for Vajikaran.

Paper - II

Part-A

Jara Samprapti Vigyan (Ageing)

1. Concept of Jara and ageing
 - a) Introduction and definition.
 - b) Epidemiology of ageing and degenerative diseases.
2. Causes of ageing
 - a) Dosh, Dhatu, Agni and Mala in Jara.
 - b) Age of onset of ageing, different Ayurvedic and Modern concepts regarding onset of ageing.
 - c) Factors of ageing process- Swabhav, Jara, Kala.
 - d) Prakriti and ageing
 - e) Environment and allied factors in ageing.

- f) Town dwelling and Diet articles such as Lavana, Kshara, etc. in ageing.
- g) Effect of life style in ageing.
- h) Psychological factors in ageing- Irshya, Bhaya, Krodha, Chinta etc.
- 3. Samprapti of Jara
- 4. Roopa of Jara- Srotanusari Rupa of Jara
- 5. Epidemiology of ageing and degenerative diseases
- 6. Classification of Jara
 - a) Reversible and Irreversible ageing process.
 - b) Introduction to common geriatric disorders like- Dementia, Alzheimer's disease, Degenerative diseases, Stress induced diseases, Injuries, Urinary retention, GIT problems, BPH, CVA, TIA, PVD, OA.

Part-B Vajikaran

- 1. Concept of Vajikaran
 - a) Knowledge of different terms used in reference to Vajikaran- Vrishya, Vajikaran, Chatakavat, Hastivat, Ashwavat, Apatyam, Santankaram
 - b) Different types of Shukradushti and their symptoms
 - c) Different types of Artavadushti and their symptoms
- 2. Panchanidan of diseases related to Shukravaha Srotas
Klaibya, Shandya, Napunsakata, Shukragatavata, Dhvajabhanga, Vyavayashosha, Shighrapatan, Shukrataralya, Shukadosha
- 3. Sexual dysfunctions
 - a) Libido related disorders-increased libido, decreased libido
 - b) Erectile dysfunctions : - Organic,secondary to chronic diseases, functional and iatrogenic
 - c) Ejaculatory disorders – premature, delayed, retrograde, anejaculation
- 4. Infertility
 - a) Male infertility-oligozoospermia, asthenozoospermia, teratozoospermia, obstructive azoospermia, immunological infertility, pyospermia
 - b) Female infertility
- 5. Introduction to sexually transmitted diseases- Phiranga, Upadamsha, Puyameha, Syphilis, Gonorrhoea, HIV/AIDS.

Second Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) – Maximum Marks-100

Paper - I

Rasayan and Vajikaran Pariksha Vigyan

Part-A

Rasayan Pariksha Vigyan

- 1. History taking and Clinical examination
 - a) Rog and Rogi Pariksha, Trividha, Chaturvidha, Shadvidha, Ashtavidha, Dashavidha and Dwadashvidha.
 - b) Neurological, ENT and Ophthalmological examination.

2. Lab Investigations
 - a) Routine Investigations - Hb, TLC, DLC, ESR, Biochemistry (Blood Sugar, Blood Urea, Creatinine, Uric acid, Lipid profile) etc.
 - b) Hormonal Assay - Thyroid, biomarker related to ageing.
 - c) Immunoglobulin studies
 - d) Enzyme studies
 - e) Radiological and sonological investigations
 - f) Specific investigations for ageing.
3. Importance of Samshodhana in Rasayan
Role of importance of Shodhana Karma in Rasayan, knowledge of different procedures useful in Rasayan
4. Psychosocial Assessment
 - a) Personality assessment and development in relation with Rasayan.
 - b) Different Scales for assessment of IQ, Memory, EQ
 - c) Anxiety and depression scale
 - d) MME Scale
 - e) Quality of life parameters
 - f) Positive psychology assessment
 - g) Counselling techniques

Part-B

Vajikaran Pariksha Vigyan

1. History taking and examination
 - a) History- general and sexual
 - b) Physical examination
 - c) General examination
 - d) Neurological and vascular
 - e) Specific Examination - sexual examination- local examination of testes, penis, vas deferens, spermatic cord
 - f) Nocturnal penile tumescence (NPT) Examination
2. Investigations
 - a) Routine Investigations - Hb, TLC, DLC, ESR, Biochemistry (Blood Sugar, Blood Urea, Creatinine, Uric acid, Lipid profile) etc.
 - b) Hormonal Assay - Thyroid, Testosterone, FSH, LH, Prolactin, etc.
 - c) Immunoglobulin studies
 - d) Enzyme studies
 - e) Genetic mapping, Chromosomal analysis
 - f) HIV, VDRL, HBSAg, etc.
 - g) Semen analysis (Semenogram)
 - h) Radiological and Sonological Investigations - Scrotal doppler, penile doppler, scrotal USG
3. Importance of Samshodhana in Vajikaran and knowledge of individual Karma useful in Vajikaran
4. Myths and Misconcepts about Sex and Vajikaran
 - a) Classification of males and females as per Kamashastra
 - b) Knowledge of different organs of sensuality and achieving orgasm.

5. Sex Education
 - a) Counselling techniques
 - b) Marriage sex counselling
 - c) Concepts of safer sex- Knowledge of pharmacology of male and female contraceptives.
 - d) Reproduction, contraception etc.
 - e) Decision making about pregnancy and parenthood
 - f) Ayurvedic and Modern concept of genetic defects leading to malformation of Secondary sexual factors.
6. Ethics and legal aspects of sex and reproduction.

Paper – II

Rasayan and Vajikaran Aushadhi Vigyan

Part-A

Rasayan Aushadhi Vigyan

1. Brief Introduction to Rasayan Drugs - Jivaniya, Brihaniya, Balya, Shramahar and Vayasthapana.
2. Pharmacology and Pharmacodynamics of Ayurvedic Rasayan Drugs.
3. Classification of Rasayan Drugs –
 - a) Vyadhyutapadaniya Pratibandhak Rasayan drugs
 - b) Vyadhibala Virodhaka Rasayan drugs
 - c) Medhya Rasayan drugs
 - d) Vatatapika Rasayan drugs
 - e) Naimittik Rasayan drugs for specific diseases
 - f) Svarna Prashana Rasayan
 - g) Knowledge of single herbal drugs used as Rasayan
 - h) Knowledge of Herbomineral-metalic and acqua marine compounds used as Rasayan
 - i) Knowledge of Compound formulation mentioned in Ayurveda
 - j) Knowledge of Drugs – Used in Kutipravesika and Vatatapika Rasayan.
 - k) Agravya Rasayan- Application and importance of Achara Rasayan in today's scenario.
4. Mode of action of Rasayan
5. Methodology of deciding the drug, dose, dosage form, anupana, pathya, apathya for Rasayan Karma.
6. Management –
 - a) Management of Jara and Akaal Jara
 - b) Management of immune deficiency disorders
 - c) Management of metabolic and endocrine disorders
 - d) Management of life style disorders
 - e) Management of degenerative disorders.
 - f) Management of pollution and toxicity related disorders
 - g) Symptomatic treatment of Kaal Jara
 - h) Procedures contraindicated in Jara
 - i) Rasayan useful in different branches of Ayurveda

- j) Rasayan drugs used in contemporary and other allied medical sciences e.g. Chinese – Ginseng, Ginko Biloba
- 7. Prevention or delaying of Jara - According to the stages
- 8. Modern perspectives of Rasayan- Immunomodulator, anti oxidants, tissue supplements, neutropics, disease modifying anti arthritics drugs, prebiotics, probiotics, Nano-Bio technological products etc.
- 9. Recent advances in Rasayan
- 10. Research methodologies in Rasayan

Part-B

Vajikaran Aushadhi Vigyan

1. Classification of Vajikaran Drugs –
 - a) Vajikar, Vrishya, Chatakvat, Hastivat, Punsatvakar, Apatya Santankar, Shukra Janak, Shukra Pravartak, Shukrasrutikar, Shukravridhikar, Shukrasrutivridhikar, Shukrastambhaka, Shukrarechak and Shukrashosaka.
 - b) Single herbal drugs used in Vajikaran and their efficacy.
 - c) Herbomineral-metallic and aqua marine compounds used in Vajikaran and their efficacy.
 - d) Compound formulations mentioned in Ayurveda as Vajikar.
 - e) Detailed Study of Vajikaran Yoga -
 - i. Drugs used in Male infertility
 - ii. Drugs used in Female infertility
2. Management-
 - a) Management of sexual dysfunctions with Vajikaran Dravya.
 - b) Invasive and noninvasive procedures in Vajikaran
 - c) Uttarbasti- Its indication and contraindication, method, drugs used, precaution and complication.
 - d) Application of Panchkarma in infertility management
 - e) Surgical procedures and implants in Vajikaran
 - f) Management of male and female infertility
 - g) Assisted reproductive techniques (IVF, IUI, ICSI, GIFT, ZIFT, etc).
 - h) Use of Vajikaran drugs in different branches of Ashtanga Ayurveda.
 - i) Vajikaran drugs used in contemporary and other allied medical sciences. e.g. Chinese Ginseng, etc.
3. Modern perspectives of Vajikaran.
4. Pumsavan karma - Gender selection, legal aspects of sex and reproduction.
5. Recent Advances and Research Methodologies in Vajikaran.

PRACTICALS

Contents of Practicals

1. Knowledge and practical aspects of Rasayan and Vajikaran.
2. Knowledge of Panchkarma procedures relevant to Rasayan and Vajikaran like Snehan Swedana, Vamana, Vircehana, Basti, Nasya and Samsarjan Krama.
3. Knowledge and interpretation of various Laboratory investigations relevant to Rasayan Vajikaran like Haemoglobin, TLC, DLC, ESR complete blood chemistry, LFT, Lipid profile, Urine examination, Semen examination, Hormonal assays etc.
4. Knowledge of current trends in Geriatrics and Sexology relevant to Rasayana and Vajikaran.

Pattern of Practical examination

1. Interpretation of Lab investigations	10 Marks
2. Knowledge of Panchkarma procedures in Rasayan and Vajikaran	10 Marks
3. Case record of Rasayan	10 Marks
4. Case record of Vajikaran	10 Marks
5. Project Work	20 Marks
6. Viva-voce	40 Marks
Total	100 Marks

Text Books for Reference

1. Vajikaran Tantra	: Dr. J.L.N. Shastri & Dr. K. Nishteshwar
2. Aphrodisiacs and treatment of Impotence in Alternative system of medicine	: Dr. P.V.V. Prasad, Mohd. Siddique and Dr. Abdul Wadood
3. Rajit Roga Shastra (Part I & Part II)	: Dr. Shiv Kumar Shastri
4. Santati Nigraha	: Dr. Shivdayal Gupta
5. Kamashastra antargat Vajikaran Vigyan	: Prof. Jyotirmitra
6. Ayurvediya Rasayan Sar	: Dr. Shailaja Shrivastava
7. Rasayan Sar (Part I & Part II)	: Dr. Shyam Sunder Acharya
8. Rasayan Khand	: Dr. Indra Dev Tripathi
9. Rasayan Tantra	: Dr. Pakshdhar Jha
10. Ayurved Chikitsa Vigyan	: Prof. Banwari Lal Gaur

AYURVEDIC COSMETOLOGY AND SKIN DISEASE

(त्वक सौन्दर्य एवं रोग विज्ञान)

D. Dermatology (Ay.)

First Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) – Maximum Marks-100

Paper - I

Physiopathology of Tvak and Saundarya Vigyan

Part-A

1. Introduction and scope of Tvak Vigyan.
2. Embryological development and anatomy of Tvak and skin.
3. Applied anatomy of Tvak- Ayurveda and Modern aspect.
4. Description of Svedavah Srotas and Kleda and applied patho-physiology of sweat.
5. Applied physiology of Tvak (Skin) in Ayurveda and Modern aspect and Srotas Vivechan in relation to skin.
6. Applied anatomy of Nail.
7. Applied aspects of Tvak as adhistan of Indriya, Dosha and Dushya.
8. Trividha, Chaturvidha, Panchvidha, Shadvidha, Ashtavidha and Dashavidha Pariksha in diagnosis of Tvak and Yaun Sankramak Roga.
9. Varna, Chhaya, Prabha and their Vikar.
10. Role of Prakriti and Sara in health and Vikar of Tvak, Keshha and Loma.
11. Role of Ahar and Vihar in maintenance of healthy skin.
12. Role of Mana in Prakriti and Vikriti of Tvak
13. Cosmetology: Ayurved and Modern aspect.
 - a) Basics of skin care, beauty and biochemistry.
 - b) Review of single and compound drugs in Ayurved and Sanskrit literature for Saundarya Prasadhan.
 - c) Natural care of skin and preventive measures.
 - d) Lepa, Pralepa, Pradeha, Udvartan, Dhoopan, Abhyanga, Swedan, Utsadan, Avasadan, Krishnakarma, Pandukarma, Pratisaran, Romsanjanan, Lomapaharan for Saundarya Prasadhan and Tvak Vikar.
 - e) Prevention and management of ageing related Tvak Vikar.
 - f) Breast care and Stan Vriddhikar Chikitsa.
 - g) Hair care in Ayurved.
 - h) Role of Rasayan in promotion of skin health.

Part-B

1. Knowledge of various lesions:
 - a) Pitika, Pidaka, Visphot, Utsedh, Mandal, Sanrambh, Pak, Koth, Utkoth, Granthi, Arbud, Vidradhi, Vaivarnya, Vyang, Charmakeel, Mansankur, Arsha, Kikkis, Vali, Vranavastu, Tvakvidaran and Valmik.
 - b) Primary lesions – Macule, patch, papule, nodule, tumor, plaque, vesicle, pustule, bullae, cyst, wheal, telangiectasia.

- c) Secondary lesions: Scale, crust, erosion, ulcer, scar, atrophy, sclerosis, excoriations, burrow, comedo, milium.
2. Histopathological, microbiological (bacterial and fungal) skin test such as skin biopsy, skin scrapping, wood's light examination, Lepromin test, VDRL, Allergy test, patch testing etc.
3. Inflammation, de-generation, atrophy and hypertrophy in relation to skin.
4. Role of Krimi in various Tvak Vikar.
5. Role of Asatmya, Viruddhahar-Vihar in Tvak Vikar.
6. Knowledge of Tvak related to Arishta Lakshana.
7. Knowledge of immunity and genetics in relation to Tvak Vikar.

Paper -II

Principles of management of Tvak Roga and Kushtha Roga

Part-A

1. Principle of management of Tvak Vikar evam Yaun Sankramak Roga in Ayurveda and Modern.
2. Role of various Shodhana measures and Raktamokshana specially Jalaukavacharana in Tvak Vikar evam Yaun Sankramak Roga.
3. Agnikarma, Ksharakarma, Shastrakarma in Tvak Vikar evam Yaun Sankramak Roga.
4. Kushthahara, Udarda prashamana, Tvachya, Varnya, Kandughna, Rakta prasadak, Rakta shodhak drugs.
5. Pathya, Apathya and Nidan parivarjan in Tvak Vikar evam Yaun Sankramak Roga.
6. Role of Sadvritta, Satvavajaya, Yoga and Rasayan in Tvak Vikar evam Yaun Sankramak Roga.
7. Recent advances in management of Tvak Vikar evam Yaun Sankramak Roga.

Part-B

1. Introduction to Kushtha.
2. Nidan, Purvarupa, Rupa, Upasaya and Samprapti of various Kushtha.
3. Various classifications of Kushtha.
4. Diagnostic methods, modern co-relation, differential diagnosis of each type of Mahakushtha and Kshudrakushtha.
5. Principles of management of each type of Kushtha including Dhatugat Avastha.
6. Detail management of all Mahakushtha and Kshudrakushtha
7. Upadrava of Kushtha and their management.
8. Sadhyata and Asadhyata of Kushtha.
9. Leprosy, its Ayurvedic co-relation and modern management in light of National Leprosy Eradication Programme.

Second Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) –Maximum Marks-100

Paper - I

Kilasa, Kshudra Roga Evam Anya Tvak Roga Part-A

1. Kilasa / Shvitra - etiopathogenesis, types, diagnosis and management.
2. Ayurvedic co-relation and management of Pigmentary skin disorders – Vitiligo, Leucoderma, Albinism, Pityriasis Versicolor, Melasma and Generalized Hyperpigmentation.
3. Ayurvedic co-relation and management of photosensitivity and photo induced disorders with environmental factors, sun burn, tanning, ultra violet radiation, skin related adverse drug reactions, photo dermatosis, localised heat urticaria, solar urticaria, cold urticaria, acrocyanosis, cold panniculitis, cold erythema, Raynaud's phenomenon.
4. Ayurvedic co-relation and management of cutaneous reaction to allergens and pollutants borne by the air, cutaneous reaction to cold, frost bite, trench foot, immersion foot, chilblains.
5. Ayurvedic co-relation and management of keratinisation and papulosquamous disorders: ichthyosis, corns, follicular keratosis, psoriasis
6. Knowledge of trichology.
7. Ayurvedic co-relation and management of alopecia, baldness, hypertrichosis, hirsutism and graying of hair.
8. Ayurvedic co-relation and management of sweat glands and sebaceous glands related disorders.

Part-B

1. Introduction to Kshudra Roga and their Modern correlation.
2. Diagnosis and management of all types of Kshudra Roga in relation to Tvak Vikar evam Yaun Sankramak Roga.
3. Diagnosis and management of all types of Prameha Pidika
4. Ayurvedic co-relation and management of Acne, Acneform eruptions and Rosacea
5. Diagnosis and management of Shitapitta, Udarda, Kotha, Utkotha
6. Ayurvedic co-relation and management of Urticaria, Urticarial vasculitis, Cholinergic urticaria, Angioedema, Insect bite.
7. Tvakgata Vata- lakshana and chikitsa.
8. Diagnosis and management of Vishphota.
9. Ayurvedic co-relation and management of Vesiculobullous skin disorders, viz –
 - a) Genetic bullous disorders like Epidermolysis bullosa, Epidermolysis bullosa simplex, Junctional epidermolysis bullosa, Hailey disease.
 - b) Autoimmune blistering disorders like Pemphigus, Bullous pemphigoid, Bullous SLE.
10. Knowledge of Skin tumors and its Ayurvedic management.

Paper - II
Sankramaka Tvak Roga and Yaun Roga
Part-A

1. Diagnosis and management of Shuka Roga.
2. Diagnosis and management of Guhya Roga.
3. Diagnosis and management of Phirang (Syphilis), Upadansha, Puyameha (Gonorrhoea)
4. Ayurvedic co-relation and management of skin disorders in AIDS.
5. Sexually transmitted infection and mucocutaneous manifestation:
 - a) Viral infection - Herpes Simplex, Warts, Molluscum Contagiosum.
 - b) Bacterial infection
 - c) Fungal infection - Candidiasis
6. Ayurvedic co-relation and management of Inflammatory dermatosis, Atopic dermatitis, Seborrhoeic dermatitis, Lichen simplex chronicus, Exogenous eczema, Irritant contact dermatitis, Allergic contact dermatitis, Phytodermatitis, Infective dermatitis.

Part-B

1. Diagnosis and management of all types of Visarpa.
2. Ayurvedic co-relation and management of viral skin infection: Herpes Simplex, Herpes Zoster, Warts and Molluscum Contagiosum.
3. Ayurvedic co-relation and management of fungal skin infection: Pityriasis versicolor, Candidiasis, Madurai foot, Dermatophytosis, Tinea Corporis, T. Cruris, T. Pedis and T. Capitis.
4. Ayurvedic co-relation and management of bacterial skin infections: Furuncle, Carbuncle, Folliculitis, Impetigo, Erysipelas, Cellulitis, Lupus vulgaris, Tubercular and non-tubercular Mycobacterial infection.
5. Ayurvedic co-relation and management of protozoal and parasitic skin infestation: Scabies, Dracunculiasis, Filariasis, Ascariasis, Pediculosis enterobiasis
6. Introduction to Paediatric, Geriatric and Occupational dermatology.

PRACTICALS

Content of Practical

1. Laboratory investigation and histopathology :
 - a) KOH preparation
 - b) Tzanck Smear
 - c) Wood's light examination
 - d) Lepromin test
 - e) Patch testing
 - f) VDRL
 - g) Biopsy
 - h) Allergy test and Hyposensitisation
 - i) Diascopy
2. Routine haematological, biochemical and pathological investigations and other routine lab investigations.

3. History taking of cases of Tvak Vikar evam Yaun Sankramak Roga:
 - a) Importance of personal history
 - b) Importance of associated complaints
 - c) Importance of family history
 - d) Importance of previous illness and its medication
 - e) History of vaccination
 - f) Importance of previous surgical interventions
 - g) Importance of present medication
 - h) Importance of occupational history: nature of work, time of work and climatic influences in working places.
 - i) Importance of food habits
 - j) Effects of drug abuse
 - k) Importance of personal hygiene
 - l) Importance of public hygiene
4. Clinical examination
 - a) Types of skin lesions
 - i. Primary
 - ii. Secondary and special
 - b) Pattern of skin lesions
 - c) Shape and surface of lesions
 - d) Distribution of lesions
 - e) Examination of all srotas
5. Clinical tests: Auspitz's sign, Nikolsky's sign, Darier's sign, Dermatographism, etc.
6. Panchkarma
 - a) Bahya Parimarjan Chikitsa
 - b) Vamana
 - c) Virechana
 - d) Basti
 - e) Nasya Karma
7. Raktamokshana:
 - a) Sira Vyadhana
 - b) Jalaukavacharana
8. Kshar Karma
9. Advance management and preventive measures in skin diseases

Pattern of Practical Examination

1. Case Records	10 Marks
2. Knowledge and Interpretation of Lab Investigations	10 Marks
3. Upakarma	10 Marks
4. Project Work	20 Marks
5. Viva-voce	50 Marks
Total	100 Marks

Text Books for Reference

1. Charak Samhita of Agnivesa with Chakrapani Tika
2. Sushruta Samhita of Sushruta with Dalhan Tika
3. Ashtanga Samgraha of Vagbhata with Indu Tika : Dr. Shivprasad Sharma
4. Ashtanga Hridaya with Arundatta and Hemadri Tika : Pt. Harishastri Paradkar
5. Bhavaprakash of Bhavmishra with Vidyotini Tika : Pt. Brahma Sankara Mishra
6. Sharangdhar Samhita with Dipika Tika : Dr. Brahmanand Tripathi
7. Bhaisajyaratnawali with Vidyotini Tika : Vd. Rageshwardatta Shastri
8. Chakradatta with Vaidyaprabha Hindi Commentary : Prof. Ramnath Dwivedi
9. Yogratnakar with Vidyotini Hindi Commentary : Bhashagaratna Brahmashankar Shastri
10. Shabda Kalpadruma : Radhakanta Deva
11. Ayurvedic Beauty Care : Melanie Sachs
12. Ayurvediya Shabdakosha : Vaidya Venimadhav shastri Joshi
13. Geriatrics in Ayurveda : Dr. S. Suresh Babu
14. AIDS evam Ayurveda : Dr. Hiralal Shivhare
15. An Illustrated Hand Book of Skin Diseases and Sexually Transmitted Infection : Uday Khopkar
16. Roxburgs Common Skin Diseases : Ronald Marks
17. Adams Occupational Skin Diseases : Adam
18. Dermatological Diseases A Practical Approach : Venkatraman Mysore
19. Clinical Methods in Dermatology and Venereology : J. S. Pasricha, Binod Khaitan
20. Illustrated Text Book of Dermatology : J. S. Pasricha, Ramji Gupta
21. Text Book of Clinical Dermatology : Virendra N. Sehgal
22. Harrisons Principles of Internal Medicine : Dennis Kasper
23. API Text Book of Medicine : Dr. Siddharth N. Shah
24. Essentials of Dermatology Venereology and Leprosy : S. P. Chattopadhyay
25. Clinical Leprosy : Virendra N. Sehgal
26. Text Book of Dermatology Venereology and Leprology : Devinder M. Thappa
27. Colour Atlas of Dermatology : L. K. Bhutani
28. Text Book of Dermatosurgery and Cosmetology : Satish Sawant
29. Illustrated Synopsis of Dermatology and STD : Neena Khanna
30. Clinical Anatomy for Medical Students : Richard Snell
31. Principles of Anatomy and Physiology : Tortora and Grabowski
32. Text Book of Medical Physiology : Guyton and Hall.

KSHAR KARMA

D. Kshar Karma First Year

Theory (Two papers) - Maximum Marks -100 (each)
Practical (one) – Maximum Marks-100

Paper - I Basic principles Part-A

Introduction to Shalya Tantra - definition and importance of Shalya Tantra, qualities of surgeon.

1. Trividha karma- Poorva karma, Pradhan karma and Pashchat karma (preoperative, operative and post operative) procedures related to application of Kshara and Kshara Sutra in ano-rectal disorders.
2. Surgical ethics.
3. Basic surgical concepts and practice of surgery.
4. Anatomy and physiology of ano-rectal region.

a) Ayurvedic View

Anatomical concepts of Guda in Ayurveda, development, various measurements, Guda vali, Uttaraguda and Adharaguda, Guda as a Marma. Function of Uttarguda and Adharaguda. Importance of Guda valis and their functions in act of defaecation. Concept of Apana Vayu and its function. Importance of Apana Vayu in act of defaecation, micturation and its involvement in the development of various ano-rectal disorders. Features of vitiated Apana vayu and measures of pacification.

b) Modern View

Anatomical structures in ano-rectal region, anatomy of anal canal, rectum, perianal area, perianal skin, fascia, muscles, anal sphincters, supports of rectum and anal canal, various structures / spaces around anal and perianal area and their significance in ano-rectal disorders. Anal gland, anal crypts, anal mucosa, anal valves, land marks of anal canal and rectum. Venous and arterial supply, venous plexus, speciality of vascular supply of rectum and anal canal. Lymphatics and innervations of rectum and anal canal. Pudendal canal (Alcocks canal) its contents and importance. Peritoneal reflections, facial covering of rectum, pelvic diaphragm, male and female perineum. Histological structures of rectum and anal canal. Functions of anal canal, rectum, perianal muscles, anal sphincter, act of defaecation, storage of waste product, structures in relation to anorectal area and their functional impact on anorectal area in relation to anorectal disorders. Continence and incontinence, assessment of anal sphincter tone.

Part-B

1. Knowledge of equipments/surgical instruments used for diagnosis and management of ano-rectal disorders. Instruments useful in the diagnosis and treatment of Fistula-in-ano. Dr.P.J.Deshpande's instruments for the use of Kshara karma.
2. Sterilization – Importance, methods and their application.
3. Diagnostic investigations for ano-rectal disorders, knowledge of Radiograph, Fistulogram, Sonogram, Sonography, CAT-Scan, MRI and other updated equipments.
4. Introduction to Research Methodology and Bio Statistics

Paper-II

Ayurvedic and Modern Drugs Pharmacology

Part-A

1. Detailed description of Kshara –
 - a) Definition, types- Pratisaraneeya Kshara and Paneeya Kshara , properties, pharmacological actions of drugs, chemical constituents, method of preparation, its standardization, sterilization and storage.
 - b) Indications, contraindications and complications of Kshara karma.
2. Ksharsutra preparation –
 - a) Historical aspects, various drugs used for its preparation including their identification, collection, properties, pharmacological actions of drugs, chemical constituents, method of preparation, its standardization, sterilization and storage.
 - b) Indications and contraindications and complications of Kshara Sutra in Ano-rectal diseases.
 - c) Various other Kshara preparations like – Kshar varti and Kshar pichu.
3. Pharmacodynamics of Kshara -
Chemical analysis, pH value, probable mode of action like penetration, necrotic and dissolution actions of Kshara.
4. Description of Paneeya Kshara and its indications.

Part-B

1. Detailed study of pharmacology of the following drugs used in the management of ano-rectal disorders.

(a) Antibiotics	(b) Laxatives
(c) Analgesics and NSAID's	(d) Haemostatics
(e) Anaesthetic agents	
2. Ayurvedic drugs used in ano-rectal disorders

Second Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) –Maximum Marks-100

Paper - I

Nidan and Chikitsa

Part-A

1. Nidan, Samprapti, Lakshana and Chikitsa of Vrana Shophya, Vrana and Nadi Vrana.
2. Aetiopathogenesis, types, signs and symptoms of inflammation, wound, sinus & pilonidal sinus.
3. Nidan, Samprapti, Lakshana and Chikitsa of Guda vidradhi.
4. Bhagandar Pidika and Bhagandar –
Bhagandar Pidika – Aetiology, types, clinical presentation, character, differential diagnosis, investigations, curable and incurable varieties, prevention and management of Bhagandar Pidaka.
Perianal, ischio-rectal, sub mucosal and other abscesses in the ano-rectal area and perineum; their clinical presentation, investigations, differential diagnosis and management.
Bhagandar- Aetiopathogenesis, types, classifications, clinical presentations, diagnosis, investigations, methods of treatment and prognosis, surgical principles, pre-operative preparations, types of incisions, operative techniques in Ayurveda for the management of Bhagandar. Post operative measures, Complications and their management.
Medical management - conservative and para surgical procedures like Kshara and Agni karma in the treatment of Bhagandar.

Part-B

Fistula -in-ano:

1. Its definition, aetiology, classifications, clinical presentation and diagnostic modalities
2. Complicated fistulae and their management – Treatment of difficult and complicated fistula-in-ano e.g. blind internal, blind external, supra levator extension, multiple fistula-in-ano, long perineal and gluteal extension. Horse shoe type fistula-in-ano, recurrent fistula-in-ano.
3. Fistulae other than crypto glandular origin - Fistula communicating with other organs like urethra, vagina, and urinary bladder, traumatic fistula etc.
4. Treatment of fistula-in-ano – Different modalities of fistula-in-ano; fistulectomy, fistulotomy, fistulectomy with primary closure, fistulectomy with skin grafting, etc, Seton treatment of fistula-in-ano; indications and contraindications, merits and demerits.
5. Management of fistula in ano in patients suffering from Diabetes, HIV, Tuberculosis, IHD and in those on steroid therapy.
6. Pre operative measures - Different Pre-operative preparation related to application of Kshara and Ksharsutra in anorectal diseases specially fistula-in-ano.
7. Post operative care - Postoperative care, wound care, urinary problems and follow up patients, etc.
8. Adjuvant therapy - Analgesics and Antibiotics and other Ayurvedic medicines in the management of fistula-in-ano.

Paper - II
Nidan and Chikitsa
Part-A

1. Arshas (Haemorrhoids)
 - a) Definition, aetiopathogenesis, prodromal features, types, clinical features, diagnosis, differential diagnosis, complications, prognosis and management according to Ayurveda and Modern.
 - b) Management of Arsha by Kshara lepa and Kshara sutra – Indications, method of application, observations and post operative observations.
2. Parikartika (Fissure-in-ano)
Definition, aetiopathogenesis, prodromal features, types, clinical features, diagnosis, differential diagnosis, complications, prognosis and management according to Ayurveda and Modern.
3. Guda Bhramsha (Prolapse of rectum): Definition, aetiopathogenesis, clinical features and management according to Ayurveda and Modern medicine.

Part-B

1. Management of pain during and after Ksharsutra therapy and measures to minimize the pain.
2. Problems and complications of Kshara Karma and Ksharsutra therapy e.g. pain, haemorrhage, infection, delayed cutting, recurrence, incontinence, strictures etc. and their management.
3. Modified technique of Ksharsutra in treatment of fistula-in-ano by Ksharsutra. Combination of surgery and Ksharsutra therapy.
4. Diagnosis of Malignancies and referral :
 - a) Malignancy of prostate
 - b) Malignancy of anal canal and rectum
 - c) Malignancy of external genitalia, cervix and uterus
 - d) Any other condition requiring immediate intervention /referral to an appropriate facility.
5. Update knowledge of Research and recent advances in the field of Kshara karma.

PRACTICALS

Contents of Practical

1. Case history recording and demonstration of Kshara Karma on patients.
2. Guidelines for Practical Training:
 - a) History taking and clinical examination of ano-rectal diseases.
 - b) Application of Kshara Karma-

Observed	-	100 cases
Assisted	-	50 cases
Operated	-	25 cases
3. Clinical examination of ano-rectal diseases includes rectal examination, digital examina-

- tion, abdominal examination and inguinal examination.
4. Special Investigations:
 - a) Proctoscopy
 - b) Sigmoidoscopy
 - c) Techniques of fistulogram
 - d) Anal manometry
 - e) Any other latest diagnostic radiological investigations.

Pattern of Practical Examination

1. Case Record	20 Marks
2. Applicability of Kshara Karma in different diseases particularly in reference to the Fistula-in-Ano, Haemorrhoids etc.	30 Marks
3. Project Work	20 Marks
4. Viva-voce	30 Marks
TOTAL	100 Marks

Text Books for Reference

1. Relevant portions of Sharir Rachana and Kriya from Bhrihatrayee and Laghutrayee.
2. Clinical Anatomy for Medical student : Snell
3. Text Book of Medical Physiology : Guyton and Hall
4. Manual of Surgical Instruments and Procedures : M.M.Kapur
5. Kshara Sutra : RAV
6. Essentials of Medical Pharmacology : K.D. Tripathi
7. Primary Anaesthesia : Maurice King
8. Relevant portions from Bhrihatrayee and Laghutrayee
9. Surgery of Colon, Rectum and Anus : Rob and Smith
10. Surgery of the Anus, Rectum and Colon : Goligher. JC
11. Demonstration of Physical signs in clinical surgery : Hamilton Bailey
12. Treatment of Fistula-in-ano by a new technique : P.J. Deshpande and K.R.Sharma.

13. Standardisation of Kshara Sutra – Ayurvedic medicated thread used in the management of Fistula-in-ano : Anupam Sharma, Manisha Mehata, Handa S.S et al Jr. Proct. Feb. 1993
14. IMCR centre for advanced Pharmacological Research on Traditional Remedies, CDRI Lucknow.
15. Dr. P.J. Deshpande's instruments for the use of Kshara Karma.

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ROGA NIDAN VIDHI (DIAGNOSTIC TECHNIQUES)
[Diploma in Clinical Pathology-Ay] D.C.P (Ay.)
First Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) – Maximum Marks-100

Paper - I
Principles of Roga Nidan and General Pathology
Part-A

Roga Nidan

Importance of Roga Nidan in clinical and laboratory practice.

1. Dosha Dushya Vigyan
2. Concepts of Agni and Ama
3. Concept of Vyadhi Kshamatwa
4. Sroto Vigyan
5. Nidan Panchaka
6. Shatkriya Kaal.

Part-B

General Pathology

Basics of Pathology-

1. Cell injury
2. Inflammation and repair.
3. Haemodynamic disorders.
4. Neoplasia.
5. Immunopathology.
6. Environmental disorders
7. Nutritional disorders
8. Hereditary and genetic disorders

Principles of Laboratory medicine-

1. General concepts and administrative issues
2. Optimizing laboratory work flow and performance
3. Principles of instrumentation
4. Clinical laboratory automation
5. Quality Control
6. Laboratory Statistics
7. Anticoagulants
8. Biomedical waste management

Paper – II
Vyadhivigyan, Clinical Pathology and Chemical Pathology
Part-A

Clinical Pathology

Haematology and Blood Banking -

1. Collection of specimen, labelling, documentation and processing
2. Staining and reporting of smears
3. Complete Haemogram.
4. Special staining methods for blood cells.
5. Investigations in haemolytic anemias and haemorrhagic disorders.
6. Bone Marrow examination
7. Haematopoiesis
8. Erythrocytic Disorders
9. Leukocytic Disorders
10. Transfusion Medicine : Blood bank serology, ABO grouping, Rh typing, special blood groups, blood banking, selection of donors, investigations in transfusion reactions.
11. Coagulation disorders

Part-B

Chemical Pathology

1. Ayurvedanusara Vishesha Pariksha –Mutra-Purisha-Sweda-Rakta-Stanya-Nishtiva-Shukra-Vamita Dravya –Puya Pariksha
2. Examination of urine, body fluids and stool.
3. Collection of blood, anti coagulants, protein precipitants.
4. Colorimetry, chromatography and electrophoresis.
5. Estimation of Blood sugar , Urea ,Creatinine,Proteins,Bilirubin,Lipid profile, LFT, Uric acid, Electrolytes,Calcium and Enzymes, T3, T4, TSH, HCG, etc.
6. Use of autoanalyzer techniques.

Second Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) –Maximum Marks-100

Paper-I

Rogi Roga Pariksha and Clinical Methods

Part-A

Rogi Roga Pariksha

1. Knowledge and clinical application of various examination tools mentioned in Ayurveda- Trividha pariksha, Chaturvidha Pariksha, Shadvidha Pariksha, Ashtavidha pariksha, Dasavidha Pariksha, Dwadasvidha Pariksha etc.

Part-B

Microbiology, Immunopathology, Histopathology Methods Clinical Microbiology and Serology

1. Collection, handling, documentation and selection of material for important procedures.
2. Use of various microbiological stains.
3. Use of various culture media and identification of bacteria by specific procedures.
4. Antibiotic sensitivity tests.
5. Sterilization and disinfection.
6. Identification of fungi in specimen and culture.
7. Diagnostic procedures in important viral infections.
8. Serological techniques, Widal, Weil Felix, VDRL, HIV, HBV, CRP, RF, ASO and Pregnancy tests.

Paper – II

Immuno-Pathology and Histo-Pathology

Part-A

Immuno-Pathology

1. Overview of the immune system and immunologic disorders.
2. Immunoassay and immunochemistry
3. Laboratory evaluation of the cellular immune system
4. Laboratory evaluation of immunoglobulin function and humoral immunity
5. Mediators of inflammation: complement systems, cytokines and adhesion molecules
6. Clinical and laboratory evaluation of immunodeficiency disorders
7. Clinical and laboratory evaluation of autoimmune diseases
8. Clinical and laboratory evaluation of hypersensitivity reactions

Part-B

Histo-Pathology

1. Collection of specimen, labelling, documentation, fixation.
2. Grossing techniques and tissue processing.
3. Cutting and staining of sections, use of special stains and immunocytochemistry, frozen sections
4. Interpretation and reporting.
5. Museum techniques.
6. Cytological techniques including FNAC – preparation, staining and reporting.

PRACTICALS

Contents of Practical

1. Laboratory Postings in various sections of Laboratory with Laboratory record book detailing, Collection, Processing and recording of the readings, Handling of Various instruments.
2. All investigative procedures, finalisation and opinion on the report.

Pattern of Practical Examination

1. Laboratory Record book	10Marks
2. Laboratory Investigations	40 Marks
3. Spotting	10 Marks
4. Project Work	20 Marks
5. Viva-voce	20 Marks
Total	100 Marks

Text Books for Reference

1. Vyadhi Vigyan : Yadavji
2. Madhava Nidan (with Madhukosha Vyakhya)
3. Kaya Chikitsa (Part 1) : Ramraksha Pathak
4. Charak Samhita-Nidan-Vimana-Indriya Sthana
5. Charak, Sushrut, Vagbhata-Related reference
6. Rogi Roga Pariksha Paddhati : Dr.Govind Prasad Upadhyay
7. Ayurvediya Nadi Pariksha Vigyan : Dr.Govind Prasad Upadhyay
8. Vikruti Vigyan : Vd.Vidhyadar Shukla
9. Clinical Pathology : Shivnath Khanna
10. Clinical methods in Ayurveda : Dr. K.R.Srikanta Murthy
11. Ayurvediya Vikriti Vigyan and Roga Vigyan : Dr.P.S.Byadgi
(Vol I & II)
12. Chest X-Ray made easy : Elsevier, Churchill Livingstone
13. Interpretation of diagnostic tests : Jacques Wallach M.D
14. Medical laboratory technology – Methods and interpretation : Dr. Sood
15. Interpreting ECG : P.J Mehta
16. Essential laboratory medicine : V.H.Talib M.D
17. Clinical radiology for medical students : G.M. Roberts, J.P.Hughes,
M.D.Hariharan
18. Clinical pathology
19. Harper's illustrated biochemistry : Robert.K.Murray

20. Text book of Microbiology	
21. Text book of Pathology	: Robins
22. Text book of Pathology	: Harshmohan
23. Pathologic basis of disease	: Robbins
24. Pathology	: Anderson
25. Oxford text book of Pathology	
26. General Pathology	: Walter & Israel
27. Systemic Pathology	: Symmers
28. Surgical Pathology	: Ackerman
29. Surgical Pathology and Cytology	: Silverberg
30. Soft Tissue Tumours	: Enzinger
31. Histopathology of the Skin	: Lever
32. Gynaecologic and Obstetric Pathology	: Novak
33. Diagnostic Cytology	: Koss
34. Fine Needle Aspiration Cytology	: Orell
35. Clinical Haematology	: Wintrobe
36. Tumours of bone	: Mirra
37. Haematology	: De Gruchy
38. Practical Haematology	: Dacie
39. Histopathology techniques	: Bancroft/Culling
40. Clinical diagnosis and management by lab methods	: Todd Sanford
41. Medical Microbiology	: Cruickshank
42. Short textbook of Chemical Pathology	: Baron
43. Essential Immunology	: Roitt
44. Autopsy Pathology	: Rezek Millard
45. Transfusion methods	: Mollison

AYURVEDIC SANGYAHARAN
Diploma in Anaesthesiology -Ay. [D.A. (Ay.)]
First Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) – Maximum Marks-100

Paper - I

Sangyahan Siddhant - Basic Sciences related to Sangyahan (Anaesthesia)

Part-A

1. History and development of Sangyahan and Anaesthesiology.
2. Nirukti and definition of Sangyahan.
3. Shishyopanayan (Induction).
4. Vishikhanupraves (Internship).
5. Agropaharaniya (Preanaesthetic measures)
6. Knowledge of Yantra-Shastra
7. Dosha-Dhatu-Mala and Prakriti in Sangyahan.
8. Shat Kriya Kaal.
9. Roga-Rogi pariksha (Examination of patients)
10. Marma and Snayu
11. Knowledge of Unmad, Mada, Murchha, Stabdhatu and Sanyas
12. Poorva Karma - Snehan, Swedan, Vaman, Virechan and Basti.
13. Sanjeevan Vidhi.
14. The relevant parts of Ayurvedic classics especially Sushrut, Charak and Ashtang Hridaya

Part-B

1. Knowledge and practical application of essential investigations related to anaesthesia practice - Blood, urine, stool, X-ray, ECG, Sonography, CT Scan, MRI, etc.
2. Applied anatomy and physiology of respiratory, cardiovascular, nervous system, hepato renal system, musculo skeletal and endocrine system.
3. Fluid and electrolyte balance.
4. Blood and component therapy.
5. Principles of gaseous exchange
6. Principles of preanaesthetic assessment and premedication in anaesthesia.
7. Shock and its management.
8. Knowledge of anaesthesia apparatus and equipments.
9. Breathing systems and monitoring devices.
10. Ethics and values in Sangyahan practice- consequences and importance.
11. Medicolegal aspect in the practice of Anaesthesia.

Paper – II

Sangyahanopayogi Bhaishajya Vigyanam (Pharmacology related to Anaesthesia with Ayurvedic and Modern concepts including recent advances)

Part-A

1. Pharmacology and clinical application of Medhya Dravya - Brahmi, Vacha, Ashvagandha, Shankhpushpi, Jatamansi, Guduchi, Madhuyasthi, Jyotishmati, etc.
2. Vedanahara Dravya-Rasna, Eranda, Nirgundi, Bhringaraja, Parijata, Shigru, Kadamba, Padmaka, Guggulu, Bhanga, Ahiphena and Godanti, etc.
3. Nidrajanana Dravya.
4. Chhardihara dravya.
5. Hridayottejaka dravya.
6. Kasahara dravya.
7. Sanjeevana dravya.

Part-B

1. Pharmacology of local anaesthetics, general anaesthetics, muscle relaxants and reversal drugs.
2. Pharmacology of drugs used in premedication
3. Pharmacology of drugs acting on autonomic nervous system, central nervous system, cardio vascular system, respiratory system and endocrine system.
4. Pharmacology of drugs used as antidepressants, cardiac stimulants and respiratory stimulants.
5. Pharmacology of drugs used in Emergency.
6. Analgesics – Narcotics and non-narcotics.

Second Year

Theory (Two papers) - Maximum Marks -100(each)
Practical (one) – Maximum Marks-100

Paper - I

Sangyahan Vidhi (Techniques of Anaesthesia)

Part-A

1. Types of Anaesthesia - Local, Regional and General Anaesthesia.
2. Techniques used in Anaesthesia.
3. The instruments and equipments useful in these techniques.
4. Special technique of anaesthesia in Paediatrics, Orthopedics, Gynaecology and Obstetrics, Cardiothoracic, Neurosurgery, Plastic surgery, Eye and E.N.T. Surgery.
5. Accident in Anaesthesia.

Part-B

Management of Anaesthesia (technique) in the following conditions:
Diabetes, Hypertension, Jaundice, Anaemia, Respiratory diseases, Thyroid diseases, Infections, Burns, Renal failure, Musculoskeletal disorders, Pulmonary Tuberculosis, Geriatrics, Laparoscopic Surgeries- Cholecystectomy, Herniotomy and Appendectomy etc.

Paper – II

Vedanaharan Evam Upshaman Chikitsa (Pain and Palliative Care)

Part-A

1. Concept of pain in Ayurved, pain pathways, pain management by drugs and other methods. e.g. Accupressure, Acupuncture, Aroma Therapy, Magnet Therapy, Panchkarma, Jalaukavacharan, Agni Karma and Siravyadha, their principles, materials and methods with indications and contraindications.
2. Upshaman Chikitsa (Palliative care) – Methods and importance.

Part-B

Saghan Chikitsa (Intensive care) –

1. Establishment and management of I.C.U. / C.C.U. / H.D.U. / NICU/ MICU/ Critical care unit.
2. Critical Care medicine.
3. Monitoring and resuscitation CPR (Cardiopulmonary Resuscitation)
4. Post anaesthetic care
5. Pain clinic setup.
6. Recent advances in the field of Pain management, Palliative care, Sangyaharan and Anaesthesiology.

PRACTICALS

Content of the Practical

Administration and Management of all type of anaesthesia techniques in different conditions and diseases as per syllabus under guidance and supervision of senior anaesthesiologist.

Practical knowledge of setting up and working of intensive care unit.

Pattern of Practical Examination

- | | |
|--|------------------|
| 1. Project work | 20 marks |
| 2. Presentation of different type of anaesthesia | 30 marks |
| 3. Spotting | 10 marks |
| 4. Viva-voce | 40 marks |
| Total | 100 marks |

Text Books for Reference

1. Sushrut Samhita with Dalhana Commentary
2. Charak Samhita
3. Ashtanga Hridaya
4. Practice of Anaesthesia : Churchill's Davidson
5. Anaesthesia : Renald D. Miller
6. Synopsis of Anaesthesia : Alfred Lee
7. Anaesthesia : Colins
8. Other upto date Reference Books and Journals available
9. Sangyahan Prakash : Dr. D.N. Pande
10. Agnikarma – Technological Innovation : Dr. P.D. Gupta
11. Practice of Anaesthesia and Resuscitation : Dr. P.K. Gupta
12. Essentials of Anaesthesiology : Prof. A.K. Paul
13. Clinical Anaesthesia : Prof. A.K. Paul
14. Anushastra Karma : Dr. D.N. Pande

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CHHAYA EVAM VIKIRAN VIGYAN

[Diploma in Radiodiagnosis (Ay.)] D.M.R.D. (Ay.)

First Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) – Maximum Marks-100

Paper - I

Fundamentals of Vikiran evam Chhaya Vigyan (Radiodiagnosis and Imaging)

Part-A

1. History and development of Vikiran evam Chhaya Vigyan.
2. Shishyopanayan - as described by Sushrut in context of Vikiran evam Chhaya Vigyan.
3. Discipline (duties and responsibilities) in Vikiran evam Chhaya section. (Radiodiagnosis and Imaging Section).
4. Fundamental principles of Ayurveda and their applied aspects, specially Panch Mahabhuta, Dosh, Dhatu, Mala, Panch Nidan, Prakriti, Shatkriyakaal, Praman, Chhaya-Pratichchaya , Prabha, Pranashta Shalya Vigyan, Rogi Pariksha (Trividha, Shadvidha especially Darshan Pariksha).

Part-B

1. Infrastructure of an ideal Vikiran evam Chhaya Section.
2. Fundamental principles of Vikiran evam Chhaya Vigyan
3. Ethics in Vikiran evam Chhaya Vigyan.
4. Introduction to basic radio imaging techniques.
5. Environmental issues related to Vikiran evam Chhaya Vigyan, disposing or recycling of radiological materials.
6. Ionizing and non ionizing energies- relevant hazards, prevention and precautions, their management by Ayurvedic and Modern medicine.
7. Emergencies in Vikiran evam Chhaya (Radiodiagnosis and Imaging) section and their management.

Paper – II

Applied Anatomy, Physiology, Pathology and Procedures in Vikiran evam Chhaya Vigyan (Radiodiagnosis and Imaging)

Part-A

Applied Anatomy, Physiology and Pathology in Vikiran evam Chhaya Vigyan (Radiodiagnosis and Imaging):

1. Knowledge of Ayurvedic and Modern applied radiological anatomy (including sectional), Physiology and Pathology of the human body.

2. Sira (Vessels), Gaurya Sira (Lymphatic channels), Mansa (Muscles), Snayu (Ligaments), Kandara (Tendons), Sandhi(Joints), Nadi (Nerve), Asthi(Bones), Strotas, Marma, Antahsravi granthi (Endocrine glands) etc.
3. Urdhwajatrugata(Supraclavicular) parts- Kapaal (Skull), Karna (Ears), Chakshu (Eyes), Nasa (Nose), Paranasal sinuses, Lala granthi (Salivary glands), Face, Greeva (Neck), Sushumna (Spinal cord) and Kaseruka (Vertebrae), Mukha (Mouth), Danta (Teeth), Mastulunga (Brain), Lasika granthi (Lymph glands), etc.
4. Koshtha (Trunk) parts- Sushumna (Spinal cord) and Kaseruka (Vertebrae).
 - a. Vaksha (Thoracic) parts- Phuphus (Lungs), Hridaya (Heart) and Sira (Vessels), Shwashnalika (Trachea, Bronchi), Annamarg (Oesophagus), Lymph nodes, Stan (Breast), Hridayabandhan (Diaphragm), etc.
 - b. Udar (Abdominal) parts- Audaryakala (Peritoneum) Aamashaya (Stomach), Kshudrantra (Small intestine), Brihadantra (Large intestine), Guda (Rectum and Anal canal), Aantrapuchha (Appendix), Yakrit (Liver), Tilam (Gall bladder), Billiary channels, Pleeha (Spleen), Agnyashaya (Pancreas), Vrikka (Kidney), Gavini (Ureter), Basti (Urinary bladder), Shishna (Penis), Paurushgranthi (Prostate), Vrishan (Testes), Shukrashaya (Seminal vesicles), Dimbashaya (Ovaries), Perineum, Garbhashaya (Uterus), Yoni, Dimbavahini (Fallopian tubes), Lasika granthi (Lymph nodes), etc.
5. Shakha- parts of upper and lower extremities.

Part-B

Procedures in Vikiran evam Chhaya Vigyan (Radiodiagnosis and Imaging)

1. Equipments used in Chhaya evam Vikiran Vigyan.
2. Trividha Karma- Poorva, Pradhan and Paschaat Karma in Vikiran evam Chhaya Vigyan.
3. Dark room techniques
4. Various routine and special, non-contrast and contrast radiography, digital radiography, radiographic positions and views.
5. Various ultra sonography procedures.
6. CT, MRI, Radionuclide scanning, PET and other recent advanced procedures in radiodiagnosis and imaging, mammography, bone densitometry, interventional radiology.

Second Year

Theory (Two papers) - Maximum Marks -100(each)

Practical (one) – Maximum Marks-100

Paper - I

Physics and Biology related to Vikiran evam Chhaya Vigyan (Radiodiagnosis and Imaging)

Part-A

1. Physics of radiography, their application, Digital radiography, Fluoroscopy.
2. Physics of ultrasonography, its applied aspect related to various USG, Doppler procedures.
3. Study of contrast materials used in Radiology.

Part-B

1. Physics of CT scan, its applied aspect, efficiency and limitations.
2. Physics of MRI, its applied aspect, efficiency and limitations.
3. Physics and its applied aspect related to other imaging procedures, e.g. PET, Radio Nuclides imaging, etc.

Paper - II

Applied Vikiran Evam Chhaya Vigyan (Radiodiagnosis and Imaging)

Part-A

1. Study of Ayurvedic classics and Modern medical Science texts related to Vikiran evam Chhaya Vigyan.
2. Applied aspects of Vikiran evam Chhaya Vigyan and interpretation of various diseases related to system, organ and metabolism as per syllabus through X-Rays.

Part-B

1. Applied aspects of Vikiran evam Chhaya Vigyan and interpretation of various diseases related to system, organ and metabolism as per syllabus through Ultrasonography, CT scan, MRI scan and other advanced Radiological techniques.
2. Application of Vikiran evam Chhaya Vigyan in context to Ayurvedic fundamentals, diagnosis, management and research.

PRACTICALS

Contents of Practical

1. Routine and Special, non-contrast and contrast radiography, interpretation and reporting.
2. Various diagnostic Ultrasonography: Routine, various Endo-USG, Garbha vinishchaya, Masanumasik Garbha vridhhi, Garbha swasthya and vyadhi, Vikrita garbha, Apra, Nabhinadi darshan, Apra / Garbha Apatan, Yonivyapat, Vandhyatva, Garbhashayabhransha, Doppler, USG guided techniques, Interpretation and reporting etc.
3. Mammography, Bone Densitometry- interpretation and reporting.
4. Interventional Radiology – interpretation and reporting.

Pattern of Practical Examination

1. Case Record	20 Marks
2. Spotting/ Investigative Spot Diagnosis	30 Marks
3. Project Work	20 Marks
4. Viva-voce	30 Marks
Total	100 marks

Text Books for Reference

1. Sushrut Samhita
2. Charak Samhita
3. Ashtanga Hridaya / Samgraha
4. Introduction to Kayachikitsa : C. Dwarkanath
5. Text Book of Radiographic Positioning and Related Anatomy : Kenneth, L Bontrager, John P Lampignano
6. Procedures in diagnostic Radiology : T. Doyle, W. Have, K. Thomson
7. Radiographic positioning : Clark
8. Radiobiology for the Radiologist : Hall
9. Christensen's Physics of Diagnostic Radiology : Curry T S , Dowdey J E, Murry R C
10. Farr's Physics for Medical Imaging : Penelope Allisy, Roberts, Jerry Williams
11. Fundamental of Diagnostic Radiology : Brant
12. Diagnostic Imaging : Federle
13. Diagnostic Imaging : Peter Armstrong, Martin Wastie, Ansrea Rockall
14. Text Book in Radiology and Imaging : D. Sutton.
15. Introduction to Vascular Ultrasonography : Zwiebel , Pellerito
16. Text book in Ultrasonography : Roumack
17. Manual of Medical Diagnostic Ultrasonography : W.H.O. Scientific group
18. Computed Tomography and MRI of the whole body: Hagga.
19. Surface and Radiological Anatomy : A. Halim
20. X-Ray equipment for student Radiographers : D N and M O Chesney
21. Clinical Sonography, A Practical Guide : Roger C. Sanders, Tom Winter.

**CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI**

List of Experts who participated to review the PG Diploma Syllabus

PHARMACEUTICS		22.	Vd. Bhajandas Swami Jaipur
1.	Dr. M.M. Jumle Convener	23.	Dr. Satyanarayan Bhat Bangalore
2.	Dr. Pradeepkumar Prajapati Jamnagar	24.	Prof. Rambabu Dwivedi IPGTR, Jamnagar
3.	Dr. L.K. Dwivedi NIA, Jaipur	BALROGA	
4.	Dr. S.S. Savarikar Mumbai	25.	Prof. Shailaja Rao SDM College, Hassan
5.	Dr. C.B. Jha BHU Varanasi	26.	Dr. B. M. Singh BHU, Varanasi
6.	Dr. Anand Chaudhary BHU Varanasi	27.	Prof. Abhimanyu Kumar NIA, Jaipur
7.	Dr. Ramachandra Reddy BHU Varanasi	28.	Prof. S K Ramachandran Govt. Ayu. Coll., Thiruvananthapuram
8.	Dr. Ramkrishna Susruta Ayu. Coll., Bangalore	29.	Dr. Moti Rai NIA, Jaipur
9.	Dr. Ranges Parmesh Himalaya Drugs Co. , Bangalore	30.	Dr. BK Jaya Singh PURI
10.	Dr. Shajahan M.A. Trivandrum	31.	Dr. Omkar Kulkarni Ayurved Mahavidyalaya, Sion
11.	Dr. Neeraj Kumar BHU, VARANASI	32.	Dr. Dinesh K S V.P.S.V. Ayurveda College, Kerala
DIETETICS		33.	Dr. Kanak Prasad Vyas Director, Dept. of Ayurved, Rajasthan
12.	Prof. B L Gaur Ex. Vice Chancellor, Raj. Ay. Uni. Jodhpur	34.	Prof. S D Sharma Shri Baba Mast Nath Ay. Coll., Rohtak
13.	Dr. D P Gadgil Pune	35.	Vaidya Jagjeet Singh Mohali , Punjab
14.	H M Chandola GAU Jamnagar	36.	Prof. R D Sharma Vadodara, Gujarat
15.	Vd. Srirang Galagali Pune	37.	Dr. R B Misra Udaypur, Rajasthan
16.	Prof. R H Singh BHU-Varanasi	38.	Dr. G N Tiwari Nagpur
17.	Prof. A K Manoj Kumar VPS Varier Kotakkala	39.	Prem Prakash Vyas College of Ayurveda, Rajasthan
18.	Dr. A. Raghu Asst. Advisor AYUSH, Delhi	40.	Prof. M H Paranjape Ashtang Ayurved College, Pune
19.	Dr. Kamlesh Sharma NIA Jaipur	MANSIKA SWASTHYA VIGYAN	
20.	Prof. O P Upadhyay NIA Jaipur	41.	Dr. Banwari Lal Gaur Ex. Vice Chancellor, Raj. Ay. Uni. Jodhpur
21.	Dr. Surendra Katoch Delhi	42.	Prof. B Narayan Prakash SDM College, Hassan

43.	Prof. R.H. Singh BHU, VARANASI	66.	Prof. Sarbeswarkar Sri Sri College of Ayurved, Bangalore
44.	Prof. H M Chandola IPGTR, Jamnagar	67.	Dr. Manjusha Rajagopal S IPGTR, Jamnagar
45.	Dr. L. Mahadevan Iyer Tamilnadu	68.	Dr Pranav Bhagvat Gomantak Ayurved, Goa
46.	Dr.K. Sundaran K Govt Ayu. Mental Hospital, Kerala	69.	Prof. Kulwant Singh Jammu Institue of Ayurveda, Jammu
47.	Dr. C.R. Agnives Mannath Ayurveda, Kerala	70.	Dr. Paras Shah Pune
48.	Dr.Prakas Mangalasseri V.P.S.V Ayurveda College, Kerala	71.	Dr. S M Sathe Pune
49.	Prof. Ajay Kr. Sharma NIA, Jaipur	72.	Prof. Kartar Singh Dhiman IPGRR, Jamnagar
50.	Prof. B G Gopinath Sri Sri College of Ayurved, Bangalore	73.	Dr. G S Lavekar Director, CCRAS, New Delhi
51.	Dr. Shrinivas Acharya Shri DM College, Udupi	74.	Dr. S.K. Sharma Advisor, Dept. of AYUSH, New Delhi
52.	Dr. M.R. Vasudevan Namboodri Thiruvanthapuram, Kerala	75.	Prof. K V S Prabhakaran Additional Director- Andhra Pradesh
53.	Dr. Baldev Kumar NIA, Jaipur	PRASUTI AND STRIROGA	
54.	Prof. U N Prasad Shri DM College, Udupi	76.	Prof. Manjiri Dwivedi BHU, Varanasi
55.	Prof. Rambabu Ramadhar Dwivedi IPGTR, Jamnagar	77.	Dr. Sushila Sharma NIA, Jaipur
56.	Prof. Eswara Sarma M P V.P.S.V Ayurveda College, Kerala	78.	Dr. Chandan Mal Jain NIA, Jaipur
57.	Prof. Shivagautam S M S Medical College, Jaipur	79.	Dr. L. Sucharita Bangalore
58.	Vaidya Tarachanda Delhi-85	80.	Prof. M. Ramesh Government Ayurved College, Bangalore
59.	Prof. Hariprasad Sharma Smt. KG Mittal Ay. Coll., Mumbai	81.	Dr. Sujata Kadam Tilak Ayurved, Pune
60.	Dr. Madhav Diggavi Taranath Govt. Ayurved, Karnataka	82.	Dr. Anjali Jadhav College of Ayurveda, Akurdi
NETRA ROGA VIGYAN		83.	Prof. Usha Deshmukh Govt. Ayurved College, Nanded
61.	Prof. B A Venkatesh Government Ayurved, Coll., Bangalore	84.	Prof. Meera Paranjape Ashtang Ayurved College, Pune
62.	Dr. P. P Namboodri Ernakulam, Kerala	85.	Prof. Mamata K V Shri DM College, Udupi
63.	Dr. Shrikanth Assisstant Director CCRAS, New Delhi	86.	Prof. C H S Sastri SDM College, Hassan
64.	Prof. Dilip B Bhusari Ashtang Ayurved College, Pune	87.	Prof. Ved Prakash Sharma Jaipur
65.	Dr. B Mukhopadhyaya BHU, VARANASI	88.	Prof. Indu U Mistry Jamnagar

89.	Dr. (Mrs.) Pooja Bhardwaj DEHRADUN	111.	Dr. Radheshyam Sharma NIA, Jaipur
90.	Dr. Bimla Chaudhary PANCHKULA, Haryana	112.	Dr. M.S. Baghel PGTR, Jamnagar
DRAVYAGUNA		113.	Prof. Sridhar Govt. Ayurved College, Bangalore
91.	Prof. M C Sharma NIA, Jaipur	114.	Dr. H.S. Kasture Ahmedabad, Gujrat
92.	Prof. Tanuja Manoj Nesri Tilak Ayurved, Pune	115.	Dr. P. Yadayya Shri RT, Ayu. Coll., AKOLA
93.	Prof. K.S. Jayashree Bangalore	116.	Dr. R.H. Singh BHU, Varanasi
94.	Dr. Ravinarayan Acharya IPGTR, Jamnagar	117.	Dr. N.P. Singh BHU, Varanasi
95.	Prof. V.K. Joshi BHU, VARANASI	118.	Dr. Shrikanth SDM Ayurved College, Udupi
96.	Prof. C R S Pillai Pankaj Kasthuri Ay. Coll. Kerala	SWASTHAVRITTA AND YOGA	
97.	Dr. Shajahan M.A. Thiruvananthapuram, Kerala	119.	Vaidya Shah Kisan Vithaldas Gultekadi, PUNE
98.	Prof. D S Lucas Bangalore	120.	Prof. Rambabu Ramadhar Dwivedi PGTR, JAMNAGAR
99.	Dr. Meeta Kotecha NIA, Jaipur	121.	Dr. B R Doddamani Shri DM College, Udupi
100.	Prof. R A Gupta JD Ayurvedic Coll., Aligarh	122.	Prof. K. Jyotilal Mannam Ayurvedic, Pandalam
101.	Prof. P P Sharma PGTR, Jamnagar	123.	Dr. Sudhakar Reddy JSS Ayurved Medical, Mysore
102.	Prof. Malatiben Chauhan PGTR, Jamnagar	124.	Prof. Anjaneya Murthy Govt. Ayurved College, Mysore
103.	Prof. Banwarilal Misra Jaipur	125.	Prof. Sagitha K. Sri Sri College of Ayurveda, Bagalore
104.	Prof. Chunekar Varanasi	126.	Prof. Nagaratna Bangalore
105.	Dr. M R Uniyal Advisor Medicinal & Aromatic Plants, Dehradun	127.	Dr. K.V. Dilipkumar V.P.S.V. Ayuturveda College, Kerala
106.	Prof. R A Gupta JD Ayurvedic Coll., Aligarh	128.	Dr. Kamlesh Kumar Sharma NIA, Jaipur
107.	Prof Gyanendra Pande PGTR, Jamnagar	129.	Vaidya Devendrakumar Triguna New Delhi
PANCHAKARMA		130.	Dr. Narain Singh Chudawat NIA, Jaipur
108.	Dr. M.R. Vasudevan Namboodri Convener, Kerala	131.	Vaidya S. K. Misra Delhi
109.	Dr. I. Mahadev Kanyakumari	132.	Dr. Niranjan Singh Tyagi GHAZIABAD
110.	Dr. L. Mahadevan Iyer Sri Sarada Ayurved Hospital, Kerala	133.	Prof. Dr. B T Chidananda Murthy Director, CCRYN, Delhi

134.	Dr. B K Singh Bharati Veedyapeeth, Pune	158.	Dr. C. V. Jayadevau VPS Varier Kotakkal
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RASAYAN AND VAJIKARAN		161.	Prof. S.C. Varshney BHU Varanasi
137.	Dr. Banwari Lal Gaur JODHPUR	162.	Prof. Y G Joshi Pune
138.	Prof. Gurudeep Singh SDM College, Hassan	163.	Dr. Srinivas Acharya SDM Ayurved College, Udupi
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141.	Dr. Niranjana Rao Shri DM College, Udupi	166.	Dr. Nesari Deputy Advisor AYUSH Delhi
142.	Dr. G. Vinod Kumar Govt. Ayurved College, Thiruvananthapuram	167.	Dr. S N Ojha D.Y. Patil Ayurved College, Pune
143.	Prof. R.H. Singh Banaras Hindu University, VARANASI	KSHAR-KARMA	
144.	Prof. B L Mehra Rajiv Gandhi, Paprola	168.	Prof. Kulwant Singh Jammu, Convener
145.	Dr. S M Angadi Bangalore	169.	Dr. Hemant Kushwaha NIA, Jaipur
146.	Dr. R P Misra Ay. Cong. Punjabi Bagh, New Delhi	170.	Dr. M. Sahu BHU, Varanasi
147.	Dr. Medhavi Lal Sharma Government Ayurvedic College, Udayapur	171.	Dr. S.K. Sharma Advisor Ayush
148.	Vaidya Devendrakumar Triguna New Delhi	172.	Dr. S. Bannigol Ayurved Mahavidyalaya, Hubli
149.	Vaidya S. K. Misra Delhi	173.	Dr. Chaturbuj Bhuyan IPGTR, Jamnagar
150.	Dr. A P Haridasan Kerala	174.	Dr. Prasanna Rao Principal, SDM Hassan
151.	Dr. Sivanandam HYDERABAD	175.	Prof. S.V. Shailaja Kalabhairaveshwar College, Bangalore
152.	Dr. Niranjana Singh Tyagi GHAZIABAD	176.	Dr. Thomas GAC, Trivendrum
153.	Dr. Madhav Diggavi Taranath Govt. Ayurved, Karnataka	177.	Dr. Ksheersagar GAMC, Mysore
154.	Dr. O P Sharma Delhi	178.	Dr. Devadatt Bhadlikar Principal, Dr. D. Y. Patil Mumbai
155.	DR. K R Kohli Director, ISM Maharashtra	ROGNIDAN VIDHI	
156.	Dr. A K Manoj Kumar VPSV, Kottakkal	179.	Dr. A.C. Kar BHU, Varanasi
AYURVEDIC COSMETOLOGY AND SKIN		180.	Dr. Pawan Goditwar NIA, Jaipur
157.	Dr. Jayaram Yadav Convener Varanasi	181.	Dr. M.S. Baghel IPGTR, Jamnagar

182.	Dr. Gopkumar Trivendrum	196.	Dr. Murlidhar Sharma SDM Ayurved College, Udupi
183.	Dr. B.V. Prasanna SDM Ayurved College, Udupi	197.	Dr. S.S. Mishara BHU Varanasi
184.	Dr. Parameshwarappa Byadgi BHU, Varanasi	198.	Dr. Arun Dwivedi BHU, Varanasi
185.	Dr. Shrikrishna Khandel NIA, Jaipur	FINAL WORK OUT BY THE FOLLOWING EXPERTS	
AYURVEDIC SANGYAHARAN		199.	Dr. Vaishali Mali Ayurved Expert in CCIM Office, New Delhi
186.	Dr. Anil Dutta Rajiv Gandhi Ayu. Coll., Paprola	200.	Dr. Richa Sharma Ayurved Expert in CCIM Office, New Delhi
187.	Dr. K.K. Panda BHU, Varanasi	201.	Dr. Kamini Kaushal Ayurved Expert in CCIM Office, New Delhi
188.	Dr. D.P. Puranik Tilak Ayurved College, Pune	202.	Dr. Seema Ahlawat Ayurved Expert in CCIM Office, New Delhi
189.	Dr. Chayakant Das Govt. Ayurved College, Burhanpur	203.	Dr. Aarti Mal Ayurved Expert in CCIM Office, New Delhi
190.	Dr. D.N. Pandey BHU, Varanasi	204.	Dr. Shweta Zade Ayurved Expert in CCIM Office, New Delhi
191.	Dr. Subrahmanyam Bhat SDM Ayurved College, Udupi	205.	Dr. Pradnya Sinalkar Ayurved Expert in CCIM Office, New Delhi
192.	Dr. Prasanna Rao SDM, Hassan	206.	Dr. Namrata Kulshrestha Ayurved Expert in CCIM Office, New Delhi
CHHAYA EVAM VIKIRAN VIGYAN		207.	Dr. Pooja Kohli Ayurved Expert in CCIM Office, New Delhi
193.	Dr. V.A. Dole Tilak Ayurved College, Pune	208.	Dr. Anant Samant Ayurved Expert in CCIM Office, New Delhi
194.	Dr. B.V. Sharma R.M.L. Hospital, Delhi	209.	Dr. Yashpal Chaudhary Ayurved Expert in CCIM Office, New Delhi
195.	Dr. Anil Kumar Sharma Rajiv Gandhi Ay. Coll., Paprola		

1. AYURVED SAMHITA & SIDDHANT

**Theory- 400 marks(100 Each)
Practical and Viva-Voce - 100 marks**

PAPER –I Charak Samhita

1. Charak Samhita complete with Ayurved Dipika commentary by Chakrapani.
2. Introductory information regarding all available commentaries on Charak Samhita

PAPER –II Sushrut Samhita & Ashtang-Hridayam

1. Sushrut Samhita Sutra sthana and Sharir- sthana. with Nibandha Samgraha commentary by Acharya Dalhana.
2. Ashtang-Hridayam Sutra Sthanamatram with Sarvanga Sundara commentary by Arun Dutt.
3. Introductory information regarding all available commentaries on Sushrut Samhita and Ashtang Hridaya.

PAPER – III Ayurvediya and Darshanika Siddhanta

Introduction and description of philosophical principles incorporated in Charak Samhita, Sushrut Samhita, Ashtanga Hridya, shtang Samgraha.

1. Analysis of principles specially loka-purusha samya, Shadpadartha, Praman, Srishti Utpatti, Panchmahabhuta, Pilupaka, Pitharpaka Karana- Karyavada, Tantrayukti, Nyayas (Maxims), Atmatatva siddhant.
2. Importance of Satkaryavad, Arambhavada, Parmanuvada Swabhavoparamvada, Swabhava Vada, Yadricha Vada, Karmvada.
3. Practical applicability principles of Samkhya- Yoga, Nyaya-Vaisheshika, Vedanta and Mimansa.

PAPER – IV Ayurved Itihas and Prayogika Siddhant.

1. Post independent Development of Ayurveda: Education, Research.
2. Globalisation of Ayurved.
3. Introduction of department of AYUSH, CCIM, CCRAS, RAV.
4. Tridosh Siddhant.
5. Panchabhautik Siddhant
6. Manastatva and its Chikitsa Siddhant.
7. Naishthiki Chikitsa.
8. Practical applicability principles of Charvak, Jain & Bauddha Darshana.
9. Journals, types of Journals review of Articles.

Practical- Viva-voce

(50 case sheets are to be filled from samhita siddhant IPD / OPD)

- 100 Marks

Reference Books

1. Charak Samhita with Chakrapani commentary.
2. Sushruta Samhita with Dalhana Commentary.
3. Ashtanga Samgraha with Sarvangasundara.
4. Ashtanga Hridaya with Sarvangasundara.
5. Vaisheshika Darshan – Prashastapada Bhasya
6. Nyaya Darshan - Vatsyayan Bhasya Patanjala
7. Yoga Darshan- Vyas Bhasya
8. Vedantsara
9. Sarvadarshan Samgraha
10. Bhartiya Darshan - Baldev Upadhyaya.
11. Ayurved Darshanam - Acharya Rajkumar Jain.
12. Ayurved Darshan Vimarsha- Dr O.P. Upadhyay.

13. Ayurvediy Jeevak Su -Dr O.P. Upadhyay.
14. Padartha Vidnyan - Dr O.P. Upadhyay.
15. Scientific Exploration of Ayurved – Dr. Sudhir Kumar.

2. AYURVEDA SAMHITA & SIDHANTA (Basic Principles)

Astanga Hridaya, Charaka (P,U), Padartha Vignana & Ayurveda Ithihasa, Sanskrit

1	Dr. B. P. Pandey	Group leader	
2	Dr. Mahesh Vyas	Coordinator -	Coordinator -
3	Dr. B. L. Gaur	Samhitha & Siddantha U.G. & P.G.	
4	Dr. O. P. Upadhyaya	Samhitha & Siddantha U.G. & P.G.	
5	Dr. H. P. Sharma	Samhitha & Siddantha U.G. & P.G.	
6	Dr.S.L.Sharma	Samhitha & Siddantha U.G. & P.G.	
7	Dr. R. D. Thakkur	Samhitha & Siddantha U.G. & P.G.	
8	Dr. Naresh Sharma	Samhitha & Siddantha U.G. & P.G.	
9	Dr. Yogita Jamadade	Samhitha & Siddantha U.G. & P.G.	
10	Dr. Abichal C.	Samhitha & Siddantha U.G. & P.G.	
11	Dr. Mohan Joshi	Samhitha & Siddantha U.G. & P.G.	
12	Dr. G. P. Rama Reddy	Padartha Vigyana & Ayurveda Ithihasa	Coordinator -
13	Dr. Brij Kumar Dwivedi	Padartha Vigyana & Ayurveda Ithihasa	
14	Dr. Milind Mokashi	Padartha Vigyana & Ayurveda Ithihasa	
15	Dr. Santhosh Nair	Padartha Vigyana & Ayurveda Ithihasa	
16	Dr. Ahalya Sharma	Padartha Vigyana & Ayurveda Ithihasa	
17	Dr. Suhag Rawal	Padartha Vigyana & Ayurveda Ithihasa	
18	Dr. G.R.R Chakravarthy	Padartha Vigyana & Ayurveda Ithihasa	
19	Dr. Nandani	Padartha Vigyana & Ayurveda Ithihasa	
20	Dr. Manoj Sharma	Padartha Vigyana & Ayurveda Ithihasa	
21	Dr. Mallika K. J.	Padartha Vigyana & Ayurveda Ithihasa	
22	Dr. Shubhangi K	Padartha Vigyana & Ayurveda Ithihasa	
23	Dr. Premchand Shastri	Sanskrit	Coordinator
24	Dr. Mohan Chand Bhat	Sanskrit	
25	P. V. Thothadrinathan	Sanskrit	
26	Dr. Nigam Sharma	Sanskrit	
27	Dr. Savitri G.S	Sanskrit	
28	Dr. B.K. Shyam Raw	Sanskrit	

2. RACHANA SHAARIRA

Total Marks – 400

PAPER-I (GARBHA SHAARIRA)

100 Marks

1. Etymology of Garbhavakranti Shaarira, features of Shukra and Shonita, description of Beeja, Beejbhaga, Beejbhagavyava and Garbhotpadakabhava, Garbha Poshana Krama, Garbhavridhikar Bhav, Masanumashiki Garbhavridhi, Foetal circulation. Explanation of lakshana occurring in Ritumati, Sadhyah Grihita Garbha. Yamal garbha, Anasthi garbha.
2. Explanation of Basic Embryology, and Systemic embryology.
3. Knowledge of basic facts in advancement in Anuvanshiki (Genetics) and Garbhajavikara (Teratology).

PAPER –II (KOSHTHANGA SIRA DHAMANI SROTAS SHAARIR)

100 Marks

- 1) **Koshthanga Shaarira:** - Detail etymological derivation of 'Koshtha' and Koshthanga, including detail study of structure of each Koshthanga. Male and Female genital organs.
- 2) **Ashaya:** - Definition, detail description.
- 3) **Kala Shaarira:**-Etymology, Definition, description of Seven Kala with their Modern component and applied aspects.
- 4) **Paribhashika Shaarira:** - Snayu, Kandara, Rajju, Sanghata, Jalaetc. and their general description.
- 5) **Sira, Dhamani and Srotas Shaarira:** - Etymological derivation, definitions, synonyms, number and types of Sira, Dhamani and Srotas, anatomical differences among Sira, Dhamani and Srotas, description of Vedhya and AvedhyaSira (Puncturable and Non puncturable Veins) and clinical importance of Sira, Dhamani and Srotas including Modern Anatomical counterparts.

PAPER –III (Marma Shaarira Evum Asthi Sandhi Peshee Shaarira)

100 Marks

- 1) **Marma Shaarira:** - Derivation and definitions of the term Marma and their features, characteristics and number of Marma according to Sushruta Divisions of Marma on morphological basis (Rachana Bheda), Shadangatvam (Regional), Abhighataja (Prognostic) classification, Trimarma according to Charaka. Knowledge of 'Marmaabhighata', MarmaViddha, Detailed study of individual marma with their clinical and Surgical importance. Importance of Marma in Shalyatantra.
- 2) **Asthi Shaarira :-** General introduction and description of Asthi, differences among number of Asthi.Types of Asthi. Detail study of each bone with its ossification &Applied anatomy.
- 3) **Sandhi Shaarira :-** Etymological derivation,description, features, number, types and Applied anatomy of all Sandhi (joints).
- 4) **Peshee Shaarira :-** Etymological derivation,description, features, number, types and Applied anatomy of all Peshee (Muscles).

PAPER – IV (Tantra Shaarira Evum Antah and BahihGranthi Vigyaniya)

100 Marks

1. Description of Panchgyanendriya – Ayurved and Modern aspects. (Sensory organs (Eye, Ear, Nose, Tongue and Skin with their Applied anatomy).

2. Shat Chakra - Location and significance in Yoga. Description of Ida, Pingala, Sushumnanadi.
3. Anatomy of brain and spinal cord, Peripheral nervous system (explanation of Nerve Plexuses and peripheral nerves, Cranial nerves and Autonomic nervous system, Cerebro-spinal fluid, Venous sinuses of Brain, Ventricular system of Brain, Blood supply of Brain, Meninges with Applied Anatomy).
4. AntahSraviGranthi and BahihSraviGranthi:-Detail study of Exocrine & Endocrine glands.

PRACTICAL:-

- 1) Dissection of atleast one cadaver during the Final part of the course.
- 2) Training of preservation techniques in the Embalming room.
- 3) Preparation of Soft tissue specimen and Models using current technology like Plastination, Lumen casting etc. under the guidance of Teaching staff and Experts of the relevant fields.
- 4) Preparation of Charts and Models of Rachana Shaarira subject to the individual capacity.
- 5) Observation of MRI, CT Scan, USG procedures, Colour Doppler etc.
- 6) Visits to various Museums of other colleges in the Medical field.
- 7) Observation of Ward procedures like Lumbar puncture, Tracheostomy, Abdominal parentesis, Liver biopsy, Venesection, etc. (subject to the availability and opportunities)

Pattern of Practical Examination

- | | |
|---|------------|
| 1. Practical record book & log book | - 20 Marks |
| 2. Spotting (Dissected organs and Bones-Joints-Muscles) | - 20 Marks |
| 3. Dissection | - 40 Marks |
| 4. Surface & Radiological Anatomy | - 40 Marks |
| 5. Dissertation Presentation | - 10 Marks |
| 6. Teaching Skills | - 20 Marks |
| 7. Viva-voce | - 50 Marks |

Reference Books-

- | | |
|--|---------------------------|
| 1. Relevant matters of Brihatrayee and Laghutrayee | |
| 2. PratyakshaShariram | - GananathSen |
| 3. AbhinavaShariram | - Damodar Sharma Gaur |
| 4. Parishadyam Sabdartha Shariram | - Damodara Sharma Gaur |
| 5. BrihatShariram | - P S Varier |
| 6. Shiva Samhita | |
| 7. Gray's Anatomy | - Latest Edition |
| 8. Human Anatomy | - B D Chaurasia |
| 9. Cunnigham's Companion to Manual of Practical Anatomy. Vol I, II & III | |
| 10. Developing Human | - Keith L Moore & Persaud |
| 11. Clinically oriented Anatomy | - Keith L Moore |
| 12. Clinically oriented Neuro Anatomy | - Richard Snell |
| 13. Surface and Radiological Anatomy | - Halim |
| 14. Grant's Methods of Anatomy | - Grant |
| 15. Grant's dissector | - Grant |
| 16. Human Embryology | - I. B. Singh |

3. KRIYA SHARIR

Paper- I (Dosa-Dhātu-Mala Vijñāna)

Contribution of different Ayurveda Samhita in Kriya Sharir

- Theory of Pancamahābhūta
- Principle of Loka-Purusa Sāmya
- Importance of Sāmānya - Viśesa principle.
- Different views on the composition of Purusa and the importance of Cikitsya Purusa.
- Importance of Gurvādi Guna in Ayurveda.
- General description of Tridosā theory
- Mutual relationship between Triguna-Tridosā-Pancamahābhūta-Indriya.
- Mutual relationship between Rtu-Dosa-Rasa-Guna.
- Biological rhythms of Tridosā on the basis of Day-Night-Age-Season and Food intake.
- Role of Dosa in the formation of Prakṛti of an individual.
- Role of Dosa in maintaining health.
- **Vāta Dosa:** General locations (*Sthāna*), general attributes (*Guna*) and general functions (*Sāmānya Karma*). Five subdivisions of *Vāta* with their specific locations, specific properties, and specific functions (*Prāna, Udāna, Samāna, Vyāna, Apāna*)
- **Pitta Dosa:** General locations (*Sthāna*), general attributes (*Guna*) and general functions (*Sāmānya Karma*). Five subdivisions of *Pitta* with their specific locations, specific properties, and specific functions (*Pācaka, Ranjaka, Ālocaka, Bhrājaka, Sādhaka*). Similarities and differences between *Agni* and *Pitta*.
- **Kapha Dosa:** General locations (*Sthāna*), general attributes (*Guna*) and general functions (*Karma*) of *Kapha*. Five subdivisions of *Kapha* with their specific locations, specific properties, and specific functions (*Bodhaka, Avalambaka, Kledaka, Tarpaka, Ślesaka*).
- Applied physiology of Tridosā principle: *Kriyākāla, Dosa Vrddhi-Dosa Ksaya*.
- **Dhātu Posana:** Process of nourishment of *Dhātu*. Description of various theories of *Dhātu Posana* (*Ksīra-Dadhi, Kedāri-Kulya, Khale Kapota* etc).
- **Dhātu:** General introduction and definition of *Dhātu*. Formation, Definition (*Nirukti*), Distribution, Attributes, quantity, classification, *Pāñcabhautika* composition and Functions of all seven *Dhātus* in detail: *Rasa, Rakta, Māmsa, Meda, Asthi, Majjā, Śukra*.
- Applied physiology of *Dhātu*: Manifestations of *Ksaya* and *Vriddhi* of each *Dhātu*. Description of *Dhātu Pradosaja Vikāra*.
- Description of *Āśraya* and *Āśrayī* kind of relationship between *Dosa* and *Dhātu*.
- Description of the characteristic features of *Astavidha Sāra*. Description of *Rasavaha, Raktavaha, Māmsavaha, Medovaha, Asthivaha, Majjāvaha* and *Śukravaha Srotāmsi*.
- **Ojas:** Definition, locations, synonyms, Formation, Distribution, Properties, Quantity, Classification and Functions of *Ojas*. Description of *Vyādhiksamitva, Bala Vrddhikara Bhāva*. Classification of *Bala*. Relation between *Ślesmā, Bala* and *Ojas*.
- Applied physiology of *Ojas*: Etiological factors and manifestations of *Ojaksaya, Visramsa* and *Vyāpat*. Physiological and clinical significance of *Ojas*.
- **Upadhātu:** General introduction and Definition of the term '*Upadhātu*'. Formation, Nourishment, Quantity, Properties, Distribution and functions of each *Upadhātu*.
- **Stanya:** Characteristic features and methods of assessing *Śuddha* and *Dūsita Stanya*, Manifestations of *Vrddhi* and *Ksaya* of *Stanya*.

- **Ārtava:** Characteristic features of Śuddha and Dūsita Ārtava. Differences between Raja and Ārtava, physiology of Ārtavavaha Srotāmsi.
- Study of Tvak
- **Physiology of Mala** - Definition of the term 'Mala'. Definition, Formation, Properties, Quantity and Functions of Purīsa, Mutra. Manifestations of Vrddhi and Kshaya of Purīsa and Mūtra.
- **Sveda** – Definition, Formation, Properties, Quantity and Functions of Svedavaha Srotāmsi. Formation of Sveda. Manifestations of Vrddhi and Kshaya of Sveda.
- **Dhātumala** – Definition, Formation, properties, Quantity, Classification and Functions of each Dhātumala .

Paper-II - Prakrti- Sattva Vijñāna

- **Deha-Prakrti:** Various definitions and synonyms for the term 'Prakrti'. Factors influencing the Prakrti. Classification of Deha-Prakrti. Characteristic features of the individuals belonging to each kind of Deha-Prakrti. Recent advances in understanding the Prakrti.
- **Pancajnanendriya:** Physiological description of Pancajnanendriya and physiology of perception of Śabda, Sparśa, Rūpa, Rasa, Gandha. Indriya-panca-pancaka; Physiological description of Karmendriya.
- **Manas** – Definition, location (sthana), Properties, Functions and Objects of Manas.
- **Ātmā** – Definition, Properties of Ātmā. Difference between Paramātmā and Jīvātmā; Characteristic features of Ātmā.
- **Buddhi** – Location, Types, Functions of Buddhi; Physiology of Dhī, Dhrti and Smrti.
- **Nidrā** – Definition of Nidrā, Classification of Nidrā. Tandra, physiological and clinical significance of Nidra; Svapnotpatti and Svapnabheda.
- Physiology of special senses. Intelligence, Memory, Learning and Motivation.
- Physiology of sleep.
- Physiology of speech and articulation;
- Physiology of Pain and temperature.

Paper-III - Kosthanga Kriya Vijñāna

- **Āhāra:** Definition and significance of Āhāra. Classification of Āhāra. Āhāra-vidhi-vidhāna. Asta āhāra-vidhi viśesāyatana, Āhāraparināmakara bhāva.
- **Āhārpāchana:** Āhāra Pāka Prakriyā, Description of Annavaha Srotās. Description of Avasthāpāka and Nishthapāka. Role of dosha in Āhārapāka. Sāra and Kitta Vibhajana. Absorption of Sāra. Utpatti and Udieeran of Vāta-Pitta-Kapha.
- Definition of the term Kostha. Physiological classification of Kostha and the characteristics of each kind of Kostha.
- **Agni:** Description of the importance of Agni. Classification of Agni. Locations, properties and functions of Jātharāgni, Bhūtāgni, and Dhātvagni.
- Applied physiology of Agni in Kriyā Śārīra and Cikitsā.
- Description of the aetiology and features of Annavaha Srotodusti. Applied physiology of Annavaha Srotās: Arocaka, Ajīrna, Atīsāra, Grahanī, Chardi, Parināma Śūla Agnimāndya.
- Description of the process of digestion of fats, carbohydrates and proteins in human gastrointestinal tract. Different digestive juices, their enzymes and their mechanisms of action. Functions of Salivary glands, Stomach, Pancreas, Small intestine, Liver and large intestine in the process of digestion and absorption.

- Movements of the gut (deglutition, peristalsis, defecation etc.) and their control. Role of neuro-endocrine mechanisms in the process of digestion and absorption. Enteric nervous system.
- Applied physiology of gastrointestinal tract: Vomiting, Diarrhoea, Malabsorption etc.
- Recent understandings related to the gut microbiota and their role in health and disease.
- Introduction to biochemical structure, properties and classification of proteins, fats and carbohydrates.
- Description of the processes involved in the metabolism of proteins, fats and carbohydrates.
- Vitamins: sources, daily requirement and functions. Physiological basis of signs and symptoms of hypo and hyper-vitaminosis.

Paper-IV - Modern Physiology and its applied aspect

Physiology of Neuro-Immune-Endocrine Mechanisms:

- Physiology of Nervous System. General introduction to nervous system: neurons, mechanism of propagation of nerve impulse.
- Study of CNS, PNS and ANS. Sensory and motor functions of nervous system. Functions of different parts of brain and spinal cord, Hypothalamus and limbic system
- Physiology of Endocrine system. Classification and characteristics of different hormones. Description of hormones secreted by Hypothalamus, Pituitary gland, Thyroid gland, Parathyroid glands, Pancreas, Adrenal glands and their physiological effects. Effects of hypo and hyper-secretion of various hormones.
- Male and female reproductive physiology. Spermatogenesis and oogenesis. Hormonal regulation of uterine and ovarian cycles. Physiology of pregnancy and lactation. Parturition.
- Adipose tissue and its Function. Circulating lipids. Description of lipoproteins like VLDL, LDL and HDL and their composition.
- Physiology of immune system. Definition and classification of immunity: Innate, acquired and artificial. Mechanisms involved in humoral and cell mediated immunity.

Cardiovascular physiology, Respiratory physiology and Blood:

- Physiology of Cardio-Vascular system: Functional anatomy of cardiovascular system. Cardiac cycle. Heart sounds. Regulation of cardiac output and venous return. Physiological basis of ECG. Heart-rate and its regulation. Arterial pulse. Systemic arterial blood pressure and its control. Regional circulations. Physiology of lymphatic circulation.
- Physiology of Respiratory system: Functional anatomy of respiratory system. Ventilation. Mechanism of respiration. Exchange and transportation of gases. Neural and chemical control of respiration. Spirometry and lung function tests. Artificial respiration.
- Functions of Haemopoietic system: Composition and functions of blood and blood cells. Haemopoiesis- (stages and development of RBCs, WBCs and platelets); Introduction to bone marrow: composition and functions of bone marrow. Structure and functions of haemoglobin, mechanism of blood clotting, study of platelets. physiological basis of blood groups. Principles of blood transfusion, plasma proteins-synthesis and functions. Applied physiology: Anaemia, Jaundice.

Musculoskeletal Physiology:

- Physiology of muscles. Classification of muscles. Electrical and mechanical properties of Cardiac, skeletal and smooth muscles.

Physiology of Excretion:

- Physiology of excretion. Functional anatomy of urinary tract. Functions of kidneys. Mechanism of formation of urine. Control of micturition. Renal function tests.
- Structure and functions of skin, sweat glands and sebaceous glands.

Learners should be well versed with the following instruments-

- Physiograph, Computerised spirometry, Biochemical Analyzer, Pulse oxymeter, Elisa Reader, Hematology Analyzer, Tread mill

Bridge areas including recent advances:

- Recent studies in biorhythms.
- Recent advances in Neuro-Immune-Endocrine physiology.
- Recent advances in stem cell research

PRACTICAL**Ayurvedic practicals**

- Assessment of Prakrti
- Assessment of Sāra
- Assessment of Dosa Vrddhi Ksaya Laksana
- Assessment of Dhātu Vrddhi – Ksaya Laksana
- Assessment of Agni
- Assessment of Kostha
- Assessment of Śarīra Bala through Vyāyāma Śakti
- Mūtra Parīksa
- Nādī Parīksā
- Anguli Pramāna
- Assessment of Sātmya

Hematology

- Use and care of Compound microscope
- Histological study of different organs
- Hemoglobin estimation
- Total RBC count
- Total WBC count
- Differential leukocyte count
- Packed cell volume (PCV)
- ESR
- Bleeding time
- Clotting time
- Blood grouping and Rh typing

Urine examination**Physical examination**

- Specific gravity and reaction of urine
- Detecting the presence of Albumin in urine

- Detecting the presence of Sugar in urine
- Detecting the presence of Ketone bodies in urine
- Detecting the presence of Bile salts and bile pigments in urine

Cardio-Vascular system

- Clinical methods of examining cardiovascular system
- Examination of Arterial Pulse
- Arterial blood pressure measurement: Effect of posture, exercise and cold pressor test on Blood Pressure
- ECG recording and its interpretation
- Heart Sounds

Respiratory system

- Clinical examination of Respiratory System
- Lung Function Tests including Spirometry

Nervous System

- Clinical examination of nervous system
- Examination of higher mental functions
- Examination of cranial nerves
- Examination of reflexes
- Examination of sensory functions
- Examination of motor functions
- Examination of Autonomic Nervous System
- EEG recording (Demonstration)

Reference Books

- | | |
|--|-------------------------------|
| • Ayurvediya Kriyasharir | - Ranjit rai Desai |
| • Kayachikitsa Parichaya | - C. Dwarikanath |
| • Prakrit Agni Vigyan | - C. Dwarikanath |
| • Sharir Kriya Vigyan | - Shiv Charan Dhyani |
| • Abhinava Sharir Kriya Vigyana | - Acharya Priyavrata Sharma |
| • Dosha Dhatu Mala Vigyana | - Shankar Gangadhar Vaidya |
| • Prakrita Dosha Vigyana | - Acharya Niranjana Dev |
| • Tridosha Vigyana | - Shri Upendranath Das |
| • Sharira Tatva Darshana | - Hirlekar Shastri |
| • Prakrita Agni Vigyana | - Niranjana Dev |
| • Deha Dhatvagni Vigyana | - Vd. Pt. Haridatt Shastri |
| • Sharir Kriya Vigyana (Part 1-2) | - Acharya Purnchandra Jain |
| • Sharir Kriya Vigyana | - Shri Moreswar Dutt. Vd. |
| • Sharira Kriya Vijnana (Part 1 and 2) | - Nandini Dhargalkar |
| • Dosha Dhatu Mala Vigyana | - Basant Kumar Shrimal |
| • Abhinava Sharir Kriya Vigyana | - Dr. Shiv Kumar Gaur |
| • Pragyogik Kriya Sharir | - Acharya P.C. Jain |
| • Kaya Chikitsa Parichaya | - Dr. C. Dwarkanath |
| • Concept of Agni | - Vd. Bhagwan Das |
| • Purush Vichaya | - Acharya V.J. Thakar |
| • Kriya Sharir | - Prof. Yogesh Chandra Mishra |

- Sharir Kriya Vigyana - Prof. Jayaram Yadav & Dr. Sunil Verma.
- Basic Principles of Kriya-Sharir (A treatise on Ayurvedic Physiology) - Dr. Srikant Kumar Panda
- Sharir Kriya – Part I & Part II – Dr. Ranade, Dr. Deshpande & Dr. Chobhe
- Human Physiology in Ayurveda - Dr Kishor Patwardhan
- Sharirkriya Vignyan Practical Hand Book – Dr. Ranade, Dr. Chobhe, Dr. Deshpande
- Sharir Kriya Part 1 – Dr. R.R. Deshpande, Dr. Wavhal
- Sharir Kriya Part 2 – Dr. R.R. Deshpande, Dr. Wavhal
- Textbook of Physiology - Gytton & Hall
- Review of medical physiology – William Ganong
- Essentials Of Medical Physiology - Sembulingam, K.
- Concise Medical Physiology - Chaudhari, Sujit. K.
- Fundamental of Anatomy & Physiology - Martini
- Principals of Anatomy & Physiology - Tortora & Grabowski
- Human Physiology - Richards, Pocock
- Samson Wrights Applied Physiology, Keele, Neil, Joels
- Brainstem Control of Wakefulness And Sleep- Steriade, Mirce
- An Introduction to Human Physiology - Green, J.h.
- Ancient Indian Medicine - Kutumbiah P.
- Biographical History of Indian Medicine - Srikanthamurthy KR
- Ayurveda Kriya Sharira - Yogesh Chandra Mishra
- Textbook of Medical Physiology - Indu Khurana
- Tridosha Theory - Subrahmanya Shastri
- Statistics in Medicine - K. Syamalan

Important journals to refer:

1. Advances in Physiology Education
2. Academic Medicine
3. Indian journal of Physiology and Pharmacology
4. Journal of Ayurveda and Integrative Medicine
5. Evidence-based Complementary and Alternative Medicine
6. AYU
7. All journals of American Physiological Society
8. Journal of Physiology

Important research papers to refer:

1. Hong KW, Oh B. Overview of personalized medicine in the disease genomic era. *BMB Rep.* 2010 Oct;43(10):643-8.
2. Prasher B, Negi S, Aggarwal S, Mandal AK, Sethi TP, Deshmukh SR, Purohit SG, Sengupta S, Khanna S, Mohammad F, Garg G, Brahmachari SK; Indian Genome Variation Consortium, Mukerji M. Whole genome expression and biochemical correlates of extreme constitutional types defined in Ayurveda. *J Transl Med.* 2008 Sep 9;6:48.
3. Patwardhan B, Bodeker G. Ayurvedic genomics: establishing a genetic basis for mind-body typologies. *J Altern Complement Med.* 2008 Jun;14(5):571-6. Review. PubMed PMID: 18564959.

4. Bhushan P, Kalpana J, Arvind C. Classification of human population based on HLA gene polymorphism and the concept of Prakriti in Ayurveda. *J Altern Complement Med.* 2005 Apr;11(2):349-53.
5. Ghodke Y, Joshi K, Patwardhan B. Traditional Medicine to Modern Pharmacogenomics: Ayurveda Prakriti Type and CYP2C19 Gene Polymorphism Associated with the Metabolic Variability. *Evid Based Complement Alternat Med.* 2009 Dec 16. [Epub ahead of print]
6. Aggarwal S, Negi S, Jha P, Singh PK, Stobdan T, Pasha MA, Ghosh S, Agrawal A; Indian Genome Variation Consortium, Prasher B, Mukerji M. EGLN1 involvement in high-altitude adaptation revealed through genetic analysis of extreme constitution types defined in Ayurveda. *Proc Natl Acad Sci U S A.* 2010 Nov 2;107(44):18961-6. Epub 2010 Oct 18.
7. Tav Pritesh Sethi, Bhavana Prasher and Mitali Mukerji. Ayurgenomics: A New Way of Threading Molecular Variability for Stratified Medicine. *ACS Chemical Biology.* 2011(6):875-880
8. Marchetti B, Morale MC, Gallo F, Batticane N, Farinella Z, Cioni M. Neuroendocrineimmunology (NEI) at the turn of the century: towards a molecular understanding of basic mechanisms and implications for reproductive physiopathology. *Endocrine.* 1995 Dec;3(12):845-61.
9. Licinio J, Frost P. The neuroimmune-endocrine axis: pathophysiological implications for the central nervous system cytokines and hypothalamus-pituitary-adrenal hormone dynamics. *Braz J Med Biol Res.* 2000 Oct;33(10):1141-8.
10. Turrin NP, Rivest S. Unraveling the molecular details involved in the intimate link between the immune and neuroendocrine systems. *Exp Biol Med (Maywood).* 2004 Nov;229(10):996-1006
11. Sewlall S, Pillay V, Danckwerts MP, Choonara YE, Ndesendo VM, du Toit LC. A timely review of state-of-the-art chronopharmaceuticals synchronized with biological rhythms. *Curr Drug Deliv.* 2010 Dec;7(5):370-88.
12. Ohdo S. Chronopharmaceutics: pharmaceuticals focused on biological rhythm. *Biol Pharm Bull.* 2010 Feb;33(2):159-67
13. Humes HD. Stem cells: the next therapeutic frontier. *Trans Am Clin Climatol Assoc.* 2005;116:167-83; discussion 183-4.
14. Bianco P, Robey PG. Stem cells in tissue engineering. *Nature.* 2001 Nov 1;414(6859):118-21
15. Bhattacharya J. The Knowledge of Anatomy and Health in Ayurveda and Modern Medicine: Colonial Confrontation and Its Outcome
16. Wujastyk D. Interpreting the image of the human body in premodern India. *Int J Hindu Studies* 13: 189–228, 2009.
17. Kristina Harris, Amira Kassis, Geneviève Major, Chieh J. Chou. Is the Gut Microbiota a New Factor Contributing to Obesity and Its Metabolic Disorders? *J Obes.* 2012; 2012: 87915

4. DRAVYAGUNA VIGYAN

PAPER-I Namarupa Vigyana

100 marks

1. Importance of Namagyana of Dravya, origin of Namarupagyana of Aushadhi in Veda, etymological derivation of various names and synonyms of Aushadhi.
2. Rupagyana in relation to Aushadhi. Sthula and Sukshma description (Macroscopic and Microscopic study) of different parts of the plant.
3. Synonyms of dravyas(aushadha and Ahara) mentioned in Vedic compendia, Brihatrayee, Bhavaprakasha and Rajanighantu.
4. Basonyms, synonyms and distinguish morphological characteristic features of medicinal plants listed in Ayurvedic Pharmacopoeia of India(API).
5. Knowledge of Anukta dravya (Extrapharmacopial drugs)with regards to namarupa.
6. Sandigdha dravya(Controversial drugs) vinischaya.
7. Knowledge of biodiversity, endangered medicinal species.
8. Knowledge of TKDL, Introduction to relevant portions of Drugs and cosmetic act, Magic remedies Act, Intellectual Property Right (IPR) and Regulations pertaining to Import and Export of Ayurvedic drugs.
09. Knowledge of tissue culture techniques
10. Knowledge of Genetically Modified Plants

PAPER –II Guna Karma Vigyan

100 marks

1. Fundamental principles of drug action in Ayurveda and conventional medicine.
2. Detailed study of rasa-guna- virya- vipaka-prabhava and karma with their applied aspects and commentators (Chakrapanidatta, Dalhana, Arunadatta, Hemadri and Indu) views on them.
3. Comprehensive study of karma as defined in Brihatrayee & Laghutrayee
4. Detailed study of Guna and Karma of dravyas listed in API and Bhavaprakasha Nighantu along with current research review.
5. Detailed study of aharadravya/ ahara varga ascribed in Brihatrayee and various nighantus along with Kritanna varga.
6. Pharmacological principles and knowledge on drugs acting on various systems.
7. Basic knowledge on experimental pharmacology for the evaluation of - analgesic, anti pyretic, anti inflammatory, anti diabetic, anti hypertensive, hypo lipidemic, anti ulcer, cardio protective, hepatoprotective, diuretics, adaptogens, CNS activites.
8. Knowledge on Heavy metal analysis, pesticidal residue and aflatoxins
9. Knowledge on evaluation of anti microbial and antimycotic activities.

PAPER – III Prayogavigyana

Marks 100

1. Bhaishjya Prayog Siddhant [Principles of drug administration] - Bhaishajya Marga (routes of drug administration), Vividha Kalpana (Dosage forms), Principles of Yoga Vijnan(compounding), Matra (Dosage), Anupana (Vehicle), Aushadha grahankal (Time of drug administration), Sevankal avadhi (duration of drug administration), Pathyapathya (Dos' /Donts' /Contraindications), complete Prescription writing (Samagra Vyavastha patraka).
2. Samyoga- Viruddh Sidhanta and its importance
3. Amayika prayoga (therapeutic uses) of important plants ascribed in as well as Brihatrayee, Chakradutta, Yoga ratnakara and Bhavaprakasha.
4. Knowledge of Pharmaco-vigilance in Ayurveda and conventional system of medicine.

5. Knowledge of clinical pharmacology and clinical drug research as per GCP guide lines.
6. Knowledge of Pharmacogenomics

PAPER- IV

100 marks

1. Etymology of nighantu, their relevance, utility and salient features.
2. Chronological history of the following Nighantus with their authors name, period and content- Paryaya ratnamala, Dhanvantari nighantu, Hridayadipika nighantu, Ashtanga nighantu, Rajanighantu, Siddhamantra nighantu, Bhavaprakasha nighantu, Madanpala nighantu, Rajavallabha nighantu, Madhava Dravyaguna, Kaiyadeva nighantu, Shodhala nighantu, Saligram nighantu, Nighantu ratnakara, Nighantu adharsha and Priya nighantu
3. Detailed study Aushadha kalpana mentioned in Sharangadhara samhita and Ayurvedic Formulary of India (AFI).
4. General awareness on poshaka ahara (Nutraceuticals), Varnya (cosmoceuticals), food additives, Excipients etc.
5. Knowledge of plant extracts, colors, flavors and preservatives.
6. Review of important modern works on classical medicinal plants published by Govt of India, department of AYUSH and ICMR.

Syllabus of the Practical training of part two M.D. (Ayu) - Dravyaguna

Practical:-

Study tours:

Field identification of medicinal plants through at least three local Dravyaguna study tours within the state and one study tour out of state. Preparation of minimum 50 herbarium sheets, along with raw drug either from field, of plants be collected during study tours.

1. Evaluation of Crude drugs:

Macro and microscopic methods of examining five drugs of each of different useful parts of plants, including their powders.

2. Phytochemical evaluation of raw material:

Quantitative standards like foreign matter, extractive (water and alcohol), ash value, acid insoluble ash and TLC separation of various parts of minimum two plants of Ayurvedic Pharmacopoeia of India.

3. Yoga vijnana :

Preparation of two yoga of each kalpana of Ayurvedic Formulary of India:

4. Pharmacology:

- ✓ Rasa nirdharana by Taste Threshold method of minimum one drug for each of rasas.
- ✓ Observation of animal experimentation models (both in vitro and in vivo)- 05 models for possible rasadi gunas.

5. Clinical

- ✓ Regular clinical training in the hospital for submission of Single Aushadhi Prayoga (Single drug trial/ Clinico-pharmacological studies.)
- ✓ Survey for Amayika prayoga of aushadhi (Pharmaco epidemiology) for studying their role in clinical practice in contemporary period -observational study-minimum.

6. Dissertation

A Dissertation, as per the approval of Departmental Research Committee/Competent Committee for the purpose, be prepared under the guidance of approved supervisor

in Dravyaguna and submitted 6 months before the final examination. The approval of Dissertation shall be essential before appearing the final examinations.

7. Method of practical training – Posting for minimum one month in each of the following units -

- ✓ Quality control laboratory of nearest pharmacy/institution for crude drug identification, adulterants and substitutes & understanding standardization techniques.
 - ✓ Experimental pharmacology laboratory for developing skills in animal experimentation
 - ✓ Regular clinical training in the Teaching hospital for studying Ekala Aushadhi Prayoga & Adverse drug reactions(ADR).
8. Post Graduate Scholar is expected to present minimum two scientific papers in National / international seminars during the course of study
9. Post Graduate Scholar is expected to publish / get accepted at least one paper in indexed/ peer reviewed journal under the supervision of guide.

Pattern of Practical Examination-

Total =200 marks

- | | |
|--|------------|
| 1. Herbarium | - 10 Marks |
| 2. Pharmacognosy practical record | - 10 Marks |
| 3. Pharmacology practical record | - 10Marks |
| 4. Clinical records record | - 10 Marks |
| 5. Practical examination(Identification of green and raw drugs, microscopic examination, Ekala aushadha pariksha | - 60 Marks |
| 6. Thesis Presentation | - 20Marks |
| 7. Viva voce | - 80 Marks |

Reference books -

5. RASA SHASTRA AND BHAI SHAJYA KALPANA

Paper I Rasa Shastra

Part A

1. History and Chronological evolution of Rasashastra, concept of Raseshwara darshan. Fundamental Principles of Rasashastra Technical terminologies (Paribhasha) used in Rasa shastra.
2. Detailed knowledge of ancient and contemporary Yantropakarana and their accessories used in aushadhikaran and their contemporary modification such as yantras, mushas, putas, Koshtis, bhrashtis, muffle furnaces and other heating appliances, ovens, driers etc. used in manufacturing of Rasaushadhis in small scale and large scale along with their applications.
3. Study of Samskara, Role of agni (Heat), jala and other dravas (water and other processing liquids), kala (Time span), paatra (container) etc. and their significance in aushadhikarana.
4. Concept of Bhavana, study of Mardana and its significance and knowledge of ancient and contemporary grinding techniques.
5. Detailed Knowledge of different procedures of Shodhana, Jarana Murchana and Marana, concept of Puta, definition, types and specifications of different Putas. Significance of different Putas in relation to Bhasmikarana and therapeutic efficacy of dravya under process. Bhasma pariksha vidhi and its significance in relation to contemporary testing procedures. Amritikaran and Lohitikarana.
6. Detailed knowledge of Satva and Druti, Satva shodhan, mrudukaran and Maran of Satva, its significance, in relation to therapeutic efficacy of dravya under process.
7. Concept of Pratinidhi dravya and discussion on controversial drugs.

PART – B

1. Detailed ancient and contemporary knowledge of Parada and its compounds with reference to source, occurrence, physico-chemical characterization, graahya agrahyatva, Parada dosha, Parada gati, Parada shodhan, Study of Ashta sanskara, ashtadasha sanskara etc., Hingulottha Parada. Concept of Parada jaran, moorcchana, bandhan, pakshaccheda and marana etc. Therapeutic properties and uses of Parada.
2. Detailed ancient & contemporary knowledge with Geochemical / mineralogical / biological identification, source, occurrence, physico-chemical characterization, graahya-agraahyatva, Shodhan Maranadi vidhi and therapeutic properties and uses of dravyas etc. included in Maharasa, Uparasa, Sadharana rasa, Dhatu, Upadhatu, Ratna, Uparatna, Visha, Upavisha, Sudha varga, Lavana varga, Kshara varga, Sikata varga and other miscellaneous drugs used in Rasashastra.
3. Detailed knowledge of manufacturing, pharmacopeial standards, storage, shelf life, therapeutic efficacy, dose, anupana, vikarashanti upaya and development of technology with Standard Operating Procedures of processing, standardization, quality control of Bhasmas and Pishtis

Bhasma - Abhraka Bhasma, Svarnamakshika Bhasma, Kasis Bhasma, Svarna Bhasma, Rajata Bhasma, Tamra Bhasma, Loha Bhasma, Mandur Bhasma, Naga Bhasma, Vanga Bhasma, Yashad Bhasma, Trivanga Bhasma, Pittala, Kamsya and Varthaloha Bhasma, Shankha Bhasma, Shukti Bhasma, Kapardika Bhasma, Godanti Bhasma, Praval Bhasma, Mrigashringa Bhasma, Mayurpiccha Bhasma, Kukkutand twak Bhasma, Hiraka Bhasma, Manikya Bhasma.

Dravaka - Shankha Dravaka

Pishti - Praval pishti, Manikya Pishti, Mukta pishti, Jahara mohara pishti, Trinakanta mani pishti etc.

4. Detailed knowledge of manufacturing, storage, shelf life, pharmacopeial standards, therapeutic efficacy, dose, anupana and development of technology with Standard Operating Procedures of processing, standardization and quality control of Kharaliya rasa, Parpati, Kupipakva rasa and Pottali rasa.
5. Study of classical texts with respective commentaries and special emphasis on Rasarnava, Rasahridaya tantra, Rasa Ratna Samucchaya, Rasendra Chintamani, Rasendra Chudamani, Rasa Ratnakara, Rasadhyaya, Rasa Kamdhenu, Anandkanda, Siddha Bhesaja Manimala, Ayurveda Prakash, Rasatarangini, Bhaishajya Ratnavali, Rasamritam etc. and the books mentioned in the Schedule I of D & C Act – 1940. Relevant portions of Brihatrayi.

Paper II Bhaishajya Kalpana

Part A

1. History and Chronological evolution of Bhaishajya Kalpana, Concept of Bhesaja and Aushadh, fundamental principles of Bhaishajya Kalpana. Technical terminologies (Paribhasha) used in Bhaishajya Kalpana.
2. Classical and Contemporary concepts of Collection, storage, Saviryata Avadhi and preservation methods of different fresh and dry Aushadhi dravyas and their graahya agrahyatva
3. Detailed knowledge of routes of drug administration, Aushadha matra, Anupana, Sahapana, Aushadha Sevana Kala, Kala Avadhi, Pathya, Apathya (Posology).
4. Detailed knowledge of manufacturing, standardization, quality control, pharmacopeial standards, storage, shelf life and development of innovative technology with Standard manufacturing Operating Procedures of following dosage forms
 - i) Panchavidha Kashaya, Churna, Rasakriya, Ghana, Avaleha, Pramathya, Mantha, Panaka, Sarkara, Kshirapaka, Ushnodaka, Aushadha Siddha Udaka, Sadangodaka, Tandulodaka, Laksharasa, Arka, Satva, Kshara, Lavana, Masi, Gutika, Vatika, Modaka, Guggulu and Varti etc.
 - ii) Sneha Kalpana: Concept of accha sneha and sneha pravicharana and Murchhana. Sneha paka, types of sneha paka and sneha siddhi lakshana, Avartana. Sneha kalpa karmukata (Pharmacokinetics and dynamics of sneha kalpa). Role of Sneha in relation to absorption of drug.
 - iii) Kritanna and Bhesaja Siddha Anna Kalpana, Aharopayogi varga, concept of medicinal and functional food, dietary supplements and nutraceuticals etc.
 - iv) Sandhana kalpana: Madya varga and Shukta varga. Asava yoni. Alcoholic and acidic fermentation. Sandhana kalpa karmukata (Pharmacokinetics and dynamics). Advancements in fermentation technology. Knowledge of regulations in relation to alcoholic drug preparations.
 - v) Bahya Prayogarthi Kalpana : Lepa, Upanaha, Udvartan, Avachurnana / Avadhulana, Abhyanga, Dhupana, Malahara.
 - vi) Mukha, Karna, Nasa, Netropacharartha Kalpana:

- vii) Basti Kalpana: Basti Yantra Nirmana, Types of basti. Anuvasana and Asthapana basti. Karma, kala and yoga basti etc. Basti Kalpa (Madhutailika, Piccha basti etc.), Comparison of Asthapana and Anuvasana basti with evacuation and retention enema.

Part B

All the following procedures are to be studied in relevance to Ayurvedic Bhaishajya Kalpas.

1. Methods of Expression and Extraction: Maceration, percolation, distillation, infusion and decoction.
2. **Liquids:** Clarified liquid, syrup, elixir, filtration techniques
3. **Solid dosage Forms: Powders:** Size reduction, separation techniques, particle size determination, principles of mixing. **Tablets:** Methods of tableting, suppositories, pessaries and capsules, sustained release dosage forms.
4. **Semisolid dosage forms,** emulsions, suspensions, creams and ointments, sterilization of ophthalmic preparations.
5. An introduction to various cosmetic preparations.
6. Drying, open and closed air drying, freeze drying, vacuum drying and other drying methods pharmaceutical excipients.
7. Study of classical texts with special emphasis on Chakradatta, Sharangadhara Samhita, Bhaishajya Ratnavali, Bhava Prakasha, Yogaratnakara, relevant portions of Brihatrayi, Ayurvedic Pharmacopeia of India, Ayurvedic Formulary of India.

Paper III Rasa Chikitsa & Aushadha Yoga Vigyana

PART- A

1. Rasachikitsa, Kshetrikaran, Rasajirna, Lohajirna, Aushadhi Sevana Vikarashanti Upaya. Ashuddha, Apakva, Avidhi Rasadravya Sevanajanya Vikara evam Vikara shanti upaya.
2. Detailed knowledge of Aushadhi patha Nischiti and sanyojan (formulation composition), dose, anupana and method of administration, therapeutic efficacy and uses (indications and contra-indications), probable mode of action etc. of the following Aushadhi yogas
 - i. **Kharaliya Rasa :** Shwasa kuthara Rasa, Tribhuvana kirti Rasa, Higuleshwara Rasa, Ananda bhairava Rasa, Maha Lakshmi vilasa Rasa, Vasnata kusumakara Rasa, Vasanta malti Rasa, Brihat vata chintamani Rasa, Laghu suta shekhar Rasa, Suta shekhara Rasa, Ram ban Rasa, Chandra kala Rasa, Yogendra Rasa, Hridyarnava rasa, Grahani kapata Rasa, Garbha pala Rasa, Jalodarari Rasa, Mrityunjaya Rasa, Madhumalini vasanta Rasa, Arsha kuthara Rasa, Krimi mudgara Rasa, Suchika bharana Rasa, Tri netra Rasa, Smruti sagara Rasa, Vata gajankusha Rasa, Agni kumar Rasa, Ekangavir Rasa, Kama dugha Rasa, Purna chandrodaya Rasa, Pratap lankeshwara Rasa, Maha vata vidhwansaka Rasa, Kasturi bhairava Rasa, Ashwa kanchuki Rasa, Gulma kuthara Rasa, Maha jwarankusha Rasa, Chandra mrita Rasa, Kapha ketu Rasa, Prabhakara Vati, Pravala Panchamrita, Gandhaka Rasayana, Chaturbhuj rasa, Navajivan rasa, Shonitargal rasa, Raktapitta kulakandan rasa, Amavatari Rasa, Kravyada Rasa, Garbha chintamani Rasa, Chintamani Rasa, Trilokya chintamani Rasa, Pradarantaka Rasa, Vangeshwara Rasa, Brihat vangeshwara Rasa, Shwasakasa Chintamani Rasa, Arogya vardhini Vati, Chandra prabha Vati, Agni tundi vati, Shankha Vati.

- ii. Kupipakva Rasa:** Rasa Sindura, Makaradhwaja, Sidha makaradhwaja, Samira pannaga Swarnavanga, Malla sindura, Rasa karpura, Rasa pushpa, Manikyasa Rasa.
- iii. Parpati Rasa :** Rasa Parpati, Loha Parpati, Tamra Parpati, Suwarna Parpati, Gagana Parpati, Vijay Parpati, Panchamrit Parpati, Shwet Parpati, Bola Parpati
- iv. Pottali Rasa:** Rasagarbha pottali, Hemagarbha pottali, Mallagarbha pottali, Hiranyagarbha pottali, Shankagarbha pottali, Lokanatha rasa, Mriganka Pottali
- v. Loha evam Mandura Kalpa:** Ayaskriti, Loha Rasayana, Amla pittantaka loha, Chandanadi loha, Dhatri loha, Navayasa loha, Putapakva vishama jwarantaka loha, Shilajatwadi loha, Tapyadi loha, Saptamrita loha, Dhatri loha Amritasara Loha, Shankaramat loha, Pradarantaka loha, Rohitaka loha. Punarnava Mandura, Shatavari Mandura, Tara Mandura, Triphala Mandura, Mandura Vataka etc.

Part B

Detailed knowledge of Aushadhi patha Nischiti and sanyojan (formulation composition), dose, anupana and method of administration, therapeutic efficacy and uses (indications and contra-indications), probable mode of action etc. of the following Aushadhi yogas

- i. Panchavidha Kashayas and their Upakalpa:** Ardraka swarasa, Tulasi swarasa, Vasa putapaka swarasa, Nimba kalka, Rasona kalka, Kulattha Kwath, Punarnavasthaka kwatha, Rasna saptaka kwatha, Dhanyak hima, Sarivadi hima, Panchakola phanta, Tandulodaka, Mustadi pramathya, Kharjuradi mantha, Shadanga paniya, Laksha rasa, Arjuna kshirapaka, Rasona kshirapaka, Chinchapanaka, Candana panaka, Banapsha sharkara, Nimbu sharkara, Amrita satva, Ardraka satva, Ajamoda arka, Yavanyadi arka
- ii. Kritanna and Bhesaja Siddha Ahara Kalpana:** Yavagu, (Krita and Akrita), Ashtaguna manda, Laja manda, Peya, Vilepi, Krishara, Yusha, Mudga yusha, Kulattha yusha, Saptamushtika yusha, Khada, Kambalika, Raga, Shadava, Mamsarasa, Veshavara, Dadhi, Katvar Dadhi, Dadhi Mastu, Takra, Gholi, Udasvita, Mathita, Chhacchika etc.
- iii. Churna:** Sitopaladi Churna, Talisadi Churna, Triphala Churna, Hingvashtaka Churna, Avipattikara Churna, Swadishta Virechana Churna, Bhaskar Lavana Churna, Sudarshana Churna, Maha Sudarshana Churna, Gandharva Haritaki Churna, Pushyanuga Churna, Ajamodadi Churna, Hingvadi Churna, Eladi Churna, Dadimashtaka Churna, Trikatu Churna, Vaishwanara Churna, Gangadhara Churna, Jati phaladi Churna, Narayana Churna etc.
- iv. Gutika:** Arogya vardhani vati, Chandra prabha vati, Chitrakadi Gutika, Sanjivani Vati, Lasunadi vati, Lavangadi Vati, Vyoshadi vati, Khadiradi Vati, Kankayana Vati, Abhayadi modaka, Marichyadi gutika, Amalakyadi gutika, Samshamini Vati, Kutaja Ghana vati, Amarasundari Vati, Shiva Gutika, Eladi Vati, Kasturyadi Gutika, Arshoghni Vati.
- v. Guggulu:** Yogaraja Guggulu, Maha yogaraja Guggulu, Trayodashanga Guggulu, Kanchanara Guggulu, Rasnadi Guggulu, Triphala Guggulu, Simhanada Guggulu, Gokshuradi Guggulu, Kaishora Guggulu, Panchatikta Guggulu, Amritadi Guggulu, Vatari Guggulu, Lakshadi Guggulu, Abha Guggulu, Navaka Guggulu, Nava Karshika Guggulu.
- vi. Sneha Kalpa**
 - Sneha Moorchhana** - Ghrita Murchhana, Taila Murchhana
 - Siddha Ghrita** - Shatavari Ghrita, Jatyadi Ghrita, Phala Ghrita, Dadimadi Ghrita, Kshirashatpala Ghrita, Mahatriphala Ghrita, Dhanvantari Ghrita, Amritaprasha Ghrita, Kalyanaka Ghrita, Brahmi Ghrita, Changeri Ghrita, Panchatikta Ghrita, Sukumara Ghrita, Panchagavya Ghrita
 - Siddha Taila** - Maha Narayana Taila, Maha Masha Taila, Bala Taila, Nirgundi Taila, Shadbindu Taila, Vishagarbha Taila, Sahacharadi Taila, Jatyadi Taila, Apamarga Kshara Taila, Tuvarka Taila, Kshirabala Taila (Avartita), Lakshadi Taila, Anu Taila, Kumkumadi Taila, Hingutriguna Taila, Kottumchukadi Taila, Prasarinyadi Taila,

Dhanwantari Taila, Balashwagandhadi Taila, Balaguduchyadi Taila, Nilibhringyadi Taila, Brihadavadi Taila, Irimedadi Taila, Chandanadi Taila, Panchaguna taila, Arka taila, Pinda Taila, Kasisadya Taila

vii. Rasakriya, Avaleha, Khanda etc.: Darvi Rasakriya, Vasa Avaleha, Brahma rasayana, Chyavanprasha Avaleha, Kushmanda Avaleha, Dadima Avaleha, Bilvadi Avaleha, Kantakaryavaleha, Haridra Khanda, Narikela khanda, Saubhagya shunthi paka, Amrita Bhallataka, Kamsa Haritaki, Chitraka Haritaki, Vyaghri Haritaki, Bahushala Guda, Kalyana Guda

viii. Sandhana Kalpa: Lodhrasava, Kumaryasava, Ushirasava, Chandanasava, Kanakasava, Sarivadyasava, Pippalyasava, Lohasava, Vasakasava, Kutajarishta, Draksharishta, Raktamitrarka, Dashamularishta, Abhayarishta, Amritarishta, Ashokarishta, Sarasvatarishta, Arjunarishta, Khadirarishta, Ashwagandha Arishta, Vidangarishta, Takrarishta, Mahadrakshasava, Mritasanjivani sura, Maireya, Varuni, Sidhu, Kanji, Dhanyamla, Madhu Shukta, Pindasava.

ix. Anya Kalpa : Phala varti, Chandrodaya varti, Arka lavana, Narikela lavana, Triphala masi, Apamarga kshara, Snuhi kshara, Ksharasutra, Atasi upanaha, Sarjarasa malahara, Gandhaka malahara, Sindhuradi Malahara, Shatadhouta Ghrita, Sahasra Dhouta Ghrita, Siktha taila, Dashanga lepa, Doshaghna lepa, Bhallataka taila patana, Jyotishmati Taila, Bakuchi Taila, Dashanga dhupa, Arshoghna dhupa, Nishadi Netra bindu, Madhutailika Basti, Piccha Basti, Yapana Basti.

PAPER – IV Pharmacology and Pharmacy Management

PART - A

1. General Pharmacology:
 - a) Principles of Pharmacology, Pharmacodynamics & Pharmacokinetics: Absorption, distribution, Metabolism & excretion, mechanism of action, dose determination and dose response, structure activity relationship.
 - b) Routes of drug administration
 - c) Factors modifying drug effect, Bioavailability and Bioequivalence, drug interactions, adverse drug reaction and drug toxicity
 - d) Preclinical evaluation: experimental pharmacology [bioassay, in vitro, in vivo, cell line studies] animal ethics.
2. Clinical pharmacology: Evaluation of New Chemical Entity – phases and methods of clinical research. Ethics involved in human research.
3. Elemental constituents of human body and its physiological importance. Deficiencies and excess of various elements (micro-nutrients).
4. Toxicity of heavy metals and chelation therapy.
5. Knowledge of toxicity and pharmacological activities of herbo-mineral compounds.
6. Detailed Knowledge of Pharmacovigilance – National and International Scenario. Pharmacovigilance of Ayurvedic Drugs

Part B

1. Scope and evolution of pharmacy. Information resources in pharmacy and pharmaceutical Science.
2. Pharmaceutical dosage form design (Pre-formulation)
3. Packaging materials and Labeling
4. Management of pharmacy, store and inventory management, personnel management, Good Manufacturing Practices related to Ayurvedic drug industry.
5. Pharmaceutical Marketing, product release and withdrawals.
6. Hospital, Dispensing and Community pharmacy.
7. Patenting and Intellectual Property Rights.
8. Laws Governing Ayurvedic drugs

- i. Relevant regulatory provisions of Ayurvedic drugs in Drug and Cosmetics Act - 1940 and Rules - 1945
 - ii. Laws pertaining to Drugs and Magic remedies (Objectionable Advertisement) Act - 1954.
 - iii. Prevention of Food Adulteration (PFA) act.
 - iv. Food Standards and Safety Act - 2006
 - v. Laws pertaining to Narcotics
 - vi. Factory and Pharmacy Acts
 - vii. Consumer Protection Act -1986
9. Regulatory Affairs related to International Trade and Practices of Ayurvedic Drugs
 10. Introduction to Ayurvedic Pharmacopoeia of India, Ayurvedic Formulary of India.
 11. Introduction to Indian Pharmacopoeia, British and United States Pharmacopoeia, Pharmacopoeial Codex
 12. Introduction to Traditional Knowledge Digital Library

Practicals:-

Minimum 150 Practical are to be performed covering all the dosage forms.
 Educational Visits to minimum Five (5) GMP approved Ayurvedic Pharmacies.
 Ten days posting in R & D / Production unit in GMP certified Ayurvedic Pharmacy.
 Minimum attendance in three National Conferences within three academic years.
 Minimum 10 clinical cases using different dosage forms are to be studied and recorded for efficacy and ADRs (if any).
 Minimum one research paper on the core contributory work of dissertation published or accepted in peer reviewed, indexed journal.
 Examinee has to submit supporting documents in relation to above mentioned academic activities at the time of Practical examination.

Pattern of Practical Examination

Total Marks : 100

Duration of the practical: 2 days

- | | |
|---|-------------------------|
| 1. Identification of the specimen: | 10 Marks |
| 2. Drug Processing | 30 Marks
(10+10+5+5) |
| i) Major Practicals: 2 (1 Rasashastra and 1 Bhaishajya Kalpana) | |
| ii) Minor Practicals: 2 (1 Rasashastra and 1 Bhaishajya Kalpana) | |
| 3. Drug testing and Analysis | 10 Marks (5+5) |
| i) Rasaushadhi – 1 | |
| ii) Kashthaushadhi – 1 | |
| 4. Power Point Presentation on dissertation work: 15 Minutes | 10 Marks |
| 6. A Demo Lecture on any subject topic: 10 Minutes. | 10 Marks |
| 7. Documentation | 15 Marks |
| i. Journals (Practical Records) of minimum 75 practicals (25 each from Rasa Shastra, Bhaishajya Kalpana and Analytical part). | |
| ii. Reports of the Visits | |
| iii. Case Records | |
| 8. Viva Voce examination | 15 Marks |

Reference Books:-

1. Rasahridaya Tantra
2. Rasarnava

3. Rasaratna Samuccahaya
4. Ayurved Prakasha
5. Rasendrachudamani
6. Rasendra Chintamani
7. Rasatarangini
8. Rasapraksha Sudhakar
9. Rasamrita
10. Rasa Chandanshu : CCRAS Publication
11. Sharangadhara Samhita
12. Sharangadhara Darpan (BP Pandey)
13. Bhavaprakasha
14. Yoga Ratnakara
15. Bhaishajya Ratnavali
16. Siddha Bhaishajya Manimala
17. Ayurvediya Aushadhikarana – Puranik and Dhamanakar
18. Bharat Bhaishajya Ratnakara
19. Rasayoga Sagara
20. Siddha Bhaishajya Manimala
21. Siddha Yoga Sangraha – Yadavaji Trikamji Acharya
22. Sahasrayoga
23. Vaidyaka Paribhasha Pradeepa
24. Dravyaguna Vijnan Part - 1 and 2 - Yadavji Trikamji
25. Chakradatta - Ratnaprabha,
26. Relevant Parts from Charaka Samhita, Sushruta Samhita, Kashyapa Samhita, Ashtanga Sangraha, Ashtanga Hridaya,
27. Remington: Science and Practice of Pharmacy
28. Theory and Practice of Industrial Pharmacy – Leon Lachman *et al*
29. Clinical Pharmacology, KD Tripathi
30. Clinical Pharmacology, Lawrence Benette
31. Drug Discovery and Evaluation (Pharmacological assays) HG Vogel
32. Pharmacological Basis of therapeutics – Goodman and Gilman
33. Data Base of Medicinal Plants of CCRAS
34. Quality and Standards of Medicinal Plants – ICMR publication
35. Quality Control of Ayurvedic Drugs – PLIM, Gaziabad
36. Ayurvedic Pharmacopeia of India
37. Ayurvedic Formulary of India
38. Indian Pharmacopeia
39. British Pharmacopeia
40. United States Pharmacopeia
41. Pharmacopeia Codex
42. Current Good Manufacturing Practices
43. Drugs and Cosmetic Act 1940 and Rules 1945 with latest amendments
44. Drugs and Magic remedies (Objectionable advertisement) Act-1954
45. Prevention of Food Adulteration (PFA) act
46. Laws pertaining to Narcotics
47. Factory and Pharmacy Acts
48. Consumer Protection Act -1986
49. Brief information on the peer reviewed journals, official websites and other official search engines along with their links (related with the subject)
50. Rutleys Elements of Mineralogy
51. Bhasma Vigyaniam
52. Kupipakva Vigyaniam
53. Anupana Manjari

6. AGADA TANTRA EVUM VIDHIVAIIDYAKA

PAPER-I Agada Tantra (Ayurvedic and Contemporary Toxicology)

100 marks

1. Agada Tantra, its sequential development during Veda kala, Samhitha kala, Samgraha kala and Adhunika kala.
2. Definition of Visha, properties of visha and its comparison with madya and oja, visha samprapti, visha prabhava, visha-vega, vegantara and visha karmukata (toxicodynamic and toxicokinetic study).
3. Descriptive and comparative study of Upavisha in unison with Contemporary Toxicology.
4. Examination of poisons as per Contemporary and Ayurvedic Methods.
5. Descriptive study of sthavara visha, definition, classifications, classical signs and symptoms of poisoning including vanaspatic (phyto poison), khanija (mineral) and compound sthavara visha.
6. Study of Jangama visha and their sources (Animal poisoning and Zoonotic Diseases). Descriptive study of snakes according to ancient and contemporary knowledge. Causes of snake bite and its types. Composition of snake venom and its pharmacological actions. Signs and symptoms of envenomation and its prognostic signs. Clinical features of Vrischika (scorpion), Luta (spider), Grihagadhika (Lizard), Mushaka (rats), Alarka (dogs), Makshika and Mashaka (mosquitoes) and their pathologic manifestations including their role in the manifestation of communicable diseases.
Shanka visha and its management. Visha sankat and Visha Kanya.
7. Garavisha and Dushi visha, their varieties, signs, symptoms and management with contemporary relevance. Detailed study of Allergies including allergic manifestations in the eyes, nose, lungs and skin.
8. Detailed study of Madya visha and substances acting on the nervous system; substance abuse. (Diagnosis, Management and De-addiction)
9. Detailed study of the contemporary knowledge about vishajanya Janpadodhvarsaniya roga (community health problems due to poisons - Environmental pollution, water pollution, soil pollution, air pollution, Industrial pollutions etc. their features and management according to ancient and recent concepts.
10. Concept of Virudha aahara, Aahara visha and Satmyasatmyata in contemporary and Ayurvedic views.
11. Conceptual study: - Drug interactions and incompatibility, Pharmacovigilance

PAPER- II Visha Chikitsa Vigyan (Management Of Poisoning)

100 marks

1. Fundamental Principles for treatment of poisoning
2. General and specific treatment of different types of Sthavara visha.
3. General and specific treatment of different types of Jangama visha (animal poisons, insect poisons, snake bites and other zoonotic diseases).
4. Emergency medical management of poisoning including preparation, administration and complications of antivenoms/antisera.
5. Chaturvimsati upakrama (24 management procedures).
6. Management of Garavisha and Dushivisha. Treatment of Allergies including allergic manifestations in the eyes, nose, lungs and skin.
7. Diagnosis and Management of Drug Induced Toxicity
8. Management of the toxic manifestations caused by the contact poisons (paduka, vasthra, abharana, mukhalepa- vishabadha etc).
9. Management of food poisoning.
10. Death due to poisoning, Duty of physician in poisoning, in cases of suspected poisoning. Post mortem findings in poisoning.
11. Extra -corporeal techniques (dialysis etc) for removal of poisons.

PAPER –III Vyavahara Ayurveda Evam Vidhi Vaidyaka**100 marks**

1. Definition of Vyavahara Ayurveda, its evolution in ancient and contemporary periods.
2. Personal identity and its medico-legal aspects
3. Death and its medico-legal aspects (Medical Thanatology)
4. Asphyxial deaths and its medico-legal importance.
5. Death due to starvation, heat and cold, lightening and electricity. Suspended Animation.
6. Medico-legal autopsy.
7. Injuries due to explosions, chemical and nuclear warfare.
8. Medico-legal aspects of injuries and wounds.
9. Impotence and sterility-Its medico-legal aspects. Regulations of Artificial Insemination. Medico –legal aspects of surrogate motherhood.
10. Sexual offences and perversions.
11. Medico-legal aspects of virginity, pregnancy, delivery, abortion, infanticide and legitimacy with related acts.
12. Indian Penal Code, Criminal procedure code and study of related acts like Indian Evidence Act, Pre Natal Diagnostic Test Act, Nursing Home Act, Human Organ Transplantation Act, Drugs and Cosmetic Act 1940, Narcotic drugs and Psychotropic substances Act 1985, Pharmacy Act 1948, Drugs and Magical Remedies (Objectionable Advertisements) Act 1954, Medicinal and Toilet Preparations Act 1955 and Anatomy Act etc. Any related act enacted by the government from time to time.
13. Courts and Legal procedures.
14. Forensic Science Laboratory
15. Medico legal aspects of mental illness
16. Duties and privileges of physician.
17. Structure of Central Council of Indian Medicine, its jurisdiction and functions. Code and Conducts as per the CCIM, Rules and Regulations there under.
18. Respective State Council of Indian Medicine, its structure, power, voluntary duties.
19. Doctor - patient relationship.
20. Rights and privileges of patients; Euthanasia.
21. Professional secrecy and privileged communication.
22. Professional negligence and malpractice
23. Indemnity Insurance scheme.
24. Consumer Protection Act related to medical practice.
25. Ethics as in classics. Types of physicians and methods of identification, Pranabhisara and Rogabhisara Physicians, qualities of physician, responsibilities of Physicians, Chaturvidha vaidya vriti, duties of physicians towards patients, Vaidya sadvritam, Apujya Vaidya who is accepting fees, relationship with females.

PAPER – IV Aushadha Yoga Vigyan**100 marks**

1. Study of process for sodhana, marana and samskarana of poisonous drugs.
2. Pharmaco-dynamics of different formulations used in Agadatantra
3. Study of pharmacology and usage of antidotes as per the Ayurvedic and contemporary science.
4. Fundamentals of pharmaceuticals according to Ayurvedic and contemporary point of view.
5. Chemical, analytical, laboratory examination of poisons and suspicious substance.
6. Introduction of different instruments /equipments used in the examination of poisons.
7. Introduction to Clinical toxicology
8. Introduction to Experimental toxicology

9. Introduction to Toxicology - genomics
10. Survey and study of the traditional and folklore vishachikista sampradaya.

Content of Practical/Demonstration

1. Identification of specimens models and equipments of toxicological and jurisprudence importance.
2. Practical training in postmortem examination (10 cases)
3. Regular clinical postings in the Agadatantra OPD / IPD
4. Medico-legal cases (20 cases)
5. Chemical Identification of various acids, alkalies, alcohols – Hydrochloric acid, Nitric acid, Sulphuric acid, Ascorbic acid, Sodium Hydroxide and Potassium Hydroxide
6. Detection of minerals Copper, Mercury, Lead, Arsenic and their compounds.
7. Physical and Chemical analysis of Datura, Karaveera, Vatsanabha, Jayapala, Arka and Bhallataka with Microscopy, powder microscopy, TLC, solvent extraction, detection of Phenol, tannins etc. (10 studies)
8. Detection of human blood, hair, semen and other biological secretions of Forensic importance.
9. Herbarium of 15 sthavara vishas and 10 agadas.
10. Preparation of two Agada yogas

Clinical Postings

1. Modern medical hospitals – 2 weeks
(For emergency management of poisoning)
2. Postmortem postings - 2 weeks
3. Court postings - 1 week

Visit to

1. Forensic Laboratory
2. Anti snake venom serum manufacturing Unit.

Pattern of practical examination

- | | |
|---|------------------|
| 1. Post mortem / Medico-legal case record and clinical record | - 10 Marks |
| 2. Identification of specimens models and equipments of jurisprudence importance. | - 20 Marks |
| 3. Spotting related to Visha, Upavisha and others poisonous drugs | - 20 Marks |
| 4. Thesis presentation | - 25 Marks |
| 5. Viva-voce | - 25 Marks |
| Total | 100 Marks |

Reference Books:-

1. Useful Portion of Charak-Sushrut-Vagbhata
2. Dravyaguna Vigyan - Acharya Yadavji
3. Aushadhigunadharm Shastra - Pt Visvanath Dvivedi
4. Kriyatmat Aushada parichaya Vigyan - Pt Visvanath Dvivedi
5. Ayurvedic Vyadhi Vigyan - Acharya Yadavji Trikamji
6. Madhavanidan with Madhukosha commentary
7. Sharangadhara Samhita
8. Yogaratnakara
9. Aushadhigunadharm Shastra -PtGangadharaShastri Gune
10. Rasendracintamani
11. Rasaratna samuchhaya
12. Vishavigyan - Dr. Krishna Kumar
13. Related matter of Kautilya Artha Shastra
14. Harmekhlatantra
15. Anupana manjari

16. Ayurvedprakash
 17. System of clinical Medicine
 18. Forensic Pharmacy
 19. Hand book of Forensic Medicine and toxicology
 20. Viva Forensic Medicine and toxicology
 21. Forensic Medicine and Ethics
 22. Modi's Medical Jurispudence and Toxicology
 23. The essentials of forensic medicine and toxicology
 24. Medical Laws and Ethics
 25. M.R.K. Krishnan's Handbook of Forensic Medicine
 26. Text book of Medical Jurisprudence and Toxicology
 27. Atlas of Forensic Medicine
 28. Medico legal Post Mortems (Atlas)
 29. Textbook of Forensic Medicine and Toxicology
 30. Textbook of Forensic Medicine and Toxicology
 31. Textbook of Forensic Medicine and Toxicology
 32. Textbook of Forensic Medicine and Toxicology
 33. Forensic Pathology
 34. Textbook of Forensic Medicine and Toxicology
 35. Pocket picture guide to Forensic Medicine
 36. Forensic Medicine
 37. Taylor's Principles and Practical of Medical Jurisprudence
 38. Doctor and law
 39. Textbook of Toxicology
 40. Medicine Harrison's Principal of Internal Medicine
 41. Agad Tantra
 42. Modern Medical Toxicology
 43. Critical care toxicology
 44. Diagnosis and Management of common poisoning
 45. Colour Atlas of Forensic Medicine
 46. Guidelines of poisons
 47. Doctors patients relationships
 48. Bhavaprakasha.
 49. Vishavaidya Jyotsnika -- English translation By VPSV Ayurveda college, Kottakkal.
 50. Lakshnamritham.
 51. Toxicology, Ayurvedic perspective
 52. Text book of Agadatantra
 53. Agadatantra ki Pathyapustaka
 54. Vyavahar Ayurveda Vigyanam
 55. Forensic Medicine
 56. Visha Chikitsa
 57. Park Text book of Preventive and Social Medicine.
 58. Environmental Science and Biotechnology
 59. Veterinary Toxicology
 60. Guide to Drinking Water Quality (3 Volumes)
 61. A short Text Book of Medical Entomology
- Savil
 - B.M. Mhithai
 - Dr. P.V. Chadha
 - L.C. Gupta
 - J.P. Narena

 - Dr.K.S. Narayan Reddy
 - Dr. H.S. Mehta

 - Dr. C.K. Parikh
 - Dr. Tomio Watenbe
 - Dr. Parikh and Others
 - Dr.V.V. Pillay
 - Dr. Karmakar
 - Dr. Singhal
 - Dr. Krishnan Vij
 - Dr. Bernard Knight
 - Lyon's
 - Gower's Medical Publication
 - Simpson Knight
 - J and A Churchis
 - Singhal
 -Singhal

 - Dr. Shekhar Namboodri
 - Dr. V.V.Pillay
 - Bruent Wallace
 - Agarwal wali
 - Govindaiah
 - W.H.O.
 - Dr.Lavekar

 - VPSV Ayurveda college, Kottakkal
 - Edited By Dr Huparikar, Dr. Joglekar
 - Edited By Dr Huparikar, Dr. Joglekar
 - Dr.Indramohan Jha (Sachchan)
 - Dr. B. Umadathan
 - Dr. M. Balakrishnan Nair
 - K. Park
 - Theory and Practice - A.G. Murukesan &C. Rajakumari
 - Dr. Satish K. Gargi
 - WHO Publication
 - H.S. Bhatti, R. Sehgal, R.C. Mahajan.

7. SWASTHAVRITTA

PAPER I VAIYAKTIKA SWASTHAVRITTAM SADVRITTAM CHA

Marks 100

1. Concept of holistic health according to Ayurveda.
2. Spectrum of health, Iceberg phenomenon of diseases, dimensions of health.
3. Dinacharya – Detailed accounts by Charaka, Sushruta, Vagbhata and Bhavamishra.
4. Probable Physiologic effect of Dinacharya procedures.
5. Ratricharya – Bhavamishra and other classics.
6. Day and night pattern in various countries.
7. Ritucharya – Classical description by Charaka, Sushruta, Vagbhata, BhelaSamhita and Bhavamishra.
8. Ritus prevalent in various Indian states.
9. Ritu pattern in various countries of the world.
10. Shodhana Schedule for Ritusandhis.
11. Concept of Vegas, types and the physiology behind each vega and vegadharana.
12. Ahara – Classical food items in Charaka, Sushruta, Vagbhata and Sharangadhara.
13. Aharavargas and comparison with todays' food items.
14. Staple diet of various States of India.
15. Staple diet of various countries in correlation with their climate.
16. Principles of dietetics. Balanced diet for healthy adult, adolescent, elderly people, pregnant ladies and lactating mothers.
17. Food intervention in malnutrition, under nutrition and over nutrition.
18. Rules of food intake according to Charaka, Sushruta and Vagbhata.
19. Pros and Cons of vegetarian and Non vegetarian foods.
20. Viruddhahara – Classical and modern day examples.
21. Sadvritta – Compare Charaka, Sushruta and Vagbhata .
22. Prajnaparadha – Causes, Effects and solution.
23. AcharaRasayana, Nityarasayana.
24. Rasayana procedures for Swastha
25. Vajeekarana for Swastha.
26. Mental Health and the role of Ayurveda in it.
27. Vyadhikshamatva – Modern and Ayurvedic concepts.
28. Principles of Health Education.
29. Genetics in Ayurveda and Modern Science

PAPER II SAMAJIKA SWASTHAVRITTAM (COMMUNITY HEALTH)

Marks 100

1. Concept of community health.
2. Concept of Prevention according to Ayurveda.
3. Concept of prevention according to Modern medicine. Levels of prevention. Stages of intervention.
4. Web of causation of diseases, Multifactorial causation.
5. Natural History of diseases.
6. Ecology and community health.
7. Disinfection practices for the community – Modern and Ayurvedic.
8. Immunization programmes. Possible contribution of Ayurveda.
9. Environment and community health (Bhumi, Jala, Vayu, Shuddhikarana ,Prakasha,Shabda, Vikirana)
10. Housing –W.H.O Standards. Design of Aaturalaya(hospital), Sutikagara, Kumaragara, Panchakarmagara and Mahanasa (Kitchen)
11. Disposal of Wastes- Refuse, Sewage. Methods of Sewage disposal in sewered and unsewered areas.
12. Occupational Health. Ergonomics. Role of Ayurveda in ESI.
13. Medical Entomology– Arthropods of Medical Importance and their control measures.

14. Knowledge of parasites in relation to communicable diseases.
15. School Health Services and possible contribution of Ayurveda.
16. Demography and Family Planning.
17. Family Welfare Programme and the role of Ayurveda in it.
18. Old age problems in community. Role of Ayurveda in Geriatrics.
19. Care of the disabled.
20. Life Style disorders (Non Communicable diseases) in community and the role of Ayurveda in them.
21. Health tourism. Ayurvedic Resort Management- Panchakarma and allied procedures.
22. Medical Sociology.

PAPER III SAMKRAMAKA ROGA PRATISHEDHAM EVAM SWASTHYAPRASHASANAM

Marks 100

1. Modern Concept of Epidemiology
2. Critical evaluation of Janapadodhwamsa.
3. Epidemiology of different Communicable diseases in detail.
4. General investigations for Communicable diseases
5. Sexually Transmitted Diseases and their control
6. Ayurvedic view of Samkramaka Rogas.
7. Investigation of an Epidemic
8. Control of Epidemics.
9. Host Defenses.
10. Ayurvedic methods of Vyadhikshamatva.
11. Health advice to travelers.
12. Hospital, Isolation ward and bio medical waste management
13. National Health Programmes. Contribution of Ayurveda in National Health Programmes.
14. Health administration under Ministry of H &FWD
15. AYUSH , NRHM, NUHM administration, functions and programmes.
16. National and International Health Agencies and their current activities.
17. Disaster management
18. Statistics related with Infectious diseases at International, National and State levels
19. Vital Statistics

PAPER IV YOGA AND NISARGOPACHARA

Marks 100

1. History and evolution of Yoga
2. Different Schools of Yoga
3. Rajayoga –(Ashtanga yoga) philosophy of Patanjali according to Yogasutras.
4. Hathayoga - according to Hathayogapradeepika, GherandaSamhita and Shivsanhita.
5. Karmayoga – Philosophy according to Bhagavad Gita
6. Mantrayoga, Layayoga, Jnanayoga and Bhaktiyoga.
7. Physiological effect of Yoga on Body and mind – Ancient and modern concepts.
8. Concept of Sthula, Sukshma and Karana Shariras
9. Concept of Panchakoshas
10. Concept of Shad chakras and Kundalini
11. Shad Kriyas and their therapeutic effects.
12. Therapeutic effect of yogic practice in the following diseases - Diabetes, Hypertension, Cardiovascular disorders, Obesity, Asthma, Piles, Irritable Bowel Syndrome, Eczema, Psoriasis, Stress Disorders, Eye disorders, Head Ache, Juvenile Delinquency, Mental retardation, Depression, Neurosis, Sexual Dysfunction, Uterine Disorders, Cancer.

13. Yoga in Ayurveda –Concept of moksha,Tools for Moksha,Naishtikichikitsa, TatvaSmriti, Satyabudhhi, yoginamBalamAishwaram (charakaSamhitaSharirasthana chapter 1 & 5)
14. History of Nisargopachara.
15. Basic Principles of Western School of Nature Cure
16. Basic Principles of Indian School of Nature Cure – Panchabhuta Upasana and its therapeutic utility.
17. Different types of Massage and their therapeutic effects
18. Concepts of Acupuncture and Acupressure.
19. Principles of Chromotherapy and Magnetotherapy

Scheme of Practicals

1.Health promotive and protective practices of Dinacharya procedures viz. Dantadhavana, Anjana, Nasya, Kavala, Gandusha, Dhumapana, Abhyanga, Udvartana

2) Practical Demonstration of Yoga

a) Aasanas (24)

- 1) Swastikasan
 - 2) Gomukhasan,
 - 3) Sarpasan,
 - 4) Kukuttasan,
 - 5) Uttankurmasan,
 - 6) Dhanurasan,
 - 7) Matsyendrasan,
 - 8) Mayurasan,
 - 9) Bhadrasan,
 - 10)Sinhasan,
 - 11)Sarvangasan,
 - 12)Shirshasan,
 - 13)Pavanmuktasan,
 - 14)Bhujangasan,
 - 15)SuptaVajrasan,
 - 16)Chakrasan,
 - 17)Siddhasan,
 - 18)Padmasan,
 - 19)Veerasan,
 - 20)Paschimatanasan,
 - 21)Vajrasan,
 - 22) Shavasan,
 - 23)Makarasan,
- Suryanamaskara

b) Pranayama

- 1) Nadishudhhi- AnulomVilomPranayam,
- 2) Suryabhedani,
- 3) Ujjayi,
- 4) Bhasrika,
- 5) Bhramari,
- 6) Sheetali,
- 7) Sitkari

c) Mudra

1) Viparita karani

- 2) Yoga Mudra
- 3) Maha Mudra
- 4) brahma Mudra
- 5) Ashwini mudra

d) Bandha

1) Jalandhara, uddiyana, mula bandha

e) Shuddhikriya – JalaNeti, Sutra Neti, JalaDhauti, Kapalbhata, Tratak Basti, Nauli, vastra dhauti (if possible)

3) Practical Demonstration of Naturopathy procedures

- a. MruttikaSnana
- b. Mruttika Patti
- c. Pada and Hasta Snana
- d. Bashpasnana (Steam bath)
- e. Awagahana (Immersion bath)
- f. pristasnana (Spinal bath)
- g. Katisnana(Hip bath)
- h. Alternate hot and cold bath
- i. Observe Jacuzzi and whirlpool bath at available places.

4) Long case sheets for Pathya, Apathya, Aushadhi (if needed), Yoga and Nisargopachara advice to

- a) Non communicable diseases 20
- b) Communicable diseases 10
- c) Garbhini Paricharya 10
- d) Mal Nutrition treatment cases 10
- e) Case studies of Immunization cases 10

iv) Departmental Practicals

- 1) Dantadhawana - 2
- 2) Anjana - 2
- 3) Nasya - 2
- 4) Gandusha- 2
- 5) Kavala- 2
- 6) Dhoompana – DhumavartiNirmana - 2

5) Educational Visits-

The brief report of each visit (Minimum 10 compulsory) should be written by student in a journal (Duly signed by Guide and HOD)

- 1) Water Purification Centre,
- 2) Milk Dairy,
- 3) Industry,
- 4) Leprosy Centre,
- 5) T.B. Centre,
- 6) Yoga Centre,
- 7) Naturopathy Centre,
- 8) Primary Health Center
- 9) Disposal of Waste Unit,
- 10) Sewage Disposal Unit ,
- 11) Hospital Disinfections,
- 12) Govt. Psychiatric Hospital
- 13) Isolation Hospital
- 14) A.R.T. Centre
- 15) Food and Drug Administration Centre
- 16) District /Civil Hospital

7) Field Work

- a) Active Participation in Various National Health Programmes
- b) Community Health Survey
- c) School Health Check-up (minimum 100 students)
8. Departmental duties : Regular Attendance as-

Duty in OPD and IPD with regard to Pathyapathya, Yoga and Nisargopachar.

1. Museum Development
2. Yoga training for self Swastha and patients.
3. Departmental Seminars
4. Research Journal /Article Reviews
5. Submit minimum 2 papers in any publications.
6. Practical knowledge of AharaDravya&Adulteration of Food
7. Proper planning, beginning ,completion of Thesis work under the guides
8. Micro Teaching (Training to take Lectures and Practicals of UG). Minimum 10.
9. Daily diary- Log book

Format of Practical / Oral Examination

Sr.No.	Heading of Practicals	Marks
1	Daily work book-Log book	10
2	Case Record Sheets	20
3	One Long Case (Pathya-Apathya advice)	20
4	Two Short Cases(10X2) (Yoga and naturopathy advice each)	20
5	Spotting on Instrument/Equipment/ Medicine/Solve a Problem-(10 Spots x2)	20
6	Thesis Presentation	50
7	Viva Voce	60
	Total	200

Reference Books:-

- 1) Relevant portions of Charak, Sushruta, Vagbhata (AshtangHrudaya), Ashtang Samgraha, Sarangadhara, Bhavaprakasha, Madhavanidan&Yogaratanakara, Bhela Samhita with the respective commentaries
- 1) SwasthavrittaSamuchaya –VaidyaPtRajesvarDuttaShastri
- 2) SwasthyaVignyan -Dr.B.G.Ghanekarshastri
- 3) PrakritikaChikitsa -Kedarnath Gupta
- 4) Reddy's Comprehensive Guide to Swasthavritta –Dr.P.Sudhakar Reddy
- 5) SwasthaVigyan - Dr.MukundswaroopVerma
- 6) Ayurvediya Hitopdesh - Vd.RanjitRai Desai
- 7) Yoga and Ayurveda - Dr.Rajkumar Jain
- 8) SwasthvrittaVigyan - Dr.Ramharsha Singh.
- 9) Swasthvrittam - Dr.BramhanandTripathi
- 10) AyurvediyaSwasthvrittam - Vd.Jalukar
- 11) HathayogPradipika – SwatmaramYogendra (Kaivalyadhama)
- 12)YogikYogPadhati - BharatiyaprakrutikChikitsaPadhat
- 13)YogikChikitsa - ShriKedarnath Gupta
- 14)PrakrutikChikitsaVigyan - Verma
- 15)Janasankhyashikshasidhanta evamUpadeysa - S.C.Seel
- 16)Swasthvritta - Dr.Shivkumar Gaud
- 17) Health and Familywelfare - T.L.Devraj
- 18)SachitraYogasanDarshika - Dr.IndramohanJha
- 19)Preventive and Social medicine - J.K.Park
- 20)Yogadeepika - Shri. B.K.S. Iyengar
- 21) Swasthavritta - Vd.Sakad
- 22)Positive Health - Dr.L.P.Gupta
- 23)Biogenic Secretes of Food In Ayurveda - Dr.L.P.Gupta
- 24)Yoga and Yogikchikitsa - Ramharsha Singh
- 25)The Foundation of Contempary Yoga - R.H.Singh
- 26)YogasidhantaevumSadhna - H.S.Datar

- 27) Patanjali Yoga Sutra – Maharshi Patanjali, Karambelkar
- 28) Prakritik Chikitsa Vidhi - Sharan Prasad
- 29) Text book of Swasthavritta - Dr. Ranade, Dr. Bobade, Dr. Deshpande
- 30) Gherand Samhita
- 31) Bio-Statistics - B.K. Mahajan
- 32) Swasthavrittavidnyan - Dr. Mangala Gauri
- 33) Community Medicine - Baride and Kulkarni.
- 34) Light on Yoga - Shri. B.K.S. Iyengar
- 35) Light on Pranayama - Shri. B.K.S. Iyengar
- 36) Light on Patanjala yogasutra - Shri. B.K.S. Iyengar
- 37) Shiva samhita – Kaivalyadhama
- 38) Gheranda samhita – Kaivalyadhama
- 39) Swasthavritta vigyan – Vd. Patrikar Vijay
- 40) Swasthavritta – Vd. Yashwant Patil and Vd. Vhawal
- 41) Food and nutrition – Swaminathan
- 42) Preventive and Social Medicine – Mahajan
- 42) Preventive and Social Medicine – B.N. Ghosh
- 43) Preventive and Social Medicine – Gupta
- 44) Yoga and Nisargopachar- Vd. Prama Joshi

Syllabus prepared by

1. Dr. Mihir Hajarnavis (Group leader)
2. Dr. Arpan Bhatt (Coordinator)
3. Dr. S. Venugopal Rao
4. Dr. Sajitha.K
5. Dr. Yeshwant.R. Patil
6. Dr. Poornima Krishnamurthy
7. Dr. Yashwant Chauhan.
8. Dr. Rajkumar Bobade
9. Dr. Jayan Damodaran
10. Dr. Yogeshwar Dayal Bansal
11. Dr. Sudhanshu Dutt Sharma

8. ROGA NIDANA

PAPER- I FUNDAMENTAL PRINCIPLES OF ROGANIDANA

Concept of Tridosha and its Pathological implications. 63 permutations and combination of Tridosha. Lina and Stambhita Dosha, their cause and importance in manifestation of Samprapti

Concept of Rakta as a Chaturtha Dosha. Importance of Rakta in the manifestation of diseases.

Concept of Ashrayashrayi bhava and its applied utility.

Different types of Dosha Gati.

Causative factors and practical utility of movement of Doshas from Kostha to Shakha and Shakha to Koshtha. Concept of Ashayapakarsha.

Trayo roga marga, their diseases and clinical importance of Roga Marga.

Concept and classification of Avarana, its role in pathogenesis, mode of diagnosis of Avarana and its importance in chikitsa sutra.

Applied aspect of Dhatu Poshana Krama and Dhatu Samvahana. Concept of Margaga and Sthanastha Dhatus.

Concept and applied aspects of Doshapaka and Dhatupaka

Fundamental and applied aspect of Dhatu, Upadhatu and Mala. Diseases developed due to their vitiation (pradoshaja vikara).

Concept and applied aspects of Srotas, their importance in health and diseased conditions.

Concept and applied aspects of Sroto Dushti and Khavaigunya. Understanding the various srotas which are not included in classical list of srotas but enumerated while describing the samprapti of diseases.

Description of Dosha-Dushya-Sammurchhana, Concept of Prakriti Sama Samaveta and Vikriti Vishama Samaveta Sammurchhana. Importance of Dosha-Dushya-Sammurchhana in Diagnosis and treatment.

Concept of Vikara vighata bhavabhava prativisesha.

Concept of Agni and its role in manifestation of health and disease.

Concept and pathogenesis of Ama. Contemporary interpretation of Ama and its role in pathogenesis.

Sama, Nirama stages of Dosha, Dhatu and Mala.

Understanding Samprapti of Santarpanottha and Apatarpanottha Vyadhi

Detailed classification of diseases as described in Ayurveda. Knowledge of ICD and DSM classification.

Detailed understanding of Nidan Panchaka with their classification and clinical importance.

Relation between 'Hetu & Lakshana' and 'Samprapti & Lakshna'.

Explanation and applied aspects of Kriyakala and its utility in diagnosis and treatment.

Importance of Upadrava, Arishta and Sadhyasadhyata and Udarka.

Natural History of the Diseases, concept of vyadhisankara in Ayurveda.

PAPER – II ROGA VIGYANA

Knowledge of classical Samprapti of following diseases with interpretation of Nidana Panchaka including Upadrava, Arishta and Sadhyasadhyata and Chikitsa Sutra. Knowledge of commonly occurring diseases of the respective systems mentioned in contemporary medicine and their Ayurvedic interpretation.

1. Diseases of Pranavaha srotas- Kasa - Shwasa - Hikka – Urahkshata – Shosha – Rajayakshma and Ayurvedic understanding of common clinical entities like Pneumonia, Pleural effusion, Bronchitis, Bronchiectasis, Pulmonary Tuberculosis, Bronchial Asthma.
2. Diseases of Annavaha- Pureeshavaha Srotas- Agnimandya - Ajirna - Aruchi- Chhardi, Amlapitta- Shoola, Grahani –Gulma- Udara Roga –Vibandha, Atisara – Pravahika along

- with various clinical presentations. Ayurvedic understanding of common clinical entities like Peptic Ulcer, Irritable Bowel Syndrome, Diarrhoea, Dysentery, Constipation, ulcerative colitis.
3. Diseases of Udakavaha Srotas- Trishna, Daha and knowledge of water and electrolyte imbalance disorders
 4. Diseases of Rasavaha Srotas - jwara and Ayurvedic understanding of common clinical entities like various types of Fever- Malaria, Typhoid, viral fevers. Pandu, Amavata, Hridroga, Shotha and Ayurvedic understanding of common clinical entities like Anaemia & its Classification, Rheumatic fever, Rheumatoid Arthritis, Angina, Ischaemic Heart Disease, Hypertension, Myocardial Infarction ,Congestive cardiac failure.
 5. Diseases of Raktavaha Srotas- Kamala - Raktapitta - Vatarakta – Kroshtukaseersha - Shitapitta – Maha Kushta – Visarpa – Shwitra and Kshudra Kushta and Ayurvedic understanding of common clinical entities like jaundice, hepatitis, bleeding disorders, Gout, Thrombo Angitis Obliterans (TAO), Deep Vein Thrombosis (DVT), Leukaemia, Thalessemia, Sickle cell Anaemia. Introduction to Urticaria, Psoriasis, Eczema, Pemphigus, Herpes.
 6. Diseases of Mamsavaha srotas- Introduction to Granthi, Arbuda, Galaganda and Arsha. Ayurvedic understanding of all types neoplasia and Thyroid diseases.
 7. Diseases of Medovaha srotas- Sthoulya - Karshya – Prameha and Ayurvedic understanding of common clinical entities like Obesity and Diabetes Mellitus.
 8. Diseases of Asthi - Majjavaha srotas- Sandhigatavata, Introduction to Asthi-majjaparipaka, Asthigata Vidradhi and Ayurvedic understanding of common clinical entities like Osteo- Arthritis, Osteomyelitis, Osteoporosis.
 9. Vatavyadhi-Akshepaka - Apatanaka - Ardita - Pakshaghata – Gridhrasi – Viswachi, Avabahuka, Manyasthambha – Katigraha-Pangutwa- Khanja-Khalwee and Ayurvedic understanding of common clinical entities like Hemiplegia, Parkinson's disease, Lumbago- Sciatica syndrome, Bell's Palsy, Ankylosing Spondylitis, MND and other commonly occurring neurological diseases.
 10. Diseases of Sukravaha srotas- Klaibya and Vandhyatva and understanding of male and female Infertility, Impotence.
 11. Diseases of Mutravaha srotas -Mutrakrichha – Mutraghata, Ashmari and Ayurvedic understanding of common clinical entities like Urinary Tract Infection, Urolithiasis, Nephropathies and Renal failure.
 12. Diseases of Swedavaha srotas-knowledge of khalitya, Palitya and Cosmetology.
 13. Diseases of Manovaha Srotas - Vishada, Udvega, Bhaya, Bhrama, Anidra, Mada, Murchha, Sanyasa, Apsmara, Unmada, Atatwabhinivesha and Ayurvedic understanding of common clinical entities like Depression, Anxiety neurosis, Phobia, Personality disorders.
 14. Indriya Pradoshaja Vikara.
 15. Jara janya Vyadhi: Alzheimer's Disease
 16. Concept and tools for the study of Anukta Vyadhi (Unexplained and newly emerging diseases).
 17. Understanding the concept of karmaja vyadhi

PAPER – III PARIKSHA VIGYANA

1. Introduction to Clinical methods and technique for the study of clinical examination
2. Importance of medical history taking and its importance in clinical medicine.
3. Aims, Objectives and Methods, applied aspects and importance of various Rogi and Roga Pariksha as per classics.
4. Srotas Pariksha, Shadanga Pariksha vis-à-vis general & systemic examination of patient.
5. Interpretation of Charakokta trividha pramana pariksha and Sushrutokta shadvidha pariksha with clinical methods mentioned in modern medicine.
6. Interpretation and use of ashtasthana nirikshana along with use of current tools as per Ayurveda.

7. Charakokta dashavidha and Sushrutokta Dwadashavidha pariksha along with the use of modern supportive tools for understanding of rogibala and roga bala concept to derive chikitsa sutra
8. Ayurvedic interpretation of all relevant findings of modern clinical examinations, various Laboratory and other Diagnostic tools.
9. Understanding of diagnostic procedures in medical emergencies.
10. Concept of Good clinical practice in Ayurveda and modern medicine.
11. Knowledge of standard clinical laboratory set up useful for Ayurvedic practice.
12. Knowledge of Ancillary common laboratory investigations for diagnosis of diseases, their methods, normal and abnormal values, factors influencing values and their Ayurvedic interpretations & clinical significance as mentioned in practical syllabus.
13. Importance of Bio markers and their utility in clinical researches
14. . Update knowledge of emerging diagnostic tools and technologies.
15. . Knowledge of various Ayurvedic diagnostic softwares/programmes available.
16. Avayava Pariksha – Radio- Imaging Techniques, Sonological Techniques, ECG, EEG etc and their clinical interpretation.

PAPER - IV VIKRITI VIGYANA AND JIVANU VIGYANA

1. Introduction to pathology and technique for the study of pathology
2. Cell injury and cellular adaptations
3. Immunopathology including amyloidosis and its interpretation with the concept of Ojas vis-à-vis Bala
4. Concept of Shotha versus Inflammation, oedema and healing
5. Derangement of Homeostasis and Hemodynamic disorders
6. |General character and classification of Neoplasia
7. Upasargjanya Vyadhi (Communicable diseases)- Romantika – Masurika – Upadamsha – Phirang and introduction to Syphilis, AIDS, Leprosy, Tuberculosis
8. Detail study of Krimi Vigyanam versus infectious and parasitic diseases along with their mode of infection and life cycle
9. Concept of Snayuka, Shleepada and introduction to Filariasis and classification of common parasites.
10. Concept and applied aspects of Janapadodhvasma and Environmental diseases
11. Nutritional disorders
12. Concept of genetic diseases and its interpretation in terms of Bija dosha
13. Knowledge of common Bacteria, Virus, Parasites, Fungi and their classification with their disease processes, Nutrition requirements, media and methods for culture and sensitivity

PRACTICAL DEMONSTRATION AND HANDS ON EXPERIENCE

1. Regular posting in Roga Nidana O.P.D.
2. Regular posting in Roga nidana I.P.D.
3. Regular posting in Laboratories
4. Regular posting in other departmental units and Educational Tour to update current medical knowledge
5. Laboratory record – maintenance of observation diary and laboratory record book.
6. Experience in conducting following laboratory investigations for diagnosis of diseases and their methods
 - a) Hematological, Biochemical and Serological measures, Peripheral blood film examination
 - b) Rapid diagnostic techniques.
 - c) Screening test for bleeding disorders- Platelet Count, bleeding time (BT), Clotting time (CT), Prothrombin time (PT).
 - d) Blood grouping - ABO system, Rh typing (Rhesus system)
7. Urine Examination
 - a. Ayurveda anusara mutra pariksha.

- b. Physical Examination, Chemical Examination, and Microscopic Examination
- c. Dipstix examination
- 8. Stool Examination
 - i. Ayurveda anusara purisha pariksha-Physical examination - Sama-Nirama Pariksha
 - ii. Microscopic and macroscopic examination of stool
- 9. Sputum Examination
 - i. Ayurveda pariksha anusara sthivana.
 - ii. Physical, Chemical and Microscopic Examination of the sputum.
- 10. Semen examination
 - 1) Ayurvediya anusara Retas pariksha.
 - 2) Semen examination & clinical interpretation
- 11. Biochemical tests related to various organ panels- Liver, Kidney, Heart, Thyroid, Pituitary and Bones.
- 12. Knowledge of different staining techniques in microbiology.
- 13. Knowledge of Sero-immunological Investigations: RA, Widal test, ASLO titer, ANA, Etc
- 14. Physical, chemical, microscopic, biochemical and bacteriological tests for various kinds of body aspirates
- 15. Knowledge of histopathological techniques.

BEDSIDE PRACTICAL /CLINICAL METHODS

1. Expertise in clinical methods (General and Systemic Examination).
2. Practical knowledge of examination of Roga based on Pancha Nidan.
3. Practical knowledge of instruments used for clinical examination.
4. Practical records of clinical examination of at least 30 long cases in I.P.D.
5. Practical records of clinical examination of at least 50 short cases.
6. Practical knowledge of ECG, USG and Imaging techniques and their clinical interpretation
7. Understanding of various Ayurvedic diagnostic softwares/programmes available like Ayu soft, Rudra, Ayut Nidana etc.

PATTERN OF EXAMINATION

Name of Paper	Hours of training	Marks
Paper I	100	100
Paper II	100	100
Paper III	100	100
Paper IV	100	100
Practicals:	Hospital/Laboratory duties at least 4 Hours per day	Total 200 :
Observation Diary		10
Laboratory record		10
Short Case (including Case Record)		20
Long Case (including Case Record)		30
Laboratory Work		40
Thesis Presentation		40
Viva Voce		50

REFERENCE BOOKS

1. Charaka Samhita with Various Commentaries
2. Madhava Nidana with various commentaries
3. Abhinava Vikriti Vigyana

- Acharya Raghuvir Prasad Dwivedi

- | | |
|---|---|
| 4. Doshakaranatwa Mimamsa | - Acharya P.V. Sharma |
| 5. Nadi Darshan | - Vd. Tara Shankar Mishra |
| 6. Nadi Vigyanam | - Vidyotini Hindi Tika |
| 7. Nadi Vigyan | - Shri Satya Dev Vashisht |
| 8. Nadi Vigyan | - Gangadhar Tika |
| 9. Nadi pariksha | - Vaidya VB Athavale |
| 10. Nadi Pariksha | - GP Upadhyay |
| 11. Rogi Pariksha vidhi | - Acharya Priyavrata
Sharma |
| 12. Roga Vigyan | - Dr. Vinay Kumar |
| 13. Siddanta Nidan | - Gananatha Sen |
| 14. Ayurvediya Roga Vargikaran | - Vd. Ramanath and
Vd. Gurdip Singh |
| 15. Ayurvediya Nidan Evum Chikitsa Ke Siddhanta | - Prof. Ram Harsh Singh |
| 16. Relevant portions of Charak Samhita,
Sushrut Samhita and Vagbhata | |
| 17. Clinical methods in Ayurveda | - K. R . S. Murthy |
| 18. Parameswarappa's Ayurvediya Vikriti Vigyan
and Roga Vikriti Vigyan | - Dr. P.S. Byadgi. |
| 19. Nidan Panchaka | - Prof SC Dhyani |
| 20. Samprapti lakshana yoh sambhandah | - K.Sadashiva Sharma |
| 21. Clinical Diagnosis in Ayurveda in
Roga Nidana and Vikriti Vigyana | - Vaidya Vasant Patil |
| 22. Oxford Handbook of Clinical Examination
and Practical Skills | - Oxford Handbooks |
| 23. Symptoms & Signs in Clinical Medicine | - Chamberlains |
| 24. Clinical Methods | - Hutchinson's |
| 25. Bedside Clinics in Medicine Part- I & II | - Kundu |
| 26. Practical Pathology | - Dr. K. Uma Chaturvedi |
| 27. Medical Laboratory Technology | - R. Sood |
| 28. Clinical Diagnosis and Management by
Davidson | - Todd, Sanford and
Laboratory methods |
| 29. Robbins Basic Pathology | - Kumar, Abbas, Fausto at |
| 30. Text Book of Pathology | - William Boyds. |
| 31. Text Book of Pathology | - Harsh Mohan |
| 32. Text Book of Pathology | - Dey and Dey |
| 33. Text Book of Parasitology | - Ramnik Sood |
| 34. Clinical Pathology and Bacteriology | - S.P. Gupta |
| 35. A Text Book of Microbiology | - Ananthanarayana, Panikar |

9. PRASUTI TANTRA- STREE ROGA

PAPER – I Garbhagarbhini Vigyan

1. Applied anatomy of female Genito urinary system, pelvis and Pelvic floor. Pelvic assesment and foetal skull.
2. Physiology, neuro endocrinology and pathology of puberty and Neuroendocrine control of menstrual cycle.. Artava, Rituchakra, Streebija, Pumbija.
3. Garbha sambhava samaagri, Garbhadhanam, Pre-conceptional counseling and care, Pumsavana, Garbhasya shad dhatvatmakata, Garbhavakranti, Matrijadi bhava, Garbha vriddhi, role of panchamahabhutas in the formation and development of foetus. Garbhasya avayavotpatti, Fundamentals of reproduction – gamatogenesis, Fertilization, Implantation and early development of human embryo.
4. Aparā, Garbhodaka Jarayu, Nabhinadi.
Placenta, amniotic fluid, membranes and umbilical cord -their formation, structure, Functions and abnormalities.
Garbha-poshana, Garbha shareerkriya vaishishtyam, Garbha lingotpatti, Garbha varnotpatti, Garbhasya masanumasika vriddhi.
Foetal physiology, circulation, Foetal growth and development
5. Bija – Bijabhaga – Bijabhagavayava janya garbhanga vikruthi. Genetics, Birth defects and other teratologic abnormalities
6. Garbhini nidana, sapekshanidana, Garbhakalina matrigata parivartana, lakshana, Dauhrida. Diagnosis and differential diagnosis of pregnancy, anatomical and physiological changes during pregnancy, Endocrinology related to pregnancy, Immunology of pregnancy.
7. Garbhiniparicharya, Masanumasika Pathya Apathya evum Garbha upaghatakara bhava. Ante Natal care, examination investigations and management,.
8. Garbhasankhya nirnay, Bahu apatyata, Multiple pregnancy.
9. Garbhavyapad - causes, clinical features, complications, management and treatment of Garbhasrava and Garbhapata , Upavishtaka, Nagodara / Upashushka, Lina garbha, Goodagarbha, Jarayu Dosha, Antarmrita garbha , Garbha shosha, Garbha kshaya, Bhutahrta garbha, Raktagulma.
Abortions, I.U.G.R, Intrauterine Foetal death Ectopic pregnancy and gestational trophoblastic neoplasia,
10. Garbhini vyapad – nidana panchaka and chikitsa of garbhini vyapad.
Early recognition, differential diagnosis and prompt management of pregnancy complications, Emesis and Hyperemesis gravidarium, Anaemia, Pregnancy Induced Hypertension, Pre-eclampsia, Eclampsia, Antepartum hemorrhage, Rh-incompatibility.
Management of pregnancies complicated by medical, surgical or Gynecological disorders in consultation with the concerned specialties by team approach
 - a. Pyrexia, Heart disease, Diabetes mellitus, Liver disorders, Respiratory diseases, Renal diseases, Epilepsy, Hypertensive disorders.
 - b. Fibroids, Ovarian tumors, Genital prolapse, Carcinoma Cervix.Infections in pregnancy:
Toxoplasmosis, Viral infections ,Rubella, CMV, Hepatitis-B, Herpes, Syphilis and other Sexually Transmitted Infections including HIV, Prevention of mother to child transmission of HIV infection (PMTCT).
11. Jataharini related to garbhini avastha
12. Evaluation of Foetal and maternal health in complicated pregnancies by making use of diagnostic modalities.
13. Prenatal diagnosis of fetal abnormalities and appropriate care. PNDT Act and its Implications.
14. Vishesh adhyayan of –

Ashtanghriday sharira	-	Adhyay	-1 st – Garbhavkranti
Sushrutasamhita sharira	-	Adhyay	-3 rd – Garbhavkranti
Charak Samhita sharira	-	Adhyaya	- 8 th Jatisutriya

PAPER – II Prasava – Vigyan

Prakrit prasav

1. Prasav paribhasha, Prasav kaal, Prasava prarambha karana, Prasava kalina garbha sthiti, Avi, Sutikagara.
 - a) Initiation and onset of parturition.
 - b) Examination and evaluation of patient in labour.
 - c) Physiology of labour.
 - d) Mechanism of labour.
 - e) Selection of place of delivery and labour room.
2. Prasava avastha evum paricharya
 - a) Stages of normal labour
 - b) Intrapartum maternal and foetal monitoring
 - c) Management of normal labour

Prasava vyapad

1. Etiopathogenesis, clinical features, prevention and management of Garbhasanga, vilambita prasav, Mudhagarbha and Aparasanga.
 - a. Prolonged labour
 - b. Cephalo pelvic disproportions
 - c. Malpresentation
 - d. Obstructed labour
 - e. Methods of Induction and Augmentation of labour
2. Complications of different stages of labour
3. Obstetric management of high risk Pregnancies- Pre eclamptic toxemia, Eclampsia, Diabetes, cardiac disease, asthma, Epilepsy, ante partum haemorrhage, preterm premature rupture of membranes, , Preterm, Post term, Multiple pregnancy, IUGR & HIV -AIDS
4. Still birth- diagnosis, complications and management.

Jatamatra/ Navajata shishu paricharya

1. Examination and management of neonate.
2. Management of birth asphyxia.
3. Detection of congenital malformation in newborn and timely referral for correction.

Sutika vigyana

1. Sutika Paribhasha, kala maryada, paricharya.
2. Sutika vyadhi and their chikitsa.
3. Stana sampat, Stanya utpatti, Stanya sampat, Stanya pariksha, Stanya vriddhi, kshaya and dusti karana, lakshan and its Chikitsa, stana shotha, stana vidhradhi.
4. Suppression of lactation
5. Normal and abnormal puerperium.

Obstetric shock and management

1. Raktadhana: blood transfusion and replacement of blood constituents.
2. Management of fluid and electrolyte imbalance in obstetrics.

Drugs used in obstetric practice, indications/contra indications, doses and side effects.

Vishesha Adhyayana of –

Ashtanga Hridaya Sharira Sthana 2nd Adhyaya – Garbha vyapad
Sushruta Samhita Nidana Sthana 8th Adhyaya – Mudhagarbha nidana
Sushruta Samhita Chikitsa Sthana 15th Adhyaya – Mudhagarbha Chikitsa

PAPER – III Stree Rog vigyan

1. **Disorders of menstruation and Female reproductive system.**
 - A) Congenital malformations of female genital tract
 - B) Artav dushti, artava vriddi, artava kshaya, asrigdara, anartava, and kashtartav.
 - C) Genital infections including sexually transmitted infections.
 - D) Abnormal vaginal discharges.
 - E) Arsha, Yonikanda, Gulma, Granthi, Arbuda.
 - F) Abnormal uterine bleeding, Endometriosis, fibroid uterus, Adenomyosis, Polycystic ovarian syndrome and neoplasia of female genital organs.
 - G) Endocrinological disorders affecting female reproductive system.
 - H) Somarog.
2. **Detailed study of yoni vyapad mentioned by different Acharyas with their commentaries and all possible correlations with modern gynecological diseases.**
3. **Vandhyatva**
 - A) Hetu, Bheda, Pariksha, and Chikitsa.
 - B) Detailed study of causative factors, Investigations with recent advances in management of infertility, Adoption law.
4. **Stanaroga**

Detailed study of Stanashotha, Stanakilaka and stanavidradhi, stana granthi, stanarbuda.
Examination of breast, diagnosis and differential diagnosis of breast lump.
5. **Measures of contraception**
 - A) Ayurvedic view of Garbha nirodha and Garbhapatkara yogas.
 - B) Temporary Contraception
 - C) Recent studies in the field of contraception.
 - D) National Health programme to improve maternal and Child health, social obstetrics and vital statistics (maternal and perinatal mortality).
6. **Sthanik chikitsa**

Detailed study of Pichu, Varti, Dhupan, Dhavana, Parisheka, lepa, Kalkadharana, Uttarabasti, agnikarma and kshara karma.
7. **Rajo Nirvritti** - Climacteric and menopause.
- Geriatric health care
8. **Study of modern diagnostic techniques and Investigations.**
9. **Important drugs used in Streerog.**
10. **Panchakarma in streerog**
11. **Vishesha Adhyayana of –**

Charaka Samhita Chikitsa Sthana – 30th Adhyaya - Yonivyapad Chikitsa
Sushruta Samhita Uttara Tantra - 38th Adhyaya – Yonivyapad Pratishedha
Kashyapa Samhita Kalpa Sthana - Shatapushpa Shatavari, Lashuna kalpa Adhyaya

PAPER – IV Prasuti–Streerog-Shalya Karma

General principles of Gynecological and Obstetric Surgeries. Analgesia and Anaesthesia in Obstetrics and Gynaec operative procedures.

Operative Obstetrics

Decision making, techniques, diagnosis and management of surgical complications.

Dilatation and evacuation, Hysterotomy, Provision of safe abortion services –selection of cases, technique and management of complications, septic abortion, criminal abortion, MTP Act.

Cervical encirclage.

Instrumental delivery (Forceps, vacuum extraction), Caesarean Section, Manual removal of Placenta, Caesarean Hysterectomy.

Operative gynecology

Selection of cases, technique and management of complications of minor and major gynecological procedures.

Dilatation and Curretage, Cervical cauterization.

Polypectomy, Myomectomy, Cystectomy, Oophorectomy.

Surgical sterilization procedures.

Hysterectomy.

Surgical procedures for genital prolapse.

Surgical management of benign genital neoplasm.

Recent advances in Gynaecology and obstetrics – Diagnostic and therapeutics

Shock and its management, Blood Transfusion, Fluid and electrolyte imbalance, Fluid therapy.

Record keeping, ethical and legal issues involved in obstetrics and gynaecology.

Medico-legal aspects – ethics, communication and counselling in obstetrics and Gynecology

Intensive care in Obstetrics and Gynecology.

Content of Practical

1. Practical training to conduct
 - Normal and Complicated deliveries
 - Assisted/ Instrumental deliveries
 - Caesarean Section
 - Neonatal resuscitation
2. Practical knowledge of grabhini pricharya, sutika pricharya and masaanumasik garbha vriddhi.
3. Practical training to perform obstetrical and Gynaecological Surgery
4. Practical training to provide family welfare/ Planning services, safe abortion methods along with surgical sterilization.
5. Practical knowledge and practice of all relevant equipment, Procedures, complications, Emergencies with their management.
6. Practical knowledge of Yogasanas and pranayam useful in Stree rog and Prasuti tantra.
7. Practical knowledge of Panchakarma and Sthanik Chikitsa used in Stree Rog and Prasuti Tantra.
8. Practical Knowledge of recent advances in Gynaecology and obstetrics.

Pattern of Practical Examination

- | | |
|--|------------|
| 1. Practical Record Book | - 20 Marks |
| 2. Bed side examination | |
| Short Case | - 20 Marks |
| Long Case | - 40 Marks |
| 3. Identification of the Instruments/x-ray/USG plate | - 20 Marks |
| 4. Thesis Presentation | - 50 Marks |
| 5. Viva Voce | - 50 Marks |

Reference Books-

1. Related matter from all the samhitas and their commentaries.
2. Prasuti tantra evum stree roga by prof Tewari P V
3. Concepts of gynecology Dr Nirmala G Joshi.
4. Prasuti Tantra Prof. M. Dwivedi
5. Stree roga vigyan - Dr VNK Usha
6. Navya prasuti Vigyan Dr Pooja Bharadwaja
7. Text book of gynaecology-Berek and Novak.
8. Text book of obstetrics- Williams
9. Text book of obstetrics- D C Dutta
10. Text book of gynaecology - D C Dutta
11. Gabbe's normal and problem pregnancies.
12. Human embryology by Sandler.
13. Jeffcoat's principles of gynaecology
14. Te linde's gynaecological surgery.

10. KAUMARBHRITYA-BALA ROGA

PAPER – I Bija, Garbha Vigyaniya (Human Genetics, Embryology)

Marks: 100

A. Prakrita Bija-Bijabhaga-Bijabhagavayava evam Tadjanya Vikriti (Genetics and related disorders)

1. Ayurvedic genetics with modern interpretations: Shukra, Shonita, Shukra Shonita Doshas, Bija-Bijabhaga-Bijabhagavayava Vikriti, Matrija and Pitraja Bhavas, Yajjah Purushiya and Atulyagotriya; Measures for obtaining good progeny.
2. Modern genetics
Basic concepts:
 1. Cell, cell division, nucleus, DNA, chromosomes, classification, karyotype, molecular and cytogenetics, structure of gene, and molecular Screening.
 2. Human Chromosomes - Structure, number and classification, methods of chromosome preparation, banding patterns.
 3. Single gene pattern inheritance: Autosomal & Sex chromosomal pattern of inheritance, Intermediate pattern and multiple alleles, Mutations, Non Mendelian inheritance, mitochondrial inheritance, Genomic imprinting, parental disomy.
 4. Criteria for multi-factorial inheritance.

Pathogenesis

1. Pathogenesis of chromosomal aberrations and their effects, recombinant DNA, genetic inheritance, inborn errors of metabolism
2. Chromosomal abnormalities: Autosomal & Sex chromosomal abnormalities, syndromes
3. Multifactorial pattern of inheritance: Teratology, Cancer Genetics – Haematological malignancies, Pharmacogenetics.
4. Chromosomal disorders
5. Chromosomal aberration (Klinefelter, Turner and Down's syndrome)
6. Genetic Counseling, Ethics and Genetics.

B. Prakrita Bija-Bijabhaga-Bijabhagavayava evam Tadjanya Vikriti (Genetics and related disorders)

1. Garbha (embryo), Garbhawastha (gestation period), sperm, ovum; spermatogenesis; oogenesis; structure of ovum
2. Sperm in the male genital tract; sperm in the female genital tract, activation and capacitation of sperm.
3. Garbha Masanumasika Vriddhi evam Vikasa (Ayurvedic and modern concepts of Embryo and Fetal development)
 - First week of development
 - Second week of development
 - Third week of development
 - Fourth to eighth week of development (Embryonic period)
 - Development from third month till birth (Fetal period)
4. Formation of Prakriti, their assessment in children viz. Bala, Kumara, Yauvana; Pathya-Apathya according to Prakriti.
5. Aparā (Placenta) Aparā Nirmana (Formation of placenta), Aparā Karya (Functions of placenta); Aparā Vikara (Placental abnormalities)
6. Nabhinadi (Umbilical Cord)
Formation and features of umbilical cord
7. Garbha Poshana (Nutrition- from conception to birth)
8. Yamala Garbha(twins)

9. Garbha Vriddhikara Bhavas, Garbhopaghatkara Bhavas.
10. Effect of maternal medication, diet and illness over fetus.
11. Teratology including defects of bija, atma karma, kal, ashaya etc.: causative factors for teratogenicity, mode of actions of teratogenes, critical periods
12. Perinatal Care and Perinatal complications
13. Scientific study of Jataharini specific to children.
14. Prenatal diagnosis
15. Samanya Janmajata Vikara (Common congenital anomalies of different systems): Sahaja Hridaya Vikara (Congenital Cardiac Disorders) Jalashirshaka (Hydrocephalus), Khandaoushtha (cleft lip), Khanda-Talu (cleft palate), Sanniruddha Guda (Anal stricture / imperforated anus), Pada-Vikriti (Talipes equinovarus and valgus), Tracheoesophageal Fistula (TOF), Spina bifida, Meningocele, Meningomyelocele, Pyloric Stenosis.

PAPER-II Navajata Shishu Vigyan evam Poshana

Marks: 100

PART-A

1. Navajata Shishu Paribhasha, Vargikarana (Important definitions and classification related to neonates.)
2. Navajata Shishu Paricharya evam Prana-Pratyagamana (Care of the newborn including recent methodology for the resuscitation)
3. Samanya Navajata Shishu Paricharya (General Neonatal Care –Labour room onwards)
4. Samaya purva evam Samaya pashchat Jata Shishu Paricharya (Management of preterm, post term and IUGR newborn)
5. Prasava Kalina Abhighataja Vyadhi (Birth injuries): Upashirshaka (Caput , cephalohematoma), Bhagna (Fractures), Mastishkantargata Raktasrava (ICH, IVH, Subdural hemorrhage)
6. Navajata Shishu Parikshana (Examination of new born): Ayu Parikshana (including Lakshanadhyaya) Modern approach of Neonatal Examination including gestational age assessment
7. Kumaragara: Navajata Shishu Kaksha Prabandhana (Nursery management), NICU, Nursery plan, staff pattern, medical records, Visankramnikarana (sterilization), Knowledge of equipments used in nursery.

PART-B

8. Navajata Shishu Vyadhi (Early neonatal disorders): Hypothermia, Shvasavarodha (Asphyxia Neonatorum/Respiratory distress), Ulvaka (Aspiration pneumonia), Rakta Vishamayata (Neonatal septicemia), Kamala (Neonatal Jaundice), Akshepaka (Neonatal convulsion), Pandu (Anemia), Atisara (Diarrhea), Asamyaka Nabhinal kartanjanya vyadhi.
9. Navajata Kshudra Vikara (Minor neonatal ailments): Chhardi (Vomiting), Vibandha (constipation), Udara shul (Infantile colic), Puya Sphota (Pyoderma), Shishu Netrabhishyanda (Ophthalmia neonatorum).
10. Sadyojatasya Atyayayika Chikitsa (Management of neonatal emergencies): Shock, Fluid and electrolyte imbalance, Convulsion, Hemorrhagic diseases of Newborn etc.
11. Procedures: Shiro-Pichu, Abhyanga, Parisheka, Pralepa, Garbhodaka Vamana (Stomach wash), Ashchytana Neonatal resuscitation techniques, Blood sampling, Intravenous canulation, Umbilical vein catheterization, Bone marrow aspiration, Phototherapy, Naso-Gastric tube insertion, Urethral catheterization, Exchange blood transfusion, Thoracocentesis, Bone marrow infusion, Lumbar puncture
12. Nutrition:
 - A. Navjat Shishu Ahara (Neonatal feeding):

1. Specific Feeding methodology as per Ayurveda and recent advances; Day to day fluid, milk, caloric requirement for the newborn, feeding technique for the preterm baby.
2. Stanyotpatti and Prasruti (Lactation physiology), Stanya Samghatana (Composition of breast milk), Stana Sampat (Characteristics of normal breast), Stanya Sampata evam Mahatva (Properties & importance of pure milk), Stanya-Piyusha (Colostrum); Stanya-Pana-Vidhi (Method for breast milk feeding), Stanyakshaya / Stanyanasha (Inadequate production and absence of breast milk), Stanya parikshana (Examination of breast milk), Stanyabhava Pathya Vyavastha (Alternative feeding methods in absence of breast milk), Various feeding methods, TPN(Total Parenteral Nutrition)
3. Stanyadosha (Vitiating of Breast milk), Stanya Shodhana (Purification of breast milk), Stanya Janana and Vardhanopakrama (Methods to enhance breast milk formation)
4. Dhatri (Wet nurse): Dhatri Guna and Dosha (Characteristics of Wet nurse), Concept of Breast Milk Banking.
5. Lehana (Elucturies)

B Bala-Poshana (Child Nutrition):

6. Daily requirements of nutrients for infant and children
7. Common food sources
8. Satmya and Asatmya Ahara (Compatible and incompatible diet)
9. Pathya evam Apathya Ahara (Congenial and non-congenial diet)
10. Stanyapanayana (Weaning)

PAPER-III Balrog (Pediatric Disorders)

Marks: 100

PART-A

1. Pranvaha Srotasjanya Vyadhi (Respiratory disorders)- Kasa (Cough), Shvasa (Respiratory distress Syndrome), Tamaka Shwasa (Childhood Asthma), Bronchiolitis, Shvasanaka Jwara (Pneumonia- bacterial, viral etc) Rajyakshma (tuberculosis), Vaksha-Puyata (Pyothorax), Vaksha Vata-Purnata (Pneumothorax)
2. Annavaha Srotasjanya Vyadhi (Gastrointestinal disorders): Jwar (Fever), Chhardi (Vomiting) Ajirna (Indigestion), Kshiralsaka, Atisara (Diarrhea), Pravahika, Vibandha (Constipation, Udarshula (Pain in abdomen), Guda bhramsh (Rectal prolapse)
3. Rasa evam Raktavaha Srotasjanya Vyadhi (Hematological and circulatory disorders): Pandu (Anemia and its various types like Nutritional, haemolytic etc.) and , Raktapitta (Bleeding disorders), Vishishta Hridrog (Specific cardiac diseases- RHD etc), Hypertension, Leukemia.
4. Mamsavaha Srotasjanya Vyadhi: Myopathies
5. Mutravaha srotasjanya Vyadhi (Urinary System disorders): Vrikkashotha (Glomerulonephritis and nephrotic syndrome), Mutrakriccha (Dysuria), Mutraghata (Anuria),
6. Vataavaha Sansthanjanya Vyadhi (Nervous system disorders): Apasmara (Epilepsy), Mastulunga-Kshaya, Mastishka-Shotha (Encephalitis), Mastishkavrana-Shotha (Meningitis),
7. Pediatric disabilities and Rehabilitation: Cerebral palsy, Ardita (Facial paralysis), Pakshavadha (Hemiplegia), Ekangaghata (Monoplegia), Adharanga Vayu (diplegia), Amavata (Juvenile Rheumatoid arthritis)
8. Manovaha Srotasa Vyadhi: Breath holding spell, Shayya mutra (Bed wetting), Autism, ADHD (Attention Deficit and hyperactive disorders), Learning Disability, Mental retardation, Temper tantrum, Pica.

PART-B

9. Antahsravi evam Chayapachayajanya Rog (Endocrine and Metabolic disorders)

10. Kuposhanjanya Vyadhi (Nutritional disorders): Karshya-Phakka-Balshosha-Parigarbhika (PEM and allied disorders), Vitamin-mineral and trace elements deficiency disorders, Hypervitaminosis,
11. Krimi evam Aupsargika Rog (Infestations and Infections): Krimi (Giardiasis and intestinal helminthiasis, Amoebiasis) Common bacterial, viral infections with special reference to vaccine-preventable diseases: Rohini (Diphtheria), Whooping cough, Aptanaka (Tetanus including neonatal tetanus), Romantika (Measles), Karnamula Shotha (Mumps), Rubella and Masurika (Chickenpox), Antrika Jwar (Typhoid and Paratyphoid), Viral Hepatitis,;; Vishama Jwar (Malaria) and Kala-azar, Dengu fever, HIV (AIDS), Poliomyelitis, Mastishkavaran Shotha (Meningitis), Mastishka Shotha (Encephalitis), Chickengunia
12. Tvaka Vikara (Skin disorders): Ahiputana (Napkin Rashes), Shakuni (Impetigo), Sidhma, Pama, Vicharchika, Charmadal (Infantile atopic dermatitis), Gudakutta.
13. Anya Vyadhyi (Miscellaneous disorders): Jalodar (Ascites), Gandamala, Apachi (Cervical lymphadenitis), Kukunakadi Akshi Rog, Hodgkin & non-Hodgkin Lymphoma, Abnormal growth patterns, Short stature, Niruddha prakash (Phimosis), Paridagdha Chhavi, Utpullika
14. Samghata- Bala Pravrita Rog (damstra): Dog bite. Snake bite, Scorpion bite etc
15. Atyayika Balarog Prabandhana (Pediatric emergency management): Shock and Anaphylaxis, Fluid and electrolyte management, Drowning, Foreign body aspiration, Status epilepticus, Acute hemorrhage, Acute renal failure, Febrile convulsion, Status asthmaticus, Burn, Acute Poisoning
16. Balagraha: Scientific study of Graha Rogs
17. Life Style disorders

PAPER-IV Kaumarabhritya in Ancient Classics and recent Advances Marks: 100

1. Significant contributions of Kashyapa samhita, Arogya raksha Kalpadrum and other texts /treatises of Ayurveda such as Harita Samhitain the field of Kaumarbhritya including relevant parts from Brihatrai
2. Panchakarma: Principles of Panchakarma [Swedan–Hasta–Pata sweda etc], and their application in pediatric practice in detail.
3. Update knowledge of clinical pediatrics including recent researches in Kaumarbhritya.
4. Fundamentals of Hospital management with special emphases on Pediatric Ward.

Practical/ Clinical Exposure for (Record of exposures to be produced at the practical examination)

1. Full term, preterm, post term new born baby care
2. Practical procedures like – phototherapy, premature baby care, KMC, venepuncture, cord blood sampling, stomach wash, suction, resuscitation, etc.
3. Practical skill of Pediatric Panchakarma procedures
4. Child Health Check up
5. IQ Assessment of Children
6. Exposure to National Health Programs related to Children, including Immunization Program.
7. Patient case Records (50 Records)
8. Practical knowledge of modern diagnostic (invasive & non invasive) tools and techniques used in pediatrics.
9. Management of common pediatrics emergencies.
10. Participation in UG teaching/training from UG syllabus via A-V aids (minimum-3)
11. Minimum 15 days compulsory reciprocal exposures in Kaumarbhritya department of other institution during the study period.
12. Participation in National/international seminars
13. Publication/acceptance of two research papers in indexed/peer reviewed/ISSN journals from the dissertation.

Pattern of practical examination:

- | | |
|--|-----------|
| 1. Case record | -15 Marks |
| 2. Bed side examination | |
| a) Short Case | -15 Marks |
| b) Long Case | -25 Marks |
| 3. Identification of instruments/ spotting | -10 Marks |
| 4. Lecture/Dissertation Presentation | -10 Marks |
| 5. Viva-voce | -25 Marks |

Reference Books

1. Kashyapa Samhita Complete Hindi translation by Satyapal Vidhyalankara English translation by Prof. Premvati Tiwari
2. Principles & practice of Pediatrics in Ayurveda: CHS Shastry
3. Child Health Care in Ayurveda: Abhimanyu Kumar
4. Ayurvedic Concepts of human Embryology: Abhimanyu Kumar
5. Kaumarbhritya by Prof. D.N. Mishra
6. Kaumarbhritya Ke Antargata Balgraho Ka Kramika Evam Vaigyanika Adhyana by Prof. Chanchal Sharma
7. Notes on Kaumarbhritya-by Dr. Dinesh K S
8. Pran - Pratyagamanam-by Dr. B.M. Singh
9. Ayurveda Dwara Matra Evam Shishu Paricharya by Dr. KS Patel, V.K. Kori & Rajgopal S
10. Kaumarbhritya related references from Charaka Samhita, Sushruta Samhita Vagbhata etc.
11. Clinical Methods in Paediatrics by Meharban Singh
12. Pediatrics Emergencies by Meharban Singh
13. Essential Pediatrics O.P. Ghai
14. Text Book of Pediatrics Nelson
15. Care of New Born by Meharban Singh

11. KAYACHIKITSA

PAPER- I Fundamentals of Kayachikitsa

100 marks

1. Rogi-Roga Pariksha: Nidan Panchak, Trividha pariksha, Ashtavidhpariksha, Dashvidhpariksha in the light of recent advances. Clinical methods-Detailed history taking and patient examination, Systemic examination as per ayurveda and recent advances.
2. Interpretation of common investigations: ECG, Echo cardiography, TMT, Spirometry, X-ray, USG, CT-Scan, MRI, EEG, EMG, in different pathological conditions.
3. Detailed Knowledge of Principles of Chikitsa in Ayurveda. Types of Chikitsa. Principles and practices of Rasayana and Vajikarna.
4. National Health Programmes and prospective role of Ayurveda services and therapeutics in them.
5. Medical ethics, Common laws and regulations applicable to clinical practice.
6. Elaborate knowledge of undertaking common medical procedures like Ryle's tube feeding, tapping, transfusions, catheterization, tractions.
7. Ayurveda Dietetics: importance of Pathya, Apathya and Anupana.
8. Drug-drug interactions and adverse drug reactions, Iatrogenic disorders.

PAPER – II Samanya Roga Chikitsa

100 marks

Nidana/ Chikitsa including Nidana Parivarjana, Pathya, Apathaya, Chikitsa siddhanta, Shamana, Shodhana, Panchakarma, Rasayana and Atyayika Chikitsa (Anupana, Drug/Non-drug) as per Ayurvedic and conventional therapeutics of following Srotogata vyadhi:

1. Pranavahasrotas: Shwasa, Hikka, Kasa, Rajayakshma, Hridroga, Parshwashoola, Urakshata, Svarabheda
Cardio-respiratory system: Bronchitis, Bronchiactasis, Bronchial asthma, COPD, Cor-pulmonale, Pneumonias, Occupational lung diseases, Pulmonary tuberculosis, Congenital Heart disorders, IHD, RHD- Valvular diseases, Cardiac failures, Cardiomyopathy, Pericarditis, Endocarditis, Hypertension,.
2. Annavahasrotas: Agnimandya, Ajirna, Aruchi, Amadosha, Amlapitta, Chhardhi, Shoola, Grahani.
Gastrointestinal disorders: GERD, APD, Malabsorption Syndrome,
3. Udakavahasrotas: Trishna, Shotha, Udararoga, water and electrolyte imbalance
4. Rasavaha srotas: Jwara, Amavata, Pandu, Madatyaya, Anaemias, Rheumatoid arthritis, Substance abuse disorders.
5. Raktavaha Srotas: Raktapitta, Kamala, Vatarakta, Kushtha, Kshudraroga, Sheetpitta, Udarda, Kotha, Visarpa, Shvitra. Haemopoeitic disorders, Bleeding and Coagulation disorders, Leukaemias, Thrombocytopenia, Disorders of Bone Marrow, Hepatobiliary disorders, Hepatitis, Cirrhosis, Cholecystitis, Liver abscess, Jaundice, Dermatological disorders, Parasitic, Infective, Allergic, Autoimmune skin disorders, Eczemas,
6. Mamsa-Medovahasrotas: Medoroga, Sthaulya, Prameha, Galaganda, Gandamala, Urustambha, Diabetes mellitus, over weight .
7. Asthi-Majjha vahasrotas: Asthikshaya, Sandhigatavata, Osteoarthritis, Osteopenia
8. Shukravahasrotas: Such as Kalibya, Dwajabhanga. Impotence
9. Mutravahasrotas: Mutrakricchra, Mutraghata, Ashmari, Urinary disorders: UTI, Lithiasis, ARF, CRF, Uraemia, BPH.
10. Purishvaha srotas: Atisara, Pravahika, Anaha, Adhamana, Krimi, Udavarta, Enteritis, Dysenteries, Ulcerative colitis, IBS, Worm infestation.

PAPER – III Vishishta Roga Chikitsa

100 marks.

Comprehensive knowledge of etiology, demography, pathogenesis, symptomatology, complications, investigations, diagnosis and drug/non-drug management of following diseases as per Ayurveda/ Conventional therapeutics:

1. Vata-Vyadhi- Pakshavadha, Adharanga Vata, Sarvanga Vata, Ananta Vata, Gata Vata, Gridhrasi, Ardita, Akshepaka, Apatantraka, Ekangvata, Vishvachi, Avabahuka, Avarana.
Musculoskeletal disorders: Myopathies, G B Syndrome, Muscular dystrophies, Lumbago
Neurological disorders: Neurodegenerative disorders like Alzheimer's, Parkinsonism, CVA, Neuropathies, Facial palsy, Motor Neuron Diseases, Epilepsy, Sciatica.
2. Sankramakroga: Sheetala, Masoorika, Updansha, Phiranga, Gonorrhoea, Chancroids, Syphilis,
3. Manasa vyadhi; Unmada, Apasmara, Atatvavinivesha, Mada, Moorcha, Sanyasa.
Common psychiatric disorders: Classification of psychiatric ailments. Disorders of thought like Schizophrenia. Disorders of Mood like Mania, Depression. Neurosis, personality disorders, psychosexual disorders.
4. Metabolic disorders: Gout, Dyslipidaemia, Atherosclerosis, Obesity.
5. Endocrinal disorders; Disorders of Pituitary, Thyroid, Adrenal Medulla, Reproductive hormones.
6. Parasitic/Infective/Communicable disorders: Shlipada, Filariasis, Vishama Jvara, Malaria, Manthara Jwara, Enteric Fever, Dengue, Chickenpox, Measles, Influenza, Kalaazar, Mumps, Rabies, Poliomyelitis, Plague, Meningitis, Encephalitis, Chickungunya, HIV/AIDs, Common worm infestations.
7. Common neoplastic disorders and their management strategies. Role of Ayurveda medicines in cancer care including palliative care.
8. Autoimmune diseases: Myopathies, Rheumatic fever, SLE.
9. Common poisonings and their management like Insecticide/Pesticide poisoning, Snake poisoning, Vegetable and chemical poisoning.
10. Janapadodhvasa Vikara. Environmental diseases and their management.

PAPER – IV Advances in Kayachikitsa

100 Marks.

Critical care medicine, Management of medical emergencies, ICU services, Field medical services

1. Hospital management strategies, Infrastructure, use of IT technology, essential manpower, equipment, Patient care, management and coordination with contemporary health institutions and field institutions.
2. National Health Campaigns of AYUSH and components under NRHM.
3. Clinical Research in Kayachikitsa and its application in clinical medicine as per new evidence base in different systemic disorders.
4. New emerging health challenges and ayurvedic medicines: Chickangunya, HIV/AIDs, Swineflu, Chickenflu, Dengue, Restless leg syndrome, Sick building syndrome, Fibromyalgia.
5. Role of Ayurveda in immune-protection, immuno-modulation and in management of other allergies and immunological disorders.
6. Indications and importance of Organ transplantation, Ethical and legal issues involved.
7. Knowledge of Geriatric care and terminal care medicine.
8. Basic knowledge of Gene therapy, Stem cell therapy, Genetic modeling and chromosomal disorders in different disease conditions.
9. Radio-isotopes, disease and tumor markers in diagnosis and assessment of therapy.
10. Scope and methods of independent and collaborative research in Kayachikitsa.
11. Disaster management strategies.
12. Application of advances in Rasayana and Vajikarana therapies
13. Application of emerging trends in Panchakarma in medical management.
14. Physical medication and rehabilitation.

PRACTICALS

Practicals shall be held to evaluate the patient care, diagnostic and treatment expertise of the student. It should also be taken as a chance to evaluate the clinical skills.

Clinical Ability Evaluation-60 marks based on

- | | |
|--|-----------|
| 1. Case records of 40 IPD Patients in Detail | 10 marks |
| 2. Long case History-1: | 20 Marks |
| 3. Short Case history-1 : | 10 Marks |
| 4. Medical procedures demonstration/ Panchakarma procedure | 20 Marks. |
- Academic Competence evaluation- 40 marks based on:
- | | |
|---------------------------------------|-----------|
| 1. Viva | 30 Marks. |
| 2. Teaching and communication skills: | 10 Marks. |

Reference Books

1. Relevant portions of Brihatrayi and Laghutrayi with commentaries
2. Cikitsadarsha- Pandit Rajeshvar Dutta Shastri
3. Kayachikitsa - Ramaraksha Pathak
4. Rog Pariksha Vidhi - Priyavrat Sharma
5. Panchakarma Vigyan - Haridas Sridhar Kasture
6. Ayurvediya Nidana- Chikitsa Siddhanta - Prof. R.H.Singh.
7. Kayachikitsa Vol. 1 and 2 - Prof. R.H.Singh.
8. The Holistic Principles of Ayurvedic Medicine - Prof. R.H.Singh.
9. Essentials of Kayachikitsa -II, Vol. 1 - Dr. Aruna
10. Kayachikitsa Vol. I-IV. - Prof. Ajay Kumar
11. Panchakarma Therapy - Prof.R.H.Singh
12. Panchakarma Illustrated -Prof.G.Shrinivasa Acharya
13. Practice of Ayurvedic Medicine(Kayachikitsa) -Prof.A.K.Tripathi
14. Nidanachikitsa Hastamalaka - Prof. R.R.Desai
15. Clinical Methods in Ayurveda - Prof. K.R. Srikantamurthy
16. Aushadhi Gunadharm Shastra - Gangadhar shastri Gune
17. Introduction to Kayachikitsa - Prof. C. Dwarakanath
18. Samprapti lakshnanayoh Sambandhah - Prof.Sadashiv Sharma
19. Nidana Panchak - Prof.S.C.Dhyani
20. Kayachikitsa - Prof.S.C.Dhyani
21. Davidson's Principles and Practice of Medicine.
22. API Text Book of Medicine.
23. Harrison's Text Book of Medicine.
24. Cecil Text Book of Medicine.
25. Relevant texts of concerned subjects.

12. MANOVIGYAN AVUM MANASAROGA

PAPER-I Manovyapara Evam Manovigyanam

Marks 100

1. Prachya - arvachya matanusara Mano vigyanasya Bhutavidyayah, Amanusha tatha Grahadinam parichaya, setihasa.
2. Prachya arvachya matanusara Manasah Nirupanam-Concept of Manas from Ayurved and modern perspective.
3. Vividha darshananusara Manasah varnanam.-concept of mind in various philosophies.
4. Manasah Svarupam – Structure of mind, Manasah Sthanam- Location of mind, Manovishayah- Objects of mind, Manogunah (Anutva and Ekatva) –Attributes of mind- Minuteness and oneness, Manasah Ubhayatmakatvam-Duality of Manas, Manasah Dravyatvam Karanatvam cha- mind as a substance and tool,Manasah Karanadravyatvam-mind as causative substance,Manodoshah- (Rajas and Tamas),Manasah Bhoutikatvam- Elemental nature of Manas Introduction to concept of Buddhi and Ahamkara - intellect and ego, Manasah Ahamkarikatvam –origin of mind from ego (samkhya),Manasah Annamayatvam- Relationship between food and mind,Manasah trigunatmakatvam(Sattva,Rajas, Tamas)- mind and the three major attributes,Manasah jadatvam- inertia of mind, Manasah dhatutvam-mind as a component of living being, Manasah Karma- Actions of Manas.
5. Manovyapara Nirupanam.
6. Manovyapare Pranodana sadhaka Bodhakadi Doshanam Sambandhah-Relation of humoral fractions such as Prana, Udana, Sadhaka- Bodhaka in the activity of Manas, Concept of Ojas and Manas
7. Katham prakopayanti ManoDoshah SharirDoshan?- How does manasika Doshas aggravate sharirika Doshas?
8. Indriya panchapanchakam- five factors in relation to the mental faculties.
9. Gyanendriyanam vishayah- the objects of sense faculties.
10. Gyanotpatti prakriyayam Manaso pradhanyam- Importance of Manas in cognitive process.
11. Indriyarthagrahananantaram Manasah vyapara avum gyanotpattou manaso dayitvam - Action of Manas in cognition after reception by respective Indriya.
12. Knowledge of Dirgha Shashkuli nyaya, Alata-chakra nyaya, Vichi-taranga nyaya, Kadamba-mukula nyaya.
13. Shabda – sparsha – rupa – rasa – gandhanam grahakam manah, tasya mahatvam cha - Manas as conductor of sense objects and its importance.
14. Vayuh indriyanam udyojakah tatha Manasah preranam -Vayu as stimulator of indriya and initiator of manas.
15. Vakpravrittou Manasah yogadanam - Role of Manas in production of speech.
16. Pratisharire Manasah bhinnatvam - Concept of individuality of mind.
17. Chikitsya purushah- treatable person (living being).
18. Atma nirupanam- description of Atma, Sukshma sharirsya varnanam- description of subtle body, Atma manasoh sambandhah- relation between Manas and Atma.
19. Antah karana chatusthaya (the four internal faculties).
20. Importance of Dhi, Dhriti and Smriti- importance of intellect, retention power and memory.
21. Role of manas in achieving Tri eshana and Chaturvidha Purushartha/chatur varga- role of manas in attaining the pursuits and four goals of life.
22. Concept of Satyabuddhi, Ritambhara Pragya and Upadha- concept of true and false knowledge.
23. Concept of Punarjanma, Purvajanmakrita karma, Karmaphala.
24. Manovaha Srotasam Parichaya– Introduction of Manovaha srotas(channels of mind)
25. Manovaha, Samgyavaha, Buddhivaha, Chetanavaha, Chetovaha, Vatavaha, Raktavaha adi upayukta Srotasam Manasroge varnanam- Description of Manovaha,

- Sangyavaha, Buddhivaha, Chetanavaha, Vatavaha, Raktavaha srotas etc in relation to Manasroga
26. Shatchakra nirupanam.
 27. Sattvasara purusha- person with mental excellence.
 28. Nidravichara- Concept of sleep, Swapna vichara- Concept of dream, Tandravichara – Concept of drowsiness.
 29. Concept of manasprakriti- mental temperament, Concept of Manasa bhava in Shareerika prakriti.
 30. Manasaroge Manovigyane cha upayukta Paribhashika shabdanam vishleshanam- technical terms used in psychology and psychiatry
 31. Manas roge upayukta Samhitanam satika adhyayanam- study of portions of treatises useful in psychiatry along with their commentary.
 32. Arvachina mano viganasya adhishtana siddhantah, mastishka karmanam sthapanam cha-Fundamentals of modern psychology and functions of brain.
 33. Applied Neuro-anatomy and physiology, Neurotransmitters, Psychoneuro immuno endocrinology
 34. Manasah swabhavika pratirodhah - Defence mechanism of mind.
 35. Shishu manas-shastra, vikasatmaka Manas-shastra – Shishu, Bala, Kumarah, Proudah, Vriddhah cha- Essential elements of psychology, developmental psychology: child, adolescence, adult and aged.
 36. Bhava, Sheela, Buddhi, Smriti, Prerakatva adinam gyanam -Concept of Mood, behaviour, attitude, emotions, intelligence, memory, motivation, perception etc.
 37. Manas Swasthya Evam Manoroganam Paribhasha – Definition of Mental Health and psychiatric disorders.
 38. Manasrogvigyansya mahatvam, phalam, prayojanam, prabhavashcha

PAPER –II Manovaiikariki Evam Bhutavidya

Marks 100

1. Manovega, Mano vikarah, ManoDoshah, ManaSharirayoh paraspara anuvaidhayitvam- mutual symbiosis of sharir and manas, Manasah chanchalatvam, Manaso vyadhinam ashrayatvam, Manasrogeshu Doshanam paraspara anubandhah, Manasvyadhi utpattou sharirDoshanam vikarakaritam, Indriyadinam hinamithyatiyogah. Prajnaparadha, Purva janma krita karma tatha Papa karmasya rogkarakatvam, Adharmasya Achararasayana upekshanasya cha rogkarakatvam.

Bhutavidya – Definition and scope with applied aspects: Divergent views

1. Types and Characteristic features of Bhuta and Graha, Amanushopasarga Vikara caused by Bhuta and Graha, Aetio-pathogenesis of Bhuta and Graha
2. Relationship of Bhuta with Jwara, Ojakshaya, Manovikara, Arishta Lakshana and Daivabala Pravritta diseases.
3. Grahavesha, affecting time of Graha, their specific features, prodromal features and prognosis.
4. Differential understanding of Balagraha and Grahabadha.
5. Sushrut's concept of invasion of Bhuta/Graha.
6. Manas Rognam Nidan, Sampraptischa
7. Manobuddhyadi Vibhramsha
8. Manas dharaniya vega.
9. Kayika-Vachika-Manasika karma hinamithyati yoga in Manasa roga samprapti.

Manovikriti –Psychopathology

1. Bijapradosha and Kulaja bhava in manas roga -Genetics and hereditary factors in Psychiatry.
2. Manas roganam prachya arvachina matanusarena vargikaranam
3. Classification of manas rogas yatha kevalamanas, manas sharir, shariramanasika, agantuja adayah
4. Understanding of Parapsychology and its role in overt psychiatric disorders.
5. Recent ICD and DSM classification

Manas Rogi pariksha vidhi- Psychiatric examination

1. Prachya arvachina matanusarena rogi pariksha visheshena sattva pariksha – Examination of patient according to Ayurvedic and modern methods
2. Trividha Sattva Pariksha
3. Charakokta Anumana Pariksha
4. Manasika avastha Pariksha - Mental Status Examination
5. Vividha pariksha manakah -Different psychiatric assessment inventories like Hamilton's scale, Bech's Depression inventory etc.
6. Manorog chikitsiya manomapaka upakaranani cha - Psychiatric and psychometric tools for diagnosis, Evidence based diagnostic methods.
7. Prayogashaliya pariksha -Investigations– Haematological, biochemical, neuro-physiological, endocrinal, EEG, radio imaging- MRI etc.
8. Manasrognam sadhyasadhyata – Prognosis of psychiatric diseases.
9. Manas Rog Sandharbhe Vidhi Vaidyakasya vistrita gyanam.
10. Forensic psychiatry- Knowledge about legal and ethical issues in psychiatry, Indian lunacy act, mental health act, Norms to setup a well equipped Mental Hospital (OPD, IPD)

PAPER – III Manas Roga Chikitsa

Marks 100

Comprehensive knowledge of etiology, demography, underlying psycho pathogenesis, symptomatology, complications, investigations, diagnosis, prognosis and drug-non drug management of following psychiatric disorders as per Ayurvedic-Modern therapeutics with their pharmacodynamics:

1. Unmada (Psychoses)- Nija, Agantuja Unmada, Bhutonmada, Vishaja Unmada, Sutikonmada, Smaronmada, Tattvonmada- Paronoia, Mano dukhaja Unmada -Stress related disorders.
2. Apasmara - -seizure disorders
3. Apatantraka – hysterical convulsions
4. Tandavaroga -Chorea
5. Yoshapasmara - conversion disorders
6. Atatvabhinivesha- Obsessive compulsive disorders
7. Vishada- Depressive illness
8. Gadodvega -Hypochondriasis
9. Mada, Murchha, Sanyasa- sensorial disorders
10. Madatyaya, Panatyaya (Panavibhrama, Paramada, Panajirna) - Substance abuse disorders.
11. Nidra vikara (Sleep disorders) , Klama, Tandra, Glani.
12. Bhrama, Vibhrama - Delusional disorders.
13. Chittodvega - Generalized Anxiety disorders.
14. Smriti vikara (memory disorders)
15. Manasika klaibya, Sushrutokta Napumsakata
16. Manasa Dosha Vikara- Kama, Krodha, Lobha, Moha, Irshya, Bhaya, Mana, Mada, Dambha, Ahamkara, Harsha, Matsarya, Iccha, Dvesha.
17. Mood and affective disorders – major depressive disorders, mania and their possible Ayurveda co-relates.
18. Schizophrenia
19. Personality disorders
20. Behavioural disorders
21. Organic mental disorders
22. Post traumatic stress disorders
23. Psycho sexual disorders
24. Eating disorders
25. Somatoform and dissociative disorders

26. Senile psychiatric disorders - Dementia, Alzhiemer's disease, Parkinsonism, Menopause, Andropause and their possible Ayurveda co-relates.
27. Adhi- Vyadhi Roganam Manasika Prabhava Chikitsa Cha - Psychosomatic disorder-- Bhayaja and Shokaja Atisara, Kamaja and Shokaja Jwara, Tamakashwasa, Prameha, Amlapitta, Parinamashula, Grahani, Ucca Raktachapa(Hypertension), Shula (pain disorders), Twak Vikara.
28. Jirna- Asadhya Sopadrava Vyadhinam Vivechanam – Mental problems in chronic incurable diseases like AIDS, Cancer etc.
29. Mano prakriti vikara – psychopathic personality.
30. Jivana Shaili Tatha mano sammarda janya roгах - Life style and stress related disorders.
31. Shishu tatha Kumara Manoroga - Child and adolescent psychiatry.
32. Jadata, Buddhimandya , Adhyayana Akshamata – Mental deficiency, mentally challenged and learning disabilities.
33. Achara vaikalya - Conduct disorders
34. Manobhava vikara - Emotional disorders
35. Cerebral palsy, infantile autism, Attention Deficit Hyperactive disorders, Tourette's disorder with their possible Ayurveda co-relates.
36. Preventive aspects in Manas Roga – Achara Rasayana, Sadvritta, Shodhana, Rasayana and Vajikarana
37. Manas Roganam Samanya Vishesa Chikitsa Siddhantanam Varnanam,- Daiva Vyapashraya, Yukti Vyapashraya, Sattvavajaya, Adravyabhuta Chikitsa Upayah.
38. Sattvavajaya Chikitsa: Its application and techniques viz. Dhi, Dhairya, Atma Jnana, Kula Jnana, Kala Jnana, Desha Jnana, Bala Jnana, Samadhi, Santwana, Ashwasana, Ayurveda Psycho shock therapy viz. Trasana, Bhayadarshana, Adbhuta Darshana, Vismarana, Vismapana and Pratidvandwi Bhava with their scientific basis.
39. Role of Rasayana, Medhya Rasayana, Achara Rasayana and Vajikarana in Manasa Roga
40. Pathyapathya in Manasa Roga.
41. Manas Rogopayogi Vividha Aushadheenam Vivechanam: Ekamulika (Single drug), Panchavidha Kashaya Kalpana, Rasa Rasayana etc.
42. Brihatrayee, Yogaratnakara, Sharngadhara, Gadanigraha, Bhavaprakasha, Sahasrayoga ukta vividha yoganam vivechanam:Brahmi, Mandukaparni, Vacha, Jatamansi, Yashtimadhu, Shankhapushpi, Kushmanda, Ashwagandha, Kushtha, Tagara, Guduchi, Jyotishmati, Srikhandadichurna,Saraswatachurna etc. Swarna, Swarnamakshika Bhasma, Rajata, Pravala, Mukta, Manahshila, Krishna Chaturmukha Rasa, Krishnachaturbhuj Rasa, Brihatvatachintamani Rasa,Vata kulantaka Rasa, Manasmitra vataka, Smritisagar Rasa, Unmada gajakesari Rasa, Apatantrakari vati,Kumarakalyana Rasa etc. Kalyanaka ghrita, Brahmi ghrita, Mahapanchagavya ghrita, Mahapaishachika ghrita, Mahabhutarava ghrita, Kushmanda ghrita, Purana ghrita, Panchagavya ghrita etc.
43. Saraswatarishta, Ashwagandharishta, Chittachandirasava etc.
44. Himasagara taila, Tungadrumadi taila, Gandharaja taila, Brahmi taila, Sidharthaka agada etc.
45. Dhupa, Nasya, Lepa, Anjana yogas useful in Manas Roga.
46. Folk Medicine in Manasa Roga.
47. Mano Bheshaja vigyanam - Essentials of Psycho pharmacology, Knowledge of Biological and Pharmacological Therapies in the Management of Various Psychiatric diseases such as hypnotics, sedatives, anxiolytics, mood stabiliser/elevators, antidepressants, antipsychotics, anticonvulsants, Electro-convulsive therapy(ECT) and its applied aspects.

Panchakarma

1. Importance of Panchakarma and other allied procedures in the management of Manasa Roga.
2. Theoretical knowledge and application of the following karmas in Manasa Roga – Snehana, Svedana, Vamana, Virechana, Basti, Nasya, Raktamokshana, Mastishkya-Shiro-Basti, Shiro-Dhara, Shiro-Pichu, Shiro-Abhyanga, Murdhni taila, Anjana, Dhupa, Dhupana etc.

Yoga

1. Manovigyana sandharbhe yogasya vaishishtyam, Yogashastrasya upayogita mahatvam cha.
2. Yogasya darshanika svarupagyanasahitam tasya astanganam samichinam Gyanam.
3. Ayurveda drishtya yoga adhyayanasya upayogita, Ayurveda shastre pratipaditah yogasya siddhantah.
4. Satvavajaye gyana-bhakti-karma yoganam manasa roge vivechanam-Hatha yogascha.
5. Role of Shatkarma - Kapalabhati, Trataka etc. in Manasa Roga.
6. Naishthiki chikitsa in Manasa Roga.
7. Therapeutic potential of Yoga, Psycho biological effects of Yoga, Spiritual therapy and Yoga.
8. Sudarshana kriya , Transcendental meditation, Yoga nidra, Vipashyana and other allied yogic techniques in Manasa Roga chikitsa.
9. Manas and prana (bio-energy), pranic healing, means of bio-energy modulation in Manasa Roga.

Other allied therapeutic procedures:

1. Various methods of psychotherapy and counselling techniques, transactional analysis, behavioural therapy, psycho analysis.
2. Swapna Samvahana chikitsa -Hypnotherapy-Past life Regression and Age Regression Therapy in Manasa Roga.
3. Knowledge of psychiatric emergency and their management.
4. Knowledge of surgical intervention in Manasa Roga
5. Recent advances and updates in concepts, drugs and therapeutic procedures in Manasa Roga.

Content of the Practicals

S.No.	Topic	No. of Cases
1.	Hypnotherapy techniques	10
2.	Case Study- Unmada	20
	Apasmara	20
	Atatvabhinivesh	10
	Chittodvega	25
	Vishada	25
	Madatyaya	10
	Psycho Sexual disorders	25
	Psychogenic headache	20
	Nidra vikara	20
	Stress related disorders	25
3.	Examination of Manasika Bhava in psychosomatic illness	25
4.	Yogasana, Pranayama and Meditation Techniques	25
5.	Panchakarma Procedures in Manasa Roga	25
6.	Anjana, Dhoopanadi Karma	25

7.	Instruments (GSR biofeedback, EST, EEG, etc.)	25
8.	Counselling on the pattern of Sattvavajaya	25
9.	Psychometric scales (Ayurveda and conventional)	30

Visit to Mental Hospitals

Pattern of Practical Examination - 100 Marks

1.	Practical Record Book	- 10 Marks
2.	Bed side examination	
a.	Short Case	- 10 Marks
b.	Long Case	- 25 Marks
3.	Assessment of Scales and inventories (Ayurveda and Conventional)	- 10 Marks
4.	Thesis Presentation(PPT)	- 25 Marks
5.	Viva-voce	- 20 Marks

Reference Books-

1.	Related matter of Charak, Sushrut and Vagbhata and other ancient texts with commentaries	
2.	Prachin Manovikara Vigyanm	- Ayodhya Prasad Achal
3.	Ayurvediya Padarth Vigyan	- Ranjit Rai Deshai
4.	Ayurved Darshan	- Acharya Rajkumar Jain
5.	Purusha Vichaya	- Prof. V.J. Thakkar
6.	Ayurvediya Manas Vigyan	- Prof. Ram Harsh Singh
7.	Yoga evum Ayurved	- Acharya Rajkumar Jain
8.	Basic principles of Ayurvediya Padartha Vigyan	- Dr Yogesh Chandra Mishra
9.	Synopsis of Psychiatry	- Harold kaplon and Benjamin saddock
10.	Oxford textbook of Psychiatry	- Michael Gerlder, Paul Harrison
11.	General psychology and Abnormal psychology	- S.K. Mangal
12.	A text book of Post Graduate Psychiatry	- Neeraj Ahuja
13.	Mind in Ayurveda and other Indian Traditions	- A.R.V.Murthy
14.	Psychopathology in Indian medicine	- Satyapal Gupta
15.	Body- Mind-Spirit Integrative Medicine	- Prof. Ram Harsh Singh
16.	Rationale of Ayurveda Psychiatry	- Dr. A.R.V. Murthy
17.	Foundations of contemporary Yoga and Yoga Therapy-	Prof. Ram Harsh Singh
18.	Stress and its Management	- Dr. K.N. Udupa
19.	Concept of Mind	- Edited by Prof. C.R. Agnivesh, Kottakkal
20.	Kayachikitsa	- Part 3 by R. R. Pathak and Vidhyadhar Shukla
21.	Panchakarma Illustrated	- Prof. Shrinivasa Acharya
22.	Unified Dimensions of Ayurvedic Medicine	- Dr. J.S. Tripathi
23.	Essential Psychiatry	- Bhatia MS
24.	Sahassrayoga	- Nishteswar and Vaidyanath
25.	Ayurveda and the Mind	- David Frawley
26.	Manasa Roga Vijnana	- Balakrishna
27.	Comprehensive Textbook of Psychiatry	- Kaplan and Sadock's
28.	Psychiatry for medical students	- Robert J Waldinger
29.	Introductions to Psychology	- Morgan / King.

13. RASAYANA&VAJIKARANA

PAPER – 1 CONCEPT & PRACTICE OF RASAYANA

Marks: 100

1. Basic fundamentals and concepts of Rasayana

- Derivation, definition and synonyms of Rasayana
 - Classification of Rasayana
 - Understanding rasayana in perspective of:
 - Neutriceutical action
 - Immunomodulation
 - Oxygen free radicals &Antioxidant activity
 - Adaptogenesis
 - Cell proliferative activity
 - Cell regenerative activity
 - Genoprotectiveactivity
 - Micronutrients
 - Anabolic activity
 - Interpretation of different types of Rasayana
 - Prakruti-Guna/character wise Rasayana
 - Sara wise rasayana
 - Dhatu specific rasayana
 - Indriyanusararasayana like netryya, hridya, tvacchya etc.
 - Srotas wise rasayana
 - Occupation wise rasayana
 - Season wise rasayana
 - Molecular biology concerned to rasayana
 - Human genome project
 - Genetics and Gene therapy
 - Stem cell theories
 - Introduction to Bioinformatics
 - Concept of Bala, types of bala, vriddhikshayahetu.
 - Knowledge of measures to improve bala
 - Concept of ojas. Types of ojas. Ojo-vriddhi-kshaya-karabhava.
 - Ojodustiprakara, hetu, samprapti and their management
 - Immunology
 - Immune system & components
 - Knowledge of immune mechanisms
 - Immune disorders
 - Rasayana as immunomodulator
 - Rasayana – immune specific/immunoglobulin specific
 - Rasayana in Immune compromised disease like, HIV/AIDS, tuberculosis, Cancer, liver cirrhosis etc.
2. Concept of jara (geriatrics) and ageing (gerontology)
 3. Concept of svabhavabalapravrittavyadhi with special reference to Jara its classification (kalaja&akalaja), etiopathogenesis and management
 4. Organ wise, system wise Common geriatric disorders and their management
 5. Yogya, ayogya, vidhi and prayojana of:
 - Kutipraveshikarasayana
 - Dronipraveshikarasayana
 - Karapratichiyarasayana

- Indraproktarasayana
 - Vaatatapikarasayana
6. Concept & practice of Achararasayana
 7. Knowledge & application of svasthavritta measures
 8. Swasthyanuvartakarasayana
 9. Rasayana as nutrient supplement
 10. Panchakarma and its role in rasayana
 11. Application of Kamyarasayanato achieve - Smriti, Medha, Bala, Prabha, Varna, Svara
 12. Knowledge of Vayasthaapana/Ayushyarasayana
 13. Naimittikarasayana – Vyadhiharaandvyadhiapunarbhavarasayana

PAPER – 2 CONCEPTS OF APATYA&SUSANTAANA

Marks: 100

1. Etymology, derivation, definition, synonyms of vandhya, vandhyaa, apatya, santaankara, susantaana
2. Importance of fertility
3. Essentials of fertility
4. Knowledge of Garbhasambhavasamagri
5. Knowledge of Garbhaadanaparicharya
6. Knowledge of Garbhotpatti
7. Knowledge of Shukravridhhi, kshayahetu, lakshana and chikitsa
8. Knowledge of Shukrapradoshajavyadhi and its management
9. Knowledge of Shukradustihetu, prakara, lakshana, diagnosis and management
10. Knowledge of Retodustiprakara, hetu, lakshana and chikitsa
11. Knowledge of Sukravahasrotodustikarana, lakshana, diagnosis and management
12. Knowledge of Disorders of spermatogenesis (etio-pathogenesis, diagnosis and management)
 - a. Oligozoospermia, asthenozoospermia, teratozoospermia, azoospermia, aspermia, pyospermia, necrozoospermia, OAT syndrome, sertoli cell only syndrome, klinefelters syndrome, kallaman's syndrome. Dal-castele's syndrome etc.
13. Obstructive azoosprmia-diagnosis, medical management and knowledge of surgical procedures
14. Retrograde ejaculation and other ejaculatory disturbances in respect to fertility – knowledge, diagnosis and management.
15. Reproductive endocrinal disorders and management
16. Immunological infertility – knowledge of various components involved in immunological infertility, mechanism, diagnosis and management
17. Sperm function tests, semen and cervical mucus interaction, post coital test
18. Knowledge of karyotyping and interpretation
19. Knowledge of chromosomal, genetic disorders pertaining to fertility and management
20. Knowledge and practice of Genetic counseling
21. Knowledge of Normal and abnormal sexual differentiation
22. Applied aspects of panchakarmain rasayana and vajikarana
23. Applied aspects of uttarbasti
24. Knowledge of Susantaana (epigenetics): preconceptional measures
25. Knowledge and technique of Pumsavanakarma for healthy progeny
26. Introduction to MART (Medically Assisted Reproductive Technologies): IUI, IVF-ET, ICSI, cloning etc.
27. Testicular biopsy – indications, surgical procedure, interpretation of HPE results
28. Knowledge of cystoscopy – diagnostic, interventional
29. Scrotal scan & Doppler
30. Knowledge of Varicocele: diagnosis, medical and surgical management
31. Knowledge of disorders of accessory sex glands and their management

PAPER – 3 CONCEPTS AND PRACTICE OF VAJIKARANA**Marks: 100**

1. Etymology, derivation, definition, scope and understanding of word vajikarana and its application in present scenario
2. Physiology of sexual act including mechanism of erection, ejaculation and orgasm
3. Knowledge of hypothalamo-pituitary-testicular axis
4. Knowledge of Psycho-neuro-endocrino-vasculogenic mechanism of sexual activity
5. Knowledge of Haemodynamics and different stages of erection
6. Psychological aspects of sexual function
7. Sukrottejakabhava. Factors influencing sexual function
8. Knowledge of Sukrasrutikarabhava
9. Knowledge of erogenous zones and lunar relationship
10. Maithunavidhi –asthangamaithuan, rules and regulations to have intercourse as per ritu, kala, gotra, kula etc.
11. Concept of Brahmacharya & its application in the present context
12. Sexual ethics
13. Myths & misconcepts regarding sex & sexuality
14. Sex education & counseling including pre- marital counseling
15. Knowledge of contraception and contraceptives
16. Knowledge of sukragatavata/sukrasthavatasukravritavata,
17. Klaibya – definition, nidana, prakara, samprapti, and chikitsa
18. Male Sexual dysfunctions (etio-pathogenesis, diagnosis & management)
 - a. Disorders of sexual desire (increased libido, decreased libido, no desire etc.)
 - b. Erectile dysfunction (psychological, endocrinological, neurological & vasculogenic)
 - c. Ejaculatory disturbances (early, delayed, anejaculation, retrograde ejaculation)
 - d. Orgasmic disorders (anorgasmia)
19. Female sexual disorders, causes, diagnosis and management
20. Knowledge of various sexual postures and advantages
21. Napumsaka, shanda, trinaputrika, vaarta, hermaphroditism – definition, classification, samprapti, clinical manifestation, diagnosis and management
22. Knowledge of paraphilia, abnormal sexual behavior, perversions and management
23. Knowledge of diagnostic aids pertaining to sexual disorders
 - a. ICIVAD (Intra Cavernal Injection of Vaso Active Drugs)
 - b. Vacuum erection devices
 - c. Penile vibrators
 - d. Rigi scan NPT (Nocturnal Penile Tumescence)/snap gauge test
 - e. Penile biothesiometer
 - f. Penile Doppler
24. Knowledge of Dhat syndrome, night emissions
25. Mutrasukra, shukrashmari, sukrameha
26. Aharsha & apraharshabhava
27. Knowledge of Sexual performance assessment scales: MSP, GRISS, GRIMS, HARDS, Libido score, IIEF-5 scoring system for ED, Androgen deficiency score
28. Knowledge of Priapism and its management
29. Knowledge of theories of andropause and management

PAPER – IV PHARMACO-THERAPEUTICS OF RASAYANA & VAJIKARANA**Marks: 100**

1. Definition, derivation, etymology, synonyms of vajikara, vrishya
2. Pharmacology and pharmacodynamics of rasayana and vajikarana drugs
3. Definition, scope and understanding of
 - a. Rasayana
 - i. Vyadhibalavirodhi

- ii. Vyadyutpadakapratibandhak
- iii. Vayasthapan
- b. Sukrajanaka/sukrala
- c. Sukrapravarthaka/rechaka
- d. Shukrashodhana
- e. Shukrastambhaka
- f. Sukrashoshaka, vyavayi/vikashi
- g. Kamoddeepana/kamottejaka etc.
- 4. Pharmacology of drugs belonging to:
 - a. Sukrajanaka/sukrala
 - b. Sukrapravarthaka/rechaka
 - c. Shukrashodhana
 - d. Shukrastabhaka
 - e. Sukrashoshaka, vyavayi/vikashi
 - f. Kamoddeepana/kamottejaka etc.
- 5. Pathya and apathya in relation to shukradhatu
- 6. Formulation, indications & uses of: Vrishyabasti, Vajikaranaabasti, Yapanabasti
- 7. Pharmacology of:
 - a. Akarakarabha,
 - b. Amalaki,
 - c. Aswagandha,
 - d. Bhallataka,
 - e. Bhang,
 - f. Bhrihati,
 - g. Gokshura,
 - h. Guduchi,
 - i. Haritaki,
 - j. Ikshu,
 - k. Jatiphala,
 - l. Jivanti,
 - m. Kapikacchu,
 - n. Kokilaksha,
 - o. Ksheeravidari,
 - p. Mandukaparni,
 - q. Masha,
 - r. Punarnava,
 - s. Shatavari,
 - t. Svetamusalī,
 - u. Yastimadhu etc.
 - v. Indraproktharasayanaa
- 8. Pharmacology of following Rasaushadhis:
 - a. Abhraka,
 - b. KukkutandaTvakBhasma,
 - c. Naga,
 - d. Rajata,
 - e. Shilajit,
 - f. Svarna,
 - g. Svarnamakshika,
 - h. Vanga,
 - i. Yashada etc.
- 9. Ingredients, properties, indications and phalasaruti of:
 - Agasthyarasayanaa,
 - Ajamamsarasayanaa
 - Akarakarabhādivati,
 - Amrita PrashaGritha,
 - AswagandhaGritha,

- AvalgujaRasayanaa
- BalaswagandhaTaila,
- Bhallathakarasayana,
- Brahmarasayana,
- Brihatcchagalladyagritha
- Chandraprabhavati,
- Chyavanaprasha,
- GokshuradiGuggulu,
- HaritakyadiRasayana,
- JatiphaladiVati,
- Kaminividravana Rasa,
- KhadiraRasayana,
- KushmandaRasayanaa
- Lasunarasayana,
- MahamashaTaila,
- Makaradhwaja,
- NagabalaRasayana,
- NarasimhaRasayanaa,
- PippaliVardhamanaRasayanaa,
- Pippalirasayana,
- PurnachadrodayaMakaradhwaja,
- ShatavariGrita,
- Shilajathurasayana,
- Siddha Makaradhwaja,
- SrigopalaTaila,
- VanariGutika
- Vasantakusumakara,
- VeeryastambhaVati,
- VidangaRasayana,
- VidaryadiGritha,
- VrishyaGritha

10. Pharmacology & Pharmacodynamics of various vajikara, vrishya and rasayanabasties
11. Neuro-psycho pharmacology of rasayana, vajikarn drugs
12. Endocrinological aspects of rasayana,vajikarana drugs
13. Recent advances in rasayana and vajikarana drugs, formulations and therapeutic techniques

PRACTICALS

1. Assessment of Prakriti
2. Assessment of saara
3. Assessment of manasaprakriti
4. History taking & clinical examination of geriatric patients
5. Examination of male genito-urinary system
6. Semen analysis- Retopariksha
7. Post coital test, semen & cervical mucus interaction test
8. Technique of ICIVAD
9. Uttarbasti
10. Technique of psychosexual counseling
11. Applicatory knowledge of assessment scales pertaining to vajikaranaa/sexual functions
12. Technique of genetic counseling
13. Practical aspects of Panchakarma pertaining to rasayana&vajikarana
14. Technique of measuring penile BP

14. SHALYA TANTRA - SAMANYA

PAPER - I Shalya Siddhanta – Fundamentals of Surgery

100 Marks

1. Sushruta's contributions in surgical concepts and practices.
2. Knowledge of Dosha, Dhatu and Mala Vigyan and their importance in surgical diseases.
3. Significance and importance of Rakta as the Chaturth Dosha.
4. Yantras and Shastras – Surgical Instruments - Ancient and recent advances.
5. Trividha Karma – Purva, Pradhana and Pashchat Karma and its Importance.
6. Asepsis and Antisepsis.
7. Nirjantukarana – Sterilization – Various methods for surgical equipments, laparoscopes, linen and Operation theatre.
8. Surgical infections – Sepsis, Tetanus and Gas gangrene.
9. Care of patients suffering from Hepatitis, HIV-AIDS, STD and other associated infectious diseases.
10. Ashtavidha Shastra Karma – Critical knowledge and their application in surgical practice.
11. Suturing materials, appropriate use of sutures, drains, prosthetic, grafts and surgical implants.
12. Concept of Marma and their clinical application.
13. Shock - Its varieties and management.
14. Raktasrava / Haemorrhage – Types, Clinical features and Management.
15. Concept of Raktastambhana –Haemostasis.
16. Vranasopha – Inflammation and Vidradhi - Abscess
17. Granthi – Cyst and Arbuda – Benign and malignant Neoplasm – Concept of Oncogenesis and genetics of cancer.
18. Gulma and Udara Roga.
19. Kshudra Roga.
20. Fluid, electrolyte, Acid Base Balance and Nutrition
 - i. Introduction of physiology of fluids and electrolytes.
 - ii. Dehydration and over hydration.
 - iii. Specific electrolyte loss, Acidosis, Alkalosis, Symptomatology and Management.
 - iv. Electrolyte changes in specific surgical conditions and their management.
 - v. Plasma volume expanders and their use in surgical condition.
 - vi. Various replacement fluids in surgery, mode of administration and complications.
 - vii. Nutrition – Indications, types, mode of administration and complications.
21. Blood Transfusion – Blood groups, compatibility, Indications, Contraindications and complications with management.
22. Knowledge of antibiotics, analgesics, anti-inflammatory and emergency drugs in surgical practice.

PAPER – II Vishishta Shalya Vigyana - Shalya Tantra Speciality

100 Marks

1. Yogya Vidhi - Practical and Experimental training
 - i. Practice of surgical procedures on different models.
 - ii. Training of Laproscopic and Endoscopic procedures.
2. Vrana – Wound management
 - i. Management of Nija Vrana, Agantuja Vrana, Dushta Vrana and Nadi Vrana.
 - ii. Vrana Chikitsa – Shasti upakramas, Pathya-apathya .
 - iii. Types and Management of Dagdha Vrana - Burns and scalds.
 - iv. Infection of hands and foot, Diabetic wound, Prameha Pidaka – Diabetic carbuncle and its management.
 - v. Management of Pressure ulcers, Venous ulcers and other chronic non-healing ulcers.
 - vi. Gangrene and its management.

3. Mutra Roga – Urological diseases.
 - i. Anatomical and physiological knowledge of kidney, ureter, urinary bladder, prostate, seminal vesicles, urethra and penis.
 - ii. Investigations of Mutravaha Srotas – Urinary tract.
 - iii. Aetiopathogenesis and surgical procedures of Ashmari – Urinary stone diseases.
 - iv. Kidney and ureter – Clinical presentation, Investigations and Management of Congenital anomalies, Trauma, Infection, Neoplasm, Hydronephrosis, Hydroureter and Haematuria.
 - v. Urinary bladder - Clinical presentation, Investigations and Management of Congenital anomalies, Trauma, Infection, Neoplasm, Diverticulum, Vesico-vaginal fistula, Atony, Schistosomiasis, Urinary diversions, Retention of urine – Mutraghata and Mutrakruccha.
 - vi. Urethra - Clinical presentation, Investigations and Management of Congenital anomalies – Hypospadias, Epispadias, Posterior urethral valve, Trauma, Infection, and Neoplasm.
 - vii. Prostate and seminal vesicles – Benign and malignant enlargement of prostate, Prostatitis, Prostatic abscess and Calculi.
 - viii. Penis – Clinical presentation, Investigations and Management of Congenital anomalies, Trauma, Infection, Phimosis, Paraphimosis, Peyronie's disease and Neoplasm.
 - ix. Testis and scrotum - Clinical presentation, Investigations and Management of Congenital anomalies, Ectopic testis, Trauma, Infection, Neoplasm, Testicular torsion, Hydrocele, Varicocele, Spermatocele, Chylocele, Pyocele, Haematocele, Epididymal cyst and Fournier's gangrene.
 - x. Renal failure – Causes, Diagnosis, Investigations and Management.
4. Asthi roga and Marma Chikitsa - Orthopaedics
 - i. Anatomy and physiology of bone.
 - ii. Diseases of Asthi / Bone and Sandhi / Joints – Congenital, Degenerative, Infective, Metabolic and Neoplastic Disorders of Bones and Joints.
 - iii. Aetiopathogenesis, treatment along with surgical procedures of Bhagna - Fracture, Sandimoksha - Dislocation and bone grafting.
 - iv. Diseases of Spine, vertebral column and spinal cord.

PAPER – III Adhunik Shalya Karma - Modern surgery

100 Marks

1. Fundamentals of modern surgery and treatment of surgical disorders including surgical anatomy, physiology and pathology.
2. Diagnosis and Surgical treatment of head and spine injury, thoracic trauma and abdominal trauma. Blast injuries and Management
3. Diagnosis and Surgical management of neck disorders e.g. salivary glands, thyroid, Thyroglossal cyst and Fistula, Branchial cyst and fistula, Cystic hygroma and Lymphadenopathies.
4. Diagnosis and Surgical management of breast diseases, Benign and Malignant breast tumours.
5. Diagnosis and Surgical measures of diseases of Gastrointestinal system -
 - i. Oral cavity - Oral ulcers, Oral cancer, Precancerous conditions, Submucosal fibrosis, Leukoplakia, Cleft lip and palate, Lip tumours, Mucosal cyst, Nasopharyngeal cancer, Tongue ulcer and cancer.
 - ii. Oesophagus - Oesophageal varices, Dysphagia, Neoplasm, Strictures and Gastro oesophageal reflux.
 - iii. Stomach and duodenum –Congenital anomalies, Injuries, Inflammation, Ulcer, Neoplasm, Pyloric stenosis, Acute dilatation, Hiatus hernia and Foreign bodies.
 - iv. Pancreas - Congenital anomalies, Acute and Chronic pancreatitis, Calculi Neoplasm and Cysts of pancreas.

- v. Peritoneum, Omentum, Mesentery, Retroperitoneal Space – Peritonitis, Abscess, Neoplasm, Mesenteric cyst, Torsion of mesentery, Vascular thrombosis, Retroperitoneal cyst and Fibrosis.
 - vi. Abdominal mass - Diagnosis and Management.
 - vii. Small intestine - Congenital anomalies, Inflammation, Ulcer, Neoplasm, Stenosis, Injuries, Foreign bodies, Diverticuli, Peutz-jeghers syndrome, Chron's disease, Carcinoid tumours, Enteric perforation and Intestinal fistula.
 - viii. Large intestine - Congenital anomalies, Inflammation, Ulcer, Neoplasm, Stenosis, Injuries, Foreign bodies, Diverticuli, Faecal fistula, Amoebiasis and Familial polyposis coli.
 - ix. Caecum and Vermiform appendix- Appendicitis, Appendicular abscess, Appendicular mass, Perforation, Carcinoid Tumor and other Neoplasm.
 - x. Gastrointestinal bleeding – Haemetemesis, Malaena, Haemobilia, Bleeding per anum - Causes, Diagnosis and Management.
 - xi. Rectum and anal canal - Diagnosis and Surgical management of Congenital Anomalies, Inflammation, Ulcer, Neoplasm, Stenosis, Prolapse, Haemorrhoids, Fistula-in-ano, Fissure-in-ano, Anorectal Abscess, Incontinence, Injuries, Foreign bodies, Sacrococcygeal Teratomas and Pilonidal sinus .
6. Umbilicus and abdominal wall – Congenital anomalies, Umbilical infections, Sinus, Neoplasm, Abdominal dehiscence, Divarication of recti, Desmoid tumor and Meleney's gangrene.
 7. Diagnosis and surgical measures of diseases of Hepatobiliary system -
 - i. Liver – Abscess, Cyst - Hydatid cyst, Primary and Secondary malignant tumours, Portal Hypertension and Budd-Chiari Syndrome.
 - ii. Gall bladder and Bile duct - Congenital anomalies, Acute and Chronic Cholecystitis, Cholelithiasis, Neoplasm, Cholangitis, Stenosis, Choledocholithiasis, Choledochal cyst and Cholangiocarcinoma.
 - iii. Spleen – Splenomegaly and Splenic Injury.
 8. Diagnosis and surgical measures for disorders of Artery, Vein, Ligaments, Muscles and Tendons.
 9. Diagnosis and surgical management of Hernias – Inguinal, Femoral, Umbilical, Incisional, Abdominal wall and other hernias.
 10. Endoscopic procedures - Oesophagogastroduodenoscopy, Sigmoidoscopy and Colonoscopy.
 11. Diagnostic and therapeutic laparoscopy.
 12. Anaesthesia - Definition, Types, Anesthetic agents, Indications, Contraindications, Procedures, Complications and management.

PAPER –IV Shalya Vangmaya – Shalya literature, Research and Development

1. Thorough study of the Sushruta Samhita including other relevant portions of Brihatrayee and Laghutrayee.
2. Knowledge and importance of Surgical Audit.
3. Medico legal issues – Understanding the implications of acts of omission and commission in practice. Issues regarding Consumer Protection Act, medical profession, national health policy - Implications in a medico-legal case like accidents, assaults etc.
4. Surgical ethics including Informed consent.
5. Knowledge of different type of experimental Surgical Model for Research in Surgery.
6. Sandhana Karma – Plastic reconstructive and cosmetic surgery. Fundamentals of Sandhana Karma –
 - i. Karna Sandhana – Auroplasty
 - ii. Nasa Sandhana – Rhinoplasty
 - iii. Ostasandhana – Cheiloplasty
 - iv. Grafts and Flaps – Techniques and applications.
 - v. Vascular anastomosis and grafts.

7. **Anushalya Karma** – Parasurgical procedures

- i. Kshara Karma, Kshara Sutra, Agnikarma and Raktamoskhana.

Pattern of Practical examination

1. Case record (25)	100 Marks
2. Short case	-10 Marks
3. Long case	-10 Marks
4. Identification of specimen / radiograph and Instruments	-20 Marks
5. Thesis Presentation	- 20 Marks
6. Viva-voce	-20 Marks

Reference Books

1. Sushruta Samhita
2. Ashtanga Sangraha
3. Ashtanga Hridaya
4. Charaka Samhita
5. The Surgical instruments of the Hindus - Girindranath Mukhopadhyaya
6. Shalya Tantra Samuchchaya - Pandit Ramadesh Sharma
7. Shalya Vigyan (Part 1-2) - Dr. Surendra Kumar Sharma
8. Shalya Samanvaya (Part 1-2) - Vd. Anantaram Sharma
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10. Sushruti - Dr. Ram Nath Dwivedi
11. Clinical Shalya Vigyan - Dr. Akhilanand Sharma
12. Bhagna Chikitsa Deshpande - Dr. Prabhakar Janardhan
13. Kshara sutra management in anorectal ailments and Dr. Kulwant Singh. - Dr. S.K. Sharma, Dr. K.R.Sharma
14. Anorectal diseases in Ayurveda Kumar Chowdary. - Dr. Sizoria and Dr. Praveen
15. Adhunik Shalya Chikitsa Siddanta - Dr. Katil Narshingham Udupa
16. Agnikarma Technology Innovation - Dr. P.D. Gupta
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19. Arsha Evum Bhagander Mein sutra Avacharan - Vd. Kanak Prasad Vyas
20. Recent advances in Kshara Sutra - Dr. M. Bhaskar Rao
21. Leech application in Ayurveda - Dr. M. Bhaskar Rao
22. Kshara Sutra - Dr. S.N.Pathak
23. Shalya Shalaky Tantra - Vd. S.G. Joshi
24. Surgical ethics of Ayurveda - Dr. D.N. Pande
25. Text book of Surgery - Sabistan
26. Operative Surgery - Rob and smith
27. Bailey and Love's Short Practice of Surgery Mann and R.C.G. Russell - Norman.S. Williams, Charles.V.
28. Fractures and Joint Injuries - Watson-Jones
29. Text books of Operative Surgery - Farquharsons'
30. Principles of Surgery - Schwartz
31. Emergency Surgery -Hamilton Bailey's
32. Surgical pathology - Willing Worth
33. Clinical methods in surgery - S. Das
34. Textbook of Operative Surgery - S. Das
35. Shalya Vigyan (Sachitra) - Anantram Sharma
36. Anushastra Karma - Dr. D.N. Pande
37. Concept of Vrana is Ayurveda - Dr. Lakshman Singh
38. Significance for Poorva Karma in Surgical Patient - Dr. Lakshman Singh

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| 39. Sangyahan Prakash | - Dr. D.N. Pande |
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| 45. Manual of Surgical Instruments | - M.M. Kapur |
| 46. Ward Procedures | - Patel Mansukh. B |
| 47. Recent trends in the management of Arshas / Haemorrhoids | - Dr. P. Hemantha Kumar |
| 48. Primary Anaesthesia | - Maurice King |
| 49. Synopsis of Anaesthesia | - Lee |
| 50. Clinical Anatomy/ Surgical Anatomy | - John E.Skandalakis |
| 51. Surgical Instruments of the Hindus | - Girindharnath Mukopadyay |
| 52. Outline of Orthopedics | - John Crawford Adams and David Hamblen. L |
| 53. Outline of Fracture | - John Crawford Adams |
| 54. Recent trends in the management of Bhagandara / Fistula-in-ano | - Dr. P. Hemantha Kumar |
| 55. Principles and Practice of Agnikarma | - Dr. Anand Kumar and Dr. Kanchan Shekokar. |
| 56. Manipal Manual of Surgery | - Dr. Rajgopal Shenoy |

15. SHALYA – KSHARA EVUM ANUSHA STRA KARMA

PAPER - I Shalya Siddhanta – Fundamentals of Surgery

100 Marks

- 1 Sushruta's contributions in surgical concepts and practices.
- 2 Knowledge of Dosha, Dhatu and Mala Vigyan and their importance in surgical diseases.
- 3 Significance and importance of Rakta as the Chaturth Dosha.
- 4 Yantras and Shastras – Surgical Instruments - Ancient and recent advances.
- 5 Trividha Karma – Purva, Pradhana and Pashchat Karma and its Importance.
- 6 Asepsis and Antisepsis.
- 7 Nirjantukarana – Sterilization – Various methods for surgical equipments, laparoscopes, linen and Operation theatre.
- 8 Surgical infections – Sepsis, Tetanus and Gas gangrene.
- 9 Care of patients suffering from Hepatitis, HIV-AIDS, STD and other associated infectious diseases.
- 10 Ashtavidha Shastra Karma – Critical knowledge and their application in surgical practice.
- 11 Suturing materials, appropriate use of sutures, drains, prosthetic, grafts and surgical implants.
- 12 Concept of Marma and their clinical application.
- 13 Shock - Its varieties and management.
- 14 Raktasrava / Haemorrhage – Types, Clinical features and Management.
- 15 Concept of Raktastambhana –Haemostasis.
- 16 Vranasopha – Inflammation and Vidradhi - Abscess
- 17 Granthi – Cyst and Arbuda – Benign and malignant Neoplasm – Concept of Oncogenesis and genetics of cancer.
- 18 Gulma and Udara Roga.
- 19 Kshudra Roga.
- 20 Fluid, electrolyte, Acid Base Balance and Nutrition
 - a. Introduction of physiology of fluids and electrolytes.
 - b. Dehydration and over hydration.
 - c. Specific electrolyte loss, Acidosis, Alkalosis, Symptomatology and Management.
 - d. Electrolyte changes in specific surgical conditions and their management.
 - e. Plasma volume expanders and their use in surgical condition.
 - f. Various replacement fluids in surgery, mode of administration and complications.
 - g. Nutrition – Indications, types, mode of administration and complications.
- 21 Blood Transfusion – Blood groups, compatibility, Indications, Contraindications and complications with management.
- 22 Knowledge of antibiotics, analgesics, anti-inflammatory and emergency drugs in surgical practice.

PAPER – II Vishista Anushastra Karma

100 Marks

1. Kshara Karma and Prayoga – Therapeutic Chemical Cauterization.

- i. Introduction of different types of Kshara, Method of preparation, Standardization, pH value, Application, Complications and its management.
- ii. Surgical Anatomy and Physiology of Anus and Rectum.
- iii. Arshas - Nidana, Purvaroop, Roopa, Samprapti, Prakara and Chikitsa.
- iv. Haemorrhoids - Aetio-pathogenesis, types and its surgical management.
- v. Knowledge of different methods of treating Haemorrhoids - Rubber band ligation, D.G.H.A.L, Radiofrequency, Ablation, Cryo-surgery, Cautery, Laser, Infrared coagulation and other advanced techniques.
- vi. Bhagandara - Nidana, Samprapti, Prakara, Doshanusarachikitsa, Knowledge and application of Kshara Sutra.

- vii. Fistula-in-ano - Definition, Aetio-Pathogenesis, Types, Diagnostic methods and its Surgical, Para Surgical Management including knowledge of Fibrin Glue, Advanced Flap Therapies and other recent techniques.
- viii. Parikartika - Nidana, Samprapti and its Chikitsa.
- ix. Fissure-in-ano - Aetio-pathogenesis, types and its surgical management.
- x. Sannirudhaguda and its Chikitsa.
- xi. Anal Stenosis - Aetio-pathogenesis and its surgical management.
- xii. Gudavidradhi - Nidana, Purvaroopo, Roopa, Samprapti, Prakara and its Chikitsa.
- xiii. Anorectal abscesses – Aetio- pathogenesis, types, complications and its surgical management.
- xiv. Gudagatashalya – Diagnosis and its Management.
- xv. Foreign body in rectum and anal canal - Method of diagnosis and its management.
- xvi. Congenital Anorectal disorders and its surgical management.
- xvii.** Gudaarbuda and Granthi and its Chikitsa.
- xviii.** Anorectaltumour - Types and its surgical management.

2. Agnikarma – Therapeutic cauterization

- i. Introduction, definition and importance of Agnikarma.
- ii. Agnikarma - Poorva, Pradhana and Paschat karma, various substances and Shalakas used for Agnikarma and their indications, contra-indications and complications.
- iii. Diagnosis and management of Oil burn, Dhumopaghata, Ushnavata, Sunburn, Frost bite and Electric burn.
- iv. Knowledge of modern thermal equipment - Diathermy, Laser therapy, microwave, Ultracission technique, Cryo Technique and its uses.
- v. Effect of Agnikarma on skin, muscle tissue, nerves, metabolism, blood circulation and infective lesions.

3. Raktamokshana – Bloodletting Procedures

- i. Introduction and importance of Raktamokshana.
- ii. Indication and contraindication of Raktamokshana.
- iii. Justification of usage of different types of Raktamokshana in various therapeutic applications.
- iv. Different types of Raktamokshana – Sastrakriitha - Siravyadhana, Prachana and Asastrakriitha - Shringa, Jaluka, Alabu and Ghati.
- v. Jalauka - Nirukti, Paryaya, Bhedha, Sangrahana, Samrakshana, Jalaukavacharana Vidhi - Poorva, Pradhana and Paschat karma.
- vi. Knowledge of Leeches - Morphology, Anatomy, Physiology, Bio-chemical effects of its various constituents present in its saliva.
- vii. Rakta- Importance, Formation, Panchabhoutikatva, RaktaSthana, Guna, Prakurta Karma and Rakta Sara Purashalakshanas. Suddha and Dushta Rakta Lakshanas. Rakta Pradoshaja Vyadhis.

PAPER – III Adhunika Shastra Karma - Modern Surgery

100 Marks

1. Fundamentals of modern surgery and treatment of surgical disorders including surgical anatomy, physiology and pathology.
2. Diagnosis and surgical measures for disorders of vein, artery, ligaments, joints and muscles.
3. Diagnosis and Surgical management of neck disorders e.g. salivary glands, thyroid tumours, etc.
4. Diagnosis and Surgical management of breast diseases.
5. Diagnosis and surgical management of traumatic disorders - Head injury, thoracic and abdominal trauma.
6. Diagnosis and surgical management of diseases of Gastrointestinal system- stomach, pancreas, peritoneum, omentum, mesentery, retroperitoneal space, small intestine, large intestine and vermiform appendix.

7. Diagnosis and surgical management of Proctological disorders.
8. Diagnosis and surgical measures of diseases of Hepatobiliary system - Liver, gall bladder, bile ducts and spleen.
9. Diagnosis and surgical management of diseases of Urogenital system.
10. Diagnosis and surgical management of diseases of scrotum and testis. – Hydrocele, Ectopic testis and Undescended testis.
11. Diagnosis and surgical management of Hernias – Inguinal, femoral, umbilical, incisional, abdominal wall and other hernias.
12. Endoscopic procedures – Oesophagogastroduodenoscopy, Sigmoidoscopy and Colonoscopy.
13. Diagnostic and therapeutic laparoscopy.
14. Anaesthesia - Definition, Types, Anaesthetic agents, Indications, Contraindications, Procedures, Complications and Management.

PAPER – IV ShalyaVangmaya

100 Marks

1. Thorough study of the Sushruta Samhita including other relevant portions of Brihatrayee and Laghutrayee.
2. Knowledge and importance of Surgical Audit.
3. Value of research and teaching in surgery.
4. Medico legal issues - Understanding the implications of acts of omission and commission in practice. Issues regarding Consumer Protection Act, medical profession, national health policy - Implications in a medico-legal case like accidents, assaults etc.
5. Surgical ethics including Informed consent.
6. Knowledge of different type of experimental Surgical Model for Research in Surgery.

Pattern of Practical examination

100 Marks

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| 7. Case record (25) | -10 Marks |
| 8. Short case | -10 Marks |
| 9. Long case | -20 Marks |
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| 11. Thesis Presentation | -20 Marks |
| 12. Viva-voce | -20 Marks |

Reference Books

- | | |
|---|-----------------------------------|
| 57. Sushruta Samhita | |
| 58. Ashtanga Sangraha | |
| 59. Ashtanga Hridaya | |
| 60. Charaka Samhita | |
| 61. The Surgical instruments of the Hindus | - Girindranath Mukhopadhyaya |
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| 66. Sushruti | - Dr. Ram Nath Dwivedi |
| 67. Clinical Shalya Vigyan | - Dr. Akhilanand Sharma |
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Deshpande | - Dr. Prabhakar Janardhan |
| 69. Kshara sutra management in anorectal ailments
and Dr. Kulwant Singh. | - Dr. S.K. Sharma, Dr. K.R.Sharma |
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| 73. Shalya Tantra Ke Siddhant | - Dr. K.K.Takral |

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| 94. Significance for Poorva Karma in Surgical Patient | - Dr. Lakshman Singh |
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| 105. Synopsis of Anaesthesia | - Lee |
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| 107. Surgical Instruments of the Hindus | - Girindharnath Mukopadyay |
| 108. Outline of Orthopedics | - John Crawford Adams and David Hamblen. L |
| 109. Outline of Fracture | - John Crawford Adams |
| 110. Recent trends in the management of Bhagandara / Fistula-in-ano | - Dr. P. Hemantha Kumar |
| 111. Principles and Practice of Agnikarma | - Dr. Anand Kumar and Dr. Kanchan Shekakar. |
| 112. Manipal Manual of Surgery | - Dr. Rajgopal Shenoy |

16. AYURVED DHANVANTRI - ASTHI SANDHI AND MARMAGAT ROGA

Paper – 1 ASTHI SANDHI MARMA ABHIGHAT SIDDHANTA

100 marks

1. Asthi Sharira - Etymology, Embryology, Applied Anatomy and Physiology of Asthi. Its Panchbhautik constitution, Poshan (Nutrition), Asthivaha Srotas, Upadhatu and Mala. Total Number and classification of Asthi. Concept of Dhatwagni in Ayurveda. Asthi Dhatu Kshaya and Vriddhi lakshana. Knowledge about Tarunasthi. Embryology, Ossification, Histology, Metabolism, Blood Supply, Types and Biomechanics of Bone and cartilage.
2. Healing mechanism of bone and factors influencing the bone healing according to Ayurvedic and Modern concept. Biological and Biophysical technologies for the Enhancement of Fracture Repair. Knowledge of Sandhaniya and Ropaniya drugs.
3. Sandhi Sharira – Classification, Applied Anatomy and Physiology of Asthi Sandhi. Classification, Applied Anatomy and Physiology of Joints and Healing Mechanism of a joint.
4. Marma Sharira – Basic concept of Marma, etymological derivation, definition, classification, Pramana, importance & applied aspect of individual Marma. Interpretation of each Marma in present context (*Regional surgical anatomy*). Detailed discription of Tri-Marma and Rogamarga. Prognosis of Marmaghata.
5. Sira, Dhamni, Lasika, and Snayu Sharira - Applied Anatomy and Physiology of Vessels, Lymphatic, Ligaments, Tendons, Muscles, Peripheral Nerves and Plexuses.
6. Knowledge of Splints, Orthotics & Prosthetics.
7. Disability calculation, Bio-mechanics of gait.
8. Vrana Vigyan – Etiology, classification, symptomatology, prognosis, complications and management principles of Nija and Sadyo Vrana. Knowledge of Shashti Upakrama, Seevana - Suturing and Vrana Bandhana -Bandaging. Wounds and Ulcers – Etiology, classification, symptomatology, complications. prognosis and management principles. Advanced wound closure techniques, suture materials, dressing / bandaging materials and techniques. Wound Healing Mechanism.
9. Vranitopasniya - Management of Vranita - Wounded person. Management Principles of wounded persons. Assessment and immediate management of poly-trauma patient , crush syndrome and Acute Respiratory Distress Syndrome.
10. Vranashotha and Vidradhi - Inflammation and Abscess – Etiology, Pathogenesis, classification, stages and management.
11. Knowledge of Orthopedic implants (*e.g. wires, screws, plates, nails*) and Instruments. Knowledge of equipments (*e.g. C-arm image intensifier and drill machines etc*).
12. Orthopedic Radiology - Knowledge of Radiological imaging techniques (X-ray, CT Scan, MRI, USG, Radioisotop scanning) in Orthopedics.
13. Medico-legal aspects in Orthopedics - Handling of Medico- legal cases and issuing of MLCs, Understanding the implications of relevant acts e.g. Consumer Protection Act, Motor Vehicle Act, Right to information Act and other relevant acts in force time to time.
14. Concept of Pain according to Ayurved and Modern Medical science.
15. Principles of Reconstruction, Transplantation, Bone grafting, Bone Banking, Bone transportation and Amputation.
16. Knowledge about National Health Policies and relevant guidelines by State Govt. or Govt. of India.

Paper – II ASTHI SANDHI MARMA GATA VYADHI VISESHA

100 marks

1. Diseases of Asthi & Asthi Dhatu - Asthigata Vata, Asthivaha srothodushti, Asthi Dhatu Kshaya & Vriddhi, Adhyasthi, Asthi Vidradhi.
 - a. Congenital, Degenerative, Infective, Metabolic, Neoplastic and Miscellaneous Disorders of Bones.

2. Diseases of Sandhi – Sandhigat Vata, Vatarakta, Amavata and Kroshtukashirshaka.
 - a. Different diseases of joints – Etiology, classification, and treatment principles.
3. Vata Vikara – Asthi, Sandhi and Marma related Vata Vikara like Gridhrasi, Bisvachi, Avabahuka, Manyastambha, Khalvi, Dhatugata vata, Snayugata vata, Katishoola, Katigraha.
4. Diseases pertaining to Muscles, Tendons, Ligaments, Fascia and Bursae.
5. Diseases and Congenital anomalies of Spine e.g. Ankylosing spondylitis, Infective conditions, Tuberculosis, Spondylolisthesis, Inter-vertebral Disc Prolapse, Spondylosis, Scoliosis, Kyphosis, spina bifida, Hemivertebra, Block vertebra, Sacralisation and Lumbrisation etc.
6. Diseases and Congenital anomalies of Cervical Spine
7. Diseases and Congenital anomalies Sacroiliac Joint and Bony Pelvis.
8. Diseases and Congenital anomalies of Hand
9. Diseases and Congenital anomalies of Foot
10. Diseases and Congenital anomalies of Limbs
11. Orthopedic Neurological Disorders. Post Polio Paralysis & Cerebral Palsy.
12. Snehana, Swedana and Panchakarma in Marma, Asthi and Sandhi Vyadhi.
13. Yogic Practices in Orthopedics.
14. Principles of Arthroplasty- Joint Replacement.
15. Introduction of Peripheral Vascular Diseases.
16. Pediatric Orthopedics
17. Orthopedic Oncology
18. Introduction of Radiotherapy, Chemotherapy, Hormone Therapy, Immunotherapy and gene therapy.

Paper – III Abhigata Vigyan – Traumatology

100 marks

1. Bhagna - Etiology, classification and General Management principles and Prognosis.
2. Modern concept of Bone and Joint injuries - Etiology, Epidemiology, Classification and General management principles.
3. Individual Bone and Joint injuries - Etiology, Epidemiology, Classification and management principles.
4. External immobilization techniques - Classical and traditional Kusa -splints, Plaster of Paris Technique, Knowledge of different splints and Plasters
5. Pathological Fractures including Fragility fractures, Stress Fractures and Peri-prosthetic Fractures.
6. Fractures in Children – Etiology, Epidemiology, Diagnosis, management and complications.
7. Prognosis of skeletal injuries, Complications of Fractures and Joint Injuries e.g. Myositis ossificans, Volkman's ischemic contracture, Compartment syndrome, Crush Syndrome, DVT, Thromboembolism, Fat Embolism.
8. Rehabilitation of trauma patient and Principles of Sukhchestaprachara - Physiotherapy and its use in skeletal injuries
9. Treatment Principles of Asahanta Bhagna - Non-unions, Vishmolvana Sahanta - Malunions and Ignored or un-reduced dislocations.
10. Diagnosis and management principles of injuries of Vessels, Nerves, Tendons and Ligaments.
11. Head, Chest and Abdominal Injuries and management principles.
12. Pelvis and Spine injuries and their management principles.
13. Sports Medicine – Sports medicine and sports related Shoulder injuries, Elbow injuries, Knee injuries, Ankle Injuries, Recurrent Dislocations and other sports related injuries.
14. Knowledge of Marma Chikitsa like Kalari Marma - Martial Art, Adankal - Marmaghata Chikitsa in Siddha Marma in trauma and sports medicine.

Paper – IV Shalya Kriyatmaka - Operative Orthopedics**100 marks**

1. Agropharniya Vigyan – Knowledge about Pre-operative preparation and Post operative care, Operation Theatre and its requirements regarding Instruments / Equipments and Personnel.
2. Fumigation of Operation Theatre and sterilization of Instruments, Equipments, Linen and Implants by various techniques.
3. Anu Shalya Karma (Para surgical procedures) in orthopedics – Role of Kshara Karma, Agni Karma, Raktavsechana in orthopedic disorders.
4. Knowledge of various Implants regarding their material, types, mechanics and practical use.
5. Knowledge of Conventional and advanced procedures being done for Different Bone and Joint Injuries e.g. Open Reduction and Internal Fixation, Closed Reduction and Internal Fixation, External fixators and other operative techniques.
6. Knowledge of Plastic Surgery in orthopedics and Bone grafting techniques.
7. Knowledge of various surgical procedures being done for Different Bone and Joint Diseases.
8. Hand Surgery for Diseases, Deformities and Injuries.
9. Foot Surgery for Diseases, Deformities and Injuries.
10. Amputations and Arthrodesis – General Principles of Amputations /Arthrodesis and regional Amputations.
11. Knowledge of Diagnostic and Therapeutic Arthroscopy.

Reference Books

Sushruta Samhita	Relevant Parts
Sushrut Samhita Ghanekar Commentary	
Sushruta Samhita (Dalhana Commentary)	Relevant Parts
Charak samhita	Relevant Parts
Ashtang Hridaya	Relevant Parts
Ashtang Sangraha	Relevant Parts
Bhava Prakash	Relevant Parts
Yog Ratnakar	Relevant Parts
Bhaishajya Ratnavali	Relevant Parts
Sharangdhar Samhita	Relevant Parts
The Surgical instruments of the Hindus Bhagna Chikitsa (Dr. P.J. Deshpandey)	– Girindranath Mukhopadhyaya.
Agni Karma – Technological Innovations	- Prof. P.D. Gupta
Shalya Tantra Samuchchaya	- Pandit Ramadesh Sharma
Shalya Vijyan (Part 1-2)	- Dr. Surendra Kumar Sharma
Shalya Samanvaya (Part 1-2)	- Vd. Anantaram Sharma
Shalya Pradipika	- Dr. Mukund Swarup Verma
Adhunika Shalya Chikitsa Siddanta	- Dr.Katil Narshingham Udupa
Shalya tantra Ke Sidhant	- Dr. K.K.Takral
Surgical Ethics in Ayurved	- Dr.G.D. Singhal
Susruta's Contribution to Surgery	- Dr. S. Sankaran
Anushastra Karma	- Dr. D.N. Pande
Concept of Vrana is Ayurved	- Dr. Lakshman Singh
Marma Chikitsa	- Dr. C. Suresh Kumar
Joint Affections and their Ayurvedic Prospective	- Vaidya Vilas M. Nanal
Marma Vimarsha	- Vaidya Vilas M. Nanal
Significance for Purva Karma in Surgical Patient	- Dr. Lakshman Singh
Medical Varmalogy	- Dr. N. Shunmugom et.al.
Siddha Varmalogy	- T. Vasanthakumar
Watson and Jones	- Fracture and Joint Injuries (J.N. Wilson)
Practical Fracture Treatment (R. McRae)	

Clinical Orthopedic Examination (R. McRae)
 Apleys System of Orthopedics (Apley Louis Solomon)
 Orthopedics – Principles & Their Application Vol. I-II (Samuel L. Turek)
 Textbook of Orthopedics and Trauma Vol. I-IV (G.S. Kulkarni)
 Fractures in Adults Vol. I – II (Rockwood and Green's)
 Fractures in Children Vol. I (Rockwood and Wilkins)
 Campbell's Operative Orthopedics Vol. I – IV
 A Concise Text Book of Surgery (S. Das)
 Pye's Surgical Handicraft
 Clinical Methods in Surgery (Sriram Bhatt)
 Clinical Methods in Surgery (S. Das)
 Operative Surgery (S. Das)
 Schwartz Principles of Surgery
 Surgical Exposures in Orthopedics - J.B. Lippincott Comp. Publication

Pattern of Practical Examination

100 marks

- | | |
|--|----------|
| • Discipline and regularity | 10 Marks |
| • Bed side examination | |
| Short case | 10 Marks |
| Long case | 20 Marks |
| • Identification of specimen / instruments/Radiographs | 10 Marks |
| • Dissertation Presentation | 25 Marks |
| • Viva –Voce | 25 Marks |

PRACTICAL TRAINING

- Training of History taking, bed side clinical examination and case presentations.
- Identification and demonstration of surgical instruments.
- Training of orthopedic related Diagnostic imaging techniques.
- Training of Local anesthetic techniques in orthopedics.
- P.G. Scholar shall develop the skills by observing, assisting and performing independently the following procedures:
 - Non-operative
 - Manipulative reductions and external immobilization techniques.
 - Application of POP cast, Splints and Braces.
 - Bandaging Techniques
 - External medicaments and Procedures like Snehana, Swedana, Vasti, Kati Vasti, Janu Vasti, Greeva Vasti etc.
 - Training in various massage techniques.
 - Corrective POP casts for club foot & other congenital deformities
 - Operative
 - External fixation of compound fractures
 - Debridement of crush injuries
 - Amputations
 - Internal fixation of common simple fractures
 - Polio surgery such as TA lengthening.
 - Sequestrectomy in chronic osteomyelitis
 - Biopsy from a mass
 - Internal fixation of Fractures.
- Training in Vrana (Wound) Management techniques.
- Practical training of Physiotherapy in orthopedic and trauma patients.
- Training of Anu Shalya Karma like Agni Karma, Kshara Karma and Rakta Mokshna in orthopedic disorders.
- Orthopedic related Panchakarma Procedures.

17. SANGYAHARAN

Paper 1 Sangyahan siddhant avum vangmaya: Literary, Research And Development

- History of Sangyahan and its development in Ayurveda.
- Importance of anesthesia in Ayurveda.
- Contribution of AAIM and other pioneers in the development of Sangyahan.
- Applied aspects of Ayurveda with respect to sangyahan Vrihatrayee and Laghutrayee.
- Instruments for anesthesia in ancient era and their development.
- Rakta, its importance, Raktadhana and Raktstambhana.
- Knowledge of disorders like Unmada, Apasmara, Mada, Murrcha, Sanyasa and Stabdhatu etc.
- Madataya, Stages of Madataya and its management.
- Pharmacology of Medhya, Vednasthapak, Madkari, Sangyasthapak, Nidrajanan, Akshepjanan and shamana, Svedjanan, Hridyae, Hridyotejak, Raktbharshamak, Shoolprashaman, Vaman and hrillashar (Antiemetic) dravya as mentioned in Ayurvedic samhita & their application in Sangyahan.
- Aroma therapy as complementary and alternative therapy in pain management and Palliative care.

Paper 2 Sangyahan Bshhaja Vigyan (Pharmacology related to Anesthesia)

Pharmacology of:

- Drugs acting on Autonomic nervous system:
 - a .Cholinergic system and drugs- Agonist and antagonist
 - b .Adrenergic system and drugs- Agonist and antagonist
- Autocoids and related drugs:
 - a. Histamine and Antihistaminic
 - b. 5HT and antagonist
 - c. NSAID'S
 - d. Prostaglandins and leukotrienes
- Drugs acting on Respiratory system
- Drugs acting on Somatic nervous system
 - a. Skeletal muscle relaxants – Depolarizer and Non-Depolarizer.
 - b. Local anesthetics
- 5. Drugs acting on central nervous system
 - a. General Anesthetics- Fixed and Volatile anesthetic agents.
 - b. Sedative and hypnotics
 - c. Anti epileptics
 - d. Anti psychotic and anti-maniacs
 - e. Opioids Analgesics and antagonists
- 6. Drugs acting on cardiovascular system
 - a. Cardiac glycosides
 - b. Anti arrhythmic drugs
 - c. Anti anginal and other anti ischemic drugs
 - d. Anti hypertensive drugs
- 7. Drugs acting on Kidneys
 - a. Diuretics
 - b. Anti diuretics
- 8. Coagulants and anti coagulants

Paper 3 Vishishta Sangyahan – Applied Anesthesia

- Airway management- Intubation, failed intubation drill, LMA, Bag and mask ventilation.

- Anesthesia For: General surgery, Obstetric and Gynecology ,E.N.T. and Ophthalmic, Orthopedic ,Dental ,Pediatric , Urology , plastic and Outpatient / Day care surgery.
- Anesthesia for patients with: Diabetes mellitus, Thyroid diseases, inherited metabolic diseases, Obesity, Respiratory diseases, Cardiac diseases, Renal diseases, Geriatric problems and neuromuscular diseases.
- Regional anesthesia:
- Sub-arachnoid and epidural anesthesia, analgesia.
- Plexus and nerve blocks for upper and lower limb
- Regional anesthesia for thorax and abdomen
- Surface anesthesia, infiltration and field blocks
- Complications of Regional and general anesthesia, morbidity, mortality and medico-legal aspects.
- Anesthesia for Endoscopic, laparoscopic Surgery and Laser Surgery
- Anesthesia for Trauma and mass casualty
- Emergency anesthesia.

Paper 4 Monitoring Advances and Research in Sangyahan

- Monitoring in anesthesia:
 - Cardiovascular, Respiratory, Renal function, Neurologic and neuromuscular monitoring.
 - Peri- operative Thermo- regulation and monitoring
 - Peri- operative awareness and monitoring depth of anesthesia with BIS.
 - Peri- operative acid-base balance
 - Pt's positioning in anesthesia, its hazards and management
 - Peri- operative Fluid management and Blood transfusion.
 - Risks and hazards of anesthesia
- Anesthesia equipments –
 - Medical gas systems
 - Breathing systems
 - Ventilators
 - Anesthesia machine
- Post operative management-
 - Post anesthesia care
 - Post operative nausea and vomiting
 - Post operative Intra-Venous fluid therapy
 - Acute post operative pain
- Misalleneous-
 - HDU,ICU, CCPR- BLS & ACLS.
 - Parental nutrition.
 - Environmental factor and electrical safety
- Management of Acute / Chronic Pain:
 - Assessment of pain
 - Peri-operative pain,
 - Chronic pain syndrome-detection and prevention,
 - WHO regime for Cancer pain,
 - TENS, Behavioral therapy
- Anesthesia in remote locations
- Clinical care in extreme environments (At high and low pressure and space).
- Relevance of Sammohana (Hypnosis), Acupressure and Acupuncture in Sangyahan.
- Recent advances in research in Sangyahrana, Pain Management and Palliative Care. Scope and Application of principles of Ayurveda in Sangyahrana Research.

METHODS OF TRAINING AND TEACHING FOR M.D. (Ayu) ANAESTHESIOLOGY -

Case Presentation	Once a Week
Seminar / Symposia	Once a Week
Pre Anesthesia Care / Clinic	Thrice a Week
Critical Care unit / Recovery Room	Once a Week
Classroom Lectures	Twice a Week
Morbidity / Mortality	Once a Week
Audit	Once a month
Journal Club	Once a month
Record Keeping	Once a month
Emergency Drills / Protocols	Once a Week
Interesting Cases	Once a Month

Practical Examination

1. Case Record(25)	-50 Marks
2. Presentation of different types of Anesthesia	-50 Marks
3. Thesis Presentation	-50 Marks
4. Viva-Voce	-50 Marks
Minimum pass marks	50%

Result: - Pass/Fail

Staff required

Teaching- Professor-1
Reader/Asso. Prof-1
Lecturer/Assi Prof-2
Sen.Resident-2

Non Teaching staff
Anesthesia Technician- 1
Anesthesia Attendent-2
Ward boy-2
Sweeper-2

Reference Books

a. Sushruta Samhita	-
b. Charka samhita	-
c. Ashtang Hridaya	-
d. Practice of Anesthesia	- Churchill Davidson
e. Miller's Anesthesia	- Ronald D Miller
f. Synopsis of Anesthesia	- Alfred Lee
g. Sangyahan Prakash	- Dr. D. N. Pande
h. Agni karma-Technological Innovation	- Dr. P.D. Gupta
i. Practice of Anesthesia and Resuscitation	- Dr. P.K. Gupta et al
j. Essentials of Anesthesiology	- Prof. A.K. Paul
k. Clinical Anesthesia	- Prof. A.K. Paul
l. Anu Shastra karma	- Dr. D.N. Pande
m. Textbook of Anesthesia	- Aitkenhead

- | | | |
|--|---|-------------------|
| n. Anesthesia and co-existing disease | - | Stoelting's |
| o. Physiology and Pharmacology | - | Stoelting's |
| p. Understanding Anesthesia Equipments | - | Dorsch & Dorsch's |
| q. Clinical anesthesiology | - | G. Edward Morgan |

18. AYURVEDA DHANWANTRI -SHALAKYA - NETRA ROGA

**Theory Four papers of- 100 marks each
Practical and Viva-voce - 100 marks**

PAPER- I Netra Rog Vangmaya

1. Available literature of Netra roga vigyana in Brihatrayi, Laghutrayi, Yogaratnakar, Chakradutta, Bhel Samhita, Harita samhita and Kashyap samhita.
2. Critical analysis of the available literature of netra roga vigyana in the above given classics e.g. Puyalasa and Vatahata Vartma In Sushruta samhita and Vagabhat samhita.
3. Unique/ specific contribution of different classics, Acharyas and commentators in the development of Netra roga vigyana.
4. Analytical determination of subjects related to eye disorders in ancient and modern literatures.
5. Update chronological development of Netra roga vigyana right from Vedic period.
6. Update chronological development of Ophthalmology.

PAPER- II Ayurvediya Netra Rog Vigyan

1. Enumeration and classification of Netra Rogas.
2. Descriptive knowledge of *etiology, pathogenesis, prodromal symptoms, clinical features, complications and prognosis* of pakshma -vartma- sandhi- - shukla- Krishna- dristi & sarvagata rogas along with exogenous eye diseases available in Ayurvedic classics. Medical and surgical Management of the above diseases with special skill development in Ashtavidha shastra & Trividha Anushastra chikitsa related to Netra roga.
3. Netra kriya kalpa procedures like seka, ashchyotana, vidalaka, pindi, tarpan, putapaka & anjana and their practical application and analysis based on ocular pharmacology. Standard operative procedures for Kriyakalpas including Aushada kalpanas.
4. Study of nayanabhighata and , its management and prevention.
5. Knowledge of preventive and community ophthalmology along with national programme for control of blindness and role of Ayurveda.
6. Ayurvedic Concept of Congenital, developmental and neoplastic diseases of netra.

PAPER – III Adhunik Netra Rog Vigyan

1. Knowledge and application of current diagnostic techniques and equipments and therapeutics in Ophthalmology.
2. Detailed study of refractive errors along with defects of accommodation and their management.
3. Detailed knowledge of classification, etiology, pathogenesis, signs and symptoms, differential diagnosis, prognosis and complications of diseases of eye orbit, lacrimal apparatus, lids, conjunctiva, cornea, sclera, uveal tract, lens, vitreous, retina, optic nerve and visual pathway with comprehensive knowledge of their medical and surgical management.
4. Ocular trauma , its emergencies and management.
5. Ocular motility disorders and their medical and surgical management
6. Neurological and systemic disorders affecting the eyes and their management.

PAPER – IV Recent Advances in Netra Chikitsa & Ophthalmology.

1. Update advances in the development of Ayurvedic drug formulations, therapeutic procedures and treatments of Netra roga.

2. Advanced technologies in the diagnosis of eye diseases.
3. Advanced technologies & techniques in the medical & surgical management of Netra roga.
4. Advanced management and technologies in Ophthalmology.
5. Detailed study of recent research works on chakshushya dravyas.
6. Comparative and critical study of modern advances in surgical techniques over the surgical methods described in Ayurvedic classics

Pattern of practical/Clinical training

1. Posting in OPD,IPD,OT & Kriya kalp Kaksha.
2. Case presentation ,clinical discussion, Seminars & Work shops.
3. Skill development in Ashtavidha shastra karma, Trividha Anushastra Karma and Modern Ophthalmic Surgical procedures viz lid surgery, pterygium surgery, cataract surgery, squint surgery, glaucoma surgery, DCR & DCT ect.

Methods of Training

- Intensive integrative training would be imparted to scholars in understanding the classical Ayurvedic aspects with an emphasis of critical comparative interpretation.
- Mandatory participation of scholars in seminars, group discussions, clinical demonstrations , journal review meetings, case study, continuing education activities and research clinical projects.
- During the first year course the emphasis would be laid to impart adequate knowledge on fundamental aspects and their applications, with a focus on latest diagnostic tools , instrumentations and laboratory procedures. Practical orientation and hospital based clinical training is an integral part of the curriculum all through.
- In the second year ,training would stress upon extending the knowledge on techniques and imparting skill for surgical performance, ophthalmic procedure based therapies, surgical/para surgical procedures **so that the scholar is able to perform ophthalmic surgical procedures like** Ashtavidha shastra karma, Trividha Anushastra Karma and Modern Ophthalmic Surgical procedures viz lid surgery, pterygium surgery, cataract surgery, squint surgery, glaucoma surgery, DCR & DCT ect **independently.**
- In the third year the scholar should concentrate on the clinical work and research work based on the dissertation.
- The participation of the scholars in all the aspects of educational process is mandatory.
- Hospital postings – The student has to work for 6 terms of resident posting is compulsory out of which first 2 postings will be as a junior resident and the next four postings will be as a senior resident.
- The student should also develop in the academic work of the department.

Pattern of Practical Examination

100 Marks

- | | |
|---|-----------|
| 1. Bed side examination | |
| Short Case 2 of 10 marks each | -20 Marks |
| Long Case | -20 Marks |
| 2. Identification of specimen / Instrument / Radiograph | -10 Marks |
| 3. Thesis Presentation / Viva | -10 Marks |
| 4. Teaching skill | -10 Marks |
| 5. Viva Voce | -30 Marks |

Reference Books

1. Charaka Samhita with commentaries
2. Sushruta Samhita and Vagbhata with commentaries
3. Astanga Hridaya and Astanga Sangraha with commentaries
4. Madhava Nidan with commentaries
5. Bhavaprakasha with commentaries
6. Sarangadhara Samhita with commentaries
7. Sahstrayoga Sangraha
8. Relevant part of Chakradhatta, Bhel Samhita, Harita Samhita
9. Shalaky Tantra - Ramanath Dwivedi
10. Shalaky Tantra - R.C. Chaudhary
11. The Actions and uses of Indigenous Ophthalmic Drugs - N.Srikanth
12. Clinical Examination of Ophthalmic Cases - Agarwal and Gupta
13. Alder's Physiology of the Eye and Clinical Applications - Cotlier, St. Louis
14. Disease of the Lens and Vitreous, Glaucoma and Hypotony - Duke Elder, St. Louis
15. A Text Book of Ophthalmology - Ahmed E.
16. A Text book of clinical ophthalmology - Dhanda
17. Modern Ophthalmology - Dutta, L.C. Jaypee Brothers
18. Manual of the Diseases of the Eye - May, C. and Worth, C.
19. Ophthalmology – Principles and Concepts - Bailliere Tindal and Castell
- Newell, F.W., C.V. Mosby Co., St. Louis.
20. Ocular Differential Diagnosis - Roy Fedrick Hamptn
Lea and Febiger
21. Clinical Ophthalmology - Smith, R.Vergheze
Company
22. Abraham Manual of Refraction - Duke and Elder
23. Hand Book of ophthalmology - B.M. Chatterjee
24. Hand Book of ophthalmology - Khurana
25. Clinical ophthalmology - Kanski
26. Parsons Diseases of Eye
27. Stallard's Eye Surgery

19.AYURVEDA DHANWANTRI - SHALAKYA - SHIRO- NASA-

KARNA EVUM KANTHA ROGA

PAPER – I Shiro- Nasa- Karna - Kantha Roga Vigyan Maulik Siddhanta and Vangmaya

1. Detailed study of Shalakyatantra from Bruhat trayee, Laghutrayee, Kashyap samhita, Yoga ratnakar, Chakradutta, Bhel samhita , Harita samhita and other granthas.
2. Comparative and critical study of rogas explained by various granthas.
3. Syntactical derivation, definition and importance of the word "Shalakyaa". Sequential development and history of science of ear, nose, throat and Shiras disorders. Establishment of "Superiority of shiras' among the organs. Determination and importance of the verse '**Nasa Hi Shiraso Dvaram**'. Syntactical derivation and the synonyms of the words Karna, Nasa, Kantha, Shiras etc.
4. Descriptive knowledge of the anatomy and Physiology of ear, nose, throat and Shiras as per ancient and modern science.
5. Examination of the ear, nose, kantha and shira as per Ayurveda and modern science.
6. Common etiology of ear, nose, throat and shiras disorders, their pathogenesis, prodromal symptoms, classification, clinical features and general treatment.
7. Importance of shaman and sodhana therapy in ear, nose, throat and shira disorders with general introduction to local therapeutic procedures of ear nose and throat and shira e.g. kaval, gandusha etc.
8. Detailed applied knowledge of recent advanced diagnostic and therapeutic techniques and equipments (Yantra and Shastra) used for ENT and Shira disorders.
9. General knowledge of 'vrana bandhana' (bandaging of wounds) and applied bandage in ear etc.
10. Update chronological development of ENT from Vedic period.
11. Study of essential modern drugs, anaesthetic agents of diagnostic and surgical importance.

PAPER – II Ayurvediya Shiro – Nasa - Karna - Kantha Roga Vigyan

1. Examination of the ear, nose, throat and shira patients.
2. Karna-Nasa –Kantha –and Shira rogas samkhya samprapti, descriptive knowledge of etiology, pathogenesis, prodromal symptoms, classification, clinical features, Upasaya-Anupsaya(prognostic measures) sadhyasadhyatwa and, complications of ear disorders described in the classics of Ayurved. Detail description along with practical orientation of their management.
3. Nasa rogas samkhya samprapti, descriptive knowledge, etiology, pathogenesis, prodromal symptoms, classification, clinical features, Upasaya-Anupsaya (prognostic measures), sadhyasadhyatwa and complications of nasal diseases described in the classics of Ayurved. Detail description along with practical orientation of their treatment.
4. Kantha rogas samkhyasamprapti, descriptive knowledge about etiology, pathogenesis, prodromal symptoms, classification, clinical features, Upasaya- Anupsaya (prognostic measures),sadhyasadhyatwa and complications of kantha diseases described in the classics of Ayurved. Detail description along with practical knowledge of treatment.
5. Shira and Kapala (cranial vault) disorders samkhya samprapti, descriptive knowledge, etiology, pathogenesis, prodromal symptoms, classification, clinical features, Upasaya-Anupsaya (prognostic measures) and complications of Shira and kapala diseases described in the classics of Ayurved. Detail description along with practical knowledge of treatment.

PAPER – III Adhunika Shiro- Nasa- Karna - Kantha Roga vigyan

1. Descriptive knowledge of instruments and recent equipments available for diagnosis of ear – nose – throat – head disorders along with their practical application.
2. Descriptive knowledge of etiology, pathogenesis, clinical features, differential diagnosis, classification along with complications of different ear – nose- throat and

head disorders. Detail knowledge of the treatment (including conservative and surgical) of the above mentioned disorders.

3. Imaging in ENT and Head disorders, detailed knowledge of LASERS, radiotherapy, chemotherapy and other recently advanced treatment modalities like speech therapy, cochlear implant, rehabilitation of the deaf and mute, etc. related to ear – nose – throat – and head disorders.
4. Management of emergencies in ENT and head disorders.

PAPER – IV Shiro- Nasa- Karna -Kantha Roga Vigyan Shalya Chikitsa

1. Knowledge of agropaaharniya and d trividha karma i.e pre operative, operative and post operative measures. Knowledge of eight types of surgical procedures (Astavidha Sashtra Karma) and post operative care of the patient with respect to ENT disorders (Vranitopasaniya).
2. Practical knowledge of updated surgical procedures in ear – like constructive surgery of external and middle ear, excision of pre auricular sinus, Tympanoplasty, Mastoidectomy, Stapedectomy, Endolymphatic sac surgery, Facial nerve decompression surgery, Cochlear implant, etc with their complications and their management.
3. Nose – Septo-rhinoplasty, SMR, Functional Endoscopic sinus surgery, Caldwell luc surgery, Antral puncture, Antral lavage, Turbinectomy, Polypectomy, Various surgical procedures done for malignancy of Nose and paranasal sinuses, Young's surgery, etc
4. Throat - Adenoidectomy, Tonsillectomy, Surgical procedures for pharyngeal abscesses, cauterization of pharyngeal wall granulations, tracheostomy, vocal cord surgery, surgery of vocal cord paralysis, management of laryngeal trauma, laryngectomy, etc.
5. General introduction of four treatment procedures like Bheshaj– Kshar – Agni– Shastra and Raktavsechana with their applied aspects in ear nose throat and shiro disorders . Chaturvidha upakrama in raktasandhan vidhi related to ear nose throat and head disorders. Haemostatic management in ENT.
6. Removal of foreign bodies in the ear nose throat and shira as per Ayurveda and modern science.
7. Karna-Sandhan Nasa-Sandhan, fundamental and applied aspects of Ayurveda.

Methods of Training

- Intensive integrative training would be imparted to scholars in understanding the classical Ayurvedic aspects with an emphasis of critical comparative interpretation.
- Mandatory participation of scholars in seminars, group discussions, clinical demonstrations , journal review meetings, case study, continuing education activities and research clinical projects.
- During the first year course the emphasis would be laid to impart adequate knowledge on fundamental aspects and their applications, with a focus on latest diagnostic tools , instrumentations and laboratory procedures. Practical orientation and hospital based clinical training is an integral part of the curriculum all through.
- In the second year ,training would stress upon extending the knowledge on techniques and imparting skill for surgical performance, ENT procedure based therapies, surgical/para surgical procedures **so that the scholar is able to perform ENT surgical procedures independently.**
- In the third year the scholar should concentrate on the clinical work and research work based on the dissertation.
- The participation of the scholars in all the aspects of educational process is mandatory.
- Hospital postings – The student has to work for 6 terms of resident posting is compulsory out of which first 2 postings will be as a junior resident and the next four postings will be as a senior resident.
- The student should also develop in the academic work of the department.

Pattern of Practical Examination:

- | | |
|---|-----------|
| 1. Case Record(25) | -10 Marks |
| 2. Bed side examination | |
| Long Case | -20 Marks |
| Short Case | -10 Marks |
| 3. Identification of specimen / Instrument / Radiograph | -10 Marks |
| 4. Thesis Presentation | -25 Marks |
| 5. Viva Voce | -25 Marks |

Reference Books

1. Sushrut Samhita
2. Charak Samhita
3. Ashtang Hridaya
4. Ashtang Samgraha
5. Laghutrayi
6. Modern books related to ENT disorder
7. Diseases of Nose Throat and Ear - Bhargav Shah
8. Diseases of Nose Throat and Ear, Head and Neck EB Edr.
9. A Text book of otorhinolaryngology - Scott Browns editions.
10. Text book of Ear Nose Throat diseases – Dhingra
11. Text book on ENT – Mohd. Maqbool
12. Logan Turner’s book on ENT
13. Ballengers text book of ENT
14. Kumin’s text book of ENT
15. Rob Smith’s book of ENT surgery
16. Paprella’s book of ENT
17. Hazarika’s text book on ENT
18. Books on examination of ENT
19. Audiology Anirwan Biswas
20. Kurt’s Audiology
21. Books on Speech therapy

20. AYURVEDA DHANWANTRI -SHALAKYA - DANTA EVUM MUKHA ROGA

PAPER – I Danta evum Mukha Roga – Ayurveda Siddhanta and Vangmaya Marks 100

1. Etymology, definition and importance of the word 'Shalakya', History and development of the science of oral and dental diseases. Etymology and synonyms of the word 'Mukha' and 'Danta'. Ancient and recent knowledge of anatomy of oral cavity and teeth along with the knowledge of salivary glands.
2. Detailed study of Oral cavity and gustatory physiology.
3. Oral hygiene, Social aspect of oral hygiene, preventive measures in oral cavity diseases, general etiology, pathogenesis, prodromal symptoms, clinical features and general management of oral cavity diseases.
4. Agropaharaniya, knowledge of purva, pradhan and pashchat karma. Study of Ashta Vidha Shastra Karmas in relation to Danta and Mukha Roga.
5. Applied and detailed study of therapeutic measures for oral and dental disorders, like Kavala, Gandusha, Dhumapana, Nasya, Murdhtaila Mukhalepa and Pratisarana and their definition, types, indications, contraindications, procedure, features of proper, excess, deficient application and their management.
6. Importance of shodhan and shaman treatment in oral and dental diseases and knowledge of common recipes useful in oral and dental diseases.
7. General introduction of four types of treatment (Bheshja, Shastra, Kshara, Agni). Detail description of Anushastra karma; their practical knowledge in oral and dental diseases.
8. Analytical determination of related subjects of danta-mukha disorders available in ancient and modern commentaries of different Samhita.

PAPER – II Ayurvediya Danta evum Mukha Rog Vijnana Marks 100

1. Examination of oral cavity, periodontia and teeth. Teeth eruption and its systemic disturbances in a child, Classification, Number of teeth along with detail knowledge of abnormal tooth eruption. Dental disorders in paediatric age group, their prevention and treatment.
2. Danta gata rogas - Dental diseases detailed in the classics of Ayurved; their etiology, pathogenesis, prodromal symptoms, clinical features, complication and applied approach in the treatment of dental diseases.
3. Detailed study of etiology, pathogenesis, prodromal-symptoms, clinical features, complications and prognosis of diseases of the Danta-Mula Gata Roga (**gum-periodontia**) as detailed in the classics of Ayurved. Practical approach/orientation in Treatment of the periodontal diseases.
4. Oshtha (lip), Jihva (tongue) and Talu (palate) Rogas, detailed study of etiology, pathogenesis, prodromal - symptoms, clinical features, complications and, prognosis. Detailed description of their treatment along with practical orientation.
5. Sarvasara Mukharogas (Generalized oral diseases) available in ayurvedic classics. Detailed study of etiology, pathogenesis, prodromal-symptoms, clinical features, complications, prognosis and management of mukha rogas along with practical orientation.
6. Knowledge of Dantabhighata (dental trauma) and Mukhabhighata (oral injury) along with diagnostic and referral skills.

PAPER – III Adhunik Danta evum Mukha Rog Vijnana Marks : 100

1. Detail study of etiology, pathogenesis, clinical features, classification and complication of various oral and dental diseases available in literature of Modern sciences. Detail study of their recent available medical therapeutics.
2. Detail description of diagnostic technology in the diagnosis of oral and dental disease.
3. Study of essential modern drugs, anaesthetic agents of diagnostic and surgical importance.

4. Descriptive Knowledge of up-to-date available modern instruments and their application for examination, diagnosis and management of oral, periodontal and dental diseases.
5. Up-to-date knowledge of applied and available surgical procedures indicated in various dental diseases like tooth extraction, RCT, Dental filling, filling materials, tooth fixation and tooth implants etc.
6. Systemic Effects of oral, periodontal and dental diseases.

PAPER – IV Danta evum Mukha Rog Vijnana & Dentistry

Marks - 100

1. Jaalandhara Bandha, its importance and application in Tooth extraction without anaesthesia.
2. Vishishta Upadanta parikalpana (Dental Material and Prosthesis).
3. Recent Research studies and advanced clinical applications of Kriya Kalpas in Danta and Mukha Rogas.
4. Detailed study of recent available medical therapeutics and Research studies in Dental and oral cavity disorders.
5. Advanced diagnostic technology in Dentistry and oral pathology.
6. Benign and malignant tumors of Oral Cavity, their management and role of Ayurveda in Such conditions.
7. Useful conducts for treatment of oral and dental diseases with study of related medico-legal aspects.

Methods of Training

- Intensive integrative training would be imparted to scholars in understanding the classical Ayurvedic aspects with an emphasis of critical comparative interpretation.
- Mandatory participation of scholars in seminars, group discussions, clinical demonstrations, journal review meetings, case study, continuing education activities and research clinical projects.
- During the first year course the emphasis would be laid to impart adequate knowledge on fundamental aspects and their applications, with a focus on latest diagnostic tools , instrumentations and laboratory procedures. Practical orientation and hospital based clinical training is an integral part of the curriculum all through.
- In the second year, training would stress upon extending the knowledge on techniques and imparting skill for surgical performance, Dental procedure based therapies, surgical / para surgical procedures **so that the scholar is able to perform Dental surgical procedures independently.**
- In the third year the scholar should concentrate on the clinical work and research work based on the dissertation.
- The participation of the scholars in all the aspects of educational process is mandatory.
- Hospital postings – The student has to work for 6 terms of resident posting is compulsory out of which first 2 postings will be as a junior resident and the next four postings will be as a senior resident.
- The student should also develop in the academic work of the department.

Pattern of Practical Examination:

- | | |
|---|-----------|
| 1. Bed side examination | |
| Short Case 2 of 10 marks each | -20 Marks |
| Long Case | -20 Marks |
| 2. Identification of specimen / Instrument / Radiograph | -10 Marks |
| 3. Thesis Presentation / Viva | -10 Marks |
| 4. Teaching skill | -10 Marks |
| 5. Viva Voce | -30 Marks |

Reference Books

1. Sushrut Samhita - Dalhana
2. Useful Portion of Charak Samhita-Ashtang Samgraha -Ashtang Hridaya
3. Useful portion of Laghutrayi related to Danta and Mukha Roga
4. Shalaky Vijnanam - Ravindra Chandra Chaudhary
5. Nimi Tantra - Ramanath Dwivedi
4. Dental Anatomy Histology - Dr. S.I. Bhalajhi
5. Essentials of Preventive and Community Dentistry -Dr. Soben Peter
6. Complete Denture Prosthodontics - Dr. J.J. Manappallil
7. Orthodontics the Art and Science - Dr. S.I. Bhalajhi
8. Text book of Pediatric Dentistry - Dr. S.G. Damle
9. Text book of Oral and Maxillofacial surgery -Dr. Vinod Kapoor
10. Clinical Periodontology - Dr. B.R.R. Varma
11. Anatomy for Dental Students - Inderveer Singh
12. Clinical Periodontology - Carranza , Newman
13. Operative Dentistry - M A Marzouk
14. Oral and maxilofacial surgery secrets - A.Omar Abubaker
15. Killey and Kay's Outline of Oral Surgery - Girdon R Seward
16. Clinical Dentistry - Ivor G. Chestnut , John Gibson
17. Synopsis of Oral Pathology - S N Bhaskar
18. Oral Pathology - Stone

21. PANCHKARMA

PAPER-I Purva Karma-Snehana and Svedana

1. Panchkarma in Ashtanga Ayurved and Significance of Shodhana
2. Ama and Shodhana, benefits of Shodhana, Samikshya Bhavas in Shodhana,
3. Importance of Pachana prior to Snehana, methods, drugs, duration and dose for Pachana, samyak Lakshana of Pachana

Snehana

1. Etymology and definition of Sneha and Snehana
2. General considerations about Snehana
3. Classifications of Sneha, Sneha-Yoni, detailed knowledge of four types main Sneha- Ghrita, Taila, Vasa and Majja with their characteristics, importance and utility, various aspects of Uttama Sneha
4. Properties of Snehana Dravya and their interpretation
5. Effects of Snehana
6. Sneha Kalpana, various types of Sneha Paka with their utility
7. Indications and contraindications of Snehana
8. Classification of Snehana: Bahya and Abhyantara Snehana
9. Bahya Snehana and Bahir-Parimarjana, utility and importance of Bahya Snehana
10. Classification of Bahya Snehana
Methods, indications, contraindications, specific utility of the followings Abhyanga, Mardana, unmardana, Padaghta, Samvahana, Udvartana/Utsadana, Udgharshana, Avagaha, Pariseka, Lepa, Pralepa, updeha, Gandusha, Kavala; Karana and Nasa Purna, Akshi Tarpana; Murdhni Taila: Shiro-abhyanga, Shirodhara, Siro Pichu and Siro Basti, Shiro Lepa (Talapotichil), Talam and Takradhara, etc.
11. Knowledge of digestion and metabolism of fat
12. Karmukata of Abhyantara and Bahya Snehana
13. Knowledge of different western massage techniques
14. Abhyantara Snehana: Brimhnartha, Shamanartha and Shodhanartha, definition, method and utility of Brimhanartha and shamanrtha Snehana; difference between Shamanartha and Shodhanartha Snehana
15. Methods of Abhyantar Snehana
16. Shodhanartha Snehana: Acchapana and Vicharana, Utility and various methods of Sadyasnehana, Avapidaka Sneha
17. Matra of Sneha : Hrasiyasi, Hrasva, Madhyama and Uttma Matra with their indications, specific utility of Ghrita, taila, Vasa and majja; Anupana of Sneha
18. Need and method of Rukshana before performing Snehana in specific conditions and Samyak Rukshana Lakshana
19. Shodhannga Snehana Vidhi and methods of fixation of dose
20. Diet and Pathya during Snehana
21. Observation of sneha Jiryamana, Jirna and Ajirna Lkashana
22. Samyak, Asnigdha and Ati Yoga Lakshana of Snehana
23. Snehs vyapta and their management
24. Pariharya vishaya and Parihara Kala

Svedana

1. Etymology and definition of Svedana
2. General considerations about Svedana
3. Properties of Svedan and Svedopaga Dravya
4. Indications and contraindications of Svedana
5. Various Classifications of Sveda and Svedna
6. Detailed knowledge of four types of Sveda of Sushruta with their utility;

7. Hina, Mridu, Madhya and Mhana Sveda; Ekanga and Sarvanga sveda with their utility
8. Utility and method of each of 13 types of Sagni and 10 types of Niragni Sveda
9. Shodhannga and Samshamaniya Sveda
10. Methods to protect the vital organs (varjya anga) during Svedan Procedure
11. Detailed Knowledge about Utility of below mentioned Svedan procedures:- Patrapinda Sveda, Shashtika Shalipinda Sveda, Churna Pinda Sveda, Jambira Pinda Sveda, Dhanya Pinda Sveda, Kukkutanda Sveda, Anna Iepa, Valuka Sveda, Ishtika Sveda, Nadi Sveda, Bashpa Sveda, Kshira bashpa Sveda, Avagaha Sveda, Parisheka Sveda, Pizichil, Dhanyamla Dhara, Kashaya Dhara, Kshira Dhara and Upanaha Sveda.
12. Avasthanusari Svedana in various disorders
13. Samyak, Ayoga and Atiyoga Lakshana, Sveda Vyapat and their management
14. Diet and regimens during and after Svedana
15. Karmukata of Svedana
16. Current sudation modalities like Sauna bath, Steam Bath, Infrared, etc.
17. Svedana with Kati Basti, Janu Basti and Griva Basti
18. Study of Snehana and Svedana related portions in classics with commentaries

PAPER – II Vamana and Virechana Karma

Vamana Karma

1. Etimology, definition and general considerations of vamana
2. Properties of Vamaka and Vamanopaga drugs
3. Knowledge and utility of important Vamaka drugs and their preparations (Vamana Yoga)
4. Avasthanusara Vamana and its utility.
5. Indications of Vamana
6. Contraindications of Vamana with reasons
7. Pachana prior to Snehana
8. Detailed knowledge and method of preparation of patient with Snehana
9. Abhyanga and Svedana as Purvakarma of Vamana
10. Diet and management of gap day
11. Need of increasing of Kapha for proper Vamana, Kapha increasing diet
12. Management of Patients on the morning of Vamana
13. Administration of food articles prior to Vamana
14. Drug, time, Anupana, Sahapana, dose and method of administration of Vamana and Vamanopaga preparations
15. Method of Vamana Karma, waiting period for automatic Vamana Vega and manipulation in its absence
16. Observations prior to beginning of Vamana such as sweat on forehead, horripilation, fullness of stomach and nausea
17. Observation and assistance of the patient during Vamana
18. Vega and Upavega of Vamaana and its counting, observations and preservation of vomitus matter and its weighing
19. Samyak, Ayoga and Atiyoga of Vamana
20. Laingiki, Vaigiki, Manaki and Antiki Shuddhi,
21. Hina, Madhya and Pravara Shddhi and Samsajana Krama accordingly
22. Detail knowledge of methods of Samsarjana Krama and its importance
23. Kavala and Dhumapana after vamana
24. Management of Ayoga, Atiyog and Vyapat of Vamana with Ayurveda and modern drugs
25. Parihara Vishaya and Kala for Vamana

26. Vamana Karmukata with Pharmaco-dynamics of Vamana

Virechana Karma

1. Etymology, definition and general considerations of Virechana
2. Importance of Vamana and Virechana as shodhana, Virechana better than Vamana
3. Necessity of Vamana prior to Virechana
4. Preparation of patients for Virechana after Vamana
5. Preparation of patients directly for Virechana
6. Properties of main Virechaka and Virechanopaga drugs, Classifications of Virechana drugs with definition, example and utility of each type
7. Indications of Vamana Karma
8. Contraindications of Virechana with reasons
9. Utility of Virechana for the specific conditions and stages of the disease
10. Internal Snehana for Virechana with diet
11. Management of 3 gap day with diet and importance of low Kapha for proper Virechana
12. Abhyanga and Svedhana as Purvakarma of Virechana
13. Management of Patients on the morning of Virechana
14. Virechana should be performed in empty stomach
15. Drug, dose, time, Anupana, sahapana and method of administration of Virechana and Virechanopaga preparations
16. Method of performing of Virechana Karma
17. Observations during Virechana, Vega and Upavega of Virechana and its counting, observations and preservation of feces and its weighing
18. Samyak, Ayoga and Atiyoga of Virechana
19. Laingiki, Vaigiki, Manaki and Antiki Shuddhi of Virechana
20. Hina, Madhya and Pravara Shddhi and Samsajana Krama accordingly
21. Detail knowledge of methods of Samsarjana Krama and its importance, and Tarpana krama and its importance
22. Management of Ayoga, Atiyog and Vyapat of Virechana with Ayurveda and modern drugs
23. Parihara Vishaya and Kala for Virechana
24. Virechana a Karmukata with Pharmaco-dynamics of Virechana
25. Applied anatomy and physiology of Gastrointestinal system related with Vamana and Virechana
26. Study of Vamana and Virechana related portions in classics with commentaries
27. Recent advances of researches on the effect of Vamana and Virechana
28. Scope of research for Vamana and Virechana.
29. Role of Vamana and virechana in promotion of health prevention and treatment of diseases

PAPER – III Basti Karma and Nasya Karma

Basti Karma

1. Etymology, definition and general considerations of Basti
2. Importance of Basti in Kayachikitsa and other branches of Ayurveda
3. Classifications of Basti
4. Drugs useful in Basti
5. Indications of Basti, its role at the various stages of diseases
6. Contraindications of Basti with reasons
7. Description of Basti yantras, Basti netra and Basti putaka and their Doshas. Modified Basti Yantra, their merits and demerits

8. Dose schedules of Niruha and Anuvasana basti

Niruha basti

Etymology, synonyms, definition and classifications and subclassifications of Niruha Basti and detailed knowledge of each type of Niruha Basti along with indications and contraindications and benefits

Contents of various types of Niruha Basti, their proportions, methods of mixing basti Dravya,

Relation of Virechana, Shodhana, Anuvasana Basti with Niruha Basti

Purvakarma for Niruha Basti; Pathya before, during and after Niruha Basti; all the aspects of administration of various Niruha Basti

Observations during and after Niruha Basti

Basti Pratyagamana,

Samyakyoga, Ayoga and Atiyoga Lakshana and Various Vyapat of Niruha Basti and their management according to Ayurved and Modern Systems of Medicines

Management during and after Niruha Basti

Pariharya vishaya and pariharakala,

Anuvasana basti

Etymology, synonyms, definition and classifications of Anuvasana Basti and detailed knowledge of each type of Anuvasana Basti along with indications and contraindications and benefits

Various types of Ghrita and Taila useful in Anuvasana Basti; Anuvasana Basti with Vasa and Majja along with their merits and demerits

Relation of Virechana, Shodhana, Niruha Basti, Snehana with Anuvasana Basti

Purvakarma for Anuvasana Basti; Pathya before, during and after Anuvasana Basti; all the aspects of administration of Anuvasana Basti including Kala

Observations during and after Anuvasana Basti

Anuvasana Basti Pratyagamana,

Samyakyoga, Ayoga and Atiyoga Lakshana and Various Vyapat of Anuvasana Basti and their management.

Management during and after Anuvasana Basti

Pariharya vishaya, Pathya and pariharakala for Anuvasana

Various combined basti schedules such as Karma, Kala, yoga Basti etc.

Detailed knowledge of Matra Basti

Detailed Knowledge of different basti formulations like Piccha Basti, Kshira Basti, Yapana Bastis, Madhutailika Basti, Erandamuladi Niruha Basti, Panchaprasrutika Basti, Kshara Basti, Vaitarana Basti, Krimighna Basti, Lekhana Basti, Vrishya Bsti, Manjishtadi Niruha Basti, Dashamula Basti, Ardhamatrika Basti, Sarva roghara Niruha Basti, Brimhana Basti, Vataghna Basti, Pittaghna Basti and Kaphaghna Basti etc, and their practical utility.

Uttara basti

1. Definition and Classification of Uttara Basti, its Netra and Putaka. Dose of Uttara Basti Sneha and Kashaya Basti. Different Uttara Basti Kalpanas in various diseases.
2. Detailed knowledge of Purvakarma and Administration of Uttara Basti in male and female, precautions, aseptic measures, complications and their management
Karmukata of Basti. Applied anatomy and physiology of colon, Pharmacodynamics of Basti.
3. Concept of 'Gut Brain' and its relevance to Basti Therapy.
4. Study of relevant portions of Basti in classics with commentaries.

Nasya Karma

1. Etymology, synonyms, importance and definition of Nasya
2. Nasya drugs according to various Samhita

3. Classifications and sub-classifications of Nasya with detailed knowledge of each type
4. Indications and contraindications of each type of Nasya with reasons
5. Drugs useful for Nasya with Dose and methods of preparations and their doses
6. Nasya Kala and Pathya before, during and after Nasya; Duration of different Nasyas
7. Purvakarma of each types of Nasya
8. Detailed knowledge of administration of each type of Nasya with management during and after Nasya.
9. Detailed knowledge of common Nasya formulations such as Shadabindu Taila, Anu taila, Kshirabala Taila, Karpasastyadi Taila, Bramhi Ghrita.
10. Samyak yoga, Ayoga and Atiyoga of each types of Nasya, its Vyapat and their management
11. Pashchata Karma; Role of Dhumapana, Kavala after Nasya,
12. Diet and Pathya before, during and after Nasya Karma
13. Pariharya vishaya, Parihara Kala,
14. Nasya Karmukata, Applied anatomy and physiology related to Nasa hi Sirso Dvaram, blood and nerve supply to nose, Shringataka marma, olfactory nerve and centers, aroma therapy, trans nasal administration of drug, recent advances in nasal drug delivery
15. Study of relevant portion in classics with commentaries

PAPER – IV Raktamokshana, Physiotherapy and Diseasewise Panchakarma

A. Raktamokshana-33 Marks

1. Definition, importance, classifications and detailed knowledge of each type of Raktamokshana with their methods of performance
2. General principles, indications, contraindications of Raktamokshana
3. Detailed knowledge of Jalaukavacharana: Indications and contraindications of Jalaukavacharana, various tyoes of Jalauka with their beneficial and harmful effects.
4. Purvakarma and method of Jalaukavacharana, observations and Pathya before, during and after Jalaukavacharana
5. Management during and after Jalaukavacharana
6. Symptoms of Samyak, Ayoga and Atiyoga and Vyapat of of Raktamokshana and their management with Ayurveda and Modern medicines.
7. Pariharya vishaya and Parihara kala
8. Karmukata of different types of Raktamokshana

B. Clinical Physical Medicine-33 Marks

1. Definitions and terminology
2. Biomechanics of human movements; Physiology of exercise
3. Treatment modalities used in Physical Medicine- general properties and detailed clinical use of each
 - a. Heat – general physiological properties and mode of action as a treatment agent, Forms of heat therapy – superficial and deep heating. General knowledge of Infrared, Paraffin Wax bath, short wave diathermy, electro magnetic therapy, ultra sound therapy, convection heating devices,
 - b. Cold as a therapeutic agent
 - c. Prescription of physical modalities and their applications in medicine.
4. Clinical use of massage, manipulation, stretching
5. Principles of occupational therapy, training in activities of daily living for rehabilitation, self-help devices (walking aids, wheelchairs, tricycles & modified vehicles), instrumental activities of daily living,
6. Physiotherapy exercises for Paralytical disorders, cervical spondylosis, frozen shoulder and slip disc.

C. Disease-wise Panchakarma-34 Marks

Role of Panchakarma in Different Stages of the following Diseases:

Jvara, Raktapitta, Madhumeha, Kushtha, Shvitra, Unmada, Apasmara, Shotha, Plihodara, Yakridaluodara, jalodara,, Arsha, Grahani, Kasa,Tamaka Shwasa, Vatarakta, Vatavyadhi, Amlapitta, Parinama Shula, Ardhavabhedaka, Ananta Vata,, Amavata, Sheetapitta, Shleepada, Mutrakruchchra, Mutrashmari, Mutraghata, Hrudroga, Pinasa, Drushtimandya, Pandu, Kamala, Sthaulya, Krimi, Madatyaya, Moorchcha, Padadari, Mukhadushika, Khalitya, Palitya,

Use of Various panchakarma Procedures in the following disorders -

Migraine, Parkinson's Disease, trigeminal neuralgia, Bell's palsy, cerebral palsy, Muscular dystrophy, hemiplegia, paraplegia, Lumbar Disc disorders, Spondylolisthesis, Ankylosing spondylosis, Carpel Tunnel Syndrome, Calcaneal Spur, Plantar fasciitis, GB syndrome, Alzhiemer's disease, Irritable Bowel Syndrome, ulcerative colitis, psoriasis, hypothyroidism, hyperthyroidism, hypertension, allergic rhinitis, , Eczema, diabetes mellitus, Chronic obstructive pulmonary Disease, Insomnia, Rheumatoid Arthritis, Gout, Osteoarthritis,multiple sclerosis, SLE, male & female infertility, cirrhosis of liver, Jaundice, General Anxiety Disorders,

Referance Books:

- | | | |
|----|---|---|
| 1 | Charak Samhita with commentary of Ayurved
Dipika by Chakrapanidatta and Jalpakalpa
taruby Gangadhara | Agnivesha |
| 2 | Sushrutha Samhita with the Nibhandha
Samgraha commentary of Dalhana and
Nyayachandrika panjika of Gayadasa on
nidansthana | Sushrutha |
| 3 | Ashtang Hridaya with Sarvanga sundara and
Ayurved rasayana commentaries
Ashtanga Sangraha with Shashilekha
commentery
Bhela Samhita
Kashyapa Samhita
Bhavaprakasha of Bhavamishra
Sharangadhara Samhita
Vangasen
Gadanigraha | Vagbhata
Vagbhata |
| 4 | Ayurvediya Panchkarma chikitsa | Dr Mukundilal Dwivedi |
| 5 | Panchkarma Vigyan | Dr Haridas Shreedhar Kasture |
| 6 | Illustrated Panchkarma | Dr.G Srinivasa Acharya |
| 7 | Ayurveda-Principles and Practice of
Panchakarma | Dr. Mandip and Dr Gurdip Singh |
| 8 | The Panchkarma Treatment of Ayurved with
Kerala Specialities | Dr. T.L. Devaraj |
| 9 | Panchkarma Therapy | Dr. R.H. Singh |
| 10 | Principles and practice of vasti | Dr. Vasudevan Nampoothiri and Dr.
L. Mahadevan |
| 11 | Claiton's Physiotherapy | |
| 12 | Teddy's Physiotherapy | |
| 13 | Harrison's Principles of Inernal Medicines | |
| 14 | Guyton's Physiology | |

22.Chhaya Avum Vikiran Vigyan

Paper-1 Fundamentals of Chhaya Avum Vikiran Vigyan (Radio-diagnosis & Imaging)

Part-A

Detail knowledge of principles of Ayurveda and their applied aspects, specially Panch Mahabhuta, Dosh, Dhatu, Mala, Panch Nidan, Prakriti, Shatkriyakaal, Praman, Chhya-Pratichchhaya , Prabha, , Rogi pariksha (Trividha, Shatvidha especially Darshan pariksha),their relevance with Chhaya avum Vikiran Vigyan.

-Study of Ayurvedic classics and modern Medical Science texts related to Chhaya avum vikiran vigyan

- Chhaya avum Vikiran vigyan as a means of Darshan priksha.

Part-B

- Infrastructure of an ideal Chhaya avum vikiran unit.
- Fundamental principles of Chhaya avum vikiran vigyan
- Detail knowledge of equipments (yantra) used in Chhaya avum Vikiran Vigyan.
- Dark room techniques
- Ionizing and non ionizing energies related to Chhaya avum Vikiran Vigyan - relevant hazards, prevention and precautions, their management by Ayurvedic and modern measurements.
- Trividh Karma –Poorva ,Pradhan avum Pashchat Karma in Chhaya avum Vikiran Vigyan
- Occupational physical disorders of consultants related to Radio-diagnosis and imaging.

Paper-2 Applied Anatomy, Physio-pathology and Procedures in Chhaya avum Vikiran Vigyan (Radio-diagnosis & Imaging)

Part-A

Applied Anatomy, Physiology & Pathology in Chhaya avum vikiran Vigyan (Radio-diagnosis & Imaging)

Detail knowledge of Ayurvedic and Modern applied radiological Anatomy (including sectional), Physiology and Pathology of the human body;

1. Sira(Vessels), Gaurya Sira, (Lymphatic channels), Mansa (Muscles), Snayu (Ligaments), Kandara (Tendons), Sandhi(Joints), Nadi(Nerve), Asthi(Bones), Strotas,Marma, Antahsraivi granthi (Endocrine glands) etc.
2. Urdhwajatrugata(Supraclavicular) parts-Kapaal(Skull),Karna(Ears),Chakshu(Eyes), Nasa(Nose), Paranasal sinuses, Lalagranthi(Salivary glands), Face, Greeva(Neck), Sushumna(Spinal cord) and Kaseruka (vertebrae), Mukha(Mouth), Danta(Teeth), Mastulunga(Brain), Lasika granthi(Lymph glands)etc.
3. Koshtha (Trunk) parts-Sushumna(Spinal cord) and Kaseruka(vertebrae).
 - a. Vaksha(Thoracic)parts-Phuphphus(Lungs),Hridaya(Heart)&Sira(Vessels), Shwashnalika (Trachea, Bronchi), Annamarg (Esophagus), Lymph nodes, Kooch (Breast), Hridayabandhan (Diaphragm)etc.
 - b. Udar(Abdominal)parts- Audaryyakalaa (Peritoneum) Aamashaya(Stomach) , Kshudrant (Smallintestine), Vrihadantra (Large intestine), Guda(Rectum and Anal canal), Aantrapuchchha (Appendix) , Yakrit(Liver), Tilam(Gall bladder), Billiary channels, Pleeaha(Spleen), Agnyashaya(Pancreas), Vrikka (Kidney),Gavini(ureter), Basti(urinarybladder), Shishna(penis),Paurushgranthi (prostate) ,Vrishan(testes),Shukrashaya (seminalvesicles),Dimbashaya(ovaries), Perineum Garbhashaya(uterus), Yoni, Dimbvahini(fallopian tubes), Lasika granthi (lymph nodes) etc.
4. Shakha-parts of upper and lower extremities.

Part –B Procedures in Chhaya avum Vikiran Vigyan (Radio-diagnosis & Imaging)

- Various routine and special, non-contrast and contrast radiography, Digital radiography, Radiographic positions and views.
- Various Ultra Sonographic procedures -Various diagnostic and therapeutic Ultrasonography [routine,,joint study, various Endo-USG, Obstetrics -Garbha vinishchaya (confirmation of pregnancy) , Masanumas Garbh vridhhi (fetal development), Garbha swastha (fetal well being) and Vyadhi (fetal diseases) ,Vikrita garbha (congenital anomalies) . Aparā (Placenta) , Nabhinadi darshan (umbilical cord),Garbhapatta (abortion) Aparā / Garbhaavayav Apaatan (Retained conceptual products), Gynaecology –Yonivyapat (gynaecological disorders), Bandhyatva (infertility) , Garbhashayabhransha (uterine prolapse)etc. Dopplers USG guided techniques and other advances.
- CT, MRI, Radionuclide scanning, PET and other recent advanced procedures in Radio-diagnosis & Imaging.
Mammography
Bone Densitometry
Interventional radiology

Paper 3 *Physics and Biology related to Chhaya avum Vikiran Vigyan(Radio diagnosis & Imaging)*

Part-A

- Physics of radiography, Digital radiography, Fluoroscopy, their application.
- Physics of ultrasonography, its applied aspect related to various U.S.G, Doppler procedures.
- Study of contrast materials used in Radio-diagnosis and imaging.

Part-B

- Physics of CT scan, its applied aspect, efficiency and limitations.
- Physics of MRI, its applied aspect, efficiency and limitations.
- Physics and its applied aspect related to other imaging procedures e.g. PET, Radio-Nuclides imaging etc.
- Biology related to Chhaya avum Vikiran Vigyan

Paper-4th *Applied Chhaya avum Vikiran Vigyan (Radio-diagnosis & Imaging)*

Part-A

Applied aspects of radiographic interpretation and reporting of various diseases related to systems, organs (as mentioned in paper-2nd, part-A) and metabolism.

Part-B

- Applied aspects of Ultrasonography, interpretation and reporting of various diseases related to system, organ (as mentioned in paper-2nd, part-A,) and metabolism, routine joint study, various Endo-USG. , Obstetrics -Garbha vinishchaya (confirmation of pregnancy) , Masanumas Garbh vridhhi (fetal development), Garbha swastha (fetal well being,bio-physical profile) and Vyadhi (fetal diseases) ,Vikrita garbha (congenital anomalies,2nd level obstretic USG) . Aparā (Placenta) , Nabhinadi darshan (umbilical cord),Garbhapatta (abortion) Aparā / Garbhaavayav Apaatan (Retained conceptual products), Gynaecology –Yonivyapat (gynaecological disorders), Bandhyatva (infertility) , Garbhashayabhransha (uterine prolapse)etc. Dopplers, USG guided techniques and other advances..
- Applied aspect , interpretation and reporting of CT scan, MRI scan and other advanced Radiological techniques.

- Application of Chhaya avum vikiran vigyan in context to Ayurvedic fundamentals, diagnosis, management and research.

Reference Books;

Shusruta Samhita	Relevant part
Charak Samhita	- do-
Astang Hridaya/Sangrah	- do-
Text Book of Radiographic Positioning and Related Anatomy	- By Kenneth L Bontrager, John P Lampignano
Radiographic interpretation to general practitioner	-W.H.O.
Procedures in diagnostic Radiology	- By T. Doyle, W. have, K. Thomson.
Radiographic positioning	- By Clark
Radiobiology for the Radiologist	- By Hall.Christensen's
Physics of Diagnostic Radiology	- By Curry T S , Dowdey J E , Murry R C
Farr's Physics for Medical Imaging	- By Penelope Allisy-Roberts , jerry Williams
Fundamental of Diagnostic Radiology	- By Brant.
Diagnostic Imaging	- By Federle
Diagnostic Imaging	- By Peter Armstrong , Martin Wastie , Ansrea Rockall
Gastrointestinal radiology	- R.L. Eisenberg
Uro-radiology	- T.Sherwood, A.J.Davidson, .B.Talner
Grainger and Allison's Diagnostic Radiology	-Text book of medical imaging
Text Book in Radiology and Imaging	- By D. Sutton.
Introduction to Vascular Ultrasonography	- By Zwiebel , Pellerito
Text book in Ultrasonography	- By Roumack
Manual of Medical Diagnostic Ultrasonography	- By W.H.O. Scientific group.
Computed Tomography & MRI of the whole body	- By Hagga.
Surface and Radiological Anatomy	- By A. Halim
X-Ray equipment for student Radiographers	- By DN and MO Chesney
Clinical Sonography , A Practical Guige	- By Roger C. Sanders ,
Tom Winter	
Ultrasonography in obstretics and gynaecology	-Callen
Standard Journals like Indian Journal of Radiology, Radiology,Radiological clinics of north America,British Journal of Radiology etc.	
Audio-visual aids	-CDs & DVDs



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SYLLABUS FOR POST – GRADUATE COURSE IN AYURVED

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3. KRIYA SHARIR		15-17
4. DRAVYAGUNA VIGYAN		18-20
5. RASA SHASTRA & BHAISHAJYA KALPANA		21-24
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13. PANCHKARMA		43-44
14. PRASUTI EVUM STRI ROGA		45-46
15. KAUMARBHRITYA-BALA ROGA		47-48
16. SHALYA -SAMANYA		49-51
17. SHALYA - KSHAR EVUM ANUSHAstra KARMA		52-54
18. ASTHI SANDHI AND MARMAGAT ROGA		55-57
19. SANGYAHARAN		58-59
20. SHALAKYA - NETRA ROGA		60-61
21. SHALAKYA – DANTA EVUM MUKHA ROGA		62-63
22. SHALAKYA- SHIRO-NASA-KARNA EVUM KANTHA ROGA		64-65

PG 1st Year Syllabus-1

M.D./M.S.-AYURVEDA PRELIMINARY

PAPER-I

RESEARCH METHODOLOGY AND MEDICAL STATISTICS

PART-A
RESEARCH METHODOLOGY

- 1 **Introduction to Research**
 - A. Definition of the term research
 - B. Definition of the term anusandhan
 - C. Need of research in the field of Ayurveda

- 2 **General guidelines and steps in the research process**
 - A. Selection of the research problem
 - B. Literature review: different methods (including computer database) with their advantages and limitations
 - C. Defining research problem and formulation of hypothesis
 - D. Defining general and specific objectives
 - E. Research design: observational and interventional, descriptive and analytical, preclinical and clinical, qualitative and quantitative
 - F. Sample design
 - G. Collection of the data
 - H. Analysis of data.
 - I. Generalization and interpretation, evaluation and assessment of hypothesis.
 - J. Ethical aspects related to human and animal experimentation.
 - K. Information about Institutional Ethics Committee (IEC) and Animal Ethics Committee (AEC) and their functions. Procedure to obtain clearance from respective committees, including filling up of the consent forms and information sheets and publication ethics.

- 3 **Preparation of research proposals in different disciplines for submission to funding agencies taking EMR-AYUSH scheme as a model.**

4. **Scientific writing and publication skills.**
 - a. Familiarization with publication guidelines- Journal specific and CONSORT guidelines.
 - b. Different types of referencing and bibliography.
 - c. Thesis/Dissertation: contents and structure
 - d. Research articles structuring: Introduction, Methods, Results and Discussions (IMRAD)

- 5 **Classical Methods of Research.**

Concept of Pratyakshadi Pramana Pariksha, their types and application for Research in Ayurveda.

Dravya-, Guna-, Karma-Parikshana Paddhati
Aushadhi-yog Parikshana Paddhati
Swastha, Atura Pariksha Paddhati
Dashvidha Parikshya Bhava
Tadvidya sambhasha, vadmarga and tantrayukti

- 6 **Comparison between methods of research in Ayurveda (Pratigya, Hetu, Udaharana, Upanaya, Nigaman) and contemporary methods in health sciences.**

PG 1st Year Syallabus-2

7. Different fields of Research in Ayurveda

Fundamental research on concepts of Ayurveda

- a. Panchamahabhuta and tridosha.
- b. Concepts of rasa, guna, virya, vipak, prabhav and karma
- c. Concept of prakriti-saradi bhava, ojas, srotas, agni, aam and koshta.

8. Literary Research-

Introduction to manuscriptology: Definition and scope. Collection, conservation, cataloguing. Data mining techniques, searching methods for new literature; search of new concepts in the available literature. Methods for searching internal and external evidences about authors, concepts and development of particular body of knowledge.

9. Drug Research (Laboratory-based)- Basic knowledge of the following:

Drug sources: plant, animal and mineral. Methods of drug identification.

Quality control and standardization aspects: Basic knowledge of Pharmacopoeial standards and parameters as set by Ayurvedic Pharmacopoeia of India.

Information on WHO guidelines for standardization of herbal preparations. Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP).

10. Safety aspects: Protocols for assessing acute, sub-acute and chronic toxicity studies. Familiarization with AYUSH guidelines (Rule 170), CDCSO and OECD guidelines.

11. Introduction to latest Trends in Drug Discovery and Drug Development

-Brief information on the traditional drug discovery process

-Brief information on the latest trends in the Drug Discovery process through employment of rational

approach techniques; anti-sense approach, use of micro and macro-arrays, cell culture based assays, use of concepts of systems biology and network physiology
-Brief introduction to the process of Drug development

12. Clinical research:

Introduction to Clinical Research Methodology identifying the priority areas of Ayurveda

Basic knowledge of the following:-

Observational and Interventional studies

Descriptive & Analytical studies

Longitudinal & Cross sectional studies

Prospective & Retrospectives studies

Cohort studies

Randomized Controlled Trials (RCT) & their types

Single-case design, case control studies, ethnographic studies, black box design, cross-over design, factorial design.

Errors and bias in research.

New concepts in clinical trial- Adaptive clinical trials/ Good clinical practices (GCP)

Phases of Clinical studies: 0,1,2,3, and 4.

Survey studies -

Methodology, types, utility and analysis of Qualitative Research methods. Concepts of in-depth interview and Focus Group Discussion.

13. Pharmacovigilance for ASU drugs. Need, scope and aims & objectives. National Pharmacovigilance Programme for ASU drugs.

14. Introduction to bioinformatics, scope of bioinformatics, role of computers in biology. Introduction to Data base- Pub med, Medlar and Scopus. Accession of databases.

15. Intellectual Property Rights- Different aspect and steps in patenting. Information on Traditional Knowledge Digital Library (TKDL).

PG 1st Year Syallabus-3

PART-B

40 marks

MEDICAL STATISTICS

Teaching hours: 80

- 1 **Definition of Statistics** : Concepts, relevance and general applications of Biostatistics in Ayurveda
- 2 **Collection, classification, presentation, analysis and interpretation of data** (Definition, utility and methods)
- 3 **Scales of Measurements** - nominal, ordinal, interval and ratio scales.
Types of variables – Continuous, discrete, dependent and independent variables.
Type of series – Simple, Continuous and Discrete
- 4 **Measures of Central tendency** – Mean, Median and Mode.
- 5 **Variability:** Types and measures of variability – Range, Quartile deviation, Percentile, Mean deviation and Standard deviation
- 6 **Probability:** Definitions, types and laws of probability,
- 7 **Normal distribution:** Concept and Properties, Sampling distribution, Standard Error, Confidence Interval and its application in interpretation of results and normal probability curve.
- 8 **Fundamentals of testing of hypotheses:**
Null and alternate hypotheses, type I and type 2 errors.
Tests of significance: Parametric and Non-Parametric tests, level of significance and power of the test, 'P' value and its interpretation, statistical significance and clinical significance
- 9 **Univariate analysis of categorical data:**
Confidence interval of incidence and prevalence, Odds ratio, relative risk and Risk difference, and their confidence intervals
- 10 **Parametric tests:** 'Z' test, Student's 't' test: paired and unpaired, 'F' test, Analysis of variance (ANOVA) test, repeated measures analysis of variance
- 11 **Non parametric methods:** Chi-square test, Fisher's exact test, McNemar's test, Wilcoxon test, Mann-Whitney U test, Kruskal – Wallis with relevant post hoc tests (Dunn)
- 12 **Correlation and regression analysis:**
Concept, properties, computation and applications of correlation, Simple linear correlation, Karl Pearson's correlation co-efficient, Spearman's rank correlation.
Regression- simple and multiple.

- 13 **Sampling and Sample size computation for Ayurvedic research:**
Population and sample. Advantages of sampling, Random (Probability) and non random (Non-probability) sampling. Merits of random sampling. Random sampling methods- simple random, stratified, systematic, cluster and multiphase sampling. Concept, logic and requirement of sample size computation, computation of sample size for comparing two means, two proportions, estimating mean and proportions.
- 14 **Vital statistics and Demography:** computation and applications - Rate, Ratio, Proportion, Mortality and fertility rates, Attack rate and hospital-related statistics
- 15 **Familiarization with the use of Statistical software** like SPSS/Graph Pad

PG 1st Year Syllabus-4

PRACTICAL**100 marks****I. RESEARCH METHODOLOGY****Teaching hours 120****PRACTICAL NAME**

- 1 **Pharmaceutical Chemistry**
Familiarization and demonstration of common lab instruments for carrying out analysis as per API
- 2 **Awareness of Chromatographic Techniques**
Demonstration or Video clips of following:
 - Thin-layer chromatography (TLC).
 - Column chromatography (CC).
 - Flash chromatography (FC)
 - High-performance thin-layer chromatography (HPTLC)
 - High Performance (Pressure) Liquid Chromatography (HPLC)
 - Gas Chromatography (GC, GLC)
- 4 **Pharmacognosy**
Familiarization and Demonstration of different techniques related to:-
Drug administration techniques- oral and parenteral.
Blood collection by orbital plexuses puncturing.
Techniques of anesthesia and euthanasia.
Information about different types of laboratory animals used in experimental research
Drug identification as per API including organoleptic evaluation
- 5 **Pharmacology and toxicology**
Familiarization and demonstration of techniques related to pharmacology and toxicology
- 6 **Biochemistry (Clinical)**
Familiarization and demonstration of techniques related to basic instruments used in a clinical biochemistry laboratory – semi and fully automated clinical analyzers, electrolyte analyzer, ELISA- techniques, nephelometry.
Demonstration of blood sugar estimation, lipid profiles, kidney function test, liver function test. HbA1, cystatin and microalbumin estimation by nephelometry or other suitable techniques.
Interpretation of the results obtained in the light of the data on normal values.
- 7 **Clinical Pathology**
Familiarization and demonstration of techniques related to basic and advanced instruments used in a basic clinical pathology lab. Auto cell counter, urine analyzer, ESR, microscopic examination of urine.
- 8 **Imaging Sciences**
Familiarization and demonstration of techniques related to the imaging techniques.
Video film demonstration of CT-Scan, MRI-scan and PET-scan.
- 9 **Clinical protocol development**

PG 1st Year Syllabus-5

II. MEDICAL STATISTICS**Practical hours:20****Statistical exercise of examples from Topic number 4, 5, 8-12, 14, 15.****Records to be prepared.****Distribution of marks (practical):**

- | | |
|--|------------|
| 1. Instrumental spotting test | – 20 marks |
| 2. Clinical protocol writing exercise on a given problem | – 20 marks |
| 3. Records: | |

- | | |
|-------------------------|-----------|
| 4. Research methodology | -10 Mark |
| 5. Medical statistics | -10 marks |
| 6. Viva- Voce | -40 Marks |

REFERENCE BOOKS:-**Pharmacognosy:**

1. Aushotosh Kar "Pharmacognosy & Pharmacobiotechnology" New Age International Publisher. Latest Edition. New Delh
2. Drug Survey by Mayaram Uniyal
3. Fahn A (1981). Plant Anatomy 3rd Edition Pergamon Press, Oxford
4. Kokate, CK., Purohit, AP, Gokhale, SB (2010). Pharmacognosy. Nirali Prakashan. Pune.
5. Kokate, CK., Khandelwal and Gokhale, SB (1996). Practical Pharmacognosy. Nirali Prakashan. Pune.
6. Trease G E and Evans W C, Pharinacognosy, Bailliere Tindall, Eastbourne, U K.
7. Tyler V C., Brady, L R., and Robers J E., Pharmacognosy, Lea and Febiger, Philadelphia.
8. Tyler VE Jr and Schwarting AE., Experimental Pharmacognosy, Burgess Pub. Co, Minneaplis, Minnesota.
9. Wallis- TE (2011)- reprint. Practical Pharmacgonosy (Fourth Edition) Pharma Med Press, Hyderabad.
10. Wallis T E, Analytical Microscopy, J & A Churchill limited, London.
11. Wallis T E., Text Book of Pharmacognosy, J & A Churchill Limited, London.
12. WHO guidelines on good agricultural and collection practices- (GACP) for medicinal plants (2003).World Health Orgar Geneva.
13. WHO monographs on selected medicinal plants (1999)—Vol. 1. 1.Plants, Medicinal 2.Herbs 3.Traditional medicine. ISI 154517 8. WHO Geneva.

PG 1st Year Syallabus-6

Pharmaceutical chemistry, quality control and drug standardization:

1. Ayurvedic Pharmacopoeia of India. Part I- volume 1 to 8 and Part II- volume 1to 3. Ministry of Health and Family \ Controller of Publication. Govt of India. New Delhi.
2. Brain, KR and Turner, TD. (1975). The Practical Evaluation Phytopharmaceuticals. Wright Scientechnica, Bristol.
3. Galen Wood Ewing (1985). Instrumental Methods of Chemical Analysis. McGraw-Hill College ; Fifth edition
4. Harborne, JB (1973). Phytochemistry Methods. Chapman and Hall, International Edition, London.
5. HPTLC- Fingerprint atlas of Ayurvedic Single Plant Drugs mentioned in Ayurvedic Pharmacopoeia Vol- III and IV. CE COUNCIL FOR RESEARCH IN AYURVEDA AND SIDDHA. New Delhi.
6. Kapoor, RC (2010). Some observations on the metal based preparations in Indian System of Medicine. Indian Jo Traditional Knoledge. 9(3): 562-575
7. Khopkar, S. M. Analytical Chemistry, New Age International Publishers , 3 rd edition
8. Laboratory Guide for- The Analysis of Ayurved and Siddha Formulations – CCRAS, New Delhi.
9. Mahadik KR, Bothara K G. Principles of Chromatography by, 1st edition, Nirali Prakashan.
10. Qadry JS and Qadry S Z., Text book of Inorganic Pharmaceutical and Medicinal Chemistry, B. S. Shah Pra Ahmedabad.
11. Quality Control Methods for Medicinal Plant Material. Reprint (2002). WHO- Geneva.
12. Rangari V.D., Pharmacognosy & Phytochemistry, Vol I, II, Career Publication,
13. Sharma BK. Instrumental Methods of Chemical Analysis by, Goel Publishing House.
14. Srivastav VK and Shrivastav KK. Introduction to Chromatography (Theory and Practice)
15. Stahl E., Thin Layer Chromatography - A Laboratory Handbook, Springer Verlag, Berlin.
16. Sukhdev Swami Handa, Suman Preet Singh Khanuja, Gennaro Longo and Dev Dutt Rakesh (2008). Extraction Techri for Medicinal and Aromatic Plants -INTERNATIONAL CENTRE FOR SCIENCE AND HIGH TECHNOLOGY- Trieste,

Biochemistry and Laboratory techniques:

1. Asokan P. (2003) Analytical Biochemistry, China publications,
2. Campbell, P.N and A.D .Smith, Biochemistry Illustrated, 4th ed, Churchill Livingstone.
3. David Frifelder. W. H. Freeman. (1982). Physical Biochemistry by; 2 edition
4. David Sultan (2003).Text book of Radiology and Imaging, Vol-1, 7th Edition.
5. Deb, A.C., Fundamentals of Biochemistry, Books and Allied (P) Ltd, 2002.
6. Harold Varley. Practical Clinical Bio-chemistry
7. Kanai L.Mukherjee. Clinical Pathology:,Medical Laboratory Technology Vol. I.Tata McGrawHill 1996, New Delhi.
8. Gradwohl, Clinical Laboratory-methods and diagnosis, Vol-I
9. Clinical Biochemistry -Sabitri Sanyal, Clinical Pathology, B.I.Churchill Livingstone (P) Ltd, New Delhi.2000.
10. Satyanarayanan,U. Essentials of Biochemistry, Books and allied(P) Ltd.2002
11. Zubay, G.L. Biochemistry, W.M.C. Brown Publishers, New York 1998.
12. Text book of Radiology and Imaging, Vol-1, David Sultan, 7th Edition. 2003.

PG 1st Year Syallabus-7

Research methodology:

1. Alley, Michael. The craft of scientific writing. Englewood Cliffs. N.N. Prentice 1987.
2. Ayurvediya Anusandhan Paddhati – P.V. Sharma
3. Altick and Fenstermaker. (2007).*The Art of Literary Research*. 4th ed. W. W. Norton. Castle, Gregory. *Blackwell C Literary Theory*. Blackwells,
4. Bowling, A. (2002). Research Methods in Health (2nd ed). Buckingham: Open University Press.
5. Day R.A. How to write a scientific paper. Cambridge University Press.

6. Cooray P.G. Guide to scientific and technical writing.
7. Deepika Chawla and Neena Sondhi. (2011). Research Methods- Concepts and cases. New Delhi: Vikas Publishing Ho
8. Greenhalgh, T. (2006) How to Read a Paper: The Basics of Evidence-Based Medicine. (3rd ed) Blackwell
9. Kothari- CR (2004). Research Methodology- Methods and Techniques (Second Revised Edition). New Age Inter Publishers- New Delhi.
10. Kumar, R. 2005. *Research Methodology: a Step-by-Step Guide for Beginners, 2nd ed.* Thousand Oaks, CA, Londo Publications.
11. Petter Laake, Haakon Breien Benestad and Bjørn Reino Olsen. (2007). Research Methodology in the Medical and B sciences. Academic Press is an imprint of Elsevier, 84 Theobald's Road, London WC1X 8RR, UK. ISBN: 978-0-12-3731
12. Relevant portions of Ayurvedic Samhitas and other texts

Drug research and development:

 1. RICK NG, (2009). DRUGS- from discovery to approval. John Wiley & Sons, Inc., Hoboken, New Jersey
 2. Research guidelines for evaluating the safety and efficacy of herbal medicines. (1993). . WHO- (Regional Office Western Pacific – Manila) ISBN 92 9061 110 3 (NLM Classification: WB 925).
 3. Jagdeesh, Sreekant Murthy, Gupta, YK and Amitabh Prakash Eds. Biomedical Research (From Ideation to Publication) Wolters Kluwer/ Lippincott Williams and Wilkins.
 4. WHO Guidelines on Safety Monitoring of herbal medicines in pharmacovigilance systems. (2004). WHO- Geneva. ISF 1592214.
 5. Natural products isolation. (2006) 2nd ed. / edited by Satyajit D. Sarker, Zahid Latif, Alexander I. Gray. (Met biotechnology; 20). Includes bibliographical references and index. Humana Press Inc. ISBN 1-58829-447-1 (acid-free ; ISBN 1-59259-955-9 (eISBN)
 6. Gazette Extraordinary Part- II-Section 3 - Sub section (i) December 2008. Govt of India. AYUSH Guidelines on safety Rule 170 of Drugs and Cosmetics Act.
 7. OECD (2000) Guidance Document on Acute Oral Toxicity. Environmental Health and Safety Monograph Series on Tes: Assessment No 24.
 8. OECD Guideline for the Testing of Chemicals – Repeated Dose 90-day Oral Toxicity Study in Rodents, 408, 1998. <http://browse.oecdbookshop.org/oecd/pdfs/free/9740801e.pdf> (latest version)
 9. OECD Series on Principles of Good Laboratory Practice (GLP) and Compliance Monitoring, 1998. http://www.oecd.org/document/63/0,2340,en_2649_34381_2346175_1_1_1_1,00.php
 10. ICH Harmonised Tripartite Guideline (2000). Maintenance of the ICH Guideline on Non-clinical Safety Studies for t conduct of Human Clinical Trials for Pharmaceuticals M3 (R1).
 11. Ghosh M.N.: Fundamentals of Experimental Pharmacology, *Scientific Book Agency*.
 12. *Bombay*.\
 - 12- Jaju B.P.: Pharmacological Practical Exercise Book, *Jaypee Brothers, New Delhi*.
 - 13- Kulkarni S.K.: Hand Book of Experimental Pharmacology, *Vallabh Prakashan, New Delhi*
 - 14- Ravindran R.: X-Pharm (Software), Indian Journal of Pharmacology, *JIPMER, Pondicherry*.

PG 1st Year Syallabus-8

Biotechnology and Bio-informatics:

1. Angela M. Meireles A (2009). Extracting Bioactive compounds for food products. Theory and applications. CRC- Pres and Francis Group.
 2. Bergeron BP 2002 Bioinformatics Computing 1st Edition, Prentice Hall
 3. Chikhale, N.J. and Virendra Gomase, Bioinformatics- Theory and Practice, Publisher: Himalaya Publication House, edition (July, 2007) ISBN-13: 978-81-8318-831-9
 4. Lesk, A.M. Introduction to Bioinformatics Oxford 2002.
 5. Satyanarayana, U.: Biotechnology, Books and Allied (P) Ltd, Kolkata, 2005
 6. Setubal J. C and J. Meidanis, Introduction to Computational Molecular Biology, PWS Publishing Company, 1997.
 7. <http://www.iitb.ac.in/~crnts>
 8. <http://www.zygogen.com>.
 9. <http://www.dsr.nic.in/reports/tifp/database/metallo.pdf>
 10. www.consort-statement.org
 11. www.strobe-statement.org
 12. www.icmr.nic.in
- Clinical Evaluation:**
1. CDSCO, Good Clinical Practices For Clinical Research in India, Schedule Y (Amended Version – 2005), <http://cdsco.nic.in/html/GCP1.php>
 2. Ethical Guidelines for Biomedical Research on Human subjects. (2000). Indian Council of Medical Research- New Delh
 3. Gallo P., Chuang-Stein C., Dragalin V., Gaydos B., Krams M., Pinheiro J. Adaptive Designs in Clinical Drug Developm: Executive Summary of the PhRMA Working Group. *Journal of Biopharmaceutical Statistics*. 16: 275–283; 2006
 4. Good Clinical Practices- (2001). Guidelines for Clinical Trial on Pharmaceutical Products in India. Central Drugs S Control Organization. Directorate General of Health Services. New Delhi. (<http://WWW.cdsco.nic.in.ich.org>)
 5. Gupta, SK Ed. Basic Principles of Clinical Research and Methodology (2007). Jaypee Brothers- new Delhi
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<http://www.cancer.gov/clinicaltrials/learning/clinical-trials-education-series>, 2001.

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9. William C. Scheffer Introduction to Clinical Researchs

PG 1st Year Syallabus-9

Medical Statistics:

1. Armitage, P. and Berry, G. (1994) Statistical Methods in Medical Research (3rd ed). Blackwell Science.
2. Armitage P, Berry G, Matthews JNS: *Statistical Methods in Medical Research*. Fourth edition. Oxford, Blackwell Scie 2002
3. Bland, M. (2000) An Introduction to Medical Statistics (3rd ed). Oxford: Oxford University Press.
4. Bradford Hill – Basic Medical Statistics
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8. Indrayan. (2008). Basic Methods of Medical Research. AITBS Publishers- India
9. Mahajan B K, Methods in Bio statistics for medical students, 5th Ed. New Delhi, Jaypee Brothers Medical Publishers
10. Mehdi, B and Prakash A. (2010). Biostatistics in Pharmacology. Practical Manual in experimental and clinical pharm: 1st Edition. New-Delhi: Jaypee brothers Medical Publishers
11. Rao, NSN and Murthy, NS. (2008) 2nd Edition. Applied statistics in health sciences. Jaypee Brothers Medical Publis Ltd. Bengaluru, New Delhi.
12. Rick J Turner and Todd A Durham (2008). Introduction to Statistics in Pharmaceutical Clinical trails. Published Pharmaceutical Press- An imprint of RPS Publishing, 1 Lambeth High Street, London SE1 7JN, UK
13. Symalan, K. (2006). Statistics in Medicine (First Edition) Trivandrum: Global Education Bureau.
14. Sundar Rao, Jesudian Richard - An Introduction to Biostatistics.
15. Suhas Kumar Shetty- Medical statistics made easy

PG 1st Year Syallabus-10

M.D.-AYURVEDA PRELIMINARY**1. AYURVED SAMHITA & SIDDHANTA (Ayurvedic Compendia & Basic Principles)****PAPER-II****THEORY- 100 marks****PART-A****Practical- Viva-Voce-100
50 marks**

1. Learning and Teaching methodology available in Samhita- Tantrayukti, Tantraguna, Tantradosha, Tachchilya, Vadi Kalpana, Arthashraya, Trividha Gyanopaya, teaching of Pada, Paada, Shloka, Vakya, Vakyartha, meaning and s different Sthana and Chatushka of Brihatrayee.
2. Manuscriptology - Collection, conservation, cataloguing, Critical editing through collation, receion (A critical revision c incorporating the most plausible elements found in varying sources), emendation (changes for improvement) and criticism (critical analysis) of manuscripts. Publication of edited manuscripts.
3. Concept of Bija chatustaya (Purush, Vyadhi, Kriyakaal, Aushadha according to Sushrut Samhita).
4. Introduction and Application of Nyaya (Maxims) - Like Shilaputrik Nyaya, Kapinjaladhikaran Nyaya, Ghunakshara Gobalivarda Nyaya, Naprishtah Guravo Vadanti Nyaya, Shringagrahika Nyaya, Chhatrinro Gacchhanti Shatapatrabhedana Nyaya, Suchikatah Nyaya.
5. Importance and utility of Samhita in present era.
6. Importance of ethics and principles of ideal living as mentioned in Samhita in the present era in relation to life style diso
7. Interpretation and co-relation of basic principles with contemporary sciences.

PART-B**50 marks**

1. Definition of Siddhanta, types and applied examples in Ayurveda.
2. Ayu and its components as described in Samhita.
3. Principles of Karana-Karyavada, its utility in advancement of research in Ayurveda.
4. Theory of Evolution of Universe (Srishti Utpatti), its process according to Ayurveda and Darshana.
5. Importance and utility of Triskandha (Hetu, Linga, Aushadh) and their need in teaching, research and clinical practice.
6. Applied aspects of various fundamental principles: Tridosha, Triguna, Purusha and Atmanirupana, Shatpadartha, Vihara. Scope and importance of Pariksha (Pramana).
7. Importance of knowledge of Sharir Prakriti and Manas Prakriti.
8. Comparative study of Principles of Ayurveda and Shad Darshanas.

1. REFERENCE BOOKS:-

1	Charak Samhita	Chakrapani commentary
2	Sushrut Samhita	Dalhana Commentary
3	Ashtanga Samgraha	Indu commentary
4	Ashtanga Hridaya	Arundutta and Hemadri commentary
5	Vaisheshika Darshan	Prashastapada Bhasya
6	Nyaya Darshan	Vatsyayan Bhasya Patanjala
7	Yoga Darshan	Vyas Bhasya
8	Vedantsara	
9	Sarvadarshan Samgraha	
10	Bhartiya Darshan	Baldev Upadhyaya
11	Ayurved Darshanam	Acharya Rajkumar Jain

PG 1st Year Syllabus-12

M.D.-AYURVEDA PRELIMINARY**RACHANA SHARIR****(Anatomy)****PAPER-II****Theory 100 marks****PART-A****50 marks**

1. Basic principles of Sharira, Purushavichaya, Rashi Purusha, Karma Purusha (Shad Dhatuj Purusha), Chaturvimshati Ek Dhatu Purusha. Relevant principles described in the Sharirasthan of Sushrut Samhita, Charak Samhita, Ashtanga Samgraha and Ashtanga Hridaya.
2. Basic principles of Garbha Sharira in Ayurveda: Definitions of Garbha, Shukra Shonita Siddhanta, Dauhrida, I Garbhotpattikar bhava.
1. Types of tissues, histological study of liver, spleen, uterus, kidney, endocrine glands, mammary gland, skin, tongue bronchi, bones, muscles, cartilages and nervous tissue.

PART-B**50**

1. Paribhasha Sharira (Anatomical terminology)
2. Pramana Sharira – Anguli and Anjali Pramana, Sama pramana Sharira, Ayama – Vistara and their prognostic values.
3. Fundamental aspects of Asthi, Sandhi, Peshi Sharir.

4. Fundamental aspects of Sira, Dhamani, Srotas – Definitions, Siravedha, Avedhya Sira. Fundamental aspect of Sro Sthana.
5. Fundamental aspects of Koshtha and Koshthang: Hridaya, Yakrit, Vrikka, phupphusa, Aantra, Pleeha, Adhivrikka Basti, Paurushagranthi, Amashaya, Agnyashaya and Vrishana.
6. Fundamental aspects of Uttamangiya Sharir – Introduction to Nervous system - development, divisions, neuron–st types, functional anatomy.
7. Mrita shodhan (as per Sushruta) and Mrita Samrakshana (preservation method of human cadaver).

PRACTICAL**100****Contents:**

1. Practical study of bones
2. Practical study of organs
3. Practical study of surface and radiological anatomy.
4. Shava Vichhedana – detailed dissection of the whole body.
5. Practical study of location of Marma
6. Demonstration of histology slides (10 slides)

PG 1st Year Syallabus-13

1. Distribution of marks (Practical)

- | | |
|---|------------|
| 1. Spotting | - 20 Marks |
| 2. Surface Anatomy | - 20 Marks |
| 3. Dissection | - 30 Marks |
| 4. Imaging Anatomy – Basic Principles and Application | - 10 Marks |
| 5. Viva-Voce | - 20 Marks |

REFERENCE BOOKS:

- | | |
|---|--------------------------|
| 1. Relevant matters of Brihatrayee and Laghutrayee | |
| 2. PratyakshaShariram | - GananathSen |
| 3. AbhinavaShariram | - Damodar Sharma Gaur |
| 4. Parishadyam Sabdartha Shariram | - Damodara Sharma Gaur |
| 5. Brihat Shariram | - P S Varier |
| 6. Shiva Samhita | |
| 7. Gray's Anatomy | - Latest Edition |
| 8. Human Anatomy | - B D Chaurasia |
| 9. Cunnigham's Companion to Manual of Practical Anatomy.Vol I, II & III | |
| 10. Developing Human | - Keith L Moore &Persaud |
| 11. Clinically oriented Anatomy | - Keith L Moore |
| 12. Clinically oriented Neuro Anatomy | - Richard Snell |
| 13. Surface and Radiological Anatomy | - Halim |
| 14. Grant's Methods of Anatomy | -Grant |
| 15. Grant's dissector | -Grant |
| 16. Human Embryology | -I. B. Singh |
| 17. Ayurvediya Human Anatomy | - G. M. Kanthi |

PG 1st Year Syallabus-14

M.D.-AYURVEDA PRELIMINARY**3.KRIYA SHARIR
(Physiology)****PAPER-II****Theory 100 Marks****PART-A****50 marks**

1. Theory of Loka-Purusha Samya
2. Theory of Panchamahabhuta
3. Physiological aspects of Samanya – Vishesh siddhanta
4. Concepts of Tridosha and Triguna
5. Concept of Dhatu
6. Concept of Mala
7. Description of Ojas
8. Process of Ahara Parinama including Aharaparinamakara Bhava and Asta Ahara Vidhi Visesayatana
9. Physiological importance of Agni, its classification and functions
10. Dhatuposana theories
11. Concepts of Atma, Manas and Indriya.

12. Concepts of Prakriti and Ashtavidha Sara.
13. Concept of Srotas

PART-B**50**

Description of essential and relevant understandings related to contemporary physiology, both general physiological and systemic physiology.

1. Essentials of cell physiology – organization of cell.
 2. Membrane physiology- transport across cell membrane, action potentials and resting membrane potentials.
 3. Homeostasis- negative and positive feedback mechanisms.
 4. Genetic code, its expression and regulation of gene expression.
 5. Essentials of cardiovascular physiology- cardiac cycle, regulation of heart rate and blood pressure.
 6. Essentials of respiratory physiology- regulation of respiration-chemical and neural, gaseous exchange, transportation of
 7. Gastrointestinal physiology- various digestive juices and their actions, gastrointestinal hormones, enteric nervous system
 8. Nervous system physiology- ANS, somatic nervous system, reflexes, general and special sensations, higher mental functions of brain, brainstem and spinal cord.
 9. Blood: Blood cells-RBCs, WBCs, platelets, plasma proteins and immunity.
 10. Muscle physiology: properties and mechanisms of contraction of skeletal, cardiac and smooth muscles.
 11. Physiology of excretion- mechanism of urine formation, micturition.
 12. Endocrine physiology: Classification of hormones, hormones secreted by pituitary, thyroid, parathyroid, adrenal glands and their functions.
- Study of male and female reproductive system: functions of reproductive hormones.

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PRACTICAL**100****Contents:****Ayurvedic practicals**

Assessment of Prakriti

Assessment of Sara

Pramana Pariksha

Hematology

Hemoglobin estimation

Total RBC count

Total WBC count

Differential leukocyte count

Packed cell volume (PCV)

ESR

Bleeding time

Clotting time

Blood grouping and Rh typing

Urine examination -**Physical examination-** Specific gravity and reaction of urine**Chemical examination**

Albumin test

Sugar test

Ketone bodies

Bile salts and pigments

Distribution of marks (Practical)

- | | |
|-----------------------------|------|
| 1. Laboratory Practical | - 20 |
| 2. Human Experiment | - 15 |
| 3. Spotting | - 15 |
| 4. Prakriti Saradi pariksha | - 20 |
| 5. Practical Record | - 10 |
| 6. Viva-voce | - 20 |

REFERENCE BOOKS:

- | | |
|-------------------------------------|-----------------------------|
| 1. Ayurvediya Kriyasharir | - Ranjit Rai Desai |
| 2. Kayachikitsa Parichaya | - C. Dwarkanath |
| 3. Prakrit Agni Vigyan | - C. Dwarkanath |
| 4. Sharir Kriya Vigyan | - Shiv Charan Dhyani |
| 5. Abhinava Sharir Kriya Vigyana | - Acharya Priyavrata Sharma |
| 6. Dosha Dhatu Mala Vigyana | - Shankar Gangadhar Vaidya |
| 7. Prakrita Dosha Vigyana | - Acharya Niranjana Dev |
| 8. Tridosha Vigyana | - Shri Upendranath Das |
| 9. Sharira Tatva Darshana | - Hirlekar Shastri |
| 10. Prakrita Agni Vigyana | - Niranjana Dev |
| 11. Deha Dhatvagni Vigyana | - Vd. Pt. Haridatt Shastri |
| 12. Sharir Kriya Vigyana (Part 1-2) | - Acharya Purnchandra Jain |
| 13. Sharir Kriya Vigyana | - Shri Moreswar Dutta Vd. |

14. Sharira Kriya Vijnana (Part 1-2) - Nandini Dhargalkar
 15. Doshha Dhatu Mala Vigyana - Basant Kumar Shrimal

PG 1st Year Syallabus-16

16. Abhinava Sharir Kriya Vigyana - Dr. Shiv Kumar Gaur
 17. Pragyogik Kriya Sharir - Acharya P.C. Jain
 18. Kaya Chikitsa Parichaya - Dr. C. Dwarkanath
 19. Concept of Agni - Vd. Bhagwan Das
 20. Purush Vichaya - Acharya V.J. Thakar
 21. Kriya Sharir - Prof. Yogesh Chandra Mishra
 22. Sharir Kriya Vigyana - Prof. Jayaram Yadav & Dr. Sunil Verma
 23. Basic Principles of Kriya-Sharir (A treatise on Ayurvedic Physiology) by -Dr. Srikant Kumar Panda
 24. Sharir Kriya – Part I & II - Dr. Ranade, Dr. Deshpande & Dr. Chobhe
 25. Human Physiology in Ayurveda - Dr Kishor Patwardhan
 26. Sharirkriya Vignyan Practical Hand Book - Dr.Ranade, Dr.Chobhe, Dr. Deshpande
 27. Sharir Kriya Part 1&2 - Dr.R.R.Deshapande, Dr.Wavhal
 28. Textbook of Physiology - Gyton & Hall
 29. Review of medical physiology - William Ganong
 30. Essentials Of Medical Physiology - Sembulingam, K.
 31. Concise Medical Physiology - Chaudhari, Sujit. K.
 32. Fundamental of Anatomy & Physiology - Martini
 33. Principals of Anatomy & Physiology - Tortora & Grabowski
 34. Human Physiology - Richards, Pocock
 35. Samson Wrights Applied Physiology, Keele, Neil, joels
 36. Brainstem Control of Wakefulness And Sleep - Steriade, Mirce
 37. An Introduction to Human Physiology - Green, J.h.
 38. Ancient Indian Medicine - Kutumbiah P.
 39. Biographical History of Indian Medicine - Srikanthamurthy KR
 40. Ayurveda Kriya Sharira - Yogesh Chandra Mishra
 41. Textbook of Medical Physiology - Indu Khurana
 42. Tridosha Theory - Subrahmanya Shastri
 43. Statistics in Medicine - K. Syamalan

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M.D.-AYURVEDA PRELIMINARY**4. DRAVYAGUNA VIGYAN****(Materia Medica & Pharmacology)****PAPER-II****Theory 100 Marks****PART-A****50 marks**

1. Panchamahabhuta siddhanta, Samanya Visheshha siddhanta, Tridosha siddhanta. Extensive study on classifications of as described in Brihatrayi.
2. Applied aspects of Rasa, Guna, Virya, Vipaka and Prabhava
3. Applied aspects of Aushdha karma with reference to Sharngadhara and Bhavaprakasha
4. Importance of Namarupa vigyan and concept of basonyms and synonyms of Dravyas
5. Applied knowledge of Bhaishajya Prayoga (marga, kalpana, matra, anupana, sevan, kala etc.)

PART-B**50**

6. Basic principles of Desha pravichara, Dravya sangrahana (collection), Samrakshana (preservation)
7. Evolution of Dravyaguna vigyan with special emphasis on Nighantus
8. Prashasta bheshaj lakshana
9. Profound knowledge on applied aspects of Agrya aushadha
10. Methodology of studying controversial, pratinidhi (substitute), apamishrana (adulterant) and unidentified dravya
11. Pharmacognosy and its relevance in Dravyaguna vigyan
12. An integrated study of Charakokta Bheshaj pariksha and scientific method of drug evaluation with special reference to safety and efficacy
13. Brief knowledge and importance of clinical pharmacology
14. General principles of various good cultivation practices, collection practices, storage practices and manufacturing pract
15. Pharmacovigilance and ADR issues

PRACTICAL

100

Contents:

1. Field visits for the Identification of important classical medicinal plants (Minimum two visits to neighboring forest areas)
2. Macroscopic and microscopic identification of minimum two plants of each of prajoyyanga (useful parts of plants)
3. Preliminary study of pharmacopoeial standards (API) of minimum 5 plants
4. Minimum two experiments on Animals

Distribution of marks (Practical)

- | | |
|---|-----------|
| 1. Herbarium sheets | -10 Marks |
| 2. Practical of macroscopic and microscopic identification of prajoyyanga (one part of the plant) | -30 Marks |
| 3. Practical record book of pharmacopoeial standards and animal experimentations | -10 Marks |
| 4. Spotting | -30 Marks |
| 5. Viva-voce | -20 Marks |

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REFERENCE BOOKS:

- | | | | |
|----|--|---|---|
| 1 | Abhinav Buti Darpan (Vol.1-2) | - | Vd. Roop Lal Vaishya |
| 2 | Aushadna Vigyna Shastra | - | Acharya Pt. Vishvanatha Dwidevi |
| 3 | Ayurvediya Aushadnkarma vigyana | - | Acharya V.J. Thakur |
| 4 | Bedi Vanaspati Kosha | - | Prof. Ramesh Bedi |
| 5 | Bhaishajyaguna Vigyana | - | Dr. Alakhnarayan Singh |
| 6 | Bhav Prakash Nigantu (English) | - | Shreekanthamurti |
| 7 | Bhav Prakash Nighantu | - | With Vd. Krishna Chandra Chunekar commentary |
| 8 | Bhrinad dravyagunadarsha | - | Mahendra Kumar Shastri |
| 9 | Classical Uses of Medicinal Plants | - | Acharya Priyavrata Sharma |
| 10 | Controversial Medicinal Plants | - | Vd. G. Bapa Lal |
| 11 | Dalhana Ka Dravyaguna Shastra Ke Kshetra Me Yogadana | - | Vd. Shiv Kumar Vyas |
| 12 | Dravyaguna Kosha | - | Acharya Priyavrata Sharma |
| 13 | Dravyaguna Sutram | - | Acharya Priyavrata Sharma |
| 14 | Dravyaguna Vigyana | - | Dr. Gyanendra Pandey |
| 15 | Dravyaguna Vigyana(Vol. 1-2) | - | Acharya Yadavji Tikram Ji |
| 16 | Dravyaguna Vijyana | - | Dr. V.M. Gogate |
| 17 | Dravyaguna Vigyana (Vol. 1-5) | - | Acharya Priyavrata Sharma |
| 18 | Dravyaguna Shastrum | - | Vaidya G.A. Phadake |
| 19 | Dravyaguna Vijyana | - | Dr. A.P. Deshpande |
| 20 | Dravyagunavijnana basic Principles | - | Prof.D.S.Lucas |
| 21 | Forgotten Healers (Indian Medicinal Plants) | - | Dr. Prakash Pranjape |
| 22 | Glossry of Vegetable Drugs in Bhrithrayis | - | Thakur Balwant Singh & Vd. Krishna Chandra Chunekar |
| 23 | Introduction to Dravyaguna | - | Acharya Priyavrata Sharma |
| 24 | Kriyatamka Aushadi Parichaya | - | Acharya Pt. Vishvanath Dwidevi |
| 25 | Materia Medica | - | Acharya Ghosh |
| 26 | Nighantu Adarsh (Vol. 1-2) | - | Vd. Bapa Lal |
| 27 | Pharmacological basis of Medical Practice | - | Goodman & Gillman |
| 28 | Pharmacology and Pharmacotherapeutics | - | Satoskar Bhandarkar & Ainapure |
| 29 | Prayogatamaka Dravyaguna Vigyana | - | Dr. Maya Ram Uniyal |

30	Priya nighantu	-	Acharya Priyavrata Sharma
31	Raspanchaka/Dravyaguna Siddhanta	-	Prof. Shivcharan Dhyani
32	System of Plant Nomenclature in Ayurveda	-	Dr. Gyanendra Panday
33	Text Book of Pharmacology	-	Trees & Valis
34	Textbook of Dravyaguna	-	Dr.K.Nishteswar
35	Unani Dravyaguna Vigyana	-	Hakim Daljeet Singh

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36	Useful parts of Charaka, Sushrut, and Vagbhata.	-	
37	Uttarakand Ki Vanaspatiya	-	Dr. Gyanendra Pandey
38	Vanoashadi Darshika	-	Thakur Balwant Singh
39	Vanoashadi Nidarshika	-	Dr. Ram Sushil Singh
40	Vedic Vanaspatiyani	-	Dr. Dinesh Chandra Sharma
41	Pharmacopia of India –all the volumes		
42	Database on medicinal plants all the volumes of CCRAS		
43	Aurveda formulary of india – all the volumes		
44	All the nighantooos		
45	Laghutrayi		

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M.D.-AYURVEDA PRELIMINARY**5. RASA SHASTRA AND BHAISHAJYA KALPANA****(Iatrochemistry & Pharmaceuticals Science)****PAPER-II****Theory 100****PART-A****50**

1. Fundamental principles of Rasa Shastra and Bhaishajya Kalpana, introduction to Rasachikitsa, Ashuddha and Bhasma- sevan Dosha and its management, introduction to Aushadha Sevan Kaal and Prayoga Marga (ro administration).
2. Introduction to basic principles of Aushadha Yoga (formulations).
3. Classification of Rasa Dravya - concept and relevance.
4. Introduction to principles of Aushadha Nirmana, concept of Shodhan, Marana, Jarana, Murcchhana, Sattvapal Amritikarana.
5. Concept of Kashaya, Panchavidha Kashaya and other Kalpana.
6. Concept of Rasashala, Rasa Mandapa with introduction to pharmacy in accordance with the Good Manufacturing P (GMP).
7. Critical study of Rasa Ratnasamuchchaya, Rasendra Chintamani, Rasa Tarangini, Sharngadhara Samhita, Chakrad Bharat Bhaishajya Ratnakara with special reference to Aushadha-Nirmana.

PART-B**50**

1. Introduction to methods of analytical, toxicity, experimental and clinical validation of classical and proprietary Ay formulations.
2. Introduction to new dosage forms.
3. Introduction to advance instruments of analysis like XRD, XRF, SEM-E-Dax, ICP analysis, Chromatography: TL chromatography, HPTLC, concept of Nanotechnology and its relevance to Aushadha-Nirman.
4. Concept of Pharmacopoeia and Formulary with introduction of 'The Ayurvedic Pharmacopoeia of India' (API) a Ayurvedic Formulary of India' (AFI).
5. Introduction to databases of medicinal plants published by CCRAS, ICMR and others.

PRACTICAL**100**

Contents:

1. Shodhan, Marana, Amritikarana of Rasa Dravya (10 practicals)
2. Preparation of different dosage forms (10 forms)
3. Pharmacopoeial standards of raw and prepared drugs (20 practicals)

Raw Materials**1. Minerals and Metals****Mineralogical Identification****Mineralogical Identification**

1. Physical form - Crystal and Amorphous
2. Hardness on Moh's scale
3. Brittleness test
4. Fracture and Cleavage
5. Streak test
6. Luster

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2. Plant Material**Macroscopic and Microscopic examination**

- a. Orgnaoleptic testing
- b. Estimation of Foreign materials
- c. Microbial load
- d. Moisture content
- e. Determination of ash value - total, water soluble and acid Insoluble ash
- f. Specific gravity
- g. Solubility- water and alcohol
- h. Extract values- water and alcohol
- i. TLC
- j. Determination of optical density
- k. Refractive index
- l. Aflatoxins
- m. Limit tests for heavy metals
- n. pH estimation

Prepared dosage forms:**1. Solid dosage forms****Rasaushadhi**

- a) Bhasma and Pishti Pariksha
- b) Determination of Particle size
- c) Limit tests for heavy metals
- d) Determination of moisture content, specific gravity, pH and acid value.

Kasthaushadhi**a. Powders (Churna)**

1. Particle size
2. Bulk density
3. Solubility
4. Estimation of Foreign material
5. Microbial load
6. Moisture content
7. Determination of ash value - total, water soluble and acid insoluble ash
8. Solubility - water and alcohol
9. Extract values - water and alcohol
10. TLC
11. Determination of Optical density
12. Refractive Index
13. Aflatoxins
14. Limit tests for Heavy metals
15. pH Value estimation

b. Tablets

1. Uniformity in weight and size
2. Tablet hardness
3. Tablet friability
4. Tablet disintegration
5. Tablet dissolution

c. Semisolid dosage forms

- a. Moisture content
- b. Sugar content
- c. Microbial load

d. Liquids

- pH value
- Specific gravity
- Determination of refractive index
- Acid value
- Viscosity
- Saponification value
- Iodine value

Note:

- All practicals should be performed in accordance with Authoritative Text Books of Schedule-I of D.C.Act-1940.
- All practicals related to Pharmacopoeial Standards should be performed in accordance with Methods Published in Pro testing of ASU Medicines and Laboratory Guidelines for the Analysis of Ayurveda & Siddha Formulations published by AYUSH, Government of India.

Distribution of marks (Practical)

- Practical Record Book - 10 Marks
- Practicals related to Preparation of Drugs
 - Major practical- one - 20 Marks
 - Minor practical- one - 10 Marks
- Drug analysis
 - Major practical- one - 20 Marks
 - Minor practical- one - 10 Marks
- Spotting - 10 Marks
- Viva-voce - 20 Marks

REFERENCE BOOKS:

1. Rasahridaya Tantra
2. Rasarnava
3. Rasaratna Samuccahaya
4. Ayurved Prakasha
5. Rasendrachudamani
6. Rasendra Chintamani
7. Rasatarangini
8. Rasaprabha Sudhakar
9. Rasamrita
10. Rasa Chandanshu : CCRAS Publication
11. Sharangadhara Samhita
12. Sharangadhara Darpan (BP Pandey)
13. Bhavaprakasha
14. Yoga Ratnakara
15. Bhaishajya Ratnavali
16. Siddha Bhaishajya Manimala
17. Bharat Bhaishajya Ratnakara
18. Rasayoga Sagara
19. Siddha Bhaishajya Manimala
20. Sahasrayoga
21. Siddha Yoga Sangraha – Yadavaji Trikamji Acharya
22. Vaidyaka Paribhasha Pradeepa

23. Ayurvediya Aushadhikarana – Puranik and Dhamanakar
24. Dravyaguna Vijnan Part - 1 and 2 - Yadavji Trikamji
25. Chakradatta - Ratnaprabha, Relevant Parts from Charaka Samhita, Sushruta Samhita, Kashyapa Samhita, A Sangraha, Ashtanga Hridaya,
26. Remington: Science and Practice of Pharmacy
27. Theory and Practice of Industrial Pharmacy – Leon Lachman *et al*
28. Clinical Pharmacology, KD Tripathi
29. Clinical Pharmacology, Lawrence Benette
30. Drug Discovery and Evaluation (Pharmacological assays) HG Vogel
31. Pharmacological Basis of therapeutics – Goodman and Gilman
32. Data Base of Medicinal Plants of CCRAS
33. Quality and Standards of Medicinal Plants – ICMR publication
34. Quality Control of Ayurvedic Drugs – PLIM, Gaziabad
35. Ayurvedic Pharmacopeia of India
36. Ayurvedic Formulary of India
37. Indian Pharmacopeia
38. British Pharmacopeia

39. United States Pharmacopeia
40. Pharmacopeia Codex
41. Current Good Manufacturing Practices
42. Drugs and Cosmetic Act 1940 and Rules 1945 with latest amendments
43. Drugs and Magic remedies (Objectionable advertisement) Act-1954
44. Prevention of Food Adulteration (PFA) act
45. Laws pertaining to Narcotics
46. Factory and Pharmacy Acts
47. Consumer Protection Act -1986
48. Brief information on the peer reviewed journals, official websites and other official search engines along with their links with the subject)
49. Rutleys Elements of Mineralogy
50. Bhasma Vigyaniam
51. Kupipakva Vigyaniam
52. Anupana Manjari

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M.D.-AYURVEDA PRELIMINARY**6. AGADATANTRA AVUM VIDHI VAIDYAKA****(Toxicology & Forensic Medicine)****PAPER-II****Theory 100****PART-A****50**

1. Introduction to Agadatantra, its sequential development, traditional and contemporary toxicology.
2. Examination of poisons as per contemporary and Ayurvedic methods.
3. Ancient and contemporary classification of Visha.
4. Knowledge about Sthavara visha, Jangama visha and Kritrima visha, their clinical and pathological manifestatic management.
5. Garavisha and Dushi visha, signs, symptoms and management with contemporary relevance.
6. Vishajanya Janapadodhvasaniya Roga (community health problems due to poisons) - environmental pollutior pollution, soil pollution, air pollution etc, their features and management according to ancient and contemporary concep
7. Concept of Viruddhahara with contemporary views.
8. Definition of Vyavahara Ayurveda.
9. Fundamentals of Vyavahara Ayurveda. Courts of law in India and legal procedures.
10. Chathurvinshati upakrama (24 management procedures).

PART-B**50**

1. Introduction to Forensic medicine.
2. Techniques of pathology, pharmacology, pharmacognosy and microbiology used in toxicology.
3. Death and its medico-legal aspects (Medical Thanatology), Medico-legal autopsy, Legal procedures in clinical medicine.
4. Forensic Science Laboratory:- Structure and functions
5. Introduction to Medical Jurisprudence.
6. Laws related to medical profession. Ancient practice of medical jurisprudence in india.
7. Ancient and contemporary fundamentals of medical ethics.
8. Madya visha (Alcoholism).
9. Diagnosis and Management of food poisoning.
10. General and Emergency medical management of poisoning including preparation, administration and complica antidotes, antivenoms, antisera.
11. Management of the toxic manifestations caused by the contact poisons (paduka, vastra, abhushana, mukhalepa- vist etc).
12. Diagnosis and management of dermatological manifestations of Visha.
13. Death due to poisoning, duty of physician in poisoning and cases of suspected poisoning.
14. Post mortem findings in poisoning.

PRACTICAL**100****Contents:**

Clinical Postings

Case records – 20 cases (Postmortem/ poisoning/dermatological/medico legal cases)

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Distribution of marks (Practical)

- | | | |
|--|------------|------------|
| 1. Case records (20 Cases) | - 20 Marks | |
| 2. Bedside clinical case taking | | |
| 3. Long Case | - 20 Marks | |
| 4. Short Case | - 10 Marks | |
| 5. Identification of specimens, models and equipments of jurisprudence importance. | | - 15 Marks |
| 6. Spotting related to Visha, Upavisha and other poisonous drugs | - 15 Marks | |
| 7. Viva-voce | -20 marks | |

REFERENCE BOOKS:

1. Useful Portion of Charak-Sushrut-Vagbhata
2. Dravyaguna Vigyan - Acharya Yadavji
3. Aushadhigunadharm Shastra - Pt Visvanath Dvivedi
4. Kriyatmat Aushada parichaya Vigyan - Pt Visvanath Dvivedi
5. Ayurvedic Vyadhi Vigyan - Acharya Yadavji Trikamji
6. Madhavanidan with Madhukosha commentary
7. Sharangadhara Samhita
8. Yogaratnakara
9. Aushadigunadharm Shastra - PtGangadhara Shastri Gune
10. Rasendracintamani
11. Rasaratna samuchhaya
12. Vishavigyan - Dr. Krishna Kumar
13. Related matter of Kautilya Artha Shastra
14. Harmekhlatantra
15. Anupana manjari
16. Ayurvedprakash
17. System of clinical Medicine - Savil
18. Forensic Pharmacy -B.M. Mhithai
19. Hand book of Forensic Medicine and toxicology - Dr. P.V. Chadha
20. Viva Forensic Medicine and toxicology - L.C. Gupta
21. Forensic Medicine and Ethics - J.P. Narena
22. Modi's Medical Jurisprudence and Toxicology
23. The essentials of forensic medicine and toxicology -Dr.K.S. Narayan Reddy
24. Medical Laws and Ethics - Dr. H.S. Mehta
25. M.R.K. Krishnan's Handbook of Forensic Medicine
26. Text book of Medical Jurisprudence and Toxicology - Dr. C.K. Parikh
27. Atlas of Forensic Medicine - Dr. Tomio Watenbe
28. Medico legal Post Mortems (Atlas) - Dr. Parikh and Others
29. Textbook of Forensic Medicine and Toxicology - Dr.V.V. Pillay
30. Textbook of Forensic Medicine and Toxicology - Dr. Karmakar
31. Textbook of Forensic Medicine and Toxicology - Dr. Singhal
32. Textbook of Forensic Medicine and Toxicology - Dr. Krishnan Vij
33. Forensic Pathology - Dr. Bernard Knight
34. Textbook of Forensic Medicine and Toxicology - Lyon's
35. Pocket picture guide to Forensic Medicine - Gower's Medical Publication
34. Forensic Medicine - Simpson Knight
35. Taylor's Principles and Practical of Medical Jurisprudence - J and A Churchis
36. Doctor and Law - Singhal
37. Textbook of Toxicology - Singhal
38. Medicine Harrison's Principal of Internal Medicine
39. Agad Tantra - Dr.Shekhar Namboodri

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1. Modern Medical Toxicology - Dr. V.V.Pillay
2. Critical care toxicology - Bruent Wallace
3. Diagnosis and Management of common poisoning- Agarwal wali
4. Colour Atlas of Forensic Medicine - Govindaiah
5. Guidelines of poisons - W.H.O.
6. Doctors patients relationships - Dr.Lavekar
7. Bhavaprakasha.
8. Vishavaidya Jyotsnika -- English translation By VPSV Ayurveda college, Kottakkal.

9. Lakshnamritham.
10. Toxicology, Ayurvedic perspective - VPSV Ayurveda college, Kottakal
11. Text book of Agadatantra - Edited By Dr Huparikar, Dr. Joglekar
12. Agadatantra ki Pathyapustaka - Edited By Dr Huparikar, Dr. Joglekar
13. Vyavahar Ayurveda Vigyanam - Dr.Indramohan Jha (Sachchan)

1. Forensic Medicine - Dr. B. Umadathan
2. Visha Chikitsa - Dr. M. Balakrishnan Nair
3. Park Text book of Preventive and Social Medicine. - K. Park
4. Environmental Science and Biotechnology - Theory Practice - A.G. Murukesan &C. Rajakumari
5. Veterinary Toxicology - Dr. Satish K. Gargi
6. Guide to Drinking Water Quality (3 Volumes) - WHO Publication
7. A short Text Book of Medical Entomology - H.S. Bhatti, R. Sehgal, R.C. Mahajan.

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M.D.-AYURVEDA PRELIMINARY**7. SWASTHAVRITTA & YOGA**
(Preventive, Social Medicine & Yoga)**PAPER-II****Theory 100****PART A****50 marks**

1. Importance and relevance of Swasthavritta and Community Medicine. History of community medicine.
2. Concept of health and disease as per Ayurveda and Modern Medicine. Various definitions and dimensions of health Ayurveda and World Health Organization.
3. Relevance of Dinacharya, Ratricharya and Ritucharya in Health Promotion.
4. Basic concept of Vega. Concept of Adharaniya and Dharaniya Vega in health promotion and prevention of disease examples.
5. Concept of Trayopastambha in health promotion and prevention of diseases.
6. Concept of nutrition as per Ayurveda and modern science.
7. Concept of Vyadhikshamatva. Concept of Bala and Ojas in relation to health.
8. Role of Panchakarma in preventive medicine.
9. Role of Rasayana in promotion of health and prevention of diseases. Scope of Rasayana in Geriatrics and Reproductive Child Health.
10. The concept of Ashtanga Yoga and its relation to health. Concept of Moksha.
11. Basic concepts of Nisargopachara including Panchabhautika Chikitsa.

PART B**50**

1. Concept of Janapadodhwamsa and tools of its prevention.
2. Principles of Epidemiology. Definitions in infectious disease epidemiology.
3. Concept of disease control and intervention strategies.
4. Levels of disease prevention
5. Basic principles of Samkramak Vikara- causes, modes of disease transmission, epidemiological triad
6. Principles of Health Education
7. Environmental Health- concept of water, soil and air purification as per Ayurveda and modern science.
8. Introduction to Meteorology
9. Role of Swasthavritta in maternal and child health care.
10. National Population Policy, National Health Policy as per Alma Ata Declaration and Role of Ayurveda therein.
11. Role of Swasthavritta in communicable and non-communicable diseases and life style disorders.
12. Biomedical waste management.
13. National health programmes.

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PRACTICAL**100****Contents:**

1. Duty in OPD and IPD with regard to Pathyapathya, Yoga and Nisargopachar
2. Preparation of different Kritanna Kalpana
3. Practice of the following
 - A. Pratimarsha Nasya
 - B. Anjana
 - C. Kavala and Gandusha
 - D. Abhyanga
 - E. Udvartana
 - F. Prayogika Dhoomapana
 - G. Matra basti
4. Health awareness lectures to the community (minimum 5)
5. Participation in observance of National & International days related to health.
6. Proficiency in performing the following Asanas

Standing Postures- Ardhakatichakrasana, Padahastasana, Ardachakrasana, Trikonasana.

Sitting postures- Swasthika, Gomukha, Padmasana, Vajrasana, Bhadrasana, shashankasana, Ushtrasana, Pashchimottanasana, Suptavajrasana, Ardhmatsyendrasana, Siddhasana.

Supine Postures- Pavanamuktasana, Sarvangasana, Matsyasana, Halasana, Chakrasana, Shavasana.

Prone postures- Bhujangasana, Shalabhasana, Dhanurasana, Makarasana.

Distribution of marks (Practical)

1. Records - 20 Marks
2. Long Procedures - 20 Marks
3. Short Procedures - 10 Marks
4. Spotting - Aahar dravyas, Family Planning
Devices, Vaccine/Serum and Models/Specimens,
Naturopathic and Yogic specimens etc. - 10 Marks
1. Yogasana - 20 Marks
2. Viva-voce - 20 Marks

REFERENCE BOOKS:

1. Relevant portions of Charak, Sushruta, Vagbhata (AshtangHrudaya), Ashtang Samgraha, Sarangadhara, Bhavaprakasha, Madhavanidan&Yogaratnakara, Bhela Samhita with the respective commentaries
2. Swasthavritta Samuchaya -VaidyaPtRajesvarDuttaShastri
3. Swasthya Vignyana -Dr.B.G.Ghanekarshastri
4. Prakritika Chikitsa -Kedarnath Gupta
5. Reddy's Comprehensive Guide to Swasthavritta -Dr.P.Sudhakar Reddy
- Swastha Vigyan - Dr.MukundswaroopVerma
- Ayurvediya Hitopdesha - Vd.RanjitRai Desai
- Yoga and Ayurveda - Dr.Rajkumar Jain
- Swasthvritta Vigyan - Dr.Ramharsha Singh.

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1. Swasthvrittam - Dr.BramhanandTripathi
2. Ayurvediya Swasthvrittam - Vd.Jalukar
3. Hathayog Pradipika - SwatmaramYogendra (Kaivalyadhama)
4. YogikYog Paddhati - BharatiyaprakrutikChikitsaPadhat
5. Yogik Chikitsa -ShriKedarnath Gupta
6. Prakrutik Chikitsa Vigyan - Verma
7. Janasankhyashikshasidhanta evam Upadesa - S.C.Seel
1. Swasthvritta - Dr.Shivkumar Gaud
2. Health and Family Welfare - T.L.Devra
3. SachitraYogasan Darshika - Dr.IndramohanJha
4. Preventive and Social medicine - J.K.Park
5. Yogadeepika - Shri. B.K.S. Iyengar
6. Swasthavritta - Vd.Sakad
7. Positive Health - Dr.L.P.Gupta
8. Biogenic Secretes of Food In Ayurveda - Dr.L.P.Gupta
9. Yoga and Yogikchikitsa - Ramharsha Singh
10. The Foundation of Contemporary Yoga - R.H.Singh
11. Yogasidhanta evum Sadhna - H.S.Datar
12. Patanjali Yoga Sutra - Maharshi Patanjali, Karambelkar
13. Prakrutik Chikitsa Vidhi - Sharan Prasad
14. Text book of Swasthavritta - Dr.Ranade, Dr.Bobade, Dr.Deshpande
15. Gherand Samhita
16. Bio-Statistics - B.K. Mahajan
17. Swasthavritta Vidnyan - Dr.Mangala Gauri

18. Community Medicine	- Baride and Kulkarni.
19. Light on Yoga	- Shri. B.K.S. Iyengar
20. Light on Pranayama	- Shri. B.K.S. Iyengar
21. Light on Patanjala Yogasutra	- Shri. B.K.S. Iyengar
22. Shiva Samhita	- Kaivalyadhama
23. Gheranda Samhita	- Kaivlyadhama
24. Swasthavritta Vigyan	- Vd. Patrikar Vijay
25. Swasthavritta	- Vd Yashwant Patil and Vd. Vhawal
26. Food and Nutrition	- Swaminathan
27. Preventive and Social Medicine	- Mahajan
28. Preventive and Social Medicine	- B.N.Ghosh
29. Preventive and Social Medicine	- Gupta
30. Yoga and Nisargopachar	- Vd. Prama Joshi

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M.D.-AYURVEDA PRELIMINARY**8. ROGA NIDANA AVUM VIKRITI VIGYAN**
(Pathology and Diagnostic Procedure)**PAPER-II****Theory 100****PART-A****50**

1. Understanding of Samprapti of diseases in Charaka Nidana Sthana in contemporary context
2. Clinical aspects of Dosha, Dhatu, Upadhatu, Mala, Agni, Ama, Srotas and Indriya
3. Understanding of the role of Trividha Avasthapaka in the vitiation of Dosha
4. Concept of Nanatmaja and Samanyaja Vikara
5. Clinical application of Avarana in diagnosis of various diseases
6. Clinical application of Shatkriyakala in diagnosis of diseases.
7. Clinical and applied aspects of concept of Upadrava and Arista

PART-B**50**

1. Ayurvedic interpretation of various laboratory investigations to derive treatment principles.
2. Interpretation of various Rogi Bala and Roga Bala technique to plan Chikitsa Sutra
3. Clinical examination of Deha Bala, Roga Bala, Agnibala And Chetas Bala
4. Knowledge of current diagnostic tools like ECG, X-Ray, CT scan, MRI and USG

PRACTICAL**100****Contents:**

1. Duty in hospital OPD and IPD.
2. Duty in pathology laboratory.
3. Case taking – 25 cases
4. Performance of pathology and biochemistry practicals – 10 cases
5. Interpretation of ECG, EEG, X-ray, CT-Scan, MRI and USG

Distribution of marks (Practical)

1. Case record (25 Cases)	- 10 marks
2. Bed side clinical case taking	
3. Long case	- 20 Marks
4. Short case	- 10 Marks
5. Laboratory Practicals	- 20 Marks
6. Interpretation of ECG, EEG, X-ray, CT-Scan, MRI and USG	- 10 Marks
7. laboratory experiment record	- 10 marks
8. Viva-voce	- 20 Marks

REFERENCE BOOKS:

1. Madhav Nidan (Madhukosha Commentary)
2. Relevant portions of Charak Samhita, Sushrut Samhita and Vagbhata
3. Doshakaranatwa Mimamsa - Acharya P.V. Sharma
4. Nadi pariksha - Vb Athavale
5. Nadi Pariksha – GP Upadhyay
6. Rogi Pariksha vidhi - Acharya Priyavrata Sharma
7. Nidan Panchak - Shivcharan Dhyani

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8. Vyadhivigyan I and II - Yadav Thrikamji
9. Ayurvediya Roga Vargikaran - Vd. Ramanat Vd. Gurdip Singh
10. Ayurvediya Nidan Evum Chikitsa Ke Siddhanta - Prof. Ram Harsh Singh
11. Clinical methods in Ayurveda - K. R. S. Murthy
12. Parameswarappa's Ayurvediya Vikriti Vigyan & Roga Vikriti Vigyan - Dr. P.S. Byadgi.
13. Oxford Handbook of Clinical Examination and Practical Skills
14. Symptoms & Signs in Clinical Medicine - Chamberlains
15. Hutchison's Clinical Methods
16. Bedside Clinics in Medicine Part- I & II - Kundu
17. Practical Pathology - Dr. K. Uma Chaturvedi
18. Medical Laboratory Technology - R. Sood
19. Clinical Diagnosis and Management by Laboratory methods - Todd, Sanford and Davidson

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M.D.-AYURVEDA PRELIMINARY**9.CHHAYA AVUM VIKIRAN VIGYAN****(Imaging and Radio diagnosis)****PAPER-II****Theory- 100****PART A****50**

1. Objectives of Chhaya avum Vikiran Vigyan.
2. History,development and concept of Chhaya avum Vikiran vigyan
3. Poorva karma (preparatory measures) related to Chhaya avum Vikiran Vigyan in relation to consultant, technical staff a patients (with their attendants) including counseling and consent.
4. Review of fundamental principles of Ayurveda.
5. Shishyopanayan regarding the Chhaya avum Vikiran Vigyan – introduction of Chhaya avum Vikiran department and hc unit, guidelines for their use, do's and don'ts, discipline, duties and responsibilities.
6. Ethical and legal issues related to Chhaya avum Vikiran Vigyan.
7. Precautions and preventions in Chhaya avum Vikiran Vigyan unit.
8. Environmental issues related to Chhaya avum Vikiran Vigyan. Impact of used radiological energies on environment.
9. Disposing and recycling of radiological materials. Biomedical waste disposal management in Chhaya avum Vikiran Vigy
10. Management of Chhaya avum Vikiran Vigyan department. Relation between consultant, student, technical staff, patient their attendants).
11. Basic concept of research methodology related to Chhaya avum Vikiran Vigyan.

PART B**50**

1. Preliminary knowledge of various modalities of Chhaya avum Vikiran Vigyan.
2. Efficiency and limitations of various radiological modalities.
3. Introduction of surface and applied anatomy, patho-physiology related to Chhaya avum Vikiran Vigyan.
4. Preliminary knowledge of equipments related to radiology.
5. Selection of appropriate radiological modalities- basis of selection, correct radiological investigation advice, further assessments and diagnostic advice.
6. Management of emergencies in radiology section, electrical and mechanical violent emergencies, radiation hazards and preventive measures.
7. Pharmacology and application of emergency drugs, analgesics, muscle relaxants, fluids, plasma expanders, oxygen and various contrast media used in Radio-diagnosis and imaging.
8. Drug and contrast media reactions and shock - its management, cardio-cerebro-pulmonary resuscitation (CCPR), endo tracheal intubation, tracheostomy.
9. Anesthesiology related to radiology.
10. Short review of common diseases, frequently investigated in the Chhaya avum Vikiran Vigyan department especially the clinical findings, anatomical and patho-physiological changes.
11. Skills of transfer of knowledge- Teaching methodology, audio-visuals preparation and presentations.
12. Knowledge of Information Technology – relevant to radiology.
13. Record keeping.
14. Documentation, books and journals, research paper writing.

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PRACTICAL

100

Contents:

- Evaluation of knowledge of functioning of equipments
- Evaluation of knowledge of Chhaya avum Vikiran Vigyan procedures
- Management of Chhaya avum Vikiran vigyan department
- Management of emergencies in Chhaya avum Vikiran Vigyan unit
- Personality development assessment.
- Basic knowledge of concepts of radiological interpretations

Distribution of Marks (practical):

1. Case Records of 25 patients	20
2. Chhaya avum Vikiran Vigyan procedures -	
1. Long procedure	20
2. Short procedure	10
3. Identification and functioning of instruments and equipments	15
4. Interpretation of Radiograph and images	15
5. Viva Voce	20

REFERENCE BOOKS:-

Shusruta Samhita	Relevant part
Charak Samhita	- do-
Astang Hridaya/Sangrah	- do-
Text Book of Radiographic Positioning and Related Anatomy John P Lampignano	- By Kenneth L Bontrager,
Radiographic interpretation to general practitioner	-W.H.O.
Procedures in diagnostic Radiology Thomson.	- By T. Doyle, W. have, K.
Radiographic positioning	- By Clark
Radiobiology for the Radiologist - By Curry T S , Dowdey J E	- By Hall.Christensen's Physics of Diagnostic Radiology
, Murry R C	
Farr's Physics for Medical Imaging	- By Penelope Allisy-
Roberts , jerry Williams	
Fundamental of Diagnostic Radiology	- By Brant.
Diagnostic Imaging	- By Federle
Diagnostic Imaging	- By Peter Armstrong ,
Martin Wastie , Ansrea	
Rockall	
Gastrointestinal radiology	- R.L. Eisenberg
Uro-radiology .B.Talner	- T.Sherwood, A.J.Davidson,
Grainger and Allison's Diagnostic Radiology imaging	-Text book of medical
Text Book in Radiology and Imaging	- By D. Sutton.
Introduction to Vascular Ultrasonography	- By Zwiebel , Pellerito
Text book in Ultrasonography	- By Roumack
Manual of Medical Diagnostic Ultrasonography	- By W.H.O. Scientific group.

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Computed Tomography & MRI of the whole body	- By Hagga.
Surface and Radiological Anatomy	- By A. Halim
X-Ray equipment for student Radiographers	- By DN and MO Chesney
Clinical Sonography , A Practical Guige	- By Roger C. Sanders , Tom Winter
Ultrasonography in obstretics and gynaecology	-Callen
Standard Journals like Indian Journal of Radiology, Radiology,Radiological clinics of north America,British Journal of Radiology etc.	
Audio-visual aids	-CDs & DVDs

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M.D.-AYURVEDA PRELIMINARY

10.KAYACHIKITSA
(General Medicine)

PAPER-II

Theory- 100

PART A

50

1. Understanding of fundamental concepts of Kayachikitsa like Vriddhi and Kshaya of Dosha, Dushya, Mala with Amshaar Kalpana. Srotodushti, Khavaigunya, Agni, Ama (Saama and Nirama Dosha, Dhatu & Mala). Aavarana, Rogamarga, Ashayapakarsha, Dosha Gati, Kriyakala. Aushadha Sevana Kala, Anupana, Pathya-Apathya and their scientific relevance during health and disease.
2. Detailed knowledge of Rogi Roga Pariksha including detailed history taking and systemic examination of patient. Clinical implementation of Dwividha Pariksha, Trividha Pariksha, Chaturvedha Pariksha, Panchavidha Pariksha, Shadvidha Pariksha, Ashtavidha Pariksha, Dashvidha Pariksha Bhavas and Prakriyadi Dashvidha Pariksha.
3. Principles of Kayachikitsa in disease management including Shodhana, Shamana and Naimittika Rasayana.
4. Introduction of the basic principles of Modern medicine, Homeopathy, Unani, Siddha, Tibetan Medicine, Yoga and Natu and their relevance in light of the basic principles of Ayurvedic medicine.

PART B

50

1. Chikitsa Siddhanta of Pranavaha, Annavaha, Udakavaha, Rasadi Dhatuvaha, Malavaha & Manovaha Srotovikara.
2. Emergency medicine: Acute Severe Asthma, pulmonary oedema, myocardial infarction, cerebro-vascular accidents, and electrolyte imbalance, haemorrhage, syncope, seizure, coma, hyperpyrexia, hypertensive encephalopathy.
3. Knowledge of conducting various medical procedures like infusions, tapping, lumbar puncture, Ryle's tube insertion, catheterization, tractions, water seal drainage, Cardio Pulmonary Resuscitation.
4. Basic knowledge of underlying principles of ECG, TMT, echo cardiography, vascular doppler studies, EEG, EMG, X-F, CT scan, MRI, PET and their interpretation.
5. Knowledge of common Ayurvedic formulations and preparations used in treatment:
Churna- Triphala, Sitopaladi, Lavanbhaskara, Hingvashtaka, Avipattikara, Gangadhara, Shaddharana, Sudarshana, Panchasakara, Ajmodadi.
Kashaya- Dashamula, Rasnasaptaka, Asanadi, Pathyadi, Phalatrikadi, Punarnavashtaka, Gojivhadi, Mahamanjishtad Drakshadi Kashaya.
Asavas-Arista- Amritarishta, Kanakasava, Chitrakasava, Saraswatarishta, Ashwagandharishta, Chandanasava.

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- Vati-** Sanjivani, Chandraprabha, Agnitundi, Chitrakadi, Khadiradi, Vyoshadi, Shankha Vati, Shiva Gutika.
Guggula-Kalpana-Triphalaguggula, Kaishoraguggula, Trayodashangaguggula, Simhanadaguggula, Yogarajaguggula, Gokshuradi guggula, Kanchanaraguggula.
Rasaushadhi- Tribhuvanakirti Rasa, Arogyavardhini Rasa, Shwasakuthara Rasa, Rasamanikya Rasa, Smritisagara Rasa, Lakshmilasa Rasa, Sutshekhara Rasa, Pravala Panchamrita Parpati, Hemagarbhapottali Rasa.
Taila- Mahanarayana Taila, Pindataila, Prasariyadi Taila, Ksheerabala Taila, Brihat Saindhavadi Taila, Panchaguna Taila, Amritadi Taila, Marichyadi Taila, Mahamasha Taila.
Ghrita- Mahatriphaladi Ghrita, Brahmi Ghrita, Panchtikta Guggulu Ghrita, Sukumara Ghrita, Dadimadya Ghrita, Kantak Ghrita, Kalyanaka Ghrita.
Lehya- Chyavanaprasha Avaleha, Kushmanda Avaleha, Ashwagandha Avaleha, Agastya Hareetaki Rasayana, Drakshavaleha, Vasavaleha, Amrita-Bhallataka Rasayana.

PRACTI CAL

100

Content:-

Daily hospital duties in OPD, IPD and casualty

Bed-side case taking – 25 patients

Distribution of marks (practical):

- | | |
|--|----------|
| 1. Case records of 25 Patients in detail | 20 marks |
| 2. Bedside clinical case taking- | |
| Long case | 20 marks |
| Short case | 10 marks |
| 3. Medical procedures/laboratory work | 15 marks |
| 4. Instruments and spotting | 15 marks |
| 5. Viva voce | 20 marks |

REFERENCE BOOKS-

- | | |
|------------------|-----------------------------------|
| Charak Samhita | -Cakrapanidutta commentry |
| Sushrut Samhita | -with all available commentaries. |
| Ashtang Samgraha | -Indu commentary |
| Ashtang Hridaya | -Arundutta and Hemadri commentry |
| Cikitsadarsha | - Pandit Rajesvardutta Shastri |

Kayachikitsa	- Ramaraksha Pathak
Rog Pariksha Vidhi	- Priyavrat Sharma
Panchakarma Vigyan	- Haridas Sridhar Kasture
Ayurved Nidan Chikitsa Siddhanta	- Prof. R.H.Singh.
Kayachikitsa Vol. I-IV.	- Prof. Ajay Kumar
Davidson's Principles and Practice of Medicine.	
API Text Book of Medicine.	
Harrison's Text Bok of Medicine.	
Cecil Text Book of Medicine.	
Relevant texts of concerned subjects.	

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M.D.-AYURVEDA PRELIMINARY**11. MANO VIGYAN AVAM MANAS ROGA****(Psychiatry)****PAPER-II****Theory- 100****PART A****50**

1. Concept of Manas in Sankhya, Yoga, Nyaya, Vaisheshika, Purva Meemamsa, Vedanta, Bouddha, Tantra and Purana. Philosophical concepts in Ayurveda and its applications.
2. Basic principles of Ayurveda psychology - Srishti utpatti, Triguna, Loka purusha samya Siddhanta, determination of Pur according to Dhatubheda, Chikitsadhikrita purusha in a psycho somatic axis, Perception and cognition in Ayurveda. Do: Dhatu, Agni, Mala Vigyanam and its psychosomatic importance, 'Shariramapi Sattvamanuvidhiyate Sattvam Cha Sharir Concept of Dharma, Artha, Kama and Moksha, concept of Apunarbhava in Ayurveda, Trividha Eshana.
3. Introduction to psychoanalytical concept – Id, Ego, Super ego. Concept of mind in Western psychology
4. Concept of Mana in Ayurveda, Mano Nirupana, Manaswarupa, Sthana, Vishaya, Karma, Guna and Dosha. Manovyapa Gyanotpatti, Gyanotpattau Manaso Dayittwam. Manas as 'Cheshta Pratyayabhutam Indriyanam Indriyo-Pakramaniyam nirupana, Atmaguna.
5. Psychological Processes – Attention and perception, intelligence, creativity, motivation, emotion, sex and other drives, s consciousness, learning, memory, cognition and dream, knowledge of developmental psychology.
6. Understanding of Manasika bhava / Manovikara and their importance in Manasroga Nidana and Chikitsa – Iccha, Dwes Sukha, Dukha, Lobha, Moha, Krodha, Shoka, Vilapa, Preeti etc. Emotional aspects of human behaviour.
7. Manovaha Sroto Nirupana, basics of neurophysiology, neurotransmitters, psychoneuroimmunology, physiological basis human behaviour, influence of nervous system on human behaviour, sensory systems, autonomic nervous system, stuc Ojas, Gyanendriya and Buddhi.
8. Satvikadi Kayanam samanya gyanam, basic concepts of personality, Sattvabala and mental disorders.
9. Manasroga samanya nidana, Pragyaparadha- samkshipta vivarana. Vibhramsha of Dhee, Dhriti and Smruti, Mano Dos Sharir Dosha in psychopathogenesis, Sadvritta and its importance.
10. Relation of psychology with parapsychology.

PART B**50**

1. Basic understanding of Sattva Pariksha , utility of Trividha, Shadvidha, Ashta Sthana, Dashavidha and Srotopariksha in psychiatric practice, Vikriti pariksha- Vibhrama of Mano -Buddhi- Samgya Gyan-Smriti-Bhakti-Sheela-Cheshta and Ach:
2. Psychiatric examination- Mental status examination, mini mental status examination, cognitive assessment with higher functions, personality and self in psycho analysis, basic psychiatric assessment inventories- Hamiltons scale, Bech's in' GRISS questionnaire, Weschlers' scale for intelligence.
3. Clinical psychology – General psychology with schools of psychology, theories of personality development, social dimer of behavior and current issues, doctor patient relationship, patient interviewing and study of therapeutic relationship. Ba knowledge about anxiety disorders, delusional disorders, phobic disorders, lying, stealing, juvenile delinquency. Mental hygiene and behaviorism.
4. Technical terms used in psychiatric practice, general symptoms of psychiatric disorders, classification of psychiatric disc as per DSM and ICD classifications.

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5. Basic knowledge about organic psychosis, psychoneurosis, Schizophrenia, mood disorders, personality disorders, sexu perversions, sleep disorders and mental retardation.
6. Basic understanding of Bhuta, Graha and Bhutavidya. Hetu, Lakshana and Samprapti of Unmada, Apasmara, Atattwabhinivesha, Grahavesha, Bhutonmada, Gadodvega, Yoshapasmara, Madatyaya.
7. Nidra and Swapna, its types and role in psychopathogenesis.

8. Basic understanding of Chikitsa bheda, descriptions of general and specific principles of Kayachikitsa, its practical application in Manasroga, Daivavyapashraya, Yuktivyapashraya, Satvavajaya chikitsa and Dravya-adravaya chikitsa, Manodosha S: chikitsa, basic treatment principles in Manasika vyadhi, Panchkarma and its application in Manasika roga, Importance of Rasayana and Vajikarana therapies in Psychiatric practice, Medhya rasayana.
9. General knowledge in the basic management principles of psychiatric disorders in modern medicine. Basic knowledge of psychopharmacology, forensic psychiatry, community psychiatry, liaison psychiatry, child psychiatry and geriatric psychiatry.
10. Application of psychiatric knowledge in other specialities viz. Kayachikitsa, Agadatantra, Shalya, Shalakyas, Prasuti- Stri and Kaumarabhritya.
11. Psychosomatic disorders, psychological understanding on essential hypertension, asthma and other allergic disorders, psoriasis, IBS, ulcerative colitis, CAD, tension /vascular headaches, pseudopsychosis, hyperemesis gravidarum, enure: diabetes mellitus, obesity, autoimmune disorders, neoplasm and psychosexual disorders.
12. Basic understanding of diagnostic applications- Haematological, biochemical, serological, histopathological, imaging - E EEG, USG, MRI scan, CT scan, PET scan in psychosomatic, psychiatric and neuro- psychiatric practices.

PRACTICAL**100****Contents:**

1. Daily hospital duties in OPD, IPD and casualty
2. Practical Record Book
 1. Psychiatric – 5 cases
 2. Psychosomatic – 5 cases
 3. Paediatric / Geriatric Psychiatry – 5 cases
 4. Psychosexual / Substance abuse – 5 cases
3. Psychiatric Inventories- MMSE, Hamilton Anxiety Depression Rating Scale, Brief Psychiatric Rating Scale, Beck's Depression Inventory, Wechsler's scale, GRISS questionnaire -2 Cases each
4. Manasa Bhava assessment scales- Sattvabala, Manasa Kaya, Smriti, Buddhi, Raja and Tama rating, Manasa Bhava Par 2 cases each

Distribution of marks (Practical)

- | | |
|--|------------|
| 1. Case records of Patients in Detail (25 Cases) | - 20 Marks |
| 2. Bedside clinical case taking | |
| Long case | - 20 Marks |
| Short case | - 10 Marks |
| • Procedure | - 15 Marks |
| • Instruments & Spotting | - 15 Marks |
| • Viva - voce | - 20 Marks |

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REFERENCE BOOKS:

1. Related matter of Charak, Sushrut and Vagbhata and other ancient texts with commentaries
2. Prachin Manovikara Vigyan - Ayodhya Prasad Achal
3. Ayurvediya Padarth Vigyan - Ranjit Rai Deshai
4. Ayurved Darshan - Acharya Rajkumar Jain
5. Purusha Vichaya - Prof. V.J. Thakkar
6. Ayurvediya Manas Vigyan - Prof. Ram Harsh Singh
7. Yoga evum Ayurved - Acharya Rajkumar Jain
8. Basic principles of Ayurvediya Padartha Vigyan - Dr Yogesh Chandra Mishra
9. Synopsis of Psychiatry - Harold Kaplan and Benjamin Saddock
1. Oxford textbook of Psychiatry - Michael Gelder, Paul Harrison
1. General psychology and Abnormal psychology - S.K. Mangal
2. A text book of Post Graduate Psychiatry - Neeraj Ahuja
3. Mind in Ayurveda and other Indian Traditions - A.R.V. Murthy
4. Psychopathology in Indian medicine - Satyapal Gupta
5. Body- Mind-Spirit Integrative Medicine - Prof. Ram Harsh Singh
6. Rationale of Ayurveda Psychiatry - Dr. A.R.V. Murthy
7. Foundations of contemporary Yoga and Yoga Therapy - Prof. Ram Harsh Singh
8. Stress and its Management - Dr. K.N. Udupa
9. Concept of Mind - Edited by Prof. C.R. Agnivesh, Kottakkal
10. Kayachikitsa - Part 3 - R. R. Pathak and Vidhyadhar Shukla
11. Panchakarma Illustrated - Prof. Shrinivasa Acharya
12. Unified Dimensions of Ayurvedic Medicine - Dr. J.S. Tripathi
13. Essential Psychiatry - Bhatia MS
14. Sahassrayoga - Nishteswar and Vaidyanath
1. Ayurveda and the Mind - David Frawley
2. Manasa Roga Vijnana - Balakrishna

- | | |
|---|-----------------------|
| 3. Comprehensive Textbook of Psychiatry | - Kaplan and Sadock's |
| 4. Psychiatry for medical students | - Robert J Waldinger |
| 5. Introductions to Psychology | - Morgan / King. |

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D.-AYURVEDA PRELIMINARY**12.RASAYAN & VAJIKARAN**
(Rejuvenation & aphrodisia)**PAPER-II****Theory- 100****PART A****50**

1. Concept of Bheshaja, classification and understanding of Swasthasya Urjaskara and Artasya Roganut.
2. Etymology, derivation, definition, synonyms and scope of Rasayana, Vajikarana & Vrishya.
3. Historical aspects of Rasayana & Vajikarana
4. Rasayana-Vajikarana Arha & Anarha
5. Classification of Rasayana & Vajikarana.
6. Knowledge of Dosha, Dhatu & Mala.
7. Knowledge of Dhatu Parinamana & Poshana Nyaya.
8. Detailed knowledge of Shukradhatu, Shukra, Retas, Veerya, Rupadravya, Prashastha Sukra Lakshana, Sukrasaara Pu
9. Knowledge of Sukravahasrotas, Sukradhara Kalaa.
10. Concept of Ojas.
11. Knowledge of Prakriti, Sara & Satwa.
12. Knowledge of concept of Agni: all components of Agni, levels of Agnimandya, Agnimandyajanya Vikara.
13. Principles of Panchakarma and application in Rasayana & Vajikarana.

PART B**50**

1. Applied anatomical & physiological aspects of male reproductive system.
2. Applied aspects of physiology of puberty.
3. Spermatogenesis.
4. Basics of genetics. Bija and it components.
5. Applied aspects of reproductive endocrinology.
6. Semen formation, knowledge of various components of semen.
7. Basics of applied pharmacology related to Rasayana & Vajikarana.
8. Knowledge of metabolism and metabolic disorders.
9. Basics of Geriatrics.

PRACTI CAL**100****Contents:-**

1. Daily hospital duties in OPD, IPD and casualty.
2. Assessment of Saara – Shukrasaara and Shukra-Asaara –10 patients.
3. Rasayan and Vajikarana in geriatric patients – 10 patients.
4. Semen analysis- Retopariksha – 10 cases.
5. Uttarbasti – 5 cases.
6. Technique of psychosexual counseling.
7. Applied knowledge of assessment scales pertaining to Vajikarana /sexual functions.
8. Practical aspects of Panchakarma pertaining to Rasayana & Vajikarana.

Distribution of Marks (practical):

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1. Case records of patients-
(15 case of Rasayana; 10 cases of Vajikarana) 20 marks
2. Bedside clinical case taking-
Long case 20 marks
Short case 10 marks
3. Semen analysis and lab investigations 20 marks
4. Instruments and spotting 10 marks
4. Viva voce 20 marks

REFERENCE BOOKS:-

1. Relevant chapters from Brihatrayee and Laghutrayee and their commentaries
2. Panchakarma by Prof.H.S. Kasture
3. Kayachikitsa Vol I & II (Including Panchakarma, Rasayana & Vajikarana) by Prof. RH Singh
4. Illustrative Panchakarma by Dr Sreenivasa Acharya
5. Campbell-Walsh Urology by
Alan J. Wein MD PhD (Hon)
,
Louis R. Kavoussi MD
,
Andrew C. Novick MD
,
Alan W. Partin MD PhD
6. Clinical Endocrinology 2013 The (Clinical Medicine Series) by MD., CG Weber
7. Sex and Human Loving -Masters and Johnson
8. Diagnosis and treatment of functional Infertility by Lunenfeld B, Insler V, Glezerman M (eds) Black well scientific publica
Berlin.
9. Human reproduction conception and contraception, He fez ESE (ed) Harpar and Row publications, New York
10. Infertility- Practical guide for the physician, Hommond GM, Talbert LM (eds) Black well scientific publications, Oxford
11. Rasayana vajeekarana- Darpan by Om prakash Upadhyaya, Soi Balachandra yantralaya, Manavashram, Jaipur
12. Vatsayana kamasutra
13. Ananga ranga
14. Kelikutuhala
 1. Infertility manual by kamini Rao
 2. Advanced infertility management- Mehroo Hansotia
 3. Endocrine and Reproductive systems – Sanders
18. Proceedings of WHO Symposium on advances in fertility regulation, Moscow: USSR
19. WHO Laboratory Manual for the examination of semen and sperm. Cambridge Uni. Press
20. WHO (1973) Reproductive function in the human male. World Health Organization, Geneva(Mannual)
21. WHO (1975): Scientific group on the epidemiology of infertility. The epidemiology of infertility, Geneva (Technical Report
No. 5820 37 P)
22. Decision making in infertility; DeCherney AH, Polan ML, Lee RD, Boyers SP (Eds), JP Brothers, New Delhi
23. Handbook of sexual Dysfunction by Richard Balon, R. Taylor Segraves pub. By Taylor and Francis Group Florida
24. The Sperm Cell (Production, Maturation, Fertilization, Regeneration) by Christopher J. De Jonge, Christopher L.R. Barratt
Cambridge University Press
25. Kaplan and Saddocks Synopsis of Psychiatry, Lippincott Williams and Wilkins

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M.D.-AYURVEDA PRELIMINARY**13.PANCHKARMA****(Five Therapeutic proedure)****PAPER-II****Theory- 100****PART A****50**

1. Chikitsa and its classifications; Antah-Parimarjana and Bahir-Parimarjana Chikitsa
2. Principles of Chikitsa, Kriyakal, Shadvidha and Dvididha Upakrama and role of Panchakarma therein.
3. Applied aspects of Trividha, Shadvidha, Ashta Vidha and Dasha Vidha Pariksha.
4. Applied anatomy and physiology of cortex, cranial and peripheral nerves. Methods of physical examinations of central n system: sensory system, motor examination-muscle power and tone, superficial and deep reflexes, difference of upper lower motor neuron lesions. Tremors and coordination.
5. Functions of various single muscles and groups of muscles, applied anatomy and physiology of joints. Methods of exan of locomotor system. Differential diagnosis of Amavata (rheumatoid arthritis), Vatarakta (gout) and Sandhivata (osteoart Examination of lumbar and cervical disorders including Gridhrasi (sciatica) and Vishvachi (Brachial neuralgia).
6. Applied anatomy and physiology of cardiovascular and respiratory systems, functions of capillaries and its permeability. Methods of examination of respiratory and cardiovascular system. Interpretation of spirometry and ECG findings.
7. Knowledge and method of examination of various skin lesions.
8. Applied anatomy of stomach, small intestine and large intestine. Detailed examination of gastro-intestinal system.

PART B**50**

1. Definition of Karma. Trividha Karma for Shodhana.
2. Importance of Panchakarma in health and disease.
3. Indications and contraindications for Shodhana. Applied aspects of Koshta and Agni.
4. Importance of Purva and Pashchata Karma in Shodhana. Parihara Vishaya for Panchakarma.
5. Samsarjana Krama. General knowledge of various Aushadha and Ahara Kalpana used for Panchakarma.

6. Areas of research in Panchkarma.
7. Knowledge of equipments and instruments used in Panchkarma in ancient times and the possible modifications therein
Knowledge of quality standards of NABH (National Accreditation Board of Hospitals) for Ayurveda, guidelines for establishment and management of eco-friendly Panchkarma theatre including management of biomedical waste.

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PRACTICAL**100**

1. Duty in Panchakarma ward and theatre.
2. Performance of 5 Cases each of Snehana, Svedana, Vamana, Virechana, Basti and Nasya with maintaining of detailed record.
3. Record of detailed examination of 25 patients treated with Panchakarma and effects observed thereon.

Distribution of marks (practical):

- | | |
|--|----------|
| 1. Case records of 25 patients in detail | 20 marks |
| 2. Performance of long Karma | 20 marks |
| 3. Performance of short Karma | 10 marks |
| 4. Panchakarma procedures | 15 marks |
| 5. Instruments and spotting | 15 marks |
| 6. Viva voce | 20 marks |

REFERENCE BOOKS:

- | | | |
|----|---|--|
| 1 | Charak Samhita with commentary of Ayurved Dipika by Chakrapanidatta and Jalpakalpa taruby Gangadhara | |
| 2 | Sushruta Samhita with the Nibandha Samgraha commentary of Dalhana and Nyayachandrika panjika of Gayadasa on nidansthana | |
| 3 | Ashtanga Hridaya with Sarvanga sundara and Ayurved rasayana commentaries | |
| 4 | Ashtanga Sangraha with Shashilekha commentery | |
| 5 | Bhela Samhita | |
| 6 | Kashyapa Samhita | |
| 7 | Bhavaprakasha of Bhavamishra | |
| 8 | Sharangadhara Samhita | |
| 9 | Vangasen | |
| 10 | Gadanigraha | |
| 11 | Ayurvediya Panchkarma chikitsa | Dr Mukundilal Dwivedi |
| 12 | Panchkarma Vigyan | Dr Haridas Shreedhar Kasture |
| 13 | Illustrated Panchkarma | Dr.G Srinivasa Acharya |
| 14 | Ayurveda-Principles and Practice of Panchakarma | Dr. Mandip and Dr Gurdip Singh |
| 15 | The Panchkarma Treatment of Ayurved with Kerala Specialities | Dr. T.L. Devaraj |
| 16 | Panchkarma Therapy | Dr. R.H. Singh |
| 17 | Principles and practice of vasti | Dr. Vasudevan Nampoothiri and Dr. L. Mahadevan |
| 18 | Claiton's Physiotherapy | |
| 19 | Teddy's Physiotherapy | |
| 20 | Harrison's Principles of Internal Medicines | |
| 21 | Guyton's Physiology | |

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M.S.-AYURVEDA PRELIMINARY**14. PRASUTI AVUM STRI ROGA**
(Gynecology & obstetrics)

PAPER-II

Theory- 100

PART A

50

1. Concept of Tridosha, Dhatu, Upadhatu, Agni, Pancha Mahabhuta in relation to Prasuti and Stri Roga.
2. Concept of Artava and Shukra.
3. Concept of Rasa, Guna, Veerya, Vipak and Karma of Dravya used in Prasuti and Stri Roga.
4. Action and adverse drug reaction related to commonly used plants and Rasa Aushadhi in Prasuti and Stri Roga.
5. Concept of Pathya- Apathya in relation to Prasuti and Stri Roga.
6. Concept of Garbhadhan and Garbha.
7. Concept of Vrana and Vrana dushti.
8. Concept of special therapies of Ayurved used in Prasuti and Stri Roga.
9. Concept of Ashtavidha Shastra Karma, Yantra & shastra used in Prasuti and Stri Roga

PRACTI CAL

100

1. Applied anatomy and physiology of genito-urinary system, abdomen, pelvis, pelvic floor, anterior abdominal wall, inguin ligament, inguinal canal, vulva, rectum and anal canal.
2. Abnormal development, structure and function of female and male urogenital systems
3. Development, structure and function of placenta, umbilical cord and amniotic fluid.
4. Physiological and neuro-endocrinal changes during puberty, adolescence and menstruation.
5. Introduction of hormones related with gynaecology and obstetrics. Ovulation, fertilization, climacteric and menopause. Biophysical and biochemical changes in uterus and cervix during pregnancy and labour.
6. Pre-natal, Natal and Post natal counseling and examination.
7. Pharmacological study of drugs used in gynaecology and obstetrics.
8. Knowledge of diagnostic techniques used in gynaecology and obstetrics.
9. Basic Knowledge of pathological and biochemical investigation used in gynaecology and obstetrics.
10. Ethics, law and Acts Related to gynaecology and obstetrics – laws of abortion and adoption.
11. Knowledge of contraception and sterilization procedures.
12. Pre-operative and post operative care in gynaecology and obstetrics.

PRACTI CAL

100

Contents:

1. Hospital duties in OPD, IPD, labor room, OT and casualty
2. History taking and counseling - 25 cases.
3. Labor cases - observation/performing - 10 cases
4. Knowledge of instruments required in gynaecology and obstetric practices.
5. Ayurvedic diagnostic and therapeutic procedures.
6. Fluid therapy and blood transfusion.
7. Contraception and sterilizations.

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8. Pre-operative, operative and post operative procedures.

Distribution of marks (Practical)

1. Case records of Patients in Detail (25 Cases) - 20 Marks
2. Bedside clinical case taking
 - Long case - 20 Marks
 - Short case - 10 Marks
1. Procedures - 15 Marks
2. Identification of instruments, X-ray etc & Spotting - 15 Marks
3. Viva - voce - 20 Marks

REFERENCE BOOKS:

1. Related matter from all the samhitas and their commentaries.
2. Prasuti tantra evum stree roga by prof Tewari P V
3. Concepts of gynecology Dr Nirmala G Joshi.
4. Prasuti Tantra Prof. M. Dwivedi
5. Stree roga vigyan - Dr VNK Usha
6. Navya prasuti Vigyan Dr Pooja Bharadwaja
7. Text book of gynaecology-Berek and Novak.
8. Text book of obstetrics- Williams
9. Text book of obstetrics- D C Dutta
10. Text book of gynaecology - D C Dutta
11. Gabbe's normal and problem pregnancies.

12. Human embryology by Saddler.
13. Jeffcoat's principles of gynaecology
14. Te linde's gynaecological surgery.

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M.D.-AYURVEDA PRELIMINARY**15. KAUMARBHRITYA - BALA ROGA****(Pediatrics)****PAPER-II****Theory- 100****PART A****50**

1. Development of Kaumarbhritya tantra including ancient and modern literature. Strength of Ayurveda specific to child health care.
2. Vayobheda (Classification of age) according to different classics
3. Anatomical and physiological differences in child compared to adult.
4. Ayurvedic consideration of physiology and pathology of Dosha, Dhatu, Mala, Oja, Agni, Prakriti (sharirika-manasika), Kriya, Dhatuposhana in children.
5. Basic Concepts of growth and development, and its assessment.
6. Ayurvedic and modern clinical methods of examination of healthy and diseased newborn and children.
7. Knowledge of modern diagnostic tools like clinical and laboratory investigations, X-ray, USG, MRI etc.
8. Fundamentals of Ayurvedic treatment for childhood disorders.
9. Applied pharmacological considerations: Ayurvedic and modern concepts of drug doses, administration, distribution, metabolism, excretion, and other important factors of consideration.
10. National programs related to pediatrics.
11. Childhood Samskara
12. Principles of Child Psychology (Ayurvedic & modern concepts)

PART B**50**

13. Concept of Bala Rasayana and its application in physical and mental health of children.
14. Concept of Vyadhi-Kshamatva avam Vardhanopaya. Concept of immunity and immune enhancing measures including immunization.
15. Concept of Dhupana and Raksha karma and their clinical application in pediatric practice
16. Basic concepts of single drugs commonly used in pediatric practice with special reference to their karma like- Guduchi, Yastimadhu, Mandukaparni, Shankhapushpi, Ativisha, Pippali, Maricha, Shunti, Haritaki, Amalaki, Tulasi, Bhumyamalaki, Daruharidra, Haridra, Vidanga, Katuki, Dadima, Brahmi, Ashvagandha, Shatavari, Bala, Kampillaka, Trivrita, Jyotishmal, Vacha, Jeevanti, Rasna, Shatavari, Anantamula (Krishna Sariva), Durva, Khadir, Tankana, Tambula, Jatamansi, Sphatil
17. Knowledge of their ingredients, indications, precautions and specific considerations including adverse drug reactions (A commonly used Ayurvedic formulations in pediatric practice e.g. Aravindasava, Baalachaturbhadra Churna, Kumarakal Rasa, Saraswatarista, Swarnaprashana (Kashyapa Samhita), Kumaryasava, Kushmanda Rasayana (Sharangdhar), Ashvagandha Rasayana (Ashtanga Hridaya), Brahmi Ghrita, Kalyanaka Ghrita, Talishadi Churna, Sitopaladi Churna, H Khanda, Krimikuthara Rasa, Mugdha Rasa, Dantodbheda-Gadantaka Rasa, Rajanyadi Churna (Ashtanga Hridaya), Samvardhana Ghrita, Ashta Mangal Ghrita.
18. Methods of preparation of various specific Kalpana (e.g. Lehya, Syrup, drops etc.) according to needs of children.
19. Common instruments and their application in new born care and general pediatric practice.
20. Specific considerations in research methods related to Pediatrics.
21. Regulatory laws related to child health management.

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PRACTICAL**100****Contents:**

1. a) In-patient case history record -(25 Patient)
- b) Child Health record - (50 Case)
1. Involvement in Outreach and National programs:
2. School Child health checkup
3. Adolescent education
4. Adolescent counseling etc

3. Pediatric ward/nursery management.

Distribution of marks (Practical)

1. a) Case History Record - (25 Patient) - 10 Marks
- b) Child Health record - (50 Case) - 10 Marks
2. Bed side clinical case taking
 1. Long Case - 20 Marks
 2. Short Case - 10 Marks
 3. Procedures/ Kriya Kalpa - 15 Marks
 4. Identification of instruments & Spotting - 15 Marks
 5. Viva-voce - 20 Marks

REFERENCE BOOKS:

1. Kashyapa Samhita Complete Hindi translation by Satyapal Vidhyalankara English translation by Prof. Premvati Tiwari
2. Principles & practice of Pediatrics in Ayurveda: CHS Shastri
3. Child Health Care in Ayurveda: Abhimanyu Kumar
4. Ayurvedic Concepts of human Embryology: Abhimanyu Kumar
5. Kaumarbhritya by Prof. D.N. Mishra
6. Kaumarbhritya Ke Antargata Balgraha Ka Kramika Evam Vaigyanika Adhyana by Prof. Chanchal Sharma
7. Notes on Kaumarbhritya-by Dr. Dinesh K S
8. Pran - Pratyagamanam-by Dr. B.M. Singh
9. Ayurveda Dwara Matra Evam Shishu Paricharya by Dr. KS Patel, V.K. Kori & Rajgopal S.
10. Kaumarbhritya related references from Charaka Samhita, Sushruta Samhita Vagbhata etc.
11. Clinical Methods in Paediatrics by Meharban Singh
12. Pediatrics Emergencies by Meharban Singh
13. Essential Pediatrics O.P. Ghai
14. Text Book of Pediatrics Nelson
15. Care of New Born by Meharban Singh

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M.S.-AYURVEDA PRELIMINARY

16.SHALYA TANTRA – SAMANYA

(General Surgery)

PAPER-II

Theory- 100

PART A

50

1. Etymology and definition of Shalya Tantra.
2. Scope and importance of Shalya Tantra.
3. Study of Sushruta Samhita Sutra Sthana.
4. Study of modern surgical clinical methodology.
5. Applied anatomy, physiology and surgical pathology of common surgical conditions including relevant Ayurvedic aspect
6. Applicability of Shat Kriyakala in the pathogenesis of surgical diseases.
7. Applicability of Prakriti in understanding the causes and role of treatment in surgical diseases.
8. Applicability of basic principles of Ayurveda in Rogi Pariksha (Trividha, Shadvidha, Ashtavidha and Dashavidha Pariksh latest investigations.
9. Concept of Rakta according to Sushruta.
10. Introduction of clinical and diagnostic methods in Shalya Tantra - X-rays, U.S.G., Endoscopies (for diagnostic and treatment purposes), MRI, CAT scanning and other recent diagnostic tools.
11. Concept and applicability of Sadhya-Asadhya (Prognosis) - Arishtha lakshana.
12. Knowledge of life saving drugs.
13. Emergency conditions and its management.
14. Diagnosis and management of Pranashtha Shalya.

PART B

50

- Yantra and Shastra – Surgical Instruments - Ancient and recent advances.
- Sterilization – methods and types.
- Basic knowledge of Sangyaharan – Anaesthesia - Types, methods, indications, contraindications, complications and its management.
- Concept of Trividha Karma – Purva, Pradhana and Pashchat.
- Ashtavidha Shastra Karmas.
- Bandhana Karma – Ancient and recent advances.
- Kshara Karma – Introduction, types, method of various preparations like Kshara, Kshara Varti, Kshara Pichu and applic
- Kshara Sutra – Method of preparation, standardization and applications.
- Agnikarma – Introduction, types and applications.

- Raktamokshana – Introduction, types and applications.
- Application of Panchakarma therapy in surgical practice.
- Scope of Pathya-Apathya in the management of surgical diseases.

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PRACTICAL

100

Content:-

1. Hospital duties in OPD, IPD, OT and casualty
2. Case record – 25 cases
3. Surgical cases - observation/performing- 10 cases
4. Knowledge of instruments required in surgical practices.
5. Ayurvedic diagnostic and therapeutic procedures.
6. Fluid therapy and blood transfusion.
7. Contraception and sterilizations.
8. Pre-operative, operative and post operative procedures.

Distribution of marks (practical):

1. Case records of 25 Patients in detail	20 marks
2. Bedside clinical case taking- Long case	20 marks
Short case	10 marks
3. Identification of instruments, X-ray etc	15 marks
4. Medical procedures	15 marks
5. Viva voce	20 marks

REFERENCE BOOKS:-

1. Sushruta Samhita
2. Ashtanga Sangraha
3. Ashtanga Hridaya
4. Charaka Samhita
5. The Surgical instruments of the Hindus - Girindranath Mukhopadhyaya
6. Shalya Tantra Samuchchaya - Pandit Ramadesh Sharma
7. Shalya Vigyan (Part 1-2) - Dr. Surendra Kumar Sharma
8. Shalya Samanvaya (Part 1-2) - Vd. Anantaram Sharma
9. Shalya Pradeepika - Dr. Mukund Swaroop Verma
10. Sushruti - Dr. Ram Nath Dwivedi
11. Clinical Shalya Vigyan - Dr. Akhilanand Sharma
12. Bhagna Chikitsa - Dr. Prabhakar Janardhan Deshpande
13. Kshara sutra management in anorectal ailments - Dr. S.K. Sharma, Dr. K.R.Sharma and Dr. Kulwant Singh.
14. Anorectal diseases in Ayurveda - Dr. Sizoria and Dr. Praveen Kumar Chowdary.
15. Adhunik Shalya Chikitsa Siddanta - Dr. Katil Narshingham Udupa
16. Agnikarma Technology Innovation - Dr. P.D. Gupta
17. Shalya Tantra Ke Siddhant - Dr. K.K.Takral
18. Recent advances in the management of
Arshas /Haemorrhoids - Dr. P. Hemantha Kumar
1. Arsha Evum Bhagander Mein sutra Avacharan- Vd. Kanak Prasad Vyas
2. Recent advances in Kshara Sutra - Dr. M. Bhaskar Rao
3. Leech application in Ayurveda - Dr. M. Bhaskar Rao
4. Kshara Sutra - Dr. S.N.Pathak
5. Shalya Shalakya Tantra - Vd. S.G. Joshi
6. Surgical ethics of Ayurveda - Dr. D.N. Pande
7. Text book of Surgery - Sabistan
8. Operative Surgery - Rob and smith

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1. Bailey and Love's Short Practice of Surgery - Norman.S. Williams, Charles.V. Mann and R.C.G. Russell
2. Fractures and Joint Injuries - Watson-Jones
3. Text books of Operative Surgery - Farquharsons'
4. Principles of Surgery - Schwartz
5. Emergency Surgery -Hamilton Bailey's
6. Surgical pathology - Willing Worth

1. Clinical methods in surgery - S. Das
2. Textbook of Operative Surgery - S. Das
3. Shalya Vigyan (Sachitra) - Anantram Sharma
4. Anushastra Karma - Dr. D.N. Pande
5. Concept of Vrana is Ayurveda - Dr. Lakshman Singh
6. Significance for Poorva Karma in Surgical Patient - Dr. Lakshman Singh
7. Sangyahan Prakash - Dr. D.N. Pande
8. A concise Text Book of Surgery - S. Das
9. A manual on Clinical Surgery - S. Das
10. A System of Surgical Diagnosis - T.N. Patel
11. A Practical Guide to Operative Surgery - S. Das
12. Drugs and Equipment for Anaesthesia - Arun kumar
13. Manual of Surgical Instruments - M.M. Kapur
14. Ward Procedures - Patel Mansukh. B
15. Recent trends in the management of Arshas / Haemorrhoids - Dr. P. Hemantha Kumar
1. Primary Anaesthesia - Maurice King
2. Synopsis of Anaesthesia - Lee
3. Clinical Anatomy/ Surgical Anatomy - John E.Skandalakis
4. Surgical Instruments of the Hindus - Girindharnath Mukopadyay
5. Outline of Orthopedics - John Crawford Adams and David Hamblen. L
6. Outline of Fracture - John Crawford Adams
7. Recent trends in the management of Bhagandara / Fistula-in-ano - Dr. P. Hemantha Kumar
8. Principles and Practice of Agnikarma - Dr. Anand Kumar and Dr. Kanchan Shekokar.
9. Manipal Manual of Surgery - Dr. Rajgopal Shenoy

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M.S.-AYURVEDA PRELIMINARY**17.SHALYA - KSHARA KARMA AVUM ANUSHASTRA KARMA
(Para Surgical Procedure including Minimal invasive Surgery)****PAPER-II****Theory- 100****PART A****50**

1. Etymology and definition of Shalya Tantra.
2. Scope and Importance of Shalya Tantra.
3. Study of Sushrut Samhita Sutra Sthana 1- 46 chapters.
4. Study of modern surgical clinical methodology.
5. Applied anatomy, physiology and surgical pathology of common surgical conditions including relevant Ayurvedic aspects.
6. Applicability of Shat Kriyakala in the pathogenesis of surgical diseases.
7. Applicability of Prakriti in understanding the causes and role of treatment in surgical diseases.
8. Applicability of basic principles of Ayurveda in Rogi Pariksha (Trividha, Shadvidha, Ashtavidha and Dashavidha Pariksha and latest investigations).
9. Concept of Rakta according to Sushruta.
10. Introduction of clinical and diagnostic methods in Shalya Tantra - X-rays, U.S.G., Endoscopies (for diagnostic and treatment purposes), MRI, CAT scanning and other recent diagnostic tools.
11. Concept and applicability of Sadhya-Asadhya- Prognosis – Arishtha Lakshana.
12. Knowledge of life saving drugs.
13. Emergency conditions and its management.
14. Diagnosis and management of Pranastha Shalya.

PART B**50**

1. Yantra and Shastra – Surgical Instruments - Ancient and recent advances.
2. Sterilization – methods and types.
3. Basic knowledge of Sangyahan – Anaesthesia - Types, methods, indications, contraindications, complications and its management.
4. Concept of Trividha Karma – Purva, Pradhana and Pashchat.
5. Ashtavidha Shastra Karmas.
6. Bandhana Karma – Ancient and recent advances.
7. Kshara Karma – Introduction, types, method of various preparations like Kshara, Kshara Varti, Kshara Pichu and applications.

8. Kshara Sutra – Method of preparation, standardization and applications.
9. Agnikarma – Introduction, types and applications.
10. Raktamokshana – Introduction, types and applications.
11. Application of Panchakarma therapy in surgical practice.
12. Scope of Pathya-Apathya in the management of surgical diseases.

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PRACTICAL

100

Content :-

1. Hospital duties in OPD, IPD, OT and casualty
2. Case record – 25 cases
3. Parasurgical cases - observation/performing- 10 cases
4. Knowledge of instruments required in parasurgical practices.
5. Ayurvedic diagnostic and therapeutic procedures.
6. Fluid therapy and blood transfusion.
7. Pre-operative, operative and post operative procedures.

Distribution of marks (practical):

1. Case records of 25 Patients in detail	20 marks
2. Bedside clinical case taking- Long case	20 marks
Short case	10 marks
3. Identification of instruments, X-ray etc.	15 marks
4. Medical procedures	15 marks
5. Viva voce	20 marks

REFERENCE BOOKS :-

- Sushruta Samhita
- Ashtanga Sangraha
- Ashtanga Hridaya
- Charaka Samhita
- The Surgical instruments of the Hindus - Girindranath Mukhopadhyaya
- Shalya Tantra Samuchchaya - Pandit Ramadesh Sharma
- Shalya Vigyan (Part 1-2) - Dr. Surendra Kumar Sharma
- Shalya Samanvaya (Part 1-2) - Vd. Anantaram Sharma
- Shalya Pradeepika - Dr. Mukund Swaroop Verma
- Sushruti - Dr. Ram Nath Dwivedi
- Clinical Shalya Vigyan - Dr. Akhilanand Sharma
- Bhagna Chikitsa - Dr. Prabhakar Janardhan Deshpande
- Kshara sutra management in anorectal ailments - Dr. S.K. Sharma, Dr. K.R.Sharma and Dr. Kulwant Singh.
- Anorectal diseases in Ayurveda - Dr. Sizoria and Dr. Praveen Kumar Chowdary.
- Adhunik Shalya Chikitsa Siddanta - Dr. Katil Narshingham Udupa
- Agnikarma Technology Innovation - Dr. P.D. Gupta
- Shalya Tantra Ke Siddhant - Dr. K.K.Takral
- Recent advances in the management of - Dr. P. Hemantha Kumar
- Arshas / Haemorrhoids
- Arsha Evum Bhagander Mein sutra Avacharan - Vd. Kanak Prasad Vyas
- Recent advances in Kshara Sutra - Dr. M. Bhaskar Rao
- Leech application in Ayurveda - Dr. M. Bhaskar Rao
- Kshara Sutra - Dr. S.N.Pathak
- Shalya Shalaky Tantra - Vd. S.G. Joshi
- Surgical ethics of Ayurveda - Dr. D.N. Pande
- Text book of Surgery - Sabistan
- Operative Surgery - Rob and smith

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1. Bailey and Love's Short Practice of Surgery - Norman.S. Williams, Charles.V. Mann and R.C.G. Russell
2. Fractures and Joint Injuries - Watson-Jones
3. Text books of Operative Surgery - Farquharsons'
4. Principles of Surgery - Schwartz
5. Emergency Surgery -Hamilton Bailey's
6. Surgical pathology - Willing Worth
7. Clinical methods in surgery - S. Das

8. Textbook of Operative Surgery	- S. Das
9. Shalya Vigyan (Sachitra)	- Anantram Sharma
10. Anushastra Karma	- Dr. D.N. Pande
11. Concept of Vrana is Ayurveda	- Dr. Lakshman Singh
12. Significance for Poorva Karma in Surgical Patient	- Dr. Lakshman Singh
13. Sangyahan Prakash	-Dr. D.N. Pande
14. A concise Text Book of Surgery	- S. Das
15. A manual on Clinical Surgery	- S. Das
16. A System of Surgical Diagnosis	- T.N. Patel
17. A Practical Guide to Operative Surgery	- S. Das
18. Drugs and Equipment for Anaesthesia	- Arun kumar
19. Manual of Surgical Instruments	- M.M. Kapur
20. Ward Procedures	- Patel Mansukh. B
21. Recent trends in the management of	- Dr. P. Hemantha Kumar
22. Arshas / Haemorrhoids	
23. Primary Anaesthesia	- Maurice King
24. Synopsis of Anaesthesia	- Lee
25. Clinical Anatomy/ Surgical Anatomy	- John E.Skandalakis
26. Surgical Instruments of the Hindus	- Girindharnath Mukopadyay
27. Outline of Orthopedics	- John Crawford Adams and David
28. Hamblen. L	
29. Outline of Fracture	- John Crawford Adams
30. Recent trends in the management of	- Dr. P. Hemantha Kumar
31. Bhagandara / Fistula-in-ano	
32. Principles and Practice of Agnikarma	- Dr. Anand Kumar and
33. Dr. Kanchan Shekokar.	
34. Manipal Manual of Surgery	- Dr. Rajgopal Shenoy

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M.S.-AYURVEDA PRELIMINARY**18.ASTHI SANDHI AND MARMAGAT ROGA**
(Orthopedics and management of vital points)**PAPER II****Theory- 100****PART A****50**

1. Etymology and definition of Shalya and Shalya Tantra. Scope and importance of Shalya Tantra.
2. Dosha, Dhatu, Mala and Sarotas vigyan.
3. Knowledge of ancient and recent Yantra and Shastra – Surgical instruments. Ashtavidha Shastra Karma and their appli in surgical practice.
4. Trividha Karma – Purva, Pradhan and Pashchat Karma. Modern principles of pre-operative and post-operative care. Cli application of Purva and Pashchat Karma in modern surgery.
5. Asepsis and Antisepsis. Sterilisation (Nirjantukikarana)-methods and types. O.T. Fumigation.
6. Surgical infections – Sepsis, Cellulitis, Erysepelas, Tetanus, Gas gangrene, Hepatitis, HIV- AIDS etc. Handling and care and Hepatitis positive patients. Knowledge of conditions like Bacteraemia, Septicaemia, Toxaemia and Pyaemia
7. Concept of Shock - Its varieties etiopathogenesis and management – Cardio-pulmonary resuscitation (CPR), Endo-trac intubation and Tracheostomy.
8. Drug reactions and Anaphylaxis – Management.
9. Sushruta's concept of Rakta and Raktasrava – Haemorrhage – Types, Patho-physiology, clinical features and managen Concept of Raktastambhana – Haemostasis. Blood transfusion – Indications, blood groups, components, compatibility : complications with management.
10. Shatkriyakaala and its applicability in the pathogenesis of surgical diseases.
11. Knowledge of Prakriti and its impact on pathogenesis, clinical features and treatment of orthopedic diseases.
12. Rogi and Rog Pariksha (Trividha, Shadvidha, Ashtavidha and Dashavidha Pariksha) and its application in the diagnosis diseases.
13. Vranashopha and Inflammation, Nadivrana and Sinuses / Fistulae, Vidradhi and abscesses.
14. Swellings – Arbuda and Tumours, Granthi and Cysts.
15. Anu Shastra Karma like Ksharakarma, Agnikarma, Raktavasechana etc. and their application in orthopedic practice.
16. Pranashta Shalya Vigyan.
17. Fluid, Electrolyte, Acid Base Balance and Nutrition
 1. Introduction to physiology of fluids and electrolytes.
 2. Dehydration and over hydration.

3. Specific electrolyte losses, symptomatology and management of Acidosis, Alkalosis and Acid-Base balance.
4. Various replacement fluids in surgery, mode of administration and complications.
5. Nutrition – pre-operative, peri-operative and post-operative.
6. Intravenous fluid therapy.
18. Knowledge of imaging and diagnostic techniques – X-ray, Ultra Sonography, CT scan, MRI and recent advances.

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PART B

50

1. Scope of Asthi Sandhi evam Marmaghata Roga specialty and its importance. Historical aspect of Ayurvedic and modern orthopedics and Marma.
2. Marma Sharira – Etymological derivation, definition, basic concept of Marma, origin, classification, Pramana. Consequences of Marmaghata and their management.
3. Vrana Vigyan – Etiology, classification, symptomatology, prognosis and management principles of Nija and Sadyo Vrana. Concept of Shashti Upakrama. Seevana and Suturing, Vrana Bandhana and Bandaging. Modern concept of Wounds and Ulcers, their classification and management principles. Recent wound closure techniques, suture materials, dressing, bandaging materials and techniques. Mechanism of wound healing.
4. Bhagna - Etiology, classification, general management principles, complications and prognosis of the skeletal injuries according to Ayurved and Modern aspect. Mechanism of bone healing.
5. Itrathadagha and Burns - Etiology, classification, symptomatology, prognosis and management principles. Knowledge of Burns Shock, its prevention and management principles.
6. Principles of initial care of injured person. Handling of poly trauma patient. ARDS (Acute Respiratory Distress Syndrome), Crush Syndrome, Thromboembolism, Fat Embolism syndrome and their management.
7. Systemic response to injury.
8. Pharmacology of emergency drugs, antibiotics, NSAIDs, Opiates, central muscle relaxants.
9. Anesthesiology related to Orthopedics. Pharmacology of local anesthetics and vasoconstrictors. Knowledge of local anesthetic techniques like local anesthetic infiltration, various blocks (e.g. ring block, nerve block, plexus block, field block, hematoma block, costal block etc.) Spinal and epidural blocks.
10. Medico-legal aspects in orthopedics. Knowledge of documentation and record keeping.

PRACTICAL

100

Contents:

- Clinical history taking and examination of orthopedic patient.
- Knowledge of diagnostic and therapeutic principles of Shalya Tantra.
- Identification and functioning of surgical and orthopedic instruments.
- Practical knowledge of documentation and record keeping.
- Practical knowledge of Anu-Shastra Karma.
- Practical Knowledge of Seevan Karma and suturing and Vrana Bandhana and bandaging.
- Knowledge about the management of orthopedic emergencies.
- Knowledge of Purva Karma and Pashchat Karma.
- Practical knowledge of sterilization and OT fumigation.
- Knowledge of handling of medico legal cases and issuing MLCs and other certificates.

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Distribution of Marks (practical):

- | | |
|---|----------|
| 1. Case Records (25 cases) | 20marks |
| 2. Bed Side examination- | |
| ▪ Patient History (Long case) | 20 marks |
| ▪ Patient History (Short case) | 10 marks |
| 3. Instruments / equipments / models identification | 15 marks |
| 4. Medical procedures | 15 marks |
| 5. Viva Voce | 20 marks |

REFERENCE BOOKS:-

- | | | |
|---|--|------------------|
| 1 | Sushruta Samhita | Relevant parts |
| 2 | Sushruta Samhita (Dalhana commentary) | Relevant parts |
| 3 | Charak samhita | Relevant parts |
| 4 | Ashtang Hridaya | Relevant parts |
| 5 | Ashtang Sangraha | Relevant parts |
| 6 | Saushruti | Ramanath Dwivedi |
| 7 | Watson and Jones – Fracture and Joint Injuries | J.N. Wilson |
| 8 | Practical Fracture Treatment | R. McRae |

9	Clinical Orthopedic Examination	R. McRae
10	Apley's System of Orthopedics	Apley Louis Solomon
11	A Concise Text Book of Surgery	S. Das
12	Pye's Surgical Handicraft	
13	Clinical Methods in Surgery	Sriram Bhatt
14	Clinical Methods in Surgery	S. Das
15	Operative Surgery	S. Das
16	Schwartz Principles of Surgery	
17	Bailey and Love's short practice of Surgery	

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M.D.-AYURVEDA PRELIMINARY**19. SANGYAHARAN**
(Anesthesiology)**PAPER-II****Theory 100****PART-A****50**

1. Shisyopanayana, Vishikhanupravesha, Agropaharaniya and Shatkriyakala.
2. Etymology and definition of Sangyaharan and its scope, application and importance in surgical practice.
3. Fundamentals of Ayurveda in relation to Sangyaharan- Panchmahabhuta, Prakriti, Dosha, Dhatu and Mala.
4. Concept of Vedana (pain), pathophysiology and modalities of pain management in Ayurveda.
5. Agni Karma in pain management.
6. Introduction, fundamentals, importance, types, methods of application, duration, instruments, equipments and various materials used for Agni Karma. The indications, contraindications, complications of Agni karma and their management.
7. Raktamokshana (blood letting) in pain management.
8. Introduction, fundamentals, importance, types, methods of application, duration, instruments, equipments and various materials used for Raktamokshana. Indications, contraindications, complications of Raktamokshana and their management.
9. Causes of vitiation of Rakta Dosha and Rakta Dushtijanya Vikaras.
10. Types of Raktamokshana and determination of appropriate amount of blood loss during Raktamokshana according to dis and patients.
11. Methods of Raktastambhana.
12. Leech Therapy in pain management. Varieties, importance, methods of applications, indications, contraindications, complications and their management and method of maintenance of leeches.
13. Trividha Karma – Purva karma (preanaesthetic management), Pradhana karma(induction and maintenance) and Pashu Karma (post anesthetic care).
14. Concept of Marma, their importance and application in Sangyaharan.

15. Concept of palliative care and its role in terminally ill patient care in Ayurveda.

PART-B**50****History of anesthesia.**

1. Molecular basis of anesthesia, cell physiology and body fluids.
2. Respiratory system: Anatomy of the upper airway – nose, pharynx, larynx, tracheobronchial segment, mechanics of respiration, physiology of respiration, ventilation, perfusion matching, lung volumes and capacities, pulmonary gas exchange and transport of gases, lung function tests – including laboratory tests for obstructive and restrictive lung diseases.
3. Cardiovascular system: Anatomy and physiology of heart and autonomic nervous system, maintenance of blood pressure systemic circulation, pulmonary circulation, microcirculation and lymphatics.
4. Nervous system: Anatomy and physiology of central nervous system, cranial nerves, nerve plexuses, spinal column. Physiology of sleep, sleep disorders, physiology of pain, physiology of neuromuscular junction, autonomic nervous system sympathetic and parasympathetic.
5. Endocrinology as related to anesthesia: Function of anterior and posterior pituitary and their dysfunction, hyper and hypothyroidism, hyper and hypoparathyroidism, diabetes mellitus – hypo and hyperglycemia, ketoacidosis. Adrenal cortex medulla functions and disorders.
6. Pathophysiology of renal failure, renal function tests.

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9. Pathophysiology of hepatic failure, liver function tests.
10. Shock and its management.
11. Fluid and electrolyte, acid base balance, ABG interpretation and water intoxication
12. Thermoregulation.
13. Pre anesthetic assessment and premedication.
14. Physics applied to anesthesia: Gas laws, ventilators & monitors, flow meters, vaporizers, breathing systems, carbon-dioxide absorbers, medical gas supply, suction machines, electrical fire & explosion hazards, pollution in O.T.
15. Sepsis, asepsis and sterilization- methods, types of sterilization of machine and equipments with special reference to tuberculosis hepatitis, HIV-AIDS etc. O.T. fumigation.
16. Intravenous fluids, crystalloid & colloids, their indications, contra indications, complications and their management.
17. Blood transfusion-indication, contra indications, complications and their management, component therapy.
18. Medicolegal and ethical aspects in research and patient care. Medico legal issues, understanding the implications of omission and profession, National Health policy - implications in a medico legal case like accidents, negligence, assault
19. Anaesthesia documentation and record keeping.

PRACTICAL**100****Contents:**

1. Anesthetic Drugs.
2. Demonstration of induction of Anesthesia.
3. Preanaesthetic assessment of patients.
4. Post anesthesia management.
5. Complications of anesthesia and their management.
6. Identification of instruments and knowledge of their use.

Distribution of marks (Practical)

- | | |
|--|------------|
| 1. Anesthesia documentation & record keeping | - 20 Marks |
| 2. Bedside clinical case taking | |
| 3. Long Case | - 20 Marks |
| 4. Short Case | - 10 Marks |
| 5. Procedure | - 15 Marks |
| 6. Identification of instruments & Spotting | - 15 Marks |
| 7. Viva-voce | - 20 Marks |

REFERENCE BOOKS

1. Sushruta Samhita
2. Charaka samhita
3. Ashtang Hridaya
4. Practice of Anesthesia - Churchill Davidson
5. Miller's Anesthesia - Ronald D Miller
6. Synopsis of Anesthesia - Alfred Lee
7. Sangyahan Prakash - Dr. D. N. Pande
8. Agni karma-Technological Innovation - Dr. P.D. Gupta
9. Practice of Anesthesia and Resuscitation - Dr. P.K. Gupta et al
10. Essentials of Anesthesiology - Prof. A.K. Paul
11. Clinical Anesthesia - Prof. A.K. Paul
12. Anu Shashtra karma - Dr. D.N. Pande
13. Textbook of Anesthesia - Aitkenhead
14. Anesthesia and co-existing disease - Stoelting's

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M.S.-AYURVEDA PRELIMINARY**20. SHALAKYA - NETRA ROGA****(Ophthalmology)****PAPER-II****Theory- 100****PART-A****50**

1. Shalakya Tantra Parichaya, Itihas and Pradhanyam.
2. Netra Sharir and related Marmas
3. Study of Dosha, Dhatu, Mala and Srotas in context to Netra chikitsa.
4. Updated knowledge of Agropaharaniya in Netra chikitsa- incorporating sterilization, Sangyahaarana (Anaesthesia).
5. Basic pharmacology of common drugs required in ocular diagnostic and therapeutic procedures.
6. Vrana Siddhanta-Trividha Shopha, Shuddha-Ashuddha Vrana, Vrana Srava, Vrana Bandha, Vranitopasana in context to chikitsa.
7. Swasthavritta related to Netra.
8. Chaturvidha Chikitsa Siddhanta and Raktamokshana in Netra chikitsa.
9. Applied knowledge of various Kriyakalpas and other therapeutic procedures related to Netra chikitsa.
10. Role of Panchkarma in Netra chikitsa.
11. Netra Chikitsa Upayogi Vishishta Yoganam, Guna, Karma prayog gyanam of most common classical Yogas.

PART-B**50 marks**

- Applied anatomy and physiology of eye, its adnexa and visual pathway.
- Clinical methods of eye examination.
- Application of various aids and techniques in the examination of eye viz Tonometry, direct Ophthalmoscopy, Perimetry, Refraction and Slit Lamp examination with their interpretation.
- Fundamentals of optics and refraction.
- Applied aspects of Aetio-Pathogenesis, clinical features, prognostic and therapeutic principles in Netra Roga Chikitsa a with Pathya-Apathya and their contemporary knowledge.
- Common ocular emergencies and their management.
- Applied aspects of Yantra and Shastra in Netra Chikitsa along with modern ophthalmic surgical instruments and equippr
- Knowledge of rules, regulations and medico legal aspects of ophthalmic practice including eye donation, eye banking a corneal grafting.
- Knowledge of handling of biomedical waste.

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PRACTICAL**100 marks****Contents:**

1. Clinical posting in OPD/IPD/Kriyakalpa Kaksha & OT
2. Clinical case presentation (10 cases)
3. Case record (20 cases)
4. Hands on training in Kriyakalpa

Distribution of marks (practical):

1. Case Record - 20 Marks
2. Bed side examination
3. Long case - 20 Marks
4. Short case - 10 Marks
5. Kriyakalpa procedure - 15 Marks
6. Identification of specimens and Instruments - 15 Marks
7. Viva-voce - 20 Marks

REFERENCE BOOKS:-

- 1 Charka Samhita with commentaries
- 2 Sushrut Samhita and vaghbhata with commentaries
- 3 Astanga hridaya and Astanga sangraha with commentaries
- 4 Madhava nidan with commentaries
- 5 Bhavaprakasha with commentaries
- 6 Sarangadhara Samhita with commentaries
- 7 Sahstrayoga Sangraha
- 8 Relevent part of Chakradhatta, Bhel Samhita, Harita Samhita

9	Shalakya Tantra	- Ramanath Dwivedi
10	Shalakya Tantra	- R.C. Chaudhary
11	The Actions and uses of Indigenous Ophthalmic Drugs	- N.Srikanth
12	Clinical Examination of Ophthalmic Cases	- Agarwal and Gupta
13	Alder's Physiology of the Eye and Clinical Applications	- Cotlier, St. Louis
14	Disease of the Lens and Vitreous, Glaucoma and Hypotony Louis	- Duke Elder, St.
15	A Text Book of Ophthalmology	- Ahmed E.
16	A Text book of clinical ophthalmology	- Dhanda
17	Modern Ophthalmology Brothers	- Dutta, L.C. Jaypee
18	Manual of the Diseases of the Eye Bailliere Tindal and Castell	- May,C.and Worth,C.
19	Ophthalmology – Principles and Concepts Mosby Co., St. Louis.	- Newell, F.W., C.V.
20	Ocular Differential Diagnosis Lea and Febiger	- Roy Fedrick Hamptn
21	Clinical Ophthalmology Company	- Smith, R.Vergnese
22	Abrahm Manual of Refraction	- Duke and Elder
23	Hand Book of ophthalmology	- B.M. Chaterjee
24	Hand Book of ophthalmology	- Khurana
25	Clinical ophthalmology	- Kanski
26	Parsons Diseases of Eye	
27	Stallard's Eye Surgery	

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M.S.-AYURVEDA PRELIMINARY

**21. SHALAKYA- DANTA AVUM MUKHA ROGA
(Dentistry and Oral Disease)**

PAPER-II

Theory- 100

PART-A

ma

1. Shalakya Tantra Parichaya, Itihas avum Pradhanyam.
2. Mukhasharir.
3. Study of Dosha, Dhatu, Mala and Srotas in context to Danta and Mukha Roga.
4. Agropaharaniya in Danta and Mukha Roga incorporating sterilization, Sangyahaarana and diagnostic and therapeutic pharmacological agents.
5. Vrana Siddhanta-Trividha Shopha, Shuddha-Dushta Vrana, Vrana Bandha and Vranitopasana in relation to Danta and Roga.
6. Swasthavritta related to Danta and Mukha Roga.
7. Chaturvidha Chikitsopaya (Bheshaja-Shastra-Kshara-Agni) Siddhanta and Raktamokshana related to Danta and Mukha Roga.
8. Applied knowledge of various Kriyakalpa and other therapeutic procedures related to Danta and Mukha Roga.
9. Role of Panchkarma in Danta and Mukha Roga.
10. Mukha and Danta Chikitsopayogi Aushadha Kalpana Parijnanam e.g. Dashana Samskara Manjana, Shwetamanjana, Vajradanta Manjana, Khadiradi Vati, Irimedadi Taila, Peetaka Churna, Kalaka Churna, Nimbadi Churna and Bhadrasmus Vati.

PART-B

50

1. Applied orodental anatomy and physiology.
2. Clinical methods adopted in orodental practices.

3. Knowledge of advanced diagnostic techniques, equipments and tests of importance in orodental practices with their interpretations.
4. Classification, aetiopathogenesis, clinical features and therapeutics of Oshtha, Danta, Dantamula, Jihva, Talu and Sarv: Mukharogas in the light of modern knowledge.
5. Basics of Sandhana Vidhi in Mukha and Danta Roga.
6. Applied aspect of Dysphagia, Manyastambha, Hanumoksha, Apachi (Cervical Lymphadenopathy) and Herpes.
7. Handling of biomedical waste.

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PRACTICAL

100

Contents:

1. Clinical posting in OPD, IPD, Kriyakalpa Kaksha and OT.
2. Clinical case presentation (10 cases).
3. Case record (20 cases).
4. Hands on training in Kriyakalpa.

Distribution of marks (practical):

1. Case Record - 20 Marks
2. Bed side examination
3. Long case - 20 Marks
4. Short case - 10 Marks
5. Kriyakalpa procedure - 15 Marks
6. Identification of specimens, radiograph and instruments - 15 Marks
7. Viva-voce - 20 Marks

Reference Books

1. Sushrut Samhita - -Dalhana
2. Useful Portion of Charak Samhita-Ashtang Samgraha -Ashtang Hridaya
3. Useful portion of Laghutrayi related to Danta and Mukha Roga
4. Shalakya Vijnanam - Ravindra Chandra Chaudhary
5. Nimi Tantra - Ramanath Dwivedi
4. Dental Anatomy Histology - Dr. S.I. Bhalajhi
5. Essentials of Preventive and Community Dentistry -Dr. Soben Peter
6. Complete Denture Prosthodontics - Dr. J.J. Manappallil
7. Orthodontics the Art and Science - Dr. S.I. Bhalajhi
8. Text book of Pediatric Dentistry - Dr. S.G. Damle
9. Text book of Oral and Maxillofacial surgery -Dr. Vinod Kapoor
10. Clinical Periodontology - Dr. B.R.R. Varma
11. Anatomy for Dental Students - Inderveer Singh
12. Clinical Periodontology - Carranza , Newman
13. Operative Dentistry - M A Marzouk
14. Oral and maxilofacial surgery secrets - A.Omar Abubaker
15. Killey and Kay's Outline of Oral Surgery - Girdon R Seward
16. Clinical Dentistry - Ivor G. Chestnut , John Gibson
17. Synopsis of Oral Pathology - S N Bhaskar
18. Oral Pathology - Stone

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M.S.-AYURVEDA PRELIMINARY

22. SHALAKYA- SHIRO-NASA- KARNA- AVUM KANTHA ROGA
(ENT & HEAD & Neck Disease)

PRACTICAL

Theory- 100

PART A

50

1. Shalakya Tantra Parichaya, Itihas and 'Pradhanya'. Establishment of 'superiority of Shiras' among all the organs. Determination and importance of the verse 'Nasa hi Shirso Dvaram'.
2. Shiro-Nasa- Karna- Avum Kantha Shariram and knowledge of related Marmas.
3. Study of Dosha- Dhatu-Mala and Srotas in context of Shiro-Nasa- Karna- Avum Kantha Chikitsa.

4. Agropaharaniya in Shiro-Nasa- Karna- Avum Kantha Chikitsa including sterilization and anesthesia.
5. Basic pharmacology of common modern drugs used in diagnostic and therapeutic procedures related to Shiro-Nasa- Karna- Avum Kantha Chikitsa.
6. Vrana Siddhanta- Trividha Shophya, Shuddha- Dushta Vrana, Vrana Bandha and Vranitopasan in context of Shiro-Nasa- Karna- Avum Kantha Chikitsa.
7. Swasthavritta related to Shiro-Nasa- Karna- Avum Kantha.
8. Chaturvidha Chikitsopaya (Bhesajya- Shastra-Kshar -Agni) and Raktamokshan related to Shiro-Nasa- Karna- Avum Kantha Chikitsa.
9. Applied knowledge of various therapeutic modalities like Shirobasti, Shirodhara, Shirovirechana, Nasya, Karna Pooran, Dhooapan, Kaval, Gandusha etc.
10. Role of Panchkarma in Shiro-Nasa- Karna- Avum Kantha Chikitsa.

PART B**50**

1. **Shiras**- Applied anatomy and physiology of skull and intracranial contents. Clinical methods and knowledge of common diagnostic equipments, procedures and their interpretation. Classification, etiopathogenesis, clinical features, prognostic considerations and therapeutics of Shiras and Kapaal Rogas in the light of modern knowledge.
2. **Nasa** - Applied anatomy and physiology of nose and paranasal sinuses. Clinical methods and knowledge of common diagnostic equipments, procedures and their interpretation. Classification, etiopathogenesis, clinical features, prognostic considerations and therapeutics of Nasa Rogas in the light of modern knowledge.
3. **Karna**- Applied anatomy and Physiology of ear and related structures. Clinical methods and knowledge of common diagnostic equipments, procedures and their interpretation. Classification, etiopathogenesis, clinical features, prognostic considerations and therapeutics of Karna Rogas in the light of modern knowledge.
4. **Kantha** - Applied anatomy and physiology of throat. Clinical methods and knowledge of common pharyngeal and laryngeal diagnostic equipments, procedures and their interpretation. Classification, etiopathogenesis, clinical features, prognostic considerations and therapeutics of Kanthagata Rogas in the light of modern knowledge.

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PRACTICAL**100****Contents:**

1. Clinical posting in OPD, IPD, Kriyakalpa Kaksha and OT.
2. Clinical case presentation (10 cases).
3. Case record (20 cases).
4. Hands on training in Kriyakalpa.

Distribution of marks (practical):

1. Case Record - 20 Marks
2. Bed side examination
- A. Long case - 20 Marks
- B. Short case - 10 Marks
- C. Kriyakalpa procedure - 15 Marks
3. Identification of specimens and Instruments - 15 Marks
4. Viva-voce - 20 Marks

REFERENCE BOOKS:-

1. Sushrut Samhita
2. Charak Samhita
3. Ashtang Hridaya
4. Ashtang Samgraha
5. Laghutrayi
6. Modern books related to ENT disorder
7. Diseases of Nose Throat and Ear - Bhargav Shah
8. Diseases of Nose Throat and Ear, Head and Neck EB Edr.
9. A Textbook of otorhinolaryngology - Scott Browns editions.
10. Text book of Ear Nose Throat diseases – Dhingra
11. Textbook on ENT – Mohd. Maqbool
12. Logan Turner's book on ENT
13. Ballengers text book of ENT
14. Kumin's text book of ENT
15. Rob Smith's book of ENT surgery
16. Paprella's book of ENT
17. Hazarika's text book on ENT
18. Books on examination of ENT
19. Audiology Anirwan Biswas
20. Kurt's Audiology
21. Books on Speech therapy

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Duration of the course

YEAR 1	
YEAR 2	
YEAR 3	
YEAR 4	
Internship	

Subjects of Study

The details of hours of study for each subject of the candidate are as below.

Number of hours studied/contribution per day = 4 (theory)/day, 3 (practical)/day.

First Year B.D.S. (Academic Year: 2010-2011)

<u>Subjects</u>	Total number of Working hours	Maximum Marks
General Human Anatomy Including Embryology & Histology (Theory+ practical)	132+198	100+100
General Human Physiology & Biochemistry (Theory+ practical)	254+132	100+100
Dental Anatomy, Embryology & oral Histology (Theory+ practical)	132+264	100(T)
Prosthodontics (Practical)	160	100

Second Year B.D.S. (Academic Year: 2011-2012)

<u>Subjects</u>	Total number of Working hours	Maximum Marks
General Pathology & Microbiology (Theory+ practical)	66+66	100+100
General & Dental Pharmacology & Therapeutics (Theory+ practical)	88+66	100+100
Dental Materials (Theory+ practical)	154+231	100+100
Pre-Clinical Conservative (Practical)	(220)	100(P)
Pre-Clinical Prosthodontics, (Practical)	(308)	100(P)
Oral Pathology & Microbiology (Practical)	44+66	---



Third Year B.D.S. (Academic Year: 2012-2013)

<u>Subjects</u>	Total number of Working hours	Maximum Marks
General Medicine (Theory+ Clinics)	88+99	100+100
General Surgery (Theory+ practical)	66+99	100+100
Oral Pathology & Oral Microbiology (Theory+ practical)	82+132	100+100

Third Year B.D.S. (Academic Year: 2012-2013)

<u>Subjects</u>	Total number of Working hours	Maximum Marks
Orthodontics (Theory+ Practical+Clinics)	44+132+72	---
Oral Medicine, Diagnosis & Radiology (Theory+Clinics)	44+72	---
Paediatric Dentistry (Theory+ Clinics)	44+72	---
Public Health Dentistry (Lectures+ Clinics)	44+72	---
Prosthodontics & Crown & Bridge (Lectures +Practical+Clinics)	44+88+72	---
Periodontology (Lectures+Clinics)	44+72	---
Conservative Dentistry --- (Lectures+Clinics)	44+72	---
Oral & Maxillofacial Surgery (Lectures+Clinics)	44+72	---

Fourth Year B.D.S. Semester I & II (Academic Year: 2013-2014)

<u>Subjects</u>	Total number of Working hours	Maximum Marks
Public Health Dentistry (Lectures+ Clinics)	44+84	100+100
Periodontology (Lectures + Clinics)	75+44	100+100
Orthodontics & Dentofacial Orthopaedics (Lectures + Clinics)	45+44	100+100

PRINCIPAL
BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY)
DENTAL COLLEGE AND HOSPITAL
SECTOR-7, C.B.D. BELAPUR,
NAVI MUMBAI - 400 614.

Examination and Assessment

Evaluation is achieved by two processes

1. Formative or internal assessment
2. Summative or university examinations.

Formative evaluation is done through a series of tests and examinations conducted periodically by the institution. Summative evaluation is done by the university through examination conducted at the end of the specified course.

II. METHODS OF EVALUATION:

Evaluation may be achieved by the following tested methods:

1. Written test
2. Practical
3. Clinical examination
4. Viva voce

INTERNAL ASSESSMENT EXAMINATION

The continuing assessment examinations is held frequently at least 3 times in a particular year and the average marks of these examinations is considered. 10% of the total marks in each subject for both theory, practical and clinical examination separately is set aside for the internal assessment examinations.

SCHEME OF EXAMINATION:

The Scheme of Examination for BDS Course is divided into 1st BDS examination at the end of the first academic year, 2nd BDS examination at the end of second year, 3rd BDS examination at the end of third. There are two examinations in the final year, designated as part 1 and part 2.

Part-I

- Public Health Dentistry
- Periodontology
- Orthodontics and Dentofacial Orthopaedic
- Oral Medicine and Radiology

Part-II

- Oral & Maxillofacial Surgery
- Conservative and Endodontics
- Prosthodontics and Crown & Bridge
- Paediatric and preventive Dentistry

The examination is open to a candidate who satisfies the requirements of attendance, progress and other rules laid down by the University. (240 days minimum teaching in each academic year is ensured)

I B.D.S. Examination:

1. General anatomy including embryology and histology
2. General human physiology and biochemistry
3. Dental Anatomy, Embryology and Oral Histology

Any student who does not clear the BDS Course in all the subjects within a period of 9 years, including one year Compulsory Rotatory paid Internship from the date of admission shall be discharged from the course.

Any candidate who fails in one subject in an Examination is permitted to go to the next higher class and appears for the said failed subject and complete it successfully before he is permitted to appear for the next higher examination.

II B.D.S. Examination:

A candidate who has not successfully completed the 1st B.D.S. examination cannot appear in the IInd year Examination.

1. General pathology and Microbiology
2. General and dental pharmacology and therapeutics
3. Dental Materials
4. Pre-Clinical Conservative – Only Practical and Viva Voce
5. Pre-Clinical Prosthodontics – Only Practical and Viva Voce

Any candidate who fails in one subject in an Examination is permitted to go to the next higher class and appears for the said failed subject and complete it successfully before he is permitted to appear for the next higher examination.

III B.D.S. Examination:

A candidate who has successfully completed the 2nd B.D.S. examination can appear IIIrd B.D.S. Examination.

1. General Medicine
2. General Surgery
3. Oral Pathology and Oral Microbiology

Any candidate who fails in one subject in an Examination is permitted to go to the next higher class and appear for the subject and complete it successfully before he is permitted to appear for the next higher examination.

IV B.D.S. Examination:

The final year examination is divided in two semesters.

Semester-I

- Public Health Dentistry
- Periodontology
- Orthodontics and Dentofacial Orthopaedic
- Oral Medicine and Radiology

Semester-II

- Oral & Maxillofacial Surgery
- Conservative and Endodontics
- Prosthodontics and Crown & Bridge
- Paediatric and preventive Dentistry

Note: -

1. Any candidate who fails in any subject in 4th (final) year Part-I examination is permitted to go to the Part-II examination and should complete both parts successfully before he/she is permitted to go for Internship programme.

PRACTICAL AND CLINICAL EXAMINATION:

1. **Objective Structured Clinical Evaluation:** The clinical and practical examination gives number of chances for the candidate to express one's skills. A number of examination stations with specific instructions is provided. This can include clinical procedures, laboratory experiments, spotters etc. Evaluation is objective and structured. This avoids examiner bias because both the examiner and the examinee are given specific instructions on what is to be observed at each station.
2. **Records/ Logbooks:** The candidate is given credit for his/her records based on the scores obtained in the record. The marks obtained for the record in the first appearance is carried over to the subsequent appearances if necessary.
- **Scheme of clinical and practical examinations:** The specific scheme of clinical and Practical examinations, the type of clinical procedures/experiments to be performed and marks allotted for each are discussed and finalized by the Chairman and it is informed to the students prior to the conduct of the examinations along with the publication of the timetable for the practical examinations. This scheme is brought to the notice of the external examiner as and when the examiner reports. The practical and clinical examinations is evaluated by two examiners of which one is an external examiner appointed from other universities preferably outside the State. Each candidate is evaluated by each examiner independently and marks computed at the end of the examination.
- **Viva Voce:** The viva voce is conducted independently by each examiner. In order to avoid vagueness and to maintain uniformity of standard and coverage, questions are pre-formulated before administering them to each student. Twenty marks are exclusively allotted for viva voce and that are divided equally amongst the examiners, i.e., 10 marks per examiner.

MARKS DISTRIBUTION IN EACH SUBJECT:

Each subject shall have a maximum of 200 marks.

Theory	100		
Practical/ Clinical	100		
Theory - 100		Practicals/ clinicals - 100	
University written exam	70	University Exam	90
Viva Voce	20		
Internal assessment (Written)	10	Internal assessment (Written)	10

Total	100		100

Practical and Viva Voce Only in University Examination

Pre-clinical Prosthodontics	
Pre-clinical Conservative Dentistry.....	
Internal Assessment	- 20
Practical	- 60
Viva Voce	- 20

	100

Criteria for a pass:

Fifty percent of the total marks in any subject computed as aggregate for theory, i.e., written, viva voce and internal assessment and practical including internal assessment, separately is essential for a pass in all years of study.

For declaration of pass in a subject, a candidate shall secure 50% marks in the University examination both in Theory and Practical/ Clinical examinations separately, as stipulated below:

- A candidate shall secure 50% marks in aggregate in university theory including Viva Voce and Internal assessment obtained in university written examination combined together.
- In the University Practical/ clinical examination, a candidate shall secure 50% of university practical marks and Internal Assessment combined together.
- In case of pre-clinical Prosthetic Dentistry and Pre-clinical conservative dentistry in II BDS, where there is no written examination, minimum for pass is 50% of marks in Practical and Viva voce combined together in University examination including Internal Assessment i.e. 50/100 marks.
- Successful candidates who obtain 65% of the total marks or more shall be declared to have passed the examination in First Class. Other successful candidates will be placed in Second Class. A candidate who obtains 75% and above is eligible for Distinction. Only those candidates who pass the whole examination in the first attempt will be eligible for distinction or class.

Grace Marks: Grace marks up to a maximum of 5 marks may be awarded to students who have failed only in one subject but passed in all other subjects.

Re-evaluation: The objective of re-evaluation is to ensure that the student receives a fair evaluation in the university examination and to minimize human error and extenuating circumstances. There are two mechanisms for this purpose.

1. Re-totalling: The University on application and remittance of a stipulated fee prescribed by the university, shall permit a recounting or opportunity to recount the marks received

- for various questions in an answer paper/ papers for theory of all subjects for which the candidate has appeared in the university examination. Any error in addition of the marks awarded if identified is suitably rectified.
2. **Re-evaluation:** Re-evaluation of theory papers in all years of study of the BDS course is permissible by the university on application and remittance of a prescribed fee. Such answer script is re-evaluated by not less than two duly qualified examiners and the average obtained is awarded to the candidate and the result accordingly reconsidered.

Qualification and experience to be eligible for examinership for BDS examination.

1. M.D.S. Degree from a recognized Institution
2. 4 years teaching experience in the subject in a dental college after MDS
3. Should be holding the post of a Reader or above in a Dental Institution approved/recognised by the Dental Council of India for B.D.S.

Note:

1. In case of Public Health Dentistry, as there is acute shortage of teachers one examiner from Public Health Dentistry and the second one could be from Periodontics. To be reviewed after three years.
2. In case of Physiology and Biochemistry if Internal examiner is from Physiology, External examiner is from Biochemistry or vice versa.
3. In case of Pathology and Microbiology if Internal is examiner is from Pathology, External examiner is from Microbiology or vice versa.
4. In case of Dental Materials, if internal is from Prosthodontics, external is from Conservative Dentistry and vice versa

50% of Examiners appointed are externals from Dental Institutions approved/recognised by the Dental Council of India for B.D.S. Course, from other University, preferably from outside the State.

Reciprocal arrangement of Examiners is discouraged, in that, the Internal Examiner in a subject should not accept external examinership for a college from which External Examiner is appointed in his subject for the corresponding period.

An external examiner is not called for more than 4 consecutive examinations.

SYLLABUS OF STUDY

I BDS

1. HUMAN ANATOMY, EMBRYOLOGY, HISTOLOGY & MEDICAL GENETICS

A) GOAL

The students should gain the knowledge and insight into, the functional anatomy of the normal human head and neck, functional histology and an appreciation of the genetic basis of inheritance and disease, and the embryological development of clinically important structures. So that relevant anatomical & scientific foundations are laid down for the clinical years of the BDS course.

B) OBJECTIVES :

a) KNOWLEDGE & UNDERSTANDING:

At the end of the 1st year BDS course in Anatomical Sciences the undergraduate student is Expected to:

1. Know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures.
2. Know the anatomical basis of disease and injury.
3. Know the microscopic structure of the various tissues, a pre-requisite for understanding of the disease processes.
4. Know the nervous system to locate the site of lesions according to the sensory and or motor deficits encountered.
5. Have an idea about the basis of abnormal development, critical stages of development, effects of teratogens, genetic mutations and environmental hazards.
6. Know the sectional anatomy of head neck and brain to read the features in radiographs and pictures taken by modern imaging techniques.
7. Know the anatomy of cardio-pulmonary resuscitation.

b) SKILLS

1. To locate various structures of the body and to mark the topography of the living anatomy.
2. To identify various tissues under microscope.
3. To identify the features in radiographs and modern imaging techniques.
4. To detect various congenital abnormalities.

C) INTEGRATION

By emphasizing on the relevant information and avoiding unwanted details, the anatomy taught integrally with other basic sciences & clinical subjects not only keeps the curiosity alive in the learner but also lays down the scientific foundation for making a better doctor, a benefit to the society.

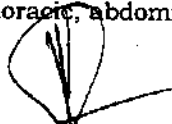
This insight is gained in a variety of ways:

- 1) Lectures & small group teaching
- 2) Demonstrations
- 3) Dissection of the human cadaver
- 4) Study of dissected specimens
- 5) Osteology
- 6) Surface anatomy on living individual
- 7) Study of radiographs & other modern imaging techniques.
- 8) Study of Histology slides.
- 9) Study of embryology models
- 10) Audio-visual aids

Throughout the course, particular emphasis is placed on the functional correlation, clinical application & on integration with teaching in other bio dental disciplines.

D) AN OUTLINE OF THE COURSE CONTENT:

1. General anatomy: Introduction of anatomical terms and brief outline of various systems of the body.
2. Regional anatomy of head & neck with osteology of bones of head & neck, with emphasis on topics of dental importance.
3. General disposition of thoracic, abdominal & pelvic organs.



4. The regional anatomy of the sites of intramuscular & intra vascular injections, & lumbar puncture.
5. General embryology & systemic embryology with respect to development of head & neck.
6. Histology of basic tissues and of the organs of gastrointestinal, respiratory, Endocrine, excretory systems & gonads.
7. Medical genetics.

E) FURTHER DETAILS OF THE COURSE.

I. INTRODUCTION TO :

1. Anatomical terms.
2. Skin, superficial fascia & deep fascia
3. Cardiovascular system, portal system collateral circulation and arteries.
4. Lymphatic system, regional lymph nodes
5. Osteology - Including ossification & growth of bones.
6. Myology - Including types of muscle tissue & innervation.
7. Syndesmology - Including classification of Joints.
8. Nervous system

II. HEAD & NECK:

01. Scalp, face & temple, lacrimal apparatus 02. Neck - Deep fascia of neck, posterior triangle, suboccipital triangle, anterior triangle, anterior median region of the neck, deep structures in the neck. 03. Cranial cavity - Meninges, parts of brain, ventricles of brain, Dural venous sinuses, cranial nerves attached to the brain, pituitary gland. 04. Cranial nerves - III, IV, V, VI, VII, IX, XII in detail. 05. Orbital cavity - Muscles of the eyeball, supports of the eye ball, nerves and vessels in the orbit. 06. Parotid gland. 07. Temporomandibular joint, muscles of mastication, infratemporal fossa, pterygopalatine fossa. 08. Submandibular region 09. Walls of the nasal cavity, paranasal air sinuses 10. Palate 11. Oral cavity, Tongue 12. Pharynx (palatine tonsil and the auditory tube) Larynx. OSTEOLOGY - Foetal skull, adult skull, individual bones of the skull, hyoid bone and cervical vertebrae

III. THORAX : Demonstration on a dissected specimen of

1. Thoracic wall
2. Heart chambers
3. Coronary arteries
4. Pericardium
5. Lungs - surfaces ; pleural cavity
6. Diaphragm

IV. ABDOMEN : Demonstration on a dissected specimen of

1. Peritoneal cavity
2. Organs in the abdominal & pelvic cavity.

V. CLINICAL PROCEDURES :

- a) Intramuscular injections: Demonstration on a dissected specimen and on a living person of the following sites of injection.
 1. Deltoid muscle and its relation to the axillary nerve and radial nerve.
 2. Gluteal region and the relation of the sciatic nerve.
 3. Vastus lateralis muscle.
- b) Intravenous injections & venesection: Demonstration of veins in the dissected specimen and on a living person.
 1. Median cubital vein 2. Cephalic vein 3. Basilic vein 4. Long saphenous vein
- c) Arterial pulsations: Demonstration of arteries on a dissected specimen and feeling of pulsation of the following arteries on a living person.
 1. Superficial temporal 2. Facial 3. Carotid 4. Axillary 5. Brachial 6. Radial 7. Ulnar 8. Femoral 9. Popliteal 10. Dorsalis pedis
- d) Lumbar puncture: Demonstration on a dissected specimen of the spinal cord, cauda equina & epidural space and the inter vertebral space between L4 & L5.

Leucocytes : Classification, number, percentage, distribution morphology, properties, functions & variation. Role of lymphocytes in immunity , leucopoiesis life span & fate of leucocytes.

Thrombocytes - Morphology, , number, variations, function & thrombopoiesis.

Haemostasis - Role of vasoconstriction, platelet plug formation in haemostasis, coagulation factors, intrinsic & extrinsic pathways of coagulation, clot retraction.

Tests of haemostatic function, platelet count, clotting time, bleeding time, prothrombin time - normal values, method & variations. Anticoagulants - mechanism of action. Bleeding disorders.

Blood groups: ABO & Rh system, method of determination, importance, indications & dangers of blood transfusion, blood substitutes.

Blood volume: Normal values, variations.

Body fluids : distribution of total body water, intracellular & extracellular compartments, major anions & cations in intra and extra cellular fluid.

Tissue fluids & lymph : Formation of tissue fluid, composition, circulation & functions of lymph.

Oedema - causes.

Functions of reticulo endothelial system.

3. MUSCLE AND NERVE

Classification of nerves, structure of skeletal muscle - Molecular mechanism of muscle contraction, neuromuscular transmission. Properties of skeletal muscle. Structure and properties of cardiac muscle & smooth muscle.

4. DIGESTIVE SYSTEM :

Introduction to digestion : General structure of G.I. tract, Innervation.

Salivary glands: Structure of salivary glands, composition , regulation of secretion & functions of saliva.

Stomach: Composition and functions of gastric juice, mechanism and regulation of gastric secretion.

Exocrine Pancreas - Structure, composition of pancreatic juice, functions of each component, regulation of pancreatic secretion.

Liver : structure , composition of bile, functions of bile, regulation of secretion –

Gall bladder : structure, functions.

Small intestine - Composition, functions & regulation of secretion of intestinal juice.

Large intestine - Functions.

Motor functions of GIT: Mastication, deglutition, gastric filling & emptying, movements of small and large intestine, defecation.

5. EXCRETORY SYSTEM :

Structure & functions of kidney, functional unit of kidney & functions of different parts.

Juxta glomerular apparatus, renal blood flow.

Formation of Urine : Glomerular filtration rate - definition, determination , normal values, factors influencing G.F.R. Tubular reabsorption - Reabsorption of sodium, glucose, water & other substances.

Tubular secretion - secretion of urea, hydrogen and other substances.

Mechanism of concentration & dilution of urine.

Role of kidney in the regulation of pH of the blood.

Micturition : anatomy & innervation of Urinary bladder, mechanism of micturition & abnormalities.

6. BODY TEMPERATURE & FUNCTIONS OF SKIN

7. ENDOCRINOLOGY

General endocrinology - Enumeration of endocrine glands & hormones - General functions of endocrine system, chemistry, mechanism of secretion, transport, metabolism, regulation of secretion of hormones.

Hormones of anterior pituitary & their actions, hypothalamic regulation of anterior pituitary function.

Disorders of secretion of anterior pituitary hormones.

Posterior pituitary : Functions, regulation & disorders of secretion.

Thyroid: Histology, synthesis, secretion & transport of hormones, actions of hormones, regulation of secretion & disorders, Thyroid function tests.

Adrenal cortex & Medulla -synthesis, secretion, action, metabolism, regulation of secretion of hormones & disorders.

Other hormones - Angiotensin, A.N.F.

VI. EMBRYOLOGY :

Oogenesis, Spermatogenesis, Fertilization, Placenta, Primitive streak, Neural crest, Bilaminar and trilaminar embryonic disc, Intra embryonic mesoderm - formation and fate, notochord formation & fate, Pharyngeal arches, pouches & clefts, Development of face, tongue, palate, thyroid gland, pituitary gland, salivary glands, and anomalies in their development, Tooth development in brief.

VII. HISTOLOGY :

The Cell :

Basic tissues - Epithelium, Connective tissue including cartilage and bone, Muscle Tissue, Nervous tissue : Peripheral nerve, optic nerve, sensory ganglion, motor ganglion, Skin

Classification of Glands

Salivary glands (serous, mucous and mixed gland), Blood vessels, Lymphoid tissue Tooth, lip, tongue, hard palate, oesophagus, stomach, duodenum, ileum, colon, vermiform appendix Liver, Pancreas, Lung, Trachea, Epiglottis, Thyroid gland, para thyroid gland, supra renal gland and pituitary gland, Kidney, Ureter, Urinary bladder, Ovary and testis.

VIII. MEDICAL GENETICS :

Mitosis, meiosis, Chromosomes, gene structure, Mendelism, modes of inheritance

2. HUMAN PHYSIOLOGY

A) GOAL

The broad goal of the teaching undergraduate students in Human Physiology aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and disease.

OBJECTIVES

a) KNOWLEDGE

At the end of the course, the student will be able to:

1. Explain the normal functioning of all the organ systems and their interactions for well-coordinated total body function.
2. Assess the relative contribution of each organ system towards the maintenance of the milieu interior.
3. List the physiological principles underlying the pathogenesis and treatment of disease.

b) SKILLS

At the end of the course, the student shall be able to :

1. Conduct experiments designed for the study of physiological phenomena.
2. Interpret experimental and investigative data
3. Distinguish between normal and abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

c) INTEGRATION

At the end of the integrated teaching the student shall acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

B) COURSE CONTENTS THEORY

1. GENERAL PHYSIOLOGY

1. Homeostasis: Basic concept, Feedback mechanisms
2. Structure of cell membrane, transport across cell membrane
3. Membrane potentials

2. BLOOD:

Composition & functions of blood.

Specific gravity, Packed cell volume, factors affecting & methods of determination.

Plasma proteins - Types, concentration, functions & variations.

Erythrocyte - Morphology, functions & variations. Erythropoiesis & factors affecting erythropoiesis.

ESR- Methods of estimation, factors affecting, variations & significance.

Haemoglobin - Normal concentration, method of determination & variation in concentration.

Blood Indices - MCV, MCH, MCHC - definition, normal values, variation.

Anaemia - Definition, classification, life span of RBC's destruction of RBC's, formation & fate of bile pigments, Jaundice - types.

PROCEDURES

1. Enumeration of Red Blood Cells
2. Enumeration of White Blood Cells
3. Differential leucocyte counts
4. Determination of Haemoglobin
5. Determination of blood group
6. Determination of bleeding time and clotting time
7. Examination of pulse
8. Recording of blood pressure.

DEMONSTRATION:

1. Determination of packed cell volume and erythrocyte sedimentation rate
2. Determination of specific gravity of blood
3. Determination of erythrocyte fragility
4. Determination of vital capacity and timed vital capacity
5. Skeletal muscle experiments.

Study of laboratory appliances in experimental physiology. Frog's gastrocnemius sciatic preparation. Simple muscle curve, effects of two successive stimuli, effects of increasing strength of stimuli, effects of temperature, genesis of fatigue and tetanus. Effect of after load and free load on muscle contraction, calculation of work done.

6. Electrocardiography: Demonstration of recording of normal Electro cardiogram
7. Clinical examination of cardiovascular and respiratory system.

BIOCHEMISTRY

AIMS AND SCOPE OF THE COURSE IN BIOCHEMISTRY

The major aim is to provide a sound but crisp knowledge on the biochemical basis of the life processes relevant to the human system and to dental/medical practice. The contents should be organized to build on the already existing information available to the students in the pre-university stage and reorienting. A mere rehash should be avoided.

The chemistry portion should strive towards providing information on the functional groups, hydrophobic and hydrophilic moieties and weak valence forces that organize macromolecules. Details on structure need not be emphasized.

Discussion on metabolic processes should put emphasis on the overall change, interdependence and molecular turnover. While details of the steps may be given, the student should not be expected to memorise them. An introduction to biochemical genetics and molecular biology is a must but details should be avoided. The exposure to antivitamin, antimetabolites and enzyme inhibitors at this stage, will provide a basis for the future study of medical subjects. An overview of metabolic regulation is to be taught by covering hormonal action, second messengers and regulation of enzyme activities. Medical aspects of biochemistry should avoid describing innumerable functional tests, most of which are not in vogue. Cataloguing genetic disorders under each head of metabolism is unnecessary. A few examples which correlate genotype change to functional changes should be adequate.

At the end of the course the student would be able to acquire a useful core of information, which can be retained for a long time. Typical acid tests can be used to determine what is to be taught or what is to be learnt. A few examples are given below.

1. Need not know the structure of cholesterol. Should know why it cannot be carried free in plasma.
2. Mutarotation should not be taught. Student should know why amylase will not hydrolyze cellulose.
3. Need not know the details of alpha - helix and beta - pleats in proteins. Should know why haemoglobin is globular and keratin is fibrous.
4. Need not know mechanism of oxidative phosphorylation. Should know more than 90 % of ATP is formed by this process.
5. Need not know details of the conversion of pepsinogen to pepsin. Should know hydrochloric acid cannot break a peptide bond at room temperature.
6. Need not remember the steps of glycogenesis.

8. REPRODUCTION

Sex differentiation, Physiological anatomy of male and female sex organs,
Female reproductive system : Menstrual cycle, functions of ovary, actions of oestrogen & Progesterone,
control of secretion of ovarian hormones, tests for ovulation, fertilization, implantation, maternal changes
during pregnancy, pregnancy tests & parturition.
Lactation, composition of milk, factors controlling lactation, milk ejection, reflex, Male reproductive
system: spermatogenesis, semen and contraception.

9. CARDIO VASCULAR SYSTEM

Functional anatomy and innervation of heart Properties of cardiac muscle
Origin & propagation of cardiac impulse and heart block.
Electrocardiogram - Normal electrocardiogram. Two changes in ECG in myocardial infarction.
Cardiac cycle - Phases, Pressure changes in atria, ventricles & aorta.
Volume changes in ventricles. Jugular venous pulse, arterial pulse.
Heart sounds: Mention of murmurs.
Heart rate: Normal value, variation & regulation.
Cardiac output: Definition, normal values, one method of determination, variation, factors affecting heart
rate and stroke volume.
Arterial blood pressure: Definition, normal values & variations, determinants, regulation & measurement
of blood pressure.
Coronary circulation.
Cardio vascular homeostasis - Exercise & posture.

10. RESPIRATORY SYSTEM

Physiology of Respiration: External & internal respiration.
Functional anatomy of respiratory passage & lungs.
Respiratory movements: Muscles of respiration, Mechanism of inflation & deflation of lungs.
Intra pleural & intra pulmonary pressures & their changes during the phases of respiration.
Mechanics of breathing - surfactant, compliance & work of breathing.
Spirometry: Lung volumes & capacities definition, normal values, significance, factors affecting vital
capacity, variations in vital capacity, FEV & its variations.
Pulmonary ventilation - alveolar ventilation & dead space - ventilation.
Composition of inspired air, alveolar air and expired air.
Exchange of gases: Diffusing capacity, factors affecting it.
Transport of Oxygen & carbon dioxide in the blood.
Regulation of respiration - neural & chemical.
Hypoxia, cyanosis, dyspnoea, periodic breathing.
Artificial respiration, pulmonary function tests.

11. CENTRAL NERVOUS SYSTEM

1. Organization of central nervous system
2. Neuronal organization at spinal cord level
3. Synapse receptors, reflexes, sensations and tracts
4. Physiology of pain
5. Functions of cerebellum, thalamus, hypothalamus and cerebral cortex.
6. Formation and functions of CSF
7. Autonomic nervous system

12. SPECIAL SENSES

Fundamental knowledge of vision, hearing, taste and smell.

PRACTICALS

The following list of practical is minimum and essential. All the practical have been categorized as
procedures and demonstrations. The procedures are to be performed by the students during practical
classes to acquire skills. All the procedures are to be included in the University practical examination.
Those categorized as demonstrations are to be shown to the students during practical classes. However
these demonstrations would not be included in the University examinations but question based on this
would be given in the form of charts, graphs and calculations for interpretation by the students.

6. BIOCHEMICAL GENETICS AND PROTEIN SYNTHESIS

Introduction to nucleotides; formation and degradation. DNA as genetic material. Introduction to replication and transcription. Forms and functions of RNA. Genetic code and mutation. Outline of translation process. Antimetabolites and antibiotics interfering in replication, transcription and translation. Introduction to cancer, viruses and oncogenes.

7. ENZYME AND METABOLIC REGULATION

Enzymes: Definition, classification, specificity and active site. Cofactors. Effect of pH, temperature and substrate concentration. Introduction to enzyme inhibitors, proenzymes and isoenzymes. Introduction to allosteric regulation, covalent modification and regulation by induction/repression.

Overview of hormones. Introduction to second messengers, cyclic AMP, calcium ion, inositol triphosphate. Mechanism of action of steroid hormones, epinephrine, glucagon and insulin in brief. Acid base regulation. Electrolyte balance.

8. STRUCTURAL COMPONENTS AND BLOOD PROTEINS

Connective tissue: Collagen and elastin. Glycosaminoglycans. Bone structure. Structure of membranes. Membrane associated processes in brief. Exocytosis and endocytosis. Introduction to cytoskeleton. Myofibril and muscle contraction in brief.

Haemoglobin: functions. Introduction to heme synthesis and degradation. Plasma proteins: classification and separation. Functions of albumin. A brief account of immunoglobulins. Plasma lipoproteins: Formation, function and turnover.

9. MEDICAL BIOCHEMISTRY

Regulation of blood glucose. Diabetes mellitus and related disorders. Evaluation of glycemic status. Hyperthyroidism and hypothyroidism: Biochemical evaluation. Hyperlipoproteinemias and atherosclerosis, Approaches to treatment. Jaundice: Classification and evaluation. Liver function tests: Plasma protein pattern, serum enzymes levels. Brief introduction to kidney function tests and gastric function tests. Acid base imbalance. Electrolyte imbalance: evaluation. Gout. Examples of genetic disorders including lysosomal storage disorders, glycogen storage disorders, glucose 6- phosphate dehydrogenase deficiency, hemoglobinopathies, inborn errors of amino acid metabolism and muscular dystrophy (one or two examples with biochemical basis will be adequate). Serum enzymes in diagnosis.

PRACTICALS: Contact hours 50

1. Qualitative analysis of carbohydrates	4
2. Color reactions of proteins and amino acids	4
3. Identification of nonprotein nitrogen substance	4
4. Normal constituents of urine	4
5. Abnormal constituents of urine	4
6. Analysis of saliva including amylase	2
7. Analysis of milk Quantitative estimations	2
8. Titrable acidity and ammonia in urine	2
9. Free and total acidity in gastric juice	2
10. Blood glucose estimation	2
11. Serum total protein estimation	2
12. Urine creatinine estimation Demonstration	2
13. Paper electrophoresis charts/clinical data evaluation	2
14. Glucose tolerance test profiles	2
15. Serum lipid profiles	1
16. Profiles of hypothyroidism and hyperthyroidism	1
17. Profiles of hyper and hypoparathyroidism	1
18. Profiles of liver function	1
19. Urea, uric acid creatinine profile in kidney disorders	1
20. Blood gas profile in acidosis/ alkalosis	1

- Should know that excess intake of carbohydrate will not increase glycogen level in liver or muscle.
7. Need not know about urea or creatinine clearance tests.
Should know the basis of increase of urea and creatinine in blood in renal insufficiency.
 8. Need not know the structure of insulin.
Should know why insulin level in circulation is normal in most cases of maturity onset diabetes.
 9. Need not know the structural details of ATP.
Should know why about 10 g of ATP in the body at any given time meets all the energy needs.
 10. Need not know the mechanism of action of prolyl hydroxylase.
Should know why the gum bleeds in scurvy.
 11. Need not know the structure of Vitamin K.
Should know the basis of internal bleeding arising due to its deficiency.
 12. Need not remember the structure of HMGCoA.
Should know why it does not lead to increased cholesterol synthesis in starvation.

BIOCHEMISTRY AND NUTRITION

1. CHEMISTRY OF BIOORGANIC MOLECULES

Carbohydrates: Definition, biological importance and classification. Monosaccharides - Isomerism, anomerism. Sugar derivatives, Disaccharides. Polysaccharides. Structures of starch and glycogen.
Lipids : Definition, biological importance and classification. Fats and fatty acids. Introduction to compound lipids. Hydrophobic and hydrophilic groups. Cholesterol. Bile salts. Micelle. Bimolecular leaflet.

Proteins: Biological importance. Amino acids: Classification. Introduction to peptides. Proteins : Simple and conjugated; globular and fibrous. Charge properties. Buffer action . Introduction to protein conformation . Denaturation.

Nucleic acids: Building units . Nucleotides. Outline structure of DNA and RNA. High energy compounds: ATP , Phosphorylamidines, Thioesters, Enol phosphates.

2. MACRONUTRIENTS AND DIGESTION

Energy needs: Basal metabolic rate. Dietary carbohydrates, fibres. Dietary lipids, essential fatty acids. Nitrogen balance. Essential amino acids. Protein quality and requirement (methods for evaluation of protein quality to be excluded). Protein calorie malnutrition. Balanced diet.
Enzymatic hydrolysis of dietary carbohydrates. Mechanism of uptake of monosaccharides. Digestion and absorption of triacylglycerols. Enzymatic hydrolysis of dietary proteins and uptake of amino acids.

3. MICRONUTRIENTS

Vitamins: Definition, classification, daily requirement, sources and deficiency symptoms. Brief account of water-soluble vitamins with biochemical functions. Vitamins A functions including visual process. Vitamin D and its role in calcium metabolism. Vitamin E. Vitamin K and gamma carboxylation. Introduction to antivitamins and hypervitaminosis.

Minerals :Classification, daily requirement. Calcium and phosphate: sources, uptake, excretion, function. Serum calcium regulation. Iron: sources, uptake and transport.
Heme and nonheme iron functions; deficiency. Iodine: Brief introduction to thyroxine synthesis. General functions of thyroxine. Fluoride: function, deficiency and excess. Indications of role of other minerals.

4. ENERGY METABOLISM

Overview: Outlines of glycolysis, pyruvate oxidation and citric acid cycle. Beta oxidation of fatty acids. Electron transport chain and oxidative phosphorylation. Ketone body formation and utilisation. Introduction to glycogenesis, glycogenolysis, fatty acid synthesis, lipogenesis and lipolysis. Gluconeogenesis. Lactate metabolism . Protein utilisation for energy. Glucogenic and ketogenic amino acids. Integration of metabolism.

5. SPECIAL ASPECTS OF METABOLISM

Importance of pentose phosphate pathway. Formation of glucuronic acid. Outlines of cholesterol synthesis and breakdown. Ammonia metabolism. Urea formation. Phosphocreatine formation. Transmethylation. Amines. Introduction to other functions of amino acids including one carbon transfer. Detoxication : Typical reactions. Examples of toxic compounds. Oxygen toxicity

2. Detailed microscopic study of Periodontal ligament & alveolar bone, age changes, histological changes in periodontal ligament & bone in normal & orthodontic tooth movement, applied aspects of alveolar bone resorption.
 3. Detailed microscopic study of Oral Mucosa, variation in structure in relation to functional requirements, mechanisms of keratinization, clinical parts of gingiva, Dentogingival & Mucocutaneous junctions & lingual papillae. Age changes & clinical considerations.
 4. Salivary Glands :
 - ◆ Detailed microscopic study of acini & ductal system.
 - ◆ Age changes & clinical considerations.
 5. TM Joint :
 - ◆ Review of basic anatomical aspects & microscopic study & clinical considerations.
 6. Maxillary Sinus :
 - ◆ Microscopic study, anatomical variations, functions & clinical relevance of maxillary sinus in dental practice.
 7. Processing of Hard & soft tissues for microscopic study :
 - ◆ Ground sections, decalcified sections & routine staining procedures.
 8. Basic histochemical staining patterns of oral tissues.
- V. ORAL PHYSIOLOGY**
1. Saliva :
 - ◆ Composition of saliva - variations, formation of saliva & mechanisms of secretion, salivary reflexes, brief review of secretomotor pathway, functions, role of saliva in dental caries & applied aspects of hyper & hypo salivation.
 2. Mastication :
 - ◆ Masticatory force & its measurement - need for mastication, peculiarities of masticatory muscles, masticatory cycle, masticatory reflexes & neural control of mastication.
 3. Deglutition :
 - ◆ Review of the steps in deglutition, swallowing in infants, neural control of deglutition & dysphagia.
 4. Calcium, Phosphorous & fluoride metabolism :
 - ◆ Source, requirements, absorption, distribution, functions & excretion, clinical considerations, hypo & hypercalcemia & hyper & hypo phosphatemia & fluorosis.
 5. Theories of Mineralization :
 - ◆ Definition, mechanisms, theories & their drawbacks.
 - ◆ Applied aspects of physiology of mineralization, pathological considerations - calculus formation.
 6. Physiology of Taste :
 - ◆ Innervation of taste buds & taste pathway, physiologic basis of taste sensation, age changes & applied aspects - taste disorders.
 7. Physiology of Speech :
 - ◆ Review of basic anatomy of larynx & vocal cords.
 - ◆ Voice production, resonators, production of vowels & different consonants - Role of palate, teeth & tongue.
 - ◆ Effects of dental prosthesis & appliances on speech & basic speech disorders.

II BDS

1. GENERAL PATHOLOGY

AIM:

At the end of the course the student should be competent to:

Apply the scientific study of disease processes, which result in morphological and functional alterations in cells, tissues and organs to the study of pathology and the practice of dentistry.

3. DENTAL ANATOMY, EMBRYOLOGY AND ORAL HISTOLOGY

INTRODUCTION

Dental Anatomy including Embryology and Oral Histology – a composite of basic Dental Sciences & their clinical applications.

SKILLS

The student should acquire basic skills in:

1. Carving of crowns of permanent teeth in wax.
2. Microscopic study of Oral tissues.
3. Identification of Deciduous & Permanent teeth.
4. Age estimation by patterns of teeth eruption from plaster casts of different age groups.

OBJECTIVES

After a course on Dental Anatomy including Embryology and Oral Histology,

1. The student is expected to appreciate the normal development, morphology, structure & functions of oral tissues & variations in different pathological/non-pathological states.
2. The student should understand the histological basis of various dental treatment procedures and physiologic ageing process in the dental tissues.
3. The students must know the basic knowledge of various research methodologies.

I. TOOTH MORPHOLOGY

1. Introduction to tooth morphology:

- Human dentition, types of teeth, & functions, Palmer's & Binomial notation systems, tooth surfaces, their junctions - line angles & point angles, definition of terms used in dental morphology, geometric concepts in tooth morphology, contact areas & embrasures - Clinical significance.
- ##### 2. Morphology of permanent teeth :
- Description of individual teeth, along with their endodontic anatomy & including a note on their chronology of development, differences between similar class of teeth & identification of individual teeth.
 - Variations & Anomalies commonly seen in individual teeth.
- ##### 3. Morphology of Deciduous teeth :
- Generalized differences between Deciduous & Permanent teeth.
 - Description of individual deciduous teeth, including their chronology of development, endodontic anatomy, differences between similar class of teeth & identification of individual teeth.
- ##### 4. Occlusion :
- Definition, factors influencing occlusion - basal bone, arch, individual teeth, external & internal forces & sequence of eruption.
 - Inclination of individual teeth - compensatory curves.
 - Centric relation & Centric occlusion - protrusive, retrusive & lateral occlusion.
 - Clinical significance of normal occlusion.

II. Introduction to & Classification of Malocclusion.

III. ORAL EMBRYOLOGY

1. Brief review of development of face, jaws, lip, palate & tongue, with applied aspects.

2. Development of teeth :

- Epithelial mesenchymal interaction, detailed study of different stages of development of crown, root & supporting tissues of tooth & detailed study of formation of calcified tissues.
- Applied aspects of disorders in development of teeth.

3. Eruption of deciduous & Permanent teeth :

- Mechanisms in tooth eruption, different theories & histology of eruption, formation of dentogingival junction, role of gubernacular cord in eruption of permanent teeth.
- Clinical or Applied aspects of disorders of eruption.

4. Shedding of teeth :

- Factors & mechanisms of shedding of deciduous teeth.
- Complications of shedding.

IV. ORAL HISTOLOGY

1. Detailed microscopic study of Enamel, Dentine, Cementum & Pulp tissue. Age changes & Applied aspects (Clinical and forensic significance) of histological considerations - Fluoride applications, transparent dentine, dentine hypersensitivity, reaction of pulp tissue to varying insults to exposed dentine ; Pulp calcifications & Hypercementosis.

8. Syphilis
 - Epidemiology
 - Types and stages of syphilis
 - Pathological features
 - Diagnostic criterias
 - Oral lesions
9. Typhoid
 - Epidemiology
- Pathogenesis
 - Pathological features
 - Diagnostic criterias
10. Thrombosis
 - Definition, Pathophysiology
 - Formation, complications & Fate of a thrombus
11. Embolism
 - Definition
 - Types
 - Effects
12. Ischaemia and Infraction
 - Definition, etiology, types
 - Infraction of various organs
13. Derangements of body fluids
 - Oedema – pathogenesis
 - Different types
14. Disorders of circulation
 - Hyperaemia
 - Shock
15. Nutritional Disorders
 - Common Vitamin Deficiencies
16. Immunological mechanisms in disease
 - Humoral & cellular immunity
 - Hypersensitivity & autommunity
17. AIDS and Hepatitis.
18. Hypertension
 - Definition, classification
 - Pathophysiology
 - Effects in various organs
19. Diabetes Mellitus
 - Def, Classification, Pathogenesis, Pathology in different organs
20. Adaptive disorders of growth
 - Atrophy & Hypertrophy, Hyperplasia, Metaplasia and Dysplasia
21. General Aspects of neoplasia
 - a. Definition, terminology, classification
 - b. Differences between benign and malignant neoplasms
 - c. The neoplastic cell
 - d. Metastasis
 - e. Etiology and pathogenesis of neoplasia, Carcinogenesis
 - f. Tumour biology
 - g. Oncogenes and anti-oncogenes
 - h. Diagnosis
 - i. Precancerous lesions
 - j. Common specific tumours, Sq papilloma & Ca, Basal cell Ca, Adenoma & Adenoca, Fibroma & Fibrosarcoma, Lipoma and liposarcoma

OBJECTIVES:

Enabling the student

1. To demonstrate and apply basic facts, concepts and theories in the field of Pathology.
2. To recognize and analyze pathological changes at macroscopically and microscopical levels and explain their observations in terms of disease processes.
3. To Integrate knowledge from the basic sciences, clinical medicine and dentistry in the study of Pathology.
4. To demonstrate understanding of the capabilities and limitations of morphological Pathology in its contribution to medicine, dentistry and biological research.
5. To demonstrate ability to consult resource materials outside lectures, laboratory and tutorial classes.

COURSE CONTENT

A. General Pathology -

1. Introduction to Pathology
Terminologies
The cell in health
The normal cell structure
The cellular functions
2. Etiology and Pathogenesis of Disease Cell Injury

Types - congenital
Acquired

Mainly Acquired causes of disease

(Hypoxic injury, chemical injury, physical injury, immunological injury)

3. Degenerations
Amyloidosis Fatty
change Cloudy
swelling
Hyaline change, mucoid degeneration
4. Cell death & Necrosis
Apoptosis
Def, causes, features and types of necrosis
Gangrene - Dry, wet, gas
Pathological Calcifications
(Dystrophic and metastatic)
5. Inflammation
- Definition, causes types, and features
- Acute inflammation
 - a. The vascular response
 - b. The cellular response
 - c. Chemical mediators
 - d. The inflammatory cells
 - e. Fate
- Chronic inflammation
Granulomatous inflammation
6. Healing
- Regeneration
- Repair
 - a. Mechanisms
 - b. Healing by primary intention
 - c. Healing by secondary intention
 - d. Fracture healing
 - e. Factors influencing healing process
 - f. Complications
7. Tuberculosis
- Epidemiology
- Pathogenesis (Formation of tubercle)
- Pathological features of Primary and secondary TB
- Complications and Fate

MICROBIOLOGY

AIM:

To introduce the students to the exciting world of microbes. To make the students aware of various branches of microbiology, importance, significance and contribution of each branch to mankind and other fields of medicine. The objectives of teaching microbiology can be achieved by various teaching techniques such as:

- a) Lectures
- b) Lecture Demonstrations
- c) Practical exercises
- d) Audio visual aids
- e) Small group discussions with regular feed back from the students.

OBJECTIVES:

A. KNOWLEDGE AND UNDERSTANDING

At the end of the Microbiology course the student is expected to :

1. Understand the basics of various branches of microbiology and able to apply the knowledge relevantly.
2. Apply the knowledge gained in related medical subjects like General Medicine and General Surgery and Dental subjects like Oral Pathology, Community Dentistry, Periodontics, Oral Surgery, Pedodontics, Conservative Dentistry and Oral medicine in higher classes.
3. Understand and practice various methods of Sterilisation and disinfection in dental clinics.
4. Have a sound understanding of various infectious diseases and lesions in the oral cavity.

A. SKILLS

1. Student should have acquired the skill to diagnose, differentiate various oral lesions.
2. Should be able to select, collect and transport clinical specimens to the laboratory.
3. Should be able to carry out proper aseptic procedures in the dental clinic.

A brief syllabus of Microbiology is given as follows:

A. GENERAL MICROBIOLOGY:

1. History, Introduction, Scope, Aims and Objectives.
2. Morphology and Physiology of bacteria.
3. Detail account of Sterilisation and Disinfection.
4. Brief account of Culture media and Culture techniques.
5. Basic knowledge of selection, collection, transport, processing of clinical Specimens and identification of bacteria.
6. Bacterial Genetics and Drug Resistance in bacteria.

B. IMMUNOLOGY:

1. Infection - Definition, Classification, Source, Mode of transmission and types of Infectious disease.
2. Immunity
3. Structure and functions of Immune system
4. The Complement System
5. Antigen
6. Immunoglobulins - Antibodies - General structure and the role played in defense mechanism of the body.
7. Immune response
8. Antigen - Antibody reactions - with reference to clinical utility.
9. Immuno deficiency disorders - a brief knowledge of various types of immuno deficiency disorders - A sound knowledge of immuno deficiency disorders relevant to dentistry.
10. Hypersensitivity reactions
11. Autoimmune disorders - Basic knowledge of various types - sound knowledge of autoimmune disorders of oral cavity and related structures.
12. Immunology of Transplantation and Malignancy
13. Immunehaematology

Systemic Pathology -

22 Anaemias

Iron Deficiency anaemia, Megaloblastic anaemia

23. Leukaemias

- Acute and chronic leukaemias, Diagnosis and clinical features

24. Diseases of Lymph nodes

- Hodgkin's disease, Non Hodgkins lymphoma, Metastatic carcinoma

25. Diseases of oral cavity

- Lichen planus, Stomatitis, Leukoplakia, Sq cell Ca, Dental caries, Dentigerous cyst, Ameloblastoma

26. Diseases of salivary glands

- Normal structure, Sialadenitis, Tumours

27. Common diseases of Bones

- Osteomyelitis, Metabolic bone diseases, Bone Tumours, Osteosarcoma, Osteoclastoma, Giant cell Tumour, Ewing's sarcoma, Fibrous dysplasia, Aneurysmal bone cyst

28. Diseases of Cardiovascular system

- Cardiac failure

- Congenital heart disease - ASD, VSD, PDA

Fallot's Tetralogy

- Infective Endocarditis

- Atherosclerosis

- Ischaemic heart Disease

29. Haemorrhagic Disorders

Coagulation cascade

Coagulation disorders

- Platelet function

- Platelet disorders

Practicals

1. Urine - Abnormal constituents

- Sugar, albumin, ketone bodies

2. Urine - Abnormal constituents

- Blood, bile salts, bile pigments

3. Haemoglobin (Hb) estimation

4. Total WBC count

5. Differential WBC Count

6. Packed cell volume (PCV), erythrocyte sedimentation Rate (ESR)

7. Bleeding Time & clotting Time

8. Histopathology Tissue

Processing Staining

9. Histopathology slides

- Acute appendicitis, Granulation tissue, fatty liver

10. Histopathology slides

CVC lung, CVC liver, Kidney amyloidosis

11. Histopathology slides

Tuberculosis, Actinomycosis, Rhinosporidiosis

12. Histopathology slides

Papilloma, Basal cell Ca, Sq cell Ca

13. Histopathology slides

Osteosarcoma, osteoclastoma, fibrosarcoma

14. Histopathology slides

Malignant melanoma, Ameloblastoma, Adenoma

15. Histopathology slides

Mixed parotid tumour, metastatic carcinoma in lymph node

SKILLS:

At the end of the course the student shall be able to:

- 1) Prescribe drugs for common dental and medical ailments.
 - 2) To appreciate adverse reactions and drug interactions of commonly used drugs.
 - 3) Observe experiments designed for study of effects of drugs.
 - 4) Critically evaluate drug formulations and be able to interpret the clinical pharmacology of marketed preparations commonly used in dentistry.
- 5) INTEGRATION: Practical knowledge of use of drugs in clinical practice will be acquired through integrated teaching with clinical departments.

LECTURE:

I. GENERAL PHARMACOLOGY:

1. General principles of pharmacology; sources and nature of drugs dosage forms; prescription writing; pharmacokinetics (absorption, distribution, metabolism and excretion of drugs), mode of action of drugs, combined effects of drugs, receptor mechanism of drug action, factors modifying drug response, adverse drug reactions; drug interactions, Implications of General Principles in clinical dentistry.
2. CNS drugs; General anaesthetics, hypnotics, anaesthetics psychotropic drugs, anti - epileptics, muscle relaxants, local anaesthetics, Implications of these drugs in clinical dentistry.
3. Autonomic drugs; sympathomimetics, antiadrenergic drugs parasympothomimetics and parasympatholytics, Implications of Autonomic drugs in clinical dentistry.
4. Cardiovascular drugs; Cardiac stimulants ; antihypertensive drugs, vasopressor agents, treatment of shock, Antianginal agents and diuretics, Implications of these drugs in clinical dentistry.
5. Autocoids:
Histamine, antihistamines, prostaglandins, leukotriens and bronchodilators, Implications of Autocoids in clinical dentistry.
6. Drugs acting on blood : coagulants and anticoagulants, hematinics, Implications of these drugs in clinical dentistry.
7. G.I.T. Drugs, Purgatives, anti-diarrhoeal, antacids, anti-emetics, Implications of these drugs in clinical dentistry.
8. Endocrines; Emphasis on treatment of diabetes and glucocorticoids, thyroid and antithyroid agents, drugs affecting calcium balance and anabolic steroids, Implications of these drugs in clinical dentistry.
9. Chemotherapy: Antimicrobial agents (against bacteria, anaerobic infections, fungi, virus and broad spectrum). Infection management in dentistry. Phamacotherapy of Tuberculosis, leprosy and chemotherapy of malignancy in general. Implications of Chemotherpy in clinical dentistry.
10. Vitamins : Water soluble vitamins, Vit. D, Vit.K. and Vit. E, Implications of Vitamins in clinical dentistry.
11. Pharmacotherapy of emergencies in dental office and emergency drugs tray Implications of Pharmacotherapy in clinical dentistry.
12. Chealating agents - BAL,EDTA and desferrioxamine,

II. DENTAL PHARMACOLOGY

1. Anti - septics, astrigents, obtundents, mummifying agents, bleaching agents, styptics, disclosing agents, dentifrices, mouth washes, caries and fluorides.
2. Pharmacotherapy of common oral conditions in dentistry.
Practicals and Demonstrations :
To familiarise the student with the methodology: prescription writing and dispensing. Rationale of drug combinations of marketed drugs.

3. DENTAL MATERIALS

The science of Dental Material has undergone tremendous changes over the years. Continued research has led to new material systems and changing concepts in the dental field. Interlinked with various specialised branches of chemistry, practically all engineering applied sciences and biological characteristics, the science of dental material emerged as a basic sciences in itself with its own values and principles.

C. SYSTEMATIC BACTERIOLOGY:

1. Pyogenic cocci - Staphylococcus, Streptococcus, Pneumococcus, Gonococcus, Meningococcus - brief account of each coccus - detailed account of mode of spread, laboratory diagnosis, Chemo therapy and prevention - Detailed account of Cariogenic Streptococci.
2. Corynebacterium diphtheriae - mode of spread, important clinical feature, Laboratory diagnosis, Chemotherapy and Active immunisation.
3. Mycobacteria - Tuberculosis and Leprosy
4. Clostridium - Gas gangrene, food poisoning and tetanus.
5. Non-sporing Anaerobes - in brief about classification and morphology, in detail about dental pathogens - mechanism of disease production and prevention.
6. Spirochaetes - Treponema pallidum - detailed account of Oral Lesions of syphilis, Borrelia vincentii.
7. Actinomycetes.

D. VIROLOGY:

1. Introduction
2. General properties, cultivation, host - virus interaction with special reference to Interferon.
3. Brief account of Laboratory diagnosis, Chemotherapy and immuno prophylaxis in general.
4. A few viruses of relevance to dentistry.
 - Herpes Virus
 - Hepatitis B Virus - brief about other types
 - Human Immunodeficiency Virus (HIV)
 - Mumps Virus
 - Brief - Measles and Rubella Virus
5. Bacteriophage - structure and Significance

E. MYCOLOGY

1. Brief Introduction
2. Candidosis - in detail
3. Briefly on oral lesions of systemic mycoses.

F. PARASITOLOGY:

1. Brief introduction - protozoans and helminths
2. Brief knowledge about the mode of transmission and prevention of commonly seen parasitic infection in the region.

2. **GENERAL AND DENTAL PHARMACOLOGY AND THERAPEUTICS**

GOAL:

The broad goal of teaching under graduate students in pharmacology is to inculcate rational and scientific basis of therapeutics keeping in view of dental curriculum and Profession.

OBJECTIVES:

At the end of the course the student shall be able to:

- i) Describe the pharmacokinetics and pharmacodynamics of essential and commonly used drugs in general and in dentistry in particular.
- ii) List the indications, contraindications; interactions, and adverse reactions of commonly used drugs with reason.
- iii) Tailor the use of appropriate drugs in disease with consideration to its cost, efficacy, safety for individual and mass therapy needs.
- iv) Indicate special care in prescribing common and essential drugs in special medical situations such as pregnancy, lactation, old age, renal, hepatic damage and immuno compromised patients.
- v) Integrate the rational drug therapy in clinical pharmacology.
- vi) Indicate the principles underlying the concepts of "Essential drugs".

4). BIOLOGICAL CONSIDERATIONS IN USE OF DENTAL MATERIALS.

Materials used are with the knowledge of appreciation of certain biological considerations for use in oral cavity. Requirement of materials with biological compatibility. Classification of materials from perspective of biological compatibility. eg. contact with soft tissues, affecting vitality of pulp, used for root canal fillings, affecting hard tissues of teeth, laboratory materials that could be accidentally be inhaled or ingested during handling. Hazards associated with materials: pH-affecting pulp, polymers causing chemical irritation, mercury toxicity, etc. Microleakage, Thermal changes, Galvanism, toxic effect of materials. Biological evaluation for systemic toxicity, skin irritation, mutagenicity and carcinogenicity. Disinfection of dental materials for infection control.

5). GYPSUM & GYPSUM PRODUCTS.

Gypsum – its origin, chemical formula, Products manufactured from gypsum.

Dental plaster, Dental stone, Die stone, high strength, high expansion stone.

Application and manufacturing procedure of each, macroscopic and microscopic structure of each . Supplied as and Commercial names.

Chemistry of setting, setting reaction, theories of setting, gauging water, Microscopic structure of set material.

Setting time: working time and setting time, Measurement of setting time and factors controlling setting time .

Setting expansion, Hygroscopic setting expansion – factors affecting each

Strength :wet strength, dry strength, factors affecting strength, tensile strength

Slurry – need and use.

Care of cast.

ADA classification of gypsum products

Description of impression plaster and dental investment

Manipulation including recent methods or advanced methods.

Disinfection : infection control, liquids, sprays, radiation Method of use of disinfectants

Storage of material – shelf life

6) IMPRESSION MATERIALS USED IN DENTISTRY

Impression plaster, Impression compound, Zinc oxide eugenol impression paste & bite registration paste incl., non eugenol paste, Hydrocolloids, reversible and irreversible, Elastomeric impression materials. Polysulphide, Condensation silicones, Addition silicones, Polyether, Visible light cure polyether urethane dimethacrylate, Historical background & development of each impression material, Definition of impression , Purpose of making impression, Ideal properties required and application of material, Classification as per ADA specification, general & individual impression material.

Application and their uses in different disciplines, Marketed as and their commercial names, Mode of supply & mode of application bulk/wash impression. Composition, chemistry of setting, Control of setting time , Type of impression trays required, Adhesion to tray, manipulation, instruments & equipments required. Techniques of impression, storage of impression, (Compatibility with cast and die material). Any recent advancements in material and mixing devices. Study of properties: Working time, setting time, flow, accuracy, strength, flexibility, tear strength, dimensional stability, compatibility with cast & die materials incl., electroplating Biological properties: tissue reaction , Shelf life & storage of material, Infection control – disinfection, Advantages & disadvantages of each material.

7). SYNTHETIC RESINS USED IN DENTISTRY.

Historical background and development of material, Denture base materials and their classification and requirement

Classification of resins

Dental resins – requirements of dental resins, applications, polymerisation, polymerisation mechanism stages in addition polymerisation, inhibition of polymerisation, co polymerization, molecular weight, crosslinking, plastixizers, Physical properties of polymers, polymer structures types of resins.

ACRYLIC RESINS:

Mode of polymerisation: Heat activated, Chemically activated, Light activated, Mode of supply, application, composition, polymerisation reaction of each. Technical considerations: Methods of manipulation for each type of resin. Physical properties of denture base resin. Miscellaneous resins & techniques: Repair resins, Relining and rebasing. Short term and long-term soft-liners, temporary crown and bridge resins, Resin

INTRODUCTION

AIMS:

Aim of the course is to present basic chemical and physical properties of Dental materials as they are related to its manipulation to give a sound educational background so that the practice of the dentistry emerged from art to empirical status of science as more information through further research becomes available. It is also the aim of the course of Dental materials to provide with certain criteria of selection and which will enable to discriminate between facts and propaganda with regards to claims of manufactures.

OBJECTIVES:

To understand the evolution and development of science of dental material.

To explain purpose of course in dental materials to personnels concerned with the profession of the dentistry. Knowledge of physical and chemical properties. Knowledge of biomechanical requirements of particular restorative procedure. An intelligent compromise of the conflicting as well as co-ordinating factors into the desired Ernest. Laying down standards or specifications of various materials to guide to manufacturers as well as to help professionals.

Search for newer and better materials which may answer our requirements with greater satisfaction. To understand and evaluate the claims made by manufactures of dental materials

NEEDS FOR THE COURSE:

The profession has to rise from an art to a science, , the need for the dentist to possess adequate knowledge of materials to exercises his best through knowledge of properties of different types of materials. The growing concern of health hazards due to mercury toxicity, inhalation of certain vapour or dust materials, irritations and allergic reaction to skin due to contact of materials. Materials causing irritation of oral tissues, pH of restorative materials causing inflammation and necrosis of pulp which is a cause for the dentist to posses wider knowledge of physical, chemical and biological properties of materials being used. For the protection for the patient and his own protection certain criteria of selection are provided that will enable the dentist to discriminate between facts and propaganda, which will make a material biologically accept.

SCOPE:

The dental materials is employed in mechanical procedures including restorative dentistry such as Prosthodontics, endodontics, periodontal, orthodontics and restorative materials. There is scarcely a dental procedure that does not make use of dental materials in one form or another and therefore the application of dental material is not limited to any one branch of dentistry. Branches such as minor surgery and periodontics require less use of materials but the physical and chemical characters of materials are important in these fields.

The toxic and tissue reaction of dental materials and their durability in the oral cavity where the temperature is between 32 & 37 degree centigrade, and the ingestion of hot or cold food ranges from 0-70 degree centigrade. The acid an alkalinity of fluids shown pH varies from 4 to 8.5. The load on 1 sq. mm of tooth or restorative materials can reach to a level as high as many kilograms. Thus the biological properties of dental materials cannot be separated from their physical and chemical properties.

2). STRUCTURE OF MATTER AND PRINCIPLES OF ADHESION.

Change of state, inter atomic primary bonds, inter atomic secondary bonds, inter atomic bond distance and bonding energy, thermal energy, crystalline structure, non crystalline structures, diffusion, adhesion and bonding and adhesion to tooth structures.

3). IMPORTANT PHYSICAL PROPERTIES APPLICABLE TO DENTAL MATERIALS

Physical properties are based on laws of mechanics, acoustics, optics, thermodynamics, electricity, magnetism, radiation, atomic structure or nuclear phenomena. Hue, value, chroma and translucency physical properties based on laws of optics, dealing with phenomena of light, vision and sight. Thermal conductivity & coefficient of thermal expansion are physical properties based on laws of thermodynamics. Stress, strain, proportional limit, elastic limit yield strength, modulus of elasticity, flexibility, resilience, impact, impact strength, permanent deformation, strength, flexure strength fatigue, static fatigue, toughness, brittleness, ductility & malleability, hardness, abrasion resistance, relaxation, rheology, Thixotropic, creep, static creep, dynamic creep, flow, colour, three dimensional colour - hue, values, chroma, Munsell system, metamersim, fluorescence, physical properties of tooth, stress during mastication

Classification of Waxes:

Properties: melting range, thermal expansion, mechanical properties, flow & residual stresses, ductility.
Dental Wax: Inlay wax: Mode of supply : Classification & composition, Ideal requirements: Properties of inlay wax: Flow, thermal properties Wax distortion & its causes.
Manipulation of inlay wax: Instruments & equipment required, including electrically heated instruments metal tips and thermostatically controlled wax baths.
Other waxes: Applications, mode of supply & properties.
Casting Wax, Base plate wax, Processing wax, Boxing wax, Utility wax, Sticky wax, Impression wax for corrective impressions, Bite registration wax.

10). DENTAL CASTING INVESTMENTS.

Definition, requirements, classification

Gypsum bonded - classification. Phosphate bonded, Silica bonded

Mode of Supply: Composition, application , setting mechanism, setting time & factors controlling.

Expansions :Setting expansion, Hygroscopic Setting expansion, & thermal expansion : factors affecting. Properties : Strength, porosity, and fineness & storage. Technical considerations: For Casting procedure, Preparation of die, Wax pattern, spruing, investing, control of shrinkage compensation, wax burnout, and heating the invested ring, casting. Casting machines, source of heat for melting the alloy. Defects in casting.

11). SOLDERING, BRAZING AND WELDING

Need of joining dental appliances, Terms & Definition

Solders: Definition, ideal requirement, types of solders - Soft & hard and their fusion temperature, application. Mode of supply of solders, Composition and selection, Properties. Tarnish & corrosion resistance mechanical properties, microstructure of soldered joint. Fluxes & Anti fluxes: Definition, Function, Types, commonly used fluxes & their selection Technique of Soldering & Brazing : free hand soldering and investment, steps and procedure. Welding,: Definition, application, requirements, procedure, weld decay - causes and how to avoid it. Laser welding.

WROUGHT BASE METAL ALLOYS

Applications and different alloys used mainly for orthodontics purpose

1. Stainless steel
2. Cobalt chromium nickel
3. Nickel titanium
4. Beta titanium

Properties required for orthodontic wires, working range, springiness, stiffness, resilience, Formability, ductility, ease of joining, corrosion resistance, stability in oral environment, bio compatibility

Stainless steels: Description, type, composition & properties of each type. Sensitisation & stabilisation , Mechanical properties – strength, tensile, yield strength, KHN. Braided & twisted wires their need , Solders for stainless steel, Fluxes, Welding

1. Wrought cobalt chromium nickel alloys, composition, allocation, properties, heat treatment, physical properties
2. Nickel - Titanium alloys, shape, memory & super elastic
3. Titanium alloys, application, composition, properties, welding, Corrosion resistance

12). DENTAL CEMENTS

Definition & Ideal requirements:

Cements: Silicate, Glass ionomer, metal modified glass ionomer, resin modified glass ionomer, zinc oxide eugenol, modified zinc oxide eugenol, zinc phosphate, zinc silico phosphate, zinc poly carboxylate, Cavity liners and cement bases, Varnishes Calcium hydroxide, Gutta percha

Application, classification (general and individual), setting mechanism, mode of supply, Properties, factors affecting setting, special emphasis on critical procedures of manipulation and protection of cement, mode of adhesion, biomechanism of caries inhibition.

Agents for pulpal protection., Modifications and recent advances, Principles of cementation. Special emphasis on cavity liners and cement bases and luting agents.

13). DENTAL CERAMICS

Historical background & General applications.

impression trays, Tray materials, Resin teeth, materials in maxillofacial prosthesis, Denture cleansers, Infection control in detail, Biological properties and allergic reactions.

RESTORATIVE RESINS:

Historical background, Resin based restorative materials, Unfilled & filled, Composite restorative materials, Mode of supply, Composition, Polymerisation mechanisms: Chemically activated, Light activated, Dual cure: Degree of conversion, Polymerisation shrinkage Classification of Composites: Application, composition and properties of each Composites of posterior teeth, Prosthodontics resins for veneering. Biocompatibility - microleakage, pulpal reaction, pulpal protection Manipulation of composites: Techniques of insertion of Chemically activated, light activated, dual cure Polymerisation, Finishing and polishing of restoration, Repair of composites Direct bonding Bonding: Need for bonding, Acid - etch technique, Enamel bonding, Dentin bonding agents. Mode of bonding, Bond strength, Sandwich technique its indication and procedure. Extended application for composites: Resins for restoring eroded teeth, Pit and fissure sealing, Resin inlays system - Indirect & direct, Core build up, Orthodontic applications.

8). METAL AND ALLOYS:

Structure and behaviour of metals, Solidification of metals, mechanism of crystallisation amorphous & crystalline. Classification of alloys, Solid solutions, Constitutes or equilibrium phase diagrams: Electric alloys, Physical properties, Peritectic alloys, Solid state reaction other binary systems: Metallography & Heat treatment. Tarnish and corrosion. Definition: causes of corrosion, protection against corrosion., Corrosion of dental restorations, clinical significance of galvanic current. Dental Amalgam.

History:

Definition of dental amalgam, application, Alloy classification, manufacture of alloy powder composition - available as.

Amalgamation : setting reaction & resulting structure , properties , Microleakage

Dimensional stability, Strength, Creep, Clinical performance

Manipulation: Selection of alloy, proportioning, mechanism of trituration, condensation, carving & finishing. Effect of dimensional changes, Marginal deterioration., Repair of amalgam, mercury toxicity, mercury hygiene.

DIRECT FILLING GOLD:

Properties of pure gold, mode of adhesion of gold for restoration forms of direct filling gold for using as restorative material

Classification : Gold Foil, Electrolytic precipitate, powdered gold.

Manipulation: Removal of surface impurities and compaction of direct filling gold.

Physical properties of compacted gold, Clinical performance.

DENTAL CASTING ALLOYS:

Historical background, desirable properties of casting alloys.

Alternatives to cast metal technology: direct filling gold, amalgam, mercury free condensable intermetallic compound - an alternative to metal casting process. CAD-CAM process for metal & ceramic inlays - without need of impression of teeth or casting procedure, pure titanium, most bio compatible metal which are difficult to cast can be made into crowns with the aid of CAD- CAM technology . Another method of making copings - by copy milling (without casting procedures).

Classification of casting alloys: By function & description.

Recent classification , High noble (HN), Noble (N) and predominantly base metal (PB)

Alloys for crown & bridge, metal ceramic & removable partial denture. Composition, function, constituents and application, each alloy both noble and base metal. Properties of alloys: Melting range, mechanical properties, hardness, elongation, modulus of elasticity, tarnish and corrosion.

Casting shrinkage and compensation of casting shrinkage. Biocompatibility - Handling hazards & precautions of base metal alloys, casting investments used. Heat treatment : Softening & hardening heat treatment. Recycling of metals. Titanium alloys & their application , properties & advantages. Technical considerations In casting . Heat source, furnaces.

9). DENTAL WAXES INCLUDING INLAY CASTING WAX

Introduction and importance of waxes. Sources of natural waxes and their chemical nature.

2. Fabrication of wax pattern
3. Sprue for inner attachment investing
4. Investing of wax pattern
5. Finishing and cementing of class II inlay in extracted tooth.

12. Endodontics

1. Identification of basic endodontic instruments
2. Coronal access cavity preparation on extracted. Upper central incisors
3. Determination of working length.
4. Biomechanical preparation of root canal space of central incisor
5. Obfuration of root canal spaces. Absens of coronal access cavity.
6. Closure of access cavity

5. PRE CLINICAL PROSTHODONTICS

1. Introduction of complete denture
2. Diagnosis and treatment planning
3. Diagnostic impression in complete denture
4. Mouth preparation in complete denture
5. Primary impression in complete denture
6. Secondary impression in complete denture
7. Mandibular moments
8. Jaw relation
9. Try in
10. Complete denture insertion
11. Relining and rebasing in complete denture
12. Special complete denture

III BDS

1. ORAL PATHOLOGY & ORAL MICROBIOLOGY

OBJECTIVES:

At the end of Oral Pathology & Oral Microbiology course, the student should be able to comprehend -

1. The different types of pathological processes, that involve the oral cavity.
2. The manifestations of common diseases, their diagnosis & correlation with clinical pathological processes.
3. An understanding of the oral manifestations of systemic diseases should help in correlating with the systemic physical signs & laboratory findings.
4. The student should understand the underlying biological principles governing treatment of oral diseases.
5. The principles of certain basic aspects of Forensic Odontology.

SKILLS:

1. Microscopic study of common lesions affecting oral tissues through microscopic slides & projection slides.
2. Study of the disease process by surgical specimens.
3. Study of teeth anomalies/polymorphisms through tooth specimens & plaster casts.
4. Microscopic study of plaque pathogens.
5. Study of haematological preparations (blood films) of anaemias & leukemias.
6. Basic exercises in Forensic Odontology such as histological methods of age estimation and appearance of teeth in injuries.

1. INTRODUCTION:

- ♦ A bird's eye view of the different pathological processes involving the oral cavity & oral cavity involvement in systemic diseases to be brought out. Interrelationship between General Medicine & General Surgery & Oral pathology to be emphasized.
- 2. Developmental disturbances of teeth, jaws and soft tissues of oral & paraoral region :
 - ♦ Introduction to developmental disturbances - Hereditary, Familial mutation, Hormonal etc. causes to be highlighted.
 - ♦ Developmental disturbances of teeth - Etiopathogenesis, clinical features, radiological features & histopathological features as appropriate :-

Dental ceramics : definition, classification, application, mode of supply, manufacturing procedure, methods of strengthening. Properties of fused ceramic: Strength and factors affecting, modulus of elasticity, surface hardness, wear resistance, thermal properties, specific gravity, chemical stability, esthetic properties, biocompatibility, technical considerations.

Metal Ceramics (PFM): Alloys - Types and composition of alloys. Ceramic - Type and Composition. Metal Ceramic Bond - Nature of bond. Bonding using electro deposition, foil copings, bonded platinum foil, swaged gold alloy foil coping. Technical considerations for porcelain and porcelain fused metal restorations. Recent advances - all porcelain restorations, Manganese core, injection moulded, castable ceramics, glass infiltrated alumina core ceramic (In ceram), ceramic veneers, inlays and onlays, and CAD - CAM ceramic. Chemical attack of ceramic by fluoride. Porcelain furnaces.

14). ABRASION & POLISHING AGENTS

Definition of abrasion and polishing. Need of abrasion and polishing. Types of abrasives: Finishing, polishing & cleaning. Types of abrasives: Diamond, Emery, aluminium oxides garnet, pumice, Kieselgurh, tripoli, rouge, tin oxide, chalk, chromic oxide, sand, carbides, diamond, zirconium silicate Zinc oxide

ABRASIVE ACTION :

Desirable characteristics of an abrasive, Rate of abrasion, Size of particle, pressure and speed.

Grading of abrasive & polishing agents. Binder, Polishing materials & procedures used. Technical consideration - Material and procedure used for abrasion and polishin Electrolytic polishing and burnishing.

15). DIE AND COUNTER DIE MATERIALS INCLUDING ELECTROFORMING AND ELECTROPOLISHING.

Types - Gypsum products, Electroforming, Epoxy resin, Amalgam.

16). DENTAL IMPLANTS : Evolution of dental implants, types and materials.

17). MECHANICS OF CUTTING : Burs and points.

At the end of the course the student should have the knowledge about the composition, properties, manipulative techniques and their various commercial names. The student should also acquire skills to select and use the materials appropriately for laboratory and clinical use.

4. PRE CLINICAL CONSERVATIVE DENTISTRY LABORATORY EXERCISES

1. Identification and study of handcutting instruments chisles, gingival margin trimmers, excavators and hatchet.
2. Identification and use of rotary cutting instruments in contra angle hand pieces burs (Micromotor)
3. Preparation class I and extended class I and class II and MOD's and class V amounting to 10 exercises in plaster models.
4. 10 exercises in mounted extracted teeth of following class I, 4 in number class I extended cavities 2, class II 4 in number and Class V 2 in number. Cavity preparation base application matrix and wedge placement restoration with amalgam.
5. Exercises on phantom head models which includes cavity preparation base and varnish application matrix and wedge placement followed by amalgam restoration.

Class I	5
Class I with extension	2
Class II	10
Class II Mods	2
Class V and III for glass ionomers	4
Class V for amalgam	2
6. Polishing of above restorations.
7. Demonstration of Class III and Class V cavity preparation. For composites on extracted tooth completing the restoration.
8. Polishing and finishing of the restoration of composites.
9. Identification and manipulation of varnish bases like Zinc Phosphate, Poly carboxylate, Glass Ionomers, Zinc Oxide, Eugenol cements.
10. Identification and manipulation of various matrices, tooth separators and materials like composites and modified glassionomer cements.
11. Cast Restoration
 1. Preparation of Class II inlay cavity

- d) Tumours of Disputed Origin - Congenital Epulis & Granular Cell Myoblastoma.
- e) Metastatic tumours - Tumors metastasizing to & from oral cavity & the routes of metastasis.

11. Traumatic, Reactive & Regressive lesions of Oral Cavity :

- ◆ Pyogenic & Giant cell granuloma, exostoses Fibrous Hyperplasia, Traumatic Ulcer & Traumatic Neuroma.
- ◆ Attrition, Abrasion, Erosion, Bruxism, Hypercementosis, Dentinal changes, Pulp calcifications & Resorption of teeth.
- ◆ Radiation effects of oral cavity, summary of Physical & Chemical injuries including allergic reactions of the oral cavity.
- ◆ Healing of Oral wounds & complications - Dry socket.

12. Non neoplastic Salivary Gland Diseases :

- ◆ Sialolithiasis, Sialosis, Sialadenitis, Xerostomia & Ptyalism.

13. Systemic Diseases involving Oral cavity :

- ◆ Brief review & oral manifestations, diagnosis & significance of common Blood, Nutritional, Hormonal & Metabolic diseases of Oral cavity.

14. Mucocutaneous Lesions :

- ◆ Etiopathogenesis, clinical features & histopathology of the following common lesions. Lichen Planus, Lupus Erythematosus, Pemphigus & Pemphigoid lesions, Erythema Multiforme, Psoriasis, Scleroderma, Ectodermal Dysplasia, Epidermolysis bullosa & White sponge nevus..

15. Diseases of the Nerves :

- ◆ Facial neuralgias - Trigeminal & Glossopharyngeal. VII nerve paralysis, Causalgia.
- ◆ Psychogenic facial pain & Burning mouth syndrome.

16. Pigmentation of Oral & Paraoral region & Discolouration of teeth :

- ◆ causes & clinical manifestations.

17. Diseases of Maxillary Sinus :

- ◆ Traumatic injuries to sinus, Sinusitis, Cysts & Tumours involving antrum.

18. a) ORAL PRECANCER – CANCER; Epidemiology, aetiology, clinical and histopathological features, TNM classification. Recent advances in diagnosis, management and prevention.

- b) Biopsy : Types of biopsy, value of biopsy, cytology, histo chemistry & frozen sections in diagnosis of oral diseases.

19. Principles of Basic Forensic Odontology (Pre-clinical Forensic Odontology):

- ◆ Introduction, definition, aims & scope.
- ◆ Sex and ethnic (racial) differences in tooth morphology and histological age estimation
- ◆ Determination of sex & blood groups from buccal mucosa / saliva.
- ◆ Dental DNA methods
- ◆ Bite marks, rugae patterns & lip prints.
- ◆ Dental importance of poisons and corrosives.
- ◆ Overview of forensic medicine and toxicology

4. GENERAL MEDICINE

GUIDELINES:

Special emphasis should be given throughout on the importance of various diseases as applicable to dentistry.

1. Special precautions/ contraindication of anaesthesia and various dental procedures in different systemic diseases.
2. Oral manifestations of systemic diseases.
3. Medical emergencies in dental practice.

A dental student should be taught in such a manner he/she is able to record the arterial pulse, blood pressure and be capable of suspecting by sight and superficial examination of the body – diseases of the heart, lungs, kidneys, blood etc. He should be capable of handling medical emergencies encountered in dental practice.

CLINICAL TRAINING:

The student must be able to take history, do general physical examination (including build, nourishment, pulse, BP, respiration, clubbing, cyanosis, jaundice, lymphadenopathy, oral cavity) and be able to examine CVS, RS and abdomen and facial nerve.

3. **GENERAL SURGERY**

AIMS:

To acquaint the student with various diseases, which may require surgical expertise and to train the student to analyze the history and be able to do a thorough physical examination of the patient. The diseases as related to head and neck region are to be given due importance, at the same time other relevant surgical problems are also to be addressed. At the end of one year of study the student should have a good theoretical knowledge of various ailments, and be practically trained to differentiate benign and malignant diseases and be able to decide which patient requires further evaluation.

1. HISTORY OF SURGERY:

The development of surgery as a speciality over the years, will give the students an opportunity to know the contributions made by various scientists, teachers and investigators. It will also enable the student to understand the relations of various specialities in the practice of modern surgery.

2. GENERAL PRINCIPLES OF SURGERY:

Introduction to various aspects of surgical principles as related to orodental diseases. Classification of diseases in general. This will help the student to understand the various diseases, their relevance to routine dental practice.

3. WOUNDS:

Their classification, wound healing, repair, treatment of wounds, medico-legal aspects of accidental wounds and complications of wounds.

4. INFLAMMATION:

Of soft and hard tissues. Causes of inflammation, varieties, treatment and sequelae.

5. INFECTIONS:

Acute and chronic abscess skin infections, cellulitis, carbuncle, and erysepelas. Specific infections such as tetanus, gangrene, syphilis, gonorrhoea, tuberculosis, Actinomycosis, Vincents angina, cancrum oris. Pyaemia, toxæmia and septicaemia.

6. TRANSMISSIBLE VIRAL INFECTIONS:

HIV and Hepatitis B with special reference to their prevention and precautions to be taken in treating patients in a carrier state.

7. SHOCK AND HAEMORRHAGE:

Classification, causes, clinical features and management of various types of shock. Syncope, Circulatory collapse. Haemorrhage - different types, causes, clinical features and management. Blood groups, blood transfusion, precautions and complications of blood and their products. Hemophilia's, their transmission, clinical features and management especially in relation to minor dental procedures.

8. TUMOURS, ULCERS, CYSTS, SINUS AND FISTULAE:

Classification, clinical examination and treatment principles in various types of benign and malignant tumours, ulcers, cysts, sinus and fistulae.

9. DISEASES OF LYMPHATIC SYSTEM:

Especially those occurring in head and neck region. Special emphasis on identifying diseases such as tubercular infection, lymphomas, leukaemias, metastatic lymph node diseases.

10. DISEASES OF THE ORAL CAVITY:

Infective and malignant diseases of the oral cavity and oropharynx including salivary glands with special emphasis on preventive aspects of premalignant and malignant diseases of the oral cavity.

THEORY SYLLABUS

CORE TOPICS (Must Know)

1. Aims of medicine Definitions of signs, symptoms, diagnosis, differential diagnosis treatment & prognosis.
2. Infections.

Enteric fever, AIDS, herpes simplex, herpes zoster, syphilis diphtheria.

G.I.T.

Stomatitis, gingival hyperplasia, dysphagia, acid peptic disease, jaundice, acute and chronic hepatitis, cirrhosis of liver ascites.

4 CVS

Acute rheumatic fever rheumatic valvular heart disease, hypertension, ischemic heart disease, infective endocarditis, common arrhythmias, congenital heart disease, congestive cardiac failure.

5 RS

Pneumonia, COPD, Pulmonary TB, Bronchial asthma

6 Hematology

Anemias, bleeding & clotting disorders, leukemias, lymphomas, agranulocytosis, splenomegaly, oral manifestations of hematologic disorders, generalized Lymphadenopathy.

7 Renal System

Acute nephritis
Nephrotic syndrome

8 Nutrition

Avitaminosis

9 CNS

Facial palsy, facial pain including trigeminal neuralgia, epilepsy, headache including migraine.

10. Endocrines

Diabetes Mellitus Acromegaly, Hypothyroidism, Thyrotoxicosis, Calcium metabolism and parathyroids.

11. Critical care

Syncope, cardiac arrest, CPR, shock

COLLATERAL TOPICS (Desirable to Know)

Infectious mononucleosis mumps, measles, rubella, malaria.

Diarrhea
Dysentery
Amoebiasis
Malabsorption

Lung Abscess
Pleural effusion
Pneumothorax
Bronchiectasis
Lung cancers.

Renal failure

Balanced diet
PEM

Avitaminosis

- Meningitis

- Examination of comatose patient

- Examination of cranial nerves.

Addison's disease, Cushing's syndrome.

Ac LVF

ARDS

SKILLS:

He should attain following skills necessary for practice of dentistry

- i) To use medium and high speed hand pieces to carry out restorative work.
- ii) Posses the skills to use and familiarise endodontic instruments and materials needed for carrying out simple endodontic treatment.
- iii) To achieve the skills to translate patients esthetic needs along with function.

ATTITUDES:

- i). Maintain a high standard of professional ethics and conduct and apply these in all aspects of professional life.
- ii). Willingness to participate in CDE programme to update the knowledge and professional skill from time to time.
- iii). To help and participate in the implementation of the national oral health policy.
- iv). He should be able to motivate the patient for proper dental treatment at the same time proper maintenance of oral hygiene should be emphasise which will help to maintain the restorative work and prevent future damage.

INTRODUCTION :

Definition aims objectives of Conservative Dentistry scope and future of Conservative Dentistry.

1. Nomenclature Of Dentition:
Tooth numbering systems A.D.A. Zsigmondy Palmer and F.D.I. systems.
2. Principles Of Cavity Preparation :
Steps and nomenclature of cavity preparation classification of cavities, nomenclature of floors angles of cavities.
3. Dental Caries :
Aetiology, classification clinical features, morphological features, microscopic features, clinical diagnosis and sequel of dental caries.
4. Treatment Planning For Operative Dentistry:
Detailed clinical examination , radiographic examination, tooth vitality tests, diagnosis and treatment planning, preparation of the case sheet.
5. Gnathological Concepts Of Restoration:
Physiology of occlusion, normal occlusion, Ideal occlusion, mandibular movements and occlusal analysis. Occlusal rehabilitation and restoration.
6. Aramamentarium For Cavity Preparation:
General classification of operative instruments, Hand cutting instruments design formula and sharpening of instruments. Rotary cutting instruments dental bur, mechanism of cutting, evaluation of hand piece and speed current concepts of rotary cutting procedures. Sterilisation and maintenance of instruments. Basic instrument tray set up.
7. Control of Operating Filed:
Light source sterilisation field of operation control of moisture, rubber dam in detail, cotton rolls and anti sialogagues.
8. Amalgam Restoration :
Indication contraindication, physical and mechanical properties , clinical behaviour. Cavity preparation for Class I , II, V and III. Step wise procedure for cavity preparation and restoration. Failure of amalgam restoration.
9. Pulp Protection :
Linners, varnishes and bases, Zinc phosphate, zinc polycarboxylate, zinc oxide eugenol and glass inomer cements.
10. Anterior Restorations :
Selection of cases, selection of material, step wise procedures for using restorations , silicate (theory only) glass inomers, composites, including sand witch restorations and bevels of the same with a note on status of the dentine bonding agents.
11. Direct Filling Gold Restorations :
Types of direct filling gold indications and limitations of cohesive gold. Annealing of gold foil cavity preparation and condensation of gold foils.
12. Preventive Measures In Restorative Practice :
Plaque Control, Pitand fissure sealants dietary measures restorative procedure and

11. **DISEASES OF LARYNX, NASOPHARYNX:**
Infections and tumours affecting these sites. Indications, procedure and complications of tracheostomy.
12. **NERVOUS SYSTEM:**
Surgical problems associated with nervous system with special reference to the principles of peripheral nerve injuries, their regeneration and principles of treatment. Detailed description of affections of facial nerve and its management. Trigeminal neuralgia, its presentation and treatment.
13. **FRACTURES:**
General principles of fractures, clinical presentation and treatment with additional reference to newer methods of fracture treatment. Special emphasis on fracture healing and rehabilitation.
14. **PRINCIPLES OF OPERATIVE SURGERY:**
Principles as applicable to minor surgical procedures including detailed description of asepsis, antiseptics, sterilisation, principles of anaesthesia and principles of tissue replacement. Knowledge of sutures, drains, diathermy, cryosurgery and use of Laser in surgery.
15. **ANOMOLIES OF DEVELOPMENT OF FACE:**
Surgical anatomy and development of face. Cleft lip and cleft palate—principles of management.
16. **DISEASES OF THYROID AND PARATHYROID:**
Surgical anatomy, pathogenesis, clinical features and management of dysfunction of thyroid and parathyroid glands. Malignant diseases of the thyroid—classification, clinical features and management.
17. **SWELLINGS OF THE JAW:**
Differential diagnosis and management of different types of swellings of the jaw.
18. **BIOPSY:**
Different types of biopsies routinely used in surgical practice.
Skills to be developed by the end of teaching is to examine a routine swelling, ulcer and other related diseases and to perform minor surgical procedures such as draining an abscess, taking a biopsy etc.

IV BDS

1. . CONSERVATIVE DENTISTRY AND ENDODONTICS

OBJECTIVES:

- A. Knowledge and understanding
- B. Skills and
- C. Attitudes

A). Knowledge and under standing:

The graduate should acquire the following knowledge during the period of training.

- i. To diagnose and treat simple restorative work for teeth.
- ii. To gain knowledge about aesthetic restorative material and to translate the same to patients needs.
- iii. To gain the knowledge about endodontic treatment on the basis of scientific foundation.
- iv. To carry out simple endodontic treatment.
- v. To carry out simple luxation of tooth and its treatment and to provide emergency endodontic treatment.

- management. Broken instruments and its management, management of single and double curved root canals.
40. Methods of cleaning and shaping like step back crown down and conventional methods.
 41. Obturation of the root canal system. Requirements of an ideal root canal filling material obturation methods using gutta percha healing after endodontic treatment. Failures in endodontics.
 42. Root canal sealers. Ideal properties classification. Manipulation of root canal sealers.
 43. post endodontic restoration fabrication and components of post core preparation.
 44. smear layer and its importance in endodontics and conservative treatment.
-
45. discoloured teeth and its management. Bleaching agents, vital and non vital bleaching methods.
 46. traumatised teeth classification of fractured teeth. Management of fractured tooth and root. Luxated teeth and its management.
 47. endodontic surgeries indication contraindications, pre operative preparation. Pre medication surgical instruments and techniques apicectomy, retrograde filling, post operative sequelae terphination hemisection, radiscetomy techniques of tooth reimplantation (both intentional and accidental) endodontic implants.
 48. root resorption.
 49. emergency endodontic procedures.
 50. lasers in conservative endodontics (introduction only) practice management
 51. professional association dentist act 1948 and its amendment 1993.
 52. duties towards the govt. Like payments of professional tax, income tax.
 53. financial management of practice
 54. dental material and basic equipment management.
 55. Ethics

2. ORAL & MAXILLOFACIAL SURGERY

AIMS:

To produce a graduate who is competent in performing extraction of teeth under both local and general anaesthesia, prevent and manage related complications, acquire a reasonable knowledge and understanding of the various diseases, injuries, infections occurring in the Oral & Maxillofacial region and offer solutions to such of those common conditions and has an exposure in to the in-patient management of maxillofacial problems.

OBJECTIVES:

a) Knowledge & Understanding:

At the end of the course and the clinical training the graduate is expected to -

1. Able to apply the knowledge gained in the related medical subjects like pathology, microbiology and general medicine in the management of patients with oral surgical problem.
2. Able to diagnose, manage and treat (understand the principles of treatment of) patients with oral surgical problems.
3. Knowledge of range of surgical treatments.
4. Ability to decide the requirement of a patient to have oral surgical specialist opinion or treatment.
5. Understand the principles of in-patient management.
6. Understanding of the management of major oral surgical procedures and principles involved in patient management.
7. Should know ethical issues and communication ability.

b) Skills:

1. A graduate should have acquired the skill to examine any patient with an oral surgical problem in an orderly manner. Be able to understand requisition of various clinical and laboratory investigations and is capable of formulating differential diagnosis.
2. Should be competent in the extraction of teeth under both local and general anaesthesia.
3. Should be able to carry out certain minor oral surgical procedures under L.A. like frenectomy, alveolar procedures & biopsy etc.

- periodontal health. Contact and contour of teeth and restorations matrices tooth separation and wedges.
13. Temporisation or Interim Restoration.
 14. Pin Amalgam Restoration Indication Contra Indication :
Advantages disadvantages of each types of pin methods of placement use of auto matrix.
Failure of pin amalgam restoration.
 15. Management Of Deep Carious Lesions Indirect And Direct Pulp Capping.
 16. Non Carious Destruction's Tooth Structures Diagnosis and Clinical Management
 17. Hyper Sensitive Dentine And Its Management.
 18. Cast Restorations
Indications, contra indications, advantages and disadvantages and materials used for same Class II and Class I cavity preparation for inlays fabrication of wax pattern spurring inverting and casting procedures & casting defects.
 19. Die Materials And Preparation Of Dies.
 20. Gingival Tissue Management For Cast Restoration And Impression Procedures
 21. Recent Cavity Modification Amalgam Restoration.
 22. Differences between Amalgam And Inlay Cavity preparation with note on all the types of Bewels used for Cast Restoration.
 23. Control Of Pain During Operative Procedures.
 24. Treatment Planning For Operative Dentistry Detailed Clinical Examination Radiographic Examination
 25. Vitality Tests, Diagnosis And Treatment Planning And Preparation Of Case Sheet.
 26. Applied Dental Materials.
 1. Biological Considerations.
Evaluation, clinical application and adverse effects of the following materials. Dental cements, Zinc oxide euginol cements zinc phosphate cements, polycarboxylates glass ionomer cements, silicate cement calcium hydroxides varnishes.
 2. Dental amalgam, technical considerations mercury toxicity mercury hygiene.
 3. Composite, Dentine bonding agents, chemical and light curing composites
 4. Rubber base Imp. Materials
 5. Nobel metal alloys & non noble metal alloys
 6. Investment and die materials
 7. Inlay casting waxes 8. Dental porcelain
 9. Aesthetic Dentistry
 27. Endodontics: introduction definition scope and future of endodontics
 28. Clinical diagnostic methods
 29. Emergency endodontic procedures
 30. Pulpal diseases causes, types and treatment .
 31. Periapical diseases: acute periapical abscess, acute periodontal abscess phoeix abscess, chronic alveolar abscess granuloma cysts condensing osteits, external resorption.
 32. Vital pulp therapy: indirect and direct pulp capping pulpotomy different types and medicaments used.
 33. Apexogenesis and apexification or problems of open apex.
 34. Rationale of endodontic treatment case selection indication and contraindications for root canal treatments.
 35. Principles of root canal treatment mouth preparation root canal instruments, hand instruments, power driven instruments, standardisation color coding principle of using endodontic instruments. Sterilisation of root canal instruments and materials rubber dam application.
 36. Anatomy of the pulp cavity: root canals apical foramen. Anomalies of pulp cavities access cavity preparation of anterior and premolar teeth.
 37. Preparation of root canal space . Determination of working length, cleaning and shaping of root canals, irrigating solution chemical aids to instrumentation.
 38. Disinfection of root canal space intracanal medicaments, poly antibiotic paste ross mans paste, mummifying agents. Out line of root canal treatment, bacteriological examinations, culture methods.
 39. Problems during cleaning and shaping of root canal spaces. Perforation and its

Principles, types of movement, force etc.

- (b) Trans-alveolar, surgical or open method, Indications, surgical procedure.

Dental elevators: uses, classification, principles in the use of elevators, commonly used elevators.

Complications of Exodontia -

Complications during exodontia

Common to both maxilla and mandible.

Post-operative complications -

Prevention and management of complications.

6. Impacted teeth:

Incidence, definition, aetiology.

- (a) Impacted mandibular third molar.

Classification, reasons for removal,

Assessment - both clinical & radiological

Surgical procedures for removal.

Complications during and after removal,

Prevention and management.

- (b) Maxillary third molar.

Indications for removal, classification,

Surgical procedure for removal.

- (c) Impacted maxillary canine

Reasons for canine impaction,

Localization, indications for removal,

Methods of management, labial and palatal approach,

Surgical exposure, transplantation, removal etc.

7. Pre-prosthetic Surgery:

Definition, classification of procedures

- (a) Corrective procedures: Alveoloplasty,

Reduction of maxillary tuberosities,

Frenectomies and removal of tori.

- (b) Ridge extension or Sulcus extension procedures

Indications and various surgical procedures

- (c) Ridge augmentation and reconstruction.

Indications, use of bone grafts, Hydroxyapatite

Implants - concept of osseo integration

Knowledge of various types of implants and

surgical procedure to place implants.

8. Diseases of the maxillary sinus

Surgical anatomy of the sinus.

Sinusitis both acute and chronic

Surgical approach of sinus - Caldwell-Luc procedure

Removal of root from the sinus.

Oro-antral fistula - aetiology, clinical features and various surgical methods for closure.

9. Disorders of T.M. Joint

Applied surgical anatomy of the joint.

Dislocation - Types, aetiology, clinical features and management.

Ankylosis - Definition, aetiology, clinical features and management

Myo-facial pain dysfunction syndrome, aetiology, clinical features, management-

Non surgical and surgical.

Internal derangement of the joint.

Arthritis of T.M. Joint.

10. Infections of the Oral cavity

Introduction, factors responsible for infection, course of odontogenic

infections, spread of odontogenic infections through various facial spaces.

Dento-alveolar abscess - aetiology, clinical features and management.

4. Ability to assess, prevent and manage various complications during and after surgery. 5. Able to provide primary care and manage medical emergencies in the dental office.
6. Understanding of the management of major oral surgical problems and principles involved in inpatient management.

DETAILED SYLLABUS

1. Introduction, definition, scope, aims and objectives.
2. Diagnosis in oral surgery:
 - (A) History taking
 - (B) Clinical examination
 - (C) Investigations.
3. Principles of infection control and cross-infection control with particular reference to HIV/AIDS and Hepatitis.
4. Principles of Oral Surgery -
 - a) Asepsis: Definition, measures to prevent introduction of infection during surgery.
 1. Preparation of the patient
 2. Measures to be taken by operator
 3. Sterilisation of instruments - various methods of sterilisation etc.
 4. Surgery set up.
 - b) Painless Surgery:
 1. Pre-anaesthetic considerations. Pre-medication: purpose, drugs used
 2. Anaesthetic considerations -
 - a) Local b) Local with IV sedations
 3. Use of general anaesthetic
 - c) Access:
 - Intra-oral: Mucoperiosteal flaps, principles, commonly used intra oral incisions. Bone Removal: Methods of bone removal.
 - Use of Burs: Advantages & precautions
 - Bone cutting instruments: Principles of using chisel & osteotome.
 - Extra-oral: Skin incisions - principles, various extra-oral incision to expose facial skeleton.
 - a) Submandibular
 - b) Pre auricular
 - c) Incision to expose maxilla & orbit
 - d) Bicoronal incision
 - d) Control of haemorrhage during surgery
 - Normal Haemostasis
 - Local measures available to control bleeding
 - Hypotensive anaesthesia etc.
 - e) Drainage & Debridement
 - Purpose of drainage in surgical wounds
 - Types of drains used
 - Debridement: purpose, soft tissue & bone debridement.
 - f) Closure of wounds
 - Suturing: Principles, suture material, classification, body response to various materials etc.
 - g) Post operative care
 - Post operative instructions
 - Physiology of cold and heat
 - Control of pain - analgesics
 - Control of infection - antibiotics
 - Control of swelling - anti-inflammatory drugs
 - Long term post operative follow up - significance.
 5. Exodontia: General considerations
 - Ideal Extraction.
 - Indications for extraction of teeth
 - Extractions in medically compromised patients.
 - Methods of extraction -
 - (a) Forceps or intra-alveolar or closed method.

- Facial paralysis - Aetiology, clinical features.
Nerve injuries - Classification, neurorrhaphy etc.
17. Cleft Lip and Palate -
Aetiology of the clefts, incidence, classification, role of dental surgeon in the management of cleft patients. Outline of the closure procedures.
18. Medical Emergencies in dental practice -
Primary care of medical emergencies in dental practice particularly -
(a) Cardio vascular (b) Respiratory (c) Endocrine
(d) Anaphylactic reaction (e) Epilepsy (f) Epilepsy
19. Emergency drugs & Intra muscular I.V. Injections -
Applied anatomy, Ideal location for giving these injections, techniques etc.
20. Oral Implantology
21. Ethics

LOCAL ANAESTHESIA:

Introduction, concept of L.A., classification of local anaesthetic agents, ideal requirements, mode of action, types of local anaesthesia, complications.

- Use of Vaso constrictors in local anaesthetic solution -
Advantages, contra-indications, various vaso constrictors used.
Anaesthesia of the mandible -
Pterygomandibular space - boundaries, contents etc.
Inferior Dental Nerve Block - various techniques
Complications
Mental foramen nerve block
Anaesthesia of Maxilla -
Intra - orbital nerve block.
Posterior superior alveolar nerve block
Maxillary nerve block - techniques.

GENERAL ANAESTHESIA -

- Concept of general anaesthesia.
Indications of general anaesthesia in dentistry.
Pre-anaesthetic evaluation of the patient.
Pre-anaesthetic medication - advantages, drugs used.
Commonly used anaesthetic agents.
Complication during and after G.A.
I.V. sedation with Diazepam and Medazolam.
Indications, mode of action, technique etc.
Cardiopulmonary resuscitation
Use of oxygen and emergency drugs. Tracheostomy.

3. ORAL MEDICINE AND RADIOLOGY

AIMS:

- (1) To train the students to diagnose the common disorders of Orofacial region by clinical examination and with the help of such investigations as may be required and medical management of oro-facial disorders with drugs and physical agents.
- (2) To train the students about the importance, role, use and techniques of radiographs/digital radiograph and other imaging methods in diagnosis.
- (3) The principles of the clinical and radiographic aspects of Forensic Odontology.
The syllabus in ORAL MEDICINE & RADIOLOGY is divided into two main parts.
(I) Diagnosis, Diagnostic methods and Oral Medicine (II) Oral Radiology. Again the part ONE is subdivided into three sections. (A) Diagnostic methods (B) Diagnosis and differential diagnosis (C) Oral Medicine & Therapeutics.

- Osteomyelitis of the jaws - definition, aetiology, pre-disposing factors, classification, clinical features and management.
Ludwigs angina - definition, aetiology, clinical features, management and complications.
11. Benign cystic lesions of the jaws -
Definition, classification, pathogenesis.
Diagnosis - Clinical features, radiological, aspiration biopsy, use of contrast media and histopathology.
Management - Types of surgical procedures, Rationale of the techniques, indications, procedures, complications etc.
 12. Tumours of the Oral cavity -
General considerations
Non odontogenetic benign tumours occurring in oral cavity - fibroma, papilloma, lipoma, ossifying fibroma, myxoma etc.
Ameloblastoma - Clinical features, radiological appearance and methods of management.
Carcinoma of the oral cavity -
Biopsy - types
TNM classification.
Outline of management of squamous
Cell carcinoma: surgery, radiation and chemotherapy
Role of dental surgeons in the prevention and early detection of oral cancer.
 13. Fractures of the jaws -
General considerations, types of fractures, aetiology, clinical features and general principles of management.
mandibular fractures - Applied anatomy, classification.
Diagnosis - Clinical and radiological
Management - Reduction closed and open
Fixation and immobilisation methods
Outline of rigid and semi-rigid internal fixation.
Fractures of the condyle - aetiology, classification, clinical features, principles of management.
Fractures of the middle third of the face.
Definition of the mid face, applied surgical anatomy, classification, clinical features and outline of management.
Alveolar fractures - methods of management
Fractures of the Zygomatic complex
Classification, clinical features, indications for treatment, various methods of reduction and fixation.
Complications of fractures - delayed union, non-union and malunion.
 14. Salivary gland diseases -
Diagnosis of salivary gland diseases
Sialography, contrast media, procedure.
Infections of the salivary glands
Sialolithiasis - Sub mandibular duct and gland and parotid duct.
Clinical features, management.
Salivary fistulae
Common tumours of salivary glands like Pleomorphic adenoma including minor salivary glands.
 15. Jaw deformities -
Basic forms - Prognathism, Retrognathism and open bite.
Reasons for correction.
Outline of surgical methods carried out on mandible and maxilla.
 16. Neurological disorders -
Trigeminal neuralgia - definition, aetiology, clinical features and methods of management including surgical.

and Histiocytosis X

- (7) Miscellaneous Disorders: Burkitt lymphoma, sturge – Weber syndrome, CREST syndrome, Rendu-Osler-Weber disease

SECTION (C): ORAL MEDICINE AND THERAPEUTICS.

The following chapters shall be studied in detail including the etiology, pathogenesis, clinical features, investigations, differential diagnosis, management and prevention

- (1) Infections of oral and paraoral structures:
Bacterial: Streptococcal, tuberculosis, syphilis, Vincent's, leprosy, actinomycosis, diphtheria and tetanus
Fungal: *Candida albicans*
Virus: Herpes simplex, herpes zoster, Ramsay Hunt syndrome, measles, herpangina, mumps, infectious mononucleosis, AIDS and hepatitis-B
- (2) Important common mucosal lesions:
White lesions: Chemical burns, leukoedema, leukoplakia, Fordyce spots, stomatitis nicotina palatinus, white sponge nevus, candidiasis, lichen planus, discoid lupus erythematosus
Vesiculo-bullous lesions: Herpes simplex, herpes zoster, herpangina, bullous lichen planus, pemphigus, cicatricial pemphigoid erythema multiforme.
Ulcers: Acute and chronic ulcers
Pigmented lesions: Exogenous and endogenous
Red lesions: Erythroplakia, stomatitis venenata and medicamentosa, erosive lesions and denture sore mouth.
- (3) Cervico-facial lymphadenopathy
- (4) Facial pain:
(i) Organic pain: Pain arising from the diseases of orofacial tissues like teeth, pulp, gingival, periodontal tissue, mucosa, tongue, muscles, blood vessels, lymph tissue, bone, paranasal sinus, salivary glands etc.,
(ii) Pain arising due to C.N.S. diseases:
(a) Pain due to intracranial and extracranial involvement of cranial nerves. (Multiple sclerosis, cerebrovascular diseases, Trotter's syndrome etc.)
(b) Neuralgic pain due to unknown causes: Trigeminal neuralgia, glossopharyngeal neuralgia, sphenopalatine ganglion neuralgia, periodic migrainous neuralgia and atypical facial pain
(iii) Referred pain: Pain arising from distant tissues like heart, spine etc.,
- (5) Altered sensations: Cacogeusia, halitosis
- (6) Tongue in local and systemic disorders: (Aglossia, ankyloglossia, bifid tongue, fissured tongue, scrotal tongue, macroglossia, microglossia, geographic tongue, median rhomboid glossitis, depapillation of tongue, hairy tongue, atrophic tongue, reactive lymphoid hyperplasia, glossodynia, glossopyrosis, ulcers, white and red patches etc.)
- (7) Oral manifestations of:
(i) Metabolic disorders:
(a) Porphyria
(b) Haemochromatosis
(c) Histiocytosis X diseases
(ii) Endocrine disorders:
(a) Pituitary: Gigantism, acromegaly, hypopituitarism
(b) Adrenal cortex: Addison's disease (Hypofunction)
Cushing's syndrome (Hyperfunction)
(c) Parathyroid glands: Hyperparathyroidism.
(d) Thyroid gland: (Hypothyroidism) Cretinism, myxedema
(e) Pancreas: Diabetes
(iii) Nutritional deficiency: Vitamins: riboflavin, nicotinic acid, folic acid Vitamin B12, Vitamin C (Scurvy)
(iv) Blood disorders:
(a) Red blood cell diseases
Deficiency anemias: (Iron deficiency, Plummer – Vinson syndrome, pernicious anemia)
Haemolytic anemias: (Thalassemia, sickle cell anemia, erythroblastosis fetalis) Aplastic anemia

COURSE CONTENT

- (1) Emphasis should be laid on oral manifestations of systemic diseases and ill-effects of oral sepsis on general health.
- (2) To avoid confusion regarding which lesion and to what extent the student should learn and know, this elaborate syllabus is prepared. As certain lesions come under more than one group, there is repetition.

Part-I ORAL MEDICINE AND DIAGNOSTIC AIDS

SECTION (A) - DIAGNOSTIC METHODS.

- (1) Definition and importance of Diagnosis and various types of diagnosis
- (2) Method of clinical examinations.
 - (a) General Physical examination by inspection.
 - (b) Oro-facial region by inspection, palpation and other means
 - (c) To train the students about the importance, role, use of saliva and techniques of diagnosis of saliva as part of oral disease
 - (d) Examination of lesions like swellings, ulcers, erosions, sinus, fistula, growths, pigmented lesions, white and red patches
 - (e) Examination of lymph nodes
 - (f) Forensic examination - Procedures for post-mortem dental examination; maintaining dental records and their use in dental practice and post-mortem identification; jurisprudence and ethics.
- (3) Investigations
 - (a) Biopsy and exfoliative cytology
 - (b) Hematological, Microbiological and other tests and investigations necessary for diagnosis and prognosis

SECTION (B) - DIAGNOSIS, DIFFERENTIAL DIAGNOSIS

While learning the following chapters, emphasis shall be given only on diagnostic aspects including differential diagnosis

- (1) Teeth: Developmental abnormalities, causes of destruction of teeth and their sequelae and discoloration of teeth
- (2) Diseases of bone and Osteodystrophies: Development disorders: Anomalies, Exostosis and tori, infantile cortical hyperostosis, osteogenesis imperfecta, Marfan's syndrome, osteopetrosis. Inflammation - Injury, infection and spread of infection, fascial space infections, osteoradionecrosis. Metabolic disorders - Histiocytosis
Endocrine - Acro-megaly and hyperparathyroidism
Miscellaneous - Paget's disease, Mono and polyostotic fibrous dysplasia, Cherubism.
- (3) Temporomandibular joint: Developmental abnormalities of the condyle. Rheumatoid arthritis, Osteoarthritis, Sub-luxation and luxation.
- (4) Common cysts and Tumors:
CYSTS: Cysts of soft tissue: Mucocele and Ranula
Cysts of bone: Odontogenic and nonodontogenic.

TUMORS:

Soft Tissue:

Epithelial: Papilloma, Carcinoma, Melanoma

Connective tissue: Fibroma, Lipoma, Fibrosarcoma

Vascular: Haemangioma, Lymphangioma

Nerve Tissue: Neurofibroma, Traumatic Neuroma, Neurofibromatosis

Salivary Glands: Pleomorphic adenoma, Adenocarcinoma, Warthin's Tumor, Adenoid cystic carcinoma.

Hard Tissue:

Non Odontogenic: Osteoma, Osteosarcoma, Osteoclastoma, Chondroma, Chondrosarcoma, Central giant cell tumor, and Central haemangioma

Odontogenic: Enameloma, Ameloblastoma, Calcifying Epithelial Odontogenic tumor, Adenomatoid Odontogenic tumor, Periapical cemental dysplasia and odontomas

(5) Periodontal diseases: Gingival hyperplasia, gingivitis, periodontitis, pyogenic granuloma

(6) Granulomatous diseases: Tuberculosis, Sarcoidosis, Midline lethal granuloma, Crohn's Disease

- (ii) Extra-oral: (a) Lateral projections of skull and jaw bones and paranasal sinuses (c) Cephalograms (d) Orthopantomograph (e) Projections of temporomandibular joint and condyle of mandible (f) Projections for Zygomatic arches
- (iii) Specialised techniques: (a) Sialography (b) Xeroradiography (c) Tomography
- (7) Factors in production of good radiographs:
 - (a) K.V.P. and mA. of X-ray machine (b) Filters (c) Collimations (d) Intensifying screens (e) Grids (f) X-ray films (g) Exposure time (h) Techniques (i) Dark room (j) Developer and fixer solutions (k) Film processing
- (8) Radiographic normal anatomical landmarks
- (9) Faculty radiographs and artefacts in radiographs
- (10) Interpretation of radiographs in various abnormalities of teeth, bones and other orofacial tissues
- (11) Principles of radiotherapy of oro-facial malignancies and complications of radiotherapy
- (12) Contrast radiography and basic knowledge of radio-active isotopes
- (13) Radiography in Forensic Odontology - Radiographic age estimation and post-mortem radiographic methods

PRACTICALS / CLINICALS:

1. Student is trained to arrive at proper diagnosis by following a scientific and systematic procedure of history taking and examination of the orofacial region. Training is also imparted in management wherever possible. Training also shall be imparted on saliva diagnostic procedures. Training also shall be imparted in various radiographic procedures and interpretation of radiographs.
2. In view of the above each student shall maintain a record of work done, which shall be evaluated for marks at the time of university examination
3. The following is the minimum of prescribed work for recording
 - (a) Recording of detailed case histories of interesting cases 10
 - (b) Intra-oral radiographs (Periapical, bitewing, occlusal) 25
 - (c) Saliva diagnostic check as routine procedure

4. ORTHODONTICS & DENTAL ORTHOPAEDICS

COURSE OBJECTIVE:

Undergraduate programme in Orthodontics is designed to enable the qualifying dental surgeon to diagnose, analyse and treat common orthodontic problems by preventive, interceptive and corrective orthodontic procedures. The following basic instructional procedures will be adapted to achieve the above objectives.

1. Introduction, Definition, Historical Background, Aims And Objectives Of Orthodontics And Need For Orthodontics Care.
2. Growth And Development: In General
 - a. Definition
 - b. Growth spurts and Differential growth
 - c. Factors influencing growth and Development
 - d. Methods of measuring growth
 - e. Growth theories (Genetic, Sicher's, Scott's, Moss's, Petrovics, Multifactorial)
 - f. Genetic and epigenetic factors in growth
 - g. Cephalocaudal gradient in growth.
3. Morphologic Development Of Craniofacial Structures
 - a. Methods of bone growth
 - b. Prenatal growth of craniofacial structures
 - c. Postnatal growth and development of: cranial base, maxilla, mandible, dental arches and occlusion.

- (b) Polycythemia
- (b) White Blood cell diseases
Neutropenia, cyclic neutropenia, agranulocytosis, infectious mononeucleosis and leukemias
- (c) Haemorrhagic disorders:
Thrombocytopenia, purpura, hemophillia, christmas disease and von willebrand's disease
- (8) Disease of salivary glands:
 - (i) Development disturbances: Aplasia, atresia and aberration
 - (ii) Functional disturbances: Xerostomia, ptyalism
 - (iii) Inflammatory conditions: Nonspecific sialadenitis, mumps, sarcoidosis heerdfort's syndrome (Uveoparotid fever), Necrotising sialometaplasia
 - (iv) Cysts and tumors: Mucocoele, ranula, pleomorphic adenoma, mucoepidermoid carcinoma
 - (v) Miscellaneous: Sialolithiasis, sjogren's syndrome, mikuliez's disease and sialosis
- (9) Dermatological diseases with oral manifestations:
 - (a) Ectodermal dysplasia (b) Hyperkerotosis palmarplantaris with periodontopathy (c) Scleroderma (d) Lichen planus including ginspan's syndrome (e) Lupus erythematosus (f) Pemphigus (g) Erythema multiforme (h) Psoriasis
- (10) Immunological diseases with oral manifestations
 - (a) Leukemia (b) Lymphomas (c) Multiple myeloma (d) AIDS clinical manifestations, opportunistic infections, neoplasms (e) Thrombocytopenia (f) Lupus erythematosus (g) Scleroderma (h) dermatomyositis (i) Submucous fibrosis (j) Rheumatoid arthritis (k) Recurrent oral ulcerations including behcet's syndrome and reiter's syndrome
- (11) Allergy: Local allergic reactions, anaphylaxis, serum sickness (local and systemic allergic manifestations to food drugs and chemicals)
- (12) Foci of oral infection and their ill effects on general health
- (13) Management of dental problems in medically compromised persons:
 - (i) Physiological changes: Puberty, pregnancy and menopause
 - (ii) The patients suffering with cardiac, respiratory, liver, kidney and bleeding disorders, hypertension, diabetes and AIDS. Post-irradiated patients.
- (14) Precancerous lesions and conditions
- (15) Nerve and muscle diseases:
 - (i) Nerves: (a) Neuropraxia (b) Neurotmesis (c) Neuritis (d) Facial nerve paralysis including Bell's palsy, Heerfordt's syndrome, Melkerson Rosenthal syndrome and ramsay hunt syndrome (e) Neuroma (f) Neurofibromatosis (g) Frey's syndrome
 - (ii) Muscles: (a) Myositis ossificans (b) Myofascial pain dysfunction syndrome (c) Trismus
- (16) Forensic odontology:
 - (a) Medicolegal aspects of orofacial injuries
 - (b) Identification of bite marks
 - (c) Determination of age and sex
 - (d) Identification of cadavers by dental appliances, Restorations and tissue remnants
- (17) Therapeutics: General therapeutic measures - drugs commonly used in oral medicine viz., antibiotics, chemotherapeutic agents, anti-inflammatory and analgesic drugs, astringents, mouth washes, styptics, demulcents, local surface anaesthetic, sialogogues, antisialogogues and drugs used in the treatment of malignancy

III ORAL RADIOLOGY

- (1) Scope of the subject and history of origin
- (2) Physics of radiation: (a) Nature and types of radiations (b) Source of radiations (c) Production of X-rays (d) Properties of X-rays (e) Compton effect (f) Photoelectric effect (g) Radiation measuring units
- (3) Biological effects of radiation
- (4) Radiation safety and protection measures
- (5) Principles of image production
- (6) Radiographic techniques:
 - (i) Intra-Oral: (a) Periapical radiographs (Bisecting and parallel technics) (b) Bite wing radiographs (c) Occlusal radiographs

- a. Definition, factors to be considered during treatment planning.
 - b. Model analysis: Pont's, Ashley Howe's, Bolton, Careys, Moyer's Mixed Dentition Analysis
 - c. Methods of gaining space in the arch:- Indications, relative merits and demerits of proximal stripping, arch expansion and extractions
 - d. Extractions in Orthodontics - indications and selection of teeth for extraction.
17. Orthodontic Appliances: General
- a. Requisites for orthodontic appliances
 - b. Classification, indications of Removable and Functional Appliances
 - c. Methods of force application
 - d. Materials used in construction of various orthodontic appliances - uses of stainless steel, technical considerations in curing of acrylic, Principles of welding and soldering, fluxes and antiluxes.
 - e. Preliminary knowledge of acid etching and direct bonding.
18. Ethics

REMOVABLE ORTHODONTIC APPLIANCES

- 1) Components of removable appliances
- 2) Different types of clasps and their uses
- 3) Different types of labial bows and their uses
- 4) Different types of springs and their uses
- 5) Expansion appliances in orthodontics:
 - i) Principles
 - ii) Indications for arch expansion
 - iii) Description of expansion appliances and different types of expansion devices and their uses.
 - iv) Rapid maxillary expansion

FIXED ORTHODONTIC APPLIANCES

- 1. Definition, Indications & Contraindications
- 2. Component parts and their uses
- 3. Basic principles of different techniques: Edgewise, Begg's, straight wire.

EXTRAORAL APPLIANCES

- 1. Headgears
- 2. chin cup
- 3. reverse pull headgears

MYOFUNCTIONAL APPLIANCES

- 1. Definition and principles
- 2. Muscle exercises and their uses in orthodontics
- 3. Functional appliances:
 - i) Activator, Oral screens, Frankels function regulator, bionator twin blocks, lip bumper
 - ii) Inclined planes - upper and lower

18. Orthodontic Management Of Cleft Lip And Palate

19. Principles Of Surgical Orthodontics

Brief knowledge of correction of:

- a. Mandibular Prognathism and Retrognathism
- b. Maxillary Prognathism and Retrognathism
- c. Anterior open bite and deep bite
- d. Cross bite

20. Principle, Differential Diagnosis & Methods Of Treatment Of:

- 1. Midline diastema
- 2. Cross bite
- 3. Open bite
- 4. Deep bite
- 5. Spacing
- 6. Crowding
- 7. Class II - Division 1, Division 2

4. Functional Development Of Dental Arches And Occlusion
 - a. Factors influencing functional development of dental arches and occlusion.
 - b. Forces of occlusion
 - c. Wolfe's law of transformation of bone
 - d. Trajectories of forces
5. Clinical Application Of Growth And Development
6. Malocclusion - In General
 - a. Concept of normal occlusion
 - b. Definition of malocclusion
 - c. Description of different types of dental, skeletal and functional malocclusion.
7. Classification of Malocclusion

Principle, description, advantages and disadvantages of classification of malocclusion by Angle's, Simon's, Lischer's and Ackerman and Proffit's.
8. Normal And Abnormal Function Of Stomatognathic System
9. Etiology Of Malocclusion
 - a. Definition, importance, classification, local and general etiological factors.
 - b. Etiology of following different types of malocclusion:
 - 1) Midline diastema
 - 2) Spacing
 - 3) Crowding
 - 4) Cross-Bite: Anterior/Posterior
 - 5) Class III Malocclusion
 - 6) Class II Malocclusion
 - 7) Deep Bite
 - 8) Open bite
10. Diagnosis And Diagnostic Aids
 - a. Definition, Importance and classification of diagnostic aids
 - b. Importance of case history and clinical examination in orthodontics
 - c. Study Models: - Importance and uses - Preparation and preservation of study models
 - d. Importance of intraoral X-rays in orthodontics
 - e. Panoramic radiographs: - Principles, Advantages, disadvantages and uses
 - f. Cephalometrics: Its advantages, disadvantages
 1. Definition
 2. Description and use of cephalostat
 3. Description and uses of anatomical landmarks lines and angles used in cephalometric analysis
 4. Analysis- Steiner's, Down's, Tweed's, Ricket's-E- line
 - g. Electromyography and its uses in orthodontics
 - h. Wrist X-rays and its importance in orthodontics
11. General Principles In Orthodontic Treatment Planning Of Dental And Skeletal Malocclusions
12. Anchorage In Orthodontics - Definition, Classification, Types and Stability Of Anchorage
13. Biomechanical Principles In Orthodontic Tooth Movement
 - a. Different types of tooth movements
 - b. Tissue response to orthodontic force application
 - c. Age factor in orthodontic tooth movement
14. Preventive Orthodontics
 - a. Definition
 - b. Different procedures undertaken in preventive orthodontics and their limitations.
15. Interceptive Orthodontics
 - a. Definition
 - b. Different procedures undertaken in interceptive orthodontics
 - c. Serial extractions: Definition, indications, contra-indication, technique, advantages and disadvantages.
 - d. Role of muscle exercises as an interceptive procedure
16. Corrective Orthodontics

- a. Down's Analysis
- b. Steiner's Analysis
- c. Tweed's Analysis

PRACTICAL TRAINING DURING FINAL YEAR B.D.S.

1. Adam's Clasp on Anterior teeth Gauge 0.7mm
 2. Modified Adam's Clasp on upper arch Gauge 0.7mm
 3. High Labial bow with Apron spring on upper arch
(Gauge of Labial bow - 0.9mm, Apron spring - 0.3mm)
 4. Coffin spring on upper arch Gauge 1mm
- Appliance Construction in Acrylic
1. Upper & Lower Hawley's Appliance
 2. Upper Hawley's with Anterior bite plane
 3. Upper Habit breaking Appliance
 4. Upper Hawley's with Posterior bite plane with 'Z' Spring
 5. Construction of Activator
 6. Lower inclined plane/Catalan's Appliance
 7. Upper Expansion plate with Expansion Screw

5. PAEDIATRIC & PREVENTIVE DENTISTRY

THEORY:

1. INTRODUCTION TO PEDODONTICS & PREVENTIVE DENTISTRY.
 - Definition, Scope, Objectives and Importance.
2. GROWTH & DEVELOPMENT:
 - Importance of study of growth and development in edodontics.
 - Prenatal and Postnatal factors in growth & development.
 - Theories of growth & development.
 - Development of maxilla and mandible and related age changes.
3. DEVELOPMENT OF OCCLUSION FROM BIRTH THROUGH ADOLESCENCE. - Study of variations and abnormalities.
4. DENTAL ANATOMY AND HISTOLOGY:
 - Development of teeth and associated structures.
 - Eruption and shedding of teeth.
 - Teething disorders and their management.
 - Chronology of eruption of teeth.
 - Differences between deciduous and permanent teeth.
 - Development of dentition from birth to adolescence.
 - Importance of first permanent molar.
5. DENTAL RADIOLOGY RELATED TO PEDODONTICS.
6. ORAL SURGICAL PROCEDURES IN CHILDREN.
 - Indications and contraindications of extractions of primary and permanent teeth in children.
 - Knowledge of Local and General Anesthesia.
 - Minor surgical procedures in children.
7. DENTAL CARIES:
 - Historical background.
 - Definition, aetiology & pathogenesis.
 - Caries pattern in primary, young permanent and permanent teeth in children.
 - Rampant caries, early childhood caries and extensive caries:
 - Definition, aetiology, Pathogenesis, Clinical features, Complications & Management
 - Role of diet and nutrition in Dental Caries.
 - Dietary modifications & Diet counseling.
 - Caries activity, tests, caries prediction, caries susceptibility & their clinical application.
8. GINGIVAL & PERIODONTAL DISEASES IN CHILDREN.
 - Normal gingiva & periodontium in children.

8. Class III Malocclusion - True and Pseudo Class III

21. Retention And Relapse

Definition, Need for retention, Causes of relapse, Methods of retention, Different types of retention devices, Duration of retention, Theories of retention.

CLINICALS AND PRACTICALS IN ORTHODONTICS

PRACTICAL TRAINING DURING II YEAR B.D.S.

I. Basic wire bending exercises Gauge 22 or 0.7mm

1. Straightening of wires (4 Nos.)
2. Bending of an equilateral triangle
3. Bending of a rectangle
4. Bending of a square
5. Bending of a circle
6. Bending of U,V.

II. Construction of Clasps (Both sides upper/lower) Gauge 22 or 0.7mm

1. 3/4 Clasp (C-Clasp)
2. Full Clasp (Jackson's Crib)
3. Adam's Clasp
4. Triangular Clasp

III. Construction of Springs (on upper both sides) Gauge 24 or 0.5mm

1. Finger Spring
2. Single Cantilever Spring
3. Double Cantilever Spring (Z-Spring)
4. T-Springs on premolars

IV. Construction of Canine retractors Gauge 23 or 0.6mm

1. U - Loop canine retractor
(Both sides on upper & lower)
2. Helical canine retractor
(Both sides on upper & lower)
3. Buccal canine retractor:
- Self supported buccal canine retractor
with
 - a) Sleeve - 5mm wire or 24 gauge
 - b) Sleeve - 19 gauge needle on any one side.
4. Palatal canine retractor on upper both sides
Gauge 23 or 0.6mm

V. Labial Bow

Gauge 22 or 0.7mm

One on both upper and lower

CLINICAL TRAINING DURING III YEAR B.D.S.

NO. EXERCISE

01. Making upper Alginate impression
02. Making lower Alginate impression
03. Study Model preparation
04. Model Analysis
 - a. Pont's Analysis
 - b. Ashley Howe's Analysis
 - c. Carey's Analysis
 - d. Bolton's Analysis
 - e. Moyer's Mixed Dentition Analysis

CLINICAL TRAINING DURING FINAL YEAR B.D.S.

NO. EXERCISE

01. Case History taking
02. Case discussion
03. Discussion on the given topic
04. Cephalometric tracings

20. PREVENTIVE DENTISTRY:

- Definition.
- Principles & Scope.
- Types of prevention.
- Different preventive measures used in Pediatric Dentistry including pit and fissure sealants and caries vaccine.

21. DENTAL HEALTH EDUCATION & SCHOOL DENTAL HEALTH PROGRAMMES.

22. FLUORIDES:

- Historical background.
- Systemic & Topical fluorides.
- Mechanism of action.
- Toxicity & Management.
- Defluoridation techniques.

23. CASE HISTORY RECORDING:

- Outline of principles of examination, diagnosis & treatment planning.

24. SETTING UP OF PEDODONTIC CLINIC.

25. ETHICS.

B. PRACTICALS:

Following is the recommended clinical quota for under-graduate students in the subject of pediatric & preventive dentistry.

1. Restorations – Class I & II only : 45
2. Preventive measures e.g. Oral Prophylaxis – 20.
3. Fluoride applications – 10
4. Extractions – 25
5. Case History Recording & Treatment Planning – 10
6. Education & motivation of the patients using disclosing agents. Educating patients about oral hygiene measures like tooth brushing, flossing etc.

6. PUBLIC HEALTH DENTISTRY

GOAL:

To prevent and control oral diseases and promote oral health through organized community efforts

OBJECTIVES: Knowledge:

At the conclusion of the course the student shall have a knowledge of the basis of public health, preventive dentistry, public health problems in India, Nutrition, Environment and their role in health, basics of dental statistics, epidemiological methods, National oral health policy with emphasis on oral health policy.

Skill and Attitude:

At the conclusion of the course the students shall have require at the skill of identifying health problems affecting the society, conducting health surveys, conducting health education classes and deciding health strategies. Students should develop a positive attitude towards the problems of the society and must take responsibilities in providing health.

Communication abilities:

At the conclusions of the course the student should be able to communicate the needs of the community efficiently, inform the society of all the recent methodologies in preventing oral disease Syllabus:

1. Introduction to Dentistry: Definition of Dentistry, History of dentistry, Scope, aims and objectives of Dentistry.
2. Public Health:
 - i. Health & Disease: - Concepts, Philosophy, Definition and Characteristics
 - ii. Public Health: - Definition & Concepts, History of public health
 - iii. General Epidemiology: - Definition, objectives, methods
 - iv. Environmental Health: - Concepts, principles, protection, sources, purification environmental sanitation of water disposal of waste sanitation, then role in mass disorder
 - v. Health Education: - Definition, concepts, principles, methods, and health education aids

- Definition, aetiology & Pathogenesis.
 - Prevention & Management of gingival & Periodontal diseases.
9. CHILD PSYCHOLOGY:
- Definition.
 - Theories of child psychology.
 - Psychological development of children with age.
 - Principles of psychological growth & development while managing child patient.
 - Dental fear and its management.
 - Factors affecting child's reaction to dental treatment.
10. BEHAVIOUR MANAGEMENT:
- Definitions.
 - Types of behaviour encountered in the dental clinic.
 - Non-pharmacological & pharmacological methods of Behaviour Management.
11. PEDIATRIC OPERATIVE DENTISTRY:
- Principles of Pediatric Operative Dentistry.
 - Modifications required for cavity preparation in primary and young permanent teeth.
 - Various Isolation Techniques.
 - Restorations of decayed primary, young permanent and permanent teeth in children using various restorative materials like Glass Ionomer, Composites & Silver Amalgam. Stainless steel, Polycarbonate & Resin Crowns.
12. PEDIATRIC ENDODONTICS
- Principles & Diagnosis.
 - Classification of Pulpal Pathology in primary, young permanent & permanent teeth.
 - Management of Pulpally involved primary, young permanent & permanent teeth.
 - Pulp capping – direct & indirect.
 - Pulpotomy
 - Pulpectomy
 - Apexogenesis
 - Apexification
 - Obturation Techniques & material used for primary, young permanent & Permanent teeth in children.
13. TRAUMATIC INJURIES IN CHILDREN:
- Classifications & Importance.
 - Sequelae & reaction of teeth to trauma.
 - Management of Traumatized teeth.
14. PREVENTIVE & INTERCEPTIVE ORTHODONTICS:
- Definitions.
 - Problems encountered during primary and mixed dentition phases & their management.
 - Serial extractions.
 - Space management.
15. ORAL HABITS IN CHILDREN:
- Definition, Aetiology & Classification.
 - Clinical features of digit sucking, tongue thrusting, mouth breathing & various other secondary habits.
 - Management of oral habits in children.
16. DENTAL CARE OF CHILDREN WITH SPECIAL NEEDS:
- Definition, Aetiology, Classification, Behavioural and Clinical features & Management of children with:
 - Physically handicapping conditions.
 - Mentally compromising conditions.
 - Medically compromising conditions.
 - Genetic disorders.
17. CONGENITAL ABNORMALITIES IN CHILDREN:
- Definition, Classification, Clinical features & Management.
18. DENTAL EMERGENCIES IN CHILDREN & THEIR MANAGEMENT.
19. DENTAL MATERIALS USED IN PEDIATRIC DENTISTRY.

- sewage water
- h) Visit to schools-to assess the oral health status of school children, emergency treatment and health education including possible preventive care at school (tooth brushing technique demonstration and oral rinse programme etc.)
- i) Visit to institution for the care of handicapped, physically, mentally, or medically compromised patients
- j) Preventive dentistry: in the department application of pit and fissure sealants, fluoride gel application procedure, A. R. T., Comprehensive health for 5 pts at least 2 patients

The colleges are encouraged to involve in the N.S.S. programme for college students for carrying out social work in rural areas

SUGGESTED INTERNSHIP PROGRAMME IN COMMUNITY DENTISTRY:

I. AT THE COLLEGE:

Students are posted to the department to get training in dental practice management.

- (a) Total oral health care approach- in order to prepare the new graduates in their approach to diagnosis, treatment planning, cost of treatment, prevention of treatment on schedule, recall maintenance of records etc. at least 10 patients (both children and adults of all types posting for at least one month).
- (b) The practice of chair side preventive dentistry including oral health education

II. AT THE COMMUNITY ORAL HEALTH CARE CENTRE (ADOPTED BY THE DENTAL COLLEGE IN RURAL AREAS)

Graduates posted for at least on month to familiarize in:

- (a) Survey methods, analysis and presentation of oral health assessment of school children and community independently using WHO basic oral health survey methods.
- (b) Participation in rural oral health education programmes
- (c) Stay in the village to understand the problems and life in rural areas

III. DESIRABLE: Learning use of computers-at least basic programme.

Examination Pattern

- I. Index: Case History
 - b) Oral hygiene indices simplified- Green and Vermilion
 - c) Silness and Loe index for Plaque
 - d) Loe and Silness index for gingival
 - e) CPI
 - f) DMF: T and S, df:t and s
 - g) Deans fluoride index
- II. Health Education
 - 1. Make one - Audio visual aid
 - 2. Make a health talk
- III. Practical work
 - 1. Pit and fissure sealant
 - 2. Topical fluoride application

7. PERIODONTOLOGY

OBJECTIVES:

The student shall acquire the skill to perform dental scaling ,diagnostic tests of periodontal diseases; to use the instruments for periodontal therapy and maintenance of the same.

The student shall develop attitude to impart the preventive measures namely, the prevention of periodontal diseases and prevention of the progress of the disease. The student shall also develop an attitude to perform the treatment with full aseptic precautions; shall develop an attitude to prevent iatrogenic diseases; to conserve the tooth to the maximum possible time by maintaining periodontal health and to refer the patients who require specialist's care.

- 1. Introduction: Definition of Periodontology, Periodontics, Periodontia, Brief historical background,

- vi. Public Health Administration: - Priority, establishment, manpower, private practice management, hospital management.
- vii. Ethics and Jurisprudence: Professional liabilities, negligence, malpractice, consents, evidence, contracts, and methods of identification in forensic dentistry.
- viii. Nutrition in oral diseases
- ix. Behavioral science: Definition of sociology, anthropology and psychology and their in dental practice and community.
- x. Health care delivery system: Center and state, oral health policy, primary health care, national programmes, health organizations.

Dental Public Health:

- 1. Definition and difference between community and clinical health.
- 2. Epidemiology of dental diseases-dental caries, periodontal diseases, malocclusion, dental fluorosis and oral cancer.
- 3. Survey procedures: Planning, implementation and evaluation, WHO oral health survey methods 1997, indices for dental diseases.
- 4. Delivery of dental care: Dental auxiliaries, operational and non-operational, incremental and comprehensive health care, school dental health.
- 5. Payments of dental care: Methods of payments and dental insurance, government plans
- 6. Preventive Dentistry- definition, Levels, role of individual, community and profession, fluorides in dentistry, plaque control programmes.

Research Methodology and Dental Statistics

- 1. Health Information: - Basic knowledge of Computers, MS Office, Window 2000, Statistical Programmes
- 2. Research Methodology: -Definition, types of research, designing a written protocol
- 3. Bio-Statistics: - Introduction, collection of data, presentation of data, Measures of Central tendency, measures of dispersion, Tests of significance, Sampling and sampling techniques- types, errors, bias, blind trails and calibration.

Practice Management

- 1. Place and locality
- 2. Premises & layout
- 3. Selection of equipments
- 4. Maintenance of records/accounts/audit.

Dentist Act 1948 with amendment.

Dental Council of India and State Dental Councils

Composition and responsibilities.

Indian Dental Association

Head Office, State, local and branches.

PRACTICALS/CLINICALS/FIELD PROGEAMME IN COMMUNITY DENTISTRY:

These exercises designed to help the student in IV year students:

- 1. Understand the community aspects of dentistry
- 2. To take up leadership role in solving community oral health programme

Exercises:

- a) Collection of statistical data (demographic) on population in India, birth rates, morbidity and mortality, literacy, per capita income
- b) Incidence and prevalence of common oral diseases like dental caries, periodontal disease, oral cancer, fluorosis at national and international levels
- c) Preparation of oral health education material posters, models, slides, lectures, play acting skits etc.
- d) Oral health status assessment of the community using indices and WHO basic oral health survey methods
- e) Exploring and planning setting of private dental clinics in rural, semi urban and urban locations, availment of finances for dental practices-preparing project report.
- f) Visit to primary health center-to acquaint with activities and primary health care delivery
- g) Visit to water purification plant/public health laboratory/ center for treatment of western and

9.	Pocket	Factors that modify the spread	
		Definition, signs and symptoms, classification, pathogenesis, histopathology, root surface changes and contents of the pocket	2
10.	Etiology	- Dental Plaque (Biofilm)	5
		- Definition, New concept of biofilm	
		- Types, composition, bacterial colonization, growth, maturation & disclosing agents	
		- Role of dental plaque in periodontal diseases	
		- Plaque microorganisms in detail and bacteria associated with periodontal diseases	
		- Plaque retentive factors	
		- Materia alba	
		- Food debris	
		- Calculus	
		- Definition	
		- Types, composition, attachment, theories of formation	
		- Role of calculus in disease	
		Food Impaction	
		- Definition	
		- Types, Etiology	
		- Hirschfelds' classification	
		- Signs, symptoms & sequelae of treatment	
		Trauma from occlusion	
		- Definition, Types	
		- Histopathological changes	
		- Role in periodontal disease	
		- Measures of management in brief	
		Habits	
		- Their periodontal significance	
		- Bruxism & parafunctional habits, tongue thrusting, lip biting, occupational habits	
		IATROGENIC FACTORS	
		Conservative Dentistry	
		- Restorations	
		- Contact point, marginal ridge, surface roughness, overhanging restorations, interface between restoration and teeth	
		Prosthodontics	
		- Interrelationship	
		- Bridges and other prosthesis, pontics (types), surface contour, relationships of margins to the periodontium, Gingival protection theory, muscle action theory & theory of access to oral hygiene.	
		Orthodontics	
		- Interrelationship, removable appliances & fixed appliances	
		- Retention of plaque, bacterial changes	
		Systemic diseases	
		- Diabetes, sex hormones, nutrition (Vit. C & proteins)	
		- AIDS & periodontium	
		- Hemorrhagic diseases, Leukemia, clotting factor disorders, PMN disorders	
11.	Risk factors	Definition. Risk factors for periodontal diseases	1
12.	Host response	Mechanism of initiation and progression of periodontal diseases	3
		- Basic concepts about cells, Mast cells, neutrophils, macrophages, lymphocytes, immunoglobulins, complement system, immune mechanisms & cytokines in brief	

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Extension
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	(osseous grafts with classification of grafts)	
	- Healing responses	
	- Other regenerative procedures; root conditioning	
	- Guided tissue regeneration	
20. Mucogingival surgery & periodontal plastic surgeries	Definition Mucogingival problems: etiology, classification of gingival recession (P.D. Miller Jr. and Sullivan and Atkins) Indications & objectives Gingival extension procedures: lateral pedicle graft, frenectomy, frenotomy Crown lengthening procedures Periodontal microsurgery in brief	3
21. Splints	- Periodontal splints - Purpose & classification - Principles of splinting	1
22. Hypersensitivity	Causes, Theories & management	1
23. Implants	Definition, types, scope & biomaterials used. Periodontal considerations: such as implant-bone interface, implant-gingiva interface, implant failure, peri-implantitis & management	1
24. Maintenance phase (SPT)	- Aims, objectives, and principles - Importance - Procedures - Maintenance of implants	1
25. Pharmaco-therapy	- Periodontal dressings - Antibiotics & anti-inflammatory drugs - Local drug delivery systems	2
26. Periodontal management of medically	Topics concerning periodontal management of medically compromised patients	1
27. Inter-disciplinary care	- Pulpo-periodontal involvement - Routes of spread of infection - Simons' classification - Management	1
28. Systemic effects of periodontal diseases in brief	Cardiovascular diseases, Low birth weight babies etc.	1
29. Infection control protocol	Sterilization and various aseptic procedures	1
30. Ethics		

TUTORIALS DURING CLINICAL POSTING;

1. Infection control
2. Periodontal instruments
3. Chair position and principles of instrumentation
4. Maintenance of instruments (sharpening)
5. Ultrasonic, Piezoelectric and sonic scaling – demonstration of technique
6. Diagnosis of periodontal disease and determination of prognosis
7. Radiographic interpretation and lab investigations

	- Stages in gingivitis-Initial, early, established & advanced	
	- Periodontal disease activity, continuous paradigm, random burst & asynchronous multiple burst hypothesis	
13. Periodontitis	- Etiology, histopathology, clinical signs & symptoms, diagnosis and treatment of adult periodontitis	6
	- Periodontal abscess; definition, classification, pathogenesis, differential diagnosis and treatment	
	- Furcation involvement, Glickmans' classification, prognosis and management	
	- Rapidly progressive periodontitis	
	- Juvenile periodontitis: Localized and generalized - Post-juvenile periodontitis	
	- Periodontitis associated with systemic diseases	
	- Refractory periodontitis	
14. Diagnosis	- Routine procedures, methods of probing, types of probes, (According to case history)	2
	- Halitosis: Etiology and treatment.	
	- Mention advanced diagnostic aids and their role in brief	
15. Prognosis	- Definition, types, purpose and factors to be taken into consideration	1
16. Treatment plan	- Factors to be considered	
17. Periodontal therapy	A. General principles of periodontal therapy. Phase I, II, III, IV therapy.	3
	Definition of periodontal regeneration, repair, new attachment and reattachment.	
	B. Plaque control	
	i. Mechanical tooth brushes, interdental cleaning aids, dentifrices	
	ii. Chemical; classification and mechanism of action of each & pocket irrigation	
18. Pocket eradication Procedures	- Scaling and root planing:	5
	- Indications	
	- Aims & objectives	
	- Healing following root planning	
	- Hand instruments, sonic, ultrasonic & piezo-electric scalers	
	- Curettage & present concepts	
	- Definition	
	- Indications	
	- Aims & objectives	
	- Procedures & healing response - Flap surgery	
	- Definition	
	- Types of flaps, Design of flaps, papilla preservation	
	- Indications & contraindications	
	- Armamentarium	
	- Surgical procedure & healing response	
19. Osseous Surgery	Osseous defects in periodontal disease	2
	- Definition	
	- Classification	
	- Surgery: resective, additive osseous surgery	

- d) Impression materials.
- e) Impression techniques.
- f) Maxillary and mandibular impression procedures.
 - i. Preliminary impressions.
 - ii. Final impressions.
- g) Laboratory procedures involved with impression making (Beading & Boxing, and cast preparation).
- H. Record bases and occlusion rims- in detail.
 - a) Materials & techniques.
 - b) Useful guidelines and ideal parameters.
 - c) Recording and transferring bases and occlusal rims.
- I. Biological consideration in jaw relation & jaw movements - craniomandibular relations.
 - a) Mandibular movements.
 - b) Maxillo -mandibular relation including vertical and horizontal jaw relations.
 - c) Concept of occlusion- discuss in brief.
- J. Relating the patient to the articulator.
 - a) Face bow types & uses- discuss in brief.
 - b) Face bow transfer procedure - discuss in brief.
- K. Recording maxillo mandibular relation.
 - a) Vertical relations.
 - b) Centric relation records. c) Eccentric relation records. d) Lateral relation records.
- L. Tooth selection and arrangement.
 - a) Anterior teeth.
 - b) Posterior teeth.
 - c) Esthetic and functional harmony.
- M. Relating inclination of teeth to concept of occlusion- in brief.
 - a) Neurocentric concept.
 - b) Balanced occlusal concept.
- N. Trial dentures.
- O. Laboratory procedures.
 - a) Wax contouring.
 - b) Investing of dentures.
 - c) Preparing of mold.
 - d) Preparing & packing acrylic resin.
 - e) Processing of dentures.
 - f) Recovery of dentures.
 - g) Lab remount procedures.
 - h) Recovering the complete denture from the cast.
 - i) Finishing and polishing the complete denture.
 - j) Plaster cast for clinical denture remount procedure.
- P. Denture insertion.
 - a) Insertion procedures.
 - b) Clinical errors.
 - c) Correcting occlusal disharmony.
 - d) Selective grinding procedures.
- Q. Treating problems with associated denture use – discuss in brief (tabulation/flow-chart form).
- R. Treating abused tissues - discuss in brief.
- S. Relining and rebasing of dentures- discuss in brief.
- T. Immediate complete dentures construction procedure- discuss in brief.
- U. The single complete denture- discuss in brief.
- V. Overdentures denture- discuss in brief.
- W. Dental implants in complete denture - discuss in brief.

Note : It is suggested that the above mentioned topics be dealt with wherever appropriate in the following

8. Motivation of patients- oral hygiene instructions

Students should be able to record a detailed periodontal case history, determine diagnosis, prognosis and plan treatment. Student should perform scaling, root planning local drug delivery and SPT. Shall be given demonstration of all periodontal surgical procedures.

DEMONSTRATIONS:

1. History taking and clinical examination of the patients
2. Recording different indices
3. Methods of using various scaling and surgical instruments
4. Polishing the teeth
5. Bacterial smear taking
6. Demonstration to patients about different oral hygiene aids
7. Surgical procedures- gingivectomy, gingivoplasty, and flap operations
8. Follow up procedures, post operative care and supervision

REQUIREMENTS:

1. Diagnosis, treatment planning and discussion and total periodontal treatment - 25 cases
2. Dental scaling, oral hygiene instructions - 50 complete cases/ equivalent
3. Assistance in periodontal surgery - 5 cases
4. A work record should be maintained by all the students and should be submitted at the time of examination after due certification from the head of the department.

Students should have to complete the work prescribed by the concerned department from time to time and submit a certified record for evaluation.

8 PROSTHODONTICS AND CROWN & BRIDGE

Complete Dentures

- A. Applied Anatomy and Physiology.
 1. Introduction
 2. Biomechanics of the edentulous state.
 3. Residual ridge resorption.
- B. Communicating with the patient
 1. Understanding the patients.
 1. Mental attitude.
 2. Instructing the patient.
- C. Diagnosis and treatment planning for patients-
 1. With some teeth remaining.
 2. With no teeth remaining.
 - a) Systemic status.
 - b) Local factor.
 - c) The geriatric patient.
 - d) Diagnostic procedures.
- D. Articulators- discussion
- E. Improving the patient's denture foundation and ridge relation -an overview.
 - a) Pre-operative examination.
 - b) Initial hard tissue & soft tissue procedure.
 - c) Secondary hard & soft tissue procedure.
 - d) Implant procedure.
 - e) Congenital deformities.
 - f) Postoperative procedure.
- F. Principles of Retention, Support and Stability
- G. Impressions - detail.
 - a) Muscles of facial expression.
 - b) Biologic considerations for maxillary and mandibular impression including anatomy landmark and their interpretation.
 - c) Impression objectives.

3. Articulators = in brief.
4. Treatment planning for single tooth restorations.
5. Treatment planning for the replacement of missing teeth including selection and choice of abutment teeth.
6. Fixed partial denture configurations.
7. Principles of tooth preparations.
8. Preparations for full veneer crowns – in detail.
9. Preparations for partial veneer crowns – in brief.
10. Provisional Restorations
11. Fluid Control and Soft Tissue Management
12. Impressions
13. Working Casts and Dies
14. Wax Patterns
15. Pontics and Edentulous Ridges
16. Esthetic Considerations
17. Finishing and Cementation

Topics To Be Covered In Brief -

1. Solder Joints and Other Connectors
2. All - Ceramic Restorations
3. Metal - Ceramic Restorations
4. Preparations of intracoronar restorations. 5. Preparations for extensively damaged teeth.
6. Preparations for periodontally weakened teeth
7. The Functionally Generated Path Technique
8. Investing and Casting
9. Resin - Bonded Fixed Partial Denture

Note : It is suggested that the above mentioned topics be dealt with wherever appropriate in the following order so as to cover –

1. Definition
2. Diagnosis(of the particular situation /patient selection /treatment planning)
3. Types / Classification
4. Materials
5. Methodology – Lab /Clinical
6. Advantages & disadvantages
7. Indications, contraindications
8. Maintenance Phase

order so as to cover -

1. Definition
2. Diagnosis (of the particular situation/patient selection/treatment planning)
3. Types / Classification
4. Materials
5. Methodology - Lab /Clinical
6. Advantages & disadvantages
7. Indications, contraindications
8. Maintenance Phase
9. Oral Implantology
10. Ethics

Removable Flexible Dentures

1. Introduction
 - Terminologies and scope
2. Classification.
3. Examination, Diagnosis & Treatment planning & evaluation of diagnostic data.
4. Components of a removable partial denture.
 - Major connectors,
 - minor connectors,
 - Rest and rest seats.
5. Components of a Removable Partial Denture.
 - Direct retainers,
 - Indirect retainers,
 - Tooth replacement.
6. Principles of Removable Partial Denture Design.
7. Survey and design - in brief.
 - Surveyors.
 - Surveying.
 - Designing.
8. Mouth preparation and master cast.
9. Impression materials and procedures for removable partial dentures.
10. Preliminary jaw relation and esthetic try-in for some anterior replacement teeth.
11. Laboratory procedures for framework construction-in brief.
12. Fitting the framework - in brief.
13. Try-in of the partial denture - in brief.
14. Completion of the partial denture - in brief.
15. Inserting the Removable Partial Denture - in brief.
16. Postinsertion observations.
17. Temporary Acrylic Partial Dentures.
18. Immediate Removable Partial Denture.
19. Removable Partial Dentures opposing Complete denture.

Note : It is suggested that the above mentioned topics be dealt with wherever appropriate in the following order so as to cover -

1. Definition
2. Diagnosis (of the particular situation /patient selection /treatment planning)
3. Types / Classification
4. Materials
5. Methodology - Lab /Clinical
6. Advantages & disadvantages
7. Indications, contraindications
8. Maintenance Phase

Fixed Partial Dentures

Topics To Be Covered In Detail -

1. Introduction
2. Fundamentals of occlusion - in brief.

- F. Parotid gland
- G. Infratemporal fossa, pterygo palatine fossa, muscles of mastication, temporomandibular joint
- H. Nasal cavity
- I. Paranasal sinuses
- J. Oral cavity- tongue, soft and hard palate
- K. Pharynx , palatine tonsil , auditory tube, Larynx
- L. Osteology: adult skull, external features and interior of skull, individual skull bones, hyoid bones and cervical vertebrae

3) Thorax:

- A. Thoracic wall
- B. Pleural cavity and pleura
- C. Mediastinum
- D. Lungs : surfaces, relations, blood supply and bronchopulmonary segments
- E. Heart : pericardium, external features, chambers, and blood supply
- F. Diaphragm

4) Clinical Procedures with anatomical background:

- A. Intra muscular injections :
Demonstrations on dissected person
Deltoid- relation to axillary nerve
Gluteus maximus- relation to sciatic nerve
- B. Intravenous injections and Venesection:
Demonstration of veins in dissected specimen and on a living person:
 1. Median cubital vein
 2. Cephalic vein
 3. Basilic vein
 4. Long saphenous vein
- C. Arterial Pulsations in dissected bodies and on a living person:
 1. Superficial temporal
 2. Facial
 3. Carotid
 4. Axillary
 5. Brachial
 6. Radial 7. Ulnar
 8. Femoral
 9. Popliteal
 10. Dorsalis pedis
- D. Lumbar Puncture : demonstration on a dissected specimen of spinal cord , cauda equina and at intervertebral space

Imaging modalities, X ray skull, Paranasal sinuses, CT scan and MRI of skull, orthopantomograph of mandible

Mechanism of thorax
Abdominal organs and pelvic organs Peritoneal cavity

Angiography and imaging of coronary vessels

Brief osteology of femur, muscles of arm. Brief osteology of bones of gluteal region, gluteal muscles and structures under cover of gluteus maximus.

Brief study of anatomical landmarks with reference to peripheral pulsations.

Brief study of anatomical landmarks of back.

PRACTICAL AND CLINICAL WORK DETAILS

GENERAL HUMAN ANATOMY INCLUDING EMBRYOLOGY AND HISTOLOGY

1. Outline of course content:

1. General Anatomy: Anatomical terms, planes, brief outline of different systems of body.
2. Regional anatomy of head and neck with osteology of bones of head and neck with emphasis on topics of dental and maxillofacial importance
3. General disposition of thoracic, abdominal and pelvic organs
4. Clinical anatomy: sites of intramuscular injections, intravascular injections, lumbar puncture
5. General Embryology and systemic embryology with reference to development of head and neck
6. Histology of basic tissues, head and neck structures and alimentary, respiratory, excretory systems, endocrine glands and gonads.
7. Medical genetics

2. Further details of the course content:

Core Topics Must Know	Collateral topics Desirable to Know
<p>1) General Anatomy:</p> <ul style="list-style-type: none"> A. Anatomical terms B. Skin , superficial fascia and deep fascia C. Cardiovascular system , portal system, collateral circulation, arteries D. Lymphatic system including lymphatic organs, and regional drainage E. Skletal system: classification of bones, ossification and growth of bones. F. Muscular system: classification of muscles. G. Arthrology : classification of joints H. Nervous system: Central , peripheral and autonomic nervous system. <p>2) Head and Neck :</p> <ul style="list-style-type: none"> A. Scalp , face, temple, lacrimal apparatus B. Neck : Deep facia of neck , facial neck spaces , triangles of neck, deep structures in the neck C. Cranial cavity : meninges, dural folds, dural venous sinuses, parts of brain, ventricles, cranial nerves attached to brain, pituitary gland D. Cranial nerves - III, IV, V, VI, VII, IX, XII in detail. E. Orbital cavity- bony orbit, ocular muscles, supports of eye ball, nerves and vessels of orbit 	<p>Internal capsule, blood supply of brain, circle of Willis, Ventricles, corpus callosum</p>

PROCEDURES

1. Study of compound microscope
2. Collection of blood
3. Enumeration of Red Blood Cells
4. Enumeration of White Blood Cells
5. Differential leucocyte counts
6. Determination of Haemoglobin
7. Determination of blood group
8. Determination of bleeding time and clotting time
9. Examination of arterial pulse
10. Recording of arterial blood pressure.

DEMONSTRATION:

1. Determination of packed cell volume and erythrocyte sedimentation rate
2. Determination of specific gravity of blood
3. Determination of erythrocyte fragility
4. Determination of vital capacity and timed vital capacity
5. Electrocardiography: Demonstration of recording of normal Electrocardiogram
6. Clinical examination of cardiovascular and respiratory system.

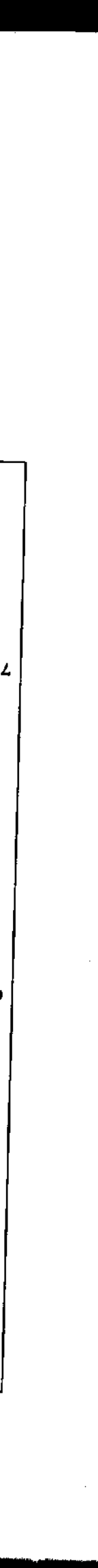
BIOCHEMISTRY

I year BDS is dedicated to learning, understanding and practising the basic sciences of Dentistry and its application in biochemical reactions in the human cells.

PRACTICALS/DEMONSTRATIONS/EXPLANATIONS:	Contact hours
1. Qualitative analysis of carbohydrates	4
2. Color reactions of proteins and amino acids	4
3. Identification of nonprotein nitrogen substance (Explanation)	4
4. Normal constituents of urine	4
5. Abnormal constituents of urine	4
6. Analysis of saliva including amylase (Explanation)	2
7. Analysis of milk Quantitative estimations (Explanation)	2
8. Titrable acidity and ammonia in urine (Explanation)	2
9. Free and total acidity in gastric juice (Explanation)	2
10. Blood glucose estimation (Demonstration)	2
11. Serum total protein estimation (Explanation)	2
12. Urine creatinine estimation (Demonstration)	2
13. Paper electrophoresis charts/clinical data evaluation (Explanation)	2
14. Glucose tolerance test profiles (Explanation)	2
15. Serum lipid profiles (Explanation)	1
16. Profiles of hypothyroidism and hyperthyroidism (Explanation)	1
17. Profiles of hyper and hypoparathyroidism (Explanation)	1
18. Profiles of liver function (Explanation)	1
19. Urea, uric acid creatinine profile in kidney disorders (Explanation)	1
20. Blood gas profile in acidosis/alkalosis (Explanation)	1

ORAL PATHOLOGY & MICROBIOLOGY

Department of Oral Pathology & Microbiology deals with the basic concepts of dental anatomy & dental histology & head, and neck pathologies by means of carving, histopathology slide discussions and cast specimens' explanations. Oral Pathology focuses on reporting a clinicopathological diagnosis. For BDS I year carving tooth anatomy using a wax block and



8. Cysts of the oral cavity - Odontogenic keratocyst, dentigerous cyst, calcifying odontogenic cyst, radicular cyst, mucocele, cholesterol clefts.
9. Odontogenic tumors - Ameloblastoma - follicular type, plexiform type, acanthomatous type; calcifying cystic odontogenic tumor, adenomatoid odontogenic tumor, ameloblastic fibroma, odontomes, odontogenic fibroma, odontogenic myxoma, cementoblastoma
10. Salivary gland tumors - Pleomorphic adenoma, warthin's tumor, adenoid cystic carcinoma, mucoepidermoid carcinoma
11. Oral Microbiology - Staphylococci, streptococci, lactobacilli, candida albicans, actinomycosis, acid fast bacteria
12. Diseases of bone - Fibrous dysplasia and Pagets disease
13. Diseases of skin - Pemphigus and Pemphigoid

II Identification of dental anomalies - tooth and cast specimens

[Points 1, 2, 3 and 4 are covered in II BDS Practical classes]

INTERNSHIP

- 1) Carving of teeth
 - a) Permanent Right/Left Maxillary Central Incisor
 - b) Permanent Right/Left Maxillary Canine
 - c) Permanent Right/Left Maxillary First Premolar
 - d) Permanent Right/Left Maxillary First Molar
 - e) Permanent Right/Left Mandibular First Molar
- 2) Attending Dental Camps (Helping to Public Health Dentistry department)
- 3) Submission of Five laminated copies of Educational pamphlet (Educational dental histology slides)
- 4) Submission of E-poster related to Dentistry

GENERAL AND DENTAL PHARMACOLOGY AND THERAPEUTICS

General and Dental pharmacology deals with the introduction of medicinal products to the undergraduate students. It helps to understand therapeutic , diagnostic and prophylactic uses of drugs

1. Meteorology:
Introduction – equipment used in dispensing pharmacy.
Weight and measures
2. Prescription Writing:
Basic principles- Parts of prescription and model prescriptions
3. Demonstration of Mixture
 - 1) Solution :Condy's lotion
 - 2) Suspension: Calamine lotion
 - 3) Emulsion: Turpentine liniment
4. Dental Pharmacology
Demonstration of dental preparations
 1. Tooth Powder
 2. Toothpaste
 3. Gum Paint
 4. Obtundant
 5. Mouth Wash

basic oral histology slide discussion is meant to be explained which helps students to understand pathologies of soft tissue and hard tissue in BDS III year course.

I BDS Practicals - Dental Anatomy and Dental Histology

Dental Anatomy:

1. Wax carving of Dumbell - one sided and two sided (2 each)
2. Wax carving of Rectangle (2 each)
3. Wax carving of all permanent teeth except third molars (Right & Left side, including root)
4. Identification of teeth by specimens (64 tooth specimens)
5. Age estimation by pattern of eruption of teeth from plaster casts for different age groups (25 casts)

Dental Histology:

1. Microscope - Parts and types
2. Cells - osteoblasts, osteocytes and osteoclasts; fibroblasts, fibrocytes & endothelial cells, peripheral blood smear, adipose tissue.
3. Stains - Hematoxylin and eosin, Mallory stain, Van Gieson, Masson Trichrome, PAS stain
4. Development of tooth - Bud stage, cap stage, bell stage and development of root
5. Enamel - Enamel rods, strain of retries, neonatal line, enamel lamellae, enamel tufts, enamel spindles, Hunter-Schregar bands, gnarled enamel.
6. Dentin - S shaped tubules, terminal and lateral branches, transverse section of dentin, DEJ, incremental lines, interlobular dentin, Tomes granular layer, dead tracts.
7. Pulp - Histology, pulp stones, diffuse calcifications
8. Cementum - Cellular cementum, acellular cementum, cement-enamel junctions
9. Periodontal ligament - Principal fibres, apical fibres, gingival group of fibers
10. Bone - Compact, woven and spongy bone
11. Oral mucous membrane - Buccal mucosa, gingiva, posterolateral region of palate, vermilion of lip, filiform papillae, circumvallate papilla, fungiform papilla, dentogingival junction
12. Maxillary sinus
13. Salivary glands - Serous, mucous and mixed glands

III BDS Practicals - Oral Pathology

I Identification of Oral Pathology slides

1. Cells and stains - osteoblasts, osteocytes and osteoclasts; fibroblasts, fibrocytes & endothelial cells, peripheral blood smear, adipose tissue, giant cells, hematoxylin and esoin, PAS stain, Masson Trichrome, Van Gieson, Mallory stain.
2. Dental Caries - Pit & fissure caries, smooth surface caries, cemented caries, decalcified section of dentinal caries.
3. Diseases of pulp and periapical tissues - Pulp hyperemia, acute pulpitis, pulp abscess, pulp polyp, periapical granuloma, osteomyelitis.
4. Regressive alterations of teeth - Dead tract, secondary dentin, linear calcification, pink spot, hypercementosis, cementicles, pulp stones.
5. Premalignant lesions and conditions - Leukoplakia (Dysplasia), oral sub mucous fibrosis, oral lichen planus, carcinoma in situ.
6. Benign tumors - Papilloma, Fibroma, Central giant cell granuloma, peripheral giant cell granuloma, pyogenic granuloma, lipoma, hemangioma, lymphangioma, osteoma, neurilemmoma, neurofibroma, ossifying fibroma
7. Malignant tumors of oral cavity - Verrucous carcinoma, squamous cell carcinoma, basal cell carcinoma, malignant melanoma, fibrosarcoma, osteosarcoma

5. Biochemical reactions
6. Sterilization and disinfection
7. Laboratory diagnosis of infectious diseases
8. Gram staining
9. Ziehl-Neelsen staining
10. Staphylococci, Streptococci
11. Pneumococci, Neisseriae
12. Gram positive nonsporing bacilli- C. diphtheriae
13. Gram positive spore forming bacilli- Clostridia
14. Gram negative bacilli- I- E. coli, Klebsiella
15. Gram negative bacilli- II- Salmonella, Proteus, Pseudomonas
16. Mycobacteria
17. Spirochaetes
18. Viruses
19. Mycology
20. Parasitology
21. Serology – Antigen antibody reactions
22. Immunisation
23. Demonstration of Dengue test, HIV tridot and HBsAg tests

PROSTHODONTICS

PRECLINICAL PROSTHODONTICS (I & II YEAR BDS)

I and II year BDS is dedicated to learning, understanding and practising the basics of Dental Materials, Anatomy of the mouth/oral tissues and practising the Clinical procedures on models / dummies through PRECLINICS.

Following skills are demonstrated and practised by students for Preclinical Prosthodontics:

1. Undersanding and marking of the Anatomical Landmarks of the edentulous Maxilla and Mandible, on plaster models.
2. Making primary impression of the edentulous plaster models using Impression Compound.
3. Fabrication of Primary casts in dental plaster.
4. Fabrication of custom tray on primary cast in cold cure acrylic resin.
5. Fabrication of Master Cast in Dental Stone.
6. Fabrication of maxillary and mandibular record bases in cold cure acrylic resin.
7. Fabrication of maxillary and mandibular wax occlusal rims from modelling wax.
8. Mounting of casts and rims on mean- value articulator.
9. Teeth Selection and teeth arrangement for complete dentures.
10. Waxing & Carving
11. Processing of Complete Dentures, including flasking, dewaxing, packing and curing procedures.

5. Experimental Pharmacology (Only Theoretical)
Methods of Drug evaluation of
 1. Analgesics
 2. Local anesthetics
 3. Skeletal Muscle Relaxant
6. Prescription writing for Medical conditions/disorders
7. Prescription writing for Dental conditions/disorders
8. Criticize, comment and rewrite the prescription
9. Fixed dose combinations

GENERAL PATHOLOGY

II Year BDS in second year we introduce them to the concept of disease and various changes that us seen in blood and tissues as well as interpretation laboratory reports.

Practicals /Demonstrations

1. Urine - Abnormal constituents - Sugar, albumin, ketone bodies
2. Urine - Abnormal constituents -Blood, bile salts, bile pigments
3. Haemoglobin (Hb) estimation
4. Total WBC count
5. Differential WBC Count
6. Packed cell volume(PCV,) rythrocyte sedimentation Rate (ESR)
7. Bleeding Time & clotting Time
8. Histopathology Tissue Processing Staining
9. Histopathology slides -Acute appendicitis, Granulation tissue, fatty liver
10. Histopathology slides CVC lung, CVC liver, Kidney amyloidosis
11. Histopathology slides Tuberculosis, Actinomycosis, Rhinosporidiosis
12. Histopathology slides Papilloma, Basal cell Ca, Sq cell Ca
13. Histopathology slides Osteosarcoma, osteoclastoma, fibrosarcoma
14. Histopathology slides Malignant melanoma, Ameloblastoma, Adenoma
15. Histopathology slides Mixed parotid tumour, metastatic carcinoma in lymph node
16. Lumbar puncture and bone marrow aspiration needles are shown and indications for the same are taught

GENERAL MICROBIOLOGY

In BDS second year we teach students about the pathogenically important microorganisms associated with various infections and disease. Along with this, we prime them about different laboratory tests that help isolate and identify these medically important pathogens. Concepts of maintaining sterility in hospital environment, prevention nosocomial infections, biomedical waste management, and many such are also introduced to the students.

PRACTICAL/DEMONSTRATIONS

1. Microscopy
2. Living agents of disease
3. Morphology of bacteria
4. Growth requirements of bacteria- common media

- Removable Partial dentures: Clinical procedures

1. Recording Case History, Performing the clinical examination, and
2. Diagnosis of a partially edentulous patients.
3. Tray Selection
4. Alginate Impression
5. Pick -Up Impression
6. Jaw Relation – vertical and centric
7. Teeth selection
8. Try -In
9. Denture Delivery

Laboratory procedures

1. Pouring of primary Cast
2. Fabrication of Special Tray
3. Pouring of Secondary Cast
4. Fabrication of record base and rims
5. Transfer of jaw relation to Articulator
6. Teeth arrangement
7. Waxing and Carving
8. Flasking, dewaxing
9. Packing and curing of partial denture
10. Deflasking
11. Denture Trimming & Polishing

- Fixed Partial dentures:

At the undergraduate level, students are trained for tooth preparation for Fixed Partial denture on plaster models and typhodonts jaw sets on phantom heads for receiving metal, Porecelain fused to metal and All ceramic restorations/ prosthesis.

Academic Schedule for Clinical Posting (III & IV Year)

Sr. No.	Exercise	III-I	III-II
1	Complete denture demonstration,	To be taken	
2	CD patient	01	01
3	RPD patient	03	03

- Project on complete denture and case history-to be done in III-I
- Post end viva on rpd- taken in III-II

IV-I

- Assignment,
- Seminar on complete denture

IV-II

- Seminar on RPD and FPD
- Discussion
- Post end exam.
- Submission of case records, crown & Bridge-Journal
- Tooth preparation on ivory teeth- Total 6 Typhodont submissions

12. Deflasking and Finishing & Polishing of Dentures.

.....
Following skills are demonstrated and practised by students for Dental Material Science:

Understanding the properties of and Manipulation of:

1. Dental plaster (Type II Gypsum)
 1. Dental Stone (Type III Gypsum)
 2. Impression Compound
 3. Zinc Oxide Eugenol Impression Paste
 4. Irreversible Hydrocolloid (Alginate)
 5. Fabrication of Dental plaster & Dental stone blocks.
-

CLINICAL PROSTHODONTICS (III & IV YEAR BDS & INTERNSHIP)

After understanding the basics and going through the Preclinical curriculum, the III, IV year BDS and Internship training is dedicated to learning, understanding and practising the Clinical procedures on patients in the CLINICS.

Following skills are demonstrated and practised by students for Clinical Prosthodontics:

- Complete dentures: Clinical procedures
 1. Recording Case History, Performing the clinical examination, and Diagnosis of a completely edentulous patient.
 2. Tray Selection
 3. Primary Impressions
 4. Border moulding and Secondary Impression
 5. Jaw relation - Vertical and Centric jaw relation.
 6. Teeth selection for patient.
 7. Try -In
 8. Denture Delivery/ Insertion in patient
 9. Follow up visit.

Laboratory procedures

1. Pouring of primary Cast
2. Fabrication of Special Tray
3. Pouring of Secondary Cast
4. Fabrication of record bases and rims
5. Transferring Jaw relation to mean value Articulator
6. Teeth arrangement for patient
7. Waxing and carving
8. Flasking
7. Dewaxing
8. packing, curing of dentures
9. Denture Trimming & Polishing

5. Exercises on phantom head models which includes cavity preparation base and varnish application

matrix and wedge placement followed by amalgam restoration.

Class I	7
Class I with extension	4
Class II	15
Class II Mods	2
Class V and III for glass ionomers	4
Class V for amalgam	3

6. Polishing of above restorations.

7. Demonstration of Class III and Class V cavity preparation. For composites on extracted tooth completing the restoration.

8. Polishing and finishing of the restoration of composites.

9. Identification and manipulation of varnish bases like Zinc Phosphate, Poly carboxylate, Glass

Ionomers, Zinc Oxide, Eugenol cements.

10. Identification and manipulation of various matrices, tooth separators and materials like composites and modified glass ionomer cements.

11. Cast Restoration

1. Preparation of Class II inlay cavity
2. Fabrication of wax pattern
3. Sprue for inner attachment investing
4. Investing of wax pattern
5. Finishing and cementing of class II inlay in extracted tooth.

A) CLINICAL TRAINING DURING THIRD YEAR:

1. Treatment planning for operative dentistry:
Detailed clinical examination, radiographic examination, tooth vitality tests, diagnosis and treatment planning, preparation of the case sheet.
2. Armamentarium for cavity preparation:
General classification of operative instruments, hand cutting instrument design formula and sharpening of instruments, rotary cutting instruments dental bur, mechanism of cutting, evaluation of hand piece and speed, current concepts of rotary cutting procedures. Sterilization and maintenance of instruments. Basic instrument tray set up.
3. Control of operating field:
Light source sterilization, field of operation, control of moisture, rubber dam in detail, cotton rolls and anti sialogagues.
4. Posterior restorations
Amalgam:- Class I restorations
Class II restorations
5. Anterior restorations:
Selection of cases:-
Class III restorations
Class IV restorations
Class I restorations
Class V restorations

Sr. No.	Exercise	IV-I	IV-II
1	Complete denture	01	02
2	RPD patients	01	01

INTERNSHIP

During the rotatory Internship after BDS, students have comprehensive training for various procedures apart from that in III and IV BDS, which is a combination of demonstration of certain procedures, practising dental procedures on models/ dummies, Clinical procedures on patients and assisting the Clinical work of residents to learn and understand certain specialized procedures.

Excercises/demonstrations

- A. Manipulation of alginate impression material
- B. Manipulation of Elastomeric impression materials
- C. Tooth preparation on typhodonts-
 - For full metal crown: 04 preparations.
 - Porcelain fused to metal: 03 preparations.
 - All ceramic preparation: 02 preparations.
- D. Designing of Cast partial dentures on partially edentulous cast

Clinical work

- A. Single crown- Full metal / Porcelain Fused to Metal : 03
- B. Transitional Partial dentures (heat cure acrylic): 02
- C. Assisting Postgraduate students for:
 - Check up of OPD patients
 - Face-bow record
 - Tooth preparations
 - Impression making

PRE-CLINICAL CONSERVATIVE DENTISTRY LABORATORY EXERCISES

1. Identification and study of hand cutting instruments chisels, gingival margin trimmers, excavators and hatchet.
2. Identification and use of rotary cutting instruments in contra angle hand pieces burs (Micromotor)
3. Preparation class I and extended class I and class II and MOD's and class V amounting to 10 exercises in plaster models.
4. 10 exercises in mounted extracted teeth of following class I, 4 in number class I extended cavities 2, class II 4 in number and Class V 2 in number. Cavity preparation, base application, matrix and wedge placement restoration with amalgam.

CARE GIVEN DURING INTERNSHIP

- | | |
|--|--------|
| 1. Restoration of extremely mutilated teeth | 1 Case |
| 2. Inlay and onlay preparation | 1 Case |
| 3. Use of tooth colored restorative materials | 4 Case |
| 4. Treatment of discolored vital and non vital teeth | 1 Case |
| 5. Management of dento alveolar fracture | 1 Case |
| 6. Management of pulpless, single rooted teeth without periapical lesion | 1 Case |
| 7. Management of dento alveolar infections | 4 Case |
| 8. Management of pulpless, single rooted teeth with periapical lesion | 5 Case |
| 9. Non surgical management of traumatized teeth | 1 Case |

DENTAL MATERIALS

1. Demonstration of manipulation of all materials: zinc phosphate, zinc oxide eugenol, glass ionomer, poly carboxylate cements, amalgam
2. Cements- manipulation and studying setting time and working time for luting and base.
3. Restoration: silver amalgam – manipulation, trituration, condensation and setting and working time.

GENERAL MEDICINE

CLINICAL TRAINING:

- Lecture on general information about rules & regulations for students while they are in ward of the hospital
- Patient history taking & general physical examination (including build, nourishment, pulse, BP, respiration, clubbing, cyanosis, jaundice, lymphadenopathy, oral cavity)
- Systemic examination of abdomen, respiratory system, cardiovascular system, central nervous system, all cranial nerves
- All systems are taught in the ward & on the patient. Every student is made to perform the examination on different patients, along with the examination the students are made to correlate the theory along with the management.

III BDS	Hours of Practical Training	Long Case	Short Case
III/I term	40 hours	02	02
III/II term	50 hours	03	03

Long Cases

- 1) Respiratory System -Pneumonia/Pleural Effusion
- 2) Cardiovascular System - Cardiomegaly/Rheumatic Heart Disease With Mitral Stenosis
- 3) Abdomen - Hepatosplenomegaly/Ascites
- 4) Cardiovascular System & Central Nervous System - Facial Palsy
- Hemiplegia
- 5) Diabetes & Hypertension - Uncontrolled Diabetes Mellitus
Uncontrolled Hypertension

6. Preventive measures in restorative dentistry :
7. Temporaization or interim restorations
8. Mangement of deep carious lesions, indirect and direct pulp capping.
Indication,contradication,advatages and disadvantages, materials used for same, Class I, and II cavity preparation for inlay , fabrication of waxpatter, spruing, investing and casting procedures and casting defects.
9. Control of pain during operative procedures.

B) CLINICAL TRAINING DURING FOURTH YEAR:

1. Posterior restorations

Amalgam:- Class I restorations
Class II restorations

2. Anterior restorations:

Selection of cases:-

Class III restorations
Class IV restorations
Class I restorations
Class V restorations

3. Cast Restoration

1. Preparation of Class II inlay cavity
2. Fabrication of wax pattern
3. Sprue for inner attachment investing
4. Investing of wax pattern
5. Finishing and cementing of class II inlay in patients.

1. Pre-Clinical Endodontic Exercises

Sr. No.	Exercise	3 rd I	3 rd II	4 th I	4 th II
1.	Class 1 Silver Amalgam restoration	5	4	6	5
2.	Class 2 Silver Amalgam restoration	2	6	10	13
3.	Class 5 glass ionomer restoration	3	4	5	4
4.	Class 3 glass ionomer restoration	-	-	-	3
5.	Class 1 Compound Silver Amalgam	5	6	9	10
6.	Case History Taking	5	5	5	5

Diagnosis & Management of Hernia & Hydrocele.

Diagnosis & Management of Breast lump.

Diagnosis & Management of Abdominal lump.

Small swellings of lipoma /fibroma /sebaceous cyst/Abscess

Dressings

Observe and Assist in major and minor dressings

Biopsy

Observe and Assist in open biopsy.

PUBLIC HEALTH DENTISTRY

In the department of public health dentistry, third year students are introduced to the basics of preventive health care, and in final year the students are taught preventive methods and clinical practices in theory and practical. The interns are entrusted with health promotion and education activities.

THIRD FIRST

- | | |
|---|---------|
| I. Case History - | 05 |
| 2. INDICES: Definition,
, requisites, classification | 05 each |
| A) Oral hygiene indices simplified- Green and Vermilion | |
| B) Silness and Loe index for Plaque | |
| C) Loe and Silness index for gingival | |
| 3. VIVA | |

THIRD SECOND

- | | |
|---------------------------|----|
| A) CPI | 05 |
| B) DMF: T and S, dmft and | 05 |
| C) Deans' fluoride index | 05 |
| D) JOURNAL COMPLETION | |
| E) VIVA | |

FINAL FIRST

- | | |
|--|----|
| A) Pit and fissure sealant | 05 |
| B) Topical fluoride application | 05 |
| C) ART | 05 |
| D) Journal completion | |
| E) Oral health status assessment of the community using indices and WHO basic oral health survey methods | 05 |
| C) GRAND VIVA | |

Short Cases

Inspection, Palpation, Percussion, Auscultation

- 1) Respiratory System- Bronchial Asthma/Stridor
- 2) Cardiovascular System -Blood Pressure Monitoring/Heart Sounds/Heart Murmurs
- 3) Abdomen - Hepatosplenomegaly/Ascites
- 4) Central Nervous System- Cranial Nerves- Ataxia/Facial Palsy
- 5) Central Nervous System- General -
 - a) Motor System-Claw Hand
 - b) Sensory System- Trigeminal Neuralgia
 - c) Reflexes -Drop Foot

Journal

- 5 Long Cases
- 5 Short Cases

GENERAL SURGERY

CLINICAL TRAINING

1. Develop communication skills with the patients – classroom sessions & ward sessions
2. History taking of surgical patient – difference between the complaints of surgical disease & medical diseases, teach the art of taking history – Classroom sessions & ward sessions
3. Examination of Swelling, wound and ulcers, deformities
4. Demonstration of various clinical signs in respect to surgical cases & their interpretation so as to reach to a diagnosis
5. Taught about Benign and malignant lesion especially head neck region
6. Introduction and demonstration of the instruments used in surgery
7. Discussion about methods of sterilisation of instruments and uses in various surgeries
8. Demonstration to students on basic techniques of dressing of ulcer, wounds & draining of abscess.

Credits to be achieved by III rd BDS students

III BDS	Hours of Practical Training	Case History taking (Minor)	Case History taking (Major)	Dressings (O) Observed (PI) Performed individually	Biopsy (O) Observed (A) Assisted
III/I term	50 hours	10	6	(O) - 10 (PI) - 5	(O) - 5 (A) - 3
III/II term	40 hours	10	8	(O) - 10 (PI) - 5	(O) - 5 (A) - 3

Major & Minor Cases (General Surgery)

Case History taking done on Swellings & Ulcers (Major & Minor)

For E.g. - Differential Diagnosis of all kinds of Neck Swellings like Thyroid swellings, Lymph node swellings (benign & malignant), Cysts of the Face & Neck.

Diagnosis & Management of Oral Ulcers as well as Diabetic Foot Ulcers.

INTERNSHIP

1. Projects / Charts / E posters / Fliers (1)
 2. Patient educations for individuals and groups on oral health public health nutrition, behavioral sciences, environmental health, preventive dentistry and epidemiology
 3. Mouth-rinsing and other oral hygiene demonstrations 5
 - Cases
 4. Tooth brushing techniques 5
 - Cases
 5. Publications (not mandatory)
 6. Standees required for health education (1)
 7. Patient guidance training in school setting (2)
 8. Community setting (2)
- Exposure to team concept and National Health Care systems:
- a) Observation of functioning of health infrastructure or
 - b) Observation of functioning of health care team including multipurpose workers male and female, health educators and other workers or
 - c) Observation of at least one National Health Program or
 - d) Observation of interlinkages of delivery of oral health care with Primary Health care.
- Mobile dental clinics, as and when available, should be provided for teaching.

PERIODONTOLOGY

Department of periodontology generally deals with imparting knowledge about the tooth supporting structures and treatment of the diseased periodontium. Lot of emphasis is placed on the clinical diagnosis and treatment planning of the periodontal disease. The department also deals with basic and advance implantology and associated procedures, both at the UG and PG level.

PRACTICAL EXERCISES DURING CLINICAL POSTING: (under supervision)

1. Infection control
2. Periodontal instruments
3. Chair position and principles of instrumentation
4. Maintenance of instruments (sharpening)
5. Ultrasonic, Piezoelectric and sonic scaling – demonstration of technique
6. Diagnosis of periodontal disease and determination of prognosis
7. Radiographic interpretation and lab investigations
8. Motivation of patients- oral hygiene instructions
9. Detailed periodontal case history, determination of diagnosis, prognosis and plan treatment.
10. Scaling, root planning local drug delivery
11. Observation of all periodontal surgical procedures.

DEMONSTRATIONS: (under supervision)

1. History taking and clinical examination of the patients
2. Recording different indices
3. Methods of using various scaling and surgical instruments
4. Polishing the teeth
5. Demonstration to patients about different oral hygiene aid
6. Follow up procedures, post operative care and supervision.

PRACTICAL TRAINING DURING THIRD AND FINAL YEAR: (under supervision)

1. Diagnosis, treatment planning and discussion and total periodontal treatment – 15 cases
2. Dental scaling, oral hygiene instructions – 25 complete cases

CARE GIVEN DURING INTERNSHIP:

1. Prophylaxis 25 Cases- (without supervision)

Assistance in:

1. Flap Operation 2 Cases
2. Root Planning 1 Case
3. Curretage 1 Case
4. Gingivectomy 1 Case
5. Perio-Endo cases 1 Case

ORTHODONTICS & DENTOFACIAL ORTHOPAEDICS.

The student should have proficiency in the following wire bending exercise which will help them in making orthodontic appliance.

**PRACTICAL TRAINING DURING IInd and IIIrd YEAR B.D.S
(UNDER SUPERVISION)**

- I. Basic wire bending exercises Gauge 22 or 0.7mm
 1. Straightening of wires (4 Nos.) -01
 2. Bending of a equilateral triangle -01
 3. Bending of a rectangle -01
 4. Bending of a square -01
 5. Bending of a circle -01
 6. Bending of U.V series -01
- II. Construction of Clasps (Both sides upper/lower) Gauge 22 or 0.7mm
 1. 3/4 Clasp (C-Clasp) -04
 2. Full Clasp (Jackson's Crib)-04
 3. Adam's Clasp -04
- III. Construction of springs (on upper both sides) Gauge 24 or 0.5mm
 1. Finger Spring -02
 2. Single Cantilever Spring -02
 3. Double Cantilever Spring (Z-Spring)-02
- IV. Construction of Canine retractors Gauge 23 or 0.6mm
 1. U - Loop canine retractor (Both sides on upper & lower)-02
 2. Helical canine retractor (Both sides on upper & lower)-02
 3. Buccal canine retractor: - Self supported buccal canine retractor with-02
- V. Labial Bow Gauge 22 or 0.7mm One on both upper and lower. -02

CLINICAL TRAINING DURING III YEAR B.D.S

The students should be trained in the following aspects to gain knowledge about creating records and about diagnosis treatment planning in orthodontic cases.

(Under supervision)

01. Making upper Alginate impression -01 set
02. Making lower Alginate impression -01 set

ORAL MEDICINE AND RADIOLOGY

PRACTICALS/CLINICALS:

1. Student is trained to arrive at proper diagnosis by following a scientific and systematic procedure of history taking and examination of the orofacial region. Training is also imparted in management wherever possible. Training also shall be imparted on saliva diagnostic procedures. Training also shall be imparted in various radiographic procedures and interpretation of radiographs.

2. In view of the above each student shall maintain a record of work done, which shall be evaluated for marks at the time of University examination

3. The following is practical work

(a) Third First Practical Training	
Recording Pulpo-periapical diseases & Periodontal diseases case history	25
Intraoral Radiographic Exercises (Technique, Processing & Interpretation)	10
(b) Third Second Practical Training	
Recording of detailed case histories of Oral mucosal lesions, Cancerous & Precancerous lesions, Orofacial pain & TMJ disorders	05
Recording Pulpo-periapical diseases & Periodontal diseases case history	25
Intraoral Radiographic Exercises (Technique, Processing & Interpretation)	25
(c) Final First Practical Training	
Recording of detailed case histories of Oral mucosal lesions, Cancerous & Precancerous lesions, Orofacial pain & TMJ disorders	05
Recording Pulpo-periapical diseases & Periodontal diseases case history	50
Intraoral Radiographic Exercises (Technique, Processing & Interpretation)	50
Saliva diagnostic check as routine procedure (Salivary gland examination, Salivary Duct examination, salivary flow examination)	

Internship

1. Standardized examination of patients	25 Cases
2. Exposure to clinical, pathological laboratory procedures and biopsies observed/assisted.	5 Cases
3. Effective training in taking processing & Interpretation of Radiographs:	
Full mouth (Intra-oral) I.O.	2 sets
(Extra oral) E.O. /OPG Tracing & Interpretation	1
Cephalogram	1
4. Effective management of cases in wards/ dental management of medically compromised patients	2 Cases
5. Seminar preparation, Presentation (QA & discussion)	1

ORAL & MAXILLOFACIAL SURGERY

The III Year Graduates learn the basics of diagnosis and management of diseases associated with hard/soft tissues of the face.

Understanding the Principles of local anaesthetic techniques, learning the Know-how of Exodontia, applying knowledge to manage medical emergencies in the dental office are some of the basic skills they try to achieve.

The IV-year graduates learn and perform extraction, manage complications as well as assist/observe minor oral surgical procedures.

Interns brush up all the above mentioned skill and practice all oral surgical procedures by following all principles of evidence based dentistry.

III/I PRACTICAL OBSERVATION AND DEMONSTRATION

PRACTICAL TOPIC

1. History Taking
2. Clinical examination
3. Investigation- x-ray OPG ect
4. Principal of infection control and with practical reference to HIV/ AIDS and hepatitis
5. Principles of oral surgery
6. Asepsis : measures to prevent introduction of infection of infection during surgery
7. Preparation of the patients
8. Measures to be taken by operator
9. Sterilisation of instruments
10. Surgery set up (instrument)
11. Painless Surgery
12. Local Anaesthesia (introduction)
13. nerve block- INB, DNB, PSA
14. Chair Positioning
15. exodontia: general consideration ideal Extraction
16. Indication for extraction of teeth
17. extraction in medically compromised patients
18. Method of extraction
19. Forceps or intra-alveolar or closed method
20. Principles types of movement and force

III/II

PRACTICAL TOPIC

1. trans-alveolar, surgical or open method indication surgical procedure.

dental elevators: uses, classification principal in the use of elevator, commonly used elevators.

complication of exodontia

complication during exodontia

Common to both maxilla and mandible

Post-operative complications

Prevention and management of complication

2. Local measures available to control bleeding Hypotensive anaesthesiaect
3. Drainage & Debridement

Purpose of drainage in surgical wounds

Debridement : purpose soft tissue & bone debridement

Closure of wounds

4. Suturing: Principles, suture material, classification, body response to various materials, ect.
5. Post-operative care

Post-operative instructions

Physiology of cold and heat

Control of pain- analgesics

Control of infection- antibiotics

Control of Swelling- anti-inflammatory drugs

Sr. No.	Year	Total No. Extractions
1	III-I	15
2	III-II	20

Iv/I

PRACTICAL TOPIC

2. Impacted teeth

Incidence, definition, aetiology

impacted mandibular third molar

Classification, reasons for removal

Assessment- both clinical & radiological

surgical procedures for removal

complications during and after removal

Prevention and management

maxillary third molar

indication for removal, classification, Surgical procedure for removal.

impacted maxillary canine reasons

canine impaction, Localization

3. Medical Emergencies in dental practice

Primary care of medical Emergencies in dental practice particularly cardiovascular , respiratory endocrine, Anaphylactic reaction, Epilepsy

4. Pre-prosthetic Surgery

Definition, classification of procedure

Corrective procedures :Alveoloplasty

Reduction of maxillary tuberosities

Preocclusives and removal of tori

Ridge extension or sulcus extension procedures indication and various surgical procedures

Ridge augmentation and reconstruction indication uses of bone grafts,

hydroxyapatite implants- concept of osseo

integration Knowledge of various types of implants and surgical procedure to place implants

IV/II

1. Infections of the Oral cavity

Introduction, factors responsible for infection course of odontogenic infection
spread of odontogenic infections through various facial spaces.

Dento-alveolar abscess- aetiology clinical features and management

osteomyelitis of the jaws- definition aetiology, pre-disposing factors classification features and management

Ludwigsanagina- definition aetiology clinical features management and complications.

Benign cystic lesions of the jaws-

definition classification pathogenesis

Diagnosis- clinical features, radiological, aspiration biopsy

2. Fractures of the Jaws

General considerations, types of fractures, aetiology, clinical features and general principles of management

mandibular fractures-applied anatomy, classification.

Diagnosis- clinical and radiological

Management- Reduction closed and open

fixation and immobilisation methods

outline of rigid and semi-rigid internal fixation

fracture of the condyle-aetiology, classification, clinical features, Principles of management

fracture of the middle third of the face

definition of the mid face, applied surgical anatomy, classification, clinical fractures- methods of management

3. Fractures of the Zygomatic complex

classification, clinical fractures, indications for treatment

various methods of reduction and fixation

Complication, of fractures- delayed union non union and malunion

4. Disorders of T.M. joint

Applied surgical anatomy of the joint

Dislocation- Types Aetiology, clinical features and management

ankylosis- definition aetiology, classification, clinical fractures- methods of management

Myo-facial pain dysfunction syndrome, aetiology, clinical features, management- non surgical and surgical

Non surgical and surgical

Internal derangement of the joint

Arthritis of T.M. joint

5. Carcinoma of the oral cavity:

cavity biopsy types

TNM classification

outline of management of squamous

cell carcinoma: surgery, radiation and chemotherapy

Role of dental surgeons in the prevention and early detection of oral cancer

Sr. No.	Year	Total No. Extractions
1	IV-I	15
2	IV-II	20

INTERNSHIP

Sr. No.	Internship	Total No.
1	Extractions	50
2	Assisting disimpaction	10
3	Assisting Major Surgery	2
4	Assisting Minor Surgery	5

PAEDIATRIC AND PREVENTIVE DENTISTRY

The under-graduate course commences with imparting training in systematic recording of case-history of paediatric patients with age-related prescription writing and treatment planning. Throughout the course, they are trained in managing the behaviour of pediatric patients, imparting dental awareness to them along with their families, restorative treatments, preventive dentistry planning etc. In internship, they are further trained in advanced treatments like pulp therapy, extra-coronal restorations, etc. Thus, they receive training in holistic, efficient and effective treatment while ultimately imparting a positive attitude towards dentistry.

PRACTICALS:

III year

1. Drug Dosage discussion
2. Case History discussion
3. Case History taking -01

IV year

1. Restorations - Class I & II only -10
2. Preventive measures e.g. Oral Prophylaxis - 10.
3. Fluoride applications - 5
4. Case History Recording & Treatment Planning - 10
6. Education & motivation of the patients using disclosing agents. Educating patients about oral hygiene measures like tooth brushing, flossing etc.

INTERNSHIP

During their posting in Pedodontics the Dental graduates shall perform/ assist:

1. Topical application of fluorides including varnish 5 Cases
2. Restorative procedures of carious deciduous teeth in children. 10 Cases
3. Pulpotomy 2 Cases
4. Pulpotomy 2 Cases
5. Fabrication and insertion of space maintainers 1 Case
6. Oral habit breaking appliances- 1 case

MAX.S.N.U.S, Implants view		
Intra-Oral Camera		1
Pulp Tester		2
Autoclave		2
Punch Biopsy Tool		2
Biopsy Equipment		2
Surgical Trolley		2
Emergency Medicines Kit		1
Extra Oral Cassettes with Intensifying Screens (Conventional & Rare Earth)		4
Lead Screens		2+1
Lead Aprons		2
Lead Gloves		2
Radiographic Filters (Conventional & Rare Earth)		1
Dark Room with Safe light facility		1
Automatic Radiographic Film Processors		2
Radiographic Film storage Lead Containers		1
Radio Viosograph, RVG System, Sensor - all sizes (0,1,2)		
Thyroid Collars		
Digital Sphygmomo meter		
Digital Printer (X-Ray)		
Digital Blood Glucose tester		
Digital Camera		
X-ray Viewer boxes		2
Lacrimal Probes		2 sets
Sialography Cannula		2 sets
Computer with color printer		1
Illuminated Mouth-Mirror & Probe		2

SECTION-V

SYALLBUS FOR M.D.S. IN VARIOUS SPECIALTIES

APPLIED BASIC SCIENCES:

The MDS Course in Applied Basic Sciences shall vary according to the particular speciality, similarly the candidates shall also acquire adequate knowledge in other subjects related to their respective speciality.

Applied Basic Sciences optional subjects:

- (i) Applied Anatomy
- (ii) Applied Physiology
- (iii) Applied Pathology

Subjects related to different specialities:

1. Bio-statistics
2. Nutrition and Dietetics
3. Teaching and Testing Methodology
4. Research Methodology
5. Psychology and Practice Management
6. Comparative Anatomy
7. Genetics Growth and Development
8. Applied Chemistry including Metallurgy, Dental Materials.

1. PROSTHODONTICS AND CROWN & BRIDGE

AIM:

To train dental graduates so as to ensure higher competence in both general and special areas of Prosthodontics and prepare a candidate for teaching, research and clinical abilities, including prevention and after care in prosthodontics including crown and bridge and implantology.

GENERAL OBJECTIVES OF THE COURSE:

- Training programme in Prosthetic dentistry including Crown & Bridge & Implantology is structured to achieve knowledge and skill in theoretical and clinical laboratory, attitude, communicative skills and ability to research with understanding of social, cultural, educational and environmental background of the society.
- To have acquired adequate knowledge and understanding of applied basic and systemic medical science, knowledge in general and particularly of head and neck.
- The postgraduates will be able to provide Prosthodontic therapy for patients with competence and working knowledge with understanding of applied medical, behavioral and clinical science, that are beyond the treatment skills of the general BDS graduate and MDS graduate of other specialities, to demonstrate evaluative and judgment skills in making appropriate decisions regarding prevention, treatment, after care and referral to deliver comprehensive care to patients.

KNOWLEDGE:

The candidate should possess knowledge of applied basic and systemic medical sciences.

- On human anatomy, embryology, histology, applied in general and particularly to head and neck, Physiology & Biochemistry, Pathology and Microbiology, virology, health and diseases of various systems of the body (systemic) principles in surgery and medicine, pharmacology, nutrition, behavioral science, age changes, genetics, Immunology, Congenital defects and syndrome and Anthropology, Bioengineering, Bio-medical and Biological Principle and applications to Dental material science.
 - Ability to diagnose and planned treatment for patients requiring a Prosthodontic therapy
 - Ability to read and interpret a radiograph and other investigations for the purpose of diagnosis and treatment plan.
- Tooth and tooth surface restorations, Complete denture Prosthodontics, removable partial denture Prosthodontics, fixed prosthodontics and maxillofacial and Craniofacial Prosthodontics, implants and implant supported Prosthodontics, T.M.J. and occlusion, craniofacial esthetic, and biomaterials, craniofacial disorders, problems of psychogenic origin.
- Age changes and Prosthodontic Therapy for the aged.
 - Ability to diagnose failed restoration and provide Prosthodontic therapy and after care.
 - Should have essential knowledge on ethics, laws and Jurisprudence and forensic odontology in Prosthodontics.
 - General health conditions and emergency as related to prosthodontics treatment.
 - Identify social, cultural, economic, environmental, educational and emotional determinants of the patient and consider them in planning the treatment.
 - Identify cases, which are outside the area of his speciality/ competence and refer them to appropriate specialists.
 - Advice regarding case management involving surgical, interim treatment etc.
 - Competent specialization in team management of craniofacial design.
 - To have acquired adequate knowledge and understanding of applied basic and systematic medical science knowledge in general and particular to head and neck.
 - Should attend continuing education programmes, seminars and conferences related to Prosthodontics, thus updating himself.
 - Teach and guide his/her team, colleague and other students.
 - Should be able to use information technology tools and carry out research both basic and clinical, with the aims of publishing his/ her work and presenting his/her work at various scientific forums.

- Should have essential knowledge of personal hygiene, infection control, prevention of cross infection and safe disposal of waste, keeping in view the risks of transmission of Hepatitis and HIV.
- Should have an ability to plan to establish Prosthodontics clinic/hospital teaching department and practice management.
- Should have a sound knowledge for the application of pharmacology. Effects of drugs on oral tissue and systems of a body and for medically compromised patients.
- The postgraduates will be able to provide Prosthodontic therapy for patients with competence and working knowledge with understanding of applied medical behavioral and clinical science that are beyond the treatment skills of the general BDS graduate and MDS graduate of other specialities to demonstrate, evaluative and judgment skills in making appropriate decisions regarding prevention, treatment after care and referral to deliver comprehensive care to patients.

SKILLS:

- The candidate should be able to examine the patients requiring Prosthodontics therapy, investigate the patient systemically, analyze the investigation results, radiography, diagnose the ailment, plan a treatment, communicate it with the patient and execute it.
- Understand the prevalence and prevention of diseases of craniomandibular system related to Prosthetic dentistry.
- The candidate should be able to restore lost functions of stomatognathic system namely mastication, speech, appearance and psychological comforts. By understanding biological, biomedical, bioengineering principles and systemic condition of the patient to provide a quality health care of the craniofacial region.
- The candidate should be able to interact with other speciality including medical speciality for a planned team management of patients for a craniofacial and oral acquired and congenital defects, temporomandibular joint syndromes, esthetics, Implant supported Prosthetics and problems of Psychogenic origin.
- Should be able to demonstrate the clinical competence necessary to carry out appropriate treatment at higher level of knowledge, training and practice skills currently available in their specialty area.
- Identify target diseases and awareness amongst the population for Prosthodontic therapy.
- Perform clinical and Laboratory procedure with understanding of biomaterials, tissue conditions related to prosthesis and have competent dexterity and skill for performing clinical and laboratory procedures in fixed, removable, implant, maxillofacial, TMJ and esthetics Prosthodontics.
- Laboratory technique management based on skills and knowledge of Dental Materials and dental equipment and instrument management.
- To understand demographic distribution and target diseases of Cranio mandibular region related to Prosthodontics.

ATTITUDES:

- Adopt ethical principles in all Prosthodontic practice. Professional honesty and integrity are to be fostered. Treatment to be delivered irrespective of social status, caste, creed or religion of patient.
- Willing to share the knowledge and clinical experience with professional colleagues.
- Willing to adopt new methods and techniques in prosthodontics from time to time based on scientific research, which is in patient's best interest.
- Respect patient's rights and privileges including patients right to information and right to seek second opinion.

COMMUNICATIVE ABILITIES:

- Develop communication skills, in particular, to explain treatment option available in management.
- Provide leadership and get the best out of his group in a congenial working atmosphere.

- Should be able to communicate in simple understandable language with the patient and explain the principles of prosthodontics to the patient. He should be able to guide and counsel the patient with regard to various treatment modalities available.
- Develop the ability to communicate with professional colleagues through various media like Internet, e-mail, videoconference, and etc. to render the best possible treatment.

COURSE CONTENTS:

The candidates shall undergo training for 3 academic years with satisfactory attendance of 80% for each year.

- The course includes epidemiology and demographic studies, research and teaching skills.
- Ability to prevent, diagnose and treat with after care for all patients for control of diseases and / or treatment related syndromes with patient satisfaction for restoring functions of Stomatognathic system by Prosthodontic therapy

The program outline addresses the knowledge, procedural and operative skills needed in Masters Degree in Prosthodontics. A minimum of 3 years of formal training through a graded system of education as specified will enable the trainee to achieve Masters Degree in Prosthodontics including Crown & Bridge and Implantology, competently and have the necessary skills/ knowledge to update themselves with advancements in the field. The course content has been identified and categorized as Essential knowledge as given below.

ESSENTIAL KNOWLEDGE:

The topics to be considered are: Basic Sciences, Prosthodontics including Crown and Bridge Implantology and Material Science.

APPLIED BASIC SCIENCES:

- A thorough knowledge on the applied aspects of Anatomy, Embryology, Histology particularly to head and neck, Physiology, Biochemistry, Pathology, Microbiology, Virology.
- Pharmacology, Health and systematic diseases principles in surgery medicine and Anesthesia, Nutrition, Behavioral sciences, age changes, genetics, Dental Material Science, congenital defects and Syndromes and Anthropology, Biomaterial Sciences, Bio-engineering and Bio-medical and Research Methodology as related to Masters degree prosthodontics including crown & bridge and implantology

It is desirable to have adequate knowledge in Bio-statistics, Research Methodology and use of computers. To develop necessary teaching skills in Prosthodontics including crown and bridge and Implantology.

APPLIED ANATOMY OF HEAD AND NECK:

General Human Anatomy - Gross Anatomy, anatomy of Head and Neck in detail. Cranial and facial bones, TMJ and function, muscles of mastication and facial expression, muscles of neck and back including muscles of deglutition and tongue, arterial supply and venous drainage of the head and neck, anatomy of the Para nasal sinuses with relation to the Vth cranial nerve. General consideration of the structure and function of the brain. Brief considerations of V, VII, XI, XII, cranial nerves and autonomic nervous system of the head and neck. The salivary glands, Pharynx, Larynx Trachea, Esophagus, Functional Anatomy of mastication, Deglutition, speech, respiration, and circulation, teeth eruption, morphology, occlusion and function. Anatomy of TMJ, its movements and myofascial pain dysfunction syndrome

Embryology - Development of the face, tongue, jaws, TMJ, Paranasal sinuses, pharynx, larynx, trachea, esophagus, Salivary glands, Development of oral and Para oral tissue including detailed aspects of tooth and dental hard tissue formation

Growth & Development - Facial form and Facial growth and development overview of Dentofacial growth process and physiology from fetal period to maturity and old age, comprehensive study of craniofacial biology. General physical growth, functional and anatomical aspects of the head, changes in craniofacial skeletal, relationship between development of the dentition and facial growth.

Dental Anatomy - Anatomy of primary and secondary dentition, concept of occlusion, mechanism of articulation, and masticatory function. Detailed structural and functional study of the oral dental and Para oral tissues. Normal occlusion, development of occlusion in deciduous mixed and permanent dentitions, root length, root configuration, tooth-numbering system.

Histology - histology of enamel, dentin, Cementum, periodontal ligament and alveolar bone, pulpal anatomy, histology and biological consideration. Salivary glands and Histology of epithelial tissues including glands.

Histology of general and specific connective tissue including bone, hematopoietic system, lymphoid etc.

Muscle and neural tissues, Endocrinal system including thyroid, Salivary glands, Histology of skin, oral mucosa, respiratory mucosa, connective tissue, bone, cartilage, cellular elements of blood vessels, blood, lymphatic, nerves, muscles, tongue, tooth and its surrounding structures.

Anthropology & Evolution - Comparative study of tooth, joints, jaws, muscles of mastication and facial expression, tongue, palate, facial profile and facial skeletal system. Comparative anatomy of skull, bone, brain, musculo - skeletal system, neuromuscular coordination, posture and gait - plantigrade and orthograde posture.

Applied Genetics and Heredity - Principles of orofacial genetics, molecular basis of genetics, genetic risks, counseling, bioethics and relationship to Orthodontic management. Dentofacial anomalies, Anatomical, psychological and pathological characteristic of major groups of developmental defects of the orofacial structures

Cell biology - Detailed study of the structure and function of the mammalian cell with special emphasis on ultra structural features and molecular aspects. Detailed consideration of Inter cellular junctions. Cell cycle and division, cell-to-cell and cell- extra cellular matrix interactions.

APPLIED PHYSIOLOGY AND NUTRITION :

Introduction, Mastication, deglutition, digestion and assimilation, Homeostasis, fluid and electrolyte balance. Blood composition, volume, function, blood groups and hemorrhage, Blood transfusion, circulation, Heart, Pulse, Blood pressure, capillary and lymphatic-circulation, shock, respiration, control, anoxia, hypoxia, asphyxia, artificial respiration. Endocrine glands in particular reference to pituitary, parathyroid and thyroid glands and sex hormones. Role of calcium and Vit D in growth and development of teeth, bone and jaws. Role of Vit. A, C and B complex in oral mucosal and periodontal health. Physiology and function of the masticatory system. Speech mechanism, mastication, swallowing and deglutition mechanism, salivary glands and Saliva

ENDOCRINES:

General principles of endocrine activity and disorders relating to pituitary, thyroid, pancreas, parathyroid, adrenals, gonads, including pregnancy and lactation. Physiology of saliva, urine formation, normal and abnormal constituents, Physiology of pain, Sympathetic and parasympathetic nervous system. Neuromuscular co-ordination of the stomatognathic system.

APPLIED NUTRITION:

General principles, balanced diet, effect of dietary deficiencies and starvation, Diet, digestion, absorption, transportation and utilization, diet for elderly patients.

APPLIED BIOCHEMISTRY:

General principles governing the various biological activities of the body, such as osmotic pressure, electrolytic dissociation, oxidation-reduction, etc. general composition of the body, intermediary metabolism, Carbohydrates, proteins, liquids and their metabolism, Enzymes, Vitamins, and minerals, Hormones, Blood and other body fluids, Metabolism of inorganic elements, Detoxication in the body, Anti metabolites

APPLIED PHARMACOLOGY AND THERAPEUTICS:

Definition of terminologies used - Dosage and mode of administration of drugs. Action and fate of drugs in the body, Drug addiction, tolerance and hypersensitive reactions, Drugs acting on the central nervous system, general anesthetics hypnotics. Analeptics and tranquilizers, Local anesthetics, Chemotherapeutics and antibiotics, Antitubercular and anti syphilitic drugs, Analgesics and antipyretics, Antiseptics, styptics, Sialogogues and antisialogogues, Haematinics, Cortisone, ACTH, insulin and other antidiabetics vitamins: A, D, B - complex group C and K etc. Chemotherapy and Radiotherapy

APPLIED PATHOLOGY :

Inflammation, repair and degeneration, Necrosis and gangrene, Circulatory disturbances, Ischemia, hyperemia, chronic venous congestion, edema, thrombosis, embolism and infarction. Infection and infective granulomas, Allergy and hypersensitive reaction; Neoplasm; Classification of tumors, Carcinogenesis, characteristics of benign and malignant tumors, spread of tumors. Applied histo pathology and clinical pathology.

APPLIED MICROBIOLOGY:

Immunity, knowledge of organisms commonly associated with diseases of the oral cavity (morphology cultural characteristics etc) of strepto, staphylo, pneumo, gono and meningococci, Clostridia group of organisms, Spirochetes, organisms of tuberculosis, leprosy, diphtheria, actinomycosis and moniliasis etc. Virology, Cross infection control, sterilization and hospital waste management

a) Applied Oral Pathology:

Developmental disturbances of oral and Para oral structures, Regressive changes of teeth, Bacterial, viral and mycotic infections of oral cavity, Dental caries, diseases of pulp and periapical tissues, Physical and chemical injuries of the oral cavity, oral manifestations of metabolic and endocrine disturbances, Diseases of the blood and blood forming organism in relation to the oral cavity, Periodontal diseases, Diseases of the skin, nerves and muscles in relation to the Oral cavity.

b) Laboratory determinations:

Blood groups, blood matching, R.B.C. and W.B.C. count, Bleeding and clotting time, Smears and cultures - urine analysis and culture

BIOSTATISTICS:

Study of Biostatistics as applied to dentistry and research. Definition, aim characteristics and limitations of statistics, planning of statistical experiments, sampling, collection, classification and presentation of data (Tables, graphs, pictograms etc) Analysis of data

INTRODUCTION TO BIOSTATISTICS:

Scope and need for statistical application to biological data. Definition of selected terms - scale of measurements related to statistics, Methods of collecting data, presentation of the statistical diagrams and graphs.

Frequency curves, mean, mode of median, Standard deviation and coefficient of variation, Correlation - Co-efficient and its significance, Binominal distributions normal distribution and Poisson distribution, Tests of significance

RESEARCH METHODOLOGY:

Understanding and evaluating dental research, scientific method and the behavior of scientists, understanding to logic - inductive logic - analogy, models, authority, hypothesis and causation, Quacks, Cranks, Abuses of Logic, Measurement and Errors of measurement, presentation of results, Reliability, Sensitivity and specificity diagnosis test and measurement, Research Strategies, Observation, Correlation, Experimentation and Experimental design. Logic of statistical interference balance judgements, judgement under uncertainty, clinical vs., scientific judgement, problem with clinical judgement, forming scientific judgements, the problem of contradictory evidence, citation analysis as a Means of literature evaluation, influencing judgement : Lower forms of Rhetorical life, Denigration, Terminal, Inexactitude.

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APPLIED RADIOLOGY:

Introduction, radiation, background of radiation, sources, radiation biology, somatic damage, genetic damage, protection from primary and secondary radiation, Principles of X-ray production, Applied principles of radio therapy and after care.

ROENTGENOGRAPHIC TECHNIQUES:

Intra oral: Extra oral roentgenography, Methods of localization digital radiology and ultra sound, Normal anatomical landmarks of teeth and jaws in radiograms, temporomandibular joint radiograms, neck radiograms.

APPLIED MEDICINE:

Systemic diseases and its influence on general health and oral and dental health. Medical emergencies in the dental offices - Prevention, preparation, medico legal consideration, unconsciousness, respiratory distress, altered consciousness, seizures, drug related emergencies, chest pain, cardiac arrest, premedication, and management of ambulatory patients, resuscitation, applied psychiatry, child, adult and senior citizens. Assessment of case, premedication, inhibition, monitoring, extubation, complication assist in O.T. for anesthesia.

APPLIED SURGERY & ANESTHESIA:

General principles of surgery, wound healing, incision wound care, hospital care, control of hemorrhage, electrolyte balance. Common bandages, sutures, splints, shifting of critically ill patients, prophylactic therapy, bone surgeries, grafts, etc., surgical techniques, nursing assistance, anesthetic assistance.

Principles in speech therapy, surgical and radiological craniofacial oncology, applied surgical ENT and ophthalmology.

ELASTIC SURGERY:

Applied understanding and assistance in programmes of plastic surgery for prosthodontics therapy.

APPLIED DENTAL MATERIAL:

- All materials used for treatment of craniofacial disorders - Clinical, treatment, and laboratory materials, Associated materials, Technical consideration, shelf life, storage, manipulations, sterilization, and waste management.
- Students shall be trained and practiced for all clinical procedures with an advanced knowledge of theory of principles, concepts and techniques of various honorably accepted methods and materials for Prosthodontics, treatment modalities includes honorable accepted methods of diagnosis, treatment plan, records maintenance, and treatment and laboratory procedures and after care and preventive.
- Understanding all applied aspects for achieving physical, psychological well being of the patients for control of diseases and / or treatment related syndromes with the patient satisfaction and restoring function of Cranio mandibular system for a quality life of a patient
- The theoretical knowledge and clinical practice shall include principles involved for support, retention, stability, esthetics, phonation, mastication, occlusion, behavioral, psychological, preventive and social aspects of science of Prosthodontics including Crown & Bridge and Implantology
- Theoretical knowledge and clinical practice shall include knowledge for laboratory practice and material science. Students shall acquire knowledge and practice of history taking, systemic and oro and Craniofacial region and diagnosis and treatment plan and prognosis record maintaining. A comprehensive rehabilitation concept with pre prosthetic treatment plan including surgical Reevaluation and prosthodontic treatment plan, impressions, jaw relations, utility of face bow and articulators, selection and positioning of teeth for retention, stability, esthetics, phonation and psychological comfort. Fit and insertion and instruction for patients after care and preventive Prosthodontics, management of failed restorations.
- TMJ syndromes, occlusion rehabilitation and craniofacial esthetics. State of the art clinical methods and materials for implants supported extra oral and intra oral prosthesis.

- Student shall acquire knowledge of testing biological, mechanical and other physical property of all material used for the clinical and laboratory procedures in prosthodontic therapy.
- Students shall acquire full knowledge and practice Equipments, instruments, materials, and laboratory procedures at a higher competence with accepted methods.
- All clinical practice shall involve personal and social obligation of cross infection control, sterilization and waster management.

I. REMOVABLE PROSTHODONTICS AND IMPLANTS

- a. Prosthodontic treatment for completely edentulous patients - Complete denture, immediate complete denture, single complete denture, tooth supported complete denture, Implant supported Prosthesis for completely edentulous
- b. Prosthodontic treatment for partially edentulous patients: - Clasp-retained partial dentures, ~~intra-coronal and-extra coronal precision attachments retained partial-dentures~~, maxillofacial prosthesis.

Prosthodontic treatment for edentulous patients: - Complete Dentures and Implant supported Prosthesis.

Complete Denture Prosthesis - Definitions, terminology, G.P.T., Boucher's clinical dental terminology

Scope of Prosthodontic - the Cranio Mandibular system and its functions, the reasons for loss of teeth and methods of restorations,

Infection control, cross infection barrier - clinical and laboratory and hospital and lab waste management

- a) Edentulous Predicament, Biomechanics of the edentulous state, Support mechanism for the natural dentition and complete dentures, Biological considerations, Functional and Para functional considerations, Esthetic, behavioral and adaptive responses, Temporomandibular joints changes.
- b) Effects of aging of edentulous patients - aging population, distribution and edentulism in old age, impact of age on edentulous mouth - Mucosa, Bone, saliva, jaw movements in old age, taste and smell, nutrition, aging, skin and teeth, concern for personal appearance in old age
- c) Sequelae caused by wearing complete denture - the denture in the oral environment - Mucosal reactions, altered taste perception, burning mouth syndrome, gagging, residual ridge reduction, denture stomatitis, flabby ridge, denture irritation hyperplasia, traumatic Ulcers, Oral cancer in denture wearers, nutritional deficiencies, masticatory ability and performance, nutritional status and masticatory functions.
- d) Temporomandibular disorders in edentulous patients - Epidemiology, etiology and management, Pharmacotherapy, Physical modalities, and Bio-behavioral modalities
- e) Nutrition Care for the denture wearing patient - Impact of dental status on food intake, Gastrointestinal functions, nutritional needs and status of older adults, Calcium and bone health, vitamin and herbal supplementation, dietary counseling and risk factor for malnutrition in patients with dentures and when teeth are extracted.
- f) Preparing patient for complete denture patients - Diagnosis and treatment planning for edentulous and partially edentulous patients - familiarity with patients, principles of perception, health questionnaires and identification data, problem identification, prognosis and treatment identification data, problem identification, prognosis and treatment planning - contributing history - patient's history, social information, medical status - systemic status with special reference to debilitating diseases, diseases of the joint, cardiovascular, disease of the skin, neurological disorders, oral malignancies, climacteric, use of drugs, mental health - mental attitude, psychological changes, adaptability, geriatric changes - physiologic, pathological, pathological and intra oral changes. Intra oral health - mucose membrane, alveolar ridges, palate and vestibular sulcus and dental health.

Data collection and recording, visual observation, radiography, palpation, measurement - sulci or fossae, extra oral measurement, the vertical dimension of occlusion, diagnostic casts.

Specific observations - existing dentures, soft tissue health, hard tissue health - teeth, bone

Biomechanical considerations - jaw relations, border tissues, saliva, muscular development - muscle tone, neuromuscular co-ordination, tongue, cheek and lips. °

Interpreting diagnostic findings and treatment planning

- g) Pre prosthetic surgery - Improving the patients denture bearing areas and ridge relations: - non surgical methods - rest for the denture supporting tissues, occlusal correction of the old prosthesis, good nutrition, conditioning of the patients musculature, surgical methods - Correction of conditions, that preclude optimal prosthetic function - hyperplastic ridge - epulis fissuratum and papillomatosis, frenular attachments and pendulous maxillary tuberosities, ridge augmentation, maxillary and Mandibular oral implants, corrections of congenital deformities, discrepancies in jaw size, relief of pressure on the mental foramen, enlargement of denture bearing areas, vestibuloplasty, ridge augmentation, replacement of tooth roots with Osseo integrated denture implants.
- h) Immediate Denture - Advantages, disadvantages, contra indication, diagnosis treatment plan and prognosis, Explanation to the patient, Oral examinations, examination of existing prosthesis, tooth modification, prognosis, referrals/adjunctive care, oral prophylaxis and other treatment needs.
First extraction/surgical visit, preliminary impressions and diagnostic casts, management of loose teeth, custom trays, final impressions and final casts two tray or sectional custom impression tray, location of posterior limit and jaw relation records, setting the denture teeth / verifying jaw relations and the patient try-in, laboratory phase, setting of anterior teeth, Wax contouring, flasking and boil out, processing and finishing, surgical templates, surgery and immediate denture insertion, post operative care and patient instructions, subsequent service for the patient on the immediate denture, over denture tooth attachments, implants or implant attachments.
- i) Over dentures (tooth supported complete dentures) - indications and treatment planning, advantages and disadvantages, selection of abutment teeth, loss of abutment teeth, tooth supported complete dentures. Non-coping abutments, abutment with copings, abutments with attachments, submerged vital roots, preparations of the retained teeth.
- j) Single Dentures: Single Mandibular denture to oppose natural maxillary teeth, single complete maxillary denture to oppose natural Mandibular teeth to oppose a partially edentulous Mandibular arch with fixed prosthesis, partially edentulous Mandibular arch with removable partial dentures. Opposing existing complete dentures, preservation of the residual alveolar ridge, necessity for retaining maxillary teeth and mental trauma.
- k) Art of communication in the management of the edentulous predicament - Communication - scope, a model of communication, why communication important, what are the elements of effective communications, special significance of doctor / patient communication, doctor behavior, The iatrosedative (doctor & act of making calm) recognizing and acknowledging the problem, exploring and identifying the problem, interpreting and explaining the problem, offering a solution to the problem for mobilize their resources to operate most efficient way, recognizing and acknowledging the problem, interpreting and explaining the problem, offering a solution to the problem.
- l) Materials prescribed in the management of edentulous patients -
Denture base materials, General requirements of biomaterials for edentulous patients, requirement of an ideal denture base, chemical composition of denture base resins, materials used in the fabrication of prosthetic denture teeth, requirement of prosthetic denture teeth, denture lining materials and tissue conditioners, cast metal alloys as denture, bases - base metal alloys.
- m) Articulators - Classification, selection, limitations, precision, accuracy and sensitivity, and Functional activities of the lower member of the articulator and uses,

- n) Fabrications of complete dentures - complete denture impressions - muscles of facial expressions and anatomical landmarks, support, retention, stability, aims and objectives - preservation, support, stability, aesthetics, and retention. Impression materials and techniques - need of 2 impressions the preliminary impression and final impression Developing an analogue / substitute for the maxillary denture bearing area - anatomy of supporting structures - mucous membrane, hard palate, residual ridge, shape of the supporting structure and factors that influence the form and size of the supporting bones, incisive foramen, maxillary tuberosity, sharp spiny process, torus palatinus, Anatomy of peripheral or limiting structures, labial vestibule, Buccal vestibule, vibrating line, preliminary and final impressions, impression making, custom tray and refining the custom tray, preparing the tray to secure the final impression, making the final impression, boxing impression and making the casts -
 Developing an analogue / substitute for the Mandibular denture bearing area
 Mandible - anatomy of supporting structure, crest of the residual ridge, the Buccal shelf shape of supporting structure, mylohyoid ridge, mental foramen, genial tubercles, torus mandibularis, Anatomy of peripheral or limiting structure - labial vestibule, Buccal vestibule, lingual border, mylohyoid muscle, retromylohyoid fossa, sublingual gland region, alveolingual sulcus, Mandibular impressions - preliminary impressions, custom tray, refining, preparing the tray, final impressions.
- o) Mandibular movements, Maxillo-mandibular relation and concepts of occlusion - Gnathology, identification of shape and location of arch form - Mandibular and maxillary, occlusion rim, level of occlusal plane and recording of trail denture base, tests to determine vertical dimension of occlusion, interocclusal, centric relation records, Biological and clinical considerations in making jaw relation records and transferring records from the patients to the articulator, Recording of Mandibular movements - influence of opposing tooth contacts, Temporomandibular joint, muscular involvements, neuromuscular regulation of Mandibular motion, the envelope of motion, rest position, Maxillo - Mandibular relations - the centric, eccentric, physiologic rest position, vertical dimension, occlusion, recording methods - mechanical, physiological, Determining the horizontal jaw relation - Functional graphics, tactile or interocclusal check record method, Orientation / sagittal relation records, Arbitrary / Hinge axis and face bow record, significance and requirement, principles and biological considerations and securing on articulators.
- p) Selecting and arranging artificial teeth and occlusion for the edentulous patient - anterior tooth selection, posterior tooth selection, and principles in arrangement of teeth, and factors governing position of teeth - horizontal, vertical. The inclinations and arrangement of teeth for aesthetics, phonetics and mechanics - to concept of occlusion.
- q) The Try in - verifying vertical dimension, centric relation, establishment of posterior palatal seal, creating a facial and functional harmony with anterior teeth, harmony of spaces of individual teeth position, harmony with sex, personality and age of the patient, co-relating aesthetics and incisal guidance.
- r) Speech considerations with complete dentures - speech production - structural and functional demands, neuropsychological background, speech production and the roll of teeth and other oral structures - bilabial sounds, labiodentals sounds, linguodental sounds, linguoalveolar sound, articulatoric characteristics, acoustic characteristics, auditory characteristics, linguopalatal and linguoalveolar sounds, speech analysis and prosthetic considerations.
- s) Waxing contouring and processing the dentures their fit and insertion and after care - laboratory procedure - wax contouring, flasking and processing, laboratory remount procedures and selective, finishing and polishing. Critiquing the finished prosthesis - doctors evaluation, patients evaluation, friends evaluation, elimination of basal surface errors, errors in occlusion, interocclusal records for remounting procedures - verifying centric relation, eliminating occlusal errors, special instructions to the patient - appearance with new denture, mastication with new dentures, speaking with new dentures, speaking with new dentures, oral hygiene with dentures, preserving of residual ridges and educational material for patients, maintaining the comfort and

health of the oral cavity in the rehabilitated edentulous patients. Twenty-four hours oral examination and treatment and preventive Prosthodontic - periodontic recall for oral examination 3 to 4 months intervals and yearly intervals.

- t) Implant supported Prosthesis for partially edentulous patients - Science of Osseo integration, clinical protocol for treatment with implant supported over dentures, managing problems and complications, implant Prosthodontics for edentulous patients: current and future directions.
- u) Implant supported prosthesis for partially edentulous patients - Clinical and laboratory protocol: Implant supported prosthesis, managing problems and complications.

- Introduction and Historical Review
- Biological, clinical and surgical aspects of oral implants
- Diagnosis and treatment planning
- Radiological interpretation for selection of fixtures
- Radiological interpretation for selection of fixtures
- Splints for guidance for surgical placement of fixtures
- Intra oral plastic surgery
- Guided bone and Tissue generation consideration for implants fixture.
- Implants supported prosthesis for complete edentulism and partial edentulism
- Occlusion for implants support prosthesis.
- Peri-implant tissue and Management
- Peri - implant and management
- Maintenance and after care
- Management of failed restoration.
- Work authorization for implant supported prosthesis - definitive instructions, legal aspects, delineation of responsibility.

Prosthodontic treatment for partially edentulous patients - Removable partial Prosthodontics -

- a. Scope, definition and terminology; Classification of partially edentulous arches - requirements of an acceptable methods of classification, Kennedy's classification, Applegate's rules for applying the Kennedy classification
 - b. Components of RPD - major connector - mandibular and maxillary, minor connectors, design, functions, form and location of major and minor connectors, tissue stops, finishing lines, reaction of tissue to metallic coverage
- Rest and rest seats - from of the Occlusal rest and rest seat, interproximal Occlusal rest seats, internal Occlusal rests, possible movements of partial dentures, support for rests, lingual rests on canines and incisor teeth, incisal rest and rest seat.
- Direct retainer- Internal attachment, extracoronal direct retainer, relative uniformity of retention, flexibility of clasp arms, stabilizing - reciprocal clasp arc, criteria for selecting a given clasp design, the basic principles of clasp design, circumferential clasp, bar clasp, combination clasp and other type of retainers.
- Indirect Retainer - denture rotation about an axis, factors influencing effectiveness of indirect retainers, forms of indirect retainers, auxiliary Occlusal rest, canine extensions from Occlusal rests, canine rests, continuous bar retainers and linguoplates, modification areas, rugae support, direct - indirect retention.
- Principles of removable partial Denture design - bio mechanic considerations, and the factors influence after mouth preparations - Occlusal relationship of remaining teeth, orientation of Occlusal plane, available space for restoration, arch integrity, tooth morphology, response of oral structure to previous-stress, periodontal conditions, abutment support, tooth supported and tooth and tissue supported, need for indirect retention, clasp design, need for rebasing, secondary impression, need for abutment tooth modification, type of major connector, type of teeth selection, patients past experience, method of replacing single teeth or missing anterior teeth.
- Difference between tooth supported and tissue supported partial dentures, essential of partial denture design, components of partial denture design, tooth support, ridge support,

- stabilizing components, guiding planes, use of splint bar for denture support, internal clip attachments, overlay abutment as support for a denture base, use of a component partial to gain support.
- c. Education of patient
 - d. Diagnosis and treatment planning
 - e. Design, treatment sequencing and mouth preparation
 - f. Surveying - Description of dental surveyor, purposes of surveying, Aims and objectives in surveying of diagnostic cast and master cast, Final path of placement, factors that determine path of placement and removal, Recording relation of cast to surveyor, measuring retention, Blocking of master cast - paralleled blockout, shaped blockout, arbitrary blockout and relief.
 - g. Diagnosis and treatment planning - Infection control and cross infection barriers - clinical and laboratory and hospital waste management, Objectives of prosthodontic treatment, Records, systemic evaluation, Oral examination, preparation of diagnostic cast, interpretation of examination data, radiographic interpretation, periodontal considerations, caries activity; prospective surgical preparation, endodontic treatment, analysis of occlusal factors, fixed restorations, orthodontic treatment, need for determining the design of components, impression procedures and occlusion, need for reshaping remaining teeth, reduction of unfavorable tooth contours, differential diagnosis : fixed or removable partial dentures, choice between complete denture and removable partial dentures, choice of materials
 - h. Preparation of Mouth for removable partial dentures - Oral surgical preparation, conditioning of abused and irritated tissues, periodontal preparation - objectives of periodontal therapy, periodontal diagnosis, control therapy, periodontal surgery.
 - i. Preparation of Abutment teeth - Classification of abutment teeth, sequence of abutment preparations on sound enamel or existing restorations, conservative restoration using crowns, splinting abutment teeth, utilization, temporary crowns to be used as abutment.
 - j. Impression Materials and Procedures for Removable Partial Dentures - Rigid materials, thermoplastic materials, Elastic materials, Impressions of the partially edentulous arch, Tooth supported, tooth tissue supported, Individual impression trays.
 - k. Support for the Distal Extension Denture Base - Distal extension removable partial denture, Factors influencing the support of distal extension base, Methods for obtaining functional support for the distal extension base.
 - l. Laboratory Procedures - Duplicating a stone cast, Waxing the partial denture framework, Anatomic replica patterns, Spruing, investing, burnout, casting and finishing of the partial denture framework, making record bases, occlusion rims, making a stone occlusal template from a functional occlusal record, arranging posterior teeth to an opposing cast or template, types of anterior teeth, waxing and investing the partial denture before processing acrylic resin bases, processing the denture, remounting and occlusal correction to an occlusal template, polishing the denture.
 - m. Initial placement, adjustment and servicing of the removable partial denture - adjustments to bearing surfaces of denture framework, adjustment of occlusion in harmony with natural and artificial dentition, instructions to the patient, follow - up services
 - n. Relining and Rebasing the removable partial denture - Relining tooth supported dentures bases; relining distal extension denture bases, methods of reestablishing occlusion on a relined partial denture.
 - o. Repairs and additions to removable partial dentures - Broken clasp arms, fractured occlusal rests, distortion or breakage of other components - major and minor connectors, loss of a tooth or teeth not involved in the support or retention of the restoration, loss of an abutment tooth necessitating its replacement and making a new direct retainer, Other types of repairs, Repair by soldering.
 - p. Removable partial denture considerations in maxillofacial prosthetics - Maxillofacial prosthetics, intra oral prosthesis, design considerations, maxillary prosthesis, Obturators, speech aids, palatal lifts, palatal augmentations, mandibular prosthesis, treatment planning, framework design, class I resection, Class II resection, mandibular flange prosthesis, jaw relation record

- q. Management of failed restorations and work authorization.

II. MAXILLOFACIAL REHABILITATION:

Scope, terminology, definitions, cross infection control and hospital waste management, work authorization.

Behavioral and psychological issues in Head and neck cancer, Psychodynamic interactions - clinician and patient - Cancer Chemotherapy: Oral Manifestations, Complications, and management, Radiation therapy of head and neck tumors: Oral effects, Dental manifestations and dental treatment: Etiology, treatment and rehabilitation (restoration) - Acquired defects of the mandible, acquired defects of hard palate, soft palate, clinical management of edentulous and partially edentulous maxillectomy patients, Facial defects, Restoration of speech, Velopharyngeal function, cleft lip and palate, cranial implants, maxillofacial trauma, Lip and cheek support prosthesis, Laryngectomy aids, Obstructive sleep apnoea, Tongue prosthesis, Esophageal prosthesis, Vaginal radiation carrier, Burn stents, Nasal stents, Auditory inserts, trismus appliances, mouth controlled devices for assisting the handicapped, custom prosthesis for lagophthalmos of the eye. Osseo integrated supported facial and maxillofacial prosthesis. Resin bonding for maxillofacial prosthesis, Implant rehabilitation of the mandible compromise by radiotherapy, Craniofacial Osseo. integration, Prosthodontic treatment, Material and laboratory procedures for maxillofacial prosthesis.

III. OCCLUSION

EVALUATION, DIAGNOSIS AND TREATMENT OF OCCLUSAL PROBLEMS:

Scope, definition, terminology, optimum oral health, anatomic harmony, functional harmony, occlusal stability, causes of deterioration of dental and oral health, Anatomical, physiological, neuro - muscular, psychological, considerations of teeth, muscles of mastication, temporomandibular joint, intra oral and extra oral and facial musculatures, the functions of Cranio mandibular system.

Occlusal therapy, the stomatognathic system, centric relation, vertical dimension, the neutral zone, the occlusal plane, differential diagnosis of temporomandibular disorders, understanding and diagnosing intra articular problems, relating treatment to diagnosis of internal derangements of TMJ, Occlusal splints, Selecting instruments for occlusal diagnosis and treatment, mounting casts, Pankey-mann-schuyler philosophy of complete occlusal rehabilitation, long centric, anterior guidance, restoring lower anterior teeth, restoring upper anterior teeth, determining the type of posterior occlusal contours, methods for determining the plane of occlusion, restoring lower posterior teeth, restoring upper posterior teeth, functionally generated path techniques for recording border movements intra orally, occlusal equilibration, Bruxism, Procedural steps in restoring occlusions, requirements for occlusal stability, solving occlusal problems through programmed treatment planning, splinting, solving - occlusal wear problems, deep overbite problems, anterior overjet problems, anterior open bite problems. Treating - end to end occlusion, splayed anterior teeth, cross bite patient, Crowded, irregular, or interlocking anterior bite, using Cephalometric for occlusal analysis, solving severe arch malrelationship problems, transcranial radiography, postoperative care of occlusal therapy.

IV. FIXED PROSTHODONTICS

Scope, definitions and terminology, classification and principles, design, mechanical and biological considerations of components - Retainers, connectors, pontics, work authorization.

- **Diagnosis and treatment planning** - patients history and interview, patients desires and expectations and needs, systemic and emotional health, clinical examinations - head and neck, oral - teeth, occlusal and periodontal, Preparation of diagnostic cast, radiographic interpretation, Aesthetics, endodontics considerations, abutment selection - bone support, root proximities and inclinations, selection of abutments, for cantilever, pier abutments, splinting, available tooth structures and crown morphology, TMJ and muscles mastication and comprehensive planning and prognosis.

- **Management of Carious teeth** - caries in aged, caries control, removal carious, protection of pulp, reconstruction measure for compromising teeth - retentive pins, horizontal slots retention grooves, prevention of caries, diet, prevention of root caries and vaccine for caries.
- **Periodontal considerations** - attachment units, ligaments, gingivitis, periodontitis Microbiological aspect of periodontal diseases, marginal lesion, occlusal trauma, periodontal pockets attached gingiva, interdental papilla, gingival embrasures, gingival/periodontal prosthesis, radiographic interpretations of Periodontia, intraoral, periodontal splinting - Fixed prosthodontics with periodontally compromised dentitions, placement of margin restorations.
- **Biomechanical principle of tooth preparations** - individual tooth preparations - Complete metal Crowns - P.F.C., All porcelain - Cerestore crowns, dicor crowns, incerem etc porcelain jacket crowns partial 3/4, ironional half, radicular 7/8, telescopic, pin-ledge ~~laminates, inlays, onlays and preparations for restoration of teeth-amalgam, glass ionomer and composite resins, Resin Bond retainers, Gingival marginal preparations - Design, material selection, and biological and mechanical considerations - intracoronal retainer and precision attachments - custom made and ready made~~
- **Isolation and fluid control** - Rubber dam applications, tissue dilation - soft tissue management for cast restoration, impression materials and techniques, provisional restoration, interocclusal records, laboratory support for fixed Prosthodontics, Occlusion, Occlusal equilibration, articulators, recording and transferring of occlusal relations, cementing of restorations.
- **Resins, Gold and gold alloys, glass ionomer, restorations.**
- **Restorations of endodontically treated teeth, Stomatognathic Dysfunction and management**
- **Management of failed restorations**

Osseo integrated supported fixed Prosthodontics - Osseo integrated supported and tooth supported fixed Prosthodontics

V. **TMJ - Temporomandibular joint dysfunction - Scope, definitions, and terminology**

Temporomandibular joint and its function, Orofacial pain, and pain from the temporomandibular joint-region, temporomandibular joint dysfunction, temporomandibular joint sounds, temporomandibular joint disorders

Anatomy related, trauma, disc displacement, Osteoarthritis/Osteoarthritis, Hyper mobility and dislocation, infectious arthritis, inflammatory diseases, Eagle's syndrome (Styloid - stylohyoid syndrome), Synovial chondromatosis, Osteochondrosis disease, Osteonecrosis, Nerve entrapment process, Growth changes, Tumors, Radiographic imaging

- Etiology, diagnosis and cranio mandibular pain, differential diagnosis and management of orofacial pain - pain from teeth, pulp, dentin, muscle pain, TMJ pain - psycho logic, physiologic - endogenous control, acupuncture analgesia, Placebo effects on analgesia, Trigeminal neuralgia, Temporal arteritis
- Occlusal splint therapy - construction and fitting of occlusal splints, management of occlusal splints, therapeutic effects of occlusal splints, occlusal splints and general muscles performance, TMJ joint uploading and anterior repositioning appliances, use and care of occlusal splints.
- Occlusal adjustment procedures - Reversible - occlusal stabilization splints and physical therapies, jaw exercises, jaw manipulation and other physiotherapy or irreversible therapy - occlusal repositioning appliances, orthodontic treatment, Orthognathic surgery, fixed and removable prosthodontic treatment and occlusal adjustment, removable prosthodontic treatment and occlusal adjustment, Indication for occlusal adjustment, special nature of orofacial pain, Indication for occlusal adjustment, special nature of orofacial pain, Psychopathological considerations, occlusal adjustment philosophies, mandibular position, excursive guidance,, occlusal contact scheme, goals of occlusal adjustment, significance of a slide in centric, Preclinical procedures, clinical procedures for occlusal adjustment.

VI. AESTHETIC

SCOPE, DEFINITIONS :

Morpho psychology and esthetics, structural esthetic rules - facial components, dental components, gingival components and physical components. Esthetics and its relationship to function - Crown morphology, physiology of occlusion, mastication, occlusal loading and clinical aspect in bio esthetic aspects, Physical and physiologic characteristic and muscular activities of facial muscle, perioral anatomy and muscle retaining exercises Smile - classification and smile components, smile design, esthetic restoration of smile, Esthetic management of the dentogingival unit, intraoral materials for management of gingival contours, and ridge contours, Periodontal esthetics, Restorations - Tooth colored restorative materials, the clinical and laboratory aspects, marginal fit; anatomy, inclinations, form, size, shape, color, embrasures, contact point.

TEACHING AND LEARNING ACTIVITIES:

All the candidates registered for MDS course shall pursue the course for a period of three years as full - time students. During this period each student shall take part actively in learning and teaching activities designed by the Institution/ University. The following teaching and learning activities in each speciality.

Prosthetic treatment should be practiced by developing skills by teaching various and more number of patients to establish skill for diagnose and treatment and after care with bio-mechanical, biological, bio-esthetics, Bio-phonetics and all treatment should be carried out in more number for developing clinical skill

1. **Lectures:** There shall be didactic lectures both in the speciality and in the allied fields. The postgraduate departments should encourage the guest lectures in the required areas to strengthen the training programmes. It is also desirable to have certain integrated lectures by multidisciplinary teams on selected topics
2. **Journal club:** The journal review meetings shall be held at least once a week. All trainees are expected to participate actively and enter relevant details in logbook. Each trainee should make presentations from the allotted journal of selected articles at least 5 times in a year.
3. **Seminars:** The seminars shall be held at least twice a week in the department, all trainees associated with postgraduate teaching are expected to participate actively and enter relevant details in logbook. Each trainee shall make at least 5-seminar presentation in each year.
4. **Symposium:** It is recommended to hold symposium on topics covering multiple disciplines one in each academic year.
5. **Workshops:** It is recommended to hold workshops on topics covering multiple disciplines one in each academic year.
6. **Clinical Postings:** Each trainee shall work in the clinics on regular basis to acquire adequate professional skills and competency in managing various cases to be treated by a specialist
7. **Clinico Pathological Conference:** The Clinico pathological conferences should be held once in a month involving the faculties of oral biology, oral medicine and radiology, oral pathology, oral surgery, period-ontology, endodontia and concerned clinical department. The trainees should be encouraged to present the clinical details, radiological and histo-pathological interpretations and participation in the discussions.
8. **Interdepartmental Meetings:** To bring in more integration among various specialities there shall be interdepartmental meeting chaired by the dean with all heads of postgraduate departments atleast once a month.
9. **Rural oriented prosthodontics health care -** To carry out a prosthodontic therapy interacting with rural centers and the institution.
10. **Teaching skills:** All the trainees shall be encouraged to take part in undergraduate teaching programmes either in the form of lectures or group discussions
11. **Evaluation skills:** All the trainees shall be encouraged to enhance their skills and knowledge in clinical, laboratory practice including theory by formulating question banks and model answers.

12. **Continuing dental Education programmes:** Each Postgraduate department shall organize these programmes on regular basis involving the other institutions. The trainees shall also be encouraged to attend such programmes conducted elsewhere.
13. **Conferences/Workshops/Advanced courses:** The trainees shall be encouraged not only to attend conference/workshops/advance courses but also to present atleast two papers at a state/national speciality meeting during their training period.
14. **Rotational posting in other Departments:** To bring in more integration between the speciality and allied fields each post graduate department shall work out a programme to rotate the trainees in related disciplines and craniofacial and maxillofacial ward.
15. **Dissertation:** Trainees shall prepare a dissertation based on the clinical or laboratory experimental work or any other study conducted by them under the supervision of the post graduate guide.

I YEAR M.D.S.

- Theoretical exposure of all applied sciences of study
- Clinical and non-clinical exercises involved in Prosthodontics therapy for assessment and acquiring higher competence
- Commencement of Library Assignment within six months.
- Short epidemiological study relevant to Prosthodontics.
- Acquaintance with books, journals and referrals to acquire knowledge of published books, journals and website for the purpose of gaining knowledge and reference - in the fields of Prosthodontics including Crown & bridge and implantology
- Acquire knowledge of instruments, equipment, and research tools in Prosthodontics.
- To acquire knowledge of Dental Material Science - Biological and biomechanical & bio-esthetics, knowledge of using material in laboratory and clinics including testing methods for dental materials.
- Participation and presentation in seminars, didactic lectures
- Evaluation - Internal Assessment examinations on Applied subjects

II YEAR M.D.S.

- Acquiring confidence in obtaining various phases and techniques for providing Prosthodontic therapy.
- Acquiring confidence by clinical practice with sufficient numbers of patients requiring tooth and tooth surface restorations.
- Fabrication of Adequate number of complete denture prosthesis following, higher clinical approach by utilizing semi-adjustable articulators, face bow and graphic tracing.
- Understanding the use of the dental surveyor and its application in diagnosis and treatment plan in R.P.D.
- Adequate numbers of R.P.D. covering all partially edentulous situation
- Adequate number of Crowns, Inlays, laminates F.P.D. covering all clinical situation.
- Selection of cases and principles in treatment of partially or complete edentulous patients by implant supported prosthesis.
- Treating single edentulous arch situation by implant supported prosthesis.
- Diagnosis and treatment planning for implant prosthesis.
- 1st stage and 2nd stage implant surgery
- Understanding the maxillofacial Prosthodontics
- Treating craniofacial defects
- Management of orofacial defects
- Prosthetic management of TMJ syndrome
- Occlusal rehabilitation
- Management of failed restoration
- Prosthodontics Management of patient with psychogenic disorder.
- Practice of child and geriatric prosthodontics
- Participation and presentation in seminars, didactic lectures

- Evaluation – Internal Assessment examinations

III YEAR M.D.S

- Clinical and laboratory practice continued from IInd year
- Occlusion equilibration procedures – fabrication of stabilizing splint for parafunctional disorders, occlusal disorders and TMJ functions.
- Practice of dental, oral and facial esthetics
- The clinical practice of all aspects of Prosthodontic therapy for elderly patients.
- Implants Prosthodontics – Rehabilitation of Partial Edentulous, Complete edentulism and for craniofacial rehabilitation
- Failures in all aspects of Prosthodontics and its management and after care
- Team management for esthetics, TMJ syndrome and Maxillofacial and Craniofacial Prosthodontics
- Management of Prosthodontics emergencies, resuscitation.
- Candidate should complete the course by attending by large number and variety of patients to master the prosthodontic therapy. This includes the practice management, examinations, treatment planning, communication with patients, clinical and laboratory techniques materials and instrumentation requiring different aspects of prosthodontic therapy, Tooth and Tooth surface restoration, Restoration of root treated teeth, splints for periodontal rehabilitations and fractured jaws, complete dentures, R.P.D. FPD. Immediate dentures over dentures implant supported prosthesis, maxillofacial and body prosthesis, occlusal rehabilitation.
- Prosthetic management of TMJ syndrome
- Management of failed restorations
- Complete and submit Library Assignment 6 months prior to examination.
- Candidates should acquire complete theoretical and clinical knowledge through seminars, symposium, workshops and reading.
- Participation and presentation in seminars, didactic lectures
- Evaluation – Internal Assessment examinations three months before University examinations

PROSTHODONTIC TREATMENT MODALITIES

1. Diagnosis and treatment plan in prosthodontics
2. Tooth and tooth surface restorations
 - Fillings
 - Veneers - composites and ceramics
 - Inlays- composite, ceramic and alloys
 - Onlay – composite, ceramic and alloys
 - Partial crowns – $\frac{3}{4}$ th, $\frac{4}{5}$ th, $\frac{7}{8}$ th, $\frac{1}{2}$ crowns
 - Pin-ledge
 - Radicular crowns
 - Full crowns

3. Tooth replacements

	PARTIAL	COMPLETE
• Tooth supported	Fixed partial denture	Overdenture
• Tissue supported	Interim partial denture	Complete denture
	Intermediate partial denture	Immediate denture
		Immediate complete denture
• Tooth and tissue Supported	Cast partial denture	Overdenture
	Precision attachment	
• Implant supported	Cement retained	Bar attachment
	Screw retained	Ball attachment
	Clip attachment	
• Tooth and implant Supported	Screw retained	
	Cement retained	

- | | | |
|--|--|--------------------|
| <ul style="list-style-type: none"> • Root supported ➤ Precision attachments • Intra coronal attachments • Extra coronal attachments • Bar - slide attachments • Joints and hinge joint attachments | <p>Dowel and core
Pin retained</p> | <p>Overdenture</p> |
|--|--|--------------------|
4. Tooth and tissue defects (Maxillo- facial and Cranio-facial prosthesis)
- A. Congenital Defects
- | | | |
|--|---|--|
| <ul style="list-style-type: none"> a. Cleft lip and palate b. Pierre Robin Syndrome c. Ectodermal dysplasia d. Hemifacial microsomia e. Anodontia f. Oligodontia g. Malformed teeth | } | <ul style="list-style-type: none"> cast partial dentures implant supported prosthesis complete dentures fixed partial dentures |
|--|---|--|
- B. Acquired defects
- a. Head and neck cancer patients - prosthodontic splints and stents
 - b. Restoration of facial defects:
 - Auricular prosthesis
 - Nasal prosthesis
 - Orbital prosthesis
 - Craniofacial implants
 - c. Midfacial defects
 - d. Restoration of maxillofacial trauma
 - e. Hemimandibulectomy
 - f. Maxillectomy
 - g. Lip and cheek support prosthesis
 - h. Ocular prosthesis
 - i. Speech and Velopharyngeal prosthesis
 - j. Laryngectomy aids
 - k. Esophageal prosthesis
 - l. Nasal stents
 - m. Tongue prosthesis
 - n. Burn stents
 - o. Auditory inserts
 - p. Trismus appliances
- | | |
|---|---|
| } | <ul style="list-style-type: none"> cast partial denture implant supported dentures complete dentures |
|---|---|
5. T.M.J and Occlusal disturbances
- a. Occlusal equilibration
 - b. Splints - Diagnostic
 - Repositioners / Deprogrammers
 - c. Anterior bite plate
 - d. Posterior bite plate
 - e. Bite raising appliances
 - f. Occlusal rehabilitation
6. Esthetic/Smile designing
- a. Laminates / Veneers
 - b. Tooth contouring (peg laterals, malformed teeth)
 - c. Tooth replacements
 - d. Team management
7. Psychological therapy
- a. Questionnaires

- b. Charts, papers, photographs
- c. Models
- d. Case reports
- e. Patient counseling
- f. Behavioral modifications
- g. Referrals

8. Geriatric Prosthodontics

- a. Prosthodontics for the elderly
- b. Behavioral and psychological counseling
- c. Removable Prosthodontics
- d. Fixed Prosthodontics
- e. Implant supported Prosthodontics
- f. Maxillofacial Prosthodontics
- g. Psychological and physiological considerations

9. Preventive measures

- a. Diet and nutrition modulation and counseling
- b. Referrals

The bench work should be completed before the clinical work starts during the first year of the MDS Course

I. Complete dentures

1. Arrangements in adjustable articulator for
 - Class I
 - Class II
 - Class III
2. Various face bow transfer to adjustable articulators
3. Processing of characterized anatomical denture

II. Removable partial denture

1. Design for Kennedy's Classification (Survey, block out and design)
 - a. Class I
 - b. Class II
 - c. Class III
 - d. Class IV
2. Designing of various components of RPD
3. Wax pattern on refractory cast
 - a. Class I
 - b. Class II
 - c. Class III
 - d. Class IV
4. Casting and finishing of metal frameworks
5. Acrylisation on metal frameworks for
 - Class I
 - Class III with modification

III. Fixed Partial Denture

1. Preparation in ivory teeth / natural teeth
 - FVC for metal
 - FVC for ceramic
 - Porcelain jacket crown
 - Acrylic jacket crown
 - PFM crown
 - 3/4th (canine, premolar and central)

- 7/8th posterior
 - Proximal half crown
 - Inlay - Class I, II, V
 - Onlay - Pin ledged, pinhole
 - Laminates
2. Preparation of different die system
3. Fabrication of wax pattern by drop wax build up technique
- Wax in increments to produce wax coping over dies of tooth preparations on substructures
 - Wax additive technique
 - 3-unit wax pattern (maxillary and Mandibular)
 - Full mouth
4. Pontic design in wax pattern
- Ridge lap
 - Sanitary
 - Modified ridge lap
 - Modified sanitary
 - Spheroidal or conical
5. Fabrication of metal framework
- Full metal bridge for posterior (3 units)
 - Coping for anterior (3 unit)
 - Full metal with acrylic facing
 - Full metal with ceramic facing
 - Adhesive bridge for anterior
 - Coping for metal margin ceramic crown
 - Pin ledge crown
6. Fabrication of crowns
- All ceramic crowns with characterisation
 - Metal ceramic crowns with characterisation
 - Full metal crown
 - Precious metal crown
 - Post and core
7. Laminates
- Composites with characterisation
 - Ceramic with characterisation
 - Acrylic
8. Preparation for composites
- Laminates
 - Crown
 - Inlay
 - Onlay
 - Class I
 - Class II
 - Class III
 - Class IV
 - Fractured anterior tooth

IV. Maxillofacial prosthesis

1. Eye
2. Ear
3. Nose
4. Face

5. Body
6. Cranial
7. Maxillectomy
8. Hemimandibulectomy
9. Finger prosthesis
10. Guiding flange
11. Obturator

V. Implant supported prosthesis

1. Step by step procedures - laboratory phase

VI. Other exercises

1. TMJ splints - stabilization appliances, maxillary and Mandibular repositioning appliances
2. Anterior disclusion appliances
3. Chrome cobalt and acrylic resin stabilization appliances
4. Modification in accommodation in irregularities in dentures
5. Occlusal splint
6. Periodontal splint
7. Precision attachments - custom made
8. Over denture coping
9. Full mouth rehabilitation (by drop wax technique, ceramic build up)
10. TMJ appliances - stabilization appliances

ESSENTIAL SKILLS:

*Key

O - Washes up and observes

A - Assists a senior

PA - Performs procedure under the direct supervision of a senior specialist

PI - Performs independently

PROCEDURE	CATEGORY			
	O	A	PA	PI
Tooth and tooth surface restoration				
a) Composites - fillings, laminates, inlay, onlay	2	2	2	10
b) Ceramics - laminates, inlays, onlays	2	2	2	10
c) Glass Ionomer	1	1	1	10
CROWNS				
FVC for metal	1	2	2	10
FVC for ceramic	1	2	2	10
Precious metal crown	1	-	1	5
Galvanoformed crown	-	-	1	1
3/4 th crowns (premolars, canines and centrals)	1	-	-	5
7/8 th posterior crown	1	-	-	5
Proximal half crown	1	-	-	5
Pinledge and pinhole crowns	1	-	-	5
Telescopic crowns	1	-	-	5
Intraradicular crowns (central, lateral, canine, premolar, and molar)	1	-	-	5
Crown as implant supported prosthesis	1	-	1	5
FIXED PARTIAL DENTURES				
Cast porcelain (3 unit)	1	-	-	5
Cast metal - precious and non precious (3 unit posterior)	1	-	-	5
Porcelain fused metal (anterior and posterior)	1	1	1	10
Multiple abutment - maxillary and Mandibular full arch	1	1	1	5
Incorporation of custom made and ready made precision joint or attachments	1	1	1	4

Adhesive bridge for anterior/posterior	1	-	1	10
Metal fused to resin anterior FPD	-	-	1	5
Interim provisional restorations (crowns and FPDs)	1	1	1	10
Immediate fixed partial dentures (interim)	1	-	-	5
Fixed prosthesis as a retention and rehabilitation for acquired and congenital defects - maxillofacial prosthetics	1	1	1	5
Implant supported prosthesis	1	-	1	1
Implant - tooth supported prosthesis	1	-	1	1
REMOVABLE PARTIAL DENTURE				
Provisional partial denture prosthesis	1	1	1	10
Cast removable partial denture (for Kennedy's Applegate classification with modification)	1	1	1	6
Removable bridge with precision attachments and telescopic crowns for anterior and posterior	1	1	2	4
Immediate RPD	1	1	1	5
Partial denture for medically compromised and handicapped patients	1	1	1	5
COMPLETE DENTURES				
Neurocentric occlusion & characterized prosthesis	-	-	1	5
Anatomic characterized prosthesis (by using semi adjustable articulator)	-	-	1	25
Single dentures	-	-	1	5
Overlay dentures	-	-	1	5
Interim complete dentures as a treatment prosthesis for abused denture supporting tissues	-	-	1	5
Complete denture prosthesis (for abnormal ridge relation, ridge form and ridge size)	-	-	1	5
Complete dentures for patients with TMJ syndromes	-	-	1	5
Complete dentures for medically compromised and handicapped patients	-	-	1	5
GERIATRIC PATIENTS				
Tooth and tooth surface restorations, crowns, fixed prosthesis, removable prosthesis	-	-	1	5
IMPLANT SUPPORTED COMPLETE PROSTHESIS				
Implant supported complete prosthesis (maxillary and Mandibular)	-	-	1	1
MAXILLOFACIAL PROSTHESIS				
Guiding flange and obturators	-	-	1	4
Speech and palatal lift prosthesis	-	-	1	2
Eye prosthesis	-	-	1	2
Ear prosthesis	-	-	1	2
Nose prosthesis	-	-	1	2
Face prosthesis	-	-	-	1
Maxillectomy	-	-	1	2
Hemimandibulectomy	-	-	1	2
Cranioplasty	-	-	1	1
Finger/ hand, foot	-	-	1	2
Body prosthesis	-	-	1	1
Management of burns, scars	-	-	-	1

TMJ SYNDROME MANAGEMENT					
	Splints - periodontal, teeth, jaws	-	-	1	4
	TMJ supportive and treatment prosthesis	-	-	1	1
	Stabilization appliances for maxilla and mandible with freedom to move from IP to CRCP	-	-	-	1
	In IP without the freedom to move to CRCP	-	-	-	1
	Repositioning appliances, anterior disclusion	-	-	-	1
	Chrome cobalt and acrylic resin stabilization appliances for modification to accommodate for the irregularities in the dentition	-	-	-	2
	Occlusal adjustment and occlusal equilibrium	-	-	1	4
FULL MOUTH REHABILITATION					
	Full mouth rehabilitation - restoration of esthetics and function of stomatognathic system	-	-	1	4
INTER-DISCIPLINARY TREATMENT MODALITIES					
	Inter-disciplinary management - restoration of Oro craniofacial defects for esthetics, phonation, mastication and psychological comforts	-	-	1	2
MANAGEMENT OF FAILED RESTORATION					
	Tooth and tooth surface restorations	-	-	-	5
	Removable prosthesis	-	-	-	10
	Crowns and fixed prosthesis	-	-	-	5
	Maxillofacial prosthesis	-	-	-	2
	Implant supported prosthesis	-	-	-	1
	Occlusal rehabilitation and TMJ syndrome	-	-	-	2
	Restoration failure of psychogenic origin	-	-	-	5
	Restoration failure to age changes	-	-	-	2

SCHEME OF EXAMINATION:**A. Theory : 300 Marks**

Written examination shall consist of four question papers each of three hours duration. Total marks for each paper will be 100. Paper I, II and III shall consist of two long questions carrying 20 marks each and 6 short essay questions each carrying 10 marks. Paper IV will be on Essay. Questions on recent advances may be asked in any or all the papers. Distribution of topics for each paper will be as follows: *

- Paper I : Applied Basic Sciences: Applied Anatomy, embryology, growth and development Genetics, Immunology, anthropology, Physiology, nutrition & Biochemistry, Pathology & Microbiology, virology, Applied pharmacology, Research Methodology and bio statistics, Applied Dental anatomy & histology, Oral pathology & oral Microbiology, Adult and geriatric psychology. Applied dental materials.
- Paper II : Removable Prosthodontics and Implant supported prosthesis(Implantology), Geriatric dentistry and Cranio facial Prosthodontics
- Paper III : Fixed Prosthodontics, occlusion, TMJ and esthetics.
- Paper IV : Essay

*The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

B. Practical / Clinical Examination : 200 Marks

Examination shall be for three days. If there are more than 6 candidates, it may be extended for one more day. Each candidate shall be examined for a minimum of three days, six hours per day including viva voce.

1. **Presentation of treated patients and records during their 3 years training period**
- 25 Marks
- | | |
|--|-----------|
| a. C.D. | - 1 mark |
| b. R. P.D. | - 2 marks |
| c. F.P.D. including single tooth and surface restoration | - 2 marks |
| d. I.S.P. | - 5 marks |
| e. Occlusal rehabilitation | - 5 marks |
| f. T.M.J. | - 5 marks |
| g. Maxillofacial Prosthesis | - 5 marks |

2. **Present actual treated patients C.D. Prosthesis and Insertion - 90 Marks**

- | | |
|--|------------|
| 1. Discussion on treatment plan and patient review | - 10 marks |
| 2. Tentative jaw relation records | - 5 marks |
| 3. Face Bow - transfer | - 5 marks |
| 4. Transferring it on articulators | - 5 marks |
| 5. Extra oral tracing and securing centric and protrusive/lateral, record | - 25 marks |
| 6. Transfer in on articulator | - 5 marks |
| 7. Selection of teeth | - 5 marks |
| 8. Arrangement of teeth | - 15 marks |
| 9. Waxedup denture trial | - 10 marks |
| 10. Fit, insertion and instruction of previously processed characterised, anatomic complete denture prosthesis | - 5 marks |

All steps will include chairside, lab and viva voce

3. **Fixed Partial Denture - 50 Marks**

- | | |
|---|------------|
| a. Case discussion and selection of patients for F.P.D. | - 5 marks |
| b. Abutment preparation isolation and fluid control | - 25 marks |
| c. Gingival retraction and impressions | - 10 marks |
| d. Cementation of provisional restoration | - 10 marks |

4. **Removable Partial Denture - 35 Marks**

- | | |
|---|------------|
| a. Surveying and designing of partial dentate cast. | - 10 marks |
| b. Discussion on components and material selection including occlusal scheme. | - 15 marks |

C. **Viva Voce : 100 Marks**

i. *Viva-Voce examination: 80 marks*

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, expression, interpretation of data and communication skills. It includes all components of course contents. It includes presentation and discussion on dissertation also.

ii. *Pedagogy Exercise: 20 marks*

A topic be given to each candidate in the beginning of clinical examination. He/she is asked to make a presentation on the topic for 8-10 minutes.

2. **PERIODONTOLOGY**

OBJECTIVES:

The following objectives are laid out to achieve the goals of the course

KNOWLEDGE:

Discuss historical perspective to advancement in the subject proper and related topics.

PART III-SEC.4]

- Describe etiology, pathogenesis, diagnosis and management of common periodontal diseases with emphasis on Indian population
- Familiarize with the biochemical, microbiologic and immunologic genetic aspects of periodontal pathology
- Describe various preventive periodontal measures
- Describe various treatment modalities of periodontal disease from historical aspect to currently available ones
- Describe interrelationship between periodontal disease and various systemic conditions
- Describe periodontal hazards due to estrogenic causes and deleterious habits and prevention of it
- Identify rarities in periodontal disease and environmental/Emotional determinates in a given case
- Recognize conditions that may be outside the area of his Speciality/ competence and refer them to an appropriate Specialist
- Decide regarding non-surgical or surgical management of the case
- Update him by attending course, conferences and seminars relevant to periodontics or by self-learning process.
- Plan out/ carry out research activity both basic and clinical aspects with the aim of publishing his work in scientific journals
- Reach to the public to motivate and educate regarding periodontal disease, its prevention and consequences if not treated
- Plan out epidemiological survey to assess prevalence and incidence of early onset periodontitis and adult periodontitis in Indian population (Region wise)
- Shall develop knowledge, skill in the science and practice of Oral Implantology
- Shall develop teaching skill in the field of Periodontology and Oral Implantology

SKILLS:

- Take a proper clinical history, thorough examination of intra orally, extra orally, medical history evaluation, advice essential diagnostic procedures and interpret them to come to a reasonable diagnosis
- Effective motivation and education regarding periodontal disease maintenance after the treatment
- Perform both non-surgical & education regarding periodontal disease, maintenance after the treatment
- Perform both non-surgical and surgical procedures independently
- Provide Basic Life Support Service (BLS) recognizes the need for and advance life support and does the immediate need for that.
- Human values, ethical practice to communication abilities
- Adopt ethical principles in all aspects of treatment modalities, Professional honesty & integrity are to be fostered Develop, Adopt ethical principles in all aspects of treatment modalities; Professional honesty & integrity are to be fostered. Develop Communication skills to make awareness regarding periodontal disease Apply high moral and ethical standards while carrying out human or animal research, Be humble, accept the limitations in his knowledge and skill, and ask for help from colleagues when needed, Respect patients rights and privileges, including patients right to information and right to seek a second opinion.

COURSE CONTENTS:

PAPER-I

APPLIED ANATOMY:

1. Development of the Periodontium
2. Micro and Macro structural anatomy and biology of the periodontal tissues
3. Age changes in the periodontal tissues
4. Anatomy of the Periodontium

- Macroscopic and microscopic anatomy
 - Blood supply of the Periodontium
 - Lymphatic system of the Periodontium
 - Nerves of the Periodontium
5. Temporomandibular joint, Maxillae and Mandible
 6. Nerves of Periodontics
 7. Tongue, oropharynx
 8. Muscles of mastication

PHYSIOLOGY:

1. Blood
2. Respiratory system - Acknowledge of the respiratory diseases which are a cause of periodontal diseases (periodontal Medicine)
3. Cardiovascular system
 - a. Blood pressure
 - b. Normal ECG
 - c. Shock
4. Endocrinology - hormonal influences on Periodontium
5. Gastrointestinal system
 - a. Salivary secretion - composition, function & regulation
 - b. Reproductive physiology
 - c. Hormones - Actions and regulations, role in periodontal disease
 - d. Family planning methods
6. Nervous system
 - a. Pain pathways
 - b. Taste - Taste buds, primary taste sensation & pathways for sensation

BIOCHEMISTRY:

1. Basics of carbohydrates, lipids, proteins, vitamins, proteins, enzymes and minerals
2. Diet and nutrition and periodontium
3. Biochemical tests and their significance
4. Calcium and phosphorus

PATHOLOGY:

1. Cell structure and metabolism
2. Inflammation and repair, necrosis and degeneration
3. Immunity and hypersensitivity
4. Circulatory disturbances - edema, hemorrhage, shock, thrombosis, embolism, infarction and hypertension
5. Disturbances of nutrition
6. Diabetes mellitus
7. Cellular growth and differentiation, regulation
8. Lab investigations
9. Blood

MICROBIOLOGY:

1. General bacteriology
 - a. Identification of bacteria
 - b. Culture media and methods
 - c. Sterilization and disinfection
2. Immunology and Infection
3. Systemic bacteriology with special emphasis on oral microbiology - staphylococci, actinomyces and other filamentous bacteria and actinobacillus actinomycetumcomitar
4. Virology
 - a. General properties of viruses
 - b. Herpes, Hepatitis, virus, HIV virus
5. Mycology

- a. Candidiasis
6. Applied microbiology
7. Diagnostic microbiology and immunology, hospital infections and management

PHARMACOLOGY:

1. General pharmacology
 - a. Definitions - Pharmacokinetics with clinical applications, routes of administration including local drug delivery in Periodontics
 - b. Adverse drug reactions and drug interactions
2. Detailed pharmacology of
 - a. Analgesics - opioid and nonopoid
 - b. Local anesthetics
 - c. Haematinics and coagulants, Anticoagulants
 - d. Vit D and Calcium preparations
 - e. Antidiabetics drugs
 - f. Steroids
 - g. Antibiotics
 - h. Antihypertensive
 - i. Immunosuppressive drugs and their effects on oral tissues
 - j. Antiepileptic drugs
3. Brief pharmacology, dental use and adverse effects of
 - a. General anesthetics
 - b. Antipsychotics
 - c. Antidepressants
 - d. Anxiolytic drugs
 - e. Sedatives
 - f. Antiepileptics
 - g. Antihypertensives
 - h. Antianginal drugs
 - i. Diuretics
 - j. Hormones
 - k. Pre-anesthetic medications
4. Drugs used in Bronchial asthma cough
5. Drug therapy of
 - a. Emergencies
 - b. Seizures
 - c. Anaphylaxis
 - d. Bleeding
 - e. Shock
 - f. Diabetic ketoacidosis
 - g. Acute addisonian crisis
6. Dental Pharmacology
 - a. Antiseptics
 - b. Astringents
 - c. Sialogogues
 - d. Disclosing agents
 - e. Antiplaque agents
7. Fluoride pharmacology

BIOSTATISTICS:

- Introduction, definition and branches of biostatistics
- Collection of data, sampling, types, bias and errors
- Compiling data-graphs and charts
- Measures of central tendency (mean, median and mode), standard deviation and variability
- Tests of significance (chi square test, t-test and Z-test)

- Null hypothesis

PAPER-II**ETIOPATHOGENESIS:**

1. Classification of periodontal diseases and conditions
2. Epidemiology of gingival and periodontal diseases
3. Defense mechanisms of gingiva
4. Periodontal microbiology
5. Basic concepts of inflammation and immunity
6. Microbial interactions with the host in periodontal diseases
7. Pathogenesis of plaque associated periodontal diseases
8. Dental calculus
9. Role of iatrogenic and other local factors
10. Genetic factors associated with periodontal diseases
11. Influence of systemic diseases and disorders of the periodontium
12. Role of environmental factors in the etiology of periodontal disease
13. Stress and periodontal diseases
14. Occlusion and periodontal diseases
15. Smoking and tobacco in the etiology of periodontal diseases
16. AIDS and periodontium
17. Periodontal medicine
18. Dentinal hypersensitivity

PAPER-III**Clinical and Therapeutic Periodontology and Oral Implantology****Please note:**

Clinical periodontology includes gingival diseases, periodontal diseases, periodontal instrumentation, diagnosis, prognosis and treatment of periodontal diseases.

I. GINGIVAL DISEASES

1. Gingival inflammation
2. Clinical features of gingivitis
3. Gingival enlargement
4. Acute gingival infections
5. Desquamative gingivitis and oral mucous membrane diseases
6. Gingival diseases in the childhood

II. PERIODONTAL DISEASES

1. Periodontal pocket
2. Bone loss and patterns of bone destruction
3. Periodontal response to external forces
4. Masticatory system disorders
5. Chronic periodontitis
6. Aggressive periodontitis
7. Necrotising ulcerative periodontitis
8. Interdisciplinary approaches
 - Orthodontic
 - Endodontic
9. Periodontic considerations in periodontal therapy

III. TREATMENT OF PERIODONTAL DISEASES**A. History, examination, diagnosis, prognosis and treatment planning**

1. Clinical diagnosis
2. Radiographic and other aids in the diagnosis of periodontal diseases
3. Advanced diagnostic techniques
4. Risk assessment

Determination of prognosis
 Treatment plan
 Indications for periodontal treatment
 General principles of anti-infective therapy with special emphasis on infection control in
 Periodontal practice
 Gingivitis and its treatment
 Periodontitis and its treatment

Periodontal instrumentation
 Instrumentation
 Principles of periodontal instrumentation
 Instruments used in different parts of the mouth

Periodontal therapy
 Preparation of tooth surface
 Plaque control
 Anti microbial and other drugs used in periodontal therapy and wasting diseases of teeth
 Periodontal management of HIV infected patients
 Occlusal evaluation and therapy in the management of periodontal diseases
 Role of orthodontics as an adjunct to periodontal therapy
 Special emphasis on precautions and treatment for medically compromised patients
 Periodontal splints
 Management of dentinal hypersensitivity

Periodontal surgical phase - special emphasis on drug prescription
 General principles of periodontal surgery
 Surgical anatomy of periodontium and related structures
 Gingival curettage
 Gingivectomy technique
 Treatment of gingival enlargements
 Periodontal flap
 Osseous surgery (resective and regenerative)
 Furcation; Problem and its management
 The periodontic - endodontic continuum
 Periodontic plastic and esthetic surgery
 Recent advances in surgical techniques

Future directions and controversial questions in periodontal therapy
 Future directions for infection control
 Research directions in regenerative therapy
 Future directions in anti-inflammatory therapy
 Future directions in measurement of periodontal diseases

Periodontal maintenance phase
 Supportive periodontal treatment
 Results of periodontal treatment

PERIODONTAL IMPLANTOLOGY

Introduction and historical review
 Biological, clinical and surgical aspects of dental implants
 Diagnosis and treatment planning
 Implant surgery
 Prosthetic aspects of dental implants
 Diagnosis and treatment of Peri implant complications
 Special emphasis on plaque control measures implant patients
 Maintenance phase

MANAGEMENT OF MEDICAL EMERGENCIES IN PERIODONTAL PRACTICE

Teaching / learning Activities

- **Seminars:** - A minimum of 15 seminars to be presented by each student during the P.G. course (Atleast 5 Seminars per year)
- **Journal clubs:** - a minimum of 25 Journal articles to be reviewed by each student during the P.G. course
- **Interdepartmental Seminars:** - Each P.G. student should present at least 1 seminar in an Interdepartmental meeting during the P.G. course. Such meetings may be held at least once every month
- **Library Assignment:** - one to be presented at the end of 18 months of the course

ACADEMIC ACTIVITIES:**I Year**

Submission of synopsis for Dissertation - within 6 months from the start of the course
Library Assignment - to be submitted at the end of the I year

II Year

Scientific Paper presentation at the conferences

III Year

Scientific Paper/ Poster presentation at conferences
Submission of Dissertation - 6 months before completion of III year

SKILLS:**First year**

Pre - Clinical work

Dental

1. Practice of incisions and suturing techniques on the typhodont models
2. Fabrication of bite guards and splints
3. Occlusal adjustments on the casts mounted on the articulator
4. X- Ray techniques and interpretation
5. Local anesthetic techniques

Medical

1. Basic diagnostic microbiology and immunology, collection and handling of sample, culture techniques
2. Basic understanding of immunological diseases
3. Interpretation of various biochemical investigations
4. Practical training and handling medical emergencies and basic life support devices
5. Basic Biostatistics - Surveying and data analysis

Clinical work

- | | |
|------------------------------------|----------|
| 1. Applied periodontal indices | 10 CASES |
| 2. Scaling and root planning (SRP) | |
| a. Hand | 15 CASES |
| b. Ultrasonic | 15 CASES |
| 3. Curettage | 10 CASES |
| 4. Gingivectomy | 20 CASES |
| 5. Gingivoplasty | 10 CASES |

Second Year

- | | |
|--|----------|
| 1. Clinical Work | 10 CASES |
| 2. Case history and treatment planning | 5 CASES |
| 3. Local Drug Delivery techniques | |
| 4. Periodontal surgical procedures | |
| - Pocket therapy | |
| - Muco-gingival surgeries | |
| - Implants (2 implants) | |
| - Management of perio endo problems | |

- G. 5. Determination of prognosis
6. Treatment plan
ing 7. Rationale for periodontal treatment
in at 8. General principles of anti-infective therapy with special emphasis on infection control in
t on 9. Halitosis and its treatment
10. Bruxism and its treatment
- B. Periodontal instrumentation
1. Instrumentation
2. Principles of periodontal instrumentation
3. Instruments used in different parts of the mouth
- C. Periodontal therapy
1. Preparation of tooth surface
2. Plaque control
3. Anti microbial and other drugs used in periodontal therapy and wasting diseases of teeth
4. Periodontal management of HIV infected patients
5. Occlusal evaluation and therapy in the management of periodontal diseases
6. Role of orthodontics as an adjunct to periodontal therapy
7. Special emphasis on precautions and treatment for medically compromised patients
8. Periodontal splints
9. Management of dentinal hypersensitivity
- D. Periodontal surgical phase - special emphasis on drug prescription
1. General principles of periodontal surgery
2. Surgical anatomy of periodontium and related structures
3. Gingival curettage
4. Gingivectomy technique
5. Treatment of gingival enlargements
6. Periodontal flap
7. Osseous surgery (resective and regenerative)
8. Furcation; Problem and its management
9. The periodontic - endodontic continuum
10. Periodontic plastic and esthetic surgery
11. Recent advances in surgical techniques
- E. Future directions and controversial questions in periodontal therapy
1. Future directions for infection control
2. Research directions in regenerative therapy
3. Future directions in anti-inflammatory therapy
4. Future directions in measurement of periodontal diseases
- F. Periodontal maintenance phase
1. Supportive periodontal treatment
2. Results of periodontal treatment
- IV. ORAL IMPLANTOLOGY**
1. Introduction and historical review
2. Biological, clinical and surgical aspects of dental implants
3. Diagnosis and treatment planning
4. Implant surgery
5. Prosthetic aspects of dental implants
6. Diagnosis and treatment of Peri implant complications
7. Special emphasis on plaque control measures implant patients
8. Maintenance phase
- V. MANAGEMENT OF MEDICAL EMERGENCIES IN PERIODONTAL PRACTICE**

Teaching / learning Activities

- **Seminars:** - A minimum of 15 seminars to be presented by each student during the P.G. course (Atleast 5 Seminars per year)
- **Journal clubs:** - a minimum of 25 Journal articles to be reviewed by each student during the P.G. course
- **Interdepartmental Seminars:** - Each P.G. student should present at least 1 seminar in an Interdepartmental meeting during the P.G. course. Such meetings may be held at least once every month
- **Library Assignment:** - one to be presented at the end of 18 months of the course

ACADEMIC ACTIVITIES:**I Year**

Submission of synopsis for Dissertation -- within 6 months from the start of the course

Library Assignment - to be submitted at the end of the I year

II Year

Scientific Paper presentation at the conferences

III Year

Scientific Paper/ Poster presentation at conferences

Submission of Dissertation - 6 months before completion of III year

SKILLS:**First year**

Pre - Clinical work

Dental

1. Practice of incisions and suturing techniques on the typhodont models
2. Fabrication of bite guards and splints
3. Occlusal adjustments on the casts mounted on the articulator
4. X- Ray techniques and interpretation
5. Local anesthetic techniques

Medical

1. Basic diagnostic microbiology and immunology, collection and handling of sample, culture techniques
2. Basic understanding of immunological diseases
3. Interpretation of various biochemical investigations
4. Practical training and handling medical emergencies and basic life support devices
5. Basic Biostatistics - Surveying and data analysis

Clinical work

- | | |
|------------------------------------|----------|
| 1. Applied periodontal indices | 10 CASES |
| 2. Scaling and root planning (SRP) | |
| a. Hand | 15 CASES |
| b. Ultrasonic | 15 CASES |
| 3. Curettage | 10 CASES |
| 4. Gingivectomy | 20 CASES |
| 5. Gingivoplasty | 10 CASES |

Second Year

- | | |
|--|----------|
| 1. Clinical Work | 10 CASES |
| 2. Case history and treatment planning | 5 CASES |
| 3. Local Drug Delivery techniques | |
| 4. Periodontal surgical procedures | |
| - Pocket therapy | |
| - Muco-gingival surgeries | |
| - Implants (2 implants) | |
| - Management of perio endo problems | |

5. Occlusal adjustments 10 CASES
6. Perio splints 10 CASES

Third Year**Clinical work****Regenerative techniques**

- Using various graft and barrier membranes
- Record, maintenance and follow up of all treated cases including implants

Assessment examinations:- In addition to the regular evaluation, log book etc., Assessment examination should be conducted once every six months & progress of the student monitored

Notes:

Submission of Synopsis for Dissertation should be done within 6 months of the commencement of the course

Submission of two copies of Library Assignments at the end of 1 and 2nd year

Submission of pre-clinical work as scheduled

Submission of Dissertation - 6 months before completion of III year

Maintenance of Work Diary/Log book as prescribed by RGUHS

MONITORING LEARNING PROGRESS:

It is essential to monitor the learning progress to each candidate through continuous appraisal and regular assessment. It not only helps teachers to evaluate students, but also students to evaluate themselves. The monitoring to be done by the staff of the department based on participation of students in various teaching / learning activities. It may be structured and assessment be done using checklists that assess various aspects. Checklists are given in Section IV

SCHEME OF EXAMINATION:**A. Theory : 300 Marks**

Written examination shall consist of four question papers each of three hours duration. Total marks for each paper will be 100. Paper I, II and III shall consist of two long questions carrying 20 marks each and 6 short essay questions each carrying 10 marks. Paper IV will be on Essay. Questions on recent advances may be asked in any or all the papers. Distribution of topics for each paper will be as follows: *

- Paper I:** Applied Basic Sciences: Applied Anatomy, Physiology, & Biochemistry; Pathology, Microbiology, Pharmacology, Research Methodology and Biostatistics.
Should Epidemiology comes under Paper II?
- Paper II:** Normal Periodontal structure, Etiology & Pathogenesis of Periodontal diseases, epidemiology as related to Periodontics
- Paper III:** Periodontal diagnosis, therapy & Oral implantology
- Paper IV:** Essay (with emphasis on recent advances in periodontics)

*The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics

B. Practical / Clinical Examination : 200 Marks

The clinical examination shall be of two days duration

1st day**Case discussion**

- Long case - One
- Short case - One

Periodontal surgery - Periodontal flap surgery on a previously prepared case in one quadrant of the mouth after getting approval from the examiners

2nd day

Post-surgical review and discussion of the case treated on the 1st day

Presentation of dissertation & discussion

All the examiners shall participate in all the aspects of clinical examinations / Viva Voce

Distribution of Marks for Clinical examination (recommended)

a) Long Case discussion	50
b) 2 short cases	50
c) Periodontal surgery	75
Post - operative review	25
Total	200

C. Viva Voce ; 100 Marks**i. Viva-Voce examination: 80 marks**

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, expression, interpretation of data and communication skills. It includes all components of course contents. It includes presentation and discussion on dissertation also.

ii. Pedagogy : 20 marks

A topic be given to each candidate in the beginning of clinical examination. He/she is asked to make a presentation on the topic for 8-10 minutes.

3. ORAL AND MAXILLOFACIAL SURGERY**OBJECTIVES:**

The training program in Oral and Maxillofacial Surgery is structured to achieve the following four objectives-

- Knowledge
- Skills
- Attitude
- Communicative skills and ability
- Research

KNOWLEDGE:

- To have acquired adequate knowledge and understanding of the etiology, pathophysiology and diagnosis, treatment planning of various common oral and Maxillofacial surgical problems both minor and major in nature
- To have understood the general surgical principles like pre and post surgical management, particularly evaluation, post surgical care, fluid and electrolyte management, blood transfusion and post surgical pain management.
- Understanding of basic sciences relevant to practice of oral and maxillofacial surgery
- Able to identify social, cultural, economic, genetic and environmental factors and their relevance to disease process management in the oral and Maxillofacial region.
- Essential knowledge of personal hygiene and infection control, prevention of cross infection and safe disposal of hospital waste keeping in view the high prevalence of hepatitis and HIV.

SKILLS:

- To obtain proper clinical history, methodical examination of the patient, perform essential diagnostic procedures and order relevant laboratory tests and interpret them and to arrive at a reasonable diagnosis about the surgical condition.
- To perform with competence minor oral surgical procedures and common maxillofacial surgery. To treat both surgically and medically (or by other means of the oral and Maxillofacial and the related area).
- Capable of providing care for maxillofacial surgery patients.

ATTITUDE:

Written examination shall consist of four question papers each of three hours duration. marks for each paper will be 100. Paper I, II and III shall consist of two long questions carrying marks each and 6 short essay questions each carrying 10 marks. Paper IV will be on E. Questions on recent advances may be asked in any or all the papers. Distribution of topics for paper will be as follows: *

PAPER-I	: Applied Basic Sciences: Applied Anatomy, Physiology, Biochemistry, General Oral Pathology and Microbiology and Pharmacology
PAPER-II	: Minor Oral Surgery and Trauma
PAPER-III	: Maxillofacial Surgery
PAPER-IV	: Essay

B. Practical / Clinical Examination : 200 Marks

1. Minor Oral Surgery 100 Marks

Each candidate is required to perform the minor oral surgical procedures under local anaesthesia. The minor surgical cases may include removal of impacted lower third molar, cyst enucleation, similar procedure where students can exhibit their professional skills in raising the flap, removal of the bone and suturing the wound.

2. (a) One long case - 60 marks
(b) Two short cases - 20 marks each

C. Viva Voce 100 Marks

i. Viva-Voce examination: 80 marks

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, expression, interpretation of data and communication skills. It includes all components of course contents. It includes presentation and discussion on dissertation also.

ii. Pedagogy Exercise: 20 marks

A topic be given to each candidate in the beginning of clinical examination. He/she is asked to make a presentation on the topic for 8-10 minutes.

4. CONSERVATIVE DENTISTRY AND ENDODONTICS

OBJECTIVES:

The following objectives are laid out to achieve the goals of the course. These are to be achieved by the time the candidate completes the course. These objectives may be considered under the following subtitles.

KNOWLEDGE:

At the end of 36 months of training, the candidates should be able to:

- Describe aetiology, pathophysiology, periapical diagnosis and management of common restorative situations, endodontic situations that will include contemporary management of dental caries, management of trauma and pulpal pathoses including periodontal situations.
- Demonstrate understanding of basic sciences as relevant to conservative / restorative dentistry and Endodontics.
- Identify social, economic, environmental and emotional determinants in a given case or community and take them into account for planning and execution at individual and community level.
- Ability to master differential diagnosis and recognize conditions that may require multi-disciplinary approach or a clinical situation outside the realm of the specialty, which he or she should be able to recognize and refer to appropriate specialist.
- Update himself by self-study and by attending basic and advanced courses, conferences, seminars, and workshops in the specialty of Conservative Dentistry-Endodontics-Dental Materials and Restorative Dentistry.
- Ability to teach/guide, colleagues and other students.

Use information technology tools and carry out research both basic and clinical with the aim of his publishing his work and presenting the same at scientific platform

SKILLS:

- Take proper chair side history, exam the patient and perform medical and dental diagnostic procedures and order as well as perform relevant tests and interpret to them to come to a reasonable diagnosis about the dental condition in general and Conservative Dentistry - Endodontics in particular. And undertake complete patient monitoring including preoperative as well as post operative care of the patient.
- Perform all levels of restorative work and surgical and non-surgical Endodontics including endodontic endosseous implants, as well as endodontic-periodontal surgical procedures as part of multidisciplinary approach to clinical condition.
- Provide basic life saving support in emergency situations.
- Manage acute pulpal and pulpo periodontal situations.
- Have a thorough knowledge of infection control measures in the dental clinical environment and laboratories.

Human Values, Ethical Practice and Communication Abilities

- Adopt ethical principles in all aspects of restorative and contemporaries Endodontics including non-surgical and surgical Endodontics.
- Professional honesty and integrity should be the top priority.
- Dental care has to be provided regardless of social status, caste, creed or religion of the patient.
- Develop communication skills in particular to explain various options available management and to obtain a true informed consent from the patient.
- Apply high moral and ethical standards while carrying on human or animal research
- He/She shall not carry out any heroic procedures and must know his limitations in performing all aspects of restorative dentistry including Endodontics. Ask for help from colleagues or seniors when required without hesitation
- Respect patient's rights and privileges including patients right to information.

COURSE CONTENTS:

PAPER-I : APPLIED ANATOMY OF HEAD AND NECK

- Development of face, paranasal sinuses and the associated structures and their anomalies, cranial and facial bones, TMJ anatomy and function, arterial and venous drainage of head and neck, muscles of face and neck including muscles of mastication and deglutition, brief consideration of structures and function of brain. Brief consideration of all cranial nerves and autonomic nervous system of head and neck. Salivary glands, Functional anatomy of mastication, deglutition and speech. Detailed anatomy of deciduous and permanent teeth, general consideration in physiology of permanent dentition, form, function, alignment, contact, occlusion.)
- Internal anatomy of permanent teeth and its significance
- Applied histology - histology of skin, oral mucosa, connective tissue, bone cartilage, blood vessels, lymphatics, nerves, muscles, tongue.

DEVELOPMENT OF TEETH:

- Enamel - development and composition, physical characteristics, chemical properties, structure
- Age changes - clinical structure
- Dentin - development, physical and chemical properties, structure type of dentin, innervations, age and functional changes.
- Pulp - development, histological structures, innervations, functions, regressive changes, clinical considerations.
- Cementum - composition, cementogenesis, structure, function, clinical consideration.
- Periodontal ligament - development, structure, function and clinical consideration.

- Salivary glands - structure, function, clinical considerations.
- Eruption of teeth.

APPLIED PHYSIOLOGY:

- Mastication, deglutition, digestion and assimilation, fluid and electrolyte balance.
- Blood composition, volume, function, blood groups, haemostasis, coagulation, blood transfusion, circulation, heart, pulse, blood pressure, shock, respiration, control, anoxia, hypoxia, asphyxia, artificial respiration, and endocrinology - general principles of endocrine activity and disorders relating to pituitary, thyroid, parathyroid, adrenals including pregnancy and lactation.
- Physiology of saliva - composition, function, clinical significance.
- Clinical significance of vitamins, diet and nutrition - balanced diet.
- Physiology of pain, sympathetic and Para sympathetic nervous system, pain pathways, physiology of pulpal pain, Odontogenic and non Odontogenic pain, pain disorders - typical and atypical, biochemistry such as osmotic pressure, electrolytic dissociation, oxidation, reduction etc. Carbohydrates, proteins, lipids and their metabolism, nucleoproteins, nucleic acid and their metabolism. Enzymes, vitamins and minerals, metabolism of inorganic elements, detoxification in the body, anti metabolites, chemistry of blood lymph and urine.

PATHOLOGY:

- Inflammation, repair, degeneration, necrosis and gangrene.
- Circulatory disturbances - ischemia, hyperemia, edema, thrombosis, embolism, infarction, allergy and hypersensitivity reaction.
- Neoplasms - classifications of tumors, characteristics of benign and malignant tumors, spread tumors.
- Blood dyscrasias
- Developmental disturbances of oral and Para oral structures, dental caries, regressive changes of teeth, pulp, periapical pathology, pulp reaction to dental caries and dental procedures.
- Bacterial, viral, mycotic infections of the oral cavity.

MICROBIOLOGY:

- Pathways of pulpal infection, oral flora and micro organisms associated with endodontic diseases, pathogenesis, host defense, bacterial virulence factors, healing, theory of focal infections, microbes or relevance to dentistry - strepto, staphylococci, lactobacilli, corynebacterium, actinomycetes, clostridium, neisseria, vibrio, bacterioids, fusobacteria, spirochetes, mycobacterium, virus and fungi.
- Cross infection, infection control, infection control procedure, sterilization and disinfection.
- Immunology - antigen antibody reaction, allergy, hypersensitivity and anaphylaxis, auto immunity, grafts, viral hepatitis, HIV infections and aids. Identification and isolation of microorganisms from infected root canals. Culture medium and culturing technique (Aerobic and anaerobic interpretation and antibiotic sensitivity test).

PHARMACOLOGY:

- Dosage and route of administration of drugs, actions and fate of drug in body, drug addiction, tolerance of hypersensitivity reactions.
- Local anesthesia - agents and chemistry, pharmacological actions, fate and metabolism of anaesthetic, ideal properties, techniques and complications.
- General anesthesia - pre medications, neuro muscular blocking agents, induction agents, inhalation anesthesia, and agents used, assessment of anesthetic problems in medically compromised patients.
- Anaesthetic emergencies
- Antihistamines, corticosteroids, chemotherapeutic and antibiotics, drug resistance, haemostasis, and haemostatic agents, anticoagulants, sympathomimetic drugs, vitamins and minerals (A, B, C, D, E, K IRON), anti sialogogue, immunosuppressants, drug interactions, antiseptics, disinfectants, anti viral agents, drugs acting on CNS.

BIOSTATISTICS:

- Introduction, Basic concepts, Sampling, Health information systems - collection, compilation, presentation of data. Elementary statistical methods - presentation of statistical data, Statistical averages - measures of central tendency, measures of dispersion, Normal distribution. Tests of significance - parametric and non - parametric tests (Fisher's exact test, Sign test, Median test, Mann Whitney test, Kruskal Wallis one way analysis, Friedmann two way analysis, Regression analysis), Correlation and regression, Use of computers.

RESEARCH METHODOLOGY:

- Essential features of a protocol for research in humans
- Experimental and non-experimental study designs
- Ethical considerations of research

APPLIED DENTAL MATERIALS:

- Physical and mechanical properties of dental materials, biocompatibility.
- Impression materials, detailed study of various restorative materials, restorative resin and recent advances in composite resins, bonding- recent developments- tarnish and corrosion; dental amalgam, direct filling gold, casting alloys, inlay wax, die materials, investments, casting procedures, defects, dental cements for restoration and pulp protection (luting, liners, bases) cavity varnishes.
- Dental ceramics-recent advances, finishing and polishing materials.
- Dental burs - design and mechanics of cutting - other modalities of tooth preparation.
- Methods of testing biocompatibility of materials used.

PAPER-II : CONSERVATIVE DENTISTRY

1. Examination, diagnosis and treatment plan
2. Occlusion as related to conservative dentistry, contact, contour, its significance. Separation of teeth, matrices, used in conservative dentistry.
3. Dental caries- epidemiology, recent concept of etiological factors, pathophysiology, Histopathology, diagnosis, caries activity tests, prevention of dental caries and management - recent methods.
4. Hand and rotary cutting instruments, development of rotary equipment, speed ranges, hazards.
5. Dental burs and other modalities of tooth preparation- recent developments (air abrasions, lasers etc)
6. Infection control procedures in conservative dentistry, isolation equipments etc.
7. Direct concepts in tooth preparation for amalgam, composite, GIC and restorative techniques, failures and management.
8. Direct and indirect composite restorations.
9. Indirect tooth colored restorations- ceramic, inlays and onlays, veneers, crowns, recent advances in fabrication and materials.
 - a. Tissue management
10. Impression procedures used for indirect restorations.
11. Cast metal restorations, indications, contraindications, tooth preparation for class 2 inlay, Onlay full crown restorations. Restorative techniques, direct and indirect methods of fabrication including materials used for fabrication like inlay wax, investment materials and
12. Direct gold restorations.
13. Recent advances in restorative materials and procedures.
14. Management of non-carious lesion.
15. Advance knowledge of minimal intervention dentistry.
16. Recent advances in restoration of endodontically treated teeth and grossly mutilated teeth
17. Hypersensitivity, theories, causes and management.
18. Lasers in Conservative Dentistry
19. CAD-CAM & CAD-CIM in restorative dentistry
20. Dental imaging and its applications in restorative dentistry (clinical photography)
21. Principles of esthetics

- Color
- Facial analysis
- Smile design
- Principles of esthetic integration
- Treatment planning in esthetic dentistry

PAPER-III : ENDODONTICS

1. Rationale of endodontics.
2. Knowledge of internal anatomy of permanent teeth, anatomy of root apex and its implications in endodontic treatment.
3. Dentin and pulp complex.
4. Pulp and periapical pathology
5. Pathobiology of periapex.
6. Diagnostic procedure - recent advances and various aids used for diagnosis-
 - a. Orofacial dental pain emergencies: endodontic diagnosis and management
7. Case selection and treatment planning
8. Infection control procedures used in Endodontics (aseptic techniques such as rubber dam, sterilization of instruments etc.)
9. Access cavity preparation - objectives and principles
10. Endodontic instruments and instrumentation - recent developments, detailed description of hand, rotary, sonic, ultra sonic etc..
11. Working length determination / cleaning and shaping of root canal system and recent development in techniques of canal preparation.
12. Root canal irrigants and intra canal medicaments used including non - surgical Endodontics by calcium hydroxide.
13. Endodontic microbiology.
14. Obturating materials, various obturation techniques and recent advances in obturation of root canal.
15. Traumatic injuries and management - endodontic treatment for young permanent teeth. Pediatric Endodontics - treatment of immature apex.
16. Endodontic surgeries, recent developments in technique and devices, endosseous endodontic implants - biology of bone and wound healing.
17. Endoperio interrelationship, endo + Perio lesion and management
18. Drugs and chemicals used in Endodontics
19. Endo emergencies and management.
20. Restoration of endodontically treated teeth, recent advances.
21. Geriatric Endodontics
22. Endo emergencies and management.
23. Biologic response of pulp to various restorative materials and operative procedures.
24. Lasers in Endodontics.
25. Multidisciplinary approach to endodontics situations.
26. Endodontics radiology- digital technology in endodontics practice.
27. Local anesthesia in endodontics.
28. Procedural errors in endodontics and their management.
29. Endodontics failures and retreatment.
30. Resorptions and its management.
31. Microscopes in endodontics.
32. Single visit endodontics, current concepts and controversies.

TEACHING / LEARNING ACTIVITIES:

The following is the minimum required to be completed before the candidate can be considered eligible to appear for final MDS exam.

First Year

Clinical Work - Operative and Endodontics**Clinical work on typhodont teeth**

Class 2 amalgam cavities	- 03
a. Conservative preparation	- 03
b. Conventional preparation	- 03
Inlay cavity preparation on premolars	- 10
And molars - MO, DO, MOD	- 06
a. Wax pattern	- 04
b. Casing	- 02
Onlay preparation on molars	- 01
a. Casting	- 05
Full Crown	- 05
a. Anterior	- 05
b. Posterior	- 02
(2 each to be processed)	- 02
7/8 crown	- 02
(1 to be processed)	- 02
3 / 4 crown premolars	- 02
(1 to be processed)	

Clinical work on natural teeth

Inlay on molars and premolars MO, DO, and MOD	- 08
a. Casting	- 02
b. Wax pattern	- 02
Amalgam cavity preparation	- 02
a. Conventional	- 02
b. Conservative	- 02
Pin retained amalgam on molar teeth	- 10
Post and core build up	- 05
a. Anterior teeth	- 04
b. Posterior teeth	- 02
Casting	- 03
a. Anterior	- 04
b. Posterior	- 06
Onlay on molars	- 04
(1 to be processed)	- 06
Full crown premolars and molars	- 02
Full crown anterior	- 03
(2 and 3 to be processed)	- 02
Veneers anterior teeth (indirect method)	- 03
10. Composite inlay (class 2)	- 03
(1 to be processed)	

11. Full tooth wax carving - all permanent teeth**ENDODONTICS:**

1. Sectioning of all maxillary and mandibular teeth.
2. Sectioning of teeth - in relation to deciduous molar, 2nd primary upper and lower molar 1 each

- (iii) Casting - 10 marks
 (iv) Cementation - 10 marks
 (v) Retraction & Elastomeric Impression - 10 marks
- Clinical Exercise II - 50 Marks**

(Inlay Exercise)

- (i) Tooth preparation for Class II Gold Inlay - 25 marks
 (ii) Fabrication of Direct Wax Pattern - 25 marks

Day 2**Clinical Exercise III - 100 Marks****(Molar Endodontics)**

- (i) Local Anaesthesia and Rubber Dam application - 20 marks
 (ii) Access Cavity - 20 marks
 (iii) Working length determination - 20 marks
 (iv) Canal Preparation - 20 marks
 (v) Master cone selection - 20 marks

C. Viva-Voce : 100 Marks**i. Viva-Voce examination: 80 marks**

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, expression, interpretation of data and communication skills. It includes all components of contents. It includes presentation and discussion on dissertation also.

ii. Pedagogy Exercise: 20 marks

A topic be given to each candidate in the beginning of clinical examination. He/she is asked make a presentation on the topic for 8-10 minutes.

Day 3:

Viva-Voce (Continued if more than 4 students are taking examination or shortage of time on day)

5. ORTHODONTICS & DENTOFACIAL ORTHOPAEDICS**OBJECTIVES:**

The training programme in Orthodontics is to structure and achieve the following four objectives

KNOWLEDGE:

1. The dynamic interaction of biologic processes and mechanical forces acting on stomatognathic system during orthodontic treatment
2. The etiology, pathophysiology, diagnosis and treatment planning of various common Orthodontic problems
3. Various treatment modalities in Orthodontics preventive interceptive and corrective.
4. Basic sciences relevant to the practice of Orthodontics
5. Interaction of social, cultural, economic, genetic and environmental factors and their relevance to management of oro - facial deformities
6. Factors affecting the long-range stability of orthodontic correction and their management

7. Personal hygiene and infection control, prevention of cross infection and safe disposal of hospital waste, keeping in view the high prevalence of Hepatitis and HIV and other highly contagious diseases.

SKILLS:

1. To obtain proper clinical history, methodical examination of the patient, perform essential diagnostic procedures, and interpret them and arrive at a reasonable diagnosis about the Dentofacial deformities.
2. To be competent to fabricate and manage the most appropriate appliance - intra or extra oral, removable or fixed, mechanical or functional, and active or passive - for the treatment of any orthodontic problem to be treated singly or as a part of multidisciplinary treatment of orofacial deformities.

ATTITUDES:

1. Develop an attitude to adopt ethical principles in all aspects of Orthodontic practice.
2. Professional honesty and integrity are to be fostered
3. Treatment care is to be delivered irrespective of the social Status, cast, creed or colleagues
4. Willingness to share the knowledge and clinical experience with professional colleagues
5. Willingness to adopt, after a critical assessment, new methods and techniques of orthodontic management developed from time to time based on scientific research, which are in the best interest of the patient
6. Respect patients rights and privileges, including patients right to information and right to seek a second opinion
7. Develop attitude to seek opinion from allied medical and dental specialists as and when required

COMMUNICATION SKILLS:

1. Develop adequate communication skills particularly with the patients giving them the various options available to manage a particular Dentofacial problem and to obtain a true informed consent from them for the most appropriate treatment available at that point of time.
2. Develop the ability to communicate with professional colleagues, in Orthodontics or other specialities through various media like correspondence, Internet, e-video, conference, etc. To render the best possible treatment.

COURSE CONTENT:

The program outlined, addresses both the knowledge needed in Orthodontics and allied Medical specialities in its scope. A minimum of three years of formal training through a graded system of education as specifies, will equip the trainee with skill and knowledge at its completion to be able to practice basic Orthodontics and have the ability to intelligently pursue further apprenticeship towards advanced Orthodontics.

SPREAD OF THE CURRICULUM:

Six months teaching of basic subjects including completion of pre-clinical exercises 2 ½ years of coverage of all the relevant topics in Orthodontics, clinical training involving treatment of patients and submission of dissertation. These may be divided into blocks of 6 to 8 months duration each, depending on the training policies of each institution.

I. APPLIED ANATOMY:

- Prenatal growth of head:
Stages of embryonic development, origin of head, origin of face, origin of teeth.
- Postnatal growth of head:
Bones of skull, the oral cavity, development of chin, the hyoid bone, general growth of head, face growth.
- Bone growth:
Origin of bone, composition of bone, units of bone structure, schedule of Ossification, mechanical properties of bone, roentgen graphic appearance of bone

- Assessment of growth and development:
Growth prediction, growth spurts, the concept of normality and growth increments of growth, differential growth, gradient of growth, methods of gathering growth data. Theories of growth and recent advances, factors affecting physical growth.
- Muscles of mastication:
Development of muscles, muscle change during growth, muscle function and facial development, muscle function and malocclusion
- Development of dentition and occlusion:
Dental development periods, order of tooth eruption, chronology of permanent tooth formation, periods of occlusal development, pattern of occlusion.
- Assessment of skeletal age
The carpal bones, carpal x-rays, cervical vertebrae

II PHYSIOLOGY:

- Endocrinology and its disorders
(Growth hormone, thyroid hormone, parathyroid hormone, ACTH) pituitary gland hormones, thyroid gland hormones, parathyroid gland hormones
- Calcium and its metabolism
- Nutrition metabolism and their disorders: proteins, carbohydrates, fats, vitamins and minerals.
- Muscle physiology
- Craniofacial Biology: cell adhesion molecules and mechanism of adhesion
- Bleeding disorders in orthodontics: Hemophilia

III DENTAL MATERIALS:

- Gypsum products: dental plaster, dental stone and their properties, setting reaction etc.
- Impression materials: impression materials in general and particularly of alginate impression material.
- Acrylics: chemistry, composition physical properties
- Composites: composition types, properties setting reaction
- Banding and bonding cements: Zn (PO₄)₂, zinc silicophosphate, Zinc polycarboxylate, resin cements and glass ionomer cements
- Wrought metal alloys: deformation, strain hardening, annealing, recovery, recrystallization, grain growth, properties of metal alloys
- Orthodontic arch wires: stainless steel gold, wrought cobalt chromium nickel alloys, alpha&beta titanium alloys
- Elastics: Latex and non-latex elastics.
- Applied physics, Bioengineering and metallurgy.
- Specification and tests methods used for materials used in Orthodontics
- Survey of all contemporary literature and Recent advances in above - mentioned materials.

IV. GENETICS:

- Cell structure, DNA, RNA, protein synthesis, cell division
- Chromosomal abnormalities
- Principles of orofacial genetics
- Genetics in malocclusion
- 5 Molecular basis of genetics
- Studies related to malocclusion
- Recent advances in genetics related to malocclusion
- Genetic counseling
- Bioethics and relationship to Orthodontic management of patients.

V. PHYSICAL ANTHROPOLOGY:

- Evolutionary development of dentition
- Evolutionary development of jaws.

nents of
Theories

VI. PATHOLOGY:

- Inflammation
- Necrosis

VII. BIostatISTICS:

- Statistical principles
 - Data Collection
 - Method of presentation
 - Method of Summarizing
 - Methods of analysis - different tests/errors
- Sampling and Sampling technique
- Experimental models, design and interpretation
- Development of skills for preparing clear concise and cogent scientific abstracts and publication

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VIII. APPLIED RESEARCH METHODOLOGY IN ORTHODONTICS:

- Experimental design
- Animal experimental protocol
- Principles in the development, execution and interpretation of methodologies in Orthodontics
- Critical Scientific appraisal of literature.

nd

IX. APPLIED PHARMACOLOGY

X. ORTHODONTIC HISTORY:

- Historical perspective,
- Evolution of orthodontic appliances,
- Pencil sketch history of Orthodontic peers
- History of Orthodontics in India

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XI. CONCEPTS OF OCCLUSION AND ESTHETICS:

- Structure and function of all anatomic components of occlusion,
- Mechanics of articulation,
- Recording of masticatory function,
- Diagnosis of Occlusal dysfunction,
- Relationship of TMJ anatomy and pathology and related neuromuscular physiology.

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XII. ETIOLOGY AND CLASSIFICATION OF MALOCCLUSION:

- A comprehensive review of the local and systemic factors in the causation of malocclusion
- Various classifications of malocclusion

ioned

XIII. DENTOFACIAL ANOMALIES:

- Anatomical, physiological and pathological characteristics of major groups of developmental defects of the orofacial structures.

XIV. CHILD AND ADULT PSYCHOLOGY:

- Stages of child development.
- Theories of psychological development.
- Management of child in orthodontic treatment.
- Management of handicapped child.
- Motivation and Psychological problems related to malocclusion / orthodontics
- Adolescent psychology
- Behavioral psychology and communication

XV. DIAGNOSTIC PROCEDURES AND TREATMENT PLANNING IN ORTHODONTICS

- Emphasis on the process of data gathering, synthesis and translating it into a treatment plan
- Problem cases - analysis of cases and its management

3. Access cavity opening and root canal therapy in relation to maxillary and mandibular permanent teeth
4. Access cavity preparation and BMP
 - Anterior
 - a. Conventional prep
 - b. Step back
 - c. Crown down
 - Obturation 03
5. BMP Premolar 06 (2 upper and 2 lower) obturation 1 each
6. BMP Molar 06 (3 upper - 2 first molars and 1 second molar, 3 lower - 2 first molars and 1 second molar) obturation 1 each
7. Post and core preparation and fabrication in relation to anterior and posterior teeth
 - a. Anterior 10 (casting 4)
 - b. Posterior 05 (casting 2)
8. Removable dies 04

Note : Technique work to be completed in the first four months.

CLINICAL WORK:

A	Composite restorations	30
B	GIC Restorations	30
C	Complex amalgam restorations	05
D	Composite inlay + veneers (direct and indirect)	05
E	Ceramic jacket crowns	05
F	Post and core for anterior teeth	05
G	Bleaching vital	05
	Non vital	20
H	RCT Anterior	05
I	Endo surgery - observation and assisting	05

Presentation of:

- Seminars - 5 seminars by each student - should include topics in dental materials, conservative dentistry and endodontics
- Journal clubs - by each student
- Submission of synopsis at the end of 6 months
- Library assignment work
- Internal assessment - theory and clinicals.

Second Year

Case discussion- 5

1	Ceramic jacket crowns	10
2	Post and core for anterior teeth	10
3	Post and core for posterior teeth	05
4	Composite restoration	05
5	Full crown for posterior teeth	15
6	Cast gold inlay	05
7	Other special types of work such as splinting - Reattachment of fractured teeth etc.	05
8	Anterior RCT	20
9	Posterior RCT	30
10	Endo surgery performed independently	05
11	Management of endo - Perio problems	05

- Under graduate teaching program as allotted by the HOD
- Seminars - 5 by each student
- Journal club - 5 by each student
- Dissertation work
- Prepare scientific paper and present in conference and clinical meeting
- Library assignment to be submitted 18 months after starting of the course
- Internal assessment - theory and clinical

Third Year

Dissertation work to be submitted 6 months before final examination.

Clinical work

- Cast gold inlay- Onlay, cuspal restoration 10
- Post and core 20
- Molar endodontics 50
- Endo surgery 05
- All other types of surgeries including crown lengthening, perioesthetics, hemi sectioning, splinting, replantation, endodontic implants.

Presentation of:

- Seminars
- Journal club
- Teaching - lecture (under graduates)
- Internal assessment - theory and clinical

MONITORING LEARNING PROGRESS:

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only helps teachers to evaluate students, but also students to evaluate themselves. ~~The monitoring be done by the staff of the department based on participation of students in various teaching / learning activities.~~ It may be structured and assessment be done using checklists that assess various aspects. Checklists are given in Section IV.

SCHEME OF EXAMINATION:-

A. Theory : 300 Marks

Written examination shall consist of four question papers each of three hours duration. Total marks for each paper will be 100. Paper I, II and III shall consist of two long questions carrying 20 marks each and 6 short essay questions each carrying 10 marks. Paper IV will be on Essay. Questions on recent advances may be asked in any or all the papers. Distribution of topics for each paper will be as follows: *

PAPER-I : Applied Basic Sciences: Applied Anatomy, Physiology, Pathology including Oral Microbiology, Pharmacology, Biostatistics and Research Methodology and Applied Dental Materials.

PAPER-II : Conservative Dentistry

PAPER-III : Endodontics

PAPER-IV : Essay

B. Clinicals : 200 Marks

The duration of Clinical and Viva Voce examination will be 2 days for a batch of four students. If the number of candidates exceeds 4, the programme can be extended to 3rd day.

Day 1

Clinical Exercise I - 50 Marks

Cast core preparation

- (i) Tooth Preparation - 10 marks
- (ii) Direct Wax Pattern - 10 marks

- Adult cases, handicapped and mentally retarded cases and their special problems
- Critique of treated cases.
- **Cephalometrics**
- Instrumentation
- Image processing
- Tracing and analysis of errors and applications
- Radiation hygiene
- Advanced Cephalometrics techniques
- Comprehensive review of literature
- Video imaging principles and application.

XVII. PRACTICE MANAGEMENT IN ORTHODONTICS:

- Economics and dynamics of solo and group practices
- Personal management
- Materials management
- Public relations
- Professional relationship
- Dental ethics and jurisprudence
- Office sterilization procedures
- Community based Orthodontics.

XVIII. CLINICAL ORTHODONTICS:

Myofunctional Orthodontics:

- Basic principles
- Contemporary appliances – their design and manipulation
- Case selection and evaluation of the treatment results
- Review of the current literature.

Dentofacial Orthopedics

- Principles
- Biomechanics
- Appliance design and manipulation
- Review of contemporary literature

Cleft lip and palate rehabilitation:

- Diagnosis and treatment planning
- Mechanotherapy
- Special growth problems of cleft cases
- Speech physiology, pathology and elements of therapy as applied to orthodontics
- Team rehabilitative procedures.

Biology of tooth movement:

- Principles of tooth movement-review
- Review of contemporary literature
- Applied histophysiology of bone, periodontal ligament
- Molecular and ultra cellular consideration in tooth movement

Orthodontic / Orthognathic surgery:

- Orthodontist' role in conjoint diagnosis and treatment planning
- Pre and post-surgical Orthodontics
- Participation in actual clinical cases, progress evaluation and post retention study
- Review of current literature

Ortho / Perio / Prostho inter relationship

- Principles of interdisciplinary patient treatment
- Common problems and their management

Basic principles of Mechanotherapy Includes Removable appliances and fixed appliances

- Design
- Construction
- Fabrication
- Management
- Review of current literature on treatment methods and results

Applied preventive aspects in Orthodontics

- Caries and periodontal disease prevention
- Oral hygiene measures
- Clinical procedures

Interceptive Orthodontics

- Principles
- Growth guidance
- Diagnosis and treatment planning
- Therapy emphasis on:
 - a. Dento-facial problems
 - b. Tooth material discrepancies
 - c. Minor surgery for Orthodontics

Retention and relapse

- Mechanotherapy – special reference to stability of results with various procedures
- Post retention analysis
- Review of contemporary literature

XIX. RECENT ADVANCES LIKE:

- Use of implants
- Lasers
- Application of F.E.M.
- Distraction Osteogenesis

SKILLS:

II. Pre - Clinical Exercises

A general outline of the type of exercises is given here. Every institution can decide the details of exercises under each category.

1. General Wire bending exercises to develop the manual dexterity.
2. Clasps, Bows and springs used in the removable appliances.
3. Soldering and welding exercises.
4. Fabrication of removable habit breaking, mechanical and functional appliances, also all types of space maintainers and space regainers.
5. Bonwill Hawley Ideal arch preparation.
6. Construction of orthodontic models trimmed and polished preferably as per specifications of Tweed or A.B.O.
7. Cephalometric tracing and various Analyses, also superimposition methods.
8. Fixed appliance typhodont exercises.
 - a) Training shall be imparted in one basic technique i.e. Standard Edgewise / Begg technique or its derivative / Straight wire etc., with adequate exposure to other techniques.
 - b) Typhodont exercise
 - i. Band making
 - ii. Bracket positioning and placement
 - iii. Different stages in treatment appropriate to technique taught
9. Clinical photography
10. Computerized imaging
11. Preparation of surgical splints, and splints for TMJ problems.
12. Handling of equipments like vacuum forming appliances and hydro solder etc.

First Year**I. Basic Pre-Clinical Exercise Work for the MDS Students:
First 6 Months****1. NON-APPLIANCE EXERCISES**

All the following exercises should be done with 0.7 or 0.8mm wire

Sl.No.	Exercise	No.
1	Straightening of 6" & 8" long wire	1 each
2	Square	1
3	Rectangle	1
4	Triangle of 2" side	1
5	Circle of 2" side	1
6	Bending of 5U's	1
7	Bending of 5V's	1

2. CLASPS

Sl.No.	Exercise	No.
1	¾ Clasps	2
2	Full clasps	2
3	Triangular Clasps	2
4	Adam's clasp - upper molar	2
5	Adam's Clasp - lower molar	2
6	Adam's Clasp - Pre-molar	2
7	Adam's Clasp - Incisor	2
8	Modification of Adam's - With Helix	2
9	Modification of Adam's - With distal extension	2
10	Modification of Adam's - With soldered tube	2
11	Dayzing Clasps on Molars	2
12	Southend Clasp	1

3. LABIAL BOWS

Sl.No.	Exercise	No.
1	Short labial bow (upper & lower)	1
2	Long labial bow (upper & lower)	1
3	Robert's retractor.	1
4	High labial bow-with apron spring's	1
5	Mill's labial bow	1
6	Reverse loop labial bow	1
7	Retention labial bow soldered to Adam's clasp	1
8	Retention labial bow extending distal to second molar	1
9	Fitted labial bow	1
10	Split high labial bow	1

4. SPRINGS

Sl.No.	Exercise	No.
1	Finger spring-mesial movement	2
2	Finger spring-distal movement	2
3	Double cantilever spring	2
4	Flapper spring	2
5	Coffin spring	2
6	T spring	2

5. CANINE RETRACTORS

Sl.No.	Exercise	No.
1	U loop canine retractor	2PAIRS
2	Helical canine retractor	2PAIRS
3	Palatal canine retractor	2PAIRS
4	Self-supporting canine retractor	2PAIRS
5	Self-supporting canine retractor	2PAIRS

6. APPLIANCES

Sl.No.	Exercise
1	Hawley's retention appliance with anterior bite plane
2	Upper Hawley's appliance with posterior bite plane
3	Upper expansion appliance with coffin spring
4	Upper expansion appliance with coffin spring
5	Upper expansion appliance with expansion screw
6	Habit breaking appliance with tongue crib
7	Oral screen and double oral screen
8	Lip bumper
9	Splint for Bruxism
10	Catalans appliance
11	Activator
12	Bionator
13	Frankel-FR 2 appliance
14	Twin block
15	Lingual arch
16	TPA
17	Quad helix
18	Bihelix
19	Utility arches
20	Pendulum appliance

7. Soldering exercises

Sl.No.	Exercise	No.
1	Star	1
2	Comb	1
3	Christmas tree	1
4	Soldering buccal tube on molar bands	1

8. Welding exercises

Sl.No.	Exercise
1	Pinching and welding of molar, premolar, canine and Incisor bands
2	Welding of buccal tubes and brackets on molar bands and incisor bands

9. Impression of upper and lower arches in alginate**10. Study model preparation****11. Model analysis**

Sl.No.	Exercise
1	Impression of upper and lower dental arches
2	PREPARATION OF STUDY MODEL - 1 And all the permanent dentition analyses to be done.
3	PREPARATION OF STUDY MODEL - 2 And all the permanent dentition analyses to be done.
4	PREPARATION OF STUDY MODEL - 3 And all the mixed dentition analyses to be done.

12. Cephalometrics

Sl.No.	Exercise
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1	Lateral cephalogram to be traced in five different colors and super imposed to see the accuracy of tracing
2	Steiner's analysis
3	Down's analysis
4	Tweed analysis
5	Rickett's analysis
6	Burrstone analysis
7	Rakosi's analysis
8	Mc Namara analysis
9	Bjork analysis
10	Coben's analysis
11	Harvold's analysis
12	Soft tissue analysis - Holdaway and Burstone

13. Basics of Clinical Photography including Digital Photography

14. Light wire bending exercises for the Begg technique

Sl.No.	Exercise
1	Wire bending technique on 0.016' wire circle "Z" Omega.
2	Bonwill-Hawley diagram
3	Making a standard arch wire
4	Inter maxillary hooks- Boot leg and Inter Maxillary type
5	Upper and Lower arch wire
6	Bending a double back arch wire
7	Bayonet bends (vertical and horizontal offsets)
8	Stage-III arch wire
9	Torquing auxiliary (upper)
10	Reverse Torquing (lower)
11	Up righting spring

15. Typhodont exercises: (Begg or P.E.A. method)

Sl.No	Exercise
1	Teeth setting in Class-II division I malocclusion with maxillary anterior Proclination and mandibular anterior crowding
2	Band pinching, welding brackets and buccal tubes to the bands
3	Stage-I
4	Stage-II
5	Pre Stage-III
6	Stage-III

CLINICAL WORK:

Once the basic pre-clinical work is completed the students can take up clinical cases and the clinical training is for the two and half years.

Each postgraduate student should start with a minimum of 50 cases of his/her own. Additionally he/she should handle a minimum of 20 transferred cases.

The type of cases can be as follows:

- i. Removable active appliances-5cases
- ii. Class-I malocclusion with Crowding
- iii. Class-I malocclusion with bi-maxillary protrusion
- iv. Class-II division-1
- v. Class-II division-2
- vi. Class-III (Orthopedic, Surgical, Orthodontic cases)
- vii. Inter disciplinary cases

- viii. Removable functional appliance cases like activator, Bionator, functional regulator, twin block and new developments
- ix. Fixed functional appliances - Herbst appliance, jasper jumper etc - 5 cases
- x. Dento-facial orthopedic appliances like head gears, rapid maxillary expansion niti expander etc., - 5 cases
- xi. Appliance for arch development such as molar distalization -m 5 cases
- xii. Fixed mechano therapy cases (Begg, PEA, Tip edge, Edgewise)
Retention procedures of above treated cases.

Other work to be done during FIRST YEAR

1. **Seminars:** One Seminar per week to be conducted in the department. A minimum of five seminars should be presented by each student each year
2. **Journal club:** One Journal club per week to be conducted in the department. A minimum of five seminars should be presented by each student each year
3. **Protocol for dissertation to be submitted on or before the end of six months from the date of admission.**
4. **Under graduate classes:** Around 4 - 5 classes should be handled by each post-graduate student
5. **Field survey:** To be conducted and submit the report
6. **Inter-departmental meetings:** should be held once in a month.
7. **Case discussions**
8. **Field visits:** To attend dental camps and to educate the masses
9. **Basic subjects classes**
10. **Internal assessment or Term paper**

Second Year:

The clinical cases taken up should be followed under the guidance. More case discussions and cases to be taken up. Other routine work as follows.

1. **Seminars:** One Seminar per week to be conducted in the department. Each student should present a minimum of five seminars each year.
2. **Journal club:** One Journal club per week to be conducted in the department. Each student should present a minimum of five seminars each year.
3. **Library assignment to be submitted on or before the end of six months.**
4. **Undergraduate classes:** each post-graduate student should handle Around 4-5 classes.
5. **Inter-departmental meetings:** Should be held once in a month
6. **Case discussions**
7. **Field visits:** To attend dental camps and to educate the masses.
8. **Internal assessment or term paper.**
9. **Dissertation work:** On getting the approval from the university work for the dissertation to be started.

Third Year:

The clinical cases taken up should be followed under the guidance. More cases discussions and cases to be taken up. Other routine work as follows:

1. **Seminars:** One Seminar per week to be conducted in the department. Each student should present a minimum of five seminars each year.
2. **Journal Club:** One Journal club per week to be conducted in the department. A minimum of five seminars should be presented by each student each year
3. **Under graduate classes:** each post - graduate student, should handle Around 4-5 classes.
4. **Inter-departmental meetings:** Should be held once in a month.
5. **The completed dissertation should be submitted six months before the final examination**
6. **Case discussions**
7. **Field visits:** To attend dental camps and to educate the masses.
8. **Finishing and presenting the cases taken up.**
9. **Preparation of finished cases and presenting the cases (to be presented for the examination)**

10. Mock examination**DISSERTATION:**

- The protocol for dissertation should be submitted on or before the end of six months from the date of admission as per calendar of events to the Registrar, Rajiv Gandhi University of Health Sciences, Karnataka, through proper channel.
- The completed dissertation should be submitted 6 months before the final examination as per calendar of events to the Registrar (Evaluation), Rajiv Gandhi University of Health Sciences, Karnataka, through proper channel.
- The dissertation should not be just a repetition of a previously undertaken study but it should try to explore some new aspects.
- Approval of dissertation is essential before a candidate appears for the University examination.

MONITORING LEARNING PROGRESS:

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only helps teachers to evaluate students, but also students to evaluate themselves. The monitoring be done by the staff of the department based on participation of students in various teaching / learning activities. It may be structured and assessment be done using checklists that assess various aspects. Checklists are given in Section IV.

SCHEME OF EXAMINATION:**A. Theory : 300 Marks**

Written examination shall consist of four question papers each of three hours duration. Total marks for each paper will be 100. Paper I, II and III shall consist of two long questions carrying 20 marks each and 6 short essay questions each carrying 10 marks. Paper IV will be on Essay. Questions on recent advances may be asked in any or all the papers. Distribution of topics for each paper will be as follows: *

Paper-I : Applied Basic Sciences: Applied anatomy, Physiology, Dental Materials, Genetics, Pathology, Physical Anthropology, Applied Research methodology, Bio-Statistics and Applied Pharmacology.

Paper II : Orthodontic history, Concepts of occlusion and esthetics, Child and Adult Psychology, Etiology and classification of malocclusion, Dentofacial Anomalies, Diagnostic procedures and treatment planning in Orthodontics, Practice management in Orthodontics

Paper III : Clinical Orthodontics

Paper IV : Essay

* The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

B. Practical / Clinical Examination : 200 Marks

Exercise No: 1 Functional Case : 50 Marks

Selection of case for functional appliance and recording of construction bite.
Fabrication and delivery of the appliance the next day.

Exercise No: 2 Multiband exercise : 50 Marks

1. III stage with auxiliary springs

OR

2. Bonding of SWA brackets and construction of suitable arch wire.

Exercise No. 3 Display of records of the treated cases (minimum of 5 cases)

5 cases * 15 marks = 75 Marks

Exercise No: 4 long case discussions: 25 Marks

No	Exercise	Marks allotted	Approximate Time
1	Functional appliance	50	1 hour 1 hour
2	III stage mechanics / Bonding and arch wire fabrication	50	1 hr 30 min
3	Display of case records (a minimum of 5 cases to be presented with all the cases)	75	1 hour
4	Long cases	25	2 hours

C. Viva Voce : 100 Marks**i. Viva-Voce examination: 80 marks**

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, expression, interpretation of data and communication skills. It includes all components of course contents. It includes presentation and discussion on dissertation also.

ii. Pedagogy Exercise: 20 marks

A topic be given to each candidate in the beginning of clinical examination. He/she is asked to make a presentation on the topic for 8-10 minutes.

6. ORAL PATHOLOGY & ORAL MICROBIOLOGY**OBJECTIVES:**

- To train a post graduate dental surgeon so as to ensure higher competence in both general and special pathology dealing with the nature of oral diseases, their causes, processes and effects.
- An oral pathologist is expected to perform routine histopathological evaluation of specimens relating to oral and perioral tissues, to carry out routine diagnostic procedures including hematological, cytological, microbiological, Immunological and ultra structural investigations.
- He/she is expected to have an understanding of current research methodology, collection and interpretation of data, ability to carry out research projects on clinical and or epidemiological aspects, a working knowledge on current databases, automated data retrieval systems, referencing and skill in writing scientific papers.
- He/she is expected to present scientific data pertaining to the field, in conferences both as poster and verbal presentations and of take part in group discussions.

BROAD OUTLINE OF THEORETICAL, CLINICAL AND PRACTICAL COURSES

1. Study of principles of routine and special techniques used for histopathology including principles of histochemistry, Immunochemistry, applied and theoretical biochemical basis of histochemistry as related to oral pathology.
2. Advanced histological and histopathological study of dental and oral tissues including embryonic considerations, clinical considerations, biology, histology, Pathology, prognosis and management of oral oncology, Concepts of oral premalignancy
3. Study of special and applied pathology of oral tissues as well as relation of local pathologic and clinical findings to systemic conditions.
4. Oral microbiology and their relationship to various branches of dentistry.
5. Oral microbiology affecting hard and soft tissues. Study of clinical changes and their significance to dental and oral diseases as related to oral pathology
6. Forensic odontology

C. Viva Voce : 100 Marks

(50 Marks - 1 ½ Hours)

i. Viva-Voce examination: 80 marks

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, expression, interpretation of data and communication skills. It includes all components of course contents. It includes presentation and discussion on dissertation also.

ii. Pedagogy Exercise: 20 marks

A topic be given to each candidate in the beginning of clinical examination. He/she is asked to make a presentation on the topic for 8-10 minutes.

8. PAEDODONTICS & PREVENTIVE DENTISTRY

OBJECTIVES:

At the end of 3 years of training the candidate should be able to

1. Create not only a good oral health in the child but also a good citizen tomorrow.
2. Instill a positive attitude and behavior in children
3. Understand the principles of prevention and preventive dentistry right from birth to adolescence
4. Guide and counsel the parents in regards to various treatment modalities including different facets of preventive dentistry
5. Prevent and intercept developing malocclusion

SKILLS:

1. Obtain proper clinical history, methodological examination of the child patient, perform essential diagnostic procedures and interpret them, and arrive at a reasonable diagnosis and treat appropriately
2. Be competent to treat dental diseases which are occurring in child patient.
3. Manage to repair and restore the lost / tooth structure to maintain harmony between both hard and soft-tissues of the oral cavity.
4. Manage the disabled children effectively and efficiently, tailored to the needs of individual requirement and conditions.
5. To acquire skills in managing efficiency life threatening condition with emphasis on basic life support measure.

ATTITUDES:

1. Develop an attitude to adopt ethical principles in all aspects of Pedodontic practice.
2. Professional honesty and integrity are to be fostered
3. Treatment care is to be delivered irrespective of the social status, cast, creed, and religion of the patients.
4. Willingness to share the knowledge and clinical experience with professional colleagues.
5. Willingness to adopt, after a critical assessment, new methods and techniques of Pedodontic management developed from time to time, based on scientific research, which are in the best interest of the child patient.
6. Respect child patient's rights and privileges, including child patients right to information and right to seek a second opinion.
7. Develop an attitude to seek opinion from allied medical and dental specialities, as and when required

COURSE CONTENTS:

1. Applied Anatomy & genetics
2. Applied Physiology
3. Applied Pathology
4. Nutrition and Dietics

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5. Growth & Development: Prenatal and Postnatal development of cranium, face, jaws, teeth and supporting structures. Chronology of dental development and development of occlusion. Dimensional changes in dental arches. Cephalometric evaluation of growth.
 6. Child Psychology: Development & Classification of behavior, personality, intelligence in children, theories of child psychology, stages of psychological child development, fear anxiety, apprehension & its management
 7. Behavior Management: Non-pharmacological & Pharmacological methods.
 8. Child Abuse & Dental Neglect
 9. Conscious Sedation, Deep Sedation & General Anesthesia in Pediatric Dentistry: (Including Other Drugs, Synergic & Antagonistic Actions of Various Drugs Used in Children)
 10. Preventive Pedodontics: Concepts, chair side preventive measures for dental diseases, high-risk caries including rampant & extensive caries - Recognition, Features & Preventive Management, Pit and Fissures Sealants, Oral Hygiene measures, Correlation of brushing with dental caries and periodontal diseases. Diet & Nutrition as related to dental caries. Diet Counseling
 11. Dental Plaque: Definition, Initiation, Pathogenesis, Biochemistry, and Morphology & Metabolism.
 12. Microbiology & Immunology as related to Oral Diseases in Children: Basic concepts, immune system in human body, Auto Immune diseases, Histopathology, Pathogenesis, Immunology of dental caries, Periodontal diseases, Tumors, Oral Mucosal lesions etc.
 13. Gingival & Periodontal diseases in Children:
 - Normal Gingiva & Periodontium in children.
 - Gingival & Periodontal diseases - Etiology, Pathogenesis, Prevention & Management
 14. Pediatric Operative Dentistry
 - Principle Of Operative Dentistry along with modifications of materials/past, current & latest including tooth colored materials.
 - Modifications required for cavity preparation in primary and young permanent teeth.
 - Various Isolation Techniques
 - Restorations of decayed primary, young permanent and permanent teeth in children using various restorative material like Glass Ionomer, Composites, Silver, Amalgam & latest material (gallium)
 - Stainless steel, Polycarbonate & Resin Crowns / Veneers & fibre pvit systems.
 15. Pediatric Endodontics:
 - a. Primary Dentition: - Diagnosis of pulpal diseases and their management - Pulp capping, Pulpotomy, Pulpectomy (Materials & Methods), Controversies & recent concepts.
 - b. Young permanent teeth and permanent teeth, Pulp capping, Pulpotomy, Apexogenesis, Apexification, Concepts, Techniques and Materials used for different procedures.
 - c. Recent advances in Pediatric diagnosis and Endodontics.
 16. Prosthetic consideration in Paediatric Dentistry.
 17. Traumatic Injuries in Children:
 - Classifications & Importance.
 - Sequelae & reaction of teeth to trauma.
 - Management of Traumatized teeth with latest concepts.
 - Management of jaw fracture in children.
 18. Interceptive Orthodontics:
 - a. Concepts of occlusion and esthetics: Structure and function of all anatomic components of occlusion, mechanics of articulations, recording of masticatory function, diagnosis of Occlusal dysfunction, relationship of TMJ anatomy and pathology and related neuromuscular physiology.
 - b. A comprehensive review of the local and systemic factors in the causation of malocclusion.
 - c. Recognition and management of normal and abnormal developmental occlusions in primary, mixed and permanent dentitions in children (Occlusal Guidance).

- d. Biology of tooth movement: A comprehensive review of the principles of teeth movement. Review of contemporary literature. Histopathology of bone and Periodontal ligament, Molecular and ultra cellular consideration in tooth movement.
 - e. Myofunctional appliances: Basic principles, contemporary appliances: Design & Fabrication
 - f. Removable appliances: Basic principles, contemporary appliances: Design & Fabrication
 - g. Case selection & diagnosis in interceptive Orthodontics (Cephalometrics, Image processing, Tracing, Radiation hygiene, Video imaging & advance Cephalometric techniques).
 - h. Space Management: Etiology, Diagnosis of space problems, analysis, Biomechanics, Planned extraction in interception orthodontics.
19. Oral Habits in Children:
- ~~Definition, Etiology & Classification~~
 - Clinical features of digit sucking, tongue thrusting, mouth breathing & various other secondary habits.
 - Management of oral habits in children
20. Dental care of Children with special needs:
- Definition Etiology, Classification, Behavioral, Clinical features & Management of children with:
 - Physically handicapping conditions
 - Mentally compromising conditions
 - Medically compromising conditions
 - Genetic disorders
21. Oral manifestations of Systemic Conditions in Children & their Management
22. Management of Minor Oral Surgical Procedures in Children
23. Dental Radiology as related to Pediatric Dentistry
24. Cariology
- Historical background
 - Definition, Aetiology & Pathogenesis
 - ~~Caries pattern in primary, young permanent and permanent teeth in children.~~
 - Rampant caries, early childhood caries and extensive caries. Definition, aetiology, Pathogenesis, Clinical features; Complications & Management.
 - Role of diet and nutrition in Dental Caries
 - Dietary modifications & Diet counseling.
 - ~~Subjective & objective methods of Caries detection with emphasis on Caries Activity tests, Caries prediction, Caries susceptibility & their clinical Applications~~
25. Pediatric Oral Medicine & Clinical Pathology: Recognition & Management of developmental dental anomalies, teething disorders, stomatological conditions, mucosal lesions, viral infections etc.
26. Congenital Abnormalities in Children: Definition, Classification, Clinical features & Management.
27. Dental Emergencies in Children and their Management.
28. Dental Materials used in Pediatric Dentistry.
29. Preventive Dentistry:
- Definition
 - Principles & Scope
 - Types of prevention
 - Different preventive measures used in Pediatric Dentistry including fissure sealants and caries vaccine.
30. Dental Health Education & School Dental Health Programmes
31. Dental health concepts, Effects of civilization and environment, Dental Health delivery system, Public Health measures related to children along with principles of Pediatric Preventive Dentistry
32. Fluorides:
- Historical background

- Systemic & Topical fluorides
 - Mechanism of action
 - Toxicity & Management.
 - Defluoridation techniques.
33. Medicological aspects in Paediatric Dentistry with emphasis on informed concept.
 34. Counseling in Paediatric Dentistry
 35. Case History Recording, Outline of principles of examination, diagnosis & treatment planning.
 36. Epidemiology: Concepts, Methods of recording & evaluation of various oral diseases. Various national & global trends of epidemiology of oral diseases.
 37. Comprehensive Infant Oral Health Care.
 38. Principles of Bio-Statistics & Research Methodology & Understanding of Computers and Photography
 39. Comprehensive cleft care management with emphasis on counseling, feeding, nasolabial bone remodeling, speech rehabilitation.
 40. Setting up of Pedodontics & Preventive Dentistry Clinic.
 41. Emerging concept in Paediatric Dentistry of scope of laser/minimum invasive procedures : Paediatric Dentistry.

First Year

Preclinical Work

(Duration - first 6 Months of First Year MDS)

(One On Each Exercise)

1. Carving of all deciduous teeth
2. Basic wire bending exercises
3. Fabrication of
 - a. Maxillary bite plate / Hawley's'
 - b. Maxillary expansion screw appliance
 - c. Canine retractor appliance
 - d. All habit breaking appliances
 - i. Removable type
 - ii. Fixed type
 - iii. Partially fixed and removable
 - e. Two Myofunctional appliance
 - f. Making of inclined plane appliance
 - g. Feeding appliances
4. Basic soldering exercise I - making of a lamp post of stainless steel wire pieces of different gauges soldered on either side of heavy gauge main post.
5. Fabrication of space maintainers
 - a. Removable type-
 - Unilateral Non - Functional space maintainer
 - Bilateral Non-Functional space maintainer
 - Unilateral functional space maintainer
 - Bilateral functional space maintainer
 - b. Space Regainers -
 - Hawley's appliances with Helical space regainer
 - Removable appliance with Slingshot space regainer
 - Removable appliance with Dumbell space regainer
 - c. Fixed Space maintainers
 - Band & long loop space maintainer
 - Band & short loop space maintainer
 - Mayne's space maintainer
 - Transpalatal arch space maintainer
 - Nance Palatal holding arch
 - Nance Palatal holding arch with canine stoppers

- Gerber space regainer
 - Distal shoe appliance
 - a. Active space maintainers
 - b. For guiding the eruption of first permanent molar
 - c. Arch holding device
 - d. Functional space maintainer
6. Basics for spot welding exercise
 7. Collection of extracted deciduous and permanent teeth
 - a. Sectioning of the teeth at various levels and planes
 - b. Drawing of section and shapes of pulp
 - c. Phantom Head Excercises : Performing ideal cavity preparation for various restorative materials for both Deciduous and permanent teeth
 - d. Performing pulpotomy, root canal treatment and Apexification procedure
 - i) Tooth preparation and fabrication of various temporary and permanent restorations on fractured anterior teeth.
 - ii) Preparation of teeth for various types of crowns
 - iii) Laminates/veneers
 - iv) Bonding & banding exercise
 5. Performing of behavioral rating and IQ tests for children.
 6. Computation of:
 - a. Caries index and performing various caries activity test.
 - b. Oral Hygiene Index
 - c. Periodontal Index
 - d. Fluoriss Index
 7. Surgical Exercises : a. Fabrication of splints b. Type of Wiring c. Suteering, various pvit system, preing & perm. tuli
 8.
 - a. Taking of periapical, occlusal, bitewing radiographs of children
 - b. Developing and processing of films, thus obtained
 - c. Tracing of soft tissue dental and skeletal landmarks as observed on Cephalometric radiographs and drawing of various planes and angles, further interpretation of Cephalometric radiographs is analysis.
 - d. Mixed dentition cast analysis
 8. Library assignment
 9. Synopsis

Clinical work Requirements from 7 to 36 months

The following is the minimum requirement to be completed before the candidate can be considered eligible to appear in the final M.D.S Examinations:

No.	Clinical Work	Total	7 To 12 Months	13 To 24 Months	25 To 36 Months
1.	Behavior Management of different age groups children with complete records.	17	2	10	5
2.	Detailed Case evaluation with complete records, treatment planning and presentation of cases with chair side and discussion	17	2	10	5
3.	Step-by-step chair side preventive dentistry scheduled for high risk children with gingival and periodontal diseases & Dental Caries	11	1	5	5
4.	Practical application of Preventive dentistry concepts in a class of 35-50 children & Dental Health Education & Motivation.	7	1	4	2

5.	Pediatric Operative Dentistry with application of recent concepts.				
	(a). Management of Dental Caries				
	(I) Class I	50	30	10	10
	(II) Class II	100	40	50	10
	(III) Other Restorations	100	20	50	30
	(b). Management of traumatized anterior teeth	15	04	06	05
	(c) Aesthetic Restorations	25	05	10	10
	(d). Pediatric Endodontic Procedures				
	• Deciduous teeth				
	• Pulpotomy/Pulpectomy	150	30	50	70
	• Permanent Molars	20	3	7	10
	• Permanent Incisor	15	2	3	10
	• Apexification & Apexogenesis	20	02	08	10
6.	Stainless Steel Crowns	50	10	20	20
7.	Other Crowns	05	01	02	02
8.	Fixed : Space Maintainers Habit breaking appliances	30	08	12	10
9.	Removable : Space Maintainers Habit breaking appliances	20	05	07	08
10.	Functional Appliances	05	01	02	02
11.	Preventive measures like fluoride applications & Pit & Fissure Sealants applications with complete follow-up and diet counseling	20	08	08	04
12.	Special Assignments	03	01	01	01
	(i) School Dental Health Programmes				
	(ii) Camps etc.,	02	01	01	-

13. — Library usage

14. — Laboratory usage

15. Continuing Dental Health Programme

(The figures given against Sl. No. 4 to 12 are the minimum number of recommended procedures to be performed)

MONITORING LEARNING PROGRESS:

It is essential to monitor the learning progress to each candidate through continuous appraisal and regular assessment. It not only helps teachers to evaluate students, but also students to evaluate themselves. The monitoring to be done by the staff of the department based on participation of students in various teaching / learning activities. It may be structured and assessment be done using checklists that assess various aspects. Checklists are given in Section IV

SCHEME OF EXAMINATION:**A. Theory - 300 Marks**

Written examination shall consist of four question papers each of three hours duration. Total marks for each paper will be 100. Paper I, II and III shall consist of two long questions carrying 20 marks each and 6 short essay questions carrying 10 marks. Paper IV will be on Essay. Questions on recent advances may be asked in any or all the papers. Distribution of topics for each paper will be as follows: *

PAPER-I : Applied Basic Sciences : Applied Anatomy, Physiology, Pathology, Microbiology, Nutrition & Dietics, Growth & Development and Dental plaque, Genetics.

PAPER-II : Clinical Paedodontics

1. Conscious sedation, Deep Sedation & General Anesthesia in Pediatric Dentistry
2. Gingival & Periodontal Diseases in Children
3. Pediatric Operative Dentistry
4. Pediatric Endodontics
5. Traumatic Injuries in Children
6. Interceptive Orthodontics
7. Oral Habits in children
8. Dental Care of Children with special needs
9. Oral Manifestations of Systemic Conditions in Children & their Management
10. Management of Minor Oral Surgical Procedures in Children
11. Dental Radiology as Related to Pediatric Dentistry
12. Pediatric Oral Medicine & Clinical Pathology
13. ~~Congenital Abnormalities in Children~~
14. Dental Emergencies in Children & Their Management
15. Dental Materials Used in Pediatric Dentistry
16. Case History Recording
17. Setting up of Pedodontic & Preventive Dentistry Clinic

PAPER-III: Preventive and Community Dentistry as applied to Pediatric Dentistry

1. Child Psychology
2. Behavior Management
3. Child Abuse & Dental Neglect
4. Preventive Pedodontics
5. Cariology
6. Preventive Dentistry
7. Dental Health Education & School Dental Health Programmes:
8. Fluorides
9. Epidemiology
10. Comprehensive Infant Oral Health Care/Comprehensive cleft care
11. Principles of Bio-Statistics & Research Methodology & Understanding of Computers and Photography

PAPER-IV: Essay

* The topics assigned to the different papers are generally evaluated under those sections. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.

B. Practical Examination : 200 Marks

The Clinical / Practical and Viva-Voce Examinations are conducted for a minimum of two days.

First Day:-

1. Case Discussion, Pulp Therapy i.e. Pulpectomy on a Primary Molar.

Case Discussion	: 20 marks
Rubber Dam application	: 10 marks
Working length X-ray	: 20 marks
Obturation	: 20 marks
Total	70 marks

2. Case Discussion, Crown preparation on a Primary Molar for Stainless steel crown and cementation of the same.

Case discussion	: 10 marks
Crown Preparation	: 20 marks
Crown selection and Cementation	: 20 marks
Total	50 marks

Case Discussion, band adaptation for fixed type of space maintainer and impression making.

Case discussion	: 20 marks
Band adaptation	: 20 marks
Impression	: 20 marks
Total	<u>60 marks</u>

Second Day:

1. **Evaluation of Fixed Space Maintainer and Cementation** : 20 marks

C. **Viva Voce** : 100 Marks

i. **Viva-Voce examination: 80 marks**

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, expression, interpretation of data and communication skills. It includes all components of course contents. It includes presentation and discussion on dissertation also.

ii. **Pedagogy Exercise: 20 marks**

A topic be given to each candidate in the beginning of clinical examination. He/she is asked to make a presentation on the topic for 8-10 minutes.

9. ORAL MEDICINE AND RADIOLOGY**OBJECTIVES:**

At the end of 3 years of training the candidate should be able to acquire adequate knowledge of the discipline.

KNOWLEDGE:

Theoretical, Clinical and practical knowledge of all oral mucosal lesions, skeletal involvement in maxillo-facial region, diagnostic procedures pertaining to them and latest information of imaging modules.

SKILLS AND ATTITUDE:

Three important skills need to be impart and maxillo-facial diseases

1. Diagnostic skill in recognition of oral with radiographic diagnosis and their management
2. Research skills in handling scientific problems pertaining to oral treatment
3. Clinical and Didactic skills in encouraging younger doctors to attain learning objectives

ATTITUDES:

The positive mental attitude and the persistence of continued learning need to be inculcated

COURSE CONTENTS:**Paper I: Applied Basic Sciences****Applied Anatomy**

1. Gross anatomy of the face:
 - a. Muscles of Facial Expression And Muscles Of Mastication
 - b. Facial nerve
 - c. Facial artery
 - d. Facial vein
 - e. Parotid gland and its relations
2. Neck region:
 - a. Triangles of the neck with special reference to Carotid, Digastric triangles and midline structures
 - b. Facial spaces
 - c. Carotid system of arteries, Vertebral Artery, and Subclavian arteries
 - d. Jugular system



Dental College & Hospital, Navi Mumbai

Bharati Vidyapeeth Deemed University Dental College & Hospital, Navi Mumbai was established in 2005. Spread over a total area of 5.5 acres and surrounded by scenic verdant hills, the College & Hospital's is both convenient to reach and instantly invigorating to visit. The college has a spacious, well aerated building for undergraduate and postgraduate courses with all necessary facilities and ambiance.

The well-equipped clinical laboratories, clinical sections and associated working areas are specially designed taking into consideration the individual departments, created in a especially designed building spread over ground plus five floors with the total area of 1,50,692.50 square feet. The basic departments concerned with medical subjects and their laboratories are created right within the premises. In addition to this, the college has a separate hostel facility for boys & girl, staff quarters within the campus. All the rooms are fully and tastefully furnished. Dining and recreation facilities are available within the premises.

Equipments

Bharati Vidyapeeth Deemed University Dental College and Hospital, Navi Mumbai is fully equipped with all the modern high tech equipments that are required for both the undergraduate and post graduate courses as prescribed by the Dental council of India. All the equipments and instruments including the consumable materials are freely available to each and every student for use during the academic study. There are photocopying, printing, internet and e-library facilities available for the students.

Research activities, scientific programs and continuing dental education:

All faculty and post-graduate students are actively involved in research activities and there are research publications in international and national peer-reviewed journals from the college. The college also conducts scientific & academic programs by inviting various experts from various fields to guide the students and staff for promotion of research. College has an Institutional Ethics



Committee (IEC) which is registered with the Ministry of Health & Family Welfare, Govt. of India. The IEC performs ethical & scientific review of all research conducted in the institute.

Sci-Fi, a scientific activity is conducted annually where students participate and compete for oral and poster presentations. 'Udaan', the e-bulletin of the institute is published every two months which highlights the important activities & achievements by the college.

Beyond academics:

Students are taught additional dental skills and advanced procedures apart from their routine syllabus in order to equip them to face the competitive dental professional scenario outside the institute. An active

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student body facilitates the development of all-important extracurricular skills like leadership and team management. Various activities conducted throughout the year encourage the students to improve their ability to think laterally.

Library:

The College has a spacious central library admeasuring about 6863 sq. feet with more than 7000 books, national & international journals. It includes two big reading halls, reference section, journal section and storage. It also has photocopying, internet and e-library facility in all computers for the benefit of students. In addition to the central library facility, each Department has its own departmental library for quick and ready reference.

Dental Camps:

Bharati Vidyapeeth Deemed University Dental College and Hospital routinely conducts Dental Camps at nearby areas for the benefit of poor population. This helps us to increase the patient material for the students for clinical practice. In addition to this treatment camps are also organized where the full-fledged Mobile Dental Van is used to carry Dental treatments at rural areas.

Our Departments:-

1) Periodontology

Periodontology is the science that deals with the diseases of the supporting tissues of the teeth and the surgical & non-surgical treatments for the same. The department has to its credit a highly knowledgeable and skilled teaching team that is well versed with latest treatment modalities. The emphasis of the department's under-graduate and post-graduate program is to develop competent clinicians who also have training and expertise in conducting high-quality research.

The department of Periodontics is made up of two sections, an undergraduate section and a post graduate section. The department also has a special surgery section where advanced surgical procedures are carried out. A well-spaced out layout ensures smooth functioning of the department. The department is well equipped with basic as well as advanced armamentarium. This includes piezosurgery, ultrasonic scalers, laser, physiodispenser, electrocautery, implants kits and RVG (digital x-ray). The various treatment modalities performed in the department include scaling, root planning, flap surgery, bone grafting, mucogingival surgeries, guided tissue



regeneration, guided bone regeneration, implant placements and special procedures related to implant surgery.

The department also puts special emphasis on patient education and motivation for improvement of community oral health. Department is active in conducting and attending CDE programmes and motivates the students to do the same.

2) Orthodontics & Dentofacial Orthopedics

The department of Orthodontics deals with correction of Malaligned teeth and Dentofacial anomalies. It aims at prevention and correction of developing Jaw abnormalities and deleterious oral habits which retards the normal growth of jaws. The department has to its credit highly knowledgeable and technically skilled staff available full time to guide the students. The department has been proactive in organizing frequent continuing dental education programs so as to update academic and clinical skills of students and faculty. The department has special left handed units for left handed operators and ample dental chair units.

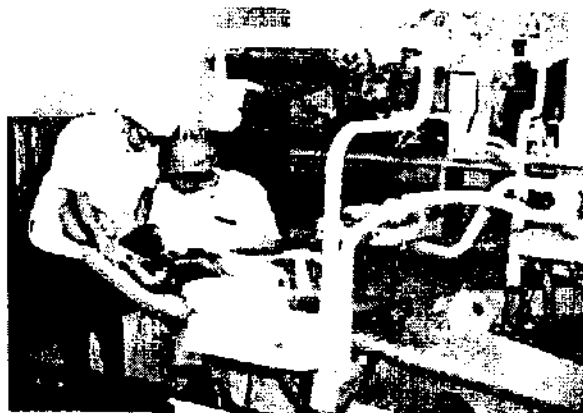


To keep up with recent and changing trends in orthodontics the department is updated with modern equipments in clinical and pre-clinical laboratories. Departmental Laboratory is equipped with Pressure molding machine (Biostar), Hydrosolder unit and Micro sandblaster & we offer many esthetic orthodontic treatment modalities like Lingual Orthodontics, Clear Aligners and use of orthodontic Micro-implants for correction of complex malocclusion in adults and advanced treatments of lingual orthodontics and aligners are also performed in the clinics. The department has to its credit an elite faculty which has a number of national and international credentials in the form of presentations, publications and posters.

3) Pedodontics & Preventive Dentistry

The department has to its credit highly knowledgeable, skilled and student friendly staff. The department aims to provide quality teaching to students and promote research. Department constantly conducts school oral health check up camps and provide a free dental treatment for the same.

The state of art infrastructure provides exclusive post graduate and under graduate sections in addition to separate play area, X-Ray room, Minor O.T., with recovery room modernized seminar room and fully updated library section.



The department now boast of specialized equipments like a conscious sedation unit, RVG (digital X-ray with a pediatric sensor, pulse oximeter, electric pulp tester, apex locators, advanced endodontic

Bharati Vidyapeeth Deemed University Dental College & Hospital, Navi Mumbai

equipments, ultrasonic cleaners, U. V. cabinet, automatic X ray processor, intraoral camera and a pressure molding machine. Along with special left handed units for left handed operators and ample pediatric dental chair units.

The department provides oral health care modalities ranging from restorations, pulpal therapy, stainless steel crowns, space maintainers to minor surgeries and complete oral rehabilitation.

4) Conservative Dentistry & Endodontics

The Dept. boasts of a large number of patients in the OPD as well as advanced equipments. There is a well equipped pre clinical laboratory with ample phantom head units. The aim and object of department is to produce post graduates with high moral integrity, ethics, clinical skill as well as sound research acumen.

The treatment modalities offered in the department include various restorative and Endodontic procedures. Restorative procedures like composite restoration, silver amalgam, glassionomer restoration are done to restore carious teeth. Various aesthetic treatments like diastema closure, laminates, veneers, smile design, tooth whitening, etc. are rendered to patients at subsidized rates. Advanced endodontic procedures like complicated root canal treatments, hemisection, radisection, peri radicular surgery, apicectomy, indirect aesthetic restorations like porcelain/composite inlays and onlays that require expertise are also offered by the department.

The department has all the advanced gadgets like endosonics, operating microscope, composite furnace, physiodispensor and various obturating systems like thermafil, guttaflow and advanced digital radiography like RVG. The Department has well equipped isolated operatory for surgical and microsurgical endodontic procedures as well as



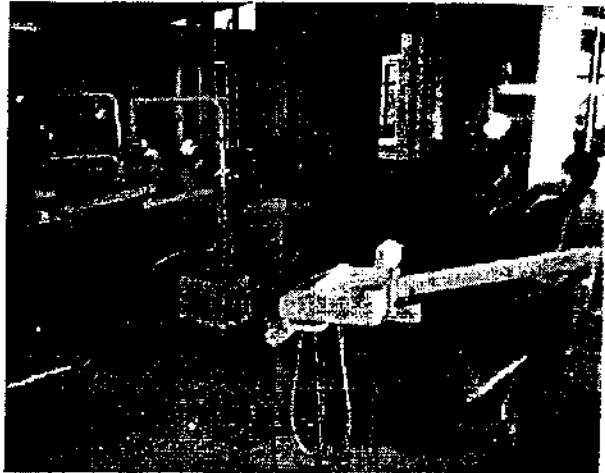
equipped ceramic laboratory and casting laboratory.

5) Prosthodontics and Crown & Bridge

Prosthodontics is the dental specialty that treats patients with missing or deficient teeth and/or oral and maxillofacial tissues. Optimal oral health and esthetics are obtained for patients through the use of dental implants, dentures, veneers and crowns

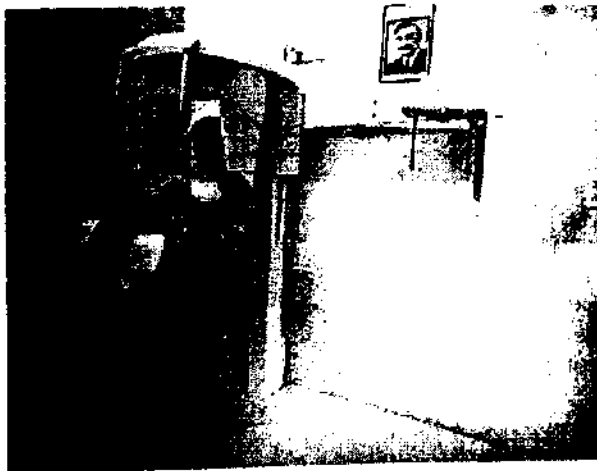
This department comprises of separate clinical sections for under graduate and post graduate students with well-equipped laboratories and separate implant operatory equipped to perform basic and advance implant procedures using various implant systems

With highly skilled teaching Faculty and best in class infrastructure the department aims to put students on par with their peers at reputed universities in India and abroad. The Department focuses on foundation knowledge, teach the latest techniques and evaluate clinical competency to provide quality prosthodontic care.



6) Oral Medicine and Radiology

Oral Medicine is the specialty of Dentistry concerned with the oral health care of patients with chronic, recurrent and medically related disorders of the oral and maxillofacial region, and with their diagnosis and non-surgical management. Oral and Maxillofacial Radiology is that specialty of Dentistry concerned with performance and interpretation of diagnostic imaging used for examining the craniofacial, dental and adjacent structures. Oral Medicine department had state of the art facilities & infrastructure with total area of 6829 Sq. feet. Oral Radiology Department is first ever AERB Approved radiation safe department.



The procedures performed at the department include detection and diagnosis of various oral diseases, oral pre-cancerous lesions & their management, early detection & diagnosis of oral cancer and the diagnosis & management of temporo-mandibular joint disorders, various oral mucosal lesions, oro-facial pain. The department also works towards giving clinical diagnosis of systemic diseases based on oral

Directors

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BHARATI VIDYAPEETH DENTAL COLLEGE
AND HOSPITAL, NAVI MUMBAI.



bvp_dental_navi_mumbai

How To Reach : 5 min walk from Kharghar Railway
station (Navi-Mumbai)

Super Specialty Services

- Oral Cancer Diagnostic Department
- Pediatric Dentistry
- Oral and Maxillofacial Surgery
- Orthognathic and orthodontic Department
- Prosthodontic and Implantology
- Conservative and Endodontic Department
- Periodontology and Implantology department
- Oral Pathology Department
- Dental Implant Department
- Laser Assisted Surgeries
- Piezoelectric surgeries

Facilities available

- Operation theatre
- RVG and OPG for radiographs
- Tobacco cessation centre
- Express Dental Clinic
- Medical Pharmacy
- Medical cell & Pathology Lab
- Mobile Dental Van
- Fully automatic Dental Chair
- Play area for children
- Library with national and international journals
- Wi-Fi Internet facilities



BHARATI VIDYAPEETH UNIVERSITY

Dental College & Hospital Navi Mumbai



Bharati Vidyapeeth (Deemed to be University)'s Dental College & Hospital, Navi Mumbai was established in the year 2005 to undertake the basic B.D.S. degree course. Our Dental College & Hospital has both clinical and preclinical academic activities to cater to the basic educational needs. The admission procedure is through the NEET Test where the students are selected by merit & admitted to the BDS Course. The total intake of students per year in Bharati Vidyapeeth (Deemed to be University)'s Dental College & Hospital is 100. The PG intake is 5 in the Department of Orthodontics, Periodontics, Conservative and Prosthodontic and 3 in Pediatrics. The College is recognized by DCI.

Total area of College & Hospital is spread over 5.5 acres. It includes spacious, well aerated building for undergraduate & postgraduate courses with all necessary facilities and ambiance. The basic departments concerned with medical subjects and their laboratories are present within the premises. Well-equipped clinical laboratories, clinical sections and associated working areas are specially designed taking into consideration the individual department's requirement guidelines.

Vision and Mission

The vision of the College of Dentistry is to be a nationally recognized dental school known for an innovative educational program, commitment to cultural diversity, discovery, transfer of scientific knowledge, the superior skills of our graduates, and the highest degree of service.

- To create learned doctors to cater to the need of expert health solutions for future healthy India.

- The mission of the College of Dentistry is to achieve excellence in the art and science of dentistry through teaching, research, and service to the society.

- To develop outstanding clinical, research and teaching professionals committed to lifelong learning.
- To provide and promote excellent patient care and community service.

Treatments offered

- Operation theatre
- TENS treatment of TMJ pain.
- RVG/ OPG for X ray

Teeth Restoring procedures

- Root canal treatment using microscope
- Fillings using advanced materials
- Complex Endodontic Surgeries
- Laminates and Veneers

Teeth saving procedures

- Gum Surgeries
- Bone graft and augmentation surgeries
- Orthognathic surgeries

Aesthetic and Cosmetic Procedures

- Teeth straightening procedures
- Teeth whitening
- Smile Designing
- Teeth cleaning procedures using ultrasonic scaling technology.
- Gum recontouring procedure
- Depigmentation procedures for black gums

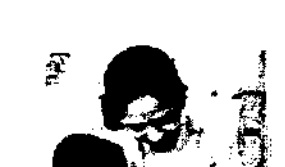
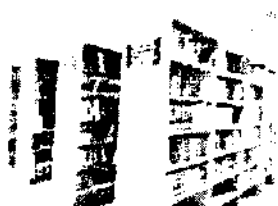
Child Care

- Fillings and root canal treatments
- Habit breaking programmes
- Pediatric surgeries under conscious sedation

Teeth replacement options

- Dental Implants
- Sinus Lift implant surgeries
- Dentures
- Fixed/Ocular/Ear Prosthesis

Faculty



Directors

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Teeth replacement options

- Dental Implants
- Sinus Lift Implant surgeries
- Dentures
- Fixed/Ocular/Ear Prosthesis

Gallery



PART – VI

SYLLABUS

The syllabus for post-graduate course includes both Applied Basic Sciences and subjects of concerned speciality. The syllabus in Applied Basic Sciences shall vary according to the particular speciality, similarly the candidates shall also acquire adequate knowledge in other subjects related to their respective speciality.

24. SYLLABUS DISTRIBUTION IN VARIOUS SPECIALITIES:

(i) PROSTHODONTICS AND CROWN & BRIDGE

Part-I

Paper-I : Applied Basic Sciences: Applied anatomy, embryology, growth and development Genetics, Immunology, anthropology, Physiology, nutrition and Biochemistry, Pathology and Microbiology, virology, Applied pharmacology, Research Methodology and bio statistics,. Applied Dental anatomy and histology, Oral pathology & oral Microbiology, Adult and geriatric psychology. Applied dental materials.

Part-II

Paper-I : Removable Prosthodontics and Implant supported prosthesis(Implantology), Geriatric dentistry and Cranio facial Prosthodontics

Paper-II : Fixed Prosthodontics, occlusion, TMJ and esthetics.

Paper-III : Descriptive and analysing type question

(ii) PERIODONTOLOGY

Part-I

Paper-I : Applied Basic Sciences: Applied Anatomy, Physiology, and Biochemistry, Pathology, Microbiology, Pharmacology, Research Methodology and Biostatistics.

Part-II

Paper I : Normal Periodontal structure, Etiology and Pathogenesis of Periodontal diseases, epidemiology as related to Periodontics

Paper II : Periodontal diagnosis, therapy and Oral implantology

Paper III : Descriptive and analysing type question

(iv) CONSERVATIVE DENTISTRY AND ENDODONTICS

Part-I

Paper-I : Applied Basic Sciences: Applied Anatomy, Physiology, Pathology including Oral Microbiology, Pharmacology, Biostatistics and Research Methodology and Applied Dental Materials.

Part-II

Paper-I : Conservative Dentistry

Paper-II : Endodontics

Paper-III : Descriptive and analysing type question



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(v) ORTHODONTICS AND DENTOFACIAL ORTHOPEDICS

Part-I

Paper-I : Applied Basic Sciences: Applied anatomy, Physiology, Dental Materials, Genetics, Pathology, Physical Anthropology, Applied Research methodology, Bio-Statistics and Applied Pharmacology.

Part-II

Paper-I : Orthodontic history, Concepts of occlusion and esthetics, Child and Adult Psychology, Etiology and classification of malocclusion, Dentofacial Anomalies, Diagnostic procedures and treatment planning in Orthodontics, Practice management in Orthodontic

Paper II : Clinical Orthodontics

Paper III : Descriptive and analysing type question

(viii) PEDIATRIC DENTISTRY

Part-I

Paper I : **Applied Basic Sciences** : Applied Anatomy, Physiology, and Biochemistry, Pathology, Microbiology, Pharmacology, Research Methodology and Biostatistics Growth and Development and Dental plaque, Genetics.

Part-II:

Paper I: Clinical Pedodontics

Paper II: Preventive and Community Dentistry as applied to Pediatric Dentistry

Paper III: Descriptive and Analysing type Question.

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DENTAL COLLEGE AND HOSPITAL PUNE**

BDS PROGRAM GOALS

The dental graduate during training in the institutions should acquire adequate knowledge necessary skills and reasonable attitude which are required for carrying all activities appropriate to general dental practice involving prevention diagnosis and treatment of anomalies and disease of the teeth, mouth jaws and associated tissues. The graduate should also understand the concept of community oral health education and be able to participate in the rural health care delivery program existing in the country.

Program objectives

The objectives are as follows

A) KNOWLEDGE AND UNDERSTANDING

The graduate should acquire the following during the period of training

1. Adequate knowledge of scientific foundation on which dentistry is based and good understanding of various relevant scientific methods, principals of biological functions, ability to evaluate and analyze scientifically various established facts and data.
2. Adequate knowledge of development, structure and function of the teeth, mouth and jaws and associated tissues both in health an disease and their relationship and effect on general state of health and also bearing on physical and social well being of the patient
3. Adequate knowledge of clinical discipline and methods which provide a coherent picture of anomalies, lesions and disease of the teeth, mouth and jaws and preventive diagnostic an therapeutic aspects of dentistry
4. Adequate clinical experience required for general dental practice
5. Adequate knowledge of the constitution, biological function ,and behavior of persons in health and sickness as well as the influence of the natural and social environment on the state of health in so far as it affects dentistry.

B) SKILLS

The graduate should be able to demonstrate following skills

1. Diagnosis and manage various common dental programs encountered in general dental practice keeping on mind the expectation and the rights of the society to receive the best possible treatment available
2. Prevent and manage complications if encountered while carrying out various surgical and other procedures
3. Carry out certain investigative procedures and ability to interpret laboratory finding
4. Control pain and anxiety amongst the patients during dental treatment
5. Promote oral health and help prevent oral diseases

C) ATTITUDE

The graduate should develop following attitude

1. Willingness to apply the current knowledge of dentistry in the best interest of the patient and community.
2. Maintain a high standard of professional ethics and conduct and apply this in all aspects of professional life.
3. To seek to improve awareness and provide possible solutions for oral health problems
4. Willingness to participate in CPED program to update knowledge and professional skills
5. Help and participate in the implementation of national oral health policy.

BDS PROGRAM SPECIFIC OUTCOME

ORAL MEDICINE AND RADIOLOGY

1. Able to identify precancerous and cancerous lesions of the oral cavity and refer to the concerned specialty for their management
2. Should have an adequate knowledge about common laboratory investigations and interpretation of their results
3. Should have adequate knowledge about medical complications that can arise while treating systematically compromised patients and take prior precautions/consents from the concerned medical specialist.
4. Have adequate knowledge about radiation health hazards, radiations safety and protection.
5. Competent to take intra oral radiographs and interpret the radiographic findings
6. Gain adequate knowledge of various extra-oral radiographic procedures, TMJ radiography and sialography.
7. Be aware of the importance of intra-and extra-oral radiography in forensic identification and age estimation.
8. Should be familiar with jurisprudence, ethics and understand the significance of dental records with respect to law.

PAEDIATRIC AND PREVENTIVE DENTISTRY

1. Able to instill a positive attitude and behavior in children towards oral health and understand the principles of prevention and preventive dentistry right from birth to adolescence.
2. Able to guide and counsel the guardian/parents with regards to various treatment modalities including different facets of preventive dentistry.
3. Able to treat dental diseases occurring the child patient
4. Able to manage the physically and mentally challenged/disabled children effectively and efficiently, tailored to the needs of individual requirement and conditions.

ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS

1. Understand about normal growth and development of facial skeleton and dentition.
2. Pinpoint growth aberrations in growth process both dental and skeletal and plan necessary treatment.
3. Diagnose the various categories of malocclusion.
4. Able to motivate and explain to the patient and parents or guardian about the necessity of treatment.
5. Plan and execute preventive orthodontics (space maintainers or space regainer).
6. Plan and execute interceptive orthodontics (habit breaking appliance).
7. Manage treatment of simple malocclusion such as such as anterior spacing using removable appliances.
8. Handle delivery and activation of removable orthodontic appliances.
9. Diagnose and appropriately refer patients with complex malocclusion to the specialist.

PERIODONTOLOGY

1. Diagnose the patient periodontal problem, plan and perform appropriate periodontal treatment
2. Competent to educate and motivate the patient.
3. Competent to perform thorough oral prophylaxis, sub gingival scaling, root planning and minor periodontal surgical procedures.
4. Give proper post treatment instructions and do periodic recall and evaluation.
5. Familiar with the concepts of Osseo integration and basic surgical aspects of Implantology.

PROSTHODONTICS AND CROWN & BRIDGE

1. Able to understand and use various dental materials
2. Competent to carry out treatment of conventional complete and partial removable dentures and fabricate fixed partial dentures.
3. Able to carry out treatment of routine prosthodontics procedures.
4. Familiar with the concept of Osseo integration and the value of implant-supported prosthodontics procedures.

CONSERVATIVE DENTISTRY AND ENDODONTICS

1. Competent to diagnose all carious lesions
2. Competent to perform class I and class II cavities and their restoration with amalgam
3. Restore class V and class III cavities with glass ionomer cements.
4. Able to diagnose and appropriately treat pulpally involved teeth (pulp capping procedure)

5. Able to perform RCT for anterior teeth
6. Competent to carry out small composite restorations
7. Understand the principles of aesthetics dental procedures.

ORAL AND MAXILLOFACIAL SURGERY

1. Able to apply the knowledge gained in the basic medical and clinical subjects in the management of patients with surgical problems
2. Able to diagnose, manage and treat patients with basic oral surgical problems
3. Have a broad knowledge of maxillofacial surgery and oral Implantology
4. Should be familiar with legal, ethical and moral issues pertaining to patient care and communication skills.
5. Should have acquired the skill to examine any patient with an oral surgical problem in an orderly manner
6. Understand and practice the basic principles of asepsis and sterilization
7. Should be competent in the extraction of teeth under both local and general anesthesia
8. Competent to carry out certain minor oral surgical procedures under LA like trans-alveolar extraction, frenctomy, dentoalveolars, simple impaction, biopsy, etc
9. Competent to assess, prevent and manage common complications that arises during and after minor oral surgery.
10. Able to provide primary care and manage medical emergencies in the dental office
11. Familiar with the management of major oral surgical problems and principles involved in in-patient managment

PUBLIC HEALTH DENTISTRY

1. Apply the principles of health promotion and disease prevention
2. Have knowledge of the organization and provision of health care in community and in the hospital services
3. Have knowledge of the prevalence of common dental condition in India
4. Have knowledge of community based preventive measures.
5. Have knowledge of the social, cultural and environmental factors which contribute to health or illness.
6. Administer oral hygiene instructions, topical fluoride therapy and fissure sealing.
7. Educate patient about the etiology and prevention of oral disease and encourage them to assure responsibility for their oral health.

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY
DENTAL COLLEGE AND HOSPITAL PUNE**

MDS PROGRAM

The objective of the post-graduate training is to train a student so as to ensure higher competence in both general and special area of interest and prepare him or her for a career in teaching, research and speciality practice. A student must achieve a high degree of clinical proficiency in the subject and develop competence in research and its methodology in the concerned field.

The objectives to be achieved by the candidate on completion of the course may be classified as under:-

- (a) Knowledge (Cognitive domain)**
- (b) Skills (Psycho motor domain)**
- (c) Human values, ethical practice and communication abilities**

(a) Knowledge

- (i) demonstrate understanding of basic sciences relevant to speciality;
- (ii) Describe etiology, path physiology, principles of diagnosis and management of common problems within the speciality in adults and children;
- (iii) Identify social, economic, environmental and emotional determinants in a given case and take them into account for planned treatment;
- (iv) Recognize conditions that may be outside the area of speciality or competence and to refer them to the concerned specialist;
- (v) Update knowledge by self study and by attending courses, conferences and seminars pertaining to speciality;
- (vi) Undertake audit, use information technology and carry out research in both basic and clinical with the aim of publishing or presenting the work at various scientific gathering;

(b) Skills:

- (i) Take a proper clinical history, examine the patient, perform essential diagnostic procedures and order relevant tests and interpret them to come to a reasonable diagnosis about the condition;
- (ii) Acquire adequate skills and competence in performing various procedures as required in the speciality.

(c) Human Values, Ethical Practice And Communication Abilities.

- (i) adopt ethical principles in all aspects of practice;
- (ii) Foster professional honesty and integrity;
- (iii) Deliver patient care irrespective of social status, caste, creed, or religion of the patient;
- (iv) Develop communication skills, to explain various options available and obtain a true informed consent from the patient;
- (v) Provide leadership and get the best out of his team in a congenial working atmosphere;
- (vi) Apply high moral and ethical standards while carrying out human or animal research;
- (vii) Be humble and accept the limitations in his knowledge and skill and to ask for help from colleagues when needed;
- (viii) Respect patient's rights and privileges including patient's right to information and right to seek a second opinion.

MDS COURSE OUTCOME

CONSERVATIVE DENTISTRY AND ENDODONTICS

COURSE OBJECTIVES:

The following objectives are laid out to achieve the goals of the course. These are to be achieved by the time the candidate completes the course. These objectives may be considered under the following subtitles.

Knowledge:

At the end of 36 months of training, the candidates should be able to:

1. Describe etiology, pathophysiology, periapical diagnosis and management of common restorative situations, endodontic situations that will include contemporary management of dental caries, management of trauma and pulpal pathosis including periodontal situations.
2. Demonstrate understanding of basic sciences as relevant to conservative / restorative dentistry and Endodontics.
3. Identify social, economic, environmental and emotional determinants in a given case or community and take them into account for planning and execution at individual and community level.
4. Ability to master differential diagnosis and recognize conditions that may require multi disciplinary approach or a clinical situation outside the realm of the specialty, which he or she should be able to recognize and refer to appropriate specialist.
5. Update himself by self-study and by attending basic and advanced courses, conferences, seminars, and workshops in the specialty of Conservative Dentistry-Endodontics-Dental Materials and Restorative Dentistry.
6. Ability to teach/guide, colleagues and other students.
7. Use information technology tools and carry out research both basic and clinical with the aim of his publishing his work and presenting the same at scientific platform.

Skills

1. Take proper chair side history, examine the patient and perform medical and dental diagnostic procedures as well as perform relevant tests and interpret to them to come to a reasonable diagnosis about the dental condition in general and Conservative Dentistry – Endodontics in particular. And undertake complete patient monitoring including preoperative as well as post operative care of the patient.
2. Perform all levels of restorative work, surgical and non-surgical Endodontics as well as endodontic-periodontal surgical procedures as part of multidisciplinary approach to clinical condition.
3. Provide basic life saving support in emergency situations.
4. Manage acute pulpal and pulpo-periodontal situations.
5. Have a thorough knowledge of infection control measures in the dental clinical environment and laboratories.
6. Should have proper knowledge of sterilization procedures

Human Values, Ethical Practice and Communication Abilities

1. Adopt ethical principles in all aspects of restorative and contemporary Endodontics including non-surgical and surgical Endodontics.
2. Professional honesty and integrity should be the top priority.
3. Dental care has to be provided regardless of social status, caste, creed or religion of the patient.
4. Develop communication skills in particular to explain various options available for management and to obtain a true informed consent from the patient.
5. Apply high moral and ethical standards while carrying on human or animal research.
6. He/She shall not carry out any heroic procedures and must know his limitations in performing all aspects of restorative dentistry including Endodontics. Ask for help from colleagues or seniors when required without hesitation.
7. Respect patient's rights and privileges including patient's right to information

ORAL AND MAXILLOFACIAL SURGERY

OBJECTIVES:

The training program in Oral and Maxillofacial Surgery is structured to achieve the following five objectives-

- 1 Knowledge
- 2 Skills
- 3 Attitude
- 4 Communicative skills and ability
- 5 Research

Knowledge:

1. To have acquired adequate knowledge and understanding of the etiology, path physiology and diagnosis, treatment planning of various common oral and maxillofacial surgical problems both minor and major in nature
- 2 To have understood the general surgical principles like pre and post surgical management, particularly evaluation, post surgical care, fluid and electrolyte management, blood transfusion and post surgical pain management.
- 3 Understanding of basic sciences relevant to practice of oral and maxillofacial surgery
- 4 Able to identify social, cultural, economic, genetic and environmental factors and their relevance to disease process management in the oral and maxillofacial region.
- 5 Essential knowledge of personal hygiene and infection control, prevention of cross infection and safe disposal of hospital waste keeping in view the high prevalence of hepatitis and HIV.

Skills:

- 1 To obtain proper clinical history, methodical examination of the patient, perform essential diagnostic procedures and order relevant laboratory tests and interpret them and to arrive at a reasonable diagnosis about the surgical condition.
- 2 To perform with competence minor oral surgical procedures and common maxillofacial surgery. To treat both surgically and medically the problems of the oral and Maxillofacial and the related area.
- 3 Capable of providing care for maxillofacial surgery patients.
- 4 Develop attitude to adopt ethical principles in all aspect of surgical practice, professional honesty and integrity are to be fostered. Surgical care is to be delivered irrespective of the social status, caste, creed or religion of the patient.
- 5Willing to share the knowledge and clinical experience with professional colleagues.
- 6 Willing to adopt new techniques of surgical management developed from time to time based on scientific research which is in the best interest of the patient
- 7 Respect patient right and privileges, including patients right to information and right to seek a second opinion.
- 8Develop attitude to seek opinion from allied medical and dental specialists as and when required.

Communication Skills:

- 1 Develop adequate communication skills particularly with the patients giving them the various options available to manage a particular surgical problem and obtain a true informed consent from them for the most appropriate treatment available at that point of time
- 2 Develop the ability to communicate with professional colleagues.
- 3 Develop ability to teach undergraduates.

PERIODONTOLOGY:

OBJECTIVES:

The following objectives are laid out to achieve the goals of the course

A) Knowledge:

Discuss historical perspective to advancement in the subject proper and related topics.

- 1.Describe etiology, pathogenesis, diagnosis and management of common periodontal diseases with emphasis on

Indian population

2. Familiarize with the biochemical, microbiologic and immunologic genetic aspects of periodontal pathology
3. Describe various preventive periodontal measures
4. Describe various treatment modalities of periodontal disease from historical aspect to currently available ones
5. Describe interrelationship between periodontal disease and various systemic conditions
6. Describe periodontal hazards due to estrogenic causes and deleterious habits and prevention of it
7. Identify rarities in periodontal disease and environmental/Emotional determinates in a given case
8. Recognize conditions that may be outside the area of his/her Speciality/ competence and refer them to an appropriate Specialist
9. Decide regarding non-surgical or surgical management of the case
10. Update the student by attending courses, conferences and seminars relevant to periodontics or by self-learning process.
11. Plan out/ carry out research activity both basic and clinical aspects with the aim of publishing his/her work in scientific journals
12. Reach to the public to motivate and educate regarding periodontal disease, its prevention and consequences if not treated
13. Plan out epidemiological survey to assess prevalence and incidence of early onset periodontitis and adult periodontitis in Indian population (Region wise) Shall develop knowledge, skill in the science and practice of Oral Implantology
14. Shall develop teaching skill in the field of Periodontology and Oral Implantology
15. Principles of Surgery and Medical Emergencies.
16. To sensitize students about inter disciplinary approach towards the soft tissues of the oral cavity with the help of specialist from other departments.

B) Skills:

1. Take a proper clinical history, thorough examination of intra oral, extra oral, medical history evaluation, advice essential diagnostic procedures and interpret them to come to a reasonable diagnosis
2. Effective motivation and education regarding periodontal disease maintenance after the treatment
3. Perform both non-surgical & education regarding periodontal disease, maintenance after the treatment
4. Perform both non-surgical and surgical procedures independently
5. Provide Basic Life Support Service (BLS) recognizes the need for advance life support and does the immediateneed for that.
6. Human values, ethical practice to communication abilities
7. Adopt ethical principles in all aspects of treatment modalities; Professional honesty & integrity are to be fostered. Develop Communication skills to make awareness regarding periodontal disease Apply high moral and ethical standards while carrying out human or animal research, Be humble, accept the limitations in his/her knowledge and skill, and ask for help from colleagues when needed, Respect patients rights and privileges, including patients right to information and right to seek a second opinion.
8. To learn the principal of lip repositioning and perio esthetics surgeries.

PROSTHODONTICS AND CROWN & BRIDGE

OBJECTIVES OF THE COURSE:

Training program for the dental graduates in Prosthetic dentistry– removable dental prosthodontics, fixed dental prosthodontics (Crown & Bridge), Implantology, maxillofacial prosthodontics and esthetic dentistry and Crown& Bridge including Implantology is structured to achieve knowledge and skill in theoretical and clinical laboratory, attitude, communicative skills and ability to perform research with a good understanding of social, cultural, educational and environmental background of the society.

1. To have adequate acquired knowledge and understanding of applied basic and systemic medical sciences, both in general and in particularly of head and neck region.

2. The postgraduates should be able to provide Prosthodontic therapy for patients with competence and working knowledge with understanding of applied medical, behavioral and clinical science, that are beyond the treatment skills of the general BDS graduates and MDS graduates of other specialties.
3. To demonstrate evaluative and judgment skills in making appropriate decisions regarding prevention, treatment, after care and referrals to deliver comprehensive care to patients.

Knowledge:

The candidate should possess knowledge of applied basic and systemic medical sciences.

- i) On human anatomy, embryology, histology, applied in general and particularly to head and neck, Physiology & Biochemistry, Pathology Microbiology & virology; health and diseases of various systems of the body (systemic) principles in surgery and medicine, pharmacology, nutrition, behavioral science, age changes, genetics, Immunology, Congenital defects & syndromes and Anthropology, Bioengineering, Bio-medical & Biological Principles.
- ii) The student shall acquire knowledge of various Dental Materials used in the specialty and be able to provide appropriate indication, understand the manipulation characteristics, compare with other materials available, be adept with recent advancements of the same.
- iii) Students shall acquire knowledge and practice of history taking, Diagnosis, treatment planning, prognosis, record maintenance of oral, craniofacial and systemic region.
- iv) Ability for comprehensive rehabilitation concept with pre prosthetic treatment plan including surgical reevaluation and prosthodontic treatment planning, impressions, jaw relations, utility of face bows, articulators, selection and positioning of teeth, teeth arrangement for retention, stability, esthetics, phonation, psychological comfort, fit and insertion.
- v) Instructions for patients in after care and preventive Prosthodontics and management of failed restorations shall be possessed by the students.
- vi) Understanding of all the applied aspects of achieving physical, psychological well-being of the patients for control of diseases and / or treatment related syndromes with the patient satisfaction and restoring function of Cranio mandibular system for a quality life of a patient.
- vii) Ability to diagnose and plan treatment for patients requiring Prosthodontics therapy.
- viii) Ability to read and interpret radiographs, and other investigations for the purpose of diagnosis and treatment Planning.
- ix) The theoretical knowledge and clinical practice shall include principles involved for support, retention, stability, esthetics, phonation, mastication, occlusion, behavioral, psychological, preventive and social aspects of Prosthodontics science of Oral and Maxillofacial Prosthodontics and Implantology.
- x) Tooth and tooth surface restorations, Complete denture Prosthodontics, removable partial denture Prosthodontics, fixed prosthodontics and maxillofacial and Craniofacial Prosthodontics, implants and implant supported Prosthodontics, T.M.J. and occlusion, craniofacial esthetics, and biomaterials, craniofacial disorders, problems of psychogenic origin.

Skills:

1. The candidate should be able to examine the patients requiring Prosthodontic therapy, investigate the patient systemically, analyze the investigation results, radiographs, diagnose the ailment, plan the treatment, communicate it with the patient and execute it.
2. To understand the prevalence and prevention of diseases of craniomandibular system related to prosthetic dentistry.
3. The candidate should be able to restore lost functions of stomatognathic system like mastication, speech, appearance and psychological comforts by understanding biological, biomedical, bioengineering principles and systemic conditions of the patients to provide quality health care in the craniofacial regions.

4. The candidate should be able to demonstrate good interpersonal, communication skills *and* team approach in interdisciplinary care by interacting with other specialties including medical specialty for planned team management of patients for craniofacial & oral acquired and congenital defects, temporomandibular joint syndromes, esthetics, Implant supported Prosthetics and problems of Psychogenic origins.
5. Should be able to demonstrate the clinical competence necessary to carry out appropriate treatment at higher level of knowledge, training and practice skills currently available in their specialty area with a patient centered approach.
6. Should be able to interpret various radiographs like IOPA, OPG, CBCT and CT. Should and be able to plan and modify treatment plan based on radiographic findings.
7. Should be able to critically appraise articles published and understand various components of different types of articles and be able to gather the weight of evidence from the same.
8. To identify target diseases and create awareness amongst the population regarding Prosthodontic therapy.
9. To perform Clinical and Laboratory procedures with a clear understanding of biomaterials, tissue conditions related to prosthesis and have required dexterity & skill for performing clinical and laboratory all procedures in fixed, removable, implant, maxillofacial, TMJ and esthetics Prosthodontics.
10. To carry out necessary adjunctive procedures to prepare the patient before prosthesis like tissue preparation and preprosthetic surgery and to prepare the patient before prosthesis / prosthetic procedures.
11. To understand demographic distribution and target diseases of Cranio mandibular region related to Prosthodontics.

Attitudes:

1. To adopt ethical principles in Prosthodontics practice, Professional honesty, credibility and integrity are to be fostered. Treatment to be delivered irrespective of social status, caste, creed or religion of patient.
2. Should be willing to share the knowledge and clinical experience with professional colleagues.
3. Should develop an attitude towards quality, excellence, *non-compromising* in treatment.
4. Should be able to self-evaluate, reflect and improve on their own.
5. Should pursue research in a goal to contribute significant, relevant and useful information, concept or methodology to the scientific fraternity.
6. Should be able to demonstrate *evidence-based* practice while handling cases.
7. Should be willing to adopt new methods and techniques in prosthodontics from time to time based on scientific research, which are in patient's best interest.
8. Should respect patient's rights and privileges, including patient's right to information and right to seek second opinion.

Communicative Abilities:

- To develop communication skills, in particular *and* to explain treatment options available in the management.
- To provide leadership and get the best out of his / her group in a congenial working atmosphere.
- Should be able to communicate in simple understandable language with the patient and explain the principles of prosthodontics to the patient. He/She should be able to guide and counsel the patient with regard to various treatment modalities available.
- To develop the ability to communicate with professional colleagues through various media like Internet, e-mails, videoconferences etc. to render the best possible treatment.

ORTHODONTICS AND DENTOFACIAL ORTHOPEDICS

OBJECTIVES:

The training programme in Orthodontics is to structure and achieve the following four objectives

Knowledge:

1. The dynamic interaction of biologic processes and mechanical forces acting on the stomatognathic system during orthodontic treatment
2. The etiology, pathophysiology, diagnosis and treatment planning of various common Orthodontic problems

3. Various treatment modalities in Orthodontics – preventive, interceptive and corrective.
4. Basic sciences relevant to the practice of Orthodontics
5. Interaction of social, cultural, economic, genetic and environmental factors and their relevance to management of oro– facial deformities
6. Factors affecting the long-range stability of orthodontic correction and their management
7. Personal hygiene and infection control, prevention of cross infection and safe disposal of hospital waste, keeping in view the high prevalence of Hepatitis and HIV and other highly contagious diseases.

Skills:

1. To obtain proper clinical history, methodical examination of the patient, perform essential diagnostic procedures, and interpret them and arrive at a reasonable diagnosis about the Dento-facial deformities.
2. To be competent to fabricate and manage the most appropriate appliance – intra or extra oral, removable or fixed, mechanical or functional, and active or passive – for the treatment of any orthodontic problem to be treated singly or as a part of multidisciplinary treatment of oro-facial deformities.

Attitude:

1. Develop an attitude to adopt ethical principles in all aspects of Orthodontic practice.
2. Professional honesty and integrity are to be fostered
3. Treatment care is to be delivered irrespective of the social status, cast, creed and religion of the patients.
4. Willingness to share the knowledge and clinical experience with professional colleagues
5. Willingness to adopt, after a critical assessment, new methods and techniques of orthodontic management developed from time to time based on scientific research, which are in the best interest of the patient
6. Respect patients’ rights and privileges, including patient’s right to information and right to seek a second opinion
7. Develop attitude to seek opinion from allied medical and dental specialists as and when required

Communication Skills:

1. Develop adequate communication skills particularly with the patients giving them the various options available to manage a particular Dento-facial problem and to obtain a true informed consent from them for the most appropriate treatment available at that point of time.
2. Develop the ability to communicate with professional colleagues, in Orthodontics or other specialties through various media like correspondence, Internet, e-video, conference, etc. to render the best possible treatment.

6. ORAL & MAXILLOFACIAL PATHOLOGY AND ORAL MICROBIOLOGY

Objectives:

1. To train a post graduate dental surgeon so as to ensure higher competence in both general and special pathology dealing with the nature of oral diseases, their causes, processes and effects.
2. An oral pathologist is expected to perform routine histopathological evaluation of specimens relating to oral and perioral tissues, to carry out routine diagnostic procedures including hematological, cytological, microbiological, Immunological and ultra structural investigations.
3. He/she is expected to have an understanding of current research methodology, collection and interpretation of data, ability to carry out research projects on clinical and or epidemiological aspects, a working knowledge on current databases, automated data retrieval systems, referencing and skill in writing scientific papers.
4. He/she is expected to present scientific data pertaining to the field, in conferences both as poster and verbal presentations and to take part in group discussions.

PEDIATRIC AND PREVENTIVE DENTISTRY

OBJECTIVES:

At the end of 3 years of training the candidate should be able to

1. Create not only a good oral health in the child but also a good citizen tomorrow.

2. Instill a positive attitude and behavior in children
3. Understand the principles of prevention and preventive dentistry right from birth to adolescence
4. Guide and counsel the parents in regards to various treatment modalities including different facets of preventive dentistry
5. Prevent and intercept developing malocclusion

Skills:

1. Obtain proper clinical history, methodological examination of the child patient, perform essential diagnostic procedures and interpret them. and arrive at a reasonable diagnosis and treat appropriately.
2. Be competent to treat dental diseases which are occurring in child patient.
3. Manage to repair and restore the lost / tooth structure to maintain harmony between both hard and soft tissues of the oral cavity.
4. Manage the disabled children effectively and efficiently, tailored to the needs of individual requirement and conditions.
5. To acquire skills in managing efficiently life threatening conditions with emphasis on basic life support measures.

Attitudes:

1. Develop an attitude to adopt ethical principles in all aspects of Pedodontics practice.
2. Professional honesty and integrity are to be fostered
3. Treatment care is to be delivered irrespective of the social status, cast, creed, and religion of the patients.
4. Willingness to share the knowledge and clinical experience with professional colleagues.
5. Willingness to adopt, after a critical assessment, new methods and techniques of Pedodontics management developed from time to time, based on scientific research, which is in the best interest of the child patient.
6. Respect child patient's rights and privileges, including child patient's right to information and right to seek a second opinion.
7. Develop an attitude to seek opinion from allied medical and dental specialities, as and when required

ORAL MEDICINE AND RADIOLOGY

OBJECTIVES:

At the end of 3 years of training the candidate should be able to acquire adequate knowledge of the discipline.

Knowledge:

Theoretical, Clinical and practical knowledge of all oral mucosal lesions, skeletal involvement of maxillofacial region, diagnostic procedures pertaining to them and latest information of imaging modules.

Skills:

Three important skills need to be imparted in maxillofacial diseases

1. Diagnostic skill in recognition of oral diseases with radiographic diagnosis and their management
2. Research skills in handling scientific problems pertaining to oral treatment
3. Clinical and Didactic skills in encouraging younger doctors to attain learning objectives

Attitudes:

The positive mental attitude and the persistence of continued learning need to be inculcated

**MEDICAL COUNCIL OF
INDIA
REGULATIONS
ON
GRADUATE MEDICAL EDUCATION, 1997**



**MEDICAL COUNCIL OF INDIA
Pocket 14, Sector 8, Dwarka
New Delhi - 110077**

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Medical Council of India

The 4th March 1997

NOTIFICATION

In exercise of the powers conferred by Section 33 of the Indian Medical Council Act, 1956 (102 of 1956) the Medical Council of India with the previous sanction of the Central Government hereby makes the following regulations, namely :-

(1) Short title and commencement : (1) These regulations may be called the "Regulations on Graduate Medical Education, 1997".

(2) They shall come into force on the date of their publication in the Official Gazette.

CHAPTER 1

2. GENERAL CONSIDERATIONS AND TEACHING APPROACH

(1) Graduate medical curriculum is oriented towards training students to undertake the responsibilities of a physician of first contact who is capable of looking after the preventive, promotive, curative & rehabilitative aspect of medicine.

(2) With wide range of career opportunities available today, a graduate has a wide choice of career opportunities. The training, though broad based and flexible should aim to provide an educational experience of the essentials required for health care in our country.

(3) To undertake the responsibilities of service situations which is a changing condition and of various types, it is essential to provide adequate placement training tailored to the needs of such services as to enable the graduates to become effective instruments of implementation of those requirements. To avail of opportunities and be able to conduct professional requirements, the graduate shall endeavour to have acquired basic training in different aspects of medical care.

(4) The importance of the community aspects of health care and of rural health care services is to be recognized. This aspect of education & training of graduates should be adequately recognized in the prescribed curriculum. Its importance has been systematically upgraded over the past years and adequate exposure to such experiences should be available throughout all the three phases of education & training. This has to be further emphasized and intensified by providing exposure to field practice areas and training during the internship period. The aim of the period of rural training during internship is to enable the fresh graduates to function efficiently under such settings.

(5) The educational experience should emphasize health and community orientation instead of only disease and hospital orientation or being-concentrated - on-curative -aspects. As such all the basic concepts of modern scientific medical education are to be adequately dealt with.

(6) There must be enough experiences to be provided for self learning. The methods and techniques that would ensure this must become a part of teaching-learning process.

(7) The medical graduate of modern scientific medicine shall endeavour to become capable of functioning independently in both urban or rural environment. He/she shall endeavour to give emphasis on fundamental aspects

of the subjects taught and on common problems of health and disease avoiding unnecessary details of specialization.

(8) The importance of social factors in relation to the problem of health and diseases should receive proper emphasis throughout the course and to achieve this purpose, the educational process should also be community based than only hospital based. The importance of population control and family welfare planning should be emphasized throughout the period of training with the importance of health and development duly emphasized.

(9) Adequate emphasis is to be placed on cultivating logical and scientific habits of thought, clarity of expression and independence of judgment, ability to collect and analyse information and to correlate them.

(10) The educational process should be placed in a historic background as an evolving process and not merely as an acquisition of a large number of disjointed facts without a proper perspective. The history of Medicine with reference to the evolution of medical knowledge both in this country and the rest of the world should form a part of this process.

(11) Lectures alone are generally not adequate as a method of training and are a poor means of transferring/acquiring information and even less effective at skill development and in generating the appropriate attitudes. Every effort should be made to encourage the use of active methods related to demonstration and on first hand experience. Students will be encouraged to learn in small groups, through peer interactions so as to gain maximal experience through contacts with patients and the communities in which they live. While the curriculum objectives often refer to areas of knowledge or science, they are best taught in a setting of clinical relevance and hands on experience for students who assimilate and make this knowledge a part of their own working skills.

(12) The graduate medical education in clinical subjects should be based primarily on out-patient teaching, emergency departments and within the community including peripheral health care institutions. The out-patient departments should be suitably planned to provide training to graduates in small groups.

(13) Clinics should be organised in small groups of preferably not more than 10 students so that a teacher can give personal attention to each student with a view to improve his skill and competence in handling of the patients.

(14) Proper records of the work should be maintained which will form the basis for the students' internal assessment and should be available to the inspectors at the time of inspection of the college by the Medical Council of India.

(15) Maximal efforts have to be made to encourage integrated teaching between traditional subject areas using a problem based learning approach starting with clinical or community cases and exploring the relevance of various preclinical disciplines in both understanding and resolution of the problem. Every attempt be made to de-emphasize compartmentalisation of disciplines so as to achieve both horizontal and vertical integration in different phases.

(16) Every attempt is to be made to encourage students to participate in group discussions and seminars to enable them to develop personality, character, expression and other faculties which are necessary for a medical graduate to function either in solo practice or as a team leader when he begins his independent career. A discussion group should not have more than 20 students.

(17) Faculty member should avail of modern educational technology while teaching the students and to attain this objective, Medical Education Units/ Departments be established in all medical colleges for faculty development and providing learning resource material to teachers.

(18) To derive maximum advantage out of this revised curriculum, the vacation period to students in one calendar year should not exceed one month, during the 4 ½ years Bachelor of Medicine and Bachelor of Surgery (MBBS) Course.

(19) In order to implement the revised curriculum in toto, State Govts. and Institution Bodies must ensure that adequate financial and technical inputs are provided.

3. OBJECTIVE OF MEDICAL GRADUATE TRAINING PROGRAMME:

(1) **NATIONAL GOALS** : At the end of undergraduate program, the medical student should be able to :

(a) recognize 'health for all' as a national goal and health right of all citizens and by undergoing training for medical profession fulfill his/her social obligations towards realization of this goal.

(b) learn every aspect of National policies on health and devote himself/herself to its practical implementation.

(c) achieve competence in practice of holistic medicine, encompassing promotive, preventive, curative and rehabilitative aspects of common diseases.

(d) develop scientific temper, acquire educational experience for proficiency in profession and promote healthy living.

(e) become exemplary citizen by observation of medical ethics and fulfilling social and professional obligations, so as to respond to national aspirations.

(2) **INSTITUTIONAL GOALS** : (I) In consonance with the national goals each medical institution should evolve institutional goals to define the kind of trained manpower (or professionals) they intend to produce. The undergraduate students coming out of a medical institute should:

(a) be competent in diagnosis and management of common health problems of the individual and the community, commensurate with his/her position as a member of the health team at the primary, secondary or tertiary levels, using his/her clinical skills based on history, physical examination and relevant investigations.

(b) be competent to practice preventive, promotive, curative and rehabilitative medicine in respect to the commonly encountered health problems.

(c) appreciate rationale for different therapeutic modalities, be familiar with the administration of the "essential drugs" and their common side effects.

(d) be able to appreciate the socio-psychological, cultural, economic and environmental factors affecting health and develop humane attitude towards the patients in discharging one's professional responsibilities.

(e) possess the attitude for continued self learning and to seek further expertise or to pursue research in any chosen area of medicine.

(f) be familiar with the basic factors which are essential for the implementation of the National Health Programmes including practical aspects of the following:

(i) Family Welfare and Material and Child Health(MCH)

(ii) Sanitation and water supply

(iii) Prevention and control of communicable and non-communicable diseases

(iv) Immunization

(v) Health Education

(g) acquire basic management skills in the area of human resources, materials and resource management related to health care delivery.

(h) be able to identify community health problems and learn to work to resolve these by designing, instituting corrective steps and evaluating outcome of such measures.

(i) be able to work as a leading partner in health care teams and acquire proficiency in communication skills.

(j) be competent to work in a variety of health care settings.

(j) have personal characteristics and attitudes required for professional life such as personal integrity, sense of responsibility and dependability and ability to relate to or show concern for other individuals.

(II) All efforts must be made to equip the medical graduate to acquire the skills as detailed in APPENDIX B.

CHAPTER II

ADMISSION, SELECTION, MIGRATION & TRAINING:-

4. Admission to the Medical Course - Eligibility Criteria : No Candidate shall be allowed to be admitted to the Medical Curriculum proper of first Bachelor of Medicine and Bachelor of Surgery (MBBS) Course until:

(1) He/she shall complete the age of 17 years on or before 31st December of the year of admission to the MBBS Course.

(2) He/she has passed qualifying examination as under:

(a) The higher secondary examination or the Indian School Certificate Examination which is equivalent to 10+2 Higher Secondary Examination after a period of 12 years study, the last two years of study comprising of physics, Chemistry, Biology and Mathematics or any other elective subjects with English at a level not less than the core course for English as prescribed by the National Council for Educational Research and Training after the introduction of the 10+2+3 years educational structure as recommended by the National Committee on education.

Note: Where the course content is not as prescribed for 10+2 education structure of the National Committee, the candidates will have to undergo a period of one year pre-professional training before admission to the Medical colleges.

or

(b) The Intermediate examination in science of an Indian University/Board or other recognized examining body with Physics, Chemistry and Biology which shall include a practical test in these subjects and also English as a compulsory subject.

or

(c) The pre-professional/pre-medical examination with Physics, Chemistry and Biology, after passing either the higher secondary school examination, or the pre-university or an equivalent examination. The pre-professional/pre-medical examination shall include a practical test in Physics, Chemistry & Biology and also English as a compulsory subject.

or

(d) The first year of the three years degree course of a recognized university, with Physics, Chemistry and Biology including a practical test in these subjects provided the examination is a "University Examination" and candidate has passed 10+2 with English at a level not less than a core course.

or

(e) B.Sc examination of an Indian University, provided that he/she has passed the B.Sc examination with not less than two of the following subjects Physics, Chemistry, Biology (Botany, Zoology) and further that he/she has passed the earlier qualifying examination with the following subjects - Physics, Chemistry, Biology and English.

or

(f) Any other examination which, in scope and standard is found to be equivalent to the intermediate science examination of an Indian University/Board, taking Physics, Chemistry and Biology including practical test in each of these subjects and English.

Note:

The pre-medical course may be conducted either at Medical College or a Science College.

Marks obtained in mathematics are not to be considered for admission to MBBS course.

After the 10+2 course is introduced, the integrated courses should be abolished.

5 Selection to Students: The selection of students to medical college shall be based solely on merit of the candidate and for determination of merit, the following criteria be adopted uniformly throughout the country:

(1) In states, having only one Medical College and one university / board/examining body conducting the qualifying examination, the marks obtained at such qualifying examination may be taken into consideration.

(2) In states, having more than one university/board/examining body conducting the qualifying examination (or where there is more than one medical college under the administrative control of one authority) a competitive entrance

examination should be held so as to achieve a uniform evaluation as there may be variation of standards at qualifying examinations conducted by different agencies.

(3) Where there are more than one college in a state and only one university/board conducting the qualifying examination, then a joint selection board be constituted for all the colleges.

(4) A competitive entrance examination is absolutely necessary in the cases of Institutions of All India character.

5 Procedure for selection to MBBS course shall be as follows :-

i) In case of admission on the basis of qualifying examination under Clause(1) based on merit, candidate for admission to MBBS course must have passed in the subjects of Physics, Chemistry, Biology & English individually and must have obtained a minimum of 50% marks taken together in Physics, Chemistry, and Biology at the qualifying examination as mentioned in Clause(2) of regulation 4. In respect of candidates belonging to Scheduled Castes, Scheduled Tribes or Other Backward Classes, the marks obtained in Physics, Chemistry and Biology taken together in qualifying examination be 40% instead of 50% as above.

ii) In case of admission on the basis of competitive entrance examination under Clause (2) to (4) of this regulation, a candidate must have passed in the subjects of Physics, Chemistry, Biology and English individually and must have obtained a minimum of 50% marks taken together in Physics, Chemistry & Biology at the qualifying examination as mentioned in Clause (2) of Regulation 4 and in addition must have come in the merit list prepared as a result of such competitive entrance examination by securing not less than 50% marks in Physics, Chemistry and Biology taken together in the competitive examination. In respect of candidates belonging to Scheduled Castes, Scheduled Tribes or other Backward Classes the marks obtained in Physics, Chemistry and Biology taken together in qualifying examination and competitive entrance examination be 40% instead of 50% as stated above.

Provided that a candidate who has appeared in the qualifying examination the result of which has not been declared, he may be provisionally permitted to take up the competitive entrance examination and in case of selection for admission to the MBBS course, he shall not be admitted to that course until he fulfils the eligibility criteria under Regulation 4.

6. Migration

- (1) Migration from one medical college to other is not a right of a student. However, migration of students from one medical college to another medical college in India may be considered by the Medical Council of India only in exceptional cases on extreme compassionate grounds*, provided following criteria are fulfilled. Routine migrations on other grounds shall not be allowed.
- (2) Both the colleges, i.e. one at which the student is studying at present and one to which migration is sought, are recognised by the Medical Council of India.
- (3) The applicant candidate should have passed first professional MBBS examination.
- (4) The applicant candidate submits his application for migration, complete in all respects, to all authorities concerned within a period of one month of passing (declaration of results) the first professional Bachelor of Medicine and Bachelor of Surgery (MBBS) examination.
- (5) The applicant candidate must submit an affidavit stating that he/she will pursue 18 months of prescribed study before appearing at IInd professional Bachelor of Medicine and Bachelor of Surgery (MBBS) examination at the transferee medical college, which should be duly certified by the Registrar of the concerned University in which he/she is seeking transfer. The transfer will be applicable only after receipt of the affidavit.

Note 1

- (i) Migration during clinical course of study shall not be allowed on any ground.
- (ii) All applications for migration shall be referred to Medical Council of India by college authorities. No institution / University shall allow migrations directly without the approval of the Council.
- (iii) Council reserves the right, not to entertain any application which is not under the prescribed compassionate grounds and also to take independent decisions where applicant has been allowed to migrate without referring the same to the Council.

Note 2 : * Compassionate grounds criteria :

- (i) Death of a supporting guardian.
- (ii) Illness of the candidate causing disability.

- (iii) Disturbed conditions as declared by Government in the Medical College area.

7. Training Period and Time Distribution

(1) Every student shall undergo a period of certified study extending over 4 ½ academic years divided into 9 semesters,(i.e. of 6 months each) from the date of commencement of his study for the subjects comprising the medical curriculum to the date of completion of the examination and followed by one year compulsory rotating internship. Each semester will consist of approximately 120 teaching days of 8 hours each college working time, including one hour of lunch.

(2) The period of 4 ½ years is divided into three phases as follows :-

a) **Phase-1**(two semesters) - consisting of Pre-clinical subjects (Human Anatomy, Physiology including Bio-Physics, Bio-chemistry and introduction to Community Medicine including Humanities). Besides 60 hours for introduction to Community Medicine including Humanities, rest of the time shall be somewhat equally divided between Anatomy and Physiology plus Biochemistry combined (Physiology 2/3 & Biochemistry 1/3).

b) **Phase-II** (3 semesters) - consisting of para-clinical/ clinical subjects.

During this phase teaching of para-clinical and clinical subjects shall be done concurrently.

The para-clinical subjects shall consist of Pathology, Pharmacology, Microbiology, Forensic Medicine including Toxicology and part of Community Medicine.

The clinical subjects shall consist of all those detailed below in Phase III.

Out of the time for Para-clinical teaching approximately equal time be allotted to Pathology, Pharmacology, Microbiology and Forensic Medicine and Community Medicine combined (1/3 Forensic Medicine & 2/3 Community Medicine). See Appendix-C.

c) **Phase-III** (Continuation of study of clinical subjects for seven semesters after passing Phase-I)

The clinical subjects to be taught during Phase II & III are Medicine and its allied specialties, Surgery and its allied specialties, Obstetrics and Gynaecology and Community Medicine.

Besides clinical posting as per schedule mentioned herewith, rest of the teaching hours be divided for didactic lectures, demonstrations, seminars, group discussions etc. in various subjects. The time distribution shall be as per Appendix-C.

The Medicine and its allied specialties training will include General Medicine, Paediatrics, Tuberculosis and Chest, Skin and Sexually Transmitted Diseases, Psychiatry, Radio-diagnosis, Infectious diseases etc. The Surgery and its allied specialties training will include General Surgery, Orthopaedic Surgery including Physio-therapy and Rehabilitation, Ophthalmology, Otorhinolaryngology, Anaesthesia, Dentistry, Radio-therapy etc. The Obstetrics & Gynaecology training will include family medicine, family welfare planning etc.

(3) The first 2 semester (approximatly 240 teaching days) shall be occupied in the Phase I (Pre-clinical) subjects and introduction to a broader understanding of the perspectives of medical education leading to delivery of health care. No student shall be permitted to join the Phase II (Para-clinical/clinical) group of subjects until he has passed in all the Phase I (Pre-clinical subjects) for which he will be permitted not more than four chances (actual examination), provided four chances are completed in three years from the date of enrollment.

(4) After passing pre-clinical subjects, 1 ½ year (3 semesters) shall be devoted to para-clinical subjects.

Phase II will be devoted to para-clinical & clinical subjects, along with clinical postings. During clinical phase (Phase III) pre-clinical and para-clinical teaching will be integrated into the teaching of clinical subjects where relevant.

(5) Didactic lectures should not exceed one third of the time schedule; two third schedule should include practicals, clinicals or/and group discussions. Learning process should include living experiences, problem oriented approach, case studies and community health care activities.

(6) Universities shall organize admission timings and admission process in such a way that teaching in first semester starts by 1st of August each year.

(7) Supplementary examination may be conducted within 6 months so that the students who pass can join the main batch and the failed students will have to appear in the subsequent year.

8. Phase Distribution and Timing of Examinations:-

6 MONTHS	6 MONTHS	6 MONTHS	
1	2		Ist professional examination (during second semester)
3	4	5	IIInd professional examination (during fifth semester)
6	7		IIIrd professional Part I (during 7th semester)
8	9		IIIrd professional Part II (Final Professional).

Note:

- a) Passing in Ist Professional is compulsory before proceeding to Phase II training.
- b) A student who fails in the IIInd professional examination, should not be allowed to appear IIIrd Professional Part I examination unless he passes all subjects of IIInd Professional examination.
- c) Passing in IIIrd Professional (Part I) examination is not compulsory before entering for 8th & 9th semester training, however passing of IIIrd Professional (Part I) is compulsory for being eligible for IIIrd Professional (Part II) examination.

During third to ninth semesters, clinical postings of three hours duration daily as specified in the Table below is suggested for various departments, after Introductory Course in Clinical Methods in Medicine & Surgery of two weeks each for the whole class.

TABLE

Total Subject:	3 rd Semester (Wks)	4 th Semester (Wks)	5 th Semester (Wks)	6 th Semester (Wks)	7 th Semester (Wks)	8 th Semester (Wks)	9 th Semester (Wks)	Total (Wks)
General*** Medicine	6	-	4	-	4	6	6	26
Paediatrics	-	2	-	2	2	4	-	10
Tuberculosis And Chest Diseases	-	2	-	-	-	-	-	02
Skin & STD	-	2	-	2	-	2	-	06
Psychiatry	-	-	2	-	-	-	-	02
Radiology*	-	-	-	-	2	-	-	02
General **** Surgery	6	-	4	-	4	6	6	26
Orthopaedics**	-	-	4	4	-	-	2	10
Ophthalmology	-	4	-	4	-	-	2	10
Ear Nose And Throat	-	4	-	4	-	-	-	08
Obstetrics and Gynaecology including Family Welfare Planning	2	4	4	-	4	4	6	24
Community Medicine	4	4	-	4	-	-	-	12
Casualty	-	-	-	2	-	-	-	02
Dentistry	-	-	-	-	2	-	-	02
Total (in Weeks)	18	22	18	22	18	22	22	142

- Clinical methods in Medicine and Surgery for whole class will be for 2 weeks each respectively at the start of 3rd semester

* This posting includes training in Radiodiagnosis and Radiotherapy where existant.

** This posting includes exposure to Rehabilitation and Physiotherapy.

*** This posting includes exposure to laboratory medicine and infectious diseases.

**** This posting includes exposure to dressing and Anesthesia.

***** This includes maternity training and Family medicine and the 3rd semester posting shall be in Family Welfare Planning.

CHAPTER III

CURRICULUM (SUBJECT-WISE)

9. Pre-clinical subjects - Phase I : In the teaching of these subjects stress shall be laid on basic principles of the subjects with more emphasis on their applied aspects.

(1) **HUMAN ANATOMY**

(i) **Goal**

The broad goal of the teaching of undergraduate students in Anatomy aims at providing comprehensive knowledge of the gross and microscopic structure and development of human body to provide a basis for understanding the clinical correlation of organs or structures involved and the anatomical basis for the disease presentations.

ii) Objectives :

A) Knowledge :

At the end of the course the student should be able to

- a. comprehend the normal disposition, clinically relevant interrelationships, functional and cross sectional anatomy of the various structures in the body.
- b. identify the microscopic structure and correlate elementary ultra-structure of various organs and tissues and correlate the structure with the functions as a prerequisite for understanding the altered state in various disease processes.
- c. comprehend the basic structure and connections of the central nervous system to analyse the integrative and regulative functions of the organs and systems. He/She should be able to locate the site of gross lesions according to the deficits encountered.
- (d) demonstrate knowledge of the basic principles and sequential development of the organs and systems, recognise the critical stages of development and the effects of common teratogens, genetic mutations and environmental hazards. He/She should be able to explain the developmental basis of the major variations and abnormalities.

(B) Skills :

At the end of the course the student should be able to:

- (a) identify and locate all the structures of the body and mark the topography of the living anatomy.
- (b) identify the organs and tissues under the microscope.
- (c) understand the principles of karyotyping and identify the gross congenital anomalies.
- (d) understand principles of newer imaging techniques and interpretation of Computerised Tomography (CT) Scan, Sonogram etc.
- (e) understand clinical basis of some common clinical procedures i.e., intramuscular & intravenous injection, lumbar puncture and kidney biopsy etc.

(C) Integration

From the integrated teaching of other basic sciences, student should be able to comprehend the regulation and integration of the functions of the organs and systems in the body and thus interpret the anatomical basis of disease process.

(2) HUMAN PHYSIOLOGY INCLUDING BIO-PHYSICS

(A) PHYSIOLOGY

i) GOAL

The broad goal of the teaching of undergraduate students in Physiology aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and disease.

ii) OBJECTIVES

a) KNOWLEDGE

At the end of the course the student will be able to :

- (1) explain the normal functioning of all the organ systems and their interactions for well coordinated total body function.
- (2) assess the relative contribution of each organ system to the maintenance of the milieu interior.
- (3) elucidate the physiological aspects of normal growth and development.
- (4) describe the physiological response and adaptations to environmental stresses.
- (5) list the physiological principles underlying pathogenesis and treatment of disease.

b) SKILLS

At the end of the course the student should be able to :

- (1) conduct experiments designed for study of physiological phenomena.
- (2) interpret experimental/investigative data.
- (3) distinguish between normal and abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

c) INTEGRATION

At the end of the integrated teaching the student should acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

(B) BIOPHYSICS

- (a) **GOAL & OBJECTIVES :** The broad goal of teaching Biophysics to undergraduate students is that they should understand basic physical principles involved in the functioning of body organs in normal and diseased conditions.

Total time for teaching Biophysics	= 5 hours
Out of which : 1. Didactic lectures	= 3 hours
2. Tutorial/group discussion	= 1 hour
3. Practical	= 1 hour

(b) Topic distribution

(1) Lectures :

- (i) Physical principles of transport across cell membranes and across capillary wall.
- ii) Biopotentials.
- iii) Physical principles governing flow of blood in heart and blood vessels.

Also physical principles governing flow of air in air passages.

2. Tutorial/group discussion: On the topic covered in didactic lectures.

3. Practicals:

Demonstration of :

- a) Biopotential on oscilloscope
- b) Electro Encephalogram (EEG)
- c) Electro Myelogram (EMG)
- d) Electro Cardiogram (ECG)

(3) **BIOCHEMISTRY**

Biochemistry including medical physics and Molecular Biology.

i) **GOAL**

The broad goal of the teaching of undergraduate students in biochemistry is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge acquired in solving clinical problems.

ii) **OBJECTIVES**

a) **KNOWLEDGE**

At the end of the course, the student should be able to :

- (1) describe the molecular and functional organization of a cell and list its subcellular components;
- (2) delineate structure, function and inter-relationships of biomolecules and consequences of deviation from normal;
- (3) summarize the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;
- (4) describe digestion and assimilation of nutrients and consequences of malnutrition;
- (5) integrate the various aspects of metabolism and their regulatory pathways;
- (6) explain the biochemical basis of inherited disorders with their associated sequelae;
- (7) describe mechanisms involved in maintenance of body fluid and pH homeostasis;
- (8) outline the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine;
- (9) summarize the molecular concepts of body defence and their application in medicine;
- (10) outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;
- (11) familiarize with the principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of a given data;
- (12) the ability to suggest experiments to support theoretical concepts and clinical diagnosis.

b. SKILLS:

At the end of the course, the student should be able to :

- (1) make use of conventional techniques/instruments to perform biochemical analysis relevant to clinical screening and diagnosis;
- (2) analyze and interpret investigative data;
- (3) demonstrate the skills of solving scientific and clinical problems and decision making;

c. INTEGRATION

The knowledge acquired in biochemistry should help the students to integrate molecular events with structure and function of the human body in health and disease.

(4) INTRODUCTION TO HUMANITIES & COMMUNITY MEDICINE

Including Introduction to the subjects of Demography, Health Economics, Medical Sociology, Hospital Management, Behavioral Sciences inclusive of Psychology.

OBJECTIVES

a) KNOWLEDGE

The student shall be able to :

1. explain the principles of sociology including demographic population dynamics;
2. identify social factors related to health, disease and disability in the context of urban and rural societies;
3. appreciate the impact of urbanization on health and disease;
4. observe and interpret the dynamics of community behavior;
5. describe the elements of normal psychology and social psychology;
6. observe the principles of practice of medicine in hospital and community setting;

(b). **SKILLS**

At the end of the course, the student should be able to make use of:

- (1) Principles of practice of medicine in hospital and community settings and familiarization with elementary nursing practices.
- (2) Art of communication with patients including history taking and medico-social work.

Teaching of community medicine, should be both theoretical as well as practical. The practical aspects of the training programme should include visits to the health establishments and to the community where health intervention programmes are in operation.

In order to inculcate in the minds of the students the basic concepts of community medicine to be introduced in this phase of training, it is suggested that the detailed curriculum drawn should include at least 30 hours of lectures, demonstrations, seminars etc. together with atleast 15 visits of two hours each.

10. **PARA CLINICAL SUBJECTS OF PHASE II**

9.1 **PATHOLOGY:**

i) **GOAL**

The broad goal of the teaching of undergraduate student in Pathology is to provide the students with a comprehensive knowledge of the mechanisms and causes of disease, in order to enable him/her to achieve complete understanding of the natural history and clinical manifestations of disease.

ii) **OBJECTIVES**

a) **KNOWLEDGE**

At the end of the course, the student should be able to :-

- (1) describe the structure and ultrastructure of a sick cell, mechanisms of cell degeneration, cell death and repair and be able to correlate structural and functional alterations.
- (2) explain the pathophysiological processes which govern the maintenance of homeostasis, mechanisms of their disturbance and the morphological and clinical manifestations associated with it.

3. describe the mechanisms and patterns to tissue response to injury such that she/he can appreciate the pathophysiology of disease processes and their clinical manifestations.
4. correlate normal and altered morphology (gross and microscopic) of different organ systems in common diseases to the extent needed for understanding of disease processes and their clinical significance.

b. **SKILLS**

At the end of the course, the student should be able to:-

1. describe the rationale and principles of technical procedures of the diagnostic laboratory tests and interpretation of the results;
2. perform the simple bed-side tests on blood, urine and other biological fluid samples;
3. draw a rational scheme of investigations aimed at diagnosing and managing the cases of common disorders;
4. understand biochemical/physiological disturbances that occur as a result of disease in collaboration with pre clinical departments.

c. **INTEGRATION**

At the end of training he/she should be able to integrate the causes of disease and relationship of different etiological factors (social, economic and environmental) that contribute to the natural history of diseases most prevalent in India.

9.2 **MICROBIOLOGY**

i) **GOAL**

The broad goal of the teaching of undergraduate students in Microbiology is to provide an understanding of the natural history of infectious disease in order to deal with the etiology, pathogenesis, laboratory diagnosis, treatment and control of infections in the community.

ii) OBJECTIVES

a. KNOWLEDGE

At the end of the course, the student should be able to:

1. state the infective micro-organisms of the human body and describe the host parasite relationship.
2. list pathogenic micro-organisms (bacteria, viruses, parasites, fungi) and describe the pathogenesis of the diseases produced by them.
3. state or indicate the modes of transmission of pathogenic and opportunistic organisms and their sources, including insect vectors responsible for transmission of infection.
4. describe the mechanisms of immunity to infections.
5. acquire knowledge on suitable antimicrobial agents for treatment of infections and scope of immunotherapy and different vaccines available for prevention of communicable diseases.
6. apply methods of disinfection and sterilization to control and prevent hospital and community acquired infections.
7. recommend laboratory investigations regarding bacteriological examination of food, water, milk and air.

(b). SKILLS

At the end of the course, the student should be able to:

1. plan and interpret laboratory investigations for the diagnosis of infectious diseases and to correlate the clinical manifestations with the etiological agent.
2. identify the common infectious agents with the help of laboratory procedures and use antimicrobial sensitivity tests to select suitable antimicrobial agents.
3. perform commonly employed bed-side tests for detection of infectious agents such as blood film for malaria, filaria, gram staining and AFB staining and stool sample for ova cyst.
4. Use the correct method of collection, storage and transport of clinical material for microbiological investigations.

c. **INTEGRATION**

The student should understand infectious diseases of national importance in relation to the clinical, therapeutic and preventive aspects.

(3) **PHARMACOLOGY**

i) **GOAL:**

The broad goal of the teaching of undergraduate students in Pharmacology is to inculcate a rational and scientific basis of therapeutics.

ii) **OBJECTIVES**

a. **KNOWLEDGE**

At the end of the course, the student should be able to:

1. describe the pharmacokinetics and pharmacodynamics of essential and commonly used drugs.
2. list the indications, contraindications, interactions and adverse reactions of commonly used drugs.
3. indicate the use of appropriate drug in a particular disease with consideration to its cost, efficacy and safety for
 - i) individual needs.
 - ii) mass therapy under national health program.
4. describe the pharmacokinetic basis, clinical presentation, diagnosis and management of common poisonings.
5. list the drugs of addiction and recommend the management.
6. classify environmental and occupational pollutants and state the management issues.
7. indicate cautions in prescription of drugs in special medical situations such as pregnancy, lactation, infancy and old age.
8. integrate the concept of rational drug therapy in clinical pharmacology.
9. state the principles underlying the concept of 'Essential Drugs'

10. evaluate the ethics and modalities involved in the development and introduction of new drugs.

b. SKILLS

At the end of the course, the student should be able to:

1. prescribe drugs for common ailments.
2. recognise adverse reactions and interactions of commonly used drugs.
3. observe experiments designed for study of effects of drugs, bioassay and interpretation of the experimental data.
4. scan information on common pharmaceutical preparations and critically evaluate drug formulations.

c. INTEGRATION

Practical knowledge of use of drugs in clinical practice will be acquired through integrated teaching with clinical departments and pre clinical departments.

(4) FORENSIC MEDICINE INCLUDING TOXICOLOGY

i) GOAL;

The broad goal of the teaching of undergraduate students in Forensic Medicine is to produce a physician who is well informed about medicolegal responsibilities in practice of medicine. He/She will also be capable of making observations and inferring conclusions by logical deductions to set enquiries on the right track in criminal matters and connected medicolegal problems. He/She acquires knowledge of law in relation to medical practice, medical negligence and respect for codes of medical ethics.

ii) OBJECTIVES

a. KNOWLEDGE

At the end of the course, the student should be able to:

1. identify the basic medicolegal aspects of hospital and general practice.
2. define the medicolegal responsibilities of a general physician while rendering community service either in a rural primary health centre or an urban health centre.

3. appreciate the physician's responsibilities in criminal matters and respect for the codes of medical ethics.
4. diagnose, manage and identify also legal aspects of common acute and chronic poisonings.
5. describe the medicolegal aspects and findings of post-mortem examination in case of death due to common unnatural conditions & poisonings.
6. detect occupational and environmental poisoning, prevention and epidemiology of common poisoning and their legal aspects particularly pertaining to Workmen's Compensation Act.
7. describe the general principles of analytical toxicology.

b) SKILLS

At the end of the course, the student should be able to :-

1. make observations and logical inferences in order to initiate enquiries in criminal matters and medicolegal problems.
2. diagnose and treat common emergencies in poisoning and manage chronic toxicity.
3. make observations and interpret findings at postmortem examination.
4. observe the principles of medical ethics in the practise of his profession.

(c) INTEGRATION

Department shall provide an integrated approach towards allied disciplines like Pathology, Radiology, Forensic Sciences, Hospital Administration etc. to impart training regarding medicolegal responsibilities of physicians at all levels of health care. Integration with relevant disciplines will provide scientific basis of clinical toxicology e.g. medicine, pharmacology etc.

(5) COMMUNITY MEDICINE

i) GOAL :

The broad goal of the teaching of undergraduate students in Community Medicine is to prepare them to function as community and first level physicians in accordance with the institutional goals.

ii) **OBJECTIVES**

a) **KNOWLEDGE**

At the end of the course, the student should be able to :-

- (1) describe the health care delivery system including rehabilitation of the disabled in the country;
- (2) describe the National Health Programmes with particular emphasis on maternal and child health programmes, family welfare planning and population control.
- (3) list epidemiological methods and describe their application to communicable and non-communicable diseases in the community or hospital situation.
- (4) apply biostatistical methods and techniques;
- (5) outline the demographic pattern of the country and appreciate the roles of the individual, family, community and socio-cultural milieu in health and disease.
- (6) describe the health information systems.
- (7) enunciate the principles and components of primary health care and the national health policies to achieve the goal of 'Health for All'.
- (8) identify the environmental and occupational hazards and their control.
- (9) describe the importance of water and sanitation in human health.
- (10) to understand the principles of health economics, health administration, health education in relation to community.

b) **SKILLS**

At the end of the course, the student should be able to :-

- (1) use epidemiology as a scientific tool to make rational decisions relevant to community and individual patient intervention.
- (2) collect, analyse, interpret and present simple community and hospital based data.

- (3) diagnose and manage common health problems and emergencies at the individual, family and community levels keeping in mind the existing health care resources and in the context of the prevailing socio-cultural beliefs.
- (4) diagnose and manage maternal and child health problems and advise a couple and the community on the family planning methods available in the context of the national priorities.
- (5) diagnose and manage common nutritional problems at the individual and community level.
- (6) plan, implement and evaluate a health education programme with the skill to use simple audio-visual aids.
- (7) interact with other members of the health care team and participate in the organisation of health care services and implementations of national health programmes.

c). **INTEGRATION ;**

Develop capabilities of synthesis between cause of illness in the environment or community and individual health and respond with leadership qualities to institute remedial measures for this.

11. CLINICAL SUBJECTS OF PHASE II & PHASE III

The teaching and training in clinical subjects will commence at the beginning of Phase II and continue throughout

The clinical subjects will be taught to prepare the MBBS graduates to understand and manage clinical problems at the level of a practitioner. Exposure to subject matter will be limited to orientation and knowledge required of a general doctor. Maximum attention to the diagnosis and management of the most common and important conditions encountered in general practice should be emphasised in all clinical subject areas. Instructions in clinical subjects should be given both in out patient and in-patient during clinical posting.

Each of the clinical departments shall provide integrated teaching calling on pre-clinical, para-clinical and other clinical departments to join in exposing the students to the full range of disciplines relevant to each clinical area of study. Problem approach will be emphasised based on basic social sciences and a continuation of clinical and laboratory syllabi to optimally understand and manage each clinical condition.

The course shall comprise of:

(1) MEDICINE & ITS ALLIED SPECIALITIES;

(A) MEDICINE:

i) GOAL:

The broad goal of the teaching of undergraduate students in Medicine is to have the knowledge, skills and behavioral attributes to function effectively as the first contact physician.

ii) OBJECTIVES

(a) KNOWLEDGE

At the end of the course, the student should be able to:

- (1) diagnose common clinical disorders with special reference to infectious diseases, nutritional disorders, tropical and environmental diseases.
- (2) outline various modes of management including drug therapeutics especially dosage, side effects, toxicity, interactions, indications and contra-indications.
- (3) propose diagnostic and investigative procedures and ability to interpret them.
- (4) provide first level management of acute emergencies promptly and efficiently and decide the timing and level of referral, if required.
- (5) recognize geriatric disorders and their management.

b. SKILLS;

At the end of the course, the student should be able to:

- (1) develop clinical skills (history taking, clinical examination and other instruments of examination) to diagnose various common medical disorders and emergencies.
- (2) refer a patient to secondary and/or tertiary level of health care after having instituted primary care.
- (3) perform simple routine investigations like haemogram, stool, urine, sputum and biological fluid examinations.

- (4) assist the common bedside investigative procedures like pleural tap, lumbar puncture, bone marrow aspiration/biopsy and liver biopsy.

c. INTEGRATION;

- (1) with community medicine and physical medicine and rehabilitation to have the knowledge and be able to manage important current national health programs, also to be able to view the patient in his/her total physical, social and economic milieu.
- (2) with other relevant academic inputs which provide scientific basis of clinical medicine e.g. anatomy, physiology, biochemistry, microbiology, pathology and pharmacology.

(B) PEDIATRICS

Pediatrics including Neonatology

The course includes systematic instructions in growth and development, nutritional needs of a child, immunization schedules and management of common diseases of infancy and childhood, scope of Social Pediatrics and counselling.

i) GOAL

The broad goal of the teaching of undergraduate students in Pediatrics is to acquire adequate knowledge and appropriate skills for optimally dealing with major health problems of children to ensure their optimal growth and development.

ii) OBJECTIVES

a. KNOWLEDGE

At the end of the course, the student should be able to:

- (1) describe the normal growth and development during foetal life, neonatal period, childhood and adolescence and outline deviations thereof.
- (2) describe the common paediatric disorders and emergencies in terms of epidemiology, etiopathogenesis, clinical manifestations, diagnosis, rational therapy and rehabilitation.
- (3) state age related requirements of calories, nutrients, fluids, drugs etc. in health and disease.

- (4) describe preventive strategies for common infectious disorders, malnutrition, genetic and metabolic disorders, poisonings, accidents and child abuse.
- (5) outline national programmes relating to child health including immunisation programmes.

b. SKILLS

At the end of the course, the student should be able to:

- (1) take a detailed pediatric history, conduct an appropriate physical examination of children including neonates, make clinical diagnosis, conduct common bedside investigative procedures, interpret common laboratory investigation results and plan and institute therapy.
- (2) take anthropometric measurements, resuscitate newborn infants at birth, prepare oral rehydration solution, perform tuberculin test, administer vaccines available under current national programs, perform venesection, start an intravenous saline and provide nasogastric feeding.
- (3) conduct diagnostic procedures such as lumbar puncture, liver and kidney biopsy, bone marrow aspiration, pleural tap and ascitic tap.
- (4) distinguish between normal newborn babies and those requiring special care and institute early care to all new born babies including care of preterm and low birth weight babies, provide correct guidance and counselling in breast feeding.
- (5). provide ambulatory care to all sick children, identify indications for specialized/inpatient care and ensure timely referral of those who require hospitalization.

(c). INTEGRATION

The training in pediatrics should prepare the student to deliver preventive, promotive, curative and rehabilitative services for care of children both in the community and at hospital as part of a team in an integrated form with other disciplines, e.g. Anatomy, Physiology, Biochemistry, Microbiology, Pathology, Pharmacology, Forensic Medicine, Community Medicine and Physical Medicine and Rehabilitation.

(C) **PSYCHIATRY**

i) **GOAL**

The aim of teaching the undergraduate student in psychiatry is to impart such knowledge and skills that may enable him to diagnose and treat common psychiatric disorders, handle psychiatric emergencies and to refer complications/unusual manifestations of common disorders and rare psychiatric disorders to the specialist.

ii) **OBJECTIVES**

a. **KNOWLEDGE**

At the end of the course, the student should be able to:

- (1) comprehend nature and development of different aspects of normal human Behaviour like learning, memory, motivation, personality and intelligence;
- (2) recognize differences between normal and abnormal behaviour;
- (3) classify psychiatric disorders;
- (4). recognize clinical manifestations of the following common syndromes and plan their appropriate management of organic psychosis, functional psychosis, schizo-phrenia, affective disorders, neurotic disorders, personality disorders, psycho-physiological disorders, drug and alcohol dependence, psychiatric disorders of childhood and adolescence;
- (5) describe rational use of different modes of therapy in psychiatric disorders.

b. **SKILLS;**

The student should be able to:

- (1) interview the patient and understand different methods of communications in patient-doctor relationship;
- (2) elicit detailed psychiatric case history and conduct clinical examination for assessment of mental status;
- (3) define, elicit and interpret psycho-pathological symptoms and signs.
- (4) diagnose and manage common psychiatric disorders;

(5) identify and manage psychological reactions and psychiatric disorders in medical and surgical patients in clinical practice and in community setting.

c. INTEGRATION;

Training in Psychiatry should prepare the students to deliver preventive, promotive, curative and re-habilitative services for the care of patients both in the family and community and to refer advance cases to a specialised Psychiatry/Mental Hospital. Training should be integrated with the departments of Medicine, Neuro Anatomy, Behavioral Sciences and Forensic medicine.

D DERMATOLOGY AND SEXUALLY TRANSMITTED DISEASES

i) GOAL:

The aim of teaching the undergraduate student in Dermatology, S.T.D. and Leprology is to impart such knowledge and skills that may enable him to diagnose and treat common ailments and to refer rare diseases or complications/unusual manifestations of common diseases, to the specialist.

ii) OBJECTIVES:

a. KNOWLEDGE:

At the end of the course of Dermato-S.T.D. and Leprology, the student Shall be able to:

1. demonstrate sound knowledge of common diseases, their clinical manifestations, including emergent situations and of investigative procedures to confirm their diagnosis;
2. demonstrate comprehensive knowledge of various modes of therapy used in treatment of respiratory diseases;
3. describe the mode of action of commonly used drugs, their doses, side-effects/toxicity, indications and contra-indications and interactions;
4. describe commonly used modes of management including the medical and surgical procedures available for the treatment of various diseases and to offer a comprehensive plan of management for a given disorder;

b. SKILLS:

The student should be able to:

1. interview the patient, elicit relevant and correct information and describe the history in a chronological order.
2. conduct clinical examination, elicit and interpret physical findings and diagnose common disorders and emergencies;
3. perform simple, routine investigative and office procedures required for making the bed-side diagnosis, especially the examination of scrapings for fungus, preparation of slit smears and staining for AFB for leprosy patients and for STD cases;
4. take a skin biopsy for diagnostic purposes;
5. manage common diseases recognizing the need for referral for specialized care, in case of inappropriateness of therapeutic response;
6. assist in the performance of common procedures, like laryngoscopic examination, pleural aspiration, respiratory physiotherapy, laryngeal intubation and pneumo-thoracic drainage/aspiration.

c. INTEGRATION:

The broad goal of effective teaching can be obtained through integration with departments of Medicine, Surgery, Microbiology, Pathology, Pharmacology and Preventive & Social Medicine.

(2) SURGERY & ITS ALLIED SPECIALITIES

(A) SURGERY - including Paediatric Surgery:

i) GOAL:

The broad goal of the teaching of undergraduate students in Surgery is to produce graduates capable of delivering efficient first contact surgical care.

ii) **OBJECTIVES:**

a. **KNOWLEDGE:**

At the end of the course, the student should be able to:

1. describe aetiology, pathophysiology, principles of diagnosis and management of common surgical problems including emergencies, in adults and children.
2. define indications and methods for fluid and electrolyte replacement therapy including blood transfusion.
3. define asepsis, disinfection and sterilization and recommended judicious use of antibiotics.
4. describe common malignancies in the country and their management including prevention.
5. enumerate different types of anaesthetic agents, their indications, mode of administration, contraindications and side effects.

b. **SKILLS:**

At the end of the course, the student should be able to:

1. diagnose common surgical conditions both acute and chronic, in adult and children.
2. plan various laboratory tests for surgical conditions and interpret the results.
3. identify and manage patients of hemorrhagic, septicaemic and other types of shock.
4. be able to maintain patent air-way and resuscitate
 - i) a critically injured patient
 - ii) patient with cardio-respiratory failure
 - iii) a drowning case
5. monitor patients of head, chest, spinal and abdominal injuries, both in adults and children.
6. provide primary care for a patient of burns.

7. acquire principles of operative surgery, including pre-operative, operative and post operative care and monitoring.
8. treat open wounds including preventive measures against tetanus and gas gangrene.
9. diagnose neonatal and pediatric surgical emergencies and provide sound primary care before referring the patient to secondary/tertiary centres.
10. identify congenital anomalies and refer them for appropriate management.

In addition to these he should have observed/assisted/ performed the following:

1. Incision and drainage of abscess
2. Debridement and suturing open wound
3. Venesection
4. Excision of simple cyst and tumours
5. Biopsy of surface malignancy
6. Catheterisation and nasogastric intubation
7. Circumcision
8. Meatotomy
9. Vasectomy
10. Peritoneal and pleural aspirations
11. Diagnostic proctoscopy
12. Hydrocele operation
13. Endotracheal intubation
14. Tracheostomy and cricothyroidotomy
15. Chest tube insertion.

(c). **INTEGRATION:**

The undergraduate teaching in surgery should be integrated at various stages with different pre and para and other clinical departments.

B. **ORTHOPEDICS:**

a. **KNOWLEDGE:**

The student should be able to:

1. explain the principles of recognition of bone injuries and dislocation.
2. apply suitable methods to detect and manage common infections of bones and joints.

3. identify congenital, skeletal anomalies and their referral for appropriate correction or rehabilitation.
4. recognize metabolic bone diseases as seen in this country.
5. explain etiogenesis, manifestations, diagnosis of neoplasm affecting bones.

b. SKILLS

At the end of the course, the student should be able to:

1. Detect sprains and deliver first aid measures for common fractures and sprains and manage uncomplicated fractures of clavicle, Colles's, forearm, phalanges etc.
2. Techniques of splinting, plaster, immobilization etc.
3. Management of common bone infections, learn indications for sequestration, amputations and corrective measures for bone deformities.
4. Aspects of rehabilitation for Polio, Cerebral Palsy and Amputation.

c. APPLICATION:

Be able to perform certain orthopedic skills, provide sound advice of skeletal and related conditions at primary or secondary health care level.

d. INTEGRATION:

Integration with anatomy, surgery, pathology, radiology and Forensic Medicine be done.

C. RADIO-DIAGNOSIS AND RADIOTHERAPY

A RADIODIAGNOSIS & IMAGING:

i) GOAL:

The broad goal of teaching the undergraduate medical students in the field of Radio-diagnosis should be aimed at making the students realise the basic need of various radio-diagnostic tools in medical practice. They should be aware of the techniques required to be undertaken in different situations for the diagnosis of various ailments as well as during prognostic estimations.

ii) **OBJECTIVES**

a. **KNOWLEDGE:**

The student should be able to:

1. understand basics of X-ray production, its uses and hazards.
2. appreciate and diagnose changes in bones - like fractures, infections, tumours and metabolic bone diseases.
3. identify and diagnose various radiological changes in disease conditions of chest and mediastinum, skeletal system, G.I. Tract, Hepatobiliary system and G.U. system.
4. learn about various imaging techniques, including isotopes C.T., Ultrasound, M.R.I. and D.S.A.

b. **SKILL**

At the end of the course the student should be able to:

1. use basic protective techniques during various imaging procedures.
2. Interpret common X-ray, radio-diagnostic techniques in various community situations.
3. advise appropriate diagnostic procedures in specialized circumstances to appropriate specialists.

B RADIOTHERAPY

i) **GOAL:**

The broad goal of teaching the undergraduate medical students in the field of Radiotherapy is to make the students understand the magnitude of the ever-increasing cancer problem in the country. The students must be made aware about steps required for the prevention and possible cure of this dreaded condition.

ii) **OBJECTIVES**

a. **KNOWLEDGE:**

The students should be able to:

1. identify symptoms and signs of various cancers and their steps of investigations and management.
2. explain the effect of radiation therapy on human beings and the basic principles involved in it.
3. know about radio-active isotopes and their physical properties
4. be aware of the advances made in radiotherapy in cancer management and knowledge of various radio therapeutic equipment while treating a patient.

b. SKILL:

At the completion of the training programme, the student should be able to:

1. take a detailed clinical history of the case suspected of having a malignant disease.
2. assist various specialists in administration of anticancer drugs and in application and use of various radiotherapeutic equipment, while treating a patient.

(3) OTO-RHINO-LARYNGOLOGY

i) GOAL:

The broad goal of the teaching of undergraduate students in Otorhinolaryngology is that the undergraduate student have acquired adequate knowledge and skills for optimally dealing with common disorders and emergencies and principles of rehabilitation of the impaired hearing.

ii) OBJECTIVES

a. KNOWLEDGE

At the end of the course, the student should be able to:

1. describe the basic pathophysiology of common ENT diseases and emergencies.
2. adopt the rational use of commonly used drugs, keeping in mind their adverse reactions.
3. suggest common investigative procedures and their interpretation.

b. SKILLS

At the end of the course, the student should be able to:

1. examine and diagnose common ENT problems including the pre-malignant and malignant disorders of the head and neck.
2. manage ENT problems at the first level of care and be able to refer whenever necessary.
3. Assist/carry out minor surgical procedures like ear syringing, ear dressings, nasal packing etc.
4. assist in certain procedures such as tracheostomy, endoscopies and removal of foreign bodies.

c. INTEGRATION:

The undergraduate training in ENT will provide an integrated approach towards other disciplines especially neurosciences, ophthalmology and general surgery.

4. OPHTHALMOLOGY

i) GOAL:

The broad goal of the teaching of students in ophthalmology is to provide such knowledge and skills to the students that shall enable him to practice as a clinical and as a primary eye care physician and also to function effectively as a community health leader to assist in the implementation of National Programme for the prevention of blindness and rehabilitation of the visually impaired.

ii) OBJECTIVES

a. KNOWLEDGE

At the end of the course, the student should have knowledge of:

1. common problems affecting the eye:
2. principles of management of major ophthalmic emergencies
3. main systemic diseases affecting the eye
4. effects of local and systemic diseases on patient's vision

and the necessary action required to minimise the sequelae of such diseases;

5. adverse drug reactions with special reference to ophthalmic manifestations;
6. magnitude of blindness in India and its main causes;
7. national programme of control of blindness and its implementation at various levels
8. eye care education for prevention of eye problems
9. role of primary health centre in organization of eye camps
10. organization of primary health care and the functioning of the ophthalmic assistant.
11. integration of the national programme for control of blindness with the other national health programmes;
12. eye bank organization

b. SKILLS:

At the end of the course, the student should be able to:

1. elicit a history pertinent to general health and ocular status;
2. assist in diagnostic procedures such as visual acuity testing, examination of eye, Schiottz tonometry, Staining for Corneal pathology, confrontation perimetry, Subjective refraction including correction of presbyopia and aphakia, direct ophthalmoscopy and conjunctival smear examination and Cover test.
3. diagnose and treat common problems affecting the eye;
4. interpret ophthalmic signs in relation to common systemic disorders;
5. assist/observe therapeutic procedures such as subconjunctival injection, Corneal/Conjunctival foreign body removal, Carbolic cautery for corneal ulcers, Nasolacrimal duct syringing and tarsorrhaphy;
6. provide first aid in major ophthalmic emergencies;

7. assist to organise community surveys for visual check up;
8. assist to organise primary eye care service through primary health centres;
9. use effective means of communication with the public and individual to motivate for surgery in cataract and for eye donation;
10. establish rapport with his seniors, colleagues and paramedical workers, so as to effectively function as a member of the eye care team.

c. INTEGRATION

The undergraduate training in Ophthalmology will provide an integrated approach towards other disciplines especially neurosciences, Otorhino-laryngology, General Surgery and Medicine.

10.5. OBSTETRICS AND GYNAECOLOGY

Obstetrics and Gynaecology to include family welfare and family planning.

i) GOAL:

The broad goal of the teaching of undergraduate students in Obstetrics and Gynaecology is that he/she should acquire understanding of anatomy, physiology and pathophysiology of the reproductive system and gain the ability to optimally manage common conditions affecting it.

ii) OBJECTIVES

a. KNOWLEDGE

At the end of the course, the student should be able to:

1. Outline the anatomy, physiology and pathophysiology of the reproductive system and the common conditions affecting it.
2. detect normal pregnancy, labour puerperium and manage the problems he/she is likely to encounter therein.
3. list the leading causes of maternal and perinatal morbidity and mortality.
4. understand the principles of contraception and various techniques employed, methods of medical termination of pregnancy, sterilisation and their complications.

5. identify the use, abuse and side effects of drugs in pregnancy, pre-menopausal and post-menopausal periods.

6. describe the national programme of maternal and child health and family welfare and their implementation at various levels.

7. identify common gynaecological diseases and describe principles of their management.

8. state the indications, techniques and complications of surgeries like Caesarian section, laparotomy, abdominal and vaginal hysterectomy, Fothergill's operation and vacuum aspiration for M.T.P.

b. SKILLS

At the end of the course, the student should be able to:

1. examine a pregnant woman; recognise high risk pregnancies and make appropriate referrals.

2. conduct a normal delivery, recognise complications and provide postnatal care.

3. resuscitate the newborn and recognise congenital anomalies.

4. advise a couple on the use of various available contraceptive devices and assist in insertion in and removal of intra-uterine contraceptive devices.

5. perform pelvic examination, diagnose and manage common gynaecological problems including early detection of genital malignancies.

6. make a vaginal cytological smear, perform a post coital test and wet vaginal smear examination for *Trichomonas vaginalis*, moniliasis and gram stain for gonorrhoea.

7. interpretation of data of investigations like biochemical, histopathological, radiological, ultrasound etc.

c. INTEGRATION:

The student should be able to integrate clinical skills with other disciplines and bring about coordinations of family welfare programmes for the national goal of population control.

d. GENERAL GUIDELINES FOR TRAINING:

1. attendance of a maternity hospital or the maternity wards of a general hospital including (i) antenatal care (ii) the management of the puerperium and (iii) a minimum period of 5 months in-patient and out-patient training including family planning.
2. of this period of clinical instruction, not less than one month shall be spent as a resident pupil in a maternity ward of a general hospital.
3. during this period, the student shall conduct at least 10 cases of labour under adequate supervision and assist in 10 other cases.
4. a certificate showing the number of cases of labour attended by the student in the maternity hospital and/or patient homes respectively, should be signed by a responsible medical officer on the staff of the hospital and should state:
 - (a) that the student has been present during the course of labour and personally conducted each case, making the necessary abdominal and other examinations under the supervision of the certifying officer who should describe his official position.
 - (b) that satisfactory written histories of the cases conducted including wherever possible antenatal and postnatal observations, were presented by the student and initialed by the supervising officer.

5. FAMILY PLANNING:

Training in Family Planning should be emphasized in all the three phases and during internship as per guideline provided in Appendix A.

6. COMMUNITY MEDICINE

The teaching and training of community medicine will continue during the first two semesters of phase III (clinical Phase). The goals, objectives and skills to be acquired by the student has already been outlined in Phase II(Para Clinical Phase).

CHAPTER – IV

12. Examination Regulations

Essentialities for qualifying to appear in professional examinations.

The performance in essential components of training are to be assessed, based on:

(1) **ATTENDANCE**

75% of attendance in a subject for appearing in the examination is compulsory provided he/she has 80% attendance in non lecture teaching. i.e. seminars, group discussions, tutorials, demonstrations, practicals, Hospital (Tertiary, Secondary, Primary) postings and bed side clinics, etc.

(2) **Internal Assessment :**

- (i) It shall be based on day to day assessment (see note), evaluation of student assignment, preparation for seminar, clinical case presentation etc.:
- (ii) Regular periodical examinations shall be conducted throughout the course. The questions of number of examinations is left to the institution:
- (iii) Day to day records should be given importance during internal assessment :
- (iv) Weightage for the internal assessment shall be 20% of the total marks in each subject :
- (v) Student must secure at least 50% marks of the total marks fixed for internal assessment in a particular subject in order to be eligible to appear in final university examination of that subject.

Note

Internal assessment shall relate to different ways in which students participation in learning participation in learning process during semesters in evaluated.

Some examples are as follows:

- (i) Preparation of subject for students seminar.
- (ii) Preparation of a clinical case for discussion.
- (iii) Clinical case study/problem solving exercise.
- (iv) Participation in Project for health care in the community (planning stage to evaluation).
- (v) Proficiency in carrying out a practical or a skill in small research project.
- (vi) Multiple choice questions (MCQ) test after completion of a system/teaching.

Each item tested shall be objectively assessed and recorded. Some of the items can be assigned as Home work/Vacation work.

(3) **UNIVERSITY EXAMINATIONS :**

Theory papers will be prepared by the examiners as prescribed. Nature of questions will be short answer type/objective type and marks for each part indicated separately.

Practicals/clinicals will be conducted in the laboratories or hospital wards. Objective will be assess proficiency in skills, conduct of experiment, interpretation of data and logical conclusion. Clinical cases should preferably include common diseases not esoteric syndromes or rare disorders. Emphasis should be on candidate's capability in eliciting physical signs and their interpretation.

Viva/oral includes evaluation of management approach and handling of emergencies. Candidate's skill in interpretation of common investigative data, x-rays, identification of specimens, ECG,etc. also is to be evaluated.

The examinations are to be designed with a view to ascertain whether the candidate has acquired the necessary for knowledge, minimum skills alongwith clear concepts of the fundamentals which are necessary for him to carry out his professional day to day work competently. Evaluation will be carried out on an objective basis.

Question papers should preferably be of short structure/objective type.

Clinical cases/practicals shall take into account common diseases which the student is likely to come in contact in practice. Rare cases/obscure syndromes, long cases of neurology shall not be put for final examination.

During evaluation (both Internal and External) it shall be ascertained if the candidate has acquired the skills as detailed in Appendix-B.

There shall be one main examination in a year and a supplementary to be held not later than 6 months after the publication of its results. Universities Examinations shall beheld as under:-

First Professional:-

In the second Semester of Phase 1 training, in the subjects of Anatomy, Physiology and Bio-Chemistry.

Second Professional:-

In the Fifth Semester of Phase II training, in the subjects of Pathology, Microbiology, Pharmacy and Forensic Medicine.

Third Profesional :-

Part 1- in the Seventh Semester of Phase III, in the subjects of Ophthalmology, Oto-rhyno-laryngology and Community Medicine.

Third Professional :-

Part II-(Final Professional) – At the end of Phase III training in the subjects of Medicine, Surgery, Obstetrics & Gynecology and Pediatrics.

Note :

Results of all university examinations shall be declared before the start of teaching for next semester.

(4) DISTRIBUTION OF MARKS TO VARIOUS DISCIPLINES :

(A) First Professional examination:(Pre-clinical Subjects):-

(a) Anatomy:

Theory-Two papers of 50 marks each
(One applied question of 10 marks in each paper) 100 marks.

Oral(Viva)	20 marks
Practical	40 marks
Internal Assessment (Theory-20; Practical-20)	40 marks
Total	200 marks

(b) Physiology including Biophysics

Theory-Two papers of 50 marks each
(One applied question of 10 marks in each paper) 100 marks

Oral (Viva)	20 marks
Practical	40 marks
Internal Assessment (Theory-20; Practical-20)	40 marks
Total	200 marks

(c) Biochemistry :

Theory-Two papers of 50 marks each
(One applied question of 10 marks in each paper) 100 marks

Oral (Viva)	20 marks
Practical	40 marks
Internal Assessment (Theory-20; Practical-20)	40 marks

Total

200 marks

Pass: In each of the subjects, a candidate must obtain 50% in aggregate with a minimum of 50% in Theory including orals and minimum of 50% in Practicals.

(B) SECOND PROFESSIONAL EXAMINATION;

(Para-clinical subjects)

:

- (a) Pathology :
- | | |
|--|-----------|
| Theory-Two papers of 40 marks each
(One applied question of 10 marks in each paper) | 80 marks |
| Oral (Viva) | 15 marks |
| Practical | |
| Internal assessment
(Theory-15; Practical-15) | 30 marks |
| Total | 150 marks |
- (b) Microbiology :
- | | |
|--|-----------|
| Theory-Two papers of 40 marks each
(One applied question of 10 marks in each paper) | 80 marks |
| Oral (Viva) | 15 marks |
| Practical | |
| Internal assessment
(Theory-15; Practical-15) | 30 marks |
| Total | 150 marks |
- (c) Pharmacology
- | | |
|--|-----------|
| Theory-Two papers of 40 marks each
Containing one question on clinical therapeutics | 80 marks |
| Oral (Viva) | 15 marks |
| Practical | 25 marks |
| Internal assessment
(Theory-15; Practical-15) | 30 marks |
| Total | 150 marks |
- (d) Forensic Medicine
- | | |
|--|-----------|
| Theory-one papers | 40 marks |
| Oral (Viva) | 10 marks |
| Practical/Clinicals | 30 marks |
| Internal assessment
(Theory-10; Practical-10) | 20 marks |
| Total | 100 marks |

Pass: In each of the subjects, a candidate must obtain 50 % in aggregate with a minimum of 50% in Theory including oral and minimum of 50% in Practicals/clinical.

(d) THIRD PROFESSIONAL

(i) PART 1

(Clinical subjects)

Part 1: To be conducted during end period of seventh semester.

(a) Ophthalmology:

Theory : One paper (should contain one question on pre-clinical and para-clinical aspects, of 10 marks)	40 marks
Oral (Viva)	10 marks
Clinical	30 marks
Internal assessment (Theory-10; Practical-10)	20 marks
Total	100 marks

(b) Oto-Rhino-Laryngology :

Theory:One paper (should contain one question on pre-clinical and para-clinical aspects, of 10 marks)	40 marks
Oral(Viva)	10 marks
Clinical	30 marks
Internal assessment (Theory –10 Practical-10)	20 marks
Total	100 marks

(c) Community Medicine including Humanities:

Theory : Two papers of 60 marks each (includes problem solving, applied aspects of management at primary level including essential drugs, occupational (agro based) diseases, rehabilitation and social aspects of community).	120 marks
Oral (Viva)	10 marks
Practical/Project evaluation	30 marks
Internal assessment (Theory -20; Practical-20)	40 marks
Total	200 marks

Pass: In each of the subjects a candidate must obtain 50% in aggregate with a minimum of 50% in Theory including orals and minimum of 50% in practicals/clinical.

PART-II

Each paper shall have two sections. Questions requiring essay type answers may be avoided.

- (a) **Medicine :**
- | | |
|---|-----------|
| Theory- Two papers of 60 marks each | 120 marks |
| Paper 1- General Medicine | |
| Paper II- General Medicine (including Psychiatry, Dermatology and S.T.D.) | |
| (Shall contain one question on basic sciences and allied subjects) | |
| Oral (Viva) Interpretation of X-ray ECG, etc. 20 marks | |
| Clinical (Bed side) | 100 marks |
| Internal assessment | 60 marks |
| (Theory-30; Practical-30) | |
| Total | 300 marks |
- (b) **Surgery:**
- | | |
|-------------------------------------|-----------|
| Theory-Two papers of 60 marks each | 120 marks |
| Paper-1-General Surgery (Section 1) | |
| Orthopaedics (Section 2) | |

PAPER II-General Surgery including

Anaesthesiology, Dental diseases and Radiology.
(shall contain one question on basic sciences and allied subjects)

Oral (Viva) Interpretation of Investigative data	20 marks
Clinical (Bed Side)	100 marks
Internal assessment	60 marks
(Theory-30; Practical-30)	60 marks
Total	300 marks

Paper 1 of Surgery shall have one section in Orthopaedics. The questions on Orthopaedic Surgery be set and assessed by examiners who are teachers in the Orthopaedic surgery.

(c) **Obstetrics and Gynaecology**

Theory Two papers of 40 marks each	80 marks
Paper I- Obstetrics including social obstetrics.	
Paper II – Gynaecology, Family Welfare and Demography	
(Shall contain one question on basic sciences and allied subjects)	
Oral (Viva) including record of delivery cases(20+10)	30 marks
Clinical	60 marks
Internal assessment	

	(Theory-30; Practical-30)	
	Total	200 marks
(d)	Pediatrics : (Including Neonatology)	
	Theory : One paper	40 marks
	(Shall contain one question on basic sciences and allied subjects)	
	Oral (Viva)	10 marks
	Clinical	30 marks
	Internal assessment	20 marks
	(Theory-10; Practical-10)	
	Total	100 marks

Pass : In each of the subjects a candidate must obtain 50% in aggregate with a minimum of 50% in Theory including orals and minimum of 50% in Practicals/clinicals.

13 APPOINTMENT OF EXAMINERS:

- (1) No person shall be appointed as an examiner in any of the subjects of the Professional examination leading to and including the final Professional examinations for the award of the MBBS degree unless he has taken atleast five years previously, a doctorate degree of a recognized university or an equivalent qualification in the particular subject as per recommendation of the Council on teachers' eligibility qualifications and has had at least five years of total teaching experience in the subject concerned in a college affiliated to a recognized university at a faculty position.
- (2) There shall be at least four examiners for 100 students, out of whom not less than 50% must be external examiners. Of the four examiners, the senior most internal examiner will act as the Chairman and co-ordinator of the whole examination programme so that uniformity in the matter of assessment of candidates is maintained. Where candidates appearing are more than 100, one additional examiner, for every additional 50 or part thereof candidates appearing, be appointed.
- (3) Non medical scientists engaged in the teaching of medical students as whole time teachers, may be appointed examiners in their concerned subjects provided they possess requisite doctorate qualifications and five year teaching experience of medical students after obtaining their postgraduate qualifications. Provided further that the 50% of the examiners (Internal & External) are from the medical qualification stream

- (4) External examiners shall not be from the same university and preferably be from outside the state.
- (5) The internal examiner in a subject shall not accept external examinership for a college from which external examiner is appointed in his subject.
- (6) A university having more than one college shall have separate sets of examiners for each college, with internal examiners from the concerned college.
- (7) External examiners shall rotate at an interval of 2 years.
- (8) There shall be a Chairman of the Board of paper-setters who shall be an internal examiner and shall moderate the questions.
- (9) Except Head of the department of subject concerned in a college/institution, all other with the rank of reader or equivalent and above with requisite qualifications and experience shall be appointed internal examiners by rotation in their subjects; provided that where there are no posts of readers, then an Assistant Professor of 5 years standing as Assistant Professor may be considered for appointment as examiner.
- (10) The grace marks up to a maximum of five marks may be awarded at the discretion of the University to a student who has failed only in one subject but has passed in all other subjects.

CHAPTER - V

14. INTERNSHIP

(1) General

Internship is a phase of training wherein a graduate is expected to conduct actual practice of medical and health care and acquire skills under supervision so that he/she may become capable of functioning independently.

(2) SPECIFIC OBJECTIVES

At the end of the internship training, the student shall be able to:

- i. diagnose clinical common disease conditions encountered in practice and make timely decision for referral to higher level;
 - ii. use discreetly the essential drugs, infusions, blood or its substitutes and laboratory services.
 - iii. Manage all type of emergencies-medical, surgical obstetric, neonatal and paediatric, by rendering first level care;
 - iv. Demonstrate skills in monitoring of the National Health Programme and schemes, oriented to provide preventive and promotive health care services to the community;
 - v. Develop leadership qualities to function effectively as a leader of the health team organised to deliver the health and family welfare service in existing socio-economic, political and cultural environment;
 - vi. Render services to chronically sick and disabled (both physical and mental) and to communicate effectively with patient and the community.
- (3) Time allocation to each discipline is approximate and shall be guided more specifically by the actual experience obtained. Thus a student serving in a district or taluk hospital emergency room may well accumulate skill in surgery, orthopaedics, medicine, obstetrics and Gynaecology and Paediatrics during even a single night on duty. Responsible authorities from the medical college shall adjust the intern experience to maximize intern's opportunities to practice skills in patient care in rough approximation of the time allocation suggested.

(4) INTERNSHIP – TIME DISTRIBUTION

Compulsory

Community Medicine	3 months
Medicine	2 months
Surgery including Orthopaedics	2 months
Obst./Gynae. Including Family Welfare Planning	2 months
Paediatric	15 days
Ophthalmology	15 days
Otorhinolaryngology	15 days
Casualty	15 days
Elective Postings	One month

Elective subjects-

Elective posting will include two of the following for 15 days in each subject.

- i) Dermatology and Sexually Transmitted Diseases,
- ii) Psychiatry,
- iii) Tuberculosis and Respiratory Diseases,
- iv) Anaesthesia,
- v) Radio-diagnosis,
- vi) Physical Medicine and Rehabilitation,
- vii) Forensic Medicine and Toxicology,
- viii) Blood bank and Transfusion Department

(5) OTHER DETAILS:

- i) All parts of the internship shall be done as far as possible in institutions of India. In case of any difficulties, the matter may be referred to the Medical Council of India to be considered on individual merit.

- ii) Every candidate will be required after passing the final MBBS examination to undergo compulsory rotational internship to the satisfaction of the College authorities and University concerned for a period of 12 months so as to be eligible for the award of the degree of Bachelor of Medicine and Bachelor of Surgery (MBBS) and full registration.
- iii) The University shall issue a provisional MBBS pass certificate on passing the final examination.
- iv) The State Medical Council will grant provisional registration to the candidate on production of the provisional MBBS pass certificate. The provisional registration will be for a period of one year. In the event of the shortage or unsatisfactory work, the period of provisional registration and the compulsory rotating internship may be suitably extended by the appropriate authorities.
- v) The intern shall be entrusted with clinical responsibilities under direct supervision of senior medical officer. They shall not be working independently.
- vi) Interns will not issue a medical certificate or a death certificate or a medicolegal document under their signature.
- vii) In recognition of the importance of hands-on experience, full responsibility for patient care and skill acquisition, internship should be increasingly scheduled to utilize clinical facilities available in District Hospital, Taluka Hospital, Community Health Centre and Primary Health Centre, in addition to Teaching Hospital. A critical element of internship will be the acquisition of specific experiences and skill as listed in major areas:

Provided that where an intern is posted to District/Sub Divisional Hospital for training, there shall be a committee consisting of representatives of the college/university, the State Government and the District administration, who shall regulate the training of such trainee.

Provided further that for such trainee a certificate of satisfactory completion of training shall be obtained from the relevant administrative authorities which shall be countersigned by the Principal/Dean of College;

- viii) Adjustment to enable a candidate to obtain training in elective clinical subjects may be made.
- ix) Each medical college shall establish links with one entire district extending out-reach activities. Similarly, Re-orientation of Medical

Education (ROME) scheme may be suitably modified to assure teaching activities at each level of District health system which will be coordinated by Dean of the medical college;

- x) Out of one year, 6 months shall be devoted to learning tertiary care being rendered in teaching hospital/district hospital suitably staffed with well qualified staff, 3 months of secondary care in a small District or Taluka Hospital/Community Health Centre and 3 months in Primary Health care out of which 2 months should be in Primary Health Programme at the Community level. One month of primary care training may be in the form of preceptorship with a practicing family physician or voluntary agency or other primary health care provider.
- xi) One year's approved service in the Armed Forces Medical Services, after passing the final MBBS examination shall be considered as equivalent to the pre-registration training detailed above; such training shall, as far as possible, be at the Base/General Hospital.

(6) **ASSESSMENT OF INTERNSHIP:**

- i) The intern shall maintain a record of work which is to be verified and certified by the medical officer under whom he works. Apart from scrutiny of the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during and at the end of the training. Based on the record of work and date of evaluation, the Dean/Principal shall issue certificate of satisfactory completion of training, following which the University shall award the MBBS degree or declare him eligible for it.
- ii) Satisfactory completion shall be determined on the basis of the following:-
 - (1) Proficiency of knowledge required for each case
SCORE 0-5
 - (2) The competency in skills expected to manage each case:
 - a) Competency for performance of self performance,
 - b) of having assisted in procedures,
 - c) of having observed.
SCORE 0-5
 - (3) Responsibility, punctuality, work up of case, involvement in treatment, follow-up reports.
SCORE 0-5

(4) Capacity to work in a team (Behaviour with colleagues, nursing staff and relationship with paramedicals).

SCORE 0-5

(5) Initiative, participation in discussions, research aptitude.

SCORE 0-5

Poor / Fair / below average / average / above average / excellent
0 1 2 3 4 5

A Score of less than 3 in any of above items will represent unsatisfactory completion of internship.

(7) Full registration shall only be given by the State Medical Council/Medical Council of India on the award of the MBBS degree by the university or its declaration that the candidate is eligible for it.

(8) Some guidelines in the implementation of the training programme are given below.

(9) INTERNSHIP – DISCIPLINE RELATED:

(i) Community Medicine

Interns shall acquire skills to deal effectively with an individual and the community in the context of primary health care. This is to be achieved by hands on experience in the district hospital and primary health Centre. The details are as under: -

(I) Community Health Centre/District Hospital/Attachment to General Practitioner:

(1) During this period of internship an intern must acquire

(a) clinical competence for diagnosis of common ailments, use of bed side investigation and primary care techniques;

(b) gain information on 'Essential drugs' and their usage;

(c) recognise medical emergencies, resuscitate and institute initial treatment and refer to suitable institution.

- (2) Undergo specific Government of India/Ministry of Health and Family Welfare approved training using Government of India prescribed training manual for Medical Officers in all National Health Programmes (e.g. child survival and safe motherhood-EPI, CDD, ARI, FP, ANC, safe delivery, Tuberculosis, Leprosy and others as recommended by Ministry of Health and Family Welfare:-
 - (a) gain full expertise in immunization against infectious disease;
 - (b) participate in programmes in prevention and control of locally prevalent endemic diseases including nutritional disorders;
 - (c) learn skills first hand in family welfare planning procedures;
 - (d) learn the management of National Health Programmes;
- (3) Be capable of conducting a survey and employ its findings as a measure towards arriving at a community diagnosis.
- (4)
 - (a) conduct programmes on health education,
 - (b) gain capabilities to use Audiovisual aids,
 - (c) acquire capability of utilization of scientific information for promotion of community health
- (5) Be capable of establishing linkages with other agencies as water supply, food distribution and other environmental/social agencies.
- (6) Acquire quality of being professional with dedication, resourcefulness and leadership.
- (7) Acquire managerial skills, delegation of duties to paramedical staff and other health professionals.

(II) TALUQA HOSPITAL

Besides clinical skill, in evaluation of patient in the environment and initiation of primary care, an Intern shall: -

- (1) effectively participate with other members of the health team with qualities of leadership;
- (2) make a community diagnosis in specific situations such as epidemics and institute relevant control measures for communicable diseases;
- (3) develop capability for analysis of hospital based morbidity and mortality statistics.

- (4) Use essential drugs in the community with the awareness of availability, cost and side effects;
- (5) Provide health education to an individual/community on :
 - a) tuberculosis;
 - b) small family, spacing, use of appropriate contraceptives;
 - c) applied nutrition and care of mothers and children;
 - d) immunization;
 - e) participation in school health programme.

(III) PRIMARY HEALTH CENTRE

- (1) Initiate or participate in family composite health care (birth to death), Inventory of events;
- (2) Participation in all of the modules on field practice for community health e.g. safe motherhood, nutrition surveillance and rehabilitation, diarrhea disorders etc.
- (3) Acquire competence in diagnosis and management of common ailments e.g. malaria, tuberculosis, enteric fever, congestive heart failure, hepatitis, meningitis acute renal failure etc.;
- (4) Acquire proficiency for Family Welfare Programmes (ante natal care, normal delivery, contraception care etc.)

(ii) GENERAL MEDICINE

- (I) Interns shall acquire following training during their term.
 - (1) acquire competence for clinical diagnosis based on history physical examination and relevant laboratory investigation and institute appropriate line of management;
 - (2) this would include diseases common in tropics (parasitic, bacterial or viral infections, nutritional disorders, including dehydration and electrolyte disturbances) and system illnesses
- (II) The intern shall have assisted as a care team in intensive care of cardiac, respirator, hepatic, neurological and metabolic emergencies.
- (III) The intern shall be able to conduct the following laboratory investigations:
 - (a) Blood: (Routine haematology smear and blood groups);
 - (b) Urine: (Routine chemical and microscopic);
 - (c) Stool: (for ova/cyst and occult blood);
 - (d) Sputum and throat swab for gram stain or acid fast stain and

(e) Cerebro Spinal Fluid (CSF) for smear.

(IV) Conduct following diagnostic procedures:

(a) Urethral catheterisation;

Proctoscopy;

Ophthalmoscopy/Otoscopy;

Indirect laryngoscopy;

(b) therapeutic procedures;

Insertion of Ryles Tube;

Pleural, ascetic tap, Cerebro Spinal Fluid (CSF) tap, installing or air way tube, Oxygen administration etc.

(V) Biopsy Procedures:

Liver, Kidney, Skin, Nerve, Lymph node, and muscle biopsy, Bone marrow aspiration, Biopsy of Malignant lesions on surface, Nasal/nerve/skin smear for leprosy.

(VI) (a) Familiarity with usage of life saving procedures:

including use of aspirator, respirator and defibrillator,

(b) Competence in interpretation of different monitoring devices such as cardiac monitor, blood gas analysis etc.

(VII) Participate as a team member in total health care of an individual including appropriate follow-up and social rehabilitation.

(VIII) Other competencies as indicated in general objectives.

(iii) PAEDIATRICS:

The details of the skills that an intern shall acquire during his/her tenure in the department of Paediatrics are as follows:

The intern shall be able to:

(1) diagnose and manage common childhood disorders including neonatal disorders and acute emergencies(enquiry from parents of sick children), examining sick child making a record of information;

(2) carry out activities related to patient care such as laboratory work, investigative procedures and use of special equipments. The details are given as under:-

- (a) diagnostic techniques: blood (including from femoral vein and umbilical cord), abscess, cerebrospinal fluid, urine, pleura and peritoneum and common tissue biopsy techniques;
 - (b) techniques related to patient care: immunization, perfusion techniques, feeding procedures, tuberculin testing & breast feeding counselling;
 - (c) use of equipment: vital monitoring, temperature monitoring, resuscitation at birth and care of children receiving intensive care;
- (3) screening of newborn babies and those with objective risk factors for any anomalies and steps for prevention in future;
- (4) plan in collaboration with parents and individual, collective surveillance of growth and development of new born babies, infants and children so that he/she is able to:
- (a) recognise growth abnormalities;
 - (b) recognise anomalies of psychomotor development;
 - (c) detect congenital abnormalities;
- (5) assess nutritional and dietary status of infants and children and organise prevention, detection and follow up of deficiency disorders both at individual and community level such as:
- (a) protein-energy malnutrition
 - (b) deficiencies of vitamins especially A, B, C and D;
 - (c) Iron deficiency;
- (6) institute early management of common childhood disorders with special reference to Paediatrics dosage and oral rehydration therapy.
- (7) Participate actively in public health programme oriented towards children in the community.

(iv) GENERAL SURGERY

An intern is expected to acquire following skills during his/her posting:

- (A) Diagnose with reasonable accuracy all surgical illnesses including emergencies
- (B) (a) resuscitate a critically injured patient and a severe burns patient;
(b) control surface bleeding and manage open wound;
- (C) (a) monitor patients of head, spine, chest abdominal and pelvic injury;

(b) institute first-line management of acute abdomen;

- (D) (a) perform venesection;
(b) perform tracheostomy and endotracheal intubation;
(c) catheterise patients with acute retention or perform trocar cystostomy,
(d) drain superficial abscesses,
(e) suturing of wound,
(f) perform circumcision,
(g) biopsy of surface tumours,
(h) Perform vasectomy

(v) CASUALTY:

The intern after training in Casualty must be able to:

- (1) identify acute emergencies in various disciplines of medical practice;
- (2) manage acute anaphylactic shock;
- (3) manage peripheral-vascular failure and shock;
- (4) manage acute pulmonary oedema and Left Ventricular failure (LVF);
- (5) undertake emergency management of drowning poisonings and seizures;
- (6) undertake emergency management of bronchial asthma and status asthmaticus;
- (7) undertake emergency management of hyperpyrexia;
- (8) undertake emergency management of comatose patients regarding airways positioning, prevention of aspiration and injuries;
- (9) assess and administer emergency management of burns;
- (10) assess and do emergency management of various trauma victims;
- (11) identify medicolegal cases and learn filling up forms as well as complete other medicolegal formalities in cases of injury, poisoning, sexual offenses, intoxication and other unnatural conditions.

(vi) OBSTETRICS AND GYNAECOLOGY :

Technical skills that interns are expected to learn:

- (1) diagnosis of early pregnancy and provision of ante-natal care;
- (2) diagnosis of pathology of pregnancy related to
 - (a) abortions;
 - (b) ectopic pregnancy;
 - (c) tumours complicating pregnancy;

- (d) acute abdomen in early pregnancy;
 - (e) hyperemesis gravidarum;
- (3) detection of high risk pregnancy cases and suitable advise e.g. PIH, hydramanios, antepartum haemorrhage, multiple pregnancies, abnormal presentations and intra-uterine growth retardation;
- (4) antenatal pelvic assessment and detection of cephalopelvic disproportion;
- (5) induction of labour and amniotomy under supervision;
- (6) management of normal labour, detection of abnormalities, post-partum hemorrhage and repair of perennial tears;
- (7) assist in forceps delivery;
- (8) assist in caesarean section and postoperative care thereof;
- (9) detection and management of abnormalities of lactation;
- (10) perform non-stress test during pregnancy;
- (11) per speculum, per vaginum and per rectal examination for detection of common congenital, inflammatory, neoplastic and traumatic conditions of vulva, vagina, uterus and ovaries;
- (12) medicolegal examination in Gynecology and obstetrics.
- (13) To perform the following procedures:-
- (a) dilation and curettage and fractional curettage;
 - (b) endometrial biopsy;
 - (c) endometrial aspiration;
 - (d) pap smear collection;
 - (e) Intra Uterine Contraceptive Device (IUCD) insertion;
 - (f) Minilap ligation;
 - (g) Urethral catheterisation;
 - (h) Suture removal in postoperative cases;
 - (i) Cervical punch biopsy;

- (14) to assist in major abdominal and vaginal surgery cases in Obstetrics and Gynaecology.
- (15) to assist in follow-up postoperative cases of obstetrics and gynaecology such as:
 - (a) Colposcopy;
 - (b) Second trimester Medical Termination of Pregnancy (MTP) procedures e.g. Emcredyl Prostaglandin instillations;
- (16) To evaluate and prescribe oral contraceptive.

(vii) OTO RHINO LARYNGOLOGY (ENT)

- (1) Interns shall acquire ability for a comprehensive diagnosis of common Ear, Nose and Throat (ENT) diseases including the emergencies and malignant neoplasma of the head and neck;
- (2) he/she shall acquire skills in the use of head mirror, otoscope and indirect laryngoscopy and first line of management of common Ear Nose and Throat (ENT) problems;
- (3) he/she shall be able to carry out minor surgical procedures such as:
 - (a) earsyringing antrum puncture and packing of the nose for epistaxis,
 - (b) nasal douching and packing of the external canal,
 - (c) Remove the foreign bodies from the nose and ear
 - (d) Observed or assisted in various endoscopic procedures and trachesotomy;
- (4) an item shall have participated as a team member in the community diagnosis e.g. Chronic Suppurative Otitis Media (CSOM) and be aware of national programme on prevention of deafness
- (5) he/she shall possess knowledge of various ENT rehabilitative programmes.

(viii) OPHTHALMOLOGY

An intern shall acquire following skills: -

- (1) he/she shall be able to diagnose and manage common ophthalmological conditions such as:-
Trauma, Acute conjunctivitis, allergic conjunctivitis, xerosis, entropion, corneal ulcer, iridocyclitis, myopia, hypermetropia, catarct, glaucoma, ocular injury and sudden loss of vision;

- (2) he shall be able to carry out assessment of refractive errors and advise its correction;
- (3) he shall be able to diagnose ocular changes in common systemic disorders;
- (4) he/she shall be able to perform investigative procedures such as:-
Tonometry, syringing, direct ophthalmoscopy, subjective refraction and fluorescein staining of cornea.
- (5) he/she shall have carried out or assisted the following procedures:
 - (1) Subconjunctival injection;
 - (2) Ocular bandaging;
 - (3) Removal of concretions;
 - (4) Epilation and electrolysis;
 - (5) Corneal foreign body removal;
 - (6) Cauterization of corneal ulcers;
 - (7) Chalazion removal;
 - (8) Entropion correction;
 - (9) Suturing conjunctival tears;
 - (10) Lids repair
 - (10) Glaucoma surgery (assisted);
 - (11) Enucleation of eye in cadaver;
- (6) he/she shall have full knowledge on available methods for rehabilitation of the blind.

(ix) ORTHOPAEDICS ;

GOAL:

The aim of teaching the undergraduate student in Orthopaedics and Rehabilitation is to impart such knowledge and skills that may enable him to diagnose and treat common ailments. He shall have ability to diagnose and suspect presence of fracture, dislocation, acute osteomyelitis, acute poliomyelitis and common congenital deformities such as congenital talipes equinovarus (CTEV) and dislocation of hip (CDH).

(A) THERAPEUTIC- An intern must know:

- (a) Splinting (plaster slab) for the purpose of emergency splintage, definitive splintage and post operative splintage and application of Thomas splint;
- (b) Manual reduction of common fractures – phalangeal, metacarpal, metatarsal and Colles's fracture;
- (c) Manual reduction of common dislocations – interphalangeal, metacarpophalangeal, elbow and shoulder dislocations;
- (d) Plaster cast application for undisplaced fractures of arm, fore arm, leg and ankle;
- (e) Emergency care of a multiple injury patient;
- (f) Precautions about transport and bed care of spinal cord injury patients.

(B) Skill that an intern should be able to perform under supervision:

- (1) Advise about prognosis of poliomyelitis, cerebral palsy, CTEV and CDH;
- (2) Advise about rehabilitation of amputees and mutilating traumatic and leprosy deformities of hand;

(C) An intern must have observed or preferably assisted at the following operations:

- (1) drainage for acute osteomyelitis;
- (2) sequestrectomy in chronic osteomyelitis;
- (3) application of external fixation;
- (4) internal fixation of fractures of long bones.

(x) DERMATOLOGY AND SEXUALLY TRANSMITTED DISEASES

An intern must be able to: -

- (1) conduct proper clinical examination; elicit and interpret physical findings, and diagnose common disorders and emergencies.
- (2) Perform simple, routine investigative procedures for making bedside diagnosis, specially the examination of scraping for fungus, preparation of slit smears and staining for AFB for leprosy patient and for STD cases;
- (3) Take a skin biopsy for diagnostic purpose;
- (4) Manage common diseases recognizing the need for referral for specialized care in case of inappropriateness of therapeutic response.

(xi) PSYCHIATRY :

An Intern must be able to:

- (1) diagnose and manage common psychiatric disorders;
- (2) identify and manage psychological reaction and psychiatric disorders in medical and surgical patients in clinical practice and community setting.

(xii) TUBERCULOSIS AND RESPIRATORY DISEASES :

An intern after training must be able to: -

- (1) conducting proper clinical examination, elicit and interpret clinical findings and diagnose common respiratory disorders and emergencies;
- (2) perform simple, routine investigative procedures required for making bed side diagnosis, specially sputum collection, examination for etiological organism like AFB, interpretation of chest X-rays and respiratory function tests;
- (3) Interpret and manage various blood gases and pH abnormalities in various respiratory diseases;
- (4) Manage common diseases recognizing need for referral for specialized care in case of inappropriateness of therapeutic response;
- (5) Perform common procedures like laryngoscopy, pleural aspiration, respiratory physiotherapy, laryngeal intubation and pneumo-thoracic drainage aspiration.

(xiii) ANAESTHESIA :

After the internship in the department of Anesthesiology an intern shall acquire knowledge, skill and attitude to:

- (1) perform pre-anaesthetic check up and prescribe pre-anaesthetic medications;
- (2) perform venepuncture and set up intravenous drip;
- (3) perform laryngoscopy and endotracheal intubation;
- (4) perform lumbar puncture, spinal anaesthesia and simple nerve blocks;
- (5) conduct simple general anaesthetic procedures under supervision;
- (6) monitor patients during anaesthesia and post operative period;
- (7) recognise and manage problems associated with emergency anaesthesia;
- (8) maintain anaesthetic records;
- (9) recognise and treat complication in post operative period;
- (10) perform cardio-pulmonary brain resuscitation (C.P.B.R.) correctly, including recognition of cardiac arrest.

(xiv) RADIO-DIAGNOSIS:

An intern after training must be able to identify and diagnose:

- (1) all aspects of 'Emergency Room' Radiology like –
 - (a) all acute abdominal conditions;
 - (b) all acute traumatic conditions with emphasis on head injuries;
 - (c) differentiation between Medical and surgical radiological emergencies;
- (2) Basic hazards and precautions in Radio-diagnostic practices.

(xv) PHYSICAL MEDICINE AND REHABILITATION:

An intern is expected to acquire the following skills during his/her internship: -

- (1) competence for clinical diagnosis based on details history an assessment of common disabling conditions like poliomyelitis, cerebral palsy, hemiplegia, paraplegia, amputations etc;
- (2) participation as a team member in total rehabilitation including appropriate follow up of common disabling conditions;
- (3) principles and procedures of fabrication and repair of artificial limbs and appliances;
- (4) various therapeutic modalities;
- (5) use of self help devices and splints and mobility aids;
- (6) familiarity with accessibility problems and home making for disabled;
- (7) ability to demonstrate simple exercise therapy in common conditions like prevention of deformity in polio, stump exercise in an amputee etc.;

(xvi) FORENSIC MEDICINE AND TOXICOLOGY

The intern is to be posted in the casualty department of the hospital while attached under Forensic Medicine Department with the following objectives:

- (1) to identify medicolegal problem in a hospital and general practice;
- (2) to identify and learn medicolegal responsibilities of a medical man in various hospital situations;
- (3) to be able to diagnose and learn management of basic poisoning conditions in the community;
- (4) to learn how to handle cases of sexual assault;
- (5) to be able to prepare medico-legal reports in various medicolegal situations;
- (6) to learn various medicolegal post-mortem procedures and formalities during its performance by police.

APPENDIX 'A'

Curriculum in 'Family Welfare' for the Bachelor of Medicine and Bachelor of Surgery (MBBS) Course.

The Curriculum may be considered under various pre and para clinical heads and the following details are worked out for each of the disciplines.

1. Anatomy

- (1) Gross and microscopic anatomy of the male and female generative organs.
- (2) The menstrual cycle.
- (3) Spermatogenesis and Oogenesis
- (4) Fertilization of the ovum.
- (5) Tissue and organ changes in the mother in pregnancy.
- (6) Embryology and Organogenesis.
- (7) Principles of Genetics.
- (8) Applied anatomy of mechanical methods of preventing conception.
 - a) in female- chemical contraceptive, pessaries, Intra-Uterine Contraceptive Device (IUCD), tubectomy etc.
 - b) in male – condom, vasectomy etc.

2. Physiology

- (1) Physiology of reproduction.
- (2) Endocrines and regulations of reproduction in the female
- (3) Endocrines and physiology of reproduction in the male.
- (4) Physiology and Endocrinology of pregnancy, parturition and lactation.
- (5) Nutritional needs of mother and child during pregnancy and lactation.
- (6) The safe period-rhythm method of contraceptions.
- (7) Principles of use of oral contraceptive.

3. Pharmacology

- (1) Mode of action and administration of:
 - (a) Chemical contraceptive
 - (b) Oral contraceptive
- (2) Contra indication for administration of contraceptives.
- (3) Toxic effects of contraceptives.

4. Community Medicine

- (1) The need for family welfare Planning.

- (2) **Organization of Family Welfare Planning service.**
- (3) **Health Education in relating to Family Welfare Planning.**
- (4) **Nutrition.**
- (5) **Psychological needs of the mother, the child and the family.**
- (6) **Demography and vital Statistics.**

5. **Obstetrics & Gynaecology**

- (1) Contraceptive methods in male/female.
 - (a) Mechanical
 - A. Pessaries, Intra Uterine Contraceptive Device (IUCD), Condoms,
 - B. Tubectomy and vasectomy
 - (b) Chemical
 - (c) Oral
 - (d) Rhythm Method
- (2) Demonstrations of use of Pessaries, IUCD, Condoms and technique of tubectomy
- (3) Advice on family planning to be imparted to parents.

6. **Paediatrics:**

- (1) Problems of child health in relation to large family.
 - (a) Organization of pediatric services.
 - (b) Nutritional problems of mother and child.
 - (c) Childhood diseases due to overcrowding.

7. **Surgery**

Technique of Vasectomy.

I. **Compulsory Internship**

Placement of a student for in-service training in a family welfare planning clinic for a period of at least one month.

II. **Examination**

It is necessary that questions on family welfare planning be introduced in the theory, practical and oral examination throughout the MBBS course.

The curriculum content has been indicated subjectwise. However, it would be more advantageous to the student for purpose of integrated learning and for understanding of the subject if family welfare planning instruction with the curriculum content indicated could be divided into two parts.

Part-I
Anatomy, Physiology, Biochemistry and Pharmacology

There shall be close integration in the teaching of these subjects. It is suggested that during the early para-clinical years, two to three weeks may be set apart for instruction in Family Welfare Planning relating to these subjects; so that the student gets an overall understanding of the principles and practice of "Family Planning" within the limited time available for covering all the subjects of the medical course. The method suggested would save time and repetition of essential facts.

Part-II

This includes the later para-clinical and clinical courses. The practical aspects of Family Welfare Planning methods should be emphasized. The program of instruction shall be supervised by the Department of Obstetrics and Gynaecology. The department of Community Medicine Internal Medicine, Psychiatry, Paediatrics and Surgery must be closely associated in imparting instruction relating to the problems arising for want of family welfare planning and the advantages to society and the individual which will be gained by adopting the measures suggested.

Seminars:

The medical colleges shall organise occasional seminars in which staff from all departments and the in-service trainees shall participate.

APPENDIX-B

A comprehensive list of skills recommended as desirable for Bachelor of Medicine and Bachelor of Surgery (MBBS) Graduate:

1. Clinical Evaluation:

- (a) To be able to take a proper and detailed history.
- (b) To perform a complete and thorough physical examination and elicit clinical signs.
- (c) To be able to properly use the stethoscope, Blood Pressure, Apparatus Auroscope, Thermometer, Nasal Speculum, Tongue Depressor, Weighing Scales, Vaginal Speculum etc.:
- (d) To be able to perform internal examination-Per Rectum (PR), Per Vaginum (PV) etc.
- (e) To arrive at a proper provisional clinical diagnosis.

II. Bed side Diagnostic Tests:

- (a) To do and interpret Haemoglobin(HB), Total Count (TC), Erythrocytic Sedimentation Rate (ESR), Blood smear for parasites, Urine examination /albumin /sugar /ketones /microscopic.:
- (b) Stool exam for ova and cysts;
- (c) Gram, staining and Siehl-Nielsen staining for AFB;
- (d) To do skin smear for lepra bacilli
- (e) To do and examine a wet film vaginal smear for Trichomonas
- (f) To do a skin scraping and Potassium Hydroxide (KOH) stain for fungus infections;
- (g) To perform and read Montoux Test.

III. Ability to Carry Out Procedures.

- (a) To conduct CPR (Cardiopulmonary resuscitation) and First aid in newborns, children and adults.
- (b) To give Subcutaneous (SC) /Intramuscular (IM) /Intravenous (IV) injections and start Intravenous (IV) infusions.
- (c) To pass a Nasogastric tube and give gastric leavage.
- (d) To administer oxygen-by mask/catheter
- (e) To administer enema
- (f) To pass a urinary catheter- male and female
- (g) To insert flatus tube
- (h) To do pleural tap, Ascitic tap & lumbar puncture
- (i) Insert intercostal tube to relieve tension pneumothorax
- (j) To control external Haemorrhage.

IV Anaesthetic Procedure

- (a) Administer local anaesthesia and nerve block
- (b) Be able to secure airway potency, administer Oxygen by Ambu bag.

IV. Surgical Procedures

- (a) To apply splints, bandages and Plaster of Paris (POP) slabs;
- (b) To do incision and drainage of abscesses;
- (c) To perform the management and suturing of superficial wounds;
- (d) To carry on minor surgical procedures, e.g. excision of small cysts and nodules, circumcision, reduction of paraphimosis, debridement of wounds etc.
- (e) To perform vasectomy;
- (f) To manage anal fissures and give injection for piles.

VI Mechanical Procedures

- (a) To perform thorough antenatal examination and identify high risk pregnancies.
- (b) To conduct a normal delivery;
- (c) To apply low forceps and perform and suture episiotomies;
- (d) To insert and remove IUD's and to perform tubectomy

VII Paediatrics

- (a) To assess new borns and recognise abnormalities and I.U. retardation
- (b) To perform Immunization;
- (c) To teach infant feeding to mothers;
- (d) To monitor growth by the use of 'road to health chart' and to recognize development retardation;
- (e) To assess dehydration and prepare and administer Oral Rehydration Therapy (ORT)
- (f) To recognize ARI clinically;

VIII ENT Procedures:

- (a) To be able to remove foreign bodies;
- (b) To perform nasal packing for epistaxis;
- (c) To perform trachesotomy

IX Ophthalmic Procedures:

- (a) To invert eye-lids;

- (b) To give Subconjunctival injection;
- (c) To perform appellation of eye-lashes;
- (d) To measure the refractive error and advise correctional glasses;
- (e) To perform nasolacrimal duct syringing for potency

X. **Dental Procedures:**

To perform dental extraction

XI **Community Healthy:**

- (a) To be able to supervise and motivate, community and para-professionals for corporate efforts for the health care;
- (b) To be able to carry on managerial responsibilities, e.g. Management of stores, indenting and stock keeping and accounting
- (c) Planning and management of health camps;
- (d) Implementation of national health programmes;
- (e) To effect proper sanitation measures in the community, e.g. disposal of infected garbage, chlorination of drinking water;
- (f) To identify and institute and institute control measures for epidemics including its proper data collecting and reporting.

XII **Forensic Medicine Including Toxicology**

- (a) To be able to carry on proper medicolegal examination and documentation of injury and age reports.
- (b) To be able to conduct examination for sexual offences and intoxication;
- (c) To be able to preserve relevant ancillary material for medico legal examination;
- (d) To be able to identify important post-mortem findings in common unnatural deaths.

XII **Management of Emergency**

- (a) To manage acute anaphylactic shock;
- (b) To manage peripheral vascular failure and shock;
- (c) To manage acute pulmonary oedema and LVF;
- (d) Emergency management of drowning, poisoning and seizures
- (e) Emergency management of bronchial asthma and status asthmaticus;
- (f) Emergency management of hyperpyrexia;
- (g) Emergency management of comatose patients regarding airways, positioning prevention of aspiration and injuries
- (h) Assess and administer emergency management of burns

APPENDIX-C

Prescribed Teaching Hours and Suggested Model Time Tables:-

Following minimum teaching hours are prescribed in various disciplines:

A. Pre-Clinical Subjects : (Phase-1-First and Second Semester)

Anatomy	650 Hrs.
Physiology	480 Hrs.
Biochemistry	240 Hrs.
Community Medicine	60 Hrs.

B. Para-Clinical Subjects: (Phase-II-5th to 7th Semester)

Pathology	300 Hrs.
Pharmacology	300 Hrs.
Microbiology	250 Hrs.

Community Medicine 200 Hrs. (including 8 weeks postings of 3 hrs each)

Forensic Medicine	100 Hrs.
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Teaching of para-clinical subjects shall be 4 hrs per day in 3rd Semester and 3Hrs per day in 4th and 5th Semesters (See attached Time Table)

C. Clinical Subjects

1. Clinical postings as per chart attached.
2. Theory lectures, demonstrations and Seminars etc.in addition to clinical postings as under. The clinical lectures to be held from 4th Semester onwards (See attached Time Table)

- Gen-Medicine	300 Hours	Gen. Surgery	300 Hours
- Paediatrics	100 "	Orhopedics	100 "
- T.B. and Chest	20 "	Ophthalmology	100 "
- Psychiatry	20 "	ENT	70 "
- Skin and STD	30 "	Radiology	20 "
- Community Medicine	50 "	Dentistry	10 "
- Anaesthesia	20 "	Obst & Gynae.	300 "
		inclusive	

Note

This period of training is minimum suggested. Adjustments where required depending on availability of time be made.

This period of training does not include university examination period.

Extra time available be devoted to other Sub-specialities.

During semesters 3 to 9 following clinical postings for each student, of 3 hrs. duration is suggested for various departments after introductory course in Clinical Methods in Medicine and surgery of 2 weeks each for the whole class.

Subjects	3 rd Sem- ester weeks	4 th Sem- ester weeks	5 th Sem- ester weeks	6 th Sem- ester weeks	7 th Sem- ester weeks	8 th Sem- ester weeks	9 th Sem- ester weeks	Total
General Medicine	6	-	4	-	4	6	6	26
Paediatrics	-	2	-	2	2	4	-	10
TB and Chest	-	2	-	-	-	-	-	02
Skin and STD	-	2	-	2	-	2	-	06
Psychiatry	-	-	2	-	-	-	-	02
Radiology	-	-	-	-	2	-	-	02
Gen Surgery	6	-	4	-	4	6	6	26
Orthopaed- ics	-	-	4	4	-	-	2	10
Ophthalmo- logy	-	4	-	4	-	-	2	10
ENT	-	4	-	4	-	-	-	08
Obst. &Gyn. And Family Planning	2	4	4	-	4	4	6	24
Comm. Med.	4	4	-	4	-	-	-	12
Casualty	-	-	-	2	-	-	-	02
Dentistry	-	-	-	-	2	-	-	02
Total	18	22	18	22	18	22	22	142

Clinical methods in Medicine and Surgery for whole class will be for 2 weeks each respectively at the start of 3rd semsester.

This posting will include training in Radiodiagnosis & Radiotherapy where existent.

This posting includes exposure to Rehabilitation Physiotherapy

This posting includes exposure to laboratory medicine and infectious diseases.

This posting includes exposure to dressing and Anaesthesia

This include maternity training and Family medicine and the 3rd semester posting shall be in Family Welfare Planning.

PHASE -II

Third Semester

Days/8-9 Time	9-10	10-11	11-12	12-1	1-2	2-3	3-4
Mon	Para Clinical Lectures	Clinical Postings		Para Clinical Lectures			Practicals
Tues	do	do		do	L		Para-Clinical
Wed	do	do		do	U		Do
Thurs	do	do		do	N		Do
Fri	do	do		do	C		Do
Sat	do	do		do	H		Do

Note : These are suggested time tables. Adjustments where required, depending upon the availability of time and facility, be made.

Fourth and Fifth Semester

Days/8-9 Time	9-10	10-11	11-12	12-1	1-2	2-3	3-4
Mon	Lectures In Clinical Subjects Subjects	Clinical Posting		Lectures in Para- Lectures			Practicals
Tues	do	do		do	L		Para-Clinical
Wed	do	do		do	U		Do
Thurs	do	do		do	N		Do
Fri	do	do		do	C		Do
Sat	do	do		do	H		Do

Sixth,Seventh,Eighth & Ninth Semester

Days/8-9 Time	<u>9-10</u>	10-11	11-12	12-1	1- 2	2-3	3-4
Mon	Lectures In Clinical Subjects	Clinical Postings		Lectures in Demonstration in clinical subjects		Practicals Demonstrations in Clinical Subjects	
Tues	do	do		do	L		
Wed	do	do		do	U	Do	
Thurs	do	do		do		Do	
Fri	do	do		do	N	Do	
Sat	do	do		do	C	Do	
					H		

Note: These are suggested time tables. Adjustments where required, depending upon the availability of time and facility, be made.

AMENDMENTS NOTIFIED IN THE GAZETTE OF INDIA IN EXISTING REGULATIONS

I. REGULATIONS ON GRADUATE MEDICAL EDUCATION

1. *Published in Part III Section 4 of the Gazette of India on 29th May, 1999.*

In the Regulations on Graduate Medical Education, 1997 –

(a) In Regulation 4 for clause (1), the following shall be substituted, namely -

“(1) He/She shall complete the age of 17 years on or before 31st December of the year of admission to the MBBS course.”

(b) In the Regulations 5, for clause (5) the following be substituted namely -

“(5) Procedure for selection to MBBS course shall be as follows:-

- (1) In case of admission on the basis of qualifying examination under clause (1) based on merit, a candidate for admission to MBBS course must have passed in the subjects of Physics, Chemistry, Biology and English individually and must have obtained a minimum of 50% marks taken together in Physics, Chemistry and Biology at the qualifying examination as mentioned in clause (2) of regulation 4. In respect of candidates belonging to Scheduled Castes, Scheduled Tribes or Other Backward Classes, the marks obtained in Physics, Chemistry and Biology taken together in qualifying examination be 40% instead of 50% as above.
- (2) In case of admission on the basis of competitive entrance examination under clause (2) to (4) of this regulation, a candidate must have passed in the subjects of Physics, Chemistry and Biology

and English individually and must have obtained a minimum of 50% marks taken together in Physics, Chemistry and Biology at the qualifying examination as mentioned in clause (2) of regulation 4 and in addition must have come in the merit list prepared as a result of such competitive entrance examination by securing not less than 50% marks in Physics, Chemistry and Biology taken together in the competitive examination. In respect of candidates belonging to Scheduled Castes, Scheduled Tribes or other Backward classes the marks obtained in Physics, Chemistry and Biology taken together in qualifying examination and competitive entrance examination be 40% instead of 50% as stated above. Provided that a candidate who has appeared in the qualifying examination the result of which has not been declared, he may be provisionally permitted to take up the competitive entrance examination and in case of selection for admission to the MBBS course, he shall not be admitted to that course until he fulfills the eligibility criteria under regulation 4.

Sd/

(Dr. M. Sachdeva)
Secretary, MCI

2. *Published in Part III Section 4 of the Gazette of India 2nd July, 2002.*

In the Regulations on Graduate Medical Education, 1997, in regulation 13, after sub-section (9), the following sub-regulation shall be inserted, namely –

“(10) The grace marks upto a maximum of five marks may be awarded at the discretion of the University to a student who has failed only in one subject but has passed in all other subject.

Sd/

(Dr. M. Sachdeva)
Secretary, MCI

3. *Published in Part III Section 4 of the Gazette of India on 30th September, 2003.*

“In Regulation 7, under Sub-Regulation, the words, “for which he will be permitted not more than four chances (actual examination), provided four chances are completed in three years from the date of enrolment” shall be deleted.”

Sd/-

Lt. Co. (Retd.) Dr. ARN Setalvad
Secretary

4. *Published in Part III Section 4 of the Gazette of India on 16th October, 2003.*

In Regulation 12 –

(i) for sub-regulation (I), the following shall be substituted namely –

“(I) ATTENDANCE: 75% attendance in a subject for appearing in the examination is compulsory inclusive of attendance in non-lecture teaching i.e. seminars, group discussions, tutorials, demonstrations, practicals, hospital (Tertiary Secondary, Primary) posting and bed side clinics etc.”

(ii) in sub-regulation (2) for clause (v), the following shall be substituted, namely –

“(v) student must secure atleast 35% marks of the total marks fixed for internal assessment in a particular subject in order to be eligible to appear in final university examination of that subject.”

Sd/-
Lt. Co. (Retd.) Dr. ARN Setalvad
Secretary

5. *Published in Part III Section 4 of the Gazette of India on 1st March, 2004.*

In the Regulations on Graduate Medical Education, 1997, in regulation 7 –

(i) for sub-regulation (6) the following sub-regulation shall be substituted namely –

“(6) The Universities and other authorities concerned shall organize admission process in such a way that teaching in first semester starts by 1st of August each year. For this purpose, they shall follow the time schedule indicated in APPENDIX E”

(ii) after sub-regulation (6), the following sub-regulations shall be inserted:

“(6A) There shall be no admission of students in respect of any academic session beyond 30th September under any circumstance. The Universities shall not register any student admitted beyond the said date.

(6B) the Medical Council of India may direct, that any student identified as having obtained admission after the last date for closure of admission be discharged from the course of study, or any medical qualification granted to such a student shall not be a recognized qualification for the purpose of the Indian Medical Council Act, 1956.

The institution which grants admission to any student after the last date specified from the same shall also be liable to face such action as may be prescribed by MCI including surrender of seats equivalent to the extent of such admission made from its sanctioned intake capacity for the succeeding academic year”.

Sd/-
Lt. Co. (Retd.) Dr. ARN Setalvad
Secretary

APPENDIX E

TIME SCHEDULE FOR COMPLETION OF THE ADMISSION PROCESS FOR FIRST MBBS COURSE

Schedule for Admission	Seats filled up by Central Government through all India Entrance Examination	Seats filled up by the State Govts./Instt.
Conduct of Entrance Examination	Month of May	Month of May
Declaration of Result of Qualifying Exam./Entrance Exam.	By 5 th June	By 15 th June
Ist round of counseling/admission	To be over by 30 th June	To be over by 25 th July
Last date for joining the allotted college and course	Within 15 days from the date of allotment of seats @@	31 st July
2 nd round of counselling for allotment of seats from waiting list	To be over by 8 th August	Upto 28 th August
Last date for joining for candidates allotted seats in 2 nd round of conseling from the waiting list	Within 15 days from the date of allotment of seats. (seats vacant after 22 nd August will be surrendered back to the States / Colleges)	
Commencement of academic session	Ist of August	
Last date upto which students can be admitted against vacancies arising due to any reason	30 th September	

NOTE:@@ Head of the College should intimate the vacancies existing after the last date of joining the course by the candidate concerned in respect of the All India Quota of seats to the DGHS within seven days and latest by 23rd of July.

MEDICAL COUNCIL OF INDIA

AMENDMENT NOTIFICATION

New Delhi, the 20th October, 2008

No. MCI-34(41)/2008-Med./29527 - In exercise of the powers conferred by Section 33 of the Indian Medical Council Act, 1956(102 of 1956), the Medical Council of India with the previous approval of the Central Government hereby makes the following regulations to further amend the Regulations on Graduate Medical Education, 1997, namely:-

1. These Regulations may be called the “Regulations on Graduate Medical Education (Amendment), 2008.”
2. In the Regulations on Graduate Medical Education, 1997, the following **additions / modifications / deletions / substitutions**, shall be as indicated therein:-
3. Clause 6(1) under heading “**Migration/Transfer**” **shall be substituted** as under:

“(1) Migration of students from one medical college to another medical college in India shall be granted only in exceptional cases to the most deserving among the applicants for good and sufficient reasons and not on routine grounds. The number of students migrating to/from any one medical college shall be kept to the minimum which shall in any case not exceed the limit of 5% of its sanctioned intake in one academic year. There shall be no migration on any ground from one medical college to another located in the same city.

(2) Migration of students from one College to another is permissible only if both the colleges are recognised by the Central Government under section 11(2) of the Indian Medical Council Act,1956 and further subject to the condition that it shall not result in increase in the sanctioned intake capacity for the academic year concerned in respect of the receiving medical college.

(3) The applicant candidate shall be eligible to apply for migration only after qualifying in the first professional MBBS examination. Migration during clinical course of study shall not be allowed on any ground.

(4) For the purpose of migration, an applicant candidate shall first obtain ‘No Objection Certificates’ from the college where he is studying for the present, the University to which it is affiliated to, the college to which migration is sought and the University to which that college is affiliated to. He shall submit his application for migration within a period of one month of passing (declaration of results) of the first professional MBBS examination alongwith the said ‘No Objection Certificates’ to the Director, Medical Education of the State where the College/Institutions including Deemed Universities to which migration is sought is situated or to the Head of the Institution in case migration is sought to a Central Government institution. The Director, Medical Education of the State concerned or the Head of the Central Government institution, as the case may be, shall take a final decision in the matter as to whether or not to allow migration in accordance with the provisions of these Regulations and communicate the same to the applicant student within a period of one month from the date of receipt of the request for migration.

(5) A student who has joined another college on migration shall be eligible to appear in the IInd professional MBBS examination only after attaining the minimum attendance in that college in the subjects, lectures, seminars etc. required for appearing in the examination prescribed under Regulation 12(1)

Note-1: The State Governments/Universities/Institutions may frame appropriate guidelines for grant of No Objection Certificate or migration, as the case may be, to the students subject to provisions of these regulations.

Note-2: Any request for migration not covered under the provisions of these Regulations shall be referred to the Medical Council of India for consideration on individual merits by the Director (Medical Education) of the State or the Head of Central Government Institution concerned. The decision taken by the Council on such requests shall be final.

Note-3: The College/Institutions shall send intimation to the Medical Council of India about the number of students admitted by them on migration within one month of their joining. It shall be open to the Council to undertake verification of the compliance of the provisions of the regulations governing migration by the Colleges at any point of time.”

4. In Clause 11 under heading “CLINICAL SUBJECTS OF PHASE II & PHASE III” the following **shall be added** after sub-clause (6) “COMMUNITY MEDICINE”:-

“(7)EMERGENCY MEDICINE - This must be a general department. Till such time a full fledged department is created this may be under the control of the department of anaesthesia.”

5. (i) In Clause 12(1), the words “provided he/she has 80%” **shall be substituted** by “inclusive of”.

(ii) In Clause 12(3) under heading “University Examinations”, para 1 & 2 **shall be substituted** by the following:

“Theory papers will be prepared by the examiners as prescribed. Nature of questions will be short answer type/objective type and marks for each part indicated separately. Question papers should preferably be of short structure/objective type.

Practicals/clinicals will be conducted in the laboratories or hospital wards. The objective will be to assess proficiency in skills, conduct of experiment, interpretation of data and logical conclusion. Clinical cases should preferably include common diseases and not esoteric syndromes or rare disorders. Emphasis should be on candidate’s capability in eliciting physical signs and their interpretation. **Clinical cases/practicals shall take into account common diseases which the student is likely to come in contact in practice. Rare cases/obscure syndromes, long cases of neurology shall not be put for final examination.”**

Note:

- a) Passing in Ist Professional is compulsory before proceeding to Phase II training.
 - b) A student who fails in the IInd professional examination, should not be allowed to appear IIIrd Professional Part I examination unless he passes all subjects of IInd Professional examination.
 - c) Passing in IIIrd Professional (Part-1) is compulsory for being eligible for IIIrd Professional (Part II) examination.”
- (iii) In Clause 12(4)(c) under the heading **Obstetrics and Gynaecology** the marks mentioned against “clinical i.e. 60 marks” **shall be substituted** “50 marks” and “Internal assessment 60(Theory-30; Practical-30)” **shall be substituted** by “Internal assessment 40(Theory–20; Practical-20)”
6. (i) In Clause 14(1), the word “conduct” **shall be substituted** by “**learn methods/modalities** for”
- (ii) Clause 14(4) under the heading “**INTERNSHIP- TIME DISTRIBUTION**” **shall be substituted** by the following:

“COMPULSORY

Community Medicine	2 months
Medicine including 15 days of Psychiatry	2 months
Surgery including 15 days Anaesthesia	2 months
Obst./Gynae. including Family	
Welfare Planning	2 months
Paediatrics	1 month
Orthopaedics including PMR	1 month
ENT	15 days
Ophthalmology	15 days
Casualty	15 days
Elective Posting (1x15 days)	15 days

Subjects for Elective posting will be as follows:

- i) Dermatology and Sexually Transmitted Diseases.
- ii) Tuberculosis and Respiratory Diseases.

- iii) Radio-Diagnosis
- iv) Forensic Medicine
- v) Blood Bank
- vi) Psychiatry

Note: Structure internship with college assessment at the end of the internship.”

Foot Note : The Principal Regulations namely, “Regulations on Graduate Medical Education, 1997” were published in Part – III, Section (4) of the Gazette of India vide Medical Council of India Notification dated the 4th March, 1997 and amended vide Council notification dated 29.05.1999, 02.07.2002, 30.09.2003, 16.10.2003 & 01.03.2004.

[Lt. Col.(Retd.) Dr. A.R.N. Setalvad]

Secretary

MEDICAL COUNCIL OF INDIA
NOTIFICATION
New Delhi, the 22nd December, 2008

No.MCI-34(41)/2008-Med./38099.- In exercise of the powers conferred by Section 33 of the Indian Medical Council Act, 1956 (102 of 1956), the Medical Council of India with the previous approval of the Central Government hereby makes the following regulations to further amend the Regulations on Graduate Medical Education, 1997, namely:-

1. These Regulations may be called the “Regulations on Graduate Medical Education (Amendment), 2008 part-III”.
2. In the Regulations on Graduate Medical Education, 1997, the following **additions/modifications/deletions/substitutions**, shall be made as indicated therein:-
- 3(i). In Chapter II, clause 6, under the heading “**Migration**”, Sub-Clause 6(1) **shall be substituted** as under:-

“6(1) Migration of students from one medical college to another medical college may be granted on any genuine ground subject to the availability of vacancy in the college where migration is sought and fulfilling the other requirements laid down in the Regulations. Migration would be restricted to 5% of the sanctioned intake of the college during the year. No migration will be permitted on any ground from one medical college to another located within the same city”.

- (ii) In Chapter II, clause 6, under the heading “**Migration**”, Sub-Clause 6(4) **shall be substituted** as under:-

“6(4) For the purpose of migration an applicant candidate shall first obtain “No Objection Certificate” from the college where he is studying for the present and the university to which that college is affiliated and also from the college to which the migration is sought and the university to which that college is affiliated. He/She shall submit his application for migration within a period of 1 month of passing (Declaration of result of the 1st Professional MBBS examination) alongwith the above cited four “No Objection Certificates” to: (a) the Director of Medical Education of the State, if migration is sought from one college to another within the same State **or** (b) the Medical Council of India, if the migration is sought from one college to another located outside the State”.

Foot Note: The Principal Regulations namely, “Regulations on Graduate Medical Education, 1997” were published in Part –III, Section (4) of the Gazette of India vide Medical Council of India Notification dated the 4th March, 1997 and amended vide Council notification dated 29.05.1999, 02.07.2002, 30.09.2003, 16.10.2003, 01.03.2004, 20.10.2008 & 15.12.2008.

(Lt. Col.(Retd.) Dr. A.R.N. Setalvad)
Secretary

MEDICAL COUNCIL OF INDIA

AMENDMENT NOTIFICATION

New Delhi , the 25th March, 2009

No. MCI-34(41)/2008-Med./54469 - In exercise of the powers conferred by Section 33 of the Indian Medical Council Act, 1956(102 of 1956), the Medical Council of India with the previous approval of the Central Government hereby makes the following regulations to further amend the Regulations on Graduate Medical Education, 1997, namely:-

1. (i) These Regulations may be called the “Regulations on Graduate Medical Education (Amendment), 2009 Part – I.”

(ii) They shall come into force on the date of their publication in the Official Gazette.

2. In the Regulations on Graduate Medical Education, 1997, the following **additions / modifications / deletions / substitutions**, shall be as indicated therein:-

3. In Chapter II, Clause 4 under the heading “Admission to the Medical Course – Eligibility Criteria”, the following **shall be added** after sub-clause 2(f): -

“3. 3% seats of the annual sanctioned intake capacity shall be filled up by candidates with locomotory disability of lower limbs between 50% to 70%.

Provided that in case any seat in this 3% quota remains unfilled on account of unavailability of candidates with locomotory disability of lower limbs between 50% to 70% then any such unfilled seat in this 3% quota shall be filled up by persons with locomotory disability of lower limbs between 40% to 50% - before they are included in the annual sanctioned seats for General Category candidates.

Provided further that this entire exercise shall be completed by each medical college / institution as per the statutory time schedule for admissions and in no case any admission will be made in the MBBS course after 30th of September.”

4. The following proviso **shall be added** before the proviso to Clause 5 (5) (ii):-

“Provided that the eligibility criteria for admission to persons with locomotory disability of lower limbs in terms of Clause 4(3) above – will be a minimum of 45% marks instead of 50% taken together in qualifying examination and competitive entrance examination for admission in MBBS course.”

[Lt. Col.(Retd.) Dr. A.R.N. Setalvad]

Secretary

Medical Council of India

Foot Note: The Principal Regulations namely, “Regulations on Graduate Medical Education, 1997” were published in Part – III, Section (4) of the Gazette of India vide Medical Council of India Notification dated the 4th March, 1997 and amended vide Council notification dated 29.05.1999, 02.07.2002, 30.09.2003, 16.10.2003, 01.03.2004, 20.10.2008, 15.12.2008 & 22.12.2008

MEDICAL COUNCIL OF INDIA
AMENDMENT NOTIFICATION

New Delhi, the 19th April, 2010

No. MCI-31(1)/2010-Med./4155- In exercise of the powers conferred by Section 33 of the Indian Medical Council Act, 1956(102 of 1956), the Medical Council of India with the previous approval of the Central Government hereby makes the following regulations to further amend the “Regulations on Graduate Medical Education, 1997”, namely: -

1. (i) These Regulations may be called the “Regulations on Graduate Medical Education (Amendment), 2010.”
- (ii) They shall come into force on the date of their publication in the Official Gazette.
2. In the Regulations on Graduate Medical Education, 1997, the following **additions / modifications / deletions / substitutions**, shall be as indicated therein:-
3. In Chapter II, Clause 7 under the heading “Training Period and Time Distribution”, sub-clause (7) **shall be substituted** as under: -

“7(7) The supplementary examination for Ist Professional MBBS examination may be conducted within 6 months so that the students who pass can join the main batch and the failed students will have to appear in the subsequent year provided that the students who pass the supplementary examination shall be allowed to appear in the second professional MBBS examination only after he/she completes the full course of study of three semesters (i.e. 18 months) for the second professional MBBS examination irrespective of the examination of the main batch.”

(Lt. Col. (Retd.) Dr. A.R.N. Setalvad)
Secretary
Medical Council of India

Foot Note : The Principal Regulations namely, “Regulations on Graduate Medical Education, 1997” were published in Part – III, Section (4) of the Gazette of India vide Medical Council of India Notification dated the 4th March, 1997 and amended vide Council notification dated 29.05.1999, 02.07.2002, 30.09.2003, 16.10.2003, 01.03.2004, 20.10.2008, 15.12.2008, 22.12.2008 & 25.03.2009.

MEDICAL COUNCIL OF INDIA

AMENDMENT NOTIFICATION

New Delhi, the 7th October, 2010

No. MCI-34(1)/2010-Med./32962. - In exercise of the powers conferred by Section 33 of the Indian Medical Council Act, 1956(102 of 1956), the Medical Council of India with the previous approval of the Central Government hereby makes the following regulations to further amend the “Regulations on Graduate Medical Education, 1997”, namely: -

1. (i) These Regulations may be called the “Regulations on Graduate Medical Education (Amendment), 2010.”

(ii) They shall come into force on the date of their publication in the Official Gazette.
2. In the Regulations on Graduate Medical Education, 1997, the following **additions / modifications / deletions / substitutions**, shall be as indicated therein:-
3. In Chapter II, Clause 4 under the heading “Admission to the Medical Course-Eligibility Criteria”, sub-clause 2 under the heading “He/She has passed qualifying examination “& Clause 5 under the heading “Selection of Students”, sub-clause 5 under the heading “Procedure for selection to MBBS course”, **shall be substituted** as under :

“4(2) He/She has passed qualifying examination as under :-

(a) The higher secondary examination or the Indian School Certificate Examination which is equivalent to 10+2 Higher Secondary Examination after a period of 12 years study, the last two years of study comprising of **Physics, Chemistry, Biology/Bio-technology** and Mathematics or any other elective subjects with English at a level not less than core course of English as prescribed by the National Council of Educational Research and Training after the introduction of the 10+2+3 years educational structure as recommended by the National Committee on education;

Note: Where the course content is not as prescribed for 10+2 education structure of the National Committee, the candidates will have to undergo a period of one year pre-professional training before admission to the Medical colleges;

Or

(b) The intermediate examination in science of an Indian University/Board or other recognised examining body with **Physics, Chemistry and Biology/Bio-technology** which shall include a practical test in these subjects and also English as a compulsory subject;

Or

(c) The pre-professional/pre-medical examination with Physics, Chemistry and Biology/Bio-technology, after passing either the higher secondary school examination, or the pre-university or an equivalent Examination. The pre-professional/pre-medical examination shall include a practical test in **Physics, Chemistry and Biology/Bio-technology** and also English as a compulsory subject;

Or

(d) The first year of the three years degree course of a recognized university, with **Physics, chemistry and Biology/Bio-technology** including a practical test in three subjects provided the examination is a "University Examination" and candidate has passed 10+2 with English at a level not less than a core course;

Or

(e) B.Sc. examination of an Indian University, provided that he/she has passed the B.Sc. examination with not less than two of the following subjects **Physics, Chemistry, Biology (Botany, Zoology)/Bio-technology** and further that he/she has passed the earlier qualifying examination with the following subjects – Physics, Chemistry, Biology and English.

Or

(f) Any other examination which, in scope and standard is found to be equivalent to the intermediate science examination of an Indian University/Board, taking **Physics, Chemistry and Biology/Bio-technology** including practical test in each of these subjects and English.

Note:

The pre-medical course may be conducted either at Medical College, or a science College.

Marks obtained in Mathematics are not to be considered for admission to MBBS Course.

After the 10+2 course is introduced, the integrated courses should be abolished.

5(5) Procedure for selection to MBBS course shall be as follows:-

- (i) In case of admission on the basis of qualifying examination under clause (1) based on merit, candidate for admission to MBBS course must have passed in the subjects of **Physics, Chemistry, Biology/Bio-technology & English** individually and must have obtained a minimum of 50% marks taken together in **Physics, Chemistry and Biology/Bio-technology** at the qualifying examination as mentioned in the clause (2) of regulation 4.

In respect of candidates belonging to Scheduled Castes, Scheduled Tribes or Other Backward classes. The marks obtained in **Physics, Chemistry and Biology/Bio-technology** taken together in qualifying examination be 40% instead of 50% as above;

- (ii) In case of admission on the basis of Competitive entrance examination under clause (2) to (4) of this regulation, a candidate must have passed in the subjects of **Physics, Chemistry, Biology/Bio-technology** and English individually and must have obtained a minimum of 50% of marks taken together in **Physics, Chemistry and Biology/Bio-technology** at the qualifying examination as mentioned in clause (2) of regulation 4 and in addition must have come in the merit list prepared as a result of such competitive entrance examination by securing not less than 50% marks in **Physics, Chemistry and Biology/Bio-technology** taken together in the competitive examination. In respect of candidates belonging to Schedule Caste, Schedule Tribes or other Backward Class the marks obtained in **Physics, Chemistry, and Biology/Bio-technology** taken together in qualifying examination and competitive entrance examination be 40% instead of 50% as stated above:

Provided that a candidate who has appeared in the qualifying examination the result of which has not been declared, he may be provisionally permitted to take up the competitive entrance examination and in case of selection for admission to the MBBS course, he shall not be admitted to that course until he fulfils the eligibility criteria under regulation 4.”

(Dr. P. Prasannaraj)
Additional Secretary
Medical Council of India

Foot Note : The Principal Regulations namely, “Regulations on Graduate Medical Education, 1997” were published in Part – III, Section (4) of the Gazette of India vide Medical Council of India Notification dated the 4th March, 1997 and amended vide Council notification dated 29.05.1999, 02.07.2002, 30.09.2003, 16.10.2003, 01.03.2004, 20.10.2008, 15.12.2008, 22.12.2008, 25.03.2009 & 19.04.2010.

MEDICAL COUNCIL OF INDIA

AMENDMENT NOTIFICATION

New Delhi, the 21st December, 2010

No. **MCI-31(1)/2010-Med./49068**- In exercise of the powers conferred by Section 33 of the Indian Medical Council Act, 1956(102 of 1956), the Medical Council of India with the previous approval of the Central Government hereby makes the following regulations to further amend the “Regulations on Graduate Medical Education, 1997”, namely: -

1. (i) These Regulations may be called the “Regulations on Graduate Medical Education (Amendment), 2010 (Part-II).”
(ii) They shall come into force on the date of their publication in the Official Gazette.
2. In the Regulations on Graduate Medical Education, 1997, the following **additions / modifications / deletions / substitutions**, shall be as indicated therein:-
3. In Chapter II, Clause 4 under the heading “Admission to the Medical Course – Eligibility Criteria” of Graduate Medical Education Regulations, 1997 , the following **shall be added** after sub-clause 1: -
“1 A. He/She has obtained a minimum of marks in National Eligibility-cum-Entrance Test as prescribed in Clause 5 of Chapter II.”
4. In Chapter II, Clause 4 (2) of Graduate Medical Education Regulations, 1997 , the following shall be added before words “He/She has passed qualifying examination as under:”
“In order to be eligible to take National Eligibility-cum-Entrance Test,”
- 5.(i) In Chapter II, Clause 4, para 2 of the Note section, the sentence “Marks obtained in Mathematics are not to be considered for admission to MBBS Course.” **shall be deleted.**
(ii) In Chapter II, Clause 5 under the heading “Selection of Students”, sub-clause (1) to (4) **shall be deleted.**
6. In Chapter II, Clause 5, sub-clause - 5, under the Heading “Procedure for selection to MBBS Course shall be as follows” **shall be substituted** as under: -
“I. There shall be a single eligibility cum entrance examination namely ‘National Eligibility-cum-Entrance Test for admission to MBBS course’ in each academic year. The overall superintendence, direction and control of National Eligibility-cum-Entrance Test shall vest with Medical Council of India. However, Medical Council of India with the previous approval of the Central Government shall select organization/s to conduct ‘National Eligibility-cum-Entrance Test for admission to MBBS course.
II. In order to be eligible for admission to MBBS course for a particular academic year, it shall be necessary for a candidate to obtain minimum of 50% (Fifty Percent) marks in each paper of National Eligibility-cum-Entrance Test held for the said academic year. However, in respect of candidates belonging to Scheduled Castes, Scheduled Tribes and Other Backward Classes, the minimum percentage marks shall be 40% (Forty Percent) in each paper and in respect of candidates with locomotory

disability of lower limbs, the minimum percentage marks shall be 45% (Forty Five Percent) in each paper of National Eligibility-cum-Entrance Test :

Provided when sufficient number of candidates belonging to respective categories fail to secure minimum marks as prescribed in National Eligibility-cum-Entrance Test in any academic year for admission to MBBS Course, the Central Government in consultation with Medical Council of India may, at its discretion, lower the minimum marks required for admission to MBBS Course for candidates belonging to respective categories and marks so lowered by the Central Government shall be applicable for the said year only.

- III. The reservation of seats in medical colleges for respective categories shall be as per applicable laws prevailing in States/ Union Territories. An all India merit list as well as State-wise merit list of the eligible candidates shall be prepared on the basis of the marks obtained in National Eligibility-cum-Entrance Test and candidates shall be admitted to MBBS course from the said lists only.
- IV. No Candidate who has failed to obtain the minimum eligibility marks as prescribed in Sub Clause (ii) above shall be admitted to MBBS Course in the said academic year.
- V. All admissions to MBBS course within the respective categories shall be based solely on marks obtained in the National Eligibility-cum-Entrance Test.”

(Dr. P. Prasannaraj)

Addl. Secretary

Medical Council of India

Foot Note : The Principal Regulations namely, “Regulations on Graduate Medical Education, 1997” were published in Part – III, Section (4) of the Gazette of India vide Medical Council of India Notification dated the 4th March, 1997 and amended vide Council notification dated 29.05.1999, 02.07.2002, 30.09.2003, 16.10.2003, 01.03.2004, 20.10.2008, 15.12.2008, 22.12.2008, 25.03.2009 & 19.04.2010.

MEDICAL COUNCIL OF INDIA
AMENDMENT NOTIFICATION
New Delhi, the 15th February, 2012

No. **MCI-31(1)/2010-Med/62051** In exercise of the powers conferred by Section 33 of the Indian Medical Council Act, 1956(102 of 1956), the Medical Council of India with previous approval of the Central Government hereby makes the following regulations to further amend the “Regulations on Graduate Medical Education, 1997”, namely: -

1. (i) These Regulations may be called the “Regulations on Graduate Medical Education (Amendment), 2012 (Part-I)”.
- (ii) They shall come into force from the date of their publication in the Official Gazette.
2. Regulations on Graduate Medical Education (Amendment), 2010 (Part II), vide notification No. MCI 31(1)/2010-Med/49068 dated 21st December 2010 published on 27th December 2010, shall be applicable from the academic year commencing from 2013-2014.
3. In the “Regulations on Graduate Medical Education, 1997”, the following additions / modifications / deletions / substitutions, shall be as indicated therein: -
4. In Chapter II, clause 5, sub-clause II, under the heading “ Procedure for selection to MBBS course shall be as follows”, as amended vide notification No. MCI-31(1)/2010-Med/49068 dated 21st December 2010, **shall be substituted** as under:

“II. In order to be eligible for admission to MBBS Course for a particular academic year, it shall be necessary for a candidate to obtain minimum of marks at 50th percentile in ‘National Eligibility-cum-Entrance Test to MBBS course’ held for the said academic year. However, in respect of candidates belonging to

Scheduled Castes, Scheduled Tribes, Other Backward Classes, the minimum marks shall be at 40th percentile. In respect of candidates with locomotory disability of lower limbs terms of Clause 4(3) above, the minimum marks shall be at 45th percentile. The percentile shall be determined on the basis of highest marks secured in the All-India common merit list in ‘National Eligibility-cum-Entrance Test for admission to MBBS course’.

Provided when sufficient number of candidates in the respective categories fail to secure minimum marks as prescribed in National Eligibility-cum-Entrance Test held for any academic year for admission to MBBS Course, the Central Government in consultation with Medical Council of India may at its discretion lower the minimum marks required for admission to MBBS Course for candidates belonging to respective categories and marks so lowered by the Central Government shall be applicable for the said academic year only.”

5. In Chapter II, clause 5, sub-clause II, under the heading “ Procedure for selection to MBBS course shall be as follows”, as amended vide notification No. MCI-31(1)/2010-Med/49068 dated 21st December 2010, **shall be added** as under:

“VI. To be eligible for admission to MBBS course, a candidate must have passed in the subjects of Physics, Chemistry, Biology/Bio-technology and English individually and must have obtained a minimum of 50% marks taken together in Physics, Chemistry and Biology/Bio-technology at the qualifying examination as mentioned in clause (2) of Regulation 4 and in addition must have come in the merit list of “National Eligibility-cum-Entrance Test” for admission to MBBS course. In respect of candidates belonging to Scheduled Castes, Scheduled Tribes or other Backward Classes the minimum marks obtained in Physics, Chemistry and Biology/Bio-technology taken together in qualifying examination shall be 40% instead of 50%. In respect of candidates with locomotory disability of lower limbs in terms of Clause 4(3) above, the minimum marks in qualifying examination in Physics, Chemistry and Biology/Bio-technology taken together in qualifying examination shall be 45% instead of 50%.

Provided that a candidate who has appeared in the qualifying examination the result of which has not been declared, he/she may be provisionally permitted to take up the National Eligibility-cum-Entrance Test and in case of selection for admission to the MBBS course, he/she shall not be admitted to that course until he fulfils the eligibility criteria under Regulation 4.

- VII. The Central Board of Secondary Education shall be the organization to conduct National Eligibility-cum-Entrance Test for admission to MBBS course.”

(Dr. Sangeeta Sharma)
Secretary
Medical Council of India

Foot Note: The Principal Regulations namely, “Regulations on Graduate Medical Education, 1997” were published in Part III, Section, Section (4) of the Gazette of India vide Medical Council of India Notification dated the 4th March, 1997 and amended vide Council notification dated 29.05.1999, 02.07.2002, 30.09.2003, 16.10.2003, 01.03.2004, 20.10.2008, 15.12.2008, 22.12.2008, 25.03.2009, 19.04.2010 & 27.12.2010.

'Social Transformation Through Dynamic Education'



BHARATI VIDYAPEETH
(Deemed to be University), Pune, India

YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE & COMMERCE, PUNE-38

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'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC

PROSPECTUS-CUM-HANDBOOK

2020-2021

SENIOR COLLEGE
(Under Graduate & Post Graduate Courses)





BHARATI VIDYAPEETH (Deemed to be University), Pune, India



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“Social Transformation Through Dynamic Education”



BHARATI VIDYAPEETH

(Deemed to be University), Pune, India

**YASHWANTRAO MOHITE COLLEGE OF
ARTS, SCIENCE & COMMERCE**

Erandwane, Pune- 411 038

*Accredited with 'A+' Grade (2017) by NAAC
'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC*

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(Established in 1978)

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INCHARGE PRINCIPAL

Yashwantrao Mohite College, Pune

PROSPECTUS-CUM-HANDBOOK

2020 - 2021

SENIOR COLLEGE

(Under Graduate & Post Graduate Courses)

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE, INDIA
YASHWANTRAO MOHITE COLLEGE OF
ARTS, SCIENCE & COMMERCE

Erandwane, Pune- 411 038

VISION, MISSION & OBJECTIVES / GOALS OF THE COLLEGE

Vision:

- ‘To be a World Class University for Social Transformation through Dynamic Education’

Mission:

- To provide inclusive borderless access to higher education and vocational education based on merit;
- To offer varied professional, technical, vocational and general education programmes to meet the changing and diverse needs of society in a global context;
- To provide quality higher education for liberation of mind and empowerment of hands;
- To promote quality research in diverse areas of development and engage in application of knowledge for community development;
- To develop national and international networks with industry, service sector and other academic and research institutions to meet the expectations of various stakeholders;
- To promote extensive use of ICT for enrichment of teaching, learning and for effective governance;
- To make quality an integral part of all University operations by promoting innovative practices.

Objectives / Goals :

- To inculcate a **Value System** among students related to non-violence, truth, and tolerance for religion, secularism, social justice, environmental awareness, scientific temper and like.
- To generate employment opportunities for the youth by fostering **Global Competencies** among them.
- To develop scientific attitude, technology orientation and practical skills among the students through the extensive **Use of Technology**.
- To contribute to **National Development** by creating social and economic equality through upliftment of the weaker section of the society.
- To promote **Quest for Excellence** by creating just challenges before the young talent.

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1: INTRODUCTION

BHARATI VIDYAPEETH

Bharati Vidyapeeth, the parent body of **Bharati Vidyapeeth (Deemed to be University)** was established on 10th May, 1964 by **Dr. Patangrao Kadam** with the objective of bringing about intellectual awakening and allround development of the people of our country through education.

Bharati Vidyapeeth is now a leading educational institution in the country, which has created a history by establishing within a short span of 53 years or so 180 educational institutions imparting education from the pre-primary stage to post graduate stage. Our colleges and institutions of higher education impart education in different disciplines including Medicine, Dentistry, Ayurved, Homoeopathy, Nursing, Arts, Science, Commerce, Engineering, Pharmacy, Management, Social Sciences, Law, Environmental Science, Architecture, Hotel Management and Catering Technology, Physical Education, Computer Science, Library Science, Information Technology, Biotechnology & Agriculture, Performing Arts etc.

These educational institutions which have achieved an acclaimed academic excellence cater to the educational needs of thousands of students coming from different parts of India and also abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student-caring teachers. These educational institutions are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Sangli, Karad, Panchgani, Jawhar and New Delhi. The spectacular success achieved by Vidyapeeth is mainly a creation of unusual foresight, exceptionally dynamic leadership and able guidance of the founder of Vidyapeeth, **Dr. Patangrao Kadam**. It has been our constant endeavour to impart high quality education and training to our students and therefore it is no wonder that our institutions have become nationally known for their academic excellence. In recognition of the academic merit achieved by its institutions and potential for development which they have, the Department of Human Resource Development, Government of India and the University Grants Commission of India have accorded the status of a deemed to be university to Bharati Vidyapeeth with its twenty nine constituent units.

Besides these 180 educational institutions, Bharati Vidyapeeth has also been successfully running a Co-operative Bank, Co-operative Consumer Stores, Co-operative Poultry, Co-operative Sugar Factory, Co-operative Spinning Mill, Charitable Hospitals and Medical Research Centre and the like.

1.2 : BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE, INDIA

*Accredited (3rd cycle) with 'A+' Grade by NAAC
'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC*

Bharati Vidyapeeth (Deemed to be University) came into existence in April, 1996, when the Ministry of Human Resource Development, Government of India, in exercise of the powers under section 3 of the University Grants Commission Act conferred the status of University to 12 institutions of Bharati Vidyapeeth on the advice of the University Grants Commission, the apex body concerned with higher education in India which made assessment of the academic excellence achieved by the institutions through a committee of experts. Subsequent to that, the Government of India, vide its various notifications brought several other institutions of Bharati Vidyapeeth under the ambit of this University. As on today the University is having 29 constituent units conducting study programmes in different disciplines, including Modern Medicine, Dentistry, Ayurved, Homoeopathy, Nursing, Arts, Science, Commerce, Engineering, Pharmacy, Management, Social Sciences, Law, Environment Science, Architecture, Hotel Management Tourism and Catering Technology, Physical Education, Computer Science, Library Science and Information Technology etc.

Bharati Vidyapeeth, the parent body of Bharati Vidyapeeth University was established in May, 1964 by Dr. Patangrao Kadam with the objective of bringing about intellectual awakening and all round development of people of our country through education. Bharati Vidyapeeth is now a leading educational institution in the country, which has created history by establishing within a span of 50 years, 180 educational institutions imparting education from the pre-primary to the post graduate stage.

These educational institutions which have achieved an acclaimed academic excellence cater to the educational needs of thousands of students coming from different parts of India and abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student-caring teachers. These educational institutions are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Sangli, Karad, Panchagani, Jawhar and New Delhi. The spectacular success achieved by Vidyapeeth is mainly the result of unusual foresight, exceptionally dynamic leadership and able guidance of the founder of Vidyapeeth, Dr. Patangrao Kadam. It has been our constant endeavour to impart high quality education and training to our students and we have achieved success in these pursuits so that our institutions have earned reputation and high acclaim for their high academic standard.

The University was accredited by the National Assessment and Accreditation Council (NAAC) with the prestigious 'A' grade in 2004. Once again the university is reaccredited with 'A' grade in 2011. In March 2017, under the third cycle of assessment, the university is accredited with 'A+' grade by NAAC. The Ministry of HRD Govt. of India has awarded 'A' Grade status to the University. Besides, the Institute of Management and Research, New Delhi, Poona College of Pharmacy, Pune and College of Engineering, Pune have received accreditation for their various courses by the National Board of Accreditation.

One of the distinctive features of this University is that it has three self-financing research institutes, which are involved in sophisticated researches in health related sciences, pharmaceutical sciences and social sciences.

The University has established its academic reputation so much that it is being preferred for admission by the students not only from India, but from abroad. At present there are about 734 overseas students coming from 45 countries.

It had been a long standing dream of our founder to get the status of a University to Bharati Vidyapeeth. That dream was realised when the Ministry of Human Resource Development (Department of Education, Government of India) on the recommendations of the University Grants Commission, New Delhi through their notification No. F.9-15/95-U.3 dated 26th April, 1996 declared a cluster of institutions of Bharati Vidyapeeth at Pune as Deemed to be University.

Present Constituent Colleges of the University

1. Medical College, Pune
2. Dental College & Hospital, Pune
3. College of Ayurved, Pune
4. Homoeopathic Medical College, Pune
5. College of Nursing, Pune
6. Yashwantrao Mohite College of Arts, Science and Commerce, Pune
7. New Law College, Pune
8. Social Sciences Centre (M.S.W.), Pune
9. Yashwantrao Chavan Institute of Social Science Studies & Research, Pune
10. Research and Development Centre in Pharmaceutical Sciences & Applied Chemistry, Pune
11. College of Physical Education, Pune
12. Institute of Environment Education & Research, Pune
13. College of Engineering, Pune
14. Poona College of Pharmacy, Pune
15. Institute of Management & Entrepreneurship Development, Pune.
16. Rajiv Gandhi Institute of Information Technology & Bio-Technology, Pune

17. Interactive Research School for Health Affairs, Pune.
18. Medical College & Hospital, Sangli.
19. Dental College & Hospital, Navi Mumbai.
20. Institute of Management & Research, New Delhi;
21. College of Architecture, Pune;
22. Institute of Hotel Management & Catering Technology, Pune;
23. Yashwantrao Mohite Institute of Management, Karad;
24. Institute of Management, Kolhapur;
25. Institute of Management & Rural Development Administration, Sangli.
26. Abhijit Kadam Institute of Management and Social Sciences, Solapur.
27. Dental College & Hospital, Sangli
28. College of Nursing, Sangli
29. College of Nursing, Navi Mumbai.

Thus, there are 29 institutions which are the constituent units of Bharati Vidyapeeth Deemed University.

As is widely known, the Central Govt. had constituted a high power Task Force consisting of very eminent and experienced academicians to evaluate the academic performance of deemed universities in the country. The Task Force appreciated the report submitted by the University and also the presentation made by Prof. Dr. Shivajirao Kadam Vice Chancellor. The Task Force noted the University's excellent performance with regard to teaching-learning process, research, scientific publications by faculty and their impact and potential, innovative academic programmes, enriched infrastructure and recommended to the Ministry of Human Resources Development, Govt. of India to award 'A' Grade status. The Central Government has accepted the recommendation of the Task Force and awarded 'A' Grade status to this University.

Ours is the only University established under section 3 of the U.G.C. Act having under its umbrella institutions of diverse disciplines of professional, technical and traditional categories such as Medicine, Dentistry, Physical Education, Natural and Physical Sciences, Social Sciences, Commerce, Law and Humanities, Pharmaceutical Sciences, Management Studies, Engineering and Technology. The UGC has recognised this University u/s 12 'B' of UGC Act.

This University is a Member of Association of Indian Universities and also a member of Association of Commonwealth Universities.

1.3 : YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE & COMMERCE, PUNE

Bharati Vidyapeeth, the parent institution has created a landmark in the history of higher education by establishing three institutes in June 1978 and Yashwantrao Mohite College is first of them. At present, the college is one of the constituent units of Bharati Vidyapeeth Deemed University. We have pleasure to introduce ourselves as one of the very few colleges in India which has been accredited in 2004 and re- accredited in 2011 with 'A' grade and accredited (3rd cycle) with 'A+' grade in 2017 by the National Assessment and Accreditation Council, Bangalore.

The college offers under graduate and post graduate programmes in various disciplines of Arts, Science, Commerce and Computer Science leading to B.A., B.Lib & I.Sc., B.Sc., B.Sc. (Computer Science), B.Com., M.A. (English), M.A. (Economics), M.Lib & I.Sc, M.Sc. (Physics), M.Sc. (Analytical Chemistry), M.Sc. (Organic Chemistry), M.Sc. (Microbiology), M.Sc. (Computer Science) and M.Com. degrees. The college is recognised Research Centre for Ph.D. degrees in English, Economics, Physics, Chemistry, Botany, Microbiology, Computer Science and Commerce.

The special feature of the college is that along with degree courses, the College also conducts two diploma programmes: (1) Diploma in Banking and (2) Diploma in Marketing, which have proved of great help to the students for their placements.

The college promotes national integration by admitting the students from 29 states and has attained international status by accommodating the students from 24 countries. The welfare of the students is always the prime concern of the college. Several activities are organized to support and enhance the capabilities of the students. Publication of the annual number Yashobharati, arranging Cultural Festival '*Sanskriti*' and conducting National Level General Knowledge Test, as well as organization of National / International Seminars and workshops every year are some of the features of the college.

The college is honoured with 'Best NSS UNIT Award' and the Programme Officer received 'Best NSS Programme Officer Award' as well as 5 students with 'Best NSS Volunteer Award' by Government of Maharashtra. The sports department of the college has created landmarks in the history. Sixteen of our students are felicitated with the highest honour in the field of sports offered by the state government i. e. 'Shiv Chhatrapati Sports Award' and the college has contributed to several National teams by participation of the students.

The college also provides the hostel facilities to both **boys and girls** students. The facilities like state-of-art laboratories, excellent library, health care centre, seminar hall, English language laboratory, Commerce laboratory, indoor and outdoor game facilities and gymnasium are provided to the students.

2 : ADMISSION TO THE COLLEGE (UG)

- 1) A student seeking admission to the college in the first year of the B.A./B.Lib & I.Sc/B.Com./B.Sc./B.Sc. (Computer Sc.) course will have to apply to the college in the prescribed form immediately after the declaration of H.S.C. examination result.
- 2) Students who were in the college during the previous year will have to apply for admission to the college within six days from the declaration of the results of the university examination.
- 3) Applications received after the prescribed date for admission will not be considered.
- 4) International students seeking admission to the college will have to apply in the prescribed form alongwith the provisional Eligibility Certificate issued by the Registrar, Bharati Vidyapeeth Deemed University, Pune and NO OBJECTION CERTIFICATE from the Central Government alongwith visa & pass port.
- 5) Students from other universities in India seeking admission to the college will have to apply in the prescribed form. They will have to apply for Eligibility Certificate to the Registrar, Bharati Vidyapeeth Deemed University in the prescribed form. They will have to submit the following documents alongwith the application for Eligibility Certificate.
 - a) Migration Certificate
 - b) Passing Certificate
 - c) Attendance Certificate
 - d) Transfer Certificate
 - e) Statement of Marks of previous examination
 - f) Character Certificate
 - g) Medical and H.I.V. Test (for international students)
- 6) Admission will be provisional till the student produces final eligibility certificate from Bharati Vidyapeeth Deemed University.
- 7) Please retain a set of xerox copies you are submitting to college.

2.1 : ELIGIBILITY FOR ADMISSION TO FIRST YEAR

B.A. / B.Com. / B.Sc. / B.Sc. (Computer Science)

1. Eligibility for admission to B.A. degree programme:

A candidate who has passed the Higher Secondary School Certificate Examination of the Maharashtra State Board or an equivalent examination of any other statutory Board or University with English as a passing subject will be admitted to the first year of this course.

2. Eligibility for admission to B.Lib. & I.Sc. Course:

Any graduate of this University or any other recognized University shall be admitted to B.Lib & I.Sc. Course.

3. Eligibility for admission to B.Com. degree programme:

A candidate who has passed the Higher Secondary School Certificate Examination in Commerce or Science of the Maharashtra State Secondary and Higher Secondary Board or an equivalent of any other Statutory Board or University with English as a passing subject will be admitted to the first year of this course.

4. Eligibility for admission to B.Sc. degree programme:

- Higher Secondary School Certificate Examination (10+2) of the Maharashtra State Board or its equivalent examination of any other statutory Board/University with English and with any three Science subjects such as (i) Physics (ii) Chemistry (iii) Biology (iv) Mathematics (v) Geography (vi) Geology etc
- Higher Secondary School Certificate Examination (10+2) with English and with any one of the following vocational subjects in technical group of +2 levels.
- Diploma in Pharmacy, Diploma in Engineering (polytechnic) or its equivalent examination recognized by MBTE, Mumbai or its equivalent of any other statutory Board or University.

Subject code	Subject
79	Auto Electrical
A1	Electrical Maintenance
A2	Mechanical Maintenance
A4	General Civil Engg.
C2	Electronics
C3	Chemical Plant Operation
C5	Elementary Laboratory Technology

Subject code	Subject
D9	Computer Science
J1/J2/J3	Electronics Technology
J4/J5/J6	Maintenance & Repairs of Electrical Domestic Appliances
K1/K2/K3	Auto Engg. Technician
P1/P2/P3	Medical Lab. Technician
P4/P5/P6	X-ray Technician
P7/P8/P9	Ophthalmic Technician
T1/T2/T3	Repair, Maintenance & Rewinding of Electrical Motors.

5. Eligibility for admission to B.Sc. Computer Science degree programme:

- A candidate who has passed the Higher Secondary School Certificate Examination of the Maharashtra State Board or Higher Secondary Examination of its equivalent of any other statutory Board or University and has passed in English and in two Science subjects (i) Physics (ii) Mathematics shall be eligible for admission to the First year B.Sc. (Computer Science) Degree course.
- Candidate who has passed H.S.C. examination (10+2) with English and any one of the following vocational subjects is also eligible for admission to the F.Y.B.Sc. (Computer Science) course.

Subject code	Subject
97	Information Technology
D9	Computer Science
C2	Electronics
J1/J2/J3	Electronics Technology

- Also student who has completed Diploma course in Engineering (Polytechnic) Computer Science, Electronics and Information Technology or its equivalent examination recognized by MBTE, Mumbai or its equivalent of any other statutory Board or University.

3 : COURSE STRUCTURE (UG PROGRAMME)

(CBCS 2018 COURSE)

(To be implemented from June 2018)

3.1 : Bachelor of Arts (B.A.)

Course Structure and scheme of credits of B.A. Course

The B.A. programme will be of three years duration consisting of six semesters and of minimum 150 Credits: Semester I (24 Credits), Semester II (26 Credits), Semester III (26 Credits), and Semester IV (24 Credits) Semester V (26 Credits), and Semester VI (24 Credits). In all six Semesters, there will be six theory courses (Core and Elective Courses) of 04 credits each and one theory course (Ability Enhancement course OR Skill Enhancement course) in Semester II, Semester III and Semester V of 02 credits each. All 36 Core and Elective Courses papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. The Ability Enhancement courses OR Skill Enhancement Courses will have 50 marks each out of which 20 marks will be for Internal Assessment and 30 marks for University Examination. Thus B.A. degree examination, six Semesters shall be of 3700 marks and of 150 credits altogether. The following shall be the course structure:

F.Y.B.A.: (Semester I & II)

A student joining the First year B.A. course shall offer six subjects mentioned below. He/she is advised to select the subjects of First Semester very carefully because he/she has to select subjects for the following semesters from the subjects offered at First Semester.

- 1) Subject in Core course is compulsory.
- 2) A student has to offer five subjects from Elective Courses given above.

F.Y.B.A. Semester I			F.Y.B.A. Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Course	A101	1. Compulsory English – I	Core Course	A201	1. Compulsory English – II
Elective Courses	Any Five from the following:		Elective Courses	Any Five from the following:	
	A111	1. English (G1) – I		A211	1. English (G1) – II
	A121	2. Economics (G1) – I		A221	2. Economics (G1) – II
	A131	3. Marathi (G1) – I		A231	3. Marathi (G1) – II
	A141	4. Geography (G1) – I		A241	4. Geography (G1) – II
	A151	5. Political Science (G1) – I		A251	5. Political Science (G1) – II
	A161	6. Sociology (G1) – I		A261	6. Sociology (G1) – II
			Skill Enhancement Course	SEC21	Basics of Information Technology

S.Y.B.A.

A student studying at Semester III & IV for the B.A. Degree shall study the subject as given below:

- 1) Compulsory English from Core courses.
- 2) He/she has to select one group as a special subject from the given Core courses groups and which is included in the subjects offered at the First Semester. There will be three papers of special subject.

- 3) He/she has to select two general subjects i.e. First paper in each Special Group and which is not included in Core courses and from the subjects offered at the First Semester.

ENVIRONMENT STUDIES

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 02 lectures per week for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree Grade Sheet. It is mandatory for every student to pass this course. If any student fails in this course, the result of his/her degree course will be withheld by the university.

S.Y.B.A. Semester III			S.Y.B.A. Semester IV		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	A301	1. Compulsory English – I	Core Course	A401	1. Compulsory English – II
Any one group from the following			Elective Courses	Any one group from the following	
A) Special Level: English			A) Special Level: English		
	A311	1. English (G2) – I		A411	1. English (S2) – II
	A312	2. English (G1) – I		A412	2. English (S1) – II
	A313	3. English (G3) – I		A413	3. English (S2) – II
B) Special Level: Economics			B) Special Level: Economics		
	A321	1. Economics (G2) – I		A421	1. Economics (G2) – II
	A322	2. Economics (S1) – I		A422	2. Economics (S1) – II
	A323	3. Economics (S2) – I		A423	3. Economics (S2) – II
C) Special Level: Marathi			C) Special Level: Marathi		
	A331	1. Marathi (G2) – I		A431	1. Marathi (G2) – II
	A332	2. Economics (S1) – I		A432	2. Marathi (S1) – I
	A333	3. Economics (S2) – I		A433	3. Marathi (S2) – II

Core Courses	D) Special Level: Geography		Core Courses	D) Special Level: Geography	
	A341	1. Geography (G2) – I		A441	1. Geography (G2) – II
	A342	2. Geography (S1) – I		A442	2. Geography (S1) – II
	A343	3. Geography (S2) – I		A443	3. Geography (S2) – II
	B) Special Level: Political Science			E) Special Level: Political Science	
	A351	1. Political Science (G2) – I		A451	1. Political Science (G2) – I
	A352	2. Political Science (S1) – I		A452	2. Political Science (S1) – II
	A353	3. Political Science (S2) – I		A453	3. Political Science (S2) – II
	F) Special Level: Sociology			F) Special Level: Sociology	
	A361	1. Sociology (G2) – I		A461	1. Sociology (G2) – II
	A362	2. Sociology (S1) – I		A462	2. Sociology (S1) – II
	A363	3. Sociology (S2) – I		A463	3. Sociology (S2) – II
	G) Special Level: Hindi			G) Special Level: Hindi	
	A371	1. Hindi (G2) – I		A471	1. Hindi (G2) – II
	A372	2. Hindi (S1) – I		A472	2. Hindi (S1) – II
A373	3. Hindi (S2) – I	A473	3. Hindi (S2) – II		
Skill Enhancement Course	SEC31	Communication Skill in English			

T.Y.B.A.

A student studying at Semester V & VI for the Third Year B.A. Degree shall study the subjects as given below.

- 1) Compulsory English.
- 2) Five papers of the group selected as special subject.

T.Y.B.A. Semester V			T.Y.B.A. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	A501	1. Compulsory English – I	Core Courses	A601	1. Compulsory English – II
	One group from the following which is concurrent with Semester III & IV:			One group from the following which is concurrent with Semester III & IV:	
	A) Special Level: English			A) Special Level: English	
	A511	1. English (S3) – I		A611	1. English (S3) – II
	A512	2. English (S4) – I		A612	2. English (S4) – II
	A513	3. English (S5) – I		A613	3. English (S5) – II
	A514	4. English (S6) – I		A614	4. English (S6) – II
	A515	5. English (S7) – I		A615	5. English (S7) – II
	B) Special Level: Economics			B) Special Level: Economics	
	A521	1. Economics (S3) – I		A621	1. Economics (S3) – II
	A522	2. Economics (S4) – I		A622	2. Economics (S4) – II
	A523	3. Economics (S5) – I		A623	3. Economics (S5) – II
	A524	4. Economics (S6) – I		A624	4. Economics (S6) – II
	A525	5. Economics (S7) – I		A625	5. Economics (S7) – II
	C) Special Level: Marathi			C) Special Level: Marathi	
	A531	1. Marathi (S3) – I		A631	1. Marathi (S3) – II
	A532	2. Marathi (S4) – I		A632	2. Marathi (S4) – II
	A533	3. Marathi (S5) – I		A633	3. Marathi (S5) – II
	A534	4. Marathi (S6) – I		A634	4. Marathi (S6) – II
	A535	5. Marathi (S7) – I		A635	5. Marathi (S7) – II

T.Y.B.A. Semester V			T.Y.B.A. Semester VI				
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper		
Core Courses	D) Special Level: Geography		Core Courses	D) Special Level: Geography			
	A541	1. Geography (S3) – I		A641	1. Geography (S3) – II		
	A542	2. Geography (S4) – I		A642	2. Geography (S4) – II		
	A543	3. Geography (S5) – I		A643	3. Geography (S5) – II		
	A544	4. Geography (S6) – I		A644	4. Geography (S6) – II		
	A545	5. Geography (S7) – I		A645	5. Geography (S7) – II		
	E) Special Level: Political Science			E) Special Level: Political Science			
	A551	1. Political Science (S3) – I		A651	1. Political Science (S3) – II		
	A552	2. Political Science (S4) – I		A652	2. Political Science (S4) – II		
	A553	3. Political Science (S5) – I		A653	3. Political Science (S5) – II		
	A554	4. Political Science (S6) – I		A654	4. Political Science (S6) – II		
	A555	5. Political Science (S7) – I		A655	5. Political Science (S7) – II		
	F) Special Level: Sociology			F) Special Level: Sociology			
	A561	1. Sociology (S3) – I		A661	1. Sociology (S3) – II		
	A562	2. Sociology (S4) – I		A662	2. Sociology (S4) – II		
	A563	3. Sociology (S5) – I		A663	3. Sociology (S5) – II		
	A564	4. Sociology (S6) – I		A664	4. Sociology (S6) – II		
	A565	5. Sociology (S7) – I		A665	5. Sociology (S7) – II		
	Ability Enhancement course	This paper is compulsory for all the students:					
		AEC 51		Soft Skills			

3.2 Bachelor of Library & Information Science (B.Lib & I.Sc.)

Eligibility for admission to B.Lib. & I.Sc. Course

Any graduate of this University or any other recognized University shall be admitted to B.Lib & I.Sc. Course.

Course Structure of B.Lib & I.Sc. Course

The B.Lib & I.Sc. programme will be of one year duration consisting of two semesters and of minimum 40 Credits: Semester I (20 Credits) and Semester II (20 Credits). In first Semester, there will be four theory papers of 04 credits each and two theory paper of 2 credit. In Second Semester, there will be three theory papers of 04 credits, three practical paers of 2 credits and one clipping project / viva voce of 2 credits. All 13 papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. Thus B.Lib & I.Sc. degree examination, two Semesters shall be of minimum 1250 marks and of minimum 40 credits altogether. The following shall be the course structure:

B.Lib & I.Sc. Semester – I

B.Lib & I.Sc. Semester – II

Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper	
Core: Compulsory	BL 11	Foundation of Library & Information Science	Core: Com- pulsory	BL 21	Information Services & System	
	BL 12	Document Description: Cataloguing Theory		BL 22	Knowledge Organization Information Processing Classification Theory	
	BL 13	Information Sources & Reference Services		BL 23	Information Technology Basic Theory	
	BL 14	Management of Libraries & Information Centers		BL 24	Information Technology Practical	
Core: Elective	Any one from the following:			BL 25	Knowledge Organization Information Processing Classification Practical	
	BL 15	Library System		BL 26	Information Retrieval: Library Cataloguing Practical	
	BL 16	Public Libraries		BL 27	Information Sources & references Services : News Paper Clipping Project	
Skill Enhance ment Course	BL 17	Soft Skills				

* For paper BL 27 Information Sources & Reference Services : News Paper Clipping Project internal evaluation is to be done by evaluation of the plan of the project submitted by the student. A student has to submit project plan with in a month from the begining of Semester II

3.3 : Bachelor of Science (B.Sc.)

F.Y.B.Sc.(Sem. I and II)

CORE SELECTIVE GROUPS

(SELECT ANY ONE GROUP FROM THE FOLLOWING)

Group I :- Physics, Chemistry, Mathematics and Statistics (PCMS)

Group II :- Physics, Mathematics, Statistics and Computer Application (PMSCA)

Group III :- Physics, Chemistry, Botany and Zoology (PCBZ)

Group IV :- Chemistry, Botany, Zoology and Microbiology (CBZM)

Group V: - Chemistry, Zoology, Microbiology and Geography (CZMG)

F.Y.B.Sc. Semester I			F.Y.B.Sc. Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Course		Physics	Core Course		Physics
	P – 11	Mechanics & Properties of Matter		P – 21	Kinetic Theory & Thermodynamics
	P – 12	Modern Physics		P -22	Electricity & Magnetism
	P – 13	Practical course – I		P – 23	Practical course - II
Core Course		Chemistry	Core Course		Chemistry
	C-11	Physical and Inorganic Chemistry – I		C-21	Physical and Inorganic Chemistry – II
	C-12	Organic and Inorganic Chemistry – I		C-22	Organic and Inorganic Chemistry - II
	C -13	Practical course – I		C – 23	Practical Course-II

Core Course		Botany	Core Course		Botany
	B –11	Plant diversity and utilization of plants – I		B –21	Plant diversity and utilization of plants – II
	B –12	Cell biology		B –22	Industrial Botany-I
	B – 13	Practical course - I		B – 23	Practical course – II
Core Course		Zoology	Core Course		Zoology
	Z – 11	Animal systematic and Functional Anatomy of Non-chordates-I		Z – 21	Functional Anatomy of Chordates-I
	Z –12	Cell Biology and Genetics		Z – 22	Applied zoology (Vermiculture and Sericulture)
	Z- 13	Practical course - I		Z- 23	Practical course – II
Core Course		Microbiology	Core Course		Microbiology
	MB-11	Introduction to Microbiology		MB-21	Microbial Nutrition, Growth and control
	MB-12	Structure of Prokaryotes and Eukaryotes		MB-22	The diversity of Microbial World
	MB-13	Practical course - I		MB- 23	Practical course – II
Core Course		Mathematics	Core Course		Mathematics
	M-11	Algebra		M-21	Analytical Geometry
	M-12	Calculus		M-22	Integral Calculus and Differential Equations
	M – 13	Practical course - I		M – 23	Practical course – II
Core Course		Statistics	Core Course		Statistics
	S-11	Descriptive Statistics - I		S-21	Descriptive Statistics-II
	S-12	Discrete Probability and Probability Distributions - I		S-22	Discrete Probability and Probability Distributions- II
	S- 13	Practical course - I		S- 23	Practical course – II

Core Course		Geography	Core Course		Geography
	G -11	Physical Geography - I		G -21	Physical Geography – II
	G – 12	Climatology - I		G – 22	Oceanography
	G- 13	Practical course - I		G- 23	Practical course – II
Core Course		Computer Application	Core Course		Computer Application
	CA-11	Computer Fundamentals		CA-21	Operating Environment
	CA-12	Programming in C -I		CA-22	Programming in C -II
	CA- 13	Practical course - I		CA- 23	Practical course – II
				This course is compulsory for all the students.	
			Core Course	UG-SEC-21	Renewable Energy And Energy Harvesting

S.Y.B.SC. (SEM. III AND IV)

CORE SELECTIVE GROUPS

(SELECT ANY ONE GROUP FROM THE FOLLOWING)

Group I :- Physics, Chemistry and Mathematics (PCM)

Group V :- Chemistry, Botany and Zoology (CBZ)

Group VI :- Chemistry, Botany and Microbiology (CBM)

Group VII :- Chemistry, Zoology and Microbiology (CZM)

ENVIRONMENT STUDIES

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 02 lectures per week for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree Grade Sheet. It is mandatory for every student to pass this course. If any student fails in this course, the result of his/her degree course will be withheld by the university.

Semester III

Semester IV

(From the Academic Year 2019-20)

Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Course		Physics	Core: Course		Physics
	P – 31	Mathematical Methods for Physics		P – 41	Waves & Oscillations
	P – 32	Optics		P – 42	Electronics
	P – 33	Practical Course - III		P – 43	Practical Course - III
Core: Course		Chemistry	Core: Course		Chemistry
	C – 31	Physical and Analytical Chemistry - I		C – 41	Physical and Analytical Chemistry - II
	C – 32	Organic and Inorganic Chemistry - III		C – 42	Organic and Inorganic Chemistry - IV
	C – 33	Practical Course - III		C – 43	Practical Course - IV
Core : Course		Botany	Core: Course		Botany
	B - 31	Plant anatomy & Embryology		B – 41	Plant Biotechnology
	B – 32	Angiosperm Taxonomy		B – 42	Plant Physiology
	B – 33	Practical Course - III		B – 43	Practical Course - IV
Core: Course		Zoology	Core: Course		Zoology
	Z – 31	Functional Anatomy of Non-chordates - II and Biodiversity		Z – 41	Functional Anatomy of chordates - II
	Z – 32	Histology of Mammals		Z – 42	Physiology of Mammals
	Z – 33	Practical Course - III		Z – 43	Practical Course - IV

Core: Course		Microbiology	Core: Course		Microbiology
	MB – 31	Microbial Metabolism		MB – 41	Principles of Disease, Epidemiology and Immunology
	MB – 32	Bacterial Genelics		MB – 42	Applied Microbiology
	MB – 33	Practical Course - III		MB – 43	Practical Course - IV
Core: Course		Mathematics	Core: Course		Mathematics
	M – 31	Calculus of Several Variables		M – 41	Vector Calculus
	M – 32	Group Theory and Differential Equations		M – 42	Complex variables
	M – 33	Practical Course - III		M – 43	Practical Course - IV
Core: Course		Statistics	Core: Course		Statistics
	S – 31	Probability Distributions And Statistical Inference - I		S – 41	Probability Distributions And Statistical inference - II
	S – 32	Probability Distributions And Statistical Methods - I		S – 42	Probability Distributions And Statistical Methods - II
	S – 33	Practical Course - III		S – 43	Practical Course - IV
Core: Course		Geography	Core: Course		Geography
	G – 31	Human Geography - I		G – 41	Human Geography - II
	G – 32	Biogeogralhy - I		G – 42	Biogeogralhy - II
	G – 33	Practical Course - III		G – 43	Practical Course - IV
Core: Course		Computer Application	Core: Course		Computer Application
	CA – 31	Advanced C Concepts - I		CA – 41	Advanced C Concepts - II
	CA – 32	Digital Electronics - I		CA – 42	Digital Electronics - II
	CA – 33	Practical Course - III		CA – 43	Practical Course - IV
Electiv e Course	Any of the following.		Electiv e Course	Any of the following.	
	ENG – 31	English - I		ENG – 41	English - II
	MAR – 32	Marathi - I		MAR – 42	Marathi - II
SEC*	This course is compulsory for all the students.				
	UG – SEC 31	Medical Dignostics			

T.Y.B.Sc. (Sem. V and VI)

The student should select any one subject from the core group which he / she has opted at S.Y.B.Sc. (Semester III and IV) as Principle subject.

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses		Physics	Core Courses		Physics
	P-51	Mathematical Methods in Physics		P-61	Classical Electrodynamics
	P-52	Quantum Mechanics		P-62	Atomic and Molecular Physics
	P-53	Solid State Physics		P-63	Nuclear Physics
	P-54	Advanced Electronics		P-64	Computational Physics
	P-55	Classical Mechanics		P-65	Thermodynamics & Statistical Physics
	P-56	Practical Course – V		P-66	Practical Course – VIII
	P-57	Practical Course – VI		P-67	Practical Course – IX
	P-58	Practical Course - VII		P-68	Practical Course - X
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	P-59A	Elements of Materials Science		P-69A	Renewable Energy sources
	P-59B	Medical Electronics		P-69B	Physics of Nano Materials
	P-59C	Digital Electronics I		P-69C	Digital Electronics II

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses		Chemistry	Core Courses		Chemistry
	C-51	Physical Chemistry –I		C-61	Physical Chemistry-II
	C-52	Inorganic Chemistry – I		C-62	Inorganic Chemistry-II
	C-53	Organic Chemistry – I		C-63	Organic Chemistry-II
	C-54	Analytical Chemistry – I		C-64	Analytical Chemistry-II
	C-55	Industrial Chemistry - I		C-65	Industrial Chemistry-II
	C-56	Practical Course – V		C-66	Practical Course – VIII
	C-57	Practical Course – VI		C-67	Practical Course – IX
	C-58	Practical Course - VII		C-68	Practical Course - X
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	C – 59A	Environment Chemistry-I		C – 69A	Environment Chemistry-II
	C – 59B	Nuclear Chemistry-I		C – 69B	Nuclear Chemistry-II
	C – 59C	Polymer Chemistry-I		C – 69C	Polymer Chemistry-II
T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Core Courses		Botany	Core Courses		Botany
	B –51	Biology of lower cryptogams(Algae & Fungi)		B –61	Biology of higher cryptogams (Bryophytes & Pteridophytes)
	B –52	Biology of seed plants (Angiosperms)		B –62	Biology of seed plants (Gymnosperms & Paleobotany)
	B –53	Plant pathology and Plant protection		B –63	Environmental Botany
	B –54	Genetics and Biostatistics		B –64	Palynology & Plant breeding
	B –55	Molecular biology and Biochemistry		B –65	Industrial botany II
	B-56	Practical Course – V		B-66	Practical Course – VIII
	B -57	Practical Course – VI		B -67	Practical Course – IX
	B - 58	Practical Course - VII		B - 68	Practical Course - X
* Ability Enhancement		UG AEC – 51		Soft Skills	

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	B- 59A	Aerobiology		B- 69A	Horticulture & Gardening
	B - 59B	Medico Botany		B - 69B	Phaemacognosy
	B - 59C	Conservation of Medicinal Plants		B - 69C	Seed Technology
Core Courses		Zoology	Core Courses		Zoology
	Z - 51	Developmental Biology		Z - 61	General Embryology
	Z - 52	Genetics and evolution		Z - 62	Toxicology
	Z - 53	Applied Zoology- Apiculture and Inland fisheries		Z - 63	Biological Techniques
	Z - 54	Parasitology		Z - 64	Functional Anatomy of Chordates-III
	Z - 55	Ecology and environmental pollution		Z - 65	Economic Entomology
	Z-56	Practical Course - V		Z-66	Practical Course - VIII
	Z -57	Practical Course - VI		Z -67	Practical Course - IX
	Z - 58	Practical Course - VII		Z - 68	Practical Course - X
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	Z- 59A	Biochemistry and Molecular Biology		Z- 69A	Biotechnology
	Z - 59B	Comparative anatomy of Chordates and Micro- techniques		Z - 69B	Biostatistics
	Z - 59C	Evolution		Z - 69C	Biodiversity and wild Life
Core Courses		Microbiology	Core Courses		Microbiology
	MB 51	Medical Microbiology		MB 61	Chemotherapy and Biomedical instrumentation
	MB 52	Clinical Pathology		MB 62	Immunology
	MB 53	Virology		MB 63	Biotechnology
	MB 54	Genetics of Prokaryotes		MB 64	Genetics of Eukaryotes and Gene Manipulation
	MB 55	Enzyme Kinetics and Regulation		MB 65	Microbial Metabolism and Biochemical Evolution
	MB -56	Practical Course - V		MB -66	Practical Course - VIII
	MB -57	Practical Course - VI		MB -67	Practical Course - IX
	MB - 58	Practical Course - VII		MB - 68	Practical Course - X

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	MB-59A	Food and diary Microbiology		MB-69A	Agricultural and Environmental Microbiology.
	MB-59B	Applied Microbiology-I		MB-69B	Applied Microbiology-II
	MB-59C	Advance Techniques in Microbiology-I		MB-69C	Advanced Techniques in Microbiology-II
Core Courses	Mathematics		Core Courses	Mathematics	
	M-51	Real Analysis- I		M-61	Real Analysis- II
	M-52	Abstract Algebra – I		M-62	Abstract Algebra – II
	M-53	Discrete Mathematics –I		M-63	Discrete Mathematics –II
	M-54	Differential Geometry-I		M-64	Differential Geometry-II
	M-55	Computer Programming and Applications –I		M-65	Computer Programming and Applications –II
	M-56	Practical Course – V		M-66	Practical Course – VIII
	M-57	Practical Course – VI		M-67	Practical Course – IX
	M-58	Practical Course - VII		M-68	Practical Course - X
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	M-59A	Mechanics(statics)		M-69A	Operation Research-II
	M-59B	Operation Research-I		M-69B	Mechanics(Dynamics)
	M-59C	Special Functions-I		M-69C	Special Functions-II
Core Courses	Statistics		Core Courses	Statistics	
	S-51	Distribution Theory - I		S-61	Distribution Theory - II
	S-52	Statistical Inference - I		S-62	Statistical Inference - II
	S-53	Sampling Methods and Design of Experiments-I		S-63	Sampling Methods and Design of Experiments-II
	S-54	Applied Statistics(A)-I		S-64	Applied Statistics(A)-II
	S-55	Applied Statistics(B)-I		S-65	Applied Statistics(B)-II
	S-56	Practical Course – V		S-66	Practical Course – VIII
	S-57	Practical Course – VI		S-67	Practical Course – IX
	S-58	Practical Course - VII		S-68	Practical Course - X

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	S – 59A	Computer Programming. 'C' Programming (Turbo C)-I		S-69A	Computer Programming. 'C' Programming (Turbo C)-II
	S – 59B	Principles of Computer Science-I		S-69B	Principles of Computer Science-II
	S – 59C	Statistical Ecology		S – 69C	Medical Statistics
Core Courses	Geography		Core Courses	Geography	
	G -51	World Regional Geography-I		G-61	World Regional Geography-II
	G-52	Geography of India-I		G-62	Geography of India-II
	G-53	Resources and environment-I		G-63	Recourses and Environment-II
	G-54	Economic Geography-I		G-64	Economic Geography-II
	G-55	Applied Geography-I		G-65	Applied Geography-II
	G-56	Practical Course – V		G- 66	Practical Course – VIII
	G-57	Practical Course – VI		G-67	Practical Course – IX
	G- 58	Practical Course - VII		G- 68	Practical Course - X
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	G-59A	Geography of Water Resources-I		G -69A	Geography of Water Resources-II
	G-59B	Geography of Soils-I		G-69B	Geography of Soils-II
	G-59C	Population Geography-I		G-69C	Population Geography-II
Core Courses	Computer Application		Core Courses	Computer Application	
	CA -51	Operating System-I		CA -61	Operating System-II
	CA -52	Visual basic. Net programming-I		CA -62	Visual basic. Net programming-II
	CA -53	Software Engineering -I		CA -63	Software Engineering-II
	CA -54	Database Management System-I		CA -64	Database Management System-II
	CA -55	Data and File structure-I		CA -65	Data and File structure-II
	CA- 56	Practical Course – V		CA- 66	Practical Course-VIII
	CA-57	Practical Course – VI		CA-67	Practical Course-IX
	CA- 58	Practical Course - VII		CA- 68	Practical Course-X
Elective Course	Any one of the following.		Elective Course	Any one of the following.	
	CA-59A	Computer Networks-I		CA-69A	Computer Networks-II
	CA-59B	Internet Programming-I		CA-69B	Internet Programming-II
	CA-59C	Theoretical computer science-I		CA-69C	Theoretical computer science-II

3.4 : Bachelor of Computer Science B.Sc. (Computer Science)

F.Y.B.Sc. (Computer Science):

F.Y.B.Sc. Semester I			F.Y.B.Sc. Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Course	CS -11	Introduction to RDBMS	Core Course	CS -21	RDBMS using oracle
	CS -12	Programming in C - I		CS -22	Programming in C - II.
	CS -13	Mathematical Foundation of Computer Science		CS -23	Graph Theory
	CS -14	Algebra -I		CS -24	Algebra-II
	CS -15	Principles of Analog Electronics - I		CS -25	Principles of Analog Electronics - II
	CS-16	Principles of Digital Electronics -I		CS -26	Principles of Digital Electronics -II
Core Practical	CS PI	Computer Science Practical - I	Core Practical	CS PIII	Computer Science Practical - III
	CS PII	Computer Science Practical - II		CS PIV	Computer Science Practical - IV
	CS EI	Electronics Practical -I		CS EII	Electronics Practical -II
Elective Courses	Any Two from the following:		Elective Courses	Any Two from the following:	
	CS -17	Computer Oriented Statistical Techniques -I		CS -27	Computer Oriented Statistical Techniques - II
	CS-18	Compulsory English -I		CS-28	Compulsory English -II
	CS-19	Elementary Algorithmics		CS-29	Operating Environment
			This paper is compulsory for all the students:		
			Skill Enhancement course	UGSEC -21	HTML Programming

S.Y.B.Sc. (Computer Science):

Semester III

Semester IV

Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Course	CS -31	Object Oriented Programming with C++	Core Course	CS -41	Data Structures using C++
	CS -32	Introduction to Net using C#		CS -42	ASP.Net
	CS -33	Linear Algebra		CS -43	Computational Geometry
	CS -34	Computer Oriented Numerical Methods		CS -44	Optimization Techniques
	CS -35	Digital systems and Microprocessors		CS -45	8051 Microcontroller
	CS-36	Principles of Communication		CS -46	Analog Systems
Core Practical	CS PV	Computer Science Practical - V	CS PVII	Computer Science Practical - VII	
	CS PVI	Computer Science Practical - VI	CS PVIII	Computer Science Practical - VIII	
	CS EIII	Electronics Practical -III	CS EIV	Electronics Practical -IV	
Elective Courses	Any One from the following:		Elective Courses	Any One from the following:	
	CS - 37	Cloud Computing - I		CS - 47	Cloud Computing - II
	CS - 38	Data warehousing and data mining - I		CS - 48	Data warehousing and data mining - II
Skill Enhancement Course	This paper is compulsory for all the students:				
	UGSE C - 31	Programming in Python			

Environment Studies

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 50 lectures for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree marksheet. If any student fails in this course, the result of his/her degree course will be withheld by the university.

T.Y.B.Sc. (Computer Science):

T.Y.B.Sc.Comp.Sci. Semester V			T.Y.B.Sc.Comp.Sci. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	CS -51	System Programming	Core Courses	CS -61	Linux Programming
	CS -52	Internet Technologies - I		CS -62	Internet Technologies – II
	CS -53	Theoretical Computer Science		CS -63	Compiler Construction
	CS -54	Programming in JAVA -I		CS -64	Programming in JAVA II
	CS -55	Software Engineering		CS -65	Unified Modeling Language
	CS-PIX	Computer Science Practical–IX		CS -PXII	Computer Science Practical – XII
	CS-PX	Computer Science Practical–X		CS PXIII	Computer Science Practical – XIII
	CS-PXI	Computer Science Practical–XI		CS -PXIV	Computer Science Practical – XIV
	CS-MI	Mini Project -I		CS -MII	Mini Project -II
Elective Courses	Any One from the following:		Elective Courses	Any One from the following:	
	CS -56	Data Communication and Networking -I		CS -56	Data Communication and Networking-II
	CS -57	Data Analytics -I		CS -57	Data Analytics -II
	CS -58	Research in Computer Science -I		CS -58	Research in Computer Science -II
Ability enhancement compulsory course	This paper is compulsory for all the students:				
	UG AEC - 51	Soft Skills			

3.5 : Bachelor of Commerce (B.Com.)

1. Course Structure and Scheme of Credits of B. Com. Course:

The B. Com. programme will be of three years duration consisting of six semesters and of minimum 158 credits: Semester I (28 Credits), Semester II (30 Credits), Semester III (26 Credits), and Semester IV (24 Credits) Semester V (26 Credits), and Semester VI (24 Credits). In Semester I and II there will be seven theory papers (Core and Elective Courses) and Semester III to VI, there will be six theory papers (Core and Elective Courses) of 4 credits each. In addition, there will be one theory course (Ability enhancement or skill enhancement course) each in Semester II, Semester III and Semester V of 2 credits each. All 38 (Core and Elective Courses) papers will have 100 marks each out of which 40 marks will be for Continuous Assessment and 60 marks for University Examination. All Ability enhancement or skill in enhancement course will have 50 marks each out of which 20 marks will be for Continuous Assessment and 30 marks for University Examination. Thus, B. Com. Degree examination, six Semesters shall be of 3950 marks and of 158 credits altogether.

A student joining B. Com. Course should note that subjects in Core Courses are compulsory. In addition, he has to offer any subject or any one group from the Elective Courses. Fundamental Course is compulsory for all the students.

The following shall be the course structure :

F.Y.B.Com. Semester I			F.Y.B.Com. Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	C101	Compulsory English I	Core Courses	C201	Compulsory English II
	C108	Financial Accounting I		C208	Financial Accounting II
	C104	Business Economics I		C204	Business Economics II
	C105	Geography of Resources I		C205	Geography of Resources II
Elective Courses	To choose any one of the following:		Elective Courses	To choose any one of the following:	
	C106	Business Mathematics & Statistics I		C206	Business Mathematics & Statistics II
	C107	Computer Application in Business I		C207	Computer Application in Business II
	To choose any one of the following:			To choose any one of the following:	
	C111	Corporate Law I		C211	Corporate Law II
	C121	Banking and Insurance I		C221	Banking and Insurance II
	C131	Marketing I		C231	Marketing II
	To choose any one of the following:			To choose any one of the following:	
	C102	Additional English I		C202	Additional English II
	C103	Marathi I		C203	Marathi II
			Skill Enhancement Course	SEC 21	Basics of Information Technology

S.Y. B.Com. Semester III

S.Y. B.Com. Semester IV

Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	C308	Corporate Accounting I	Core Courses	C408	Corporate Accounting II
	C309	Communication Skills I		C409	Communication Skills II
	C310	Principal of Business Management I		C410	Principles of Business Management II
	C304	Business Economics III		C404	Business Economics IV
Elective Courses	To choose any one of the following:		Elective Courses	To choose any one of the following:	
	C311	Corporate Law III		C411	Corporate Law IV
	C321	Banking and Insurance III		C421	Banking and Insurance IV
	C331	Marketing III		C431	Marketing IV
	To choose any one of the following:			To choose any one of the following:	
	C341	Cost Management Accounting I		C441	Cost Management Accounting II
	C351	Business Entrepreneurship I		C451	Business Entrepreneurship II
	C361	E - Commerce I		C461	E - Commerce II
	C371	Business Administration I		C471	Business Entrepreneurship II
Skill Enhancement Course	SEC 31	Women Empowerment & Social Justice			

T.Y.B.Com. Semester V			T.Y.B.Com. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	C508	Corporate Accounting III	Core Courses	C608	Corporate Accounting IV
	C512	International Economics I		C604	International Economics II
Elective Course	To choose any one of the following:		Elective Course	To choose any one of the following:	
	C513	Auditing & Taxation I		C612	Auditing & Taxation II
	C504	Business Regulatory Framework I		C613	Business Regulatory Framework II
	To choose any one of the following:			To choose any one of the following:	
	C511	Corporate Law V		C611	Corporate Law VI
	C521	Banking and Insurance V		C621	Banking and Insurance VI
	C531	Marketing V		C631	Marketing VI
	To choose any one Group of the following:			To choose any one Group of the following:	
	Group A			Group A	
	C541	Cost & Management Accounting III		C641	Cost & Management Accounting V
	C542	Cost & Management Accounting IV		C642	Cost & Management Accounting VI
	Group B			Group B	
	C551	Business Entrepreneurship III		C651	Business Entrepreneurship V
	C552	Business Entrepreneurship IV		C652	Business Entrepreneurship VI
	Group C			Group C	
	C561	E-Commerce III		C661	E-Commerce V
	C562	E-Commerce IV		C662	E-Commerce VI
	Group D			Group D	
	C571	Business Administration III		C671	Business Administration V
	C572	Business Administration IV		C672	Business Administration VI
Ability Enhancement Course	This paper is compulsory for all the students.				
	AEC 51	Soft Skills			

4 : SCHEME OF EXAMINATION (2018 Course)

FOR ALL UNDERGRADUATE PROGRAMMES

- **University Terms**

The dates for the commencement and conclusion of the First and the Second terms shall be fixed by the University authorities. The terms can be kept by students, who have registered their names with the University.

- **Scheme of Examination**

The assessment of students in the academic session 2018-19 and thereafter shall be based on-

- (a) University Examinations (UE)
- (b) Internal Assessment (IA)
- (c) Choice Based Credit System (CBCS) and
- (d) Semester Grade Point Average (SGPA) and Cumulative Grade Point Average System (CGPA).

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 4 credits will be given to a student who secures at least 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks. The Internal Assessment may be in the forms as follows:

- | | |
|---|----------|
| a) Attendance | 10 Marks |
| b) Home Assignment/Tutorial/Test/Presentation | 15 Marks |
| c) Mid Semester Examination | 15 Marks |

- **Practical : (Applicable to Commerce Faculty only)**

There shall be compulsory practical examination of 10 marks for B.Com. degree for all Elective Courses at the end of each semester but before UE. The practical examination will be based on the following:

- a) Journal : 5 Marks
- b) Oral : 5 Marks

Students should note that there is separate heads of passing in practical examination for B. Com.

The 60 marks in UE of the Elective Courses having practical will be converted into 50 marks.

- **Diploma in Marketing and Diploma in Banking (along with to B.Com. Degree): (Applicable to Commerce Faculty only)**

A student admitted for B. Com. Semester I and opted for Marketing or Banking and Insurance as one of the elective courses, shall enroll himself/herself for Diploma in

Marketing or Diploma in Banking as the case may be. He/She has to apply for Diploma in the prescribed form. The duration of the Diploma is of three years and can be completed along with with B. Com. degree. The medium of instruction and examination shall be English.

For successful completion of the Diploma -

1. A student has to complete all practicals in Semester I, II, III and IV while in Semester V and VI he/she has to complete project report under the supervision of the concerned subject teacher.
2. The evaluation of project and viva voce examination shall be done by marks only and then it will be converted into grade in the ten point scale and awarded the same to the student.
3. A student shall have to obtain minimum 40% marks in project evaluation and viva voce taken together.

After successful completion of the diploma course, separate Diploma will be conferred on the students in the convocation of the University.

● **Standard of Passing**

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, a student must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weightage for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

● **Formula to Calculate Grade Points (GP)**

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set $x = \text{Max} / 10$ (since we have adopted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} < 8x$	Truncate (Marks/x) +2
$4x \leq \text{Marks} < 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a student in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment to the course. The CGPA of learner when he/she completes the programme is the final result of the learner.

The SGPA is calculated by the formula $SGPA = \frac{\sum Ck \times GPk}{\sum Ck}$ where Ck is the credit-value assigned to a course and GPk is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. The SGPA shall be calculated up to two decimal place accuracy.

The CGPA is calculated by the formula $CGPA = \frac{\sum Ck \times GPk}{\sum Ck}$, where Ck is the credit-value assigned to a course and GPk is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment to the course and also during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. The CGPA shall be calculated up to two decimal place accuracy.

The Formula to compute equivalent percentage marks for specified CGPA

% Marks (CGPA) =	$10 \times CGPA - 10$	if $5.00 \leq CGPA \leq 6.00$
	$5 \times CGPA + 20$	if $6.00 \leq CGPA \leq 8.00$
	$10 \times CGPA - 20$	if $8.00 \leq CGPA \leq 9.00$
	$20 \times CGPA - 110$	if $9.00 \leq CGPA \leq 9.50$
	$40 \times CGPA - 300$	if $9.50 \leq CGPA \leq 10.00$

- **Award of Honours**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Equivalent Range of Marks (%)	Final Grade	Performance Descriptor	Final Class
$9.50 \leq \text{CGPA} \leq 10.00$	$80 \leq \text{Marks} \leq 100$	O	Outstanding	First Class with Distinction
$9.00 \leq \text{CGPA} \leq 9.49$	$70 \leq \text{Marks} < 80$	A+	Excellent	
$8.00 \leq \text{CGPA} \leq 8.99$	$60 \leq \text{Marks} < 70$	A	Very Good	First Class
$7.00 \leq \text{CGPA} \leq 7.99$	$55 \leq \text{Marks} < 60$	B+	Good	Higher Second Class
$6.00 \leq \text{CGPA} \leq 6.99$	$50 \leq \text{Marks} < 55$	B	Average	Second Class
$5.00 \leq \text{CGPA} \leq 5.99$	$40 \leq \text{Marks} < 50$	C	Satisfactory	Pass Class
CGPA Below 5.00	Marks Below 40	F	Fail	Fail

- **Gracing**

The gracing shall be done as per existing rules of the University.

- **Verification and Revaluation**

There is a provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

- **Rule for ATKT**

A candidate shall be permitted to proceed further from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidate should register for all the backlog subjects of earlier semesters along with current (subsequent) semester subjects. However, he/she should have clear all the papers at Semester I & II when he/she is admitted to Semester V.

- **Span Period to Qualify a Degree**

As per the guidelines issued by the University Grants Commission (UGC) on "Determination of Uniform Span Period within which a student may be allowed to Qualify for a Degree", a student has to qualify for a degree within the period prescribed by the UGC. If a student could not, he/she will be allowed two more years beyond the prescribed period.

In exceptional cases, further extension of one more year may be considered by the University. This is applicable to those students who will be admitted from the academic year 2016-17 onwards as per the Notification (No. 775 dated 14/12/2015) issued by Bharati Vidyapeeth University.

- **Format of the Transcript**

A student will be given a transcript indicating his/her performance at the end of every semester examination. The transcript shall be given as per the following table along with other necessary details.

5. : ELIGIBILITY FOR ADMISSION TO POST GRADUATE PROGRAMMES

Choice Based Credit System (CBCS) (2018 Course)

1. Eligibility for admission to M.A. (English) Course:

Any graduate of this University or any other recognized University shall be admitted to M.A. (English) Course.

2. Eligibility for admission to M.A. (Economics) Course:

Any graduate of this University or any other recognized University shall be admitted to B.A. (Economics) Course.

3. Eligibility for admission to M.Lib. & I.Sc Course:

Any graduate of this University or any other recognized University shall be admitted to B.A. (Economics) Course.

4. Eligibility for admission to M.Sc. (Chemistry) Course:

A student shall be eligible for admission to the First Year M.Sc (Analytical/Organic/Inorganic Chemistry) degree course who has completed B.Sc (Chemistry) graduation from any recognized university satisfying the following conditions. The candidate should have secured at least 50% (45% for SC/ST) in aggregate at graduate level university examination.

5. Eligibility for admission to M.Sc. (Microbiology) Course:

A candidate who has passed the

- Bachelor of Science from any recognized university with Microbiology as Principle subject (Major) or Microbiology (Honors).
- Bachelor of Science from any recognized university with Botany/Zoology/Biochemistry/Biotechnology/Environmental science as major subjects with Microbiology as subsidiary subject.
- Bachelor of Science from any recognized university with Microbiology as one of the subjects.
- The candidate who has secured aggregate of 50% marks (45 % marks in case of SC/ST) in the graduate course as well as in the Microbiology Subject shall be eligible for admission to the First Year M.Sc. degree course.

6. Eligibility for admission to M.Sc. (Computer Science) Course:

A student shall be eligible for admission to the First Year M.Sc. (Computer Science) degree course who has completed B.Sc.(Computer Science) / B.Sc(Computer application)/B.Sc.(IT)graduation from any recognized university satisfying the following conditions. The candidate should have secured at least 50% (45% for SC/ST) in aggregate at graduate level university examination.

7. Eligibility for admission to M.Com. Course:

A candidate who has passed the B. Com. or B.B.A. of this University or any other recognised university or any graduate of this or any other recognised university shall be permitted to take admission to the M. Com. degree course of this University.

6 : Course Structure (PG Programme)(CBCS 2018 COURSE)

6.1 : Master of Arts (M.A. English)

1. Course Structure of M.A. (English) Course:

The M.A. programme will be of two years duration consisting of four semesters and of minimum 70 Credits: Semester I (16 Credits), Semester II (18 Credits), Semester III (18 Credits), and Semester IV (18 Credits). In first three Semesters, there will be four theory papers of 04 credits each. In Fourth Semester, there will be three theory papers of 06 credits and one research project of 10 credits. All 16 papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. All Ability enhancement or skill enhancement courses will have 50 marks each, out of which 20 marks will be for continuous assessment and 30 marks for university examination. Thus M.A. English degree examination, four Semesters shall be of minimum 1700 marks and of minimum 70 credits altogether. The following shall be the course structure:

M.A. English: First Year The M.A. programme will be of two years duration consisting

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Compulsory	PGEN G 11	Literature in English from 1550 to 1832 – I	Core: Compulsory	PGENG 21	Literature in English from 1550 to 1832 – II
	PGEN G 12	Introduction to the Study of English Language – I		PGENG 22	Introduction to the Study of English Language – II
	PGEN G 13	English Language and Literature Teaching – I		PGENG 23	English Language and Literature Teaching – II
Core: Elective	Any one from the following:		Core: Elective	Any one from the following:	
	PGEN G 14	a) Postcolonial Literature – I		PGENG 24	a) Postcolonial Literature – II
	PGEN G 15	b) Linguistics and Stylistics – I		PGENG 25	b) Linguistics and Stylistics – II
	PGEN G 16	c) American Literature: 19th Century – I		PGENG 26	c) American Literature: 19th Century – II
	PGEN G 17	d) Indian Literature in English Translation – I		PGENG 27	d) Indian Literature in English Translation – II
			Ability Enhancement Course	PGAEC 11	English for Specific Purposes

Semester III			Semester IV		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Compulsory	PGEN G 31	Literature in English from 1832 to 1980 – I	Core: Compulsory	PGENG 41	Literature in English from 1832 to 1980 – II
	PGEN G 32	Contemporary Critical Thoughts – I		PGENG 42	Contemporary Critical Thoughts – II
	PGEN G 33	Research Methodology – I		PGENG 43	Research Methodology – II (Project Report)
Core: Elective	Any one from the following:		Core: Elective	Any one from the following:	
	PGEN G 34	a) Postcolonial Indian English Literature – I		PGENG 44	a) Postcolonial Indian English Literature – II
	PGEN G 35	b) Semantics and Pragmatics – I		PGENG 45	b) Semantics and Pragmatics – II
	PGEN G 36	c) Contemporary American Literature and Culture – I		PGENG 46	c) Contemporary American Literature and Culture – II
	PGEN G 37	d) World Classics in English Translation – I		PGENG 47	d) World Classics in English Translation – II
Skill Enhancement Course	PGSEC 31	Soft Skills			

2. Scheme of Examination:

The Assessment of Regular students of Master of Arts (M.A.) English course in the academic session 2018-19 and after, shall be based on

- University Examinations,
- Internal Assessment,
- Choice Based Credit System, and
- Semester Grade Point Average and Cumulative Grade Point Average system

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures atleast 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks which will be carried out by the department during the term. The Internal Assessment may be in the forms as follows: Attendance, Written tests, seminars, term papers, presentations, assignments, orals or any such others. There will be at least two types of assessments from the types given above.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A candidate shall be permitted to proceed from the First Semester up to Final Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

Research Project Work:

There will be a Research Project to be prepared by a student during the fourth semester. The objective of the project work is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational areas of the subject. The project work is to be undertaken under guidance of a teacher allotted to a student by the department.

Division of Marks

Synopsis with working bibliography (Internal Assessment)	: 40 Marks
A full Project Report (Minimum 50-80 pages) (University Assessment)	: 40 Marks
Viva Voce (University Assessment)	: 20 Marks

As the Research Project is based on the self study done by the candidate and evaluated for 100 marks altogether, 06 credits will be awarded to a successful candidate in this subject. The project may be evaluated by two examiners one internal and one external, selected from the panel of PG examiners of the University.

The candidate has to submit the project 15 days before the commencement of the fourth semester university examination. A candidate who fails to submit the project may resubmit the same in the subsequent semester examination for evaluation. The project work activities must be duly supported by documentary evidence to be endorsed by the Head or Guide.

3. Standard of Passing:

A candidate shall be declared to have passed in the paper provided he/she has secured minimum GP of 4.5 in the University Examination and a GPA of 4.0 in aggregate of University Examination and Internal Assessment taken together.

A student who passes in all the courses will be declared to have passed M.A. (English) with the following honours.

CGPA in [4.00, 4.99] -- Pass Class

CGPA in [5.00, 5.49] -- Second Class

CGPA in [5.50, 5.99] -- Higher Second Class

CGPA in [6.00, 7.99] -- First Class

CGPA in [8.00, 10.00] -- First Class with Distinction

4. Scheme of credits:

Four hours per week teaching in one semester will lead to four credits and research project will carry 06 credits.

5. Grade point scheme:

The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0,69.9]	A	8.0
[60.0,64.9]	B+	7.0
[55.0,59.9]	B	6.0
[50.0,54.9]	C+	5.5
[45.0,49.9]	C	5.0
[40.0,44.9]	D	4.5

GRACING:

The gracing shall be done as per existing rules of the University.

VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

6.1 : Master of Arts (M.A.) Economics (CBCS 2019 Course) **(Under : The Faculty of Arts, Social Sciences and Commerce)**

The M.A. Economics degree course provides an opportunity to acquire advanced knowledge in the main areas of Economics.

1. Course Structure of Objectives of the course:

The Post Graduate Degree Programm M.A. (Economics), provides an opportunity to acquire in-depth knowledge of advance economic theories with a view to develop analytical skills for applying these theories to current economic problems in India and abroad.

Eligibility for admission to M.A. (Economics) Course:

Any graduate of this university or any other recognized university shall be admitted to M.A. (Economics) Course. However, a student who has a degree other than Economics as a special subject shall have to clear the entrance test conducted by the department.

Medium of Instructions:

The medium of instructions of M.A. (Economics) Course will be in English only.

Course Structure of M.A. (Economics) Course:

The M.A. Economics course will be of two years duration consisting of two separate parts i.e. Part – I and Part – II. There will be four papers in each year i.e. Part – I and Part – II. All 08 papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. Skill and Ability Enhancement Courses having (50 + 50 = 100 marks) Thus M.A. Economics degree examination, Part – I and Part – II shall be of 900 marks. The following shall be the course structure:

M.A. Economics: Part – I

Code	Title of the paper	Maximum Marks		
		Internal Assessment	University Examination	Total
ECO 11	Micro Economic Analysis	40	60	100
ECO 12	Public Economics	40	60	100
ECO 13	Agricultural Economics	40	60	100
Any one from the following:				
ECO 14	a) Industrial Economics	40	60	100
ECO 15	b) Financial Institutions and Markets	40	60	100
Ability Enhancement Course	Fundamental of Investments (Semester II)	20	30	50

M.A. Economics: Part – II

Code	Title of the paper	Maximum Marks		
		Internal Assessment	University Examination	Total
ECO 21	Macro Economic Analysis	40	60	100
ECO 22	International Economics	40	60	100
ECO 23	Research Methodology	40	60	100
Any one from the following:				
ECO 24	a) Economics of Growth and Development	40	60	100
ECO 25	b) Demography	40	60	100
Skill Enhancement Course	Consumer Protection (Semester III)	20	30	50

(Note: Special paper for second year will be from the same group as chosen by the student in Part – I. In the column M. A. Economics Part I title of the papers are for the semester-I as well as for Semester II and at the same time in the column M. A. Economics Part II title of the papers are the same for the semester III and Semester IV)

1. Scheme of Examination:

The Assessment of Regular students of Master of Arts (M.A.) Economics course in the academic session 2019-20 and after, shall be based on

- (a) University Examinations,
- (b) Internal Assessment,
- (c) Choice Based Credit System, and
- (d) Semester Grade Point Average and Cumulative Grade Point Average system

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures at least 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks which will be carried out by the department during the term. The Internal Assessment may be in the forms as follows: Attendance, Written tests, seminars, term papers, presentations, assignments, orals or any such others. There will be at least two types of assessments from the types given above.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A candidate shall be permitted to proceed from the First Semester up to Final Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

Research Project Work :

There will be a Research Project to be prepared by a student during the fourth semester. The objective of the project work is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational areas of the subject. The project work is to be undertaken under guidance of a teacher allotted to a student by the department.

Division of Marks :

Synopsis with working bibliography (Internal Assessment)	:	40 Marks
A full Project Report (Minimum 50-80 pages)		
(University Assessment)	:	40 Marks
Viva Voce (University Assessment)	:	20 Marks

As the Research Project is based on the self study done by the candidate and evaluated for 100 marks altogether, 06 credits will be awarded to a successful candidate in this subject. The project may be evaluated by two examiners one internal and one external, selected from the panel of PG examiners of the University.

The candidate has to submit the project report before the deadline announced by the department. A candidate who fails to submit the project may resubmit the same in the subsequent semester examination for evaluation. The project work activities must be duly supported by documentary evidences to be endorsed by the Head or the Guide.

2. Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, a student must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

Even a student fails in IA, he/she shall be declared 'pass' in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the student passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

A candidate shall be permitted to proceed further from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the backlog subjects of earlier semesters along with current (subsequent) semester subjects.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

3. Formula to Calculate Grade Points (GP):

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set $x = Max/10$ (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} < 8x$	Truncate (Marks/x) +2
$4x \leq \text{Marks} < 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a student in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment to the course. The CGPA of a student when he/she completes the programme is the final result of the student.

The SGPA is calculated by the formula $SGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$, where C_k is the credit-value assigned to a course and GP_k is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. The SGPA shall be calculated up to two decimal place accuracy.

The CGPA is calculated by the formula $CGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$, where C_k is the credit-value assigned to a course and GP_k is the GPA obtained by the student in

the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment to the course and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. The CGPA shall be calculated up to two decimal place accuracy.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA) =	$10 \times \text{CGPA} - 10$	if $5.00 \leq \text{CGPA} \leq 6.00$
	$5 \times \text{CGPA} + 20$	if $6.00 \leq \text{CGPA} \leq 8.00$
	$10 \times \text{CGPA} - 20$	if $8.00 \leq \text{CGPA} \leq 9.00$
	$20 \times \text{CGPA} - 110$	if $9.00 \leq \text{CGPA} \leq 9.50$
	$40 \times \text{CGPA} - 300$	if $9.50 \leq \text{CGPA} \leq 10.00$

4. Award of honours:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} < 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} < 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} < 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} < 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} < 50$
CGPA Below 5.00	F	Fail	Mar

5. Gracing:

The gracing shall be done as per existing rules of the University.

6. Verification and Revaluation:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

6.3 Master of Library & Information Science (M.Lib & I.Sc.) (CBCS 2018 COURSE)

- 1. Eligibility for admission to M.Lib. & I.Sc. Course:** B.Lib. & I.Sc. degree of this University or any other recognized University shall be admitted to M.Lib & I.Sc. Course.

Course Structure of M.Lib & I.Sc. Course:

The M.Lib & I.Sc. programme will be of one years duration consisting of two semesters and of minimum 38 Credits: Semester I (20 Credits) and Semester II (18 Credits). In first Semester, there will be four theory papers of 04 credits each and two theory paper of 2 credit. In Second Semester, there will be four theory papers of 04 credits and one practical paer of 2 credits. All 10 papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. Thus B.Lib & I.Sc. degree examination, two Semesters shall be of minimum 1050 marks and of minimum 36 credits altogether. The following shall be the course structure:

Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Compulsory	ML 11	Information Communication and Society	Core: Compulsory	ML 21	Research Methods and statistical Techniques
	ML 12	Information Sources Services & System		ML 22	Applications of Information Technologies in LIS Theory
	ML 13	Management of libraries and Information Centers		ML 23	Information Processing and Retrieval
	ML 14	Academic and Public Library Systems		ML 24	Applications of Information Technologies in LIS:Practical
Core: Elective	Any one from the following:		Core: Elective	Any one from the following:	
	ML 15	Technical Writing Development		ML 25	Library and Users
	ML 16	Multimedia Application Development		ML 26	Social Science Information System
	ML 17	Information Analysis, Repackaging and Consolidation			
Skill Enhancement Course	ML 18	Use of of Social Media in LIS			

5. Scheme of Examination

The Assessment of Regular students of Master of Library & Information Science (M.Lib & I.Sc.) course in the academic session 2018-19 and after, shall be based on

- (a) University Examinations,
- (b) Internal Assessment,
- (c) Choice Based Credit System, and
- (d) Semester Grade Point Average and Cumulative Grade Point Average system

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures atleast 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks which will be carried out by the department during the term. The Internal Assessment may be in the forms as follows: Attendance, Written tests, seminars, term papers, presentations, assignments, orals or any such others. There will be at least two types of assessments from the types given above.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average(SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A candidate shall be permitted to proceed from the First Semester up to Final Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

6. Standard of Passing

A candidate shall be declared to have passed in the paper provided he/she has secured minimum GP of 4.5 in the University Examination and a GPA of 4.0 in aggregate of University Examination and Internal Assessment taken together.

A student who passes in all the courses will be declared to have passed M.Lib & I.Sc. with the following honours.

- CGPA in [4.00, 4.99] -- Pass Class
- CGPA in [5.00, 5.49] -- Second Class
- CGPA in [5.50, 5.99] -- Higher Second Class
- CGPA in [6.00, 7.99] -- First Class
- CGPA in [8.00, 10.00] -- First Class with Distinction

7. Scheme of credits

Four hours per week teaching in one semester will lead to four credits and project will carry 02 credits.

8. Grade point scheme

The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0, 69.9]	A	8.0
[60.0, 64.9]	B+	7.0
[55.0, 59.9]	B	6.0
[50.0, 54.9]	C+	5.5
[45.0, 49.9]	C	5.0
[40.0, 44.9]	D	4.5

At the end of each semester, student will be given a transcript showing the performance and result in each course. The transcript shows, for each course the title of the course, credit values, grade in UE, grade in IA, Grade point index, result as pass or fail. Also, the Semester grade point average and cumulative grade point average will be shown. Further, the equivalent percentage of marks corresponding to

SGPA and CGPA will be shown. The formula to convert SGPA or CGPA to equivalent percentage is given by:

$$10 \times \text{CGPA} \text{ if CGPA/SGPA is in } [4.00, 6.00]$$

$$\text{Equivalent percentage marks} = 05 \times \text{CGPA} + 30 \text{ if CGPA/SGPA is in } [6.00, 9.00]$$

$$25 \times \text{CGPA} - 150 \text{ if CGPA/SGPA is in } [9.00, 10.00]$$

The above formula computes to the following table:-

Range in % of marks	Range of CGPA	Letter grade	Division
[75.0, 100]	[9.00, 10.00]	O	First class with Distinction
[70.0, 74.9]	[8.00, 8.99]	A+	
[65.0, 69.9]	[7.00, 7.99]	A	First class
[60.0, 64.9]	[6.00, 6.99]	B+	
[55.0, 59.9]	[5.50, 5.99]	B	Higher second class
[50.0, 54.9]	[5.00, 5.49]	C+	Second class
[45.0, 49.9]	[4.50, 4.99]	C	Pass class
[40.0, 44.9]	[4.00, 4.49]	D	
[00.0, 39.9]	[0.00, 3.99]	F	Fail

Thus, the percentage of marks can be obtained by using the following table:

CGPA	% of Marks	CGPA	% of Marks	CGPA	% of Marks	CGPA	% of Marks
4.0	40.0	5.5	55.0	7.0	65.0	8.5	72.5
4.1	41.0	5.6	56.0	7.1	65.5	8.6	73.0
4.2	42.0	5.7	57.0	7.2	66.0	8.7	73.5
4.3	43.0	5.8	58.0	7.3	66.5	8.8	74.0
4.4	44.0	5.9	59.0	7.4	67.0	8.9	74.5
4.5	45.0	6.0	60.0	7.5	67.5	9.0	75.0
4.6	46.0	6.1	60.5	7.6	68.0	9.1	77.5
4.7	47.0	6.2	61.0	7.7	68.5	9.2	80.0
4.8	48.0	6.3	61.5	7.8	69.0	9.3	82.5
4.9	49.0	6.4	62.0	7.9	69.5	9.4	85.0
5.0	50.0	6.5	62.5	8.0	70.0	9.5	87.5
5.1	51.0	6.6	63.0	8.1	70.5	9.6	90.0
5.2	52.0	6.7	63.5	8.2	71.0	9.7	92.5
5.3	53.0	6.8	64.0	8.3	71.5	9.8	95.0
5.4	54.0	6.9	64.5	8.4	72.0	9.9	97.5
						10.0	100.0

GRACING

The gracing shall be done as per existing rules of the University.

VERIFICATION AND REVALUATION

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

FORMAT OF THE TRANSCRIPT

The student will be given a transcript indicating his/her performance at the end of every semester examination. The transcript shall be given as per the following table along with other necessary details:

Course No.	Course Name	No. of Credits	University Examination		Internal Assessment		Grade Point Average	Result
			Grade	Grade Point	Grade	Grade Point		
1								
2								
3								
4								
5								
6								
Total Cumulative Credits Completed			SGPA		CGPA		Equivalent Marks (%)	

Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be the GPA.

6.4 : Master of Science (Analytical/Organic/Inorganic Chemistry)

1. INTRODUCTION

The Master of Science (Analytical/Organic/Inorganic Chemistry), program is a full time 84 Credits program offered by BharatiVidyapeeth Deemed University, Pune.

2. GENERAL OBJECTIVES OF THE COURSE:

Chemistry is a pervasive subject. All the branches of science need chemistry. It is an experimental science and students need to train in practicals to get expertise in doing fine experiments and handle sophisticated instruments. Along with the data obtained its statistical analysis is also required to establish authenticity in the fields like environmental science, space chemistry and biotechnology. There are immense potentialities for chemistry and post graduates to undertake advanced research or in Industries as skilled chemists.

GOAL OF THE SYLLABUS: To impart the thorough knowledge of Chemistry, capability of self thinking, self study, identifying the problems and develop the problem solving attitude. To make the student globally competent.

3. ELIGIBILITY FOR ADMISSION TO THIS COURSE

A student shall be eligible for admission to the First Year M.Sc (Analytical/Organic/Inorganic Chemistry) degree course who has completed B.Sc (Chemistry) graduation from any recognized university satisfying the following conditions. The candidate should have secured at least 50% (45% for SC/ST) in aggregate at graduate level university examination.

4. COURSE STRUCTURE

- 1) The M.Sc. (Chemistry) course will be of four semesters and with a minimum of 84 credits. The medium of instruction and examination will be on English.
- 2) Credits for Semester I-12 Credits, Semester II -30 Credits, Semester III- 18 Credits and Semester IV- 24 Credits.
- 3) The assessment of 1 credit at Semester IV of M.Sc.(Chemistry) that is for Industrial Training programme will be carried out as follows :-

- i) A student will inform the department about the joining date of the above mentioned training.
 - ii) The student will have to make presentation at the end of the programme and the student will have to submit a compiled report which will be assessed towards course credit as Internal Assessment Marks for Core Elective subject.
- 4) Each theory course prescribed for M. Sc. should be covered in 4 hours, each of 60 minutes duration per week per course
 - 5) Each practical course will require 4 hours of laboratory work per week and the course will be extended over two semesters and will be examined at the end of the academic year.
 - 6) For theory course the question paper should include at least 20 % weightage for problem solving. Problem solving would include numerical problems and may be objective type questions.
 - 7) Thus M.Sc (Analytical/Organic/Inorganic Chemistry) degree examination has four semesters and shall be of 2100 marks and of minimum 84 credits altogether. The following shall be the course structure:

M.Sc. (Analytical Chemistry): SEMESTER – I

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH-101	Physical Chemistry- I	04	04	03	40	60	100
		PGCH-102	Inorganic Chemistry-I	04	04	03	40	60	100
		PGCH-103	Organic Chemistry-I	04	04	03	40	60	100

SEMESTER – II

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam. Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester II	Core: Compulsory	PGCH - 201	Physical Chemistry- II	04	04	03	40	60	100
		PGCH - 202	Inorganic Chemistry-II	04	04	03	40	60	100
		PGCH - 203	Organic Chemistry-II	04	04	03	40	60	100
		PGCH - 204	Fundamentals of analytical Chemistry	04	04	03	40	60	100
		PGCH - 205	Physical Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 206	Inorganic Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 207	Organic Chemistry practical*	04	02+02	06	40	60	100
	Ability Enhancement Course	PGCH - 208	Scientific Writing	02	02	02	20	30	50

SEMESTER – III

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam. Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester III	Core: Compulsory	PGAC 301	Thermal, Radio and Electro-analytical methods	04	04	03	40	60	100
		PGAC 302	Modern Aspects of Analytical Chemistry	04	04	03	40	60	100
		PGAC 303	Recent Analytical Techniques	04	04	03	40	60	100
		PGAC 304	Analysis of Pharmaceuticals	04	04	03	40	60	100
		PGAC 305	Assessment of Water Quality	02	02	02	20	30	50

SEMESTER – IV

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam . Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester IV	Core: Compulsory	PGAC 401	Advanced Analytical Techniques	04	04	03	40	60	100
		PGAC 402	Recent Separation Techniques	04	04	03	40	60	100
Any one from the following: From PGAC-403 to PGAC-405									
Semester IV	Core: Elective#	PGAC 403	Environmental Analysis	04	3+1	03	40	60	100
		PGAC 404	Computer Interface with Chemistry	04	3+1	03	40	60	100
		PGAC 405	Modern Methods of Analysis	04	3+1	03	40	60	100
	Core: Compulsory	PGAC 406	Practical Course -I*	02	2+2	06	40	60	100
		PGAC 407	Practical Course -II*	02	2+2	06	40	60	100
		PGAC 408	Practical Course –III * OR Project Work*	02	2+2	06	40	60	100

* Examination for practical courses will be conducted at the end of academic year.

Core Elective Course includes Core: Elective subjects and Industrial project. Industrial Project includes one day visit, Internet survey, project writing, presentation or oral and be evaluated as the internal marks for Core: Elective Course (PGAC-403, PGAC-404, PGAC-405).

M.Sc. (Organic Chemistry): SEMESTER – I

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH - 101	Physical Chemistry- I	04	04	03	40	60	100
		PGCH - 102	Inorganic Chemistry-I	04	04	03	40	60	100
		PGCH - 103	Organic Chemistry-I	04	04	03	40	60	100

SEMESTER – II

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam. Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH - 201	Physical Chemistry- II	04	04	03	40	60	100
		PGCH - 202	Inorganic Chemistry-II	04	04	03	40	60	100
		PGCH - 203	Organic Chemistry-II	04	04	03	40	60	100
		PGCH - 204	Fundamentals of analytical Chemistry	04	04	03	40	60	100
		PGCH - 205	Physical Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 206	Inorganic Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 207	Organic Chemistry practical*	04	02+02	06	40	60	100
	Ability Enhancement Course	PGAE C- 208	Scientific Writing	02	02	02	20	30	50

SEMESTER – III

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester III	Core: Compulsory	PGOC 301	Advanced Organic Reaction Mechanism	04	04	03	40	60	100
		PGOC 302	Spectroscopic Methods In Structure Determination	04	04	03	40	60	100
		PGOC 303	Advanced Stereochemistry	04	04	03	40	60	100
		PGOC 304	Medicinal Chemistry	04	04	03	40	60	100
	Skill Enhancement Course	PGSEC 305	Assessment of Water Quality	02	02	02	20	30	50

SEMESTER – IV

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam . Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester IV	Core: Compulsory	PGOC - 401	Synthetic Organic Chemistry	04	04	03	40	60	100
		PGOC - 402	Chemistry Of Natural Products	04	04	03	40	60	100
Any one from the following: From PGAC-403 to PGAC-405									
Semester IV	Core: Elective#	PGOC - 403	Green Chemistry	04	04	3+1	40	60	100
		PGOC - 404	Applied Organic Chemistry	04	04	3+1	40	60	100
		PGOC - 405	Bio-Organic Chemistry	04	04	3+1	40	60	100
	Core: Compulsory	PGOC - 406	Mixture Separation*	02	2+2	06	40	60	100
		PGOC - 407	Advanced Preparations*	02	2+2	06	40	60	100
		PGOC - 408	Research Project / Laboratory Course*	02	2+2	06	40	60	100

* Examination for practical courses will be conducted at the end of academic year.

Core Elective Course includes Core: Elective subjects and Industrial project. Industrial Project includes one day visit, Internet survey, project writing, presentation or oral and be evaluated as the internal marks for Core: Elective Course (PGOC-403, PGOC-404, PGOC-405).

M.Sc. (Inorganic Chemistry): SEMESTER – I

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH - 101	Physical Chemistry- I	04	04	03	40	60	100
		PGCH - 102	Inorganic Chemistry-I	04	04	03	40	60	100
		PGCH - 103	Organic Chemistry-I	04	04	03	40	60	100

SEMESTER – II

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam. Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH - 201	Physical Chemistry- II	04	04	03	40	60	100
		PGCH - 202	Inorganic Chemistry-II	04	04	03	40	60	100
		PGCH - 203	Organic Chemistry-II	04	04	03	40	60	100
		PGCH - 204	Fundamentals of analytical Chemistry	04	04	03	40	60	100
		PGCH - 205	Physical Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 206	Inorganic Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 207	Organic Chemistry practical*	04	02+02	06	40	60	100
	Ability Enhancement Course	PGAE C- 208	Scientific Writing	02	02	02	20	30	50

SEMESTER – III

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester III	Core: Compulsory	PGIC-301	Advanced Coordination Chemistry	04	04	03	40	60	100
		PGIC-302	Bioinorganic Chemistry and Heterogeneous Catalysis	04	04	03	40	60	100
		PGIC-303	Inorganic Solid State Chemistry and Inorganic Polymer Chemistry	04	04	03	40	60	100
		PGIC-304	Inorganic Analytical Chemistry	04	04	03	40	60	100
	Skill Enhancement Course	PGSEC 305	Assessment of Water Quality	02	02	03	20	30	50

SEMESTER – IV

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester IV	Core: Compulsory	PGIC-401	Organometallic Chemistry	04	04	03	40	60	100
		PGIC-402	Material Chemistry and Nanoscience and Nanotechnology Related to Inorganic Systems	04	04	03	40	60	100
Any one from the following: From PGAC-403 to PGAC-405									
Semester IV	Core: Elective#	PGIC - 403	Modern Instrumental Techniques for Inorganic Analysis	04	3+1	03	40	60	100
		PGIC - 404	Inorganic Pharmaceutical Chemistry	04	3+1	03	40	60	100
		PGIC - 405	Applications of Inorganic Chemistry in Agriculture, Environmental Science and Space Science	04	3+1	03	40	60	100
	Core: Compulsory	PGIC - 406	Practical Course-I*	02	2+2	06	40	60	100
		PGIC - 407	Practical Course-II*	02	2+2	06	40	60	100
		PGIC - 408	Research Project OR Practical Course-III*	02	2+2	06	40	60	100

* Examination for practical courses will be conducted at the end of academic year.

Core Elective Course includes Core: Elective subjects and Industrial project. Industrial Project includes one day visit, Internet survey, project writing, presentation or oral and be evaluated as the internal marks for Core: Elective Course (PGOC-403, PGOC-404, PGOC-405).

5. SCHEME OF CREDITS:

The M.Sc (Analytical/Organic/Inorganic Chemistry) is of 84 credits. The distribution of credits over semesters is given below.

Course Type	Credits	SEM-I	SEM - II	SEM – III	SEM-IV	Total	Examination
		L(pw) 60Hrs	L(pw) 60Hrs	L(pw) 60Hrs	L(pw) 60Hrs	Credits 60Hrs	
Core Compulsory Theory	4	4 60Hrs	4 60Hrs	4 60Hrs	4 60Hrs	16C 240Hrs	University
Core Compulsory Theory	4	4 60Hrs	4 60Hrs	4 60Hrs	4 60Hrs	16C 240Hrs	University
Core Compulsory Theory	4	4 60Hrs	4 60Hrs	4 60Hrs	-	12C 180Hrs	University
Core Compulsory Theory	4	-	4 60Hrs	4 60Hrs	-	8C 120Hrs	University
Core: Elective Theory	3	-	-	-	3 45Hrs	3C 45Hrs	University
Industrial Project	1	-	-	-	1 15Hrs	1C 15Hrs	University
Ability Enhancement Course	2	-	2 30Hrs	-	-	2C 30Hrs	University
Skill Enhancement Course	2	-	-	2 30Hrs	-	2C 30Hrs	University
Physical Chemistry Practical	2+2	-2 60Hrs	2 30Hrs	-	-	4C 60Hrs	University
Inorganic Chemistry Practical	2+2	-2 60Hrs	2 30Hrs	-	-	4C 60Hrs	University
Organic Chemistry Practical	2+2	-2 60Hrs	2 30Hrs	-	-	4C 60Hrs	University
Practical Course –I	2+2	-	-	2 30Hrs	2 30Hrs	4C 60Hrs	University
Practical Course –II	2+2	-	-	2 30Hrs	2 30Hrs	4C 60Hrs	University
Practical Course-III OR Project Work	2+2	-	-	2 30Hrs	2 30Hrs	4C 60Hrs	University

Total Required Credits:

Semester	Core Courses	Elective Course	SEC / AECC	Total
I	12	----	----	12
II	28	----	02	30
III	16	----	02	18
IV	20	04	----	24
Grand Total	76	04	04	84

6. MEDIUM OF INSTRUCTION:

The medium of instruction and examination shall be English.

7. UNIVERSITY TERMS:

The dates for the commencement and conclusion of the First and the Second terms shall be fixed by the University authorities. The terms can be kept by students, who have registered their names with the University.

8. SCHEME OF EXAMINATION:

The Assessment of Regular students of Master of Science (M.Sc.) course in the academic session 2018-19 and thereafter shall be based on

- (a) University Examinations (UE),
- (b) Continuous Internal Assessment (IA),
- (c) Choice Based Credit System (CBCS), and
- (d) Semester Grade Point Average (SGPA) and Cumulative Grade Point Average system (CGPA)

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures atleast 40% of

marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks which will be carried out by the department during the term. The Internal Assessment may be in the forms as follows: Attendance, Written tests, seminars, term papers, presentations, assignments, orals or any such others. There will be at least two types of assessments from the types given above.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A candidate shall be permitted to proceed from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

9. Research Project Work:

There will be a Research Project optional for practical course –III to be prepared by a student. The objective of the project work is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational areas of the subject. The project work is to be undertaken under guidance of a teacher allotted to a student by the department.

Division of Marks

Internal Assessment :40 Marks

A full Project Report&Viva Voce (University Assessment) : 60 Marks

As the Research Project is based on the self study done by the candidate and evaluated for 100 marks altogether, 04 credits will be awarded to a successful candidate in this subject. The project may be evaluated by three examiners one internal and two external, selected from the panel of PG examiners of the University.

The candidate has to submit the project report before the deadline announced by the department. A candidate who fails to submit the project may resubmit the

same in the subsequent semester examination for evaluation. The project work activities must be duly supported by documentary evidences to be endorsed by the Head or the Guide.

10. STANDARD OF PASSING:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, a student must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

Even a student fails in IA, he/she shall be declared 'pass' in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the student passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weighteg for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA

FORMULA TO CALCULATE GRADE POINTS (GP):

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set $x = \text{Max} / 10$ (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} < 8x$	Truncate (Marks/x) +2
$4x \leq \text{Marks} < 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a student in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment to the course. The CGPA of learner when he/she completes the programme is the final result of the learner.

The SGPA is calculated by the formula $SGPA = \frac{\sum Ck \times GPk}{\sum Ck}$ where Ck is the credit-value assigned to a course and GPk is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. The SGPA shall be calculated up to two decimal place accuracy.

The CGPA is calculated by the formula $CGPA = \frac{\sum Ck \times GPk}{\sum Ck}$ where Ck is the credit-value assigned to a course and GPk is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment to the course and also during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. The CGPA shall be calculated up to two decimals place accuracy.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA) =	$10 \times \text{CGPA} - 10$	if $5.00 \leq \text{CGPA} \leq 6.00$
	$5 \times \text{CGPA} + 20$	if $6.00 \leq \text{CGPA} \leq 8.00$
	$10 \times \text{CGPA} - 20$	if $8.00 \leq \text{CGPA} \leq 9.00$
	$20 \times \text{CGPA} - 110$	if $9.00 \leq \text{CGPA} \leq 9.50$
	$40 \times \text{CGPA} - 300$	if $9.50 \leq \text{CGPA} \leq 10.00$

11. AWARD OF HONOURS:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} < 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} < 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} < 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} < 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} < 50$
CGPA Below 5.00	F	Fail	Marks Below 40

A candidate shall be permitted to proceed further from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the backlog subjects of earlier semesters along with current (subsequent) semester subjects.

12. GRACING:

The gracing shall be done as per existing rules of the University.

13. VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

14. FORMAT OF THE TRANSCRIPT:

The student will be given a transcript indicating his/her performance at the end of every semester examination. The transcript shall be given as per the following table along with other necessary details:

Course No.	Course Name	No.of Credits	University Examination		Internal Assessment		Grade Point Average	Result
			Grade	Grade Point	Grade	Grade Point		
1								
2								
3								
4								
5								
Total Cumulative Credits Completed			SGPA		CGPA		Equivalent Marks (%)	

Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be the GPA.

6.5 : Master of Science (M.Sc. Microbiology)

1. Structure of M.Sc. (Microbiology) CBCS degree program

The overall structure of the course to be implemented from the academic year 2018-2019 onwards is as follows.

- A. The M.Sc. (Microbiology) course will be of 2 years duration. Each year will be of 2 semesters - Thus the entire course will be of 4 semesters.
- B. First, Second and Fourth semester will comprise of four theory and two practical courses each.
- C. Third semester will be totally for Internship (Major project).
- D. Entire M.Sc. course in Microbiology shall be covered in 14 theory papers including 'Ability enhancement course' and 'Skill enhancement course', 6 practical courses, and an Internship (major project with Dissertation). Each theory paper will be covered in 4 lectures of one hour per week. Each practical course shall be covered in two practical turns of three clock hours per week. Thus, the students will work for each practical on two days of the week, daily for minimum six hrs. Students will be given eight hrs in a week for library work.
- E. Students will have to complete an Internship program (Major project with dissertation) so as to learn research methodology and presentation of work. The Internship (major project with dissertation) shall carry 200 marks. The students will work for their projects, complete the experimental work in third semester, and complete the writing part of the project during the winter break. Minimum number of students participating in a project will be two and maximum number of students would be four. The assessment of the project will be at beginning of the fourth semester which includes the presentation and viva-voce by external and internal examiner

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
THEORY : Core Compulsory	PGMB101	Biochemistry	Core: Compulsory	PGMB201	Fermentor Design and Microbial Biotechnology
	PGMB102	Immunology		PGMB202	Analytical Techniques
	PGMB103	Genetics and Molecular Biology		PGMB203	Quantitative Biology
Core Elective	Any one from the following:		Core Elective	Any one from the following:	
	PGMB104	Microbial Ecology		PGMB204	Microbial Metabolism
	PGMB105	Environmental Microbiology		PGMB205	Physiology and Metabolism
Practical Course	PGMB111	Practical course 1	Practical Course	PGMB211	Practical course 3
	PGMB112	Practical course 2		PGMB212	Practical course 4
			Ability Enhancement Course	PGAEC201	Scientific Writing

SEMESTER-III

Subject Type	Code	Title of the paper
Core: Compulsory	PGMB 304	Internship (major project).
	PGMB305	Internship (major project).

SEMESTER-IV

Subject Type	Code	Title of the paper
Core: Compulsory	PGMB 401	Virology
	PGMB 402	Medical Microbiology
	PGMB 403	Food and Dairy Microbiology
Core: Elective	Any one from the following:	
	PGMB 404	Advanced Biotechnology
	PGMB 405	Advanced Analytical Techniques
Practical Course	PGMB 411	Practical course 5
	PGMB 412	Practical course 6
Skill Enhancement Course	PGSEC 401	Exploring Microbial Diversity

2. Rules for the examination: -

- A. A candidate shall not be admitted to the semester examination unless he / she has satisfactorily kept terms for the courses at the respective department of this university.
- B. An application (which must be in the prescribed form and accompanied by the prescribed fee) for admission to any of the examination of M.Sc. (Microbiology Degree course shall be submitted by a candidate to the Registrar through the Head of the Institution attended by him / her on or before the prescribed date along with a certificate from the Head of the Institution having attended the course and kept the terms in the various subjects and of having satisfied the other conditions laid down by the university and of being fit candidate for the examination.
- C. Assessment pattern

a. **Continuous Internal Assessment :**

Theory: Three Tutorials will be conducted through out the semester for each theory course and marks out of 40 per course will be submitted to the university as Internal marks.

Practical: Internal marks for the practical course will be based on the continuous assessment of the daily work, orals, seminars/presentations; Tour/visit reports, class tests, literature review and attendance(Any two). Students will be assessed for 40 marks for each practical course.

b. **Annual Examination :**

Theory: An University examination will be held at the end of every semester. This Examination in each subject will be of 60 marks for three hours duration

The final result of the students in each subject will be based on Final GPA obtained by the students for the internal assessment and University Examination.

Practical: There shall be Annual practical examination of 60 marks at the end of 2nd and 4th Semester.

The practical examination for the courses PGMB 111, PGMB 112, PGMB 211, and PGMB 212 will be conducted at the end of second semester. Practical examination for courses PGMB 411 and PGMB 412 will be conducted at the end of fourth semester. Practical courses PGMB 311 PGMB 312 are allotted for Internship. The assessment for the said courses will be as follows.

Project Work: Students have to undertake a major project so as to learn research methodology and presentation of work. The project shall carry 200 marks which will be allotted as follows:

Project experimental work (140 marks)

Assessment by the external examiner : 70 marks

Assessment by the project guide : 70 marks

Presentation of the project (40 marks)

Assessment by the external examiner : 20 marks

Assessment by the guide – (day to day) : 20 marks

Two seminars presentations (20 marks) : (10 marks per seminar)

Seminars in the third semester on the project work

The assessment for the said courses will be conducted at the beginning of the fourth semester.

The student will be assessed on the basis of following criteria for 140 marks.

- (i) Choice of the topic selected for the project.
- (ii) Aims and objectives of the project.
- (iii) Updated literature survey.
- (iv) Novel and other applications of the project (can a patent be filed on further work).Materials and methodology used.
- (v) Out come and Achievements of the project.
- (vi) Conclusion.
- (vii) Presentation of the project. (methodology of presentation)

Award of the Grade will be based on the following criteria.

c. Rules regarding ATKT to second year M.Sc. Microbiology course.

A student will be allowed to keep terms at the second year of the M.Sc. course if her / his terms for the first year have been granted.

d. Standard of passing :

- i. The candidate who has obtained at least D grade shall be declared to have passed in the said course.
- ii. The candidate who has not secured C grade in a particular paper in the University Examination will have to secure at least C grade in the subsequent examination in the particular paper.:

A) The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:-

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0,67.9]	A	8.0
[60.0,64.9]	B+	7.0
[55.0,59.9]	B	6.0
[50.0,54.9]	C+	5.5
[45.0,49.9]	C	5.0
[40.0,44.9]	D	4.5
[00.0, 39.9]	F	0.0

(B) For courses which have both University Examination (UE) and Internal Assessment(IA):

In order to pass in a course, the student must obtain a minimum of 'D' grade at the UE and a GPI of 4.0 in aggregate of UE and IA. There is no separate passing in IA. The GPI is calculated only if the student passes at UE by combining percentage marks at UE and IA with weights 0.6 and 0.4 respectively. A student who fails has to clear the course by appearing at UE only as a back-log candidate.

(C) For courses which have no University Examination:

There are some courses, the General courses, for which there is no UE. The respective institutes conduct 'continuous assessment' and EoTE(End of term examination).For such courses the computation of GPI, passing criteria, and back-log clearing rules are as in (B) above.

(D) At the end of each semester, a cumulative grade point average (CGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

(E) A student who passes in all the courses will be declared to have passed the entire M.Sc (Microbiology) with the following honours.

CGPI in [4.00, 4.99] -- Pass Class

CGPI in [5.00, 5.49] -- Second Class

CGPI in [5.50, 5.99] -- Higher Second Class

CGPI in [6.00, 6.99] -- First Class

CGPI in [7.00, 10.00] -- Distinction.

(F) PROMOTION RULES:

A student will be allowed to keep all terms for the duration of the programme.

(G) Continuous Assessment (CA)

40% marks of the course towards CA will be based on tests (Minimum 2). In addition, a teacher may consider one or more of the following evaluation systems:-

i) Seminar /presentation by the student

ii) Assignment by the student

Each theory paper is of 60 marks and internal paper is for 40 marks.

Each practical examination for lab course is of 60 marks and four hour duration for three consecutive days.. The project courses in Semester III will be evaluated for 200 marks for the allotted credits by a panel consisting of one internal and one external examiner.

6.6 : Master of Computer Science (M.Sc. Computer Science)

1. Course Structure

The M.Sc. (Computer Science) course will be two year full time course consisting of minimum four semesters and with a minimum of 94 credits. The medium of instruction and examination will be only English. The credit allotment for M.Sc.(Computer Science) course : Semester I (24 Credits), Semester II (26Credits), Semester III (26 Credits), and Semester IV (18 Credits). In each Semester, there will be four papers(three core compulsory and one core elective) of 100 marks each, two Laboratory course and minor project for each Semester of 100 marks each, out of which 40 marks will be for internal assessment and 60 marks for university examination. Fourth semester is internship for 200 marks. Thus M.Sc.(Computer Science) degree examination, four semesters shall be 2400 marks and of minimum 94credits altogether . The following shall be the course structure:

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Compulsory	PGCS-101	Algorithm Design Patterns	Core: Compulsory	PGCS-201	Software Project Management
	PGCS-102	Paradigm of programming Languages		PGCS-202	Cloud Computing
	PGCS-103	Advanced Database Concepts		PGCS-203	Java Application Programming
	PGCS-MI	Minor Project –I		PGCS-MII	Minor Project -II
Core: Elective	Any one from the following:		Core: Elective	Any one from the following:	
	PGCS-104	Parallel Processing		PGCS-204	Network Security
	PGCS-105	Theory of Automata		PGCS-205	Embedded Computing
	PGCS-106	Digital Image Processing		PGCS-206	Data Mining

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Elective : Practical's	Any two from the following:		Elective : Practical's	Any two from the following:	
	PGCS-107	Lab Course –I		PGCS-207	Lab Course –IV
	PGCS-108	Lab Course –II		PGCS-208	Lab Course –V
	PGCS-109	Lab Course –III		PGCS-209	Lab Course –VI
			Ability Enhancement Course	PGAEC 11	Soft Skills

SEMESTER III

Semester	Subject Type	Code	Title of the paper	
Semester III	Core:Compulsory	PGCS-301	Artificial Intelligence	
		PGCS-302	Mobile Technologies	
		PGCS-303	.Net Technologies	
		PGCS-MIII	Minor Project –III	
	Core: Elective	Any one from the following:		
		PGCS-304	Software Architecture	
		PGCS-305	Software Testing	
	Elective Practical's	PGCS-306	Advanced Operating System	
		Any two from the following:		
		PGCS-307	Lab Course –VII	
		PGCS-308	Lab Course –VIII	
		Skill Enhancement Course	PGSEC 31	Android Programming

SEMESTER IV

Semester	Course Number	Course Title
Semester IV	PGCS-401	Internship

5. Scheme of Examination:

In order to pass in a course, the student must obtain a minimum of 'D' grade at the UE and a GPI of 4.5 in aggregate of University Examination and Internal Assessment .For each paper of 100 marks , there will be internal assessment of 40 marks and the university examination of 60 marks for 3 hours duration.

The Internal Assessment (IA) of each course will be for 40 marks and conducted by the college during the term. The assessment may be based on evaluations of the following: Written tests, seminar/presentation by the student, assignment, orals or any other. Hence there must be at least two evaluations of different kind.

Each practical examination for laboratory course is of 100 marks and three hours duration. The minor projects in Semesters I ,II and III will be evaluated for 100 marks for the allotted credits by a panel consisting of one internal and one external examiner .For both laboratory course and minor project , there will be internal assessment of 40 marks and the university examination of 60 marks.

A candidate shall be permitted to proceed from the first semester upto final semester irrespective of their failure in any of the semester examinations subject to the condition that the candidate should register for all the arrear subjects of earlier semesters along with current(subsequent)semester subjects.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A student who passes in all the courses will be declared to have passed the entire M.Sc (Computer Science) with the following honours.

CGPA in [4.00, 4.99]	-- Pass Class
CGPA in [5.00, 5.49]	-- Second Class
CGPA in [5.50, 5.99]	-- Higher Second Class
CGPA in [6.00, 7.99]	-- First Class
CGPA in [8.00, 10.00]	– First Class with Distinction

6. STANDARD OF PASSING:

A candidate shall be declared to have passed in the paper provided he/she has secured minimum GP of 4.5 in the University Examination and a GPA of 4.0 in aggregate of University Examination and Internal Assessment taken together.

A student who passes in all the courses will be declared to have passed M.Sc (Computer Science) with the following honours.

CGPA in [4.00, 4.99]	-- Pass Class
CGPA in [5.00, 5.49]	-- Second Class
CGPA in [5.50, 5.99]	-- Higher Second Class
CGPA in [6.00, 7.99]	-- First Class
CGPA in [8.00, 10.00]	-- First Class with Distinction

7. Scheme of credits:

The M.Sc(Comp.Sci) is of 94credits. The distribution of credits over semesters is given below.

Semester	Total credits
SEM I	24
SEM II	26
SEM III	26
SEM IV	18
Total	94

4 Credits	:	4 lectures per week
2 Credits	:	4 hours practical per week

8. Grade point scheme:

The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0,69.9]	A	8.0
[60.0,64.9]	B+	7.0
[55.0,59.9]	B	6.0
[50.0,54.9]	C+	5.5
[45.0,49.9]	C	5.0
[40.0,44.9]	D	4.5

9. GRACING:

The gracing shall be done as per existing rules of the University.

10. VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

6.7 : Master of Commerce (M. Com.) (CBCS 2018 Course)

1. Course Structure:

The M. Com. degree course will be of two year duration consisting of four semesters and of minimum 70 credits as below:

Semester I (16 credits)] Semester II (18 credits), Semester III (18 credits) and Semester IV (18 credits). In each semester there will be four theory papers of 4 credits each. In addition there will be one theory course (Ability enhancement or skill enhancement course) each in semester II & III of 2 credits each in fourth semester there will be research project of 2 credits.

In each Semester, there will be four papers of 100 marks each out of which 40 marks will be for Internal Assessment (attendance, home assignments, class tests, long term papers, classroom presentations) and 60 marks for University Examination. All ability enhancement or skill enhancement courses will have 50 mark each, out of which 20 marks will be for continuous assessment and 30 marks for university examination. Thus M. Com. degree examination, four Semesters shall be of 1700 marks and of minimum 70 credits altogether. The following shall be the course structure.

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Compulsory	PGCO M101	Business Finance-I	Core Compulsory	PGCOM 201	Business Finance-II
	PGCO M102	Management Concepts & Organisational Behaviour-I		PGCOM 202	Management Concepts & Organisational Behaviour-II
Core Elective	To choose any one Group of the following:		Core Elective	To choose any one Group of the following:	
	Group A			Group A	
	PGCO M 103	Advanced Accounting-I		PGCOM 203	Advanced Accounting-III
	PGCO M 104	Advanced Accounting-II		PGCOM 204	Advanced Accounting-IV
	Group B			Group B	
	PGCO M 105	Marketing-I		PGCOM 205	Marketing-III
	PGCO M 106	Marketing-II		PGCOM 206	Marketing-IV
	Group C			Group C	
	PGCO M 107	Business Administration-I		PGCOM 207	Business Administration-III
	PGCO M 108	Business Administration-II		PGCOM 208	Business Administration-IV
	Group D			Group D	
	PGCO M 109	Advanced Cost Accounting-I		PGCOM 209	Advanced Cost Accounting-III
	PGCO M 110	Advanced Cost Accounting-II		PGCOM 210	Advanced Cost Accounting-IV
				Skill Enhancement Course	This Paper is compulsory for all Students
			PGGEN 21	Consumer Protection	

Semester III			Semester IV		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Compulsory	PGCO M301	Management Accounting -I	Core Compulsory	PGCOM 401	Management Accounting -II
	PGCO M302	Research Methodology-I		PGCOM 402	Research Methodology-II(Project Report)
Core Elective	To choose any one Group of the following:		Core Elective	To choose any one Group of the following:	
	Group A			Group A	
	PGCO M 303	Advanced Accounting-V		PGCOM 403	Advanced Accounting-VII
	PGCO M 304	Advanced Accounting-VI		PGCOM 404	Advanced Accounting-VIII
	Group B			Group B	
	PGCO M 305	Marketing-V		PGCOM 405	Marketing-VII
	PGCO M 306	Marketing-VI		PGCOM 406	Marketing-VIII
	Group C			Group C	
	PGCO M 307	Business Administration-V		PGCOM 407	Business Administration-VII
	PGCO M 308	Business Administration-VI		PGCOM 408	Business Administration-VIII
	Group D			Group D	
	PGCO M 309	Advanced Cost Accounting-V		PGCOM 409	Advanced Cost Accounting-VII
	PGCO M 310	Advanced Cost Accounting-VI		PGCOM 410	Advanced Cost Accounting-VIII
Ability Enhancement Course	This Paper is compulsory for all Students				
	PGGE N 31	Income Tax Management			

5. Scheme of Examination:

The examination of regular students of M. Com. degree course of the Bharati Vidyapeeth (Deemed to be University), Pune, India admitted in the academic session 2018-19 and after shall be based on-

- (a) Semester Examinations,
- (b) Continuous Assessment,
- (c) Choice Based Credit System, and
- (d) Semester Grade Point Average and Cumulative Grade Point Average System

For each paper of 100 marks, there will be an Internal Assessment (IA) of 40 marks and the University Examination (UE) of 60 marks/3 hours duration at the end of each semester. A candidate who will secure atleast 40% of marks allotted to each paper will be given 4 credits. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The IA for each paper will be of 40 marks which will be carried out by the department during the term. The IA may be in the forms of written tests, seminars, term papers, presentations, assignments, orals or any such others. Here will be at least two types of assessments given above.

There shall be four semester examinations: first semester examination at the middle of the first academic year and the second semester examination at the end of the first academic year. Similarly, the third and fourth semester examinations shall be held at the middle and the end of the second academic year, respectively.

The candidates shall be permitted to proceed from the first semester up to final semester irrespective of their failure in any of the semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects

At the end of each semester, a cumulative grade point (CGPA) & also semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all course in which the student has passed till that semester.

6. **Research Project Work:**

There will be a Research Project to be prepared by a student during the fourth semester. The objective of the project work is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational areas of the subject. The project work is to be undertaken under guidance of a teacher allotted to a student by the department.

Division of Marks

Synopsis with working bibliography (Internal Assessment) : 40 Marks

A full Project Report (Minimum 50-80 pages) : 40 Marks

Viva Voce : 20 Marks

As the Research Project is based on the self study done by the candidate and evaluated for 100 marks altogether, 6 credits will be awarded to a successful candidate in this subject. The project may be evaluated by two examiners one internal and one external, selected from the panel of PG examiners of the University. The viva voce must be conducted by the teachers selected out of the panel of PG examiners maintained by the University.

The candidate has to submit the project Report on or before the date declared by the department. The project report shall be typed and submitted in duplicate. A candidate who fails to submit the project may resubmit the same in the subsequent semester examination for evaluation. The project work activities must be duly supported by documentary evidence to be endorsed by the Head or Guide.

7. **Standard of Passing:**

A candidate shall be declared to have passed in the paper provided he/she has secured minimum GP of 4.5 in the UE and a GPA of 4.0 in aggregate of UE and IA taken together.

8. **Classification of Successful Candidates:**

Candidates who secured not less than 60% of aggregate marks (IA+UE) in the whole examination shall be declared to have passed the examination in the first class. All other successful candidates shall be declared to have passed in second

class. Candidates who obtain 70% of the marks in the aggregate (IA+UE) shall be deemed to have passed the examination in first class with distinction.

A student who passes in all the courses will be declared to have passed the M. Com. degree with the following honours.

CGPA in [4.00, 4.99]	-- Pass Class
CGPA in [5.00, 5.49]	-- Second Class
CGPA in [5.50, 5.99]	-- Higher Second Class
CGPA in [6.00, 7.99]	-- First Class
CGPA in [8.00, 10.00]	-- First Class with Distinction

9. Scheme of Credits:

Sixty (60) hours of teaching will lead to four credits (which mean four hours per week teaching in one semester) and long term paper as well as presentation will carry one credit each.

10. Medium of Instruction:

The medium of instruction and examination shall be in English. However, students can write their papers in Marathi also.

11. Extra Credits:

Regular students can also opt for extra credits if the departmental committee agrees. A student must at the commencement of the semester communicate which extra credits he/she is going to opt. A student can enroll for extra credits over and above the total 70 credits prescribed for the course by attending and appearing for the examination of the opted extra credits. However, in such case grades of the extra credit will not be counted for arriving at GPA.

The extra credit course can be selected from within the institute or any other faculties of Bharati Vidyapeeth University offering courses for Faculty of Arts, Social Sciences and Commerce or Faculty of Science, which will be declared at the commencement of session. Such extra credits will be mentioned separately in the grade sheet.

12. Grade Points Scheme:

The term grading system indicates a 10-point scale of evaluation of the performances of students in terms of marks obtained in the Internal and External Examination, grade points and letter grade. The total performance within a semester and continuous performance starting from the first semester are indicated respectively by Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA). Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking.

The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0,67.9]	A	8.0
[60.0,64.9]	B+	7.0
[55.0,59.9]	B	6.0
[50.0,54.9]	C+	5.5
[45.0,49.9]	C	5.0
[40.0,44.9]	D	4.5
[00.0, 39.9]	F	0.0

GRACING:

The gracing shall be done as per existing rules of the University.

VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.



BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE, INDIA
YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE & COMMERCE, PUNE-38

7.1 : FEE STRUCTURE
UNDER GRADUATE (GRANT-IN-AID SECTION)

ACADEMIC YEAR 2020-2021

CLASS	FEES													Total Fee
	Admission Fee	Tuition Fee	Laboratory Fee	Library Fee	Student Activity & Magazine Fee	Gymkhana Fee	University Eligibility Fee	Student Welfare and Insurance	College Test & Tutorial Fee	Medical Check up Fee	University Development Fund	Sem. Exam. Fee		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
F.Y.B.A.(Sem I & II)	10	800	0	100	200	50	50	50	50	100	100	250	1760	
S.Y.B.A.(Sem II & III)	10	800	0	100	200	50	0	50	50	100	100	300	1760	
T.Y.B.A.(Sem IV & V)	10	800	0	100	200	50	0	50	50	100	100	300	1760	
F.Y.B.SC.(Sem I & II)	10	800	325	100	200	50	50	50	50	100	100	300	2135	
S.Y.B.SC.(Sem II & III)	10	800	325	100	200	50	0	50	50	100	100	350	2135	
T.Y.B.SC.(Sem IV & V)	10	800	325	100	200	50	0	50	50	100	100	350	2135	
F.Y.B.Com.(Sem I & II)	10	800	0	100	200	50	50	50	50	100	100	250	1760	
S.Y.B.Com.(Sem II & III)	10	800	0	100	200	50	0	50	50	100	100	300	1760	
T.Y.B.Com.(Sem IV & V)	10	800	0	100	200	50	0	50	50	100	100	300	1760	

NOTE :

- 1) Every international student has to pay Rs. 1000/- as Medical check up & HIV Test fees and Tuition fees five times than that of Maharashtra student.
- 2) The international students seeking admission to Bachelor Degree should pay eligibility fee US \$400, and for Master Degree US \$500.
- *3) Students other than Maharashtra State should pay the Tuition fee double to the fees of regular Maharashtra State students.
- 4) The students offering computer application subject should pay Rs. 7,000/- as additional laboratory fee every year.

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE, INDIA
YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE &
COMMERCE, PUNE-38**

7.2 : FEE STRUCTURE

**Under-Graduate & Post-Graduate (Non Grant Section)
ACADEMIC YEAR 2020-2021**

Sr.No.	Class	Adm. Fee	Tuition Fee	Total Fee
1	F.Y. B.Sc. (Comp. Sc.)	500	27000	27500
2.	S.Y. B.Sc. (Comp. Sc.)	500	27000	27500
3.	T.Y. B.Sc. (Comp. Sc.)	500	27000	27500
4.	M.Sc. I (Chemistry)	500	35000	35000
5.	M.Sc. II (Chemistry)	500	30000	35500
6.	M.Sc. I (Microbiology)	500	35000	35500
7.	M.Sc. II (Microbiology)	500	35000	35500
8.	M.Sc. I (Computer Science)	500	35000	35500
9.	M.Sc. II (Computer Science)	500	35000	35500
10.	M.A. I (English) & Economics	500	11000	11500
11.	M.A. II (English) & Economics	500	11000	11500
12.	M.Com. I	500	11000	11500
13.	M.Com. II	500	11000	11500
14.	B.Lib & I.Sc.	500	10000	10500
15.	M.Lib & I.Sc.	500	14000	14500

NOTE :

- 1) Every International student has to pay Rs. 1,000/- as Medical Check up & HIV Test fees and Tuition fees five times than that of Maharashtra student.
- 2) The International students seeking admission to Bachelor Degree should pay eligibility fee US \$400 and for Master Degree US\$ 500.

● **Refund of Fees**

1. If a student submits his application for cancellation of admission in a prescribed form duly completed within 15 calendar days from the date of admission to that particular course, 10 per cent of the total amount of tuition fees prescribed for the course will be deducted from the amount of tuition fees paid by him.
2. If a student submits his application for cancellation of admission in a prescribed form duly completed within 30 calendar days from the date of admission to that particular

course, 25 per cent of the total amount of tuition fees prescribed for the course will be deducted from the amount of tuition fees paid by him.

3. If a student submits his application for cancellation of his admission after 30 calendar days from the date of admission to that particular course no refund of fees will be made
4. Under no circumstances other fees paid by the student will be refunded either in part or in full except the amount of college and university development fund.
5. If any student admitted to any of course leaves the course at any time after 90 calendar days after the date of his admission to that course in an academic year, he/she will be required to pay full amount of tuition fees for the entire Year of the course.

- **Hostel Accommodation**

Accommodation for boys and girls is available in the hostels. The students who have been admitted in the college will be eligible for admission in the hostel. They will have to apply separately in the prescribed form available in the hostel office.

- **Refund of Deposits**

A student should collect his/her deposit(s) within six months from the date of cancellation of his/her admission or within six months of completion of his/her course.

- **Grant of Terms**

The student will be granted terms and allowed to appear at university examination provided he has kept satisfactory **attendance of 75% for each subject / course / paper**.

- **Govt. Scholarships & Freeships**

Eligible and deserving students can avail of the facilities of various Govt. scholarships which are awarded on the basis of merit at S.S.C/H.S.C. examination and income of parents. This facility is not applicable for B.Sc. Computer Science students & Post Graduate Courses.

Scholarships

- 1) National Merit Scholarship
- 2) National Loan Scholarship
- 3) State Govt./Central Government Open Merit Scholarship
- 4) Scholarship to Children of Primary and Secondary School Teachers
- 5) Talent Development in Maths and Physics Scholarship.
- 6) Freedom Fighter
- 7) Physically Handicapped Students Scholarship
- 8) Central Government Minority Scholarship
- 9) Single Girl Child - Indira Gandhi Scholarship
- 10) North-East / State Government Scholarship

NOTE : It will be the sole responsibility of the student to apply for freeships/ scholarships in the prescribed form and before the prescribed date. The college will not be responsible for any loss of scholarship / freeship due to negligence on the part of the student. Merit scholarship/freeship will be awarded to the deserving students by the college.

- **Extra Curricular Activities**

The following extra curricular activities are provided to the students by the college.

- 1) National Cadet Corps (N.C.C.)

The College has N.C.C. facility.

- 2) National Service Scheme (N.S.S.)

Interested students may join N.S.S.

- 3) Debating, Art Circle, Science Association, Commerce Association and Ladies Association.

- 4) Indoor, Outdoor Games

- **Library**

The college has a well equipped library. Needy and deserving students are given books under the Book-Bank Scheme.

- **Gymkhana**

Adequate arrangements are made for games and sports. Special equipments are made available for the development of the Gymnasium Section. The facilities for following games are provided by the college.

Name of Games :

- 1) Basket Ball

- 7) Table Tennis

- 2) Soft Ball

- 8) Chess

- 3) Foot Ball

- 9) Wrestling

- 4) Holly Ball

- 10) Athletics

- 5) Hand Ball

- 11) Swimming

- 6) Cricket

- 12) Gymnasium & Other Indian Games.

- **Earn and Learn Scheme**

Poor and meritorious students are given financial assistance under this scheme by providing some work to meet their expenses towards fees, books etc.

- **Medical Check-Up**

A medical check up is compulsory for all the students.

- **Student Safety Policy**

Bharati Vidyapeeth Deemed University provides facility of student safety policy for students studying in the Bharati Vidyapeeth Deemed University.

8 : RULES OF DISCIPLINE

- 1) Students should be regular and punctual in attending classes, tutorials and submission of the term-work in various subjects. Terms shall not be granted and a student shall not be certified for examination if his/her progress, conduct and attendance is not satisfactory.
- 2) Students, if found indulging in anti-national activities contrary to the provisions of the Acts & Laws enforced by Government will be liable to be expelled from the college without any notice by the Principal of the College.
- 3) Ragging of students in any form within or outside the College and hostel is strictly prohibited. Defaulters will be strictly dealt with as per Govt. instructions in this matter.
- 4) Smoking, drinking (alcohol) and use of drugs is strictly prohibited in the premises of the College and hostel.
- 5) Bicycles, scooters and vehicles should be parked only in areas provided for the purpose. The institute accepts no responsibility for their safe custody. Vehicles lodged elsewhere may be confiscated.
- 6) Any changes in the address of the student must be intimated by him in writing to the college office immediately.
- 7) Students must use aprons and uniforms of prescribed pattern while working in dissection hall, laboratories, class-room and in the college.
- 8) A student must carry Identity Card / Smart Card signed by the Principal and produce the same whenever asked by the College Authorities. **Without Identity card / Smart Card students will not be allowed to enter the college premises.**
- 9) A student is expected to read the notices put up on the notice board of the College. The College accepts no responsibility for loss of any advantage by student due to his failure to read the notice in time.
- 10) In case, a student requires to remain absent for some reasons, he/she will be required to take the prior permission of the Principal.
- 11) If any of the statement made in application form or any information supplied by the student in connection with his/her admission is later on, at any time found to

be false or incorrect, his/her admission will be cancelled, fees forfeited and he/she will be expelled from the college by the Principal and prosecuted by Govt., if deemed necessary.

- 12) A student shall not go to the press or any other publicity media without permission of the Principal.
- 13) Any damage to the college property, apparatus, furniture, equipments, library books, building etc. must be paid immediately by the students.
- 14) Students must attend social and national events organised by the College such as 26th January, 10th May and 15th August, and all other declared national celebrations.
- 15) A student will be bound by the rules and regulations framed by the College / University from time to time.
- 16) No student will be allowed to appear for the university examination unless he/she has paid all his/her dues and completed his/her practical journals and has kept satisfactory attendance.
- 17) Principal reserves the right to prescribe from time to time any rule/s of discipline and accordingly take necessary disciplinary action.

Bharati Vidyapeeth Deemed University framed general discipline code of conduct for the admitted students in the college premises entitled as "Student Discipline and Conduct Rule 2008" under the provision of Article 24(h) rules of Vidyapeeth. Students are required to go through in above "Student Discipline and Conduct Rule 2008". The same is displayed on the notice board for the information of admitted students.



IMPORTANT NOTE

Attendance of International Students :

Office of the Commissioner of Police has made mandatory to the college to observe International students attendance in the college and send the monthly report of the individual international student to the police (FRO). In this context, International students are appealed to be regular and punctual in attending classes, practical work, tutorials, submission of the term-work in various subjects. If the progress, conduct and attendance of any international student is not satisfactory his/her terms shall not be granted

09 : Instructions to Newly admitted Students for Permanent Registration Number (PRN) Registration

1. Student need to visit the “www.bvuniversity.edu.in” website.
2. Click on **Student PRN No. generation** link under the Admission Notice Column.
3. Select **New Registration** link (1st time user only).
4. Select College / Faculty / Course / Specialization (if any) as per specified on College Fee receipt.
5. Now create USER by entering all the valid personal details. Use EMAIL ID as USER ID for further communication.
6. After successfully creation of USER, all the credentials will be send on mail (on registered mail ID).
7. Student now needs to login and with the valid credential to fill the form.
8. After login student needs to UPLOAD PHOTO, SIGNATURE and FEE RECEIPT in soft copy (Guidelines for uploading Images are given on the Website).
9. After uploading these documents, student will proceed on next page.
10. Student needs to enter personal details, local communication details, permanent communication details and educational details.
11. System will display the list of eligibility documents according to the course.
12. After completing these procedures student will able to see the application form, at this stage student can edit and update the information.
13. Student will submit the form and take print out of this form.
14. Student needs to submit this application form to the college office.
15. For existing students, the same procedure is applicable except they have to enter PRN number at the time of filling the form.
16. Kindly refer registration guide given on the website.
17. For any difficulties regarding PRN system, kindly contact **020-24407163** or mail on **bvusisprn@gmail.com**

Anti-Ragging Undertaking

As per the norms laid down by the Ministry of Human Resource Development, Governemnt of India and University Grants Commission, New Delhi all the students seeking admission first time in this College, have to submit Anti-Ragging undertaking online through the following websites :

- 1) **www.antiragging.in**
- 2) **www.amanmovement.org**

A student has to take print out of the same undertaking and attach the hard copy to admission form. Submission of Anti-Ragging Undertaking is mandatory to all newly admitted students.





Institutions of Bharati Vidyapeeth Bharati Vidyapeeth (Deemed to be University) Pune, India

Accredited with 'A+' Grade (3rd cycle) by NAAC,
'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



CONSTITUENT INSTITUTIONS

• Medical College, Pune (with School of Optometry, School of Audiology and Speech Language Pathology and Centre for Health Management and Research, Pune) • Medical College & Hospital, Sangli • Dental College & Hospital, Pune • Dental College & Hospital, Navi Mumbai • Dental College & Hospital, Sangli • College of Ayurved, Pune • Homoeopathic Medical College, Pune • College of Nursing, Pune • College of Nursing, Sangli • College of Nursing, Navi Mumbai • College of Engineering, Pune • College of Architecture, Pune • Poona College of Pharmacy, Pune • Institute of Management & Entrepreneurship Development, Pune • Institute of Management and Research, New Delhi • Abhijit Kadam Institute of Management & Social Sciences, Solapur • Institute of Management, Kolhapur • Institute of Management and Rural Dev. Administration, Sangli • Yashwantrao Mohite Institute of Management, Karad • Institute of Hotel Management & Catering Technology, Pune • Yashwantrao Mohite College of Arts, Science and Commerce, Pune (with School of Performing Arts) • New Law College, Pune • College of Physical Education, Pune • Social Sciences Centre, Pune (Social Work) • Institute of Environment Education and Research, Pune • Interactive Research School for Health Affairs, Pune • Rajiv Gandhi Institute of Information Technology and Bio-Technology, Pune • Yashwantrao Chavan Institute of Social Science Studies & Research, Pune • Research and Development Centre in Pharmaceutical Sciences and Applied Chemistry, Pune.

Bharati Vidyapeeth – Higher Education (Institutions Affiliated to other Universities)

• College of Engineering for Women, Pune • College of Fine Arts, Pune • Kala Mahavidyalaya, Pune • Jawaharlal Nehru Institute of Technology (Polytechnic), Pune • Institute of Pharmacy (Polytechnic), Pune • School of Photography, Pune • College of Engineering, Lavale, Pune • Institute of Management Studies & Research, Navi Mumbai • Institute of Management and Master of Computer Application and Information Technology, Navi Mumbai • College of Engineering, Navi Mumbai • College of Architecture and School of Designing and Decoration, Navi Mumbai • College of Pharmacy, Navi Mumbai • Institute of Pharmacy (Poly), Navi Mumbai • Institute of Technology (Poly), Navi Mumbai • Institute of Hotel and Tourism Management, Navi Mumbai • College of Engineering, New Delhi • Institute of Computer Application and Management, New Delhi • College of Pharmacy, Kolhapur • New Law College, Kolhapur • College of Engineering, Kolhapur • Dr. Patangrao Kadam Arts, Science & Commerce College (Jr., Sr., and P.G.), Sangli • Matoshri Bayabai Shripatrao Kadam Kanya Mahavidyalaya (Jr. & Sr.) Kadegaon (Sangli) • New Law College, Sangli • Institute of Technology (Poly), Palus (Sangli) • Loknete Mohanrao Kadam College of Agriculture, Kadegaon (Sangli) • College of Horticulture, Kadegaon (Sangli) • Yashwantrao Chavan Law College, Karad

School of Bharati Vidyapeeth

• Bal Viikas Mandir (Marathi Medium) – Erandwane, Pune – 38, Navi Mumbai, Solapur • Primary, Secondary Schools and Junior Colleges (Marathi Medium) at different places such as in Pune, Solapur, Raigad, Satara, Sangli, Kolhapur, Palghar and other places • Ravindranath Tagore School of Excellence, Pre-Primary and Primary Schools, Balewadi, Pune • Pre Primary, Primary, High Schools and Senior Secondary Schools (English Medium), Erandwane, Pune, Dhankawadi, Pune, Lohegaon, Pune, Navi Mumbai, Jawhar, Dist. Palghar, Vikramgad, Dist. Satara, Kolhapur, Vita, Dist. Sangli, Kadegaon, Dist. Sangli • Residential CBSC School (English Medium) Pachgani, Dist. Satara • Primary and Secondary Ashram Schools, Jawhar, Dist. Palghar • Industrial Training Institute for Girls, Kadegaon (Sangli).

Associate Institutions

• Bharati Vidyapeeth English-Maths Exam Department • Bharati Vidyapeeth's Bharati Printing Press • Bharati Sahakari Bank Ltd. • Bharati Madhyawarti Sahakari Grahak Bhandar Ltd. • Sonhira Sahakari Sakhar Karkhana Ltd., Wangi, Kadegaon, Dist. Sangli • Sageshwar Sahakari Soot Girmi Ltd., Kadegaon, Dist. Sangli • Krishna Verala Sahakari Soot Girmi Ltd., Kundal-Palus, • Sou. Vijaymala Patangrao Kadam Mahila Auodyogik Sahakari Santha, Kadegaon, Dist. Sangli • Mahatma Gandhi Hospital & Research Centre | Bharati Vidyapeeth Medical Foundation • Bharati Hospital & Research Centre • Eye Bank • Mobile Health Care Unit & Ambulance • Foundation for Rural Development • Bharati Vidyapeeth Krida Pratishthan • Bharati Vidyapeeth Kala Academy • Sonhira Milk Producers and Allied Agro Co-op. Soc. Ltd., Kadegaon • Sonhira Co-op. Poultry Society Ltd., Kadegaon, Dist. Sangli

*Where the mind is without fear and
The head is held high;
Where knowledge is free;
Where the world has not been broken
Up into fragments by narrow domestic walls;
Where words come out from the depth of truth...
Where the clear stream of reason has
Not lost its way into the dreary desert
Sand of dead habit...
Into that heaven of freedom, my
Father, let my country awake.*

- Rabindranath Tagore



**Bharati Vidyapeeth (Deemed to be University), Pune
YASHWANTRAO MOHITE COLLEGE, PUNE**

SCIENCE RESEARCH CENTRE

C) FACULTY : ARTS / SCIENCE / COMMERCE / COMPUTER SCIENCE

Under Graduate/ Post Graduate

Class :

Subjects Offered :

- 1..... 2.....
- 3..... 4.....
- 5..... 6.....
- 7..... 8.....
- 9. Practical Courses

D) DECLARATION BY STUDENT

- 1) I have read the rules of the College and do hereby undertake, if admitted, to abide by them as they are at present in force or those hereafter framed by the College authorities.
- 2) I have read carefully the rules & regulations printed in the prospectus as regards to keeping and granting of terms, I will abide by the decision of the Principal in the matter of the grant of terms.
- 3) I have fully understood the rules regarding refund of fees mentioned in the prospectus.
- 4) I also further undertake to keep my guardian in regular touch with my progress in studies and other conditions while at the College.
- 5) I hereby submit to the disciplinary jurisdiction of the Vice Chancellor and other officer and authorities of the University and authorities of the College and Institution and shall observe and abide by the rules made by the Vice Chancellor on that behalf/and also the rules made by the Principal of the College.

6) **Anti Ragging Affidavit Reference No. :** **Yours obediently,**

Place

Signature

Date

(Name:)

E) PARTICULARS AND DECLARATION OF PARENTS/GUARDIAN

- 1) Parents Full Name & address :.....
- 2) Relationship of Parent/ GuardianContact No.

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- 3) Occupation : Farmer/ Worker/ Labour/ Business/ Government employee/Private employee/others
- 4) Office Address
-Contact No.

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- 5) Annual Income Rs.

I hereby give my consent for admitting my son/daughter/ ward in the college, I have read all the rules and regulations of this college and I undertake that my Son/daughter/ward will abide by all the rules/ discipline of the college. Any disciplinary action taken against him/ her by college in case of violation of the rules will be binding on me.

Date :

Signature of Guardian/ Parent's

.....
(Name)

F) FOR OFFICE USE ONLY

Shri. / Miss. / Mrs. has been provisionally admitted in the faculty of in class subject to the approval of the University.

Place : Pune

Date :

Checked by

Principal



Bharati Vidyapeeth Deemed University, Pune (India)

Accredited with 'A+' Grade (2017) by NAAC
'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



Hon'ble Dr. Patangrao Kadam
M.A., LL.B., Ph.D.
Chancellor

Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Pro Chancellor

Prof. M. M. Salunkhe
M.Sc., Ph.D., F.R.S.C.
Vice Chancellor



Bharati Vidyapeeth Bhavan,
Lal Bahadur Shastri Marg,
Pune - 411 030 (INDIA)

Tel. : +91-20-24407100, 24325701
Fax : +91-20-24339121, 24321910
E-mail : bvuniversity@yahoo.co.in
Web : www.bvuniversity.edu.in

NOTIFICATION NO. 875

It is hereby notified for the information of all concerned that the Academic Council, at its 54th meeting held on 18/09/2017, has resolved to approve the revised course structure for B.A. and B.Com. programme under the Faculty of Arts, Social Sciences and Commerce and syllabus for semesters I and II of B.A. and B.Com. based on Choice Based Credit System to be implemented from the academic year 2018-19.

A copy of the revised course structure for B.A. and B.Com. programme and syllabus for F.Y.B.A. and F.Y.B.Com. programmes based on CBCS is enclosed.

All the concern may please note.

Ref. No. BVDU/2017-18/1794
Date: September 21, 2017

G. Deshpande
Registrar

To

1. The Dean, Faculty of Arts, Social Sciences and Commerce, Pune - 38
2. The Principal, BVDU Y. M. College, Pune - 38.
3. The Controller of Examinations, BVDU.
4. The IT Cell for uploading in the Website.

Notation/AC18-9-2017(54-5.2)



[Signature]
Incharge Principal
Yashwantrao Mohite College, Pune-38



Bharati Vidyapeeth Deemed University, Pune (India)

Accredited with 'A' Grade (2017) by NAAC
'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



Hon'ble Dr. Patangrao Kadam
MA, LL.B, Ph.D.
Chancellor

Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Pro Chancellor

Prof. M. M. Salunkhe
M.Sc., Ph.D., FRSC
Vice Chancellor



Bharati Vidyapeeth Bhavan,
Lal Bahadur Shastri Marg
Pune - 411 030 (INDIA)

Tel.: +91-20-24407100, 24325701
Fax: +91-20-24339121, 24321910
E-mail: bvuniversity@yahoo.co.in
Web: www.bvuniversity.edu.in

NOTIFICATION NO. 876

It is hereby notified for the information of all concerned that the Academic Council, at its 54th meeting held on 18/09/2017, has resolved to approve the revised course structure for B.Sc. and B.Sc. (Computer Science) programme under the Faculty of Science and syllabus for semesters I and II of B.Sc. and B.Sc. (Computer Science) based on Choice Based Credit System to be implemented from the academic year 2018-19.

A copy of the revised course structure for B.Sc. and B.Sc. (Computer Science) programme and syllabus for F. Y. B.Sc. and F. Y. B.Sc. (Computer Science) programmes based on CBCS is enclosed.

All the concern may please note.

Ref. No. BVDU/2017-18/1795

Date: September 21, 2017

G. Jayakumar
Registrar

To

1. The Dean, Faculty of Science, Pune - 38
2. The Principal, BVDU Y. M. College, Pune - 38.
3. The Controller of Examinations, BVDU.
4. The IT Cell for uploading in the Website.

Notification AC18/9/2017(24-5/2)



[Handwritten Signature]

Incharge Principal
Yashwantrao Mohite College, Pune-38



Prof. Dr. Shivajirao Kadam
Chancellor M.Sc., Ph.D.

Prof. Dr. M. M. Salunkhe
Vice Chancellor M.Sc., Ph.D., F.R.S.C.

Bharati Vidyapeeth (Deemed to be University) Pune, India.

Founder Chancellor : Dr. Patangrao Kadam

- ★ Accredited with 'A**' Grade (2017) by NAAC ★
- ★ Category-I University Status by UGC ★
- ★ NIRF Ranking - 60 ★

"Social Transformation Through Dynamic Education"

Celebrating



and Beyond
BHARATI VIDYAPEETH

Dr. Vishwajeet Kadam
B.Tech., M.B.A., Ph.D.
Pro Vice Chancellor
G. Jayakumar
M.Com., Dip. Pub. Adm.
Registrar

NOTIFICATION NO. 957

It is hereby notified for the information of all concerned that the Academic Council, at its 56th meeting held on 4-12-2018, has resolved to approve the revised syllabi of S.Y. B.A., S.Y. B.Com., S.Y. B.Sc. and S.Y. B.Sc. (Computer Science) under CBCS pattern of the Faculty of Arts, Social Science and Commerce and the Faculty of Science to be implemented from the academic year 2019-20.

A copy of the revised syllabi of S.Y. B.A., S.Y. B.Com., S.Y. B.Sc. and S.Y. B.Sc. (Computer Science) is enclosed.

This is for the information of all concern.

Ref. No. BVDU/2018-19/4232

Date: January 8, 2019

G. Jayakumar
Registrar

To,

- 1 The Dean, Faculty of Arts, Social Sciences and Commerce, Social Science Centre, Pune 38
- 2 The Dean, Faculty of Science, Y. M. College, Pune 38
- 3 The Principal, Y. M. College, Pune 38
- 4 The Controller of Examinations, BVDU.
- 5 The IT Cell for uploading in the Website.

Notification AC4-12-2018(2665)



Yashwantrao Mohite
Incharge Principal

Bharati Vidyapeeth Bhavan, Lal Bahadur Shastri Marg, Pune - 411 030 (INDIA)
Tel. : +91-20-24407100, 24325701 | Fax : +91-20-24439121, 24321810 | E-mail : bvuniversity@yahoo.co.in | Web : www.bvuniversity.edu.in

Yashwantrao Mohite College, Pune-38



Bharati Vidyapeeth (Deemed to be University) Pune, India.

Founder Chancellor : Dr. Patangrao Kadam

Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Chancellor

Prof. Dr. M. M. Salunkhe
M.Sc., Ph.D., F.R.S.C.
Vice Chancellor

★ Accredited with 'A+' Grade (2017) by NAAC ★
★ Category-I University Status by UGC ★
★ NIRF Ranking - 66 ★

"Social Transformation Through Dynamic Education"



Dr. Vishwajeet Kadam
B.Tech., M.B.A., Ph.D.
Pro Vice Chancellor

G. Jayakumar
M.Com., Dip.Pub.Admn.
Registrar

NOTIFICATION NO. 1001

It is hereby notified for the information of all concerned that the Academic Council, at its 59th meeting held on 18-7-2019, has resolved to approve the revised syllabi of T.Y. B.A., T.Y. B.Com., T.Y. B.Sc. and T.Y. B.Sc. (Computer Science) under CBCS pattern of the Faculty of Arts, Social Science and Commerce and the Faculty of Science to be implemented from the academic year 2020-21.

A copy of the revised syllabi of T.Y. B.A., T.Y. B.Com., T.Y. B.Sc. and T.Y. B.Sc. (Computer Science) is enclosed.

This is for the information of all concern.

Ref. No. BVDU/2019-20/1097

Date: July 26, 2019

G. Jayakumar
Registrar

To,

- 1 The Dean, Faculty of Arts, Social Sciences and Commerce, Social Science Centre, Pune 38
- 2 The Dean, Faculty of Science, Y. M. College, Pune 38
- 3 The Principal, Y. M. College, Pune 38
- 4 The Controller of Examinations, BVDU.
- ✓ 5 The IT Cell for uploading in the Website.

AC18-7-2019(59-5.10)



[Signature]
Incharge Principal
Yashwantrao Mohite College, Pune-38



Bharati Vidyapeeth Deemed University, Pune (India)

Accredited with 'A' Grade (2017) by NAAC
A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



Hon'ble Dr. Patangrao Kadam
M.A., LL.B., Ph.D.
Chancellor

Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Pro Chancellor

Prof. M. M. Salunkhe
M.Sc., Ph.D., FRSC
Vice Chancellor



Bharati Vidyapeeth Bhawan,
Lal Bahadur Shastri Marg,
Pune - 411 030 (INDIA)

Tel. : +91-20-24407100, 24325701
Fax : +91-20-24339121, 24321910
E-mail : bvuniversity@yahoo.co.in
Web : www.bvuniversity.edu.in

NOTIFICATION NO. 877

It is hereby notified for the information of all concerned that the Academic Council, at its 54th meeting held on 18/09/2017, has resolved to approve the revised course structure for M.A. and M.Com. programme under the Faculty of Arts, Social Sciences and Commerce offered at BVDU Y. M. College, Pune and syllabus for semesters I, II, III and IV of M.A. and M.Com. based on Choice Based Credit System to be implemented from the academic year 2018-19.

A copy of the revised course structure for M.A. and M.Com. programme and syllabus for semesters I, II, III and IV of M.A. and M.Com. programmes based on CBCS is enclosed.

All the concern may please note.

Ref. No. BVDU/2017-18/1796
Date: September 21, 2017

G. Rajakumar
Registrar

To

1. The Dean, Faculty of Arts, Social Sciences and Commerce, Pune - 38
2. The Principal, BVDU Y. M. College, Pune - 38.
3. The Controller of Examinations, BVDU.
4. The IT Cell for uploading in the Website.

Notification/AC/18-9/2017(54-5-2)

Incharge Principal
Yashwantrao Mohite College, Pune-38





Hon'ble Dr. Patangrao Kadam
M.A., LL.B., Ph.D.
Chancellor

Prof. Dr. Shivajirao Kadam
M.Sc., Ph.D.
Pro Chancellor

Prof. M. M. Salunkhe
M.Sc., Ph.D., F.R.S.C.
Vice Chancellor

Bharati Vidyapeeth (Deemed to be University) Pune, India.

Accredited with 'A+' Grade (2017) by NAAC
'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



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NOTIFICATION NO.905

It is hereby notified for the information of all concerned that the Academic Council, at its 55th meeting held on 26-3-2018, has resolved to approve the revised course structure and syllabi of M.Sc. (Microbiology), M.Sc. (Computer Science), M.Sc. (Analytical/Organic/Inorganic Chemistry) under CBCS in the Faculty of Science offered in the University to be implemented from the academic year 2018-19.

All the concerned may please note.

Ref. No. BVDU/2017-18/ 5346

Date: April 10, 2018

G. Rajeshwar
Registrar

To

1. The Dean, Faculty of Science, BVDU, Y. M. College, Pune 38
2. The Principal, BVDU, Y. M. College, Pune 38
3. The Controller of Examinations, BVDU.
4. The IT Cell for uploading in the Website.

Notification No. 26-3-2018 (55-5-3)



[Signature]
Incharge Principal
Yashwantrao Mohite College, Pune-38



Bharati Vidyapeeth (Deemed to be University) Pune, India.

Founder Chancellor : Dr. Patangrao Kadam

- Accredited with 'A' Grade (2017) by HAAC
- Category-I University Status by UGC
- NIRF Ranking - 66

"Social Transformation Through Dynamic Education"

Prof. Dr. Shivajirao Kadam
Chancellor

Prof. Dr. M. M. Salunkhe
Vice Chancellor



Dr. Vishwanjeet Kulkarni
Pro Vice Chancellor
G. Jayakumar
Registrar

NOTIFICATION NO. 930

The authorities of the University have approved to start the following two programmes on regular mode under BVDU Yashwantrao Mohite College of Arts, Science and Commerce, Pune from the academic year 2018-19.

- (1) Bachelor of Library & Information Science (B.Lib. & I.Sc.) and
- (2) Master of Library & Information Science (M.Lib. & I.Sc.)

It was further resolved to approve the Course Structure, Syllabus and Examination Rules for the above programmes.

All concerned are requested to make a note the same.

Ref. No. BVDU/2018-19/ 1626
Date : August 22, 2018

G. Jayakumar
Registrar

To,

1. The Principal, Y. M. College, Pune 411038.
2. The Dean, Faculty of Arts, Social Sciences and Commerce, Social Science Centre, Pune 411038.
3. The Controller of Examinations, BVDU.
4. The Eligibility Section, BVDU
5. Webmaster for uploading in the website.

Signature of Registrar

Incharge Principal
Yashwantrao Mohite College, Pune-38



Doctor of Pharmacy (Pharm D)

(Approved by the Government of India, Ministry of Health vide letter No. V.13013/1/2007-PMS dated 13th March 2008 announced in the Gazette on India dated 10th May 2008.)
(<http://www.pci.nic.in>).

Duration of Course :

- Six academic years (Five years study and one year Internship) after PUC or D.Pharm
- Three years (Two years study and one year Internship) after B.Pharm

Intake :

- Six years Pharm D program - 30 students
- Three years (post Baccalaureate) Pharm D program - 10 students

Course Content :

- Theory and practical subjects very similar for B.Pharm course
- Internship or residency for one year in multi speciality teaching hospital
 - Includes postings in speciality hospital units
 - Six months in general medicine department
 - Two months each in three other speciality departments

Certificate of passing Examination :

Pharmacy Council of India is a national apex body controlling the course; Doctor of Pharmacy (Pharm.D) Degree will be issued by Rajiv Gandhi University of Health Sciences, Bangalore (R.G.U.H.S.) after passing examinations.

Duration of the course. –

- a) Pharm.D: The duration of the course shall be six academic years (five years of study and one year of internship or residency) full time with each academic year spread over a period of not less than two hundred working days. The period of six years duration is divided into two phases –

Phase I – consisting of First, Second, Third, Fourth and Fifth academic year.

Phase II – consisting of internship or residency training during sixth year involving posting in speciality units. It is a phase of training wherein a student is exposed to actual pharmacy practice or clinical pharmacy services and acquires skill under supervision so that he or she may become capable of functioning independently.

- b) Pharm.D. (Post Bacculaureate): The duration of the course shall be for three academic years (two years of study and one year internship or residency) full time with each academic year spread over a period of not less than two hundred working days. The period of three years duration is divided into two phases –

Phase I – consisting of First and Second academic year.

Phase II – consisting of Internship or residency training during third year involving posting in speciality units. It is a phase of training wherein a student is exposed to actual pharmacy practice or clinical pharmacy services, and acquires skill under supervision so that he or she may become capable of functioning independently.

Minimum qualification for admission to. –

- a) Pharm.D. Part-I Course – A pass in any of the following examinations -

(1) 10+2 examination with Physics and Chemistry as compulsory subjects along with one of the following subjects:

Mathematics or Biology.

(2) A pass in D.Pharm course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

(3) Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

Provided that a student should complete the age of 17 years on or before 31st December of the year of admission to the course.

Provided that there shall be reservation of seats for the students belonging to the Scheduled Castes, Scheduled Tribes and other Backward Classes in accordance with the instructions issued by the Central Government/State Government/Union Territory Administration as the case may be from time to time.

b) Pharm.D. (Post Baccalaureate) Course -

A pass in B.Pharm from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act:

Provided that there shall be reservation of seats for the students belonging to the Scheduled Castes, Scheduled Tribes and other Backward Classes in accordance with the instructions issued by the Central Government/State Government/Union Territory Administration as the case may be from time to time.

Number of admissions in the above said programmes shall be as prescribed by the Pharmacy Council of India from time to time and presently be restricted as below –

- i) Pharm.D. Programme – 30 students.
- ii) Pharm.D. (Post Baccalaureate) Programme – 10 students.

Institutions running B.Pharm programme approved under section 12 of the Pharmacy Act, will only be permitted to run Pharm.D. programme. Pharm.D. (Post Baccalaureate) programme will be permitted only in those institutions which are permitted to run Pharm.D. programme.

Course of study. – The course of study for Pharm.D. shall include the subjects as given in the Tables below. The number of hours in a week, devoted to each subject for its teaching in theory, practical and tutorial shall not be less than that noted against it in columns (3), (4) and (5) below.

T A B L E S

First Year :

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
1.1	Human Anatomy and Physiology	3	3	1
1.2	Pharmaceutics	2	3	1
1.3	Medicinal Biochemistry	3	3	1
1.4	Pharmaceutical Organic Chemistry	3	3	1
1.5	Pharmaceutical Inorganic Chemistry	2	3	1
1.6	Remedial Mathematics/ Biology	3	3*	1
	Total hours	16	18	6 = (40)

* For Biology

Second Year:

S.No	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
2.1	Pathophysiology	3	-	1
2.2	Pharmaceutical Microbiology	3	3	1
2.3	Pharmacognosy & Phytopharmaceuticals	3	3	1
2.4	Pharmacology-I	3	-	1
2.5	Community Pharmacy	2	-	1
2.6	Pharmacotherapeutics-I	3	3	1
	Total Hours	17	9	6 = 32

Third Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
3.1	Pharmacology-II	3	3	1
3.2	Pharmaceutical Analysis	3	3	1
3.3	Pharmacotherapeutics-II	3	3	1
3.4	Pharmaceutical Jurisprudence	2	-	-
3.5	Medicinal Chemistry	3	3	1
3.6	Pharmaceutical Formulations	2	3	1
	Total hours	16	15	5 = 36

Fourth Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical/ Hospital Posting	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
4.1	Pharmacotherapeutics-III	3	3	1
4.2	Hospital Pharmacy	2	3	1
4.3	Clinical Pharmacy	3	3	1
4.4	Biostatistics & Research Methodology	2	-	1
4.5	Biopharmaceutics & Pharmacokinetics	3	3	1
4.6	Clinical Toxicology	2	-	1
	Total hours	15	12	6 = 33

Fifth Year:

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Hospital posting*	No. of hours of Seminar
(1)	(2)	(3)	(4)	(5)
5.1	Clinical Research	3	-	1
5.2	Pharmacoepidemiology and Pharmacoeconomics	3	-	1
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	2	-	1
5.4	Clerkship *	-	-	1
5.5	Project work (Six Months)	-	20	-
	Total hours	8	20	4 = 32

* Attending ward rounds on daily basis.

Sixth Year:

Internship or residency training including postings in speciality units. Student should independently provide the clinical pharmacy services to the allotted wards.

- (i) Six months in General Medicine department, and
- (ii) Two months each in three other speciality departments

8. Syllabus. – The syllabus for each subject of study in the said Tables shall be as specified in Appendix -A to these regulations.

9. Approval of the authority conducting the course of study. – (1) No person, institution, society or university shall start and conduct Pharm.D or Pharm.D. (Post Baccalaureate) programme without the prior approval of the Pharmacy Council of India.

(2) Any person or pharmacy college for the purpose of obtaining permission under sub-section (1) of section 12 of the Pharmacy Act, shall submit a scheme as prescribed by the Pharmacy Council of India.

(3) The scheme referred to in sub-regulation (2) above, shall be in such form and contain such particulars and be preferred in such manner and be accompanied with such fee as may be prescribed:

Provided that the Pharmacy Council of India shall not approve any institution under these regulations unless it provides adequate arrangements for teaching in regard to building, accommodation, labs., equipments, teaching staff, non-teaching staff, etc., as specified in Appendix-B to these regulations.

10. Examination. – (1) Every year there shall be an examination to examine the students.

(2) Each examination may be held twice every year. The first examination in a year shall be the annual examination and the second examination shall be supplementary examination.

(3) The examinations shall be of written and practical (including oral nature) carrying maximum marks for each part of a subject as indicated in Tables below :

T A B L E S

First Year examination :

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
1.1	Human Anatomy and Physiology	70	30	100	70	30	100
1.2	Pharmaceutics	70	30	100	70	30	100
1.3	Medicinal Biochemistry	70	30	100	70	30	100
1.4	Pharmaceutical Organic Chemistry	70	30	100	70	30	100
1.5	Pharmaceutical Inorganic Chemistry	70	30	100	70	30	100
1.6	Remedial Mathematics/ Biology	70	30	100	70*	30*	100*
				600			600 = 1200

* for Biology.

Second Year examination :

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
2.1	Pathophysiology	70	30	100	-	-	-
2.2	Pharmaceutical Microbiology	70	30	100	70	30	100
2.3	Pharmacognosy & Phytopharmaceuticals	70	30	100	70	30	100
2.4	Pharmacology-I	70	30	100	-	-	-
2.5	Community Pharmacy	70	30	100	-	-	-
2.6	Pharmacotherapeutics-I	70	30	100	70	30	100
				600			300 = 900

Third Year examination :

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
3.1	Pharmacology-II	70	30	100	70	30	100
3.2	Pharmaceutical Analysis	70	30	100	70	30	100
3.3	Pharmacotherapeutics-II	70	30	100	70	30	100
3.4	Pharmaceutical Jurisprudence	70	30	100	-	-	-
3.5	Medicinal Chemistry	70	30	100	70	30	100
3.6	Pharmaceutical Formulations	70	30	100	70	30	100
				600			500 = 1100

Fourth Year examination :

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
4.1	Pharmacotherapeutics-III	70	30	100	70	30	100
4.2	Hospital Pharmacy	70	30	100	70	30	100
4.3	Clinical Pharmacy	70	30	100	70	30	100
4.4	Biostatistics & Research Methodology	70	30	100	-	-	-
4.5	Biopharmaceutics & Pharmacokinetics	70	30	100	70	30	100
4.6	Clinical Toxicology	70	30	100	-	-	-
				600			400 = 1000

Fifth Year examination :

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Practicals		
		Examination	Sessional	Total	Examination	Sessional	Total
5.1	Clinical Research	70	30	100	-	-	-
5.2	Pharmacoepidemiology and Pharmacoeconomics	70	30	100	-	-	-
5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	70	30	100	-	-	-
5.4	Clerkship *	-	-	-	70	30	100
5.5	Project work (Six Months)	-	-	-	100**	-	100
				300			200 = 500

* Attending ward rounds on daily basis.

** 30 marks – viva-voce (oral)

70 marks – Thesis work

11. Eligibility for appearing Examination.— Only such students who produce certificate from the Head of the Institution in which he or she has undergone the Pharm.D. or as the case may be, the Pharm.D. (Post Baccalaureate) course, in proof of his or her having regularly and satisfactorily undergone the course of study by attending not less than 80% of the classes held both in theory and in practical separately in each subject shall be eligible for appearing at examination.

12. Mode of examinations.— (1) Theory examination shall be of three hours and practical examination shall be of four hours duration.

(2) A Student who fails in theory or practical examination of a subject shall re-appear both in theory and practical of the same subject.

(3) Practical examination shall also consist of a viva –voce (Oral) examination.

(4) Clerkship examination – Oral examination shall be conducted after the completion of clerkship of students. An external and an internal examiner will evaluate the student. Students may be asked to present the allotted medical cases followed by discussion. Students' capabilities in delivering clinical pharmacy services, pharmaceutical care planning and knowledge of therapeutics shall be assessed.

13. Award of sessional marks and maintenance of records.— (1) A regular record of both theory and practical class work and examinations conducted in an institution imparting training for Pharm.D. or as the case may be, Pharm.D. (Post Baccalaureate) course, shall be maintained for each student in the institution and 30 marks for each theory and 30 marks for each practical subject shall be allotted as sessional.

(2) There shall be at least two periodic sessional examinations during each academic year and the highest aggregate of any two performances shall form the basis of calculating sessional marks.

(3) The sessional marks in practicals shall be allotted on the following basis:-

(i) Actual performance in the sessional examination (20 marks);

(ii) Day to day assessment in the practical class work, promptness, viva-voce record maintenance, etc. (10 marks).

14. Minimum marks for passing examination.— A student shall not be declared to have passed examination unless he or she secures at least 50% marks in each of the subjects separately in the theory examinations, including sessional marks and at least 50% marks in each of the practical examinations including sessional marks. The students securing 60% marks or above in aggregate in all subjects in a single attempt at the Pharm.D. or as the case may be, Pharm. D. (Post Baccalaureate) course examination shall be declared to have passed in first class. Students securing 75% marks or above in any subject or subjects shall be declared to have passed with distinction in the subject or those subjects provided he or she passes in all the subjects in a single attempt.
15. Eligibility for promotion to next year.— All students who have appeared for all the subjects and passed the first year annual examination are eligible for promotion to the second year and, so on. However, failure in more than two subjects shall debar him or her from promotion to the next year classes.
16. Internship.— (1) Internship is a phase of training wherein a student is expected to conduct actual practice of pharmacy and health care and acquires skills under the supervision so that he or she may become capable of functioning independently.
- (2) Every student has to undergo one year internship as per Appendix-C to these regulations.
17. Approval of examinations.— Examinations mentioned in regulations 10 to 12 and 14 shall be held by the examining authority hereinafter referred to as the university, which shall be approved by the Pharmacy Council of India under sub-section (2) of section 12 of the Pharmacy Act, 1948. Such approval shall be granted only if the examining authority concerned fulfills the conditions as specified in Appendix-D to these regulations.
18. Certificate of passing examination.— Every student who has passed the examinations for the Pharm.D. (Doctor of Pharmacy) or Pharm.D. (Post Baccalaureate) (Doctor of Pharmacy) as the case may be, shall be granted a certificate by the examining authority.

CHAPTER-III
Practical training

19. Hospital posting.— Every student shall be posted in constituent hospital for a period of not less than fifty hours to be covered in not less than 200 working days in each of second, third & fourth year course. Each student shall submit report duly certified by the preceptor and duly attested by the Head of the Department or Institution as prescribed. In the fifth year, every student shall spend half a day in the morning hours attending ward rounds on daily basis as a part of clerkship. Theory teaching may be scheduled in the afternoon.
20. Project work.— (1) To allow the student to develop data collection and reporting skills in the area of community, hospital and clinical pharmacy, a project work shall be carried out under the supervision of a teacher. The project topic must be approved by the Head of the Department or Head of the Institution. The same shall be announced to students within one month of commencement of the fifth year classes. Project work shall be presented in a written report and as a seminar at the end of the year. External and the internal examiners shall do the assessment of the project work.
- (2) Project work shall comprise of objectives of the work, methodology, results, discussions and conclusions.
21. Objectives of project work.— The main objectives of the project work is to—
- (i) show the evidence of having made accurate description of published work of others and of having recorded the findings in an impartial manner; and
 - (ii) develop the students in data collection, analysis and reporting and interpretation skills.
22. Methodology.— To complete the project work following methodology shall be adopted, namely:—
- (i) students shall work in groups of not less than *two* and not more than *four* under an authorised teacher;
 - (ii) project topic shall be approved by the Head of the Department or Head of the Institution;
 - (iii) project work chosen shall be related to the pharmacy practice in community, hospital and clinical setup. It shall be patient and treatment (Medicine) oriented, like drug utilisation reviews, pharmacoepidemiology, pharmacovigilance or pharmacoconomics;
 - (iv) project work shall be approved by the institutional ethics committee;
 - (v) student shall present at least three seminars, one in the beginning, one at middle and one at the end of the project work; and
 - (vi) two-page write-up of the project indicating title, objectives, methodology anticipated benefits and references shall be submitted to the Head of the Department or Head of the Institution.
23. Reporting .— (1) Student working on the project shall submit jointly to the Head of the Department or Head of the Institution a project report of about 40-50 pages. Project report should include a certificate issued by the authorised teacher, Head of the Department as well as by the Head of the Institution

- (2) Project report shall be computer typed in double space using Times Roman font on A4 paper. The title shall be in bold with font size 18, sub-titles in bold with font size 14 and the text with font size 12. The cover page of the project report shall contain details about the name of the student and the name of the authorised teacher with font size 14.
- (3) Submission of the project report shall be done at least one month prior to the commencement of annual or supplementary examination.

24. Evaluation.— The following methodology shall be adopted for evaluating the project work—

- (i) Project work shall be evaluated by internal and external examiners.
- (ii) Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of four students).
- (iii) Three seminars presented by students shall be evaluated for twenty marks each and the average of best two shall be forwarded to the university with marks of other subjects.
- (iv) Evaluation shall be done on the following items:
- | | Marks |
|-------------------------------|--------------|
| a) Write up of the seminar | (7.5) |
| b) Presentation of work | (7.5) |
| c) Communication skills | (7.5) |
| d) Question and answer skills | (7.5) |

Total (30 marks)

- (v) Final evaluation of project work shall be done on the following items:
- | | Marks |
|-------------------------------|--------------|
| a) Write up of the seminar | (17.5) |
| b) Presentation of work | (17.5) |
| c) Communication skills | (17.5) |
| d) Question and answer skills | (17.5) |

Total (70 marks)

Explanation.— For the purposes of differentiation in the evaluation in case of topic being the same for the group of students, the same shall be done based on item numbers b, c and d mentioned above.

APPENDIX-A

(See regulation 8)

PHARM.D. SYLLABUS

First Year

1.1 HUMAN ANATOMY & PHYSIOLOGY (THEORY)

Theory : 3 Hrs. /Week

1. Scope and Objectives: This course is designed to impart a fundamental knowledge on the structure and functions of the human body. It also helps in understanding both homeostasis mechanisms and homeostatic imbalances of various body systems. Since a medicament, which is produced by pharmacist, is used to correct the deviations in human body, it enhances the understanding of how the drugs act on the various body systems in correcting the disease state of the organs.

2. Upon completion of the course the student shall be able to:

- a. describe the structure (gross and histology) and functions of various organs of the human body;
- b. describe the various homeostatic mechanisms and their imbalances of various systems;
- c. identify the various tissues and organs of the different systems of the human body;
- d. perform the hematological tests and also record blood pressure, heart rate, pulse and Respiratory volumes;
- e. appreciate coordinated working pattern of different organs of each system; and
- f. appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body

3. Course materials:

Text books

- a. Tortora Gerard J. and Nicholas, P. Principles of anatomy and physiology Publisher Harpercollins college New York.
- b. Wilson, K.J.W. Ross and Wilson's foundations of anatomy and physiology. Publisher: Churchill Livingstone, Edinburg.

Reference books

- a. Guyton arthur, C. *Physiology of human body*. Publisher: Holtsaunders.
- b. Chatterjee,C.C. *Human physiology*. Volume 1&11. Publisher: medical allied agency, Calcutta.
- c. Peter L. Williams, Roger Warwick, Mary Dyson and Lawrence, H.
- d. *Gray's anatomy*. Publisher:Churchill Livingstone, London.

4. Lecture wise program :

Topics

- 1 Scope of anatomy and physiology, basic terminologies used in this subject
(Description of the body as such planes and terminologies)
- 2 Structure of cell – its components and their functions.
- 3 Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues-their sub-types and characteristics
- 4 a) Osseous system - structure, composition and functions of the Skeleton. (done in practical classes - 6hrs)
b) Classification of joints, Types of movements of joints and disorders of joints
(Definitions only)
- 5 Haemopoetic System
 - a) Composition and functions of blood
 - b) Haemopoiesis and disorders of blood components (definition of disorder)
 - c) Blood groups
 - d) Clotting factors and mechanism
 - e) Platelets and disorders of coagulation
- 6 Lymph
 - a) Lymph and lymphatic system, composition, formation and circulation.
 - b) Spleen: structure and functions, Disorders
 - c) Disorders of lymphatic system (definition only)
- 7 Cardiovascular system
 - a) Anatomy and functions of heart
 - b) Blood vessels and circulation (Pulmonary, coronary and systemic circulation)
 - c) Electrocardiogram (ECG)
 - d) Cardiac cycle and heart sounds
 - e) Blood pressure – its maintenance and regulation
 - f) Definition of the following disorders
Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina,
Myocardial infarction, Congestive heart failure, Cardiac arrhythmias
- 8 Respiratory system
 - a) Anatomy of respiratory organs and functions
 - b) Mechanism / physiology of respiration and regulation of respiration
 - c) Transport of respiratory gases
 - d) Respiratory volumes and capacities, and Definition of: Hypoxia, Asphyxia,
Dybarism, Oxygen therapy and resuscitation.
- 9 Digestive system
 - a) Anatomy and physiology of GIT
 - b) Anatomy and functions of accessory glands of GIT
 - c) Digestion and absorption
 - d) Disorders of GIT (definitions only)

- 10 Nervous system
 - a) Definition and classification of nervous system
 - b) Anatomy, physiology and functional areas of cerebrum
 - c) Anatomy and physiology of cerebellum
 - d) Anatomy and physiology of mid brain
 - e) Thalamus, hypothalamus and Basal Ganglia
 - f) Spinal cord: Structure & reflexes – mono-poly-planter
 - g) Cranial nerves – names and functions
 - h) ANS – Anatomy & functions of sympathetic & parasympathetic N.S.

- 11 Urinary system
 - a) Anatomy and physiology of urinary system
 - b) Formation of urine
 - c) Renin Angiotensin system – Juxtaglomerular apparatus - acid base Balance
 - d) Clearance tests and micturition

- 12 Endocrine system
 - a) Pituitary gland
 - b) Adrenal gland
 - c) Thyroid and Parathyroid glands
 - d) Pancreas and gonads

- 13 Reproductive system
 - a) Male and female reproductive system
 - b) Their hormones – Physiology of menstruation
 - c) Spermatogenesis & Oogenesis
 - d) Sex determination (genetic basis)
 - e) Pregnancy and maintenance and parturition
 - f) Contraceptive devices

- 14 Sense organs
 - a) Eye
 - b) Ear
 - c) Skin
 - d) Tongue & Nose

- 15 Skeletal muscles
 - a) Histology
 - b) Physiology of Muscle contraction
 - c) Physiological properties of skeletal muscle and their disorders (definitions)

- 16 Sports physiology
 - a) Muscles in exercise, Effect of athletic training on muscles and muscle performance,
 - b) Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise,
 - c) Drugs and athletics

1.1 HUMAN ANATOMY & PHYSIOLOGY (PRACTICAL)

Practical : 3 Hrs./Week

General Requirements: Dissection box, Laboratory Napkin, muslin cloth, record, Observation book(100pages), Stationary items, Blood lancet.

Course materials:

Text books

Goyal, R. K, Natvar M.P, and Shah S.A, Practical anatomy, physiology and biochemistry, latest edition, Publisher: B.S Shah Prakashan, Ahmedabad.

Reference books

Ranade VG, Text book of practical physiology, Latest edition, Publisher: PVG, Pune Anderson Experimental Physiology, Latest edition, Publisher: NA

List of Experiments:

1. Study of tissues of human body
 - (a) Epithelial tissue.
 - (b) Muscular tissue.
2. Study of tissues of human body
 - (a) Connective tissue.
 - (b) Nervous tissue.
3. Study of appliances used in hematological experiments.
4. Determination of W.B.C. count of blood.
5. Determination of R.B.C. count of blood.
6. Determination of differential count of blood.
7. Determination of
 - (a) Erythrocyte Sedimentation Rate.
 - (b) Hemoglobin content of Blood.
 - (c) Bleeding time & Clotting time.
8. Determination of
 - (a) Blood Pressure.
 - (b) Blood group.

9. Study of various systems with the help of charts, models & specimens
 - (a) Skeleton system part I-axial skeleton.
 - (b) Skeleton system part II- appendicular skeleton.
 - (c) Cardiovascular system.
 - (d) Respiratory system.
 - (e) Digestive system.
 - (f) Urinary system.
 - (g) Nervous system.
 - (h) Special senses.
 - (i) Reproductive system.
10. Study of different family planning appliances.
11. To perform pregnancy diagnosis test.
12. Study of appliances used in experimental physiology.
13. To record simple muscle curve using gastrocnemius sciatic nerve preparation.
14. To record simple summation curve using gastrocnemius sciatic nerve preparation.
15. To record simple effect of temperature using gastrocnemius sciatic nerve preparation.
16. To record simple effect of load & after load using gastrocnemius sciatic nerve preparation.
17. To record simple fatigue curve using gastrocnemius sciatic nerve preparation.

Scheme of Practical Examination:

	Sessionals	Annual
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

1.2 PHARMACEUTICS (THEORY)

Theory : 2 Hrs. /Week

1. Scope and objectives: This course is designed to impart a fundamental knowledge on the art and science of formulating different dosage forms. It prepares the students for most basics of the applied field of pharmacy.

2. Upon the completion of the course the student should be able to:

- a. know the formulation aspects of different dosage forms;
- b. do different pharmaceutical calculation involved in formulation;
- c. formulate different types of dosage forms; and
- d. appreciate the importance of good formulation for effectiveness.

3. Course materials:

Text books

- a. Cooper and Gunns Dispensing for pharmacy students.
- b. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma.

Reference books

- a. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.
- b. Remington's Pharmaceutical Sciences.
- c. Register of General Pharmacy by Cooper and Gunn.
- d. General Pharmacy by M.L.Schroff.

4. Lecture wise programme:

Topics

- 1 a. Introduction to dosage forms - classification and definitions
b. Prescription: definition, parts and handling
c. Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses.
- 2 Historical back ground and development of profession of pharmacy and pharmaceutical industry in brief.
- 3 Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such as BP, USP, European Pharmacopoeia, Extra pharmacopoeia and Indian national formulary.
- 4 Weights and measures, Calculations involving percentage solutions, allegation, proof spirit, isotonic solutions etc.
- 5 Powders and Granules: Classification advantages and disadvantages, Preparation of simple, compound powders, Insufflations, Dusting powders, Eutectic and Explosive powders, Tooth powder and effervescent powders and granules.
- 6 Monophasic Dosage forms: Theoretical aspects of formulation including adjuvant like stabilizers, colorants, flavours with examples. Study of Monophasic liquids like gargles, mouth washes, Throat paint, Ear drops, Nasal drops, Liniments and lotions, Enemas and collodions.

- 7 Biphasic dosage forms: Suspensions and emulsions, Definition, advantages and disadvantages, classification, test for the type of emulsion, formulation, stability and evaluation.
- 8 Suppositories and pessaries: Definition, advantages and disadvantages, types of base, method of preparation, Displacement value and evaluation.
- 9 Galenicals: Definition, equipment for different extraction processes like infusion, Decoction, Maceration and Percolation, methods of preparation of spirits, tinctures and extracts.
- 10 Pharmaceutical calculations.
- 11 Surgical aids: Surgical dressings, absorbable gelatin sponge, sutures, ligatures and medicated bandages.
- 12 Incompatibilities: Introduction, classification and methods to overcome the incompatibilities.

1.2 PHARMACEUTICS (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments:

1. Syrups

- a. Simple Syrup I.P
- b. Syrup of Ephedrine Hcl NF
- c. Syrup Vasaka IP
- d. Syrup of ferrous Phosphate IP
- e. Orange Syrup

2. Elixir

- a. Piperizine citrate elixir BP
- b. Cascara elixir BPC
- c. Paracetamol elixir BPC

3. Linctus

- a. Simple Linctus BPC
- b. Pediatric simple Linctus BPC

4. Solutions

- a. Solution of cresol with soap IP
- b. Strong solution of ferric chloride BPC
- c. Aqueous Iodine Solution IP
- d. Strong solution of Iodine IP
- e. Strong solution of ammonium acetate IP

- 5. Liniments**
 - a. Liniment of turpentine IP*
 - b. Liniment of camphor IP
- 6. Suspensions***
 - a. Calamine lotion
 - b. Magnesium Hydroxide mixture BP
- 7. Emulsions***
 - a. Cod liver oil emulsion
 - b. Liquid paraffin emulsion
- 8. Powders***
 - a. Eutectic powder
 - b. Explosive powder
 - c. Dusting powder
 - d. Insufflations
- 9. Suppositories***
 - a. Boric acid suppositories
 - b. Chloral suppositories
- 10. Incompatibilities**
 - a. Mixtures with Physical
 - b. Chemical & Therapeutic incompatibilities

* colourless bottles required for dispensing * Paper envelope (white), butter paper and white paper required for dispensing.

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

1.3 MEDICINAL BIOCHEMISTRY (THEORY)

Theory : 3 Hrs. /Week

1. Scope of the Subject: Applied biochemistry deals with complete understanding of the molecular level of the chemical process associated with living cells. Clinical chemistry deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment, and prevention of diseases.

2. Objectives of the Subject (Know, do, appreciate) :

The objective of the present course is providing biochemical facts and the principles to the students of pharmacy. Upon completion of the subject student shall be able to –

- understand the catalytic activity of enzymes and importance of isoenzymes in diagnosis of diseases;
- know the metabolic process of biomolecules in health and illness (metabolic disorders);
- understand the genetic organization of mammalian genome; protein synthesis; replication; mutation and repair mechanism;
- know the biochemical principles of organ function tests of kidney, liver and endocrine gland; and
- do the qualitative analysis and determination of biomolecules in the body fluids.

Text books (Theory)

- Harpers review of biochemistry - Martin
- Text book of biochemistry – D.Satyanarayana
- Text book of clinical chemistry- Alex kaplan &Laverve L.Szabo

Reference books (Theory)

- Principles of biochemistry -- Lehninger
- Text book of biochemistry -- Ramarao
- Practical Biochemistry-David T.Plummer.
- Practical Biochemistry-Pattabhiraman.

3. Lecture wise programme:

Topics

- 1 Introduction to biochemistry:** Cell and its biochemical organization, transport process across the cell membranes. Energy rich compounds; ATP, Cyclic AMP and their biological significance.
- 2 Enzymes:** Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases.
- 3 Carbohydrate metabolism:** Glycolysis, Citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, gluconeogenesis, glycogenesis. Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases); Glucose, Galactose tolerance test and their significance; hormonal regulation of carbohydrate metabolism.
- 4 Lipid metabolism:** Oxidation of saturated (β -oxidation); Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids; metabolism of cholesterol; Hormonal regulation of lipid metabolism. Defective metabolism of lipids (Atherosclerosis, fatty liver,

hypercholesterolemia).

- 5 **Biological oxidation:** Coenzyme system involved in Biological oxidation. Electron transport chain (its mechanism in energy capture; regulation and inhibition); Uncouplers of ETC; Oxidative phosphorylation;
- 6 **Protein and amino acid metabolism:** protein turn over; nitrogen balance; Catabolism of Amino acids (Transamination, deamination & decarboxylation). Urea cycle and its metabolic disorders; production of bile pigments; hyperbilirubinemia, porphoria, jaundice. Metabolic disorder of Amino acids.
- 7 **Nucleic acid metabolism:** Metabolism of purine and pyrimidine nucleotides; Protein synthesis; Genetic code; inhibition of protein synthesis; mutation and repair mechanism; DNA replication (semiconservative /onion peel models) and DNA repair mechanism.
- 8 **Introduction to clinical chemistry: Cell;** composition; malfunction; Roll of the clinical chemistry laboratory.
- 9 **The kidney function tests:** Role of kidney; Laboratory tests for normal function includes-
 - a) Urine analysis (macroscopic and physical examination, quantitative and semiquantitative tests.)
 - b) Test for NPN constituents. (Creatinine /urea clearance, determination of blood and urine creatinine, urea and uric acid)
 - c) Urine concentration test
 - d) Urinary tract calculi. (stones)
- 10 **Liver function tests:** Physiological role of liver, metabolic, storage, excretory, protective, circulatory functions and function in blood coagulation.
 - a) Test for hepatic dysfunction-Bile pigments metabolism.
 - b) Test for hepatic function test- Serum bilirubin, urine bilirubin, and urine urobilinogen.
 - c) Dye tests of excretory function.
 - d) Tests based upon abnormalities of serum proteins.
Selected enzyme tests.
- 11 **Lipid profile tests:** Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.
- 12 **Immunochemical techniques** for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases.
Radio immuno assay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA)
- 13 **Electrolytes:** Body water, compartments, water balance, and electrolyte distribution. Determination of sodium, calcium potassium, chlorides, bicarbonates in the body fluids.

1.3 MEDICINAL BIOCHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

Title of the Experiment:

- 1 Qualitative analysis of normal constituents of urine.*
 - 2 Qualitative analysis of abnormal constituents of urine.*
 - 3 Quantitative estimation of urine sugar by Benedict's reagent method.**
 - 4 Quantitative estimation of urine chlorides by Volhard's method.**
 - 5 Quantitative estimation of urine creatinine by Jaffe's method.**
 - 6 Quantitative estimation of urine calcium by precipitation method.**
 - 7 Quantitative estimation of serum cholesterol by Libermann Burchard's method.**
 - 8 Preparation of Folin Wu filtrate from blood.*
 - 9 Quantitative estimation of blood creatinine.**
 - 10 Quantitative estimation of blood sugar Folin-Wu tube method.**
 - 11 Estimation of SGOT in serum.**
 - 12 Estimation of SGPT in serum.**
 - 13 Estimation of Urea in Serum.**
 - 14 Estimation of Proteins in Serum.**
 - 15 Determination of serum bilirubin**
 - 16 Determination of Glucose by means of Glucoseoxidase.**
 - 17 Enzymatic hydrolysis of Glycogen/Starch by Amylases.**
 - 18 Study of factors affecting Enzyme activity. (pH & Temp.)**
 - 19 Preparation of standard buffer solutions and its pH measurements (any two)*
 - 20 Experiment on lipid profile tests**
 - 21 Determination of sodium,calcium and potassium in serum.**
- ** indicate major experiments & * indicate minor experiments

Assignments:

Format of the assignment

1. Minimum & Maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.
4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

1.4 PHARMACEUTICAL ORGANIC CHEMISTRY (THEORY)

Theory : 3 Hrs. /Week

- 1. Scope and objectives:** This course is designed to impart a very good knowledge about
 - IUPAC/Common system of nomenclature of simple organic compounds belonging to different classes of organic compounds;
 - Some important physical properties of organic compounds;
 - Free radical/ nucleophilic [alkyl/ acyl/ aryl] /electrophilic substitution, free radical/ nucleophilic / electrophilic addition, elimination, oxidation and reduction reactions with mechanism, orientation of the reaction, order of reactivity, stability of compounds;
 - Some named organic reactions with mechanisms; and
 - Methods of preparation, test for purity, principle involved in the assay, important medicinal uses of some important organic compounds.

2. Course materials:

Text books

- T.R.Morrison and R. Boyd - Organic chemistry,
- Bentley and Driver-Text book of Pharmaceutical chemistry
- I.L.Finer- Organic chemistry, the fundamentals of chemistry

Reference books

- Organic chemistry – J.M.Cram and D.J.Cram
- Organic chemistry- Brown
- Advanced organic chemistry- Jerry March, Wiley
- Organic chemistry- Cram and Hammered, Pine Hendrickson

3. Lecture wise programme :

Topics

- Structures and Physical properties:
 - Polarity of bonds, polarity of molecules, M.P, Inter molecular forces, B.P, Solubility, non ionic solutes and ionic solutes, protic and aprotic Solvents, ion pairs,
 - Acids and bases, Lowry bronsted and Lewis theories
 - Isomerism
- Nomenclature of organic compound belonging to the following classes Alkanes, Alkenes, Dienes, Alkynes, Alcohols, Aldehydes, Ketones, Amides, Amines, Phenols, Alkyl Halides, Carboxylic Acid, Esters, Acid Chlorides And Cycloalkanes.
- Free radicals chain reactions of alkane : Mechanism, relative reactivity and stability
- Alicyclic compounds : Preparations of cyclo alkanes, Bayer strain theory and orbital picture of angle strain.
- Nucleophilic aliphatic substitution mechanism: Nucleophiles and leaving groups, kinetics of second and first order reaction, mechanism and kinetics of SN_2 reactions. Stereochemistry and steric hindrance, role of solvents, phase transfer catalysis, mechanism and kinetics of SN_1 reactions, stereochemistry, carbocation and their stability, rearrangement of carbocation, role of solvents in SN_1 reaction, Ion dipole bonds, SN_2 versus SN_1 solvolyses, nucleophilic assistance by the solvents.
- Dehydro halogenation of alkyl halides: 1,2 elimination, kinetics, E_2 and E_1

- mechanism, elimination via carbocation, evidence for E2 mechanism, absence of rearrangement isotope effect, absence hydrogen exchange, the element effect, orientation and reactivity, E2 versus E1, elimination versus substitution, dehydration of alcohol, ease of dehydration, acid catalysis, reversibility, orientation.
- 7 Electrophilic and free radicals addition: Reactions at carbon-carbon, double bond, electrophile, hydrogenation, heat of hydrogenation and stability of alkenes, markownikoff rule, addition of hydrogen halides, addition of hydrogen bromides, peroxide effect, electrophilic addition, mechanism, rearrangement, absence of hydrogen exchange, orientation and reactivity, addition of halogen, mechanism, halohydrin formation, mechanism of free radicals addition, mechanism of peroxide initiated addition of hydrogen bromide, orientation of free addition, additions of carbene to alkene, cyclo addition reactions.
 - 8 Carbon-carbon double bond as substituents: Free radical halogenations of alkenes, comparison of free radical substitution with free radical addition, free radical substitution in alkenes, orientation and reactivity, allylic rearrangements.
 - 9 Theory of resonance: Allyl radical as a resonance hybrid, stability, orbital picture, resonance stabilisation of allyl radicals, hyper conjugation, allyl cation as a resonance hybrid, nucleophilic substitution in allylic substrate, SN1 reactivity, allylic rearrangement, resonance stabilisation of allyl cation, hyper conjugation, nucleophilic substitution in allylic substrate, SN2 nucleophilic substitution in vinylic substrate, vinylic cation, stability of conjugated dienes, resonance in alkenes, hyper conjugation, ease of formation of conjugated dienes, orientation of elimination, electrophilic addition to conjugated dienes, 1,4- addition, 1,2-versus 1,4-addition, rate versus equilibrium, orientation and reactivity of free radical addition to conjugated dienes.
 - 10 Electrophilic aromatic substitution: Effect of substituent groups, determination of orientation, determination of relative reactivity, classification of substituent group, mechanism of nitration, sulphonation, halogenation, friedel craft alkylation, friedel craft acylation, reactivity and orientation, activating and deactivating O,P,M directing groups, electron release via resonance, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogenation of alkyl benzene, resonance stabilization of benzyl radical.
 - 11 Nucleophilic addition reaction: Mechanism, ionisation of carboxylic acids, acidity constants, acidity of acids, structure of carboxylate ions, effect of substituent on acidity, nucleophilic acyl substitution reaction, conversion of acid to acid chloride, esters, amide and anhydride. Role of carboxyl group, comparison of alkyl nucleophilic substitution with acyl nucleophilic substitution.
 - 12 Mechanism of aldol condensation, claisen condensation, cannizzaro reaction,

- crossed aldol condensation, crossed cannizzaro reaction, benzoin condensation, perkin condensation. Knoevenagel, Reformatsky reaction, Wittig reaction, Michael addition.
- 13 Hoffman rearrangement: Migration to electron deficient nitrogen, Sandmeyer's reaction, basicity of amines, diazotisation and coupling, acidity of phenols, Williamson synthesis, Fries rearrangement, Kolbe reaction, Reimer tieman's reactions.
 - 14 Nucleophilic aromatic substitution: Bimolecular displacement mechanisms, orientation, comparison of aliphatic nucleophilic substitution with that of aromatic.
 - 15 Oxidation reduction reaction.
 - 16 Study of the following official compounds- preparation, test for purity, assay and medicinal uses of Chlorbutol, Dimercaprol, Glyceryl trinitrate, Urea, Ethylene diamine dihydrate, Vanillin, Paraldehyde, Ethylene chloride, Lactic acid, Tartaric acid, citric acid, salicylic acid, aspirin, methyl salicylate, ethyl benzoate, benzyl benzoate, dimethyl pthalate, sodium lauryl sulphate, saccharin sodium, mephensin.

1.4 PHARMACEUTICAL ORGANIC CHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

I. Introduction to the various laboratory techniques through demonstration involving synthesis of the following compounds (at least 8 compounds to be synthesised):

1. Acetanilide / aspirin (Acetylation)
2. Benzanilide / Phenyl benzoate (Benzoylation)
3. P-bromo acetanilide / 2,4,6 – tribromo aniline (Bromination)
4. Dibenzylidene acetone (Condensation)
5. 1-Phenylazo-2-naphthol (Diazotisation and coupling)
6. Benzoic acid / salicylic acid (Hydrolysis of ester)
7. M-dinitro benzene (Nitration)
8. 9, 10 – Anthraquinone (Oxidation of anthracene) / preparation of benzoic acid from toluene or benzaldehyde
9. M-phenylene diamine (Reduction of M-dinitrobenzene) / Aniline from nitrobenzene
10. Benzophenone oxime
11. Nitration of salicylic acid
12. Preparation of picric acid
13. Preparation of O-chlorobenzoic acid from O-chlorotoluene
14. Preparation of cyclohexanone from cyclohexanol

II. Identification of organic compounds belonging to the following classes by :

Systematic qualitative organic analysis including preparation of derivatives Phenols, amides, carbohydrates, amines, carboxylic acids, aldehyde and ketones, Alcohols, esters, hydrocarbons, anilides, nitrocompounds.

III. Introduction to the use of stereo models:

Methane, Ethane, Ethylene, Acetylene, Cis alkene, Trans alkene, inversion of configuration.

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

1.5 PHARMACEUTICAL INORGANIC CHEMISTRY (THEORY)

Theory : 2 Hrs. /Week

1. **Scope and objectives:** This course mainly deals with fundamentals of Analytical chemistry and also the study of inorganic pharmaceuticals regarding their monographs and also the course deals with basic knowledge of analysis of various pharmaceuticals.
2. **Upon completion of the course student shall be able to:**
 - a. understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceuticals;
 - b. know the analysis of the inorganic pharmaceuticals their applications; and
 - c. appreciate the importance of inorganic pharmaceuticals in preventing and curing the disease.

3. **Course materials:**

Text books

- a. A text book Inorganic medicinal chemistry by Surendra N. Pandeya
- b. A. H. Beckett and J. B. Stanlake's Practical Pharmaceutical chemistry Vol-I & Vol-II
- c. Inorganic Pharmaceutical Chemistry III-Edition P.Gundu Rao

Reference books

- a. Inorganic Pharmaceutical Chemistry by Anand & Chetwal
- b. Pharmaceutical Inorganic chemistry by Dr.B.G.Nagavi
- c. Analytical chemistry principles by John H. Kennedy
- d. I.P.1985 and 1996, Govt. of India, Ministry of health

4. **Lecture wise programme:**

Topics

- 1 Errors
- 2 Volumetric analysis
- 3 Acid-base titrations
- 4 Redox titrations
- 5 Non aqueous titrations
- 6 Precipitation titrations
- 7 Complexometric titrations
- 8 Theory of indicators
- 9 Gravimetry
- 10 Limit tests
- 11 Medicinal gases
- 12 Acidifiers
- 13 Antacids
- 14 Cathartics
- 15 Electrolyte replenishers
- 16 Essential Trace elements
- 17 Antimicrobials
- 18 Pharmaceutical aids
- 19 Dental Products
- 20 Miscellaneous compounds
- 21 Radio Pharmaceuticals

1.5 PHARMACEUTICAL INORGANIC CHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

- 1. Limit test (6 exercises)**
 - a. Limit test for chlorides
 - b. Limit test for sulphates
 - c. Limit test for iron
 - d. Limit test for heavy metals
 - e. Limit test for arsenic
 - f. Modified limit tests for chlorides and sulphates

- 2. Assays (10 exercises)**
 - a. Ammonium chloride- Acid-base titration
 - b. Ferrous sulphate- Cerimetry
 - c. Copper sulphate- Iodometry
 - d. Calcium gluconate- Complexometry
 - e. Hydrogen peroxide – Permanganometry
 - f. Sodium benzoate – Nonaqueous titration
 - g. Sodium chloride – Modified volhard's method
 - h. Assay of KI – KIO_3 titration
 - i. Gravimetric estimation of barium as barium sulphate
 - j. Sodium antimony gluconate or antimony potassium tartarate

- 3. Estimation of mixture (Any two exercises)**
 - a. Sodium hydroxide and sodium carbonate
 - b. Boric acid and Borax
 - c. Oxalic acid and sodium oxalate

- 4. Test for identity (Any three exercises)**
 - a. Sodium bicarbonate
 - b. Barium sulphate
 - c. Ferrous sulphate
 - d. Potassium chloride

- 5. Test for purity (Any two exercises)**
 - a. Swelling power in Bentonite
 - b. Acid neutralising capacity in aluminium hydroxide gel
 - c. Ammonium salts in potash alum
 - d. Adsorption power heavy Kaolin
 - e. Presence of Iodates in KI

- 6. Preparations (Any two exercises)**
 - a. Boric acids

- b. Potash alum
- c. Calcium lactate
- d. Magnesium sulphate

Scheme of Practical Examination :

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment 1&2	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

1.6 REMEDIAL MATHEMATICS/BIOLOGY (THEORY)

Theory : 3 Hrs. /Week

REMEDIAL MATHEMATICS :

1. Scope and objectives: This is an introductory course in mathematics. This subjects deals with the introduction to matrices, determinants, trigonometry, analytical geometry, differential calculus, integral calculus, differential equations, laplace transform.

2. Upon completion of the course the student shall be able to : –

- a. Know Trigonometry, Analytical geometry, Matrices, Determinant, Integration, Differential equation, Laplace transform and their applications;
- b. solve the problems of different types by applying theory; and
- c. appreciate the important applications of mathematics in pharmacy.

3. Course materials:

Text books

- a. Differential calculus By Shantinarayan
- b. Text book of Mathematics for second year pre-university by Prof.B.M.Sreenivas

Reference books

- a. Integral calculus By Shanthinarayan
- b. Engineering mathematics By B.S.Grewal
- c. Trigonometry Part-I By S.L.Loney

4. Lecture wise programme :

Topics

- 1 **Algebra :** Determinants, Matrices
- 2 **Trigonometry :** Sides and angles of a triangle, solution of triangles
- 3 **Analytical Geometry :**Points, Straight line, circle, parabola
- 4 **Differential calculus:** Limit of a function, Differential calculus, Differentiation of a sum, Product, Quotient Composite, Parametric, exponential, trigonometric and Logarithmic function. Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions of two variables
- 5 **Integral Calculus:** Definite integrals, integration by substitution and by parts, Properties of definite integrals.
- 6 **Differential equations:** Definition, order, degree, variable separable, homogeneous, Linear, heterogeneous, linear, differential equation with constant coefficient, simultaneous linear equation of second order.
- 7 **Laplace transform:** Definition, Laplace transform of elementary functions, Properties of linearity and shifting.

BIOLOGY :

1. Scope and objectives: This is an introductory course in Biology, which gives detailed study of natural sources such as plant and animal origin. This subject has been introduced to the pharmacy course in order to make the student aware of various naturally occurring drugs and its history, sources, classification, distribution and the characters of the plants and animals. This subject gives basic foundation to Pharmacognosy.

2. Course materials:

Text books

- a. Text book of Biology by S.B.Gokhale
- b. A Text book of Biology by Dr.Thulajappa and Dr. Seetaram.

Reference books

- a. A Text book of Biology by B.V.Sreenivasa Naidu
- b. A Text book of Biology by Naidu and Murthy
- c. Botany for Degree students By A.C.Dutta.
- d. Outlines of Zoology by M.Ekambaranatha ayyer and T.N.Ananthakrishnan.
- e. A manual for pharmaceutical biology practical by S.B.Gokhale and C.K.Kokate.

3. Lecture wise programme :

Topic

PART – A

- 01 Introduction
- 02 General organization of plants and its inclusions
- 03 Plant tissues
- 04 Plant kingdom and its classification
- 05 Morphology of plants
- 06 Root, Stem, Leaf and Its modifications
- 07 Inflorescence and Pollination of flowers
- 08 Morphology of fruits and seeds
- 09 Plant physiology
- 10 Taxonomy of Leguminosae, umbelliferae, Solanaceae, Lilliaceae, Zinziberaceae, Rubiaceae
- 11 Study of Fungi, Yeast, Penicillin and Bacteria

PART-B

- 01 Study of Animal cell
- 02 Study animal tissues
- 03 Detailed study of frog
- 04 Study of Pisces, Raptiles, Aves
- 05 General organization of mammals
- 06 Study of poisonous animals

1.6 BIOLOGY (PRACTICAL)

Practical : 3 Hrs./Week

Title:

1. Introduction of biology experiments
2. Study of cell wall constituents and cell inclusions
3. Study of Stem modifications
4. Study of Root modifications
5. Study of Leaf modifications
6. Identification of Fruits and seeds
7. Preparation of Permanent slides
8. T.S. of Senna, Cassia, Ephedra, Podophyllum.
9. Simple plant physiological experiments
10. Identification of animals
11. Detailed study of Frog
12. Computer based tutorials

Scheme of Practical Examination :

	Sessionals	Annual
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance.

Second year

2.1 PATHOPHYSIOLOGY (THEORY)

Theory : 3 Hrs. /Week

- 1. Scope of the Subject:** This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic Pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge of its application in other subject of pharmacy.
- 2. Objectives of the Subject :** Upon completion of the subject student shall be able to –
 - a. describe the etiology and pathogenesis of the selected disease states;
 - b. name the signs and symptoms of the diseases; and
 - c. mention the complications of the diseases.

Text books (Theory)

- a. Pathologic basis of disease by- Cotran, Kumar, Robbins
- b. Text book of Pathology- Harsh Mohan
- c. Text book of Pathology- Y.M. Bhide

Reference books (Theory)

- a. Clinical Pharmacy and Therapeutics; Second edition; Roger Walker; Churchill Livingstone publication

3. Detailed syllabus and lecture wise schedule :

Chapter

- 1 Basic principles of cell injury and Adaptation**
 - a) Causes, Pathogenesis and morphology of cell injury
 - b) Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen infiltration and glycogen infiltration and glycogen storage diseases
- 2 Inflammation**
 - a) Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation
 - b) Repairs of wounds in the skin, factors influencing healing of wounds
- 3 Diseases of Immunity**
 - a) Introduction to Tand B cells
 - b) MHC proteins or transplantation antigens
 - c) Immune tolerance
 - Hypersensitivity
Hypersensitivity type I, II, III, IV, Biological significance, Allergy due to food, chemicals and drugs
 - Autoimmunity
Criteria for autoimmunity, Classifications of autoimmune diseases in man, mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft.
 - Acquired immune deficiency syndrome (AIDS)
 - Amyloidosis

- 4 **Cancer:** differences between benign and malignant tumors, Histological diagnosis of malignancy, invasions and metastasis, patterns of spread, disturbances of growth of cells, classification of tumors, general biology of tumors, spread of malignant tumors, etiology and pathogenesis of cancer.
- 5 Types of shock, mechanisms, stages and management
- 6 Biological effects of radiation
- 7 Environmental and nutritional diseases
 - i) Air pollution and smoking- SO₂,NO, NO₂, and CO
 - ii) Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.
- 8 Pathophysiology of common diseases
 - a. Parkinsonism
 - b. Schizophrenia
 - c. Depression and mania
 - d. Hypertension,
 - e. Stroke (ischaemic and hemorrhage)
 - f. Angina, CCF, Atherosclerosis, Myocardial infarction
 - g. Diabetes Mellitus
 - h. Peptic ulcer and inflammatory bowel diseases
 - i. Cirrhosis and Alcoholic liver diseases
 - j. Acute and chronic renal failure
 - k. Asthma and chronic obstructive airway diseases
- 9 Infectious diseases :
Sexually transmitted diseases (HIV,Syphilis,Gonorrhoea), Urinary tract infections, Pneumonia, Typhoid, Tuberculosis, Leprosy, Malaria Dysentery (bacterial and amoebic), Hepatitis- infective hepatitis.

4. Assignments :

Title of the Experiment

- 1 Chemical Mediators of inflammation
- 2 Drug Hypersensitivity
- 3 Cigarette smoking & its ill effects
- 4 Biological Effects of Radiation
- 5 Etiology and hazards of obesity
- 6 Complications of diabetes
- 7 Diagnosis of cancer
- 8 Disorders of vitamins
- 9 Methods in Pathology-Laboratory values of clinical significance
- 10 Pathophysiology of Dengue Hemorrhagic Fever (DHF)

Format of the assignment

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year
4. It shall be computer draft copy.
5. Name and signature of the student
6. Time allocated for presentation may be 8+2 Min.

2.2 PHARMACEUTICAL MICROBIOLOGY (THEORY)

Theory : 3 Hrs. /Week

- 1. Scope of the Subject:** Microbiology has always been an essential component of pharmacy curriculum. This is because of the relevance of microbiology to pharmaceutical sciences and more specifically to pharmaceutical industry. Pharmaceutical biotechnology is the logical extension of pharmaceutical microbiology, which is expected to change the complete drug product scenario in the future. This course deals with the various aspects of microorganisms, its classification, morphology, laboratory cultivation identification and maintenance. Its also discusses with sterilization of pharmaceutical products, equipment, media etc. The course further discusses the immunological preparations, diseases its transmission, diagnosis, control and immunological tests.

2. Objectives of the Subject :

Upon completion of the subject student shall be able to –

- know the anatomy, identification, growth factors and sterilization of microorganisms;
- know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
- do estimation of RNA and DNA and there by identifying the source;
- do cultivation and identification of the microorganisms in the laboratory;
- do identification of diseases by performing the diagnostic tests; and
- appreciate the behavior of motility and behavioral characteristics of microorganisms.

Text books (Theory)

- Vanitha Kale and Kishor Bhusari “ Applied Microbiology ” Himalaya Publishing house Mumbai.
- Mary Louis Turgeon “ Immunology and Serology in Laboratory Medicines” 2nd edition, 1996 Mosby- Year book inc St. Louis Missouri 63146.
- Harsh Mohan, “ Text book of Pathology” 3rd edition, 1998, B-3 Ansari road Darya ganj N. Delhi.

Reference books (Theory)

- Prescot L.M., Jarley G.P Klein D.A “Microbiology” 2nd- edition Mc Graw Hill Company Inc
- Rawlins E.A.”Bentley’s Text Book of Pharmaceutics” B ailliere Tindals 24-28 London 1988
- Forbisher “ Fundamentals of Microbiology” Philidelphia W.B. Saunders.
- Prescott L.M. Jarley G.P., Klein.D.A. “ Microbiology.”2nd edition WMC Brown Publishers, Oxford. 1993
- War Roitt, Jonathan Brostoff, David male, “ Immunology”3rd edition 1996, Mosby-year book Europe Ltd, London.
- Pharmacopoeia of India, Govt of India, 1996.

3. Detailed syllabus and lecture wise schedule :

Title of the topic

- 1 Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them.
- 2 Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae, Spirochetes.
- 3 Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures.
- 4 Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. Counting of bacteria -Total and Viable counting techniques.
- 5 Detailed study of different methods of sterilization including their merits and demerits. Sterilization methods for all pharmaceutical products. Detailed study of sterility testing of different pharmaceutical preparations . Brief information on Validation.
- 6 Disinfectants- Study of disinfectants, antiseptics, fungicidal and virucidal agents factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteristatic, , virucidal activities, evaluation of preservatives in pharmaceutical preparations.
- 7 Immunology- Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity(active and passive) . Antigens, chemical nature of antigens structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization programme, and importance of booster dose.
- 8 Diagnostic tests : Schick's Test, Elisa test, Western Blot test, Southern Blot PCR Widal, QBC, Mantoux Peripheral smear. Study of malarial parasite.
- 9 Microbial culture sensitivity Testing: Interpretation of results Principles and methods of different microbiological assays, microbiological assay of Penicillin, Streptomycin and vitamin B₂ and B₁₂. Standardisation of vaccines and sera.
- 10 Study of infectious diseases: Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis & Gonorrhoea and HIV.

2.2 PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)

Practical : 3 Hrs./Week

Title of the Experiment:

- 1 Study of apparatus used in experimental microbiology*.
- 2 Sterilisation of glass ware's. Preparation of media and sterilisation.*
- 3 Staining techniques – Simple staining ; Gram's staining ; Negative staining**
- 4 Study of motility characters*.
- 5 Enumeration of micro-organisms (Total and Viable)*
- 6 Study of the methods of isolation of pure culture.*
- 7 Bio chemical testing for the identification of micro*-organisms.
- 8 Cultural sensitivity testing for some micro-organisms.*
- 9 Sterility testing for powders and liquids.*
- 10 Determination of minimum inhibitory concentration.*
- 11 Microbiological assay of antibiotics by cup plate method.*
- 12 Microbiological assay of vitamins by Turbidometric method**
- 13 Determination of RWC.**
- 14 Diagnostic tests for some common diseases, Widal, malarial parasite.**

* Indicate minor experiment & ** indicate major experiment

Assignments:

- 1 Visit to some pathological laboratories & study the activities and equipment/instruments used and reporting the same.
2. Visit to milk dairies (Pasturization) and microbial laboratories(other sterization methods) & study the activities and equipment/instruments used and reporting the same.
3. Library assignments
 - a. Report of recent microbial techniques developed in diagnosing some common diseases.
 - b. Latest advancement developed in identifying, cultivating & handling of microorganisms.

Format of the assignment:

1. Minimum & Maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.
4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15

Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

2.3 PHARMACOGNOSY & PHYTOPHARMACEUTICALS (THEORY)

Theory : 3 Hrs. /Week

1. Scope and objectives: This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.

2. Upon completion of the course student shall be able to:

- a. understand the basic principles of cultivation, collection and storage of crude drugs;
- b. know the source, active constituents and uses of crude drugs; and
- c. appreciate the applications of primary and secondary metabolites of the plant.

3. Course materials:

Text books

- a. Pharmacognosy by G.E. Trease & W.C.Evans.
- b. Pharmacognosy by C.K.Kokate,Gokhale & A.C.Purohit.

Reference books

- a. Pharmacognosy by Brady & Tyler.E.
- b. Pharmacognosy by T.E.Wallis.
- c. Pharmacognosy by C.S. Shah & Qadery.
- d. Pharmacognosy by M.A. Iyengar.

4. Lecture wise programme:

Topics

- 1 Introduction.
- 2 Definition, history and scope of Pharmacognosy.
- 3 Classification of crude drugs.
- 4 Cultivation, collection, processing and storage of crude drugs.
- 5 Detailed method of cultivation of crude drugs.
- 6 Study of cell wall constituents and cell inclusions.
- 7 Microscopical and powder Microscopical study of crude drugs.
- 8 Study of natural pesticides.
- 9 Detailed study of various cell constituents.
- 10 Carbohydrates and related products.
- 11 Detailed study carbohydrates containing drugs.(11 drugs)
- 12 Definition sources, method extraction, chemistry and method of analysis of lipids.
- 13 Detailed study of oils.
- 14 Definition, classification, chemistry and method of analysis of protein.
- 15 Study of plants fibers used in surgical dressings and related products.
- 16 Different methods of adulteration of crude drugs.

2.3 PHARMACOGNOSY & PHYTOPHARMACEUTICALS (PRACTICAL)

Practical : 3 Hrs./Week

General Requirements: Laboratory Napkin, Observation Book 150 pages Zero brush, Needle, Blade, Match box.

List of experiments:

- 1 Introduction of Pharmacognosy laboratory and experiments.
- 2 Study of cell wall constituents and cell inclusions.
- 3 Macro, powder and microscopic study of Datura.
- 4 Macro, powder and microscopic study of Senna.
- 5 Macro, powder and microscopic study of Cassia.cinnamon.
- 6 Macro, powder and microscopic study of Cinchona.
- 7 Macro, powder and microscopic study of Ephedra.
- 8 Macro, powder and microscopic study of Quassia.
- 9 Macro, powder and microscopic study of Clove
- 10 Macro, powder and microscopic study of Fennel.
- 11 Macro, powder and microscopic study of Coriander.
- 12 Macro, powder and microscopic study of Isapgol.
- 13 Macro, powder and microscopic study of Nux vomica.
- 14 Macro, powder and microscopic study of Rauwolfia.
- 15 Macro, powder and microscopic study of Liquorice.
- 16 Macro, powder and microscopic study of Ginger.
- 17 Macro, powder and microscopic study of Podophyllum.
- 18 Determination of Iodine value.
- 19 Determination of Saponification value and unsaponifiable matter.
- 20 Determination of ester value.
- 21 Determination of Acid value.
- 22 Chemical tests for Acacia.
- 23 Chemical tests for Tragacanth.
- 24 Chemical tests for Agar.
- 25 Chemical tests for Starch.
- 26 Chemical tests for Lipids.(castor oil,sesame oil, shark liver oil,bees wax)
- 27 Chemical tests for Gelatin.

Scheme of Practical Examination:

	Sessionals	Annual
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

2.4 PHARMACOLOGY – I (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, apart from general pharmacology, drugs acting on autonomic nervous system, cardiovascular system, central nervous system, blood and blood forming agents and renal system will be taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.
2. **Objectives of the Subject :** Upon completion of the subject student shall be able to (Know, do, appreciate) –
 - a. understand the pharmacological aspects of drugs falling under the above mentioned chapters;
 - b. handle and carry out the animal experiments;
 - c. appreciate the importance of pharmacology subject as a basis of therapeutics; and
 - d. correlate and apply the knowledge therapeutically.

Text books (Theory) (Author, Title, Edition, Publication Place, Publisher, Year of Publication)

- a. Tripathi, K. D. Essentials of medical pharmacology. 4th Ed, 1999. Publisher: Jaypee, Delhi.
- b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16th edition (single volume), 1999. Publisher: Popular, Dubai.
- c. Rang, H.P. & Dale, M.M. Pharmacology. 4th edition, 1999. Publisher: Churchill Living stone.

Reference books (Theory)(Author, Title, Edition, Publication Place, Publisher, Publication Year)

- a. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9th Ed, 1996. Publisher Mc Graw Hill, Pergamon press.
- b. Craig, C.R.&Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown.Co
- c. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, Int.
- d. Shargel and Leon. Applied Biopharmaceutics and pharmacokinetics. Latest edition. Publisher: Prentice Hall, London.

Text books (Practical) :

Kulkarni, S. K. and Dandia, P. C. Hand book of experimental pharmacology. Latest edition, Publisher: Vallab, Delhi.

Reference books (Practical)

- a. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.
- b. Macleod, L.J. Pharmacological experiments on isolated preparations. Latest edition, Publisher: Churchill livingstone.
- c. Ghosh, M.N. Fundamentals of experimental pharmacology. Latest edition, Publisher: Scientific book agency, Kolkata.
- d. Ian Kitchen. Textbook of in vitro practical pharmacology. Latest edition, Publisher: Black well Scientific.

3. Detailed syllabus and lecture wise schedule :

Title of the topic

1. General Pharmacology

- a) Introduction, definitions and scope of pharmacology
- b) Routes of administration of drugs
- c) Pharmacokinetics (absorption, distribution, metabolism and excretion)
- d) Pharmacodynamics
- e) Factors modifying drug effects
- f) Drug toxicity - Acute, sub- acute and chronic toxicity.
- g) Pre-clinical evaluations
- h) Drug interactions

Note: The term Pharmacology used here refers to the classification, mechanism of action, pharmacokinetics, pharmacodynamics, adverse effects, contraindications, Therapeutic uses, interactions and dose and route of administration.

2. Pharmacology of drugs acting on ANS

- a) Adrenergic and antiadrenergic drugs
- b) Cholinergic and anticholinergic drugs
- c) Neuromuscular blockers
- d) Mydriatics and miotics
- e) Drugs used in myasthenia gravis
- f) Drugs used in Parkinsonism

3. Pharmacology of drugs acting on cardiovascular system

- a) Antihypertensives
- b) Anti-anginal drugs
- c) Anti-arrhythmic drugs
- d) Drugs used for therapy of Congestive Heart Failure
- e) Drugs used for hyperlipidaemias

4. Pharmacology of drugs acting on Central Nervous System

- a) General anesthetics
- b) Sedatives and hypnotics
- c) Anticonvulsants
- d) Analgesic and anti-inflammatory agents
- e) *Psychotropic drugs*
- f) Alcohol and methyl alcohol
- g) CNS stimulants and cognition enhancers
- h) Pharmacology of local anaesthetics

5. Pharmacology of Drugs acting on Respiratory tract

- a) Bronchodilators

- b) Mucolytics
- c) Expectorants
- d) Antitussives
- e) NasalDecongestants

6. **Pharmacology of Hormones and Hormone antagonists**

- a) Thyroid and Antithyroid drugs
- b) Insulin, Insulin analogues and oral hypoglycemic agents
- c) Sex hormones and oral contraceptives
- d) Oxytocin and other stimulants and relaxants

7. **Pharmacology of autocooids and their antagonists**

- a) Histamines and Antihistaminics
- b) 5-Hydroxytryptamine and its antagonists
- c) Lipid derived autocooids and platelet activating factor

2.5 COMMUNITY PHARMACY (THEORY)

Theory : 2 Hrs. /Week

- 1. Scope:** In the changing scenario of pharmacy practice in India, Community Pharmacists are expected to offer various pharmaceutical care services. In order to meet this demand, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling, health screening services for improved patient care in the community set up.
- 2. Objectives:** Upon completion of the course, the student shall be able to –
 - a. know pharmaceutical care services;
 - b. know the business and professional practice management skills in community pharmacies;
 - c. do patient counselling & provide health screening services to public in community pharmacy;
 - d. respond to minor ailments and provide appropriate medication;
 - e. show empathy and sympathy to patients; and
 - f. appreciate the concept of Rational drug therapy.

Text Books:

- a. Health Education and Community Pharmacy by N.S.Parmar.
- b. WHO consultative group report.
- c. Drug store & Business management by Mohammed Ali & Jyoti.

Reference books:

- a. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.
- b. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams & Wilkins.

Special requirements:

1. Either the college is having model community pharmacy (meeting the schedule N requirement) or sign MoU with at least 4-5 community pharmacies nearby to the college for training the students on dispensing and counselling activities.
2. Special equipments like B.P apparatus, Glucometer, Peak flow meter, and apparatus for cholesterol estimation.

3. Scheme of evaluation (80 Marks)

- | | |
|---|----|
| 1. Synopsis | 10 |
| 2. Major Experiment
(Counselling of patients with specific diseases – emphasis should be given on Counselling introduction, content, process and conclusion) | 30 |
| 3. Minor Experiment(Ability to measure B.P/ CBG / Lung function) | 15 |
| 4. Prescription Analysis (Analyzing the prescriptions for probable drug interaction and ability to tell the management) | 15 |
| 5. Viva – Voce | 10 |

4. Lecture wise programme :

Topics

- 1 Definition, scope, of community pharmacy
Roles and responsibilities of Community pharmacist**

- 2 Community Pharmacy Management**
 - a) Selection of site, Space layout, and design
 - b) Staff, Materials- coding, stocking
 - c) Legal requirements
 - d) Maintenance of various registers
 - e) Use of Computers: Business and health care soft wares
- 3 Prescriptions** – parts of prescription, legality & identification of medication related problems like drug interactions.
- 4 Inventory control in community pharmacy**
Definition, various methods of Inventory Control
ABC, VED, EOQ, Lead time, safety stock
- 5 Pharmaceutical care**
Definition and Principles of Pharmaceutical care.
- 6 Patient counselling**
Definition, outcomes, various stages, barriers, Strategies to overcome barriers
Patient information leaflets- content, design, & layouts, advisory labels
- 7 Patient medication adherence**
Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.
- 8 Health screening services**
Definition, importance, methods for screening
Blood pressure/ blood sugar/ lung function and Cholesterol testing
- 9 OTC Medication- Definition, OTC medication list & Counselling**
- 10 Health Education**
WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.
Commonly occurring Communicable Diseases, causative agents,
Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhoea and AIDS
Balance diet, and treatment & prevention of deficiency disorders
Family planning – role of pharmacist
- 11 Responding to symptoms of minor ailments**
Relevant pathophysiology, common drug therapy to,
Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Pyrexia, Ophthalmic symptoms, worms infestations.
- 12 Essential Drugs concept and Rational Drug Therapy**
Role of community pharmacist
- 13 Code of ethics for community pharmacists**

2.6 PHARMACOTHERAPEUTICS - I (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives:** At completion of this subject it is expected that students will be able to understand –
 - a. the pathophysiology of selected disease states and the rationale for drug therapy;
 - b. the therapeutic approach to management of these diseases;
 - c. the controversies in drug therapy;
 - d. the importance of preparation of individualised therapeutic plans based on diagnosis;
 - e. needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
 - f. describe the pathophysiology of selected disease states and explain the rationale for drug therapy;
 - g. summarise the therapeutic approach to management of these diseases including reference to the latest available evidence;
 - h. discuss the controversies in drug therapy;
 - i. discuss the preparation of individualised therapeutic plans based on diagnosis; and
 - j. identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

Text Books

- a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication.
- b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.

Reference Books

- a. Pathologic basis of disease - Robins SL, W.B.Saunders publication.
- b. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.
- c. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
- d. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
- e. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
- f. Relevant review articles from recent medical and pharmaceutical literature.

3. Detailed syllabus and lecture wise schedule :

Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases

Title of the topic

- 1 **Cardiovascular system:** Hypertension, Congestive cardiac failure, Angina

Pectoris, Myocardial infarction, , Hyperlipidaemias , Electrophysiology of heart and Arrhythmias

- 2 Respiratory system :** Introduction to Pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases
Endocrine system : Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis
- 3 General prescribing guidelines for**
 - a. Paediatric patients
 - b. Geriatric patients

 - c. Pregnancy and breast feeding
- 4 Ophthalmology:** Glaucoma, Conjunctivitis- viral & bacterial
- 5 Introduction to rational drug use**
Definition, Role of pharmacist Essential drug concept Rational drug formulations

2.6 PHARMACOTHERAPEUTICS - I (PRACTICAL)

Practical : 3 Hrs./Week

Practicals :

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation. A minimum of 20 cases should be presented and recorded covering most common diseases.

Assignments :

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

Format of the assignment:

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

Third Year

3.1 PHARMACOLOGY – II (THEORY)

Theory : 3 Hrs. /Week

1. Scope of the Subject: This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, drugs acting on autacoids, respiratory system, GIT, immune system and hormones, and pharmacology of autacoids and hormones will be concentrated. In addition, pharmacology of chemotherapeutic agents, vitamins, essential minerals and principles of toxicology are also taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.

2. Objectives of the Subject Upon completion of the subject student shall be able to:

- a. understand the pharmacological aspects of drugs falling under the above mentioned chapters,
- b. carry out the animal experiments confidently,
- c. appreciate the importance of pharmacology subject as a basis of therapeutics, and
- d. correlate and apply the knowledge therapeutically.

Text books (Theory)

- a. Tripathi, K. D. Essentials of medical pharmacology. 4th edition, 1999. Publisher: Jaypee, Delhi.
- b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16th edition (single volume), 1999. Publisher: Popular, Dubai.
- c. Rang, H.P. and Dale, M.M. Pharmacology. 4th edition, 1999. Publisher: Churchill Living stone.

Reference books (Theory)

- a. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9th edition, 1996. Publisher: Mc Graw Hill, Pergamon press.
- b. Craig, C.R. and Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown and company.
- c. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, International.
- d. Gupta, P.K. and Salunkhe, D.K. Modern Toxicology. Volume I, II and III. Latest edition. Publisher: B.V. Gupta, Metropolitan Book Co. (p) Ltd, New Delhi.

Text books (Practical)

Kulkarni, S. K. and Dandia, P. C. Hand book of experimental pharmacology. Latest edition, Publisher: Vallab, Delhi.

Reference books (Practical) :

- a. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.
- b. Macleod, L.J. Pharmacological experiments on isolated preparations. Latest edition, Publisher: Churchill livingstone.
- c. Ghosh, M.N. Fundamentals of experimental pharmacology. Latest edition, Publisher: Scientific book agency, Kolkata.
- d. Ian Kitchen. Textbook of in vitro practical pharmacology. Latest edition, Publisher: Black well Scientific.

3. Detailed syllabus and lecture wise schedule:

Title of the topic

1. **Pharmacology of Drugs acting on Blood and blood forming agents**
 - a) Anticoagulants
 - b) Thrombolytics and antiplatelet agents
 - c) Haemopoietics and plasma expanders

2. **Pharmacology of drugs acting on Renal System**
 - a) Diuretics
 - b) Antidiuretics

3. **Chemotherapy**
 - a) Introduction
 - b) Sulfonamides and co-trimoxazole
 - c) Penicillins and Cephalosporins
 - d) Tetracyclins and Chloramphenicol
 - e) Macrolides, Aminoglycosides, Polyene & Polypeptide antibiotics
 - f) Quinolines and Fluroquinolines
 - g) Antifungal antibiotics
 - h) Antiviral agents
 - i) Chemotherapy of tuberculosis and leprosy
 - j) Chemotherapy of Malaria
 - k) Chemotherapy of protozoal infections (amoebiasis, Giardiasis)
 - l) Pharmacology of Anthelmintic drugs
 - m) Chemotherapy of cancer (Neoplasms)

4. **Immunopharmacology**
Pharmacology of immunosuppressants and stimulants

5. **Principles of Animal toxicology**
Acute, sub acute and chronic toxicity

6. **The dynamic cell: The structures and functions of the components of the cell**

- a) Cell and macromolecules: Cellular classification, subcellular organelles, macromolecules, large macromolecular assemblies
- b) Chromosome structure: Pro and eukaryotic chromosome structures, chromatin structure, genome complexity, the flow of genetic information.
- c) DNA replication: General, bacterial and eukaryotic DNA replication.
- d) The cell cycle: Restriction point, cell cycle regulators and modifiers.
- e) Cell signaling: Communication between cells and their environment, ion-channels, signal transduction pathways (MAP kinase, P38 kinase, JNK, Ras and PI3-kinase pathways, biosensors.

The Gene: Genome structure and function:

- a) Gene structure: Organization and elucidation of genetic code.
- b) Gene expression: Expression systems (pro and eukaryotic), genetic elements that control gene expression (nucleosomes, histones, acetylation, HDACS, DNA binding protein families.
- c) Transcription and Transcription factors: Basic principles of transcription in pro and eukaryotes. Transcription factors that regulate transcription in pro and eukaryotes.

RNA processing: rRNA, tRNA and mRNA processing.

Protein synthesis: Mechanisms of protein synthesis, initiation in eukaryotes, translation control and post-translation events

Altered gene functions: Mutations, deletions, amplifications, LOH, traslocations, trinucleotide repeats and other genetic abnormalities. Oncogenes and tumor suppressor genes.

The gene sequencing, mapping and cloning of human disease genes.

Introduction to gene therapy and targeting.

Recombinant DNA technology: principles. Processes (gene transfer technology) and applications

Books:

- 1 Molecular Biology of the Cell by Alberts B., Bray, D., Lewis, J., Raff M., Roberts, K and Watson, JD, 3rd edition.
- 2 Molecular Cell Biology By Lodish, H., Baltimore, D., Berk, A et al., 5th edition.
- 3 Molecular Biology by Turner, PC., McLennan, AG., Bates, AD and White MRH 2nd edition.
- 4 Genes VIII by Lewin, B., (2004)
- 5 Pharmaceutical Biotechnology, by Crommelin, DJA and Sindelar RD (1997)
- 6 Recombinant DNA by Watson, JD., Gilman, M., et al., (1996)
- 7 Biopharmaceutical: Biochemistry and Biotechnology by Walsh, G., (1998)

3.1 PHARMACOLOGY – II (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments:

1. Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits).
2. Study of physiological salt solutions used in experimental pharmacology.
3. Study of laboratory appliances used in experimental pharmacology.
4. Study of use of anesthetics in laboratory animals.
5. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation.
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method.
7. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method.
8. To record the dose response curve of Histamine using isolated guinea-pig ileum preparation.
9. Study of agonistic and antagonistic effects of drugs using isolated guinea-pig ileum preparation.
10. To carry out bioassay of Histamine using isolated guinea-pig ileum preparation by interpolation method.
11. To carry out bioassay of Histamine using guinea-pig ileum preparation by three point method.
12. To study the routes of administration of drugs in animals (Rats, Mice, Rabbits).
13. Study of theory, principle, procedure involved and interpretation of given results for the following experiments:
 - a) Analgesic property of drug using analgesiometer.
 - b) Antiinflammatory effect of drugs using rat-paw edema method.
 - c) Anticonvulsant activity of drugs using maximal electroshock and pentylene tetrazole methods.
 - d) Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone induced sleeping time methods.
 - e) Locomotor activity evaluation of drugs using actophotometer and rotorod.
 - f) Cardiotoxic activity of drugs using isolated frog heart and mammalian heart preparations.

Scheme of Practical Examination:

	Sessionals	Annual
Identification	02	10
Synopsis	04	10
Major Experiment (Bioassay)	08	30
Minor Experiment (Interpretation of given Graph or simulated experiment)	04	10
Viva	02	10
Max Marks	20	70
Duration	3hrs	4hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

3.2 PHARMACEUTICAL ANALYSIS (THEORY)

Theory : 3 Hrs. /Week

1. **Quality Assurance:**

- a. Introduction, sources of quality variation, control of quality variation.
- b. Concept of statistical quality control.
- c. Validation methods- quality of equipment, validation of equipment and validation of analytical instruments and calibration.
- d. GLP, ISO 9000.
- e. Total quality management, quality review and documentation.
- f. ICH- international conference for harmonization-guidelines.
- g. Regulatory control.

2. **Chromatography:**

Introduction, history, classification, separation techniques, choice of methods. The following techniques be discussed with relevant examples of pharmaceutical products involving principles and techniques of separation of drugs from excipients.

- a. **Column Chromatography:** Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography.
- b. **TLC:** Introduction, principle, techniques, R_f value and applications.
- c. **PC:** Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications.
- d. **Ion-exchange chromatography:** Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.
- e. **HPLC:** Introduction, theory, instrumentation, and applications.
- f. **HP TLC:** Introduction, theory, instrumentation, and applications.
- g. **Gas Chromatography:** Introduction, theory, instrumentation-carrier gases, types of columns, stationary phases in GLC & GSC. Detectors-Flame ionization detectors, electron capture detector, thermal conductivity detector. Typical gas chromatogram, derivatisation techniques, programmed temperature gas chromatography, applications.
- h. **Electrophoresis:** Principles of separation, equipment for paper and gel electrophoresis, and application.
- i. **Gel filtration and affinity chromatography:** Introduction, technique, applications.

3. **Electrometric Methods:**

Theoretical aspects, instrumentation, interpretation of data/spectra and analytical applications be discussed on the following topics.

- a. **Potentiometry:** Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, Potentiometric titrations, methods of detecting end point, Karl Fischer titration.
- b. **Conductometry:** Introduction, conductivity cell, conductometric titrations and applications.
- c. **Polarography:** Instrumentation, DME, residual current, diffusion current and limiting current, polarographic wave, Ilkovic's equation, Effect of oxygen on polarographic wave, Polarographic maxima and suppressors and applications.
- d. **Amperometric Titrations:** Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of Amperometry over potentiometry. Pharma applications.

4. **Spectroscopy:**

Theoretical aspects, instrumentation, elements of interpretation of data/spectra and application of analytical techniques be discussed on:

a. **Absorption Spectroscopy:**

- Theory of electronic, atomic and molecular spectra. Fundamental laws of photometry, Beer-Lambert's Law, application and its deviation, limitation of Beer law, application of the law to single and multiple component analysis, measurement of equilibrium constant and rate constant by spectroscopy. Spectra of isolated chromophores, auxochromes, batho-chromic shift, hypsochromic shift, hyperchromic and hypochromic effect, effect of solvent on absorption spectra, molecular structure and infrared spectra.

Instrumentation – Photometer, U.V.-Visible spectrophotometer – sources of U.V.-Visible radiations, collimating systems, monochromators, samples cells and following detectors-Photocell, Barrier layer cell, Phototube, Diode array, applications of U.V.-Visible spectroscopy in pharmacy and spectrophotometric titrations.

- **Infrared Spectroscopy:** Vibrational transitions, frequency – structure correlations, Infrared absorption bands, Instrumentation–IR spectro-meter – sources of IR, Collimating systems, monochromators, sample cells, sample handling in IR spectroscopy and detectors–Thermocouple, Golay Cells, Thermistor, Bolometer, Pyroelectric detector, Applications of IR in pharmacy.
- **Fluorimetric Analysis:** Theory, luminescence, factors affecting fluorescence, quenching. Instrumentation, Applications, fluorescent indicators, study of pharmaceutically important compounds estimated by fluorimetry.

- b. **Flame Photometry:** Theory, nebulisation, flame and flame temperature, interferences, flame spectrometric techniques and instrumentation and pharmaceutical applications.
- c. **Atomic Absorption Spectrometry:** Introduction, Theory, types of electrodes, instrumentation and applications.

- d. **Atomic Emission Spectroscopy:** Spectroscopic sources, atomic emission spectrometers, photographic and photoelectric detection.
- e. **NMR & ESR (introduction only):** Introduction, theoretical aspects and applications.
- f. **Mass Spectroscopy: (Introduction only)** – Fragmentation, types of ions produced mass spectrum and applications.
- g. **Polarimetry: (Introduction only)** – Introduction to optical rotatory dispersion, circular dichroism, polarimeter.
- h. **X-RAY Diffraction: (Introduction only)** – Theory, reciprocal lattice concept, diffraction patterns and applications.
- i. **Thermal Analysis:** Introduction, instrumentation, applications, and DSC and DTA.

3.2 PHARMACEUTICAL ANALYSIS (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments:

1. Separation and identification of Amino Acids by Paper Chromatography.
2. Separation and identification of Sulpha drugs by TLC technique.
3. Effect of pH and solvent on the UV spectrum of given compound.
4. Comparison of the UV spectrum of a compound with that of its derivatives.
5. Determination of dissociation constant of indicators using UV-Visible spectroscopy.
6. Conductometric titration of mixture of acids with a strong base.
7. Potentiometric titration of a acid with a strong base.
8. Estimation of drugs by Fluorimetric technique.
9. Study of quenching effect in fluorimetry.
10. Colourimetric estimation of Supha drugs using BMR reagent.
11. Simultaneous estimation of two drugs present in given formulation.
12. Assay of Salicylic Acid by colourimetry.
13. Determination of Chlorides and Sulphates in Calcium gluconate by Nepheloturbidimetric Method.
14. Determination of Na/K by Flame Photometry.
15. Determination of pKa using pH meter.
16. Determination of specific rotation.
17. Comparison of the IR spectrum of a compound with that of its derivatives.
18. Demonstration of HPLC.
19. Demonstration of HPTLC.
20. Demonstration of GC-MS.
21. Demonstration of DSC.
22. Interpretation of NMR spectra of any one compound.

Reference Books:

1. Text Book of Pharm. Analysis by Higuchi. T and Hasen. E. B., New York Inter Science Publishers.
2. Quantitative Pharma. Analysis by Jenkins, The Blakiston division, New York.
3. Quantitative Drug Analysis, by Garrot. D, Chapman & Hall Ltd., London.
4. Undergraduate Instrumental Analysis by James. E., CBS Publishers.
5. Instrumental Analysis by Willard and Merritt, EWP, East West Press Ltd., Delhi/Madras.
6. Pharm Analysis by Skoog and West, Sounders Manipal College Publishing.
7. Text Book of Chemical Analysis, by A.I.Vogel, ELBS with Macmillan press, Hampshire.
8. Textbook of Pharm. Analysis by K.A.Connors, John Wiley & Sons, New York, Brisbane, Singapore.
9. Textbook of Pharm. Analysis (Practical) by Beckett & Stenlake, CBS Publishers, Delhi.
10. Textbook of Drug Analysis by P.D. Sethi., CBS Publishers, Delhi.
11. Spectroscopy by Silverstein, John & Wiley & Sons. Inc., Canada & Singapore.
12. How to practise GMP-A Plan for total quality control by P.P. Sharma, Vandana Publications, Agra.
13. The Science & Practice of Pharmacy by Remington Vol-I & II, Mack Publishing Co. Pennsylvania.

14. TLC by Stahl, Spring Verlay.
15. Text Book of Pharm. Chemistry by Chatten, CBS Publications.
16. Spectroscopy by William Kemp, ELBS with Macmillan Press, Hampshire.
17. I.P.-1996, The Controller of Publications, New Delhi.
18. BPC- Dept. of Health, U.K. for HMSO.
19. USP - Mack Publishing Co., Easton, PA.
20. The Extra Pharmacopoeia – The Pharm. Press, London.

Practicals

Title of the Experiment:

- 1 Study of agonistic and antagonistic effects of drugs using Guinea-pig ileum preparation.**
- 2 To study the effects of drugs on intestinal motility using frog's esophagus model*
- 3 To study the effects of drugs using rat uterus preparation.**
- 4 To study the anticonvulsant property of drugs (any one model).*
- 5 To study antihistaminic property of drug using histamine induced anaphylactic reaction in guinea pigs.
- 6 To study the apomorphine-induced compulsive behaviour (stereotypy) in mice.*
- 7 To study the muscle relaxant property of diazepam in mice using rotarod apparatus.*
- 8 To study the antiinflammatory property of indomethacin against carrageenan-induced paw oedema.**
- 9 To study the anxiolytic effect of diazepam in mice using mirrored-chamber apparatus.**
- 10 To demonstrate the effect of various drugs on the blood pressure and respiration of anaesthetized dog.
- 11 To study the effect of anthelmintics on earthworms.
- 12 To study the taming effect of chlorpromazine.*
- 13 To study the effects of drugs on vas deferense of the male rat.**
- 14 To study the effect of drugs on pesticide toxicity using rats as model.
- 15 To study the effect of drugs on heavy metal toxicity.

** indicate major experiment & * indicate minor experiment

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15

Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

3.3 PHARMACOTHERAPEUTICS – II (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives of the Subject Upon completion of the subject student shall be able to –**
 - a. know the pathophysiology of selected disease states and the rationale for drug therapy
 - b. know the therapeutic approach to management of these diseases;
 - c. know the controversies in drug therapy;
 - d. know the importance of preparation of individualised therapeutic plans based on diagnosis; and
 - e. appreciate the needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

Text books (Theory)

Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication

Reference books (Theory)

- a. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
- b. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
- c. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA]

3. Detailed syllabus and lecture wise schedule :

Etiopathogenesis and pharmacotherapy of diseases associated with following systems / diseases –

Title of the topic

1. **Infectious disease:** Guidelines for the rational use of antibiotics and surgical Prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection- Malaria, HIV & Opportunistic infections, Fungal infections, Viral infections, Gonorrhoea and Syphilis
- 2 **Musculoskeletal disorders**
Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus.
- 3 **Renal system**
Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug induced renal disorders
- 4 **Oncology:** Basic principles of Cancer therapy, General introduction to cancer chemotherapeutic agents, Chemotherapy of breast cancer, leukemia. Management of chemotherapy nausea and emesis
- 5 **Dermatology:** Psoriasis, Scabies, Eczema, Impetigo

3.3 PHARMACOTHERAPEUTICS – II (PRACTICAL)

Practical : 3 Hrs./Week

Practicals :

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation.

The student shall be trained to understand the principle and practice involved in selection of drug therapy including clinical discussion.

A minimum of 20 cases should be presented and recorded covering most common diseases.

Assignments :

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

Format of the assignment :

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination :

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

3.4 PHARMACEUTICAL JURISPRUDENCE (THEORY)

Theory : 2 Hrs. /Week

1. **Scope of the Subject:** (4-6 lines): This course exposes the student to several important legislations related to the profession of pharmacy in India. The Drugs and Cosmetics Act, along with its amendments are the core of this course. Other acts, which are covered, include the Pharmacy Act, dangerous drugs, medicinal and toilet preparation Act etc. Besides this the new drug policy, professional ethics, DPCO, patent and design Act will be discussed.
2. **Objectives of the Subject:** Upon completion of the subject student shall be able to (Know, do, and appreciate) –
 - a. practice the Professional ethics;
 - b. understand the various concepts of the pharmaceutical legislation in India;
 - c. know the various parameters in the Drug and Cosmetic Act and rules;
 - d. know the Drug policy, DPCO, Patent and design act;
 - e. understand the labeling requirements and packaging guidelines for drugs and cosmetics;
 - f. be able to understand the concepts of Dangerous Drugs Act, Pharmacy Act and Excise duties Act; and
 - g. other laws as prescribed by the Pharmacy Council of India from time to time including International Laws.

Text books (Theory)

Mithal , B M. Textbook of Forensic Pharmacy. Calcutta :National; 1988.

Reference books (Theory)

- a. Singh, KK, editor. Beotra's the Laws of Drugs, Medicines & cosmetics. Allahabad: Law Book House; 1984.
- b. Jain, NK. A Textbook of forensic pharmacy. Delhi: Vallabh prakashan ; 1995.
- c. Reports of the Pharmaceutical enquiry Committee
- d. I.D.M.A., Mumbai. DPCO 1995
- e. Various reports of Amendments.
- f. Deshapande, S.W. The drugs and magic remedies act 1954 and rules 1955. Mumbai: Susmit Publications; 1998.
- g. Eastern Book Company .The narcotic and psychotropic substances act 1985, Lucknow: Eastern; 1987.

3. Detailed syllabus and lecture wise schedule:

Title of the topic

1. **Pharmaceutical Legislations** – A brief review.
2. Principle and Significance of professional ethics. Critical study of the code of pharmaceutical ethics drafted by PCI.
3. **Drugs and Cosmetics Act, 1940, and its rules 1945.**
Objectives, Legal definition, Study of Schedule's with reference to Schedule B, C&C1, D, E1, F&F1, F2, F3, FF, G, H, J, K, M, N, P, R, V, W, X, Y.
Sales, Import, labeling and packaging of Drugs And Cosmetics
Provisions Relating to Indigenous Systems.
Constitution and Functions of DTAB, DCC, CDL.
Qualification and duties –Govt. analyst and Drugs Inspector.

4. **Pharmacy Act –1948.**
Objectives Legal Definitions, General Study, Constitution and Functions of State & Central Council, Registration & Procedure, ER.
5. **Medicinal and Toilet Preparation Act –1955.**
Objectives, Legal Definitions, Licensing, Bonded and Non Bonded Laboratory, Ware Housing, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations.
6. **Narcotic Drugs and Psychotropic substances Act-1985 and Rules.** Objectives, Legal Definitions, General Study, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and regulations, Schedules to the Act.
7. **Study of Salient Features of Drugs and magic remedies Act and its rules.**
8. **Study of essential Commodities Act Relevant to drugs price control Order.**
9. **Drug Price control Order & National Drug Policy (Current).**
10. **Prevention Of Cruelty to animals Act-1960.**
11. **Patents & design Act-1970.**
12. **Brief study of prescription and Non-prescription Products.**

4. Assignments:

Format of the assignment

1. Minimum & Maximum number of pages
2. It shall be a computer draft copy
3. Reference(s) shall be included at the end.
4. Name and signature of the student
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min

Case studies relating to

1. Drugs and Cosmetics Act and rules along with its amendments, Dangerous Drugs Act, Medicinal and Toilet preparation Act, New Drug Policy, Professional Ethics, Drugs (Price control) Order, Patent and Design Act.
2. Various prescription and non-prescription products.
3. Medical and surgical accessories.
4. Diagnostic aids and appliances available in the market.

3.5 MEDICINAL CHEMISTRY (THEORY)

Theory : 3 Hrs. /Week

1. Modern concept of rational drug design: A brief introduction to Quantitative Structure Activity Relationship (QSAR), prodrug, combinatorial chemistry and computer aided drug design (CADD) and concept of antisense molecules.

A study of the development of the following classes of drugs including SAR, mechanism of action, synthesis of important compounds, chemical nomenclature, brand names of important marketed products and their side effects.

2. Anti-infective agents
 - a) Local anti-infective agents
 - b) Preservatives
 - c) Antifungal agents
 - d) Urinary tract anti-infectives
 - e) Antitubercular agents
 - f) Antiviral agents and Anti AIDS agents
 - g) Antiprotozoal agents
 - h) Anthelmintics
 - i) Antiscabies and Antipedicular agents
3. Sulphonamides and sulphones
4. Antimalarials
5. Antibiotics
6. Antineoplastic agents
7. Cardiovascular agents
 - a) Antihypertensive agents
 - b) Antianginal agents and vasodilators
 - c) Antiarrhythmic agents
 - d) Antihyperlipidemic agents
 - e) Coagulants and Anticoagulants
 - f) Endocrine
8. Hypoglycemic agents
9. Thyroid and Antithyroid agents
10. Diuretics
11. Diagnostic agents
12. Steroidal Hormones and Adrenocorticoids

3.5 MEDICINAL CHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

1. Assays of important drugs from the course content.
2. Preparation of medicinally important compounds or intermediates required for synthesis of drugs.
3. Monograph analysis of important drugs.
4. Determination of partition coefficients, dissociation constants and molar refractivity of compounds for QSAR analysis.

Reference Books:

- a. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott-Raven Publishers-New York, Philadelphia.
- b. William.O.Foye, Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd., New Delhi.
- c. Burgers, Medicinal Chemistry, M.E., Welly Med.Chemistry M.E. Walfed Johnwilley and Sons, Wiley-interscience Publication, New York, Toranto.
- d. A Text Book of Medicinal Chemistry Vol. I and II by Surendra N. Pandeya, S.G. Publisher, 6, Dildayal Nagar, Varanasi -10.
- e. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
- f. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.
- g. Organic Drug Synthesis-Ledniser Mitzsher Vol. I and II.
- h. Pharmaceutical Chemistry drug Synthesis Vol. I and II by H. J. Roth and A. Kleemann.
- i. The Science and Practice of Pharmacy Vol. 1 and 2, Remington, MACK Publishing Company, Easton, Pennsylvania.

3.6 PHARMACEUTICAL FORMULATIONS (THEORY)

Theory : 2 Hrs. /Week

1. **Scope of the Subject:** Scope and objectives of the course: Subject deals with the formulation and evaluation of various pharmaceutical dosage forms.
2. **Objectives of the Subject:** Upon completion of the subject student shall be able to (Know, do, appreciate) –
 - a. understand the principle involved in formulation of various pharmaceutical dosage forms;
 - b. prepare various pharmaceutical formulation;
 - c. perform evaluation of pharmaceutical dosage forms; and
 - d. understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situations.

Text books (Theory)

- a. Pharmaceutical dosage forms, Vol, I,II and III by lachman
- b. Rowlings Text book of Pharmaceutics
- c. Tutorial Pharmacy – Cooper & Gun

Reference books (Theory)

- a. Remington's Pharmaceutical Sciences
- b. USP/BP/IP

3. Detailed syllabus and lecture wise schedule:

Title of the topic

1. Pharmaceutical dosage form- concept and classification
2. **Tablets:** Formulation of different types of tablets, tablet excipients, granulation techniques quality control and evaluation of tablets. Tablet coating, Type of coating, quality control tests for coated tablet.
3. **Capsules;** Production and filling of hard gelatin capsules, Raw material for shell, finishing, quality control tests for capsules. Production and filling of soft gelatin capsules, quality control tests for soft gelatin capsules.
4. **Liquid orals:** Formulation and evaluation of suspensions, emulsions and solutions. Stability of these preparations
5. **Parenterals** Introduction Containers used for Parenterals (including official tests) Formulation of large and small volume Parenterals Sterilization
6. **Ophthalmic preparations (Semi – Solids):** Introduction and classification Factors affecting absorption and anatomy of skin Packaging storage and labeling, Ointments Types of Ointment Base Preparation of ointment, Jellies Types of jellies Formulation of jellies Suppositories, Method of preparation, Types Packaging
7. Definition and concept of **Controlled and novel Drug delivery systems** with available examples, viz. parenteral, trans dermal, buccal, rectal, nasal, implants, ocular

3.6 PHARMACEUTICAL FORMULATIONS (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments :

- 1. Manufacture of Tablets**
 - a. Ordinary compressed tablet-wet granulation
 - b. Tablets prepared by direct compression.
 - c. Soluble tablet.
 - d. Chewable tablet.
- 2. Formulation and filling of hard gelatin capsules**
- 3. Manufacture of parenterals**
 - a. Ascorbic acid injection
 - b. Calcium gluconate injection
 - c. Sodium chloride infusion.
 - d. Dextrose and Sodium chloride injection/ infusion.
- 4. Evaluation of Pharmaceutical formulations (QC tests)**
 - a. Tablets
 - b. Capsules
 - c. Injections
- 5. Formulation of two liquid oral preparations and evaluation by assay**
 - a. Solution: Paracetamol Syrup
 - b. Antacid suspensions- Aluminum hydroxide gel
- 6. Formulation of semisolids and evaluation by assay**
 - a. Salicylic acid and benzoic acid ointment
 - b. Gel formulation Diclofenac gel
- 7. Cosmetic preparations**
 - a. Lipsticks
 - b. Cold cream and vanishing cream
 - c. Clear liquid shampoo
 - d. Tooth paste and tooth powders.
- 8. Tablet coating (demonstration)**

Scheme of Practical Examination :

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

Fourth Year

4.1 PHARMACOTHERAPEUTICS – III (THEORY)

Theory : 3 Hrs. /Week

- 1. Scope :** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
- 2. Objectives:** At completion of this subject it is expected that students will be able to understand –
 - a. the pathophysiology of selected disease states and the rationale for drug therapy;
 - b. the therapeutic approach to management of these diseases;
 - c. the controversies in drug therapy;
 - d. the importance of preparation of individualised therapeutic plans based on diagnosis;
 - e. needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
 - f. describe the pathophysiology of selected disease states and explain the rationale for drug therapy;
 - g. to summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;
 - h. to discuss the controversies in drug therapy;
 - i. to discuss the preparation of individualised therapeutic plans based on diagnosis; and
 - j. identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

Text Books

- a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication
- b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange

Reference Books

- a. Pathologic basis of disease - Robins SL, W.B.Saunders publication
- b. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication
- c. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
- d. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
- e. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
- f. Relevant review articles from recent medical and pharmaceutical literature.

4.1 PHARMACOTHERAPEUTICS – III (PRACTICAL)

Practical : 3 Hrs./Week

Practicals:

Hospital postings for a period of at least 50 hours is required to understand the principles and practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation. Each student should present at least two medical cases they have observed and followed in the wards.

Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases:

Title of the topic

- 1 **Gastrointestinal system:** Peptic ulcer disease, Gastro Esophageal Reflux Disease, Inflammatory bowel disease, Liver disorders - Alcoholic liver disease, Viral hepatitis including jaundice, and Drug induced liver disorders.
- 2 **Haematological system:** Anaemias, Venous thromboembolism, Drug induced blood disorders.
- 3 **Nervous system:** Epilepsy, Parkinsonism, Stroke, Alzheimer's disease,
- 4 **Psychiatry disorders:** Schizophrenia, Affective disorders, Anxiety disorders, Sleep disorders, Obsessive Compulsive disorders
- 5 Pain management including Pain pathways, neuralgias, headaches.
- 6 Evidence Based Medicine

Assignments:

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

Format of the assignment:

1. Minimum & Maximum number of pages
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year
4. It shall be computer draft copy
5. Name and signature of the student
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination :

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

4.2 HOSPITAL PHARMACY (THEORY)

Theory : 2 Hrs. /Week

1. **Scope:** In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug dispensing, manufacturing of parenteral preparations, drug information, patient counselling, and therapeutic drug monitoring for improved patient care.
2. **Objectives:** Upon completion of the course, the student shall be able to –
 - a. know various drug distribution methods;
 - b. know the professional practice management skills in hospital pharmacies;
 - c. provide unbiased drug information to the doctors;
 - d. know the manufacturing practices of various formulations in hospital set up;
 - e. appreciate the practice based research methods; and
 - f. appreciate the stores management and inventory control.

Text books: (latest editions)

- a. Hospital pharmacy by William .E. Hassan
- b. A text book of Hospital Pharmacy by S.H.Merchant & Dr. J.S. Qadry. Revised by R.K.Goyal & R.K. Parikh

References:

- a. WHO consultative group report.
- b. R.P.S. Vol.2. Part –B; Pharmacy Practice section.
- c. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.

3. Lecture wise programme :

Topics

1 Hospital - its Organisation and functions

2 Hospital pharmacy-Organisation and management

- a) Organizational structure-Staff, Infrastructure & work load statistics
- b) Management of materials and finance
- c) Roles & responsibilities of hospital pharmacist

3 The Budget – Preparation and implementation

4 Hospital drug policy

- a) Pharmacy and Therapeutic committee (PTC)
- b) Hospital formulary
- c) Hospital committees
 - Infection committee
 - Research and ethical committee
- d) developing therapeutic guidelines
- e) Hospital pharmacy communication - Newsletter

5 Hospital pharmacy services

- a) Procurement & warehousing of drugs and Pharmaceuticals
- b) Inventory control
Definition, various methods of Inventory Control
ABC, VED, EOQ, Lead time, safety stock
- c) Drug distribution in the hospital
 - i) Individual prescription method
 - ii) Floor stock method
 - iii) Unit dose drug distribution method
- d) Distribution of Narcotic and other controlled substances
- e) Central sterile supply services – Role of pharmacist

6 Manufacture of Pharmaceutical preparations

- a) Sterile formulations – large and small volume parenterals
- b) Manufacture of Ointments, Liquids, and creams
- c) Manufacturing of Tablets, granules, capsules, and powders
- d) Total parenteral nutrition

7 Continuing professional development programs

Education and training

8 Radio Pharmaceuticals – Handling and packaging

9 Professional Relations and practices of hospital pharmacist

4.2 HOSPITAL PHARMACY (PRACTICAL)

Practical : 3 Hrs./Week

1. Assessment of drug interactions in the given prescriptions
2. Manufacture of parenteral formulations, powders.
3. Drug information queries.
4. Inventory control

List of Assignments:

1. Design and Management of Hospital pharmacy department for a 300 bedded hospital.
2. Pharmacy and Therapeutics committee – Organization, functions, and limitations.
3. Development of a hospital formulary for 300 bedded teaching hospital
4. Preparation of ABC analysis of drugs sold in one month from the pharmacy.
5. Different phases of clinical trials with elements to be evaluated.
6. Various sources of drug information and systematic approach to provide unbiased drug information.
7. Evaluation of prescriptions generated in hospital for drug interactions and find out the suitable management.

Special requirements:

1. Each college should sign MoU with nearby local hospital having minimum 150 beds for providing necessary training to the students' on hospital pharmacy activities.
2. Well equipped with various resources of drug information.

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

4.3 CLINICAL PHARMACY (THEORY)

Theory : 3 Hrs. /Week

1. Objectives of the Subject :

Upon completion of the subject student shall be able to (Know, do, appreciate) –

- a. monitor drug therapy of patient through medication chart review and clinical review;
- b. obtain medication history interview and counsel the patients;
- c. identify and resolve drug related problems;
- d. detect, assess and monitor adverse drug reaction;
- e. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; and
- f. retrieve, analyse, interpret and formulate drug or medicine information.

Text books (Theory)

- a. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia.
- b. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
- c. Biopharmaceutics and Applied Pharmacokinetics - Leon Shargel, Prentice Hall publication.
- d. A text book of Clinical Pharmacy Practice; Essential concepts and skills, Dr.G.Parthasarathi etal, Orient Orient Langram Pvt.Ltd. ISSBN8125026

References

- a. Australian drug information -Procedure manual. The Society of Hospital Pharmacists of Australia.
- b. Clinical Pharmacokinetics - Rowland and Tozer, Williams and Wilkins Publication.
- c. Pharmaceutical statistics. Practical and clinical applications. Sanford Bolton, Marcel Dekker, Inc.

2. Detailed syllabus and lecture wise schedule:

Title of the topic

1. **Definitions, development and scope of clinical pharmacy**
2. **Introduction to daily activities of a clinical pharmacist**
 - a. Drug therapy monitoring (medication chart review, clinical review, pharmacist interventions)
 - b. Ward round participation
 - c. Adverse drug reaction management
 - d. Drug information and poisons information
 - e. Medication history
 - f. Patient counseling
 - g. Drug utilisation evaluation (DUE) and review (DUR)
 - h. Quality assurance of clinical pharmacy services

3. **Patient data analysis**
The patient's case history, its structure and use in evaluation of drug therapy & Understanding common medical abbreviations and terminologies used in clinical practices.
4. **Clinical laboratory tests used in the evaluation of disease states, and interpretation of test results**
 - a. Haematological, Liver function, Renal function, thyroid function tests
 - b. Tests associated with cardiac disorders
 - c. Fluid and electrolyte balance
 - d. Microbiological culture sensitivity tests
 - e. Pulmonary Function Tests
5. **Drug & Poison information**
 - a. Introduction to drug information resources available
 - b. Systematic approach in answering DI queries
 - c. Critical evaluation of drug information and literature
 - d. Preparation of written and verbal reports
 - e. Establishing a Drug Information Centre
 - f. Poisons information- organization & information resources
6. **Pharmacovigilance**
 - a. Scope, definition and aims of pharmacovigilance
 - b. Adverse drug reactions - Classification, mechanism, predisposing factors, causality assessment [different scales used]
 - c. Reporting, evaluation, monitoring, preventing & management of ADRs
 - d. Role of pharmacist in management of ADR.
7. Communication skills, including patient counselling techniques, medication history interview, presentation of cases.
8. Pharmaceutical care concepts
9. Critical evaluation of biomedical literature
10. Medication errors

4.3 CLINICAL PHARMACY (PRACTICAL)

Practical : 3 Hrs./Week

Students are expected to perform 15 practicals in the following areas covering the topics dealt in theory class.

- a. Answering drug information questions (4 Nos)
- b. Patient medication counselling (4 Nos)
- c. Case studies related to laboratory investigations (4 Nos)
- d. Patient medication history interview (3 Nos)

Assignment:

Students are expected to submit THREE written assignments (1500 – 2000 words) on the topics given to them covering the following areas dealt in theory class.

Drug information, Patient medication history interview, Patient medication counselling, Critical appraisal of recently published articles in the biomedical literature which deals with a drug or therapeutic issue.

Format of the assignment:

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

4.4 BIOSTATISTICS AND RESEARCH METHODOLOGY (THEORY)

Theory : 2 Hrs. /Week

1. Detailed syllabus and lecture wise schedule

1 Research Methodology

- a) Types of clinical study designs:
Case studies, observational studies, interventional studies,
- b) Designing the methodology
- c) Sample size determination and Power of a study
Determination of sample size for simple comparative experiments, determination of sample size to obtain a confidence interval of specified width, power of a study
- d) Report writing and presentation of data

2 Biostatistics

2.1 a) Introduction

- b) Types of data distribution
- c) Measures describing the central tendency distributions- average, median, mode
- d) Measurement of the spread of data-range, variation of mean, standard deviation, variance, coefficient of variation, standard error of mean.

2.2 Data graphics

Construction and labeling of graphs, histogram, piecharts, scatter plots, semilogarithmic plots

2.3 Basics of testing hypothesis

- a) Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals.
- b) Level of significance (Parametric data)- students t test (paired and unpaired), chi Square test, Analysis of Variance (one-way and two-way)
- c) Level of significance (Non-parametric data)- Sign test, Wilcoxon's signed rank test, Wilcoxon rank sum test, Mann Whitney U test, Kruskal-Wallis test (one way ANOVA)
- d) Linear regression and correlation- Introduction, Pearson's and Spearman's correlation and correlation co-efficient.
- e) Introduction to statistical software: SPSS, Epi Info, SAS.

2.4 Statistical methods in epidemiology

Incidence and prevalence, relative risk, attributable risk

3. Computer applications in pharmacy

Computer System in Hospital Pharmacy: Patterns of Computer use in Hospital Pharmacy – Patient record database management, Medication order entry – Drug labels and list – Intravenous solution and admixture, patient medication profiles, Inventory control, Management report & Statistics.

Computer In Community Pharmacy

Computerizing the Prescription Dispensing process

Use of Computers for Pharmaceutical Care in community pharmacy

Accounting and General ledger system

Drug Information Retrieval & Storage :

Introduction – Advantages of Computerized Literature Retrieval

Use of Computerized Retrieval

Reference books:

- a. Pharmaceutical statistics- practical and clinical applications, Sanford Bolton 3rd edition, publisher Marcel Dekker Inc. New York.
- b. Drug Information- A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E Stanovich , 3rd edition, McGraw Hill Publications 2006

4.5 BIOPHARMACEUTICS AND PHARMACOKINETICS (THEORY)

Theory : 3 Hrs. /Week

1. Biopharmaceutics

1. Introduction to Biopharmaceutics
 - a. Absorption of drugs from gastrointestinal tract.
 - b. Drug Distribution.
 - c. Drug Elimination.

2. Pharmacokinetics

2. Introduction to Pharmacokinetics.
 - a. Mathematical model
 - b. Drug levels in blood.
 - c. Pharmacokinetic model
 - d. Compartment models
 - e. Pharmacokinetic study.
3. One compartment open model.
 - a. Intravenous Injection (Bolus)
 - b. Intravenous infusion.
4. Multicompartment models.
 - a. Two compartment open model.
 - b. IV bolus, IV infusion and oral administration
5. Multiple – Dosage Regimens.
 - a. Repetitive Intravenous injections – One Compartment Open Model
 - b. Repetitive Extravascular dosing – One Compartment Open model
 - c. Multiple Dose Regimen – Two Compartment Open Model
6. Nonlinear Pharmacokinetics.
 - a. Introduction
 - b. Factors causing Non-linearity.
 - c. Michaelis-menton method of estimating parameters.
7. Noncompartmental Pharmacokinetics.
 - a. Statistical Moment Theory.
 - b. MRT for various compartment models.
 - c. Physiological Pharmacokinetic model.
8. Bioavailability and Bioequivalence.
 - a. Introduction.
 - b. Bioavailability study protocol.
 - c. Methods of Assessment of Bioavailability

4.5 BIOPHARMACEUTICS AND PHARMACOKINETICS (PRACTICAL)

Practical : 3 Hrs./Week

1. Improvement of dissolution characteristics of slightly soluble drugs by some methods.
2. Comparison of dissolution studies of two different marketed products of same drug.
3. Influence of polymorphism on solubility and dissolution.
4. Protein binding studies of a highly protein bound drug and poorly protein bound drug.
5. Extent of plasma-protein binding studies on the same drug (i.e. highly and poorly protein bound drug) at different concentrations in respect of constant time.
6. Bioavailability studies of some commonly used drugs on animal/human model.
7. Calculation of K_a , K_e , $t_{1/2}$, C_{max} , AUC, AUMC, MRT etc. from blood profile data.
8. Calculation of bioavailability from urinary excretion data for two drugs.
9. Calculation of AUC and bioequivalence from the given data for two drugs.
10. In vitro absorption studies.
11. Bioequivalency studies on the different drugs marketed.(eg) Tetracycline, Sulphamethoxzole, Trimethoprim, Aspirin etc., on animals and human volunteers.
12. Absorption studies in animal inverted intestine using various drugs.
13. Effect on contact time on the plasma protein binding of drugs.
14. Studying metabolic pathways for different drugs based on elimination kinetics data.
15. Calculation of elimination half-life for different drugs by using urinary elimination data and blood level data.
16. Determination of renal clearance.

References:

- a. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi
- b. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania.
- c. Pharmacokinetics: By Milo Gibaldi Donald, R. Merceel Dekker Inc.
- d. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
- e. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
- f. Biopharmaceutics; By Swarbrick
- g. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
- h. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
- i. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
- j. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebert F Notari Marcel Dekker Inn, New York and Basel, 1987.
- k. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, C. Roylan, Marcel Dekker Inc, New York 1996.

4.6 CLINICAL TOXICOLOGY (THEORY)

Theory : 2 Hrs. /Week

1. General principles involved in the management of poisoning
2. Antidotes and the clinical applications.
3. Supportive care in clinical Toxicology.
4. Gut Decontamination.
5. Elimination Enhancement.
6. Toxicokinetics.
7. Clinical symptoms and management of acute poisoning with the following agents –
 - a) Pesticide poisoning: organophosphorous compounds, carbamates, organochlorines, pyrethroids.
 - b) Opiates overdose.
 - c) Antidepressants
 - d) Barbiturates and benzodiazepines.
 - e) Alcohol: ethanol, methanol.
 - f) Paracetamol and salicylates.
 - g) Non-steroidal anti-inflammatory drugs.
 - h) Hydrocarbons: Petroleum products and PEG.
 - i) Caustics: inorganic acids and alkali.
 - j) Radiation poisoning
8. Clinical symptoms and management of chronic poisoning with the following agents –
Heavy metals: Arsenic, lead, mercury, iron, copper
9. Venomous snake bites: Families of venomous snakes, clinical effects of venoms, general management as first aid, early manifestations, complications and snake bite injuries.
10. Plants poisoning. Mushrooms, Mycotoxins.
11. Food poisonings
12. Envenomations – Arthropod bites and stings.

Substance abuse:

Signs and symptoms of substance abuse and treatment of dependence

- a) CNS stimulants :amphetamine
- b) Opioids
- c) CNS depressants
- d) Hallucinogens: LSD
- e) Cannabis group
- f) Tobacco

References:

- a. Matthew J Ellenhorn. ELLENHORNS MEDICAL TOXICOLOGY – DIAGNOSIS AND TREATMENT OF POISONING. Second edition. Williams and Wilkins publication, London
- b. V V Pillay. HANDBOOK OF FORENSIC MEDICINE AND TOXICOLOGY. Thirteenth edition 2003 Paras Publication, Hyderabad

Fifth year

5.1 CLINICAL RESEARCH (THEORY)

Theory : 3 Hrs. /Week

1. Drug development process:

Introduction

Various Approaches to drug discovery

1. Pharmacological
2. Toxicological
3. IND Application
4. Drug characterization
5. Dosage form

2. Clinical development of drug:

1. Introduction to Clinical trials
2. Various phases of clinical trial.
3. Methods of post marketing surveillance
4. Abbreviated New Drug Application submission.
5. Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines
6. Challenges in the implementation of guidelines
7. Ethical guidelines in Clinical Research
8. Composition, responsibilities, procedures of IRB / IEC
9. Overview of regulatory environment in USA, Europe and India.
10. Role and responsibilities of clinical trial personnel as per ICH GCP
 - a. Sponsor
 - b. Investigators
 - c. Clinical research associate
 - d. Auditors
 - e. Contract research coordinators
 - f. Regulatory authority
11. Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)
12. Informed consent Process
13. Data management and its components
14. Safety monitoring in clinical trials.

References :

- a. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
- b. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.
- c. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
- d. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
- e. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
- f. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
- g. Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.

5.2 PHARMACOEPIDEMIOLOGY AND PHARMACOECONOMICS (THEORY)

Theory : 3 Hrs. /Week

1. Pharmacoepidemiology :

Definition and scope:

Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications.

Measurement of outcomes in pharmacoepidemiology

Outcome measure and drug use measures

Prevalence, incidence and incidence rate. Monetary units, number of prescriptions, units of drugs dispensed, defined daily doses and prescribed daily doses, medication adherence measurement

Concept of risk in pharmacoepidemiology

Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio

Pharmacoepidemiological methods

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods

Drug utilization review, case reports, case series, surveys of drug use, cross – sectional studies, cohort studies, case control studies, case –cohort studies, meta – analysis studies, spontaneous reporting, prescription event monitoring and record linkage system.

Sources of data for pharmacoepidemiological studies

Ad Hoc data sources and automated data systems.

Selected special applications of pharmacoepidemiology

Studies of vaccine safety, hospital pharmacoepidemiology, pharmacoepidemiology and risk management, drug induced birth defects.

2. Phrmacoconomics:

Definition, history, needs of pharmaco-economic evaluations

Role in formulary management decisions

Pharmaco-economic evaluation

Outcome assessment and types of evaluation

Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods:

Cost – minimization, cost- benefit, cost – effectiveness, cost utility

3. Applications of Pharmacoconomics

Software and case studies

5.3 CLINICAL PHARMACOKINETICS AND PHARMACOTHERAPEUTIC DRUG MONITORING (THEORY)

Theory : 2 Hrs. /Week

- 1. Introduction to Clinical pharmacokinetics.**
- 2. Design of dosage regimens:**
Nomograms and Tabulations in designing dosage regimen, Conversion from intravenous to oral dosing, Determination of dose and dosing intervals, Drug dosing in the elderly and pediatrics and obese patients.
- 3. Pharmacokinetics of Drug Interaction:**
 - a. Pharmacokinetic drug interactions
 - b. Inhibition and Induction of Drug metabolism
 - c. Inhibition of Biliary Excretion.
- 4. Therapeutic Drug monitoring:**
 - a. Introduction
 - b. Individualization of drug dosage regimen (Variability – Genetic, Age and Weight, disease, Interacting drugs).
 - c. Indications for TDM. Protocol for TDM.
 - d. Pharmacokinetic/Pharmacodynamic Correlation in drug therapy.
 - e. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations.
- 5. Dosage adjustment in Renal and hepatic Disease.**
 - a. Renal impairment
 - b. Pharmacokinetic considerations
 - c. General approach for dosage adjustment in Renal disease.
 - d. Measurement of Glomerular Filtration rate and creatinine clearance.
 - e. Dosage adjustment for uremic patients.
 - f. Extracorporeal removal of drugs.
 - g. Effect of Hepatic disease on pharmacokinetics.
- 6. Population Pharmacokinetics.**
 - a. Introduction to Bayesian Theory.
 - b. Adaptive method or Dosing with feed back.
 - c. Analysis of Population pharmacokinetic Data.
- 7. Pharmacogenetics**
 - a. Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes.
 - b. Genetic Polymorphism in Drug Transport and Drug Targets.
 - c. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations

Pharmacy Council of India
New Delhi

Rules & Syllabus for the Bachelor
of Pharmacy (B. Pharm) Course

[Framed under Regulation 6, 7 & 8 of the Bachelor of
Pharmacy (B. Pharm) course regulations 2014]

CHAPTER- I: REGULATIONS

1. Short Title and Commencement

These regulations shall be called as “The Revised Regulations for the B. Pharm. Degree Program (CBCS) of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

2. Minimum qualification for admission

2.1 First year B. Pharm:

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

2.2. B. Pharm lateral entry (to third semester):

A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

3. Duration of the program

The course of study for B.Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and /or tutorial (T) hours, and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

7.2. Minimum credit requirements

The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project over the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of 'Communication Skills' (Theory and Practical) and 'Computer Applications in Pharmacy' (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

8. Academic work

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

9. Course of study

The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

Table-I: Course of study for semester I

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1	4
BP102T	Pharmaceutical Analysis I – Theory	3	1	4
BP103T	Pharmaceutics I – Theory	3	1	4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1	4
BP105T	Communication skills – Theory *	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-	2
BP107P	Human Anatomy and Physiology – Practical	4	-	2
BP108P	Pharmaceutical Analysis I – Practical	4	-	2
BP109P	Pharmaceutics I – Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4	-	2
BP111P	Communication skills – Practical*	2	-	1
BP112RBP	Remedial Biology – Practical*	2	-	1
Total		32/34[§]/36[#]	4	27/29[§]/30[#]

[#]Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

[§]Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

* Non University Examination (NUE)

Table-II: Course of study for semester II

Course Code	Name of the course	No. of hours	Tutorial	Credit points
BP201T	Human Anatomy and Physiology II – Theory	3	1	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1	4
BP203T	Biochemistry – Theory	3	1	4
BP204T	Pathophysiology – Theory	3	1	4
BP205T	Computer Applications in Pharmacy – Theory *	3	-	3
BP206T	Environmental sciences – Theory *	3	-	3
BP207P	Human Anatomy and Physiology II –Practical	4	-	2
BP208P	Pharmaceutical Organic Chemistry I– Practical	4	-	2
BP209P	Biochemistry – Practical	4	-	2
BP210P	Computer Applications in Pharmacy – Practical*	2	-	1
Total		32	4	29

*Non University Examination (NUE)

Table-III: Course of study for semester III

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1	4
BP302T	Physical Pharmaceutics I – Theory	3	1	4
BP303T	Pharmaceutical Microbiology – Theory	3	1	4
BP304T	Pharmaceutical Engineering – Theory	3	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	-	2
BP306P	Physical Pharmaceutics I – Practical	4	-	2
BP307P	Pharmaceutical Microbiology – Practical	4	-	2
BP 308P	Pharmaceutical Engineering –Practical	4	-	2
Total		28	4	24

Table-IV: Course of study for semester IV

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1	4
BP402T	Medicinal Chemistry I – Theory	3	1	4
BP403T	Physical Pharmaceutics II – Theory	3	1	4
BP404T	Pharmacology I – Theory	3	1	4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1	4
BP406P	Medicinal Chemistry I – Practical	4	-	2
BP407P	Physical Pharmaceutics II – Practical	4		2
BP408P	Pharmacology I – Practical	4	-	2
BP409P	Pharmacognosy and Phytochemistry I – Practical	4	-	2
Total		31	5	28

Table-V: Course of study for semester V

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP501T	Medicinal Chemistry II – Theory	3	1	4
BP502T	Industrial PharmacyI– Theory	3	1	4
BP503T	Pharmacology II – Theory	3	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1	4
BP506P	Industrial PharmacyI – Practical	4	-	2
BP507P	Pharmacology II – Practical	4	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	-	2
Total		27	5	26

Table-VI: Course of study for semester VI

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3	1	4
BP606T	Quality Assurance –Theory	3	1	4
BP607P	Medicinal chemistry III – Practical	4	-	2
BP608P	Pharmacology III – Practical	4	-	2
BP609P	Herbal Drug Technology – Practical	4	-	2
Total		30	6	30

Table-VII: Course of study for semester VII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP701T	Instrumental Methods of Analysis – Theory	3	1	4
BP702T	Industrial PharmacyII – Theory	3	1	4
BP703T	Pharmacy Practice – Theory	3	1	4
BP704T	Novel Drug Delivery System – Theory	3	1	4
BP705P	Instrumental Methods of Analysis – Practical	4	-	2
BP706PS	Practice School*	12	-	6
Total		28	5	24

* Non University Examination (NUE)

Table-VIII: Course of study for semester VIII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812ET	Dietary Supplements and Nutraceuticals			
BP813PW	Project Work	12	-	6
Total		24	4	22

Table-IX: Semester wise credits distribution

Semester	Credit Points
I	27/29 [§] /30 [#]
II	29
III	26
IV	28
V	26
VI	26
VII	24
VIII	22
Extracurricular/ Co curricular activities	01*
Total credit points for the program	209/211[§]/212[#]

* The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

[§]Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics course.

[#]Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology course.

10. Program Committee

1. The B. Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Program Committee shall be as follows:

A senior teacher shall be the Chairperson; One Teacher from each department handling B.Pharm courses; and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:

- i. Periodically reviewing the progress of the classes.
- ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
- iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessionalexam (Internal Assessment) and before the end semester exam.

11. Examinations/Assessments

The scheme for internal assessment and end semester examinations is given in Table – X.

11.1. End semester examinations

The End Semester Examinations for each theory and practical coursethrough semesters I to VIII shall be conducted by the university except for the subjects with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables-X: Schemes for internal assessments and end semester examinations semester wise

Semester I

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP101T	Human Anatomy and Physiology I– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP103T	Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP105T	Communication skills – Theory *	5	10	1 Hr	15	35	1.5 Hrs	50
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr	15	35	1.5 Hrs	50
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP111P	Communication skills – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
Total		70/75[§]/80[#]	115/125[§]/130[#]	23/24[§]/26[#] Hrs	185/200[§]/210[#]	490/525[§]/ 540[#]	31.5/33[§]/ 35[#] Hrs	675/725[§]/ 750[#]

[#]Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

[§]Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

* Non University Examination (NUE)

Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP203T	Biochemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP204T	Pathophysiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP205T	Computer Applications in Pharmacy – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP206T	Environmental sciences – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP207P	Human Anatomy and Physiology II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP208P	Pharmaceutical Organic Chemistry I– Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP209P	Biochemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
Total		80	125	20 Hrs	205	520	30 Hrs	725

* The subject experts at college level shall conduct examinations

Semester III

Course code	Name of the course	Internal Assessment			End Semester Exams		Total Marks	
		Continuous Mode	Sessional Exams		Total	Marks		Duration
			Marks	Duration				
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP302T	PhysicalPharmaceuticsI –Theory	10	15	1 Hr	25	75	3 Hrs	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	4 Hrs	50
Total		60	100	20	160	440	28Hrs	600

Semester IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		70	115	21 Hrs	185	515	31 Hrs	700

Semester V

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP501T	Medicinal Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP502T	Industrial PharmacyI– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP503T	Pharmacology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP504T	Pharmacognosy II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP506P	Industrial PharmacyI– Practical	5	10	4 Hr	15	35	4 Hrs	50
BP507P	Pharmacology II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP508P	Pharmacognosy II – Practical	5	10	4 Hr	15	35	4 Hrs	50
Total		65	105	17 Hr	170	480	27 Hrs	650

Semester VI

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP602T	Pharmacology III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP606T	Quality Assurance– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP607P	Medicinal chemistry III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP608P	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP609P	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		75	120	18 Hrs	195	555	30 Hrs	750

Semester VII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP706 PS	Practice School*	25	-	-	25	125	5 Hrs	150
Total		70	70	8Hrs	140	460	21 Hrs	600

* The subject experts at college level shall conduct examinations

Semester VIII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP803ET	Pharmaceutical Marketing – Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BP804ET	Pharmaceutical Regulatory Science – Theory							
BP805ET	Pharmacovigilance – Theory							
BP806ET	Quality Control and Standardization of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory							
BP808ET	Cell and Molecular Biology – Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology – Theory							
BP811ET	Advanced Instrumentation Techniques – Theory							
BP812PW	Project Work	-	-	-	-	150	4 Hrs	150

Total	40	60	4 Hrs	100	450	16 Hrs	550
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11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table-XI:Scheme for awarding internal assessment: Continuous mode

Theory		
Criteria	Maximum Marks	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
Total	10	5
Practical		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
Total	5	

Table- XII: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

11.2.1. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables – X.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

Question paper pattern for theory Sessional examinations

For subjects having University examination

I. Multiple Choice Questions (MCQs)	=	10 x 1 = 10
OR		OR
Objective Type Questions (5 x 2) (Answer all the questions)	=	05 x 2 = 10
I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 2 out of 3)	=	2 x 5 = 10

Total	=	30 marks

For subjects having Non University Examination

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20

Total	=	30 marks

Question paper pattern for practical sessional examinations

I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05

Total	=	40 marks

12. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of B.Pharm. program if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

13. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessments shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

15. Re-examination of end semester examinations

Reexamination of end semester examinations shall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

Table-XIII: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

Question paper pattern for end semester theory examinations

For 75 marks paper

I. Multiple Choice Questions(MCQs)	=	20 x 1	=	20
OR				OR
Objective Type Questions (10 x 2)	=	10 x 2	=	20
(Answer all the questions)				
II. Long Answers (Answer 2 out of 3)	=	2 x 10	=	20
III. Short Answers (Answer 7 out of 9)	=	7 x 5	=	35

Total = 75 marks

For 50 marks paper

I. Long Answers (Answer 2 out of 3)	=	2 x 10	=	20
II. Short Answers (Answer 6 out of 8)	=	6 x 5	=	30

Total = 50 marks

For 35 marks paper

I. Long Answers (Answer 1 out of 2)	=	1 x 10	=	10
II. Short Answers (Answer 5 out of 7)	=	5 x 5	=	25

Total = 35 marks

Question paper pattern for end semester practical examinations

I. Synopsis	=	5
II. Experiments	=	25
III. Viva voce	=	5

Total = 35 marks

16. Academic Progression:

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. Academic progression rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I, II and III semesters till the IV semester examinations. However, he/she shall not be eligible to attend the courses of V semester until all the courses of I and II semesters are successfully completed.

A student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of I, II, III and IV semesters are successfully completed.

A student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of I, II, III, IV, V and VI semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 26.

A lateral entry student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of III and IV semesters are successfully completed.

A lateral entry student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V and VI semesters are successfully completed.

A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 26.

Any student who has given more than 4 chances for successful completion of I / III semester courses and more than 3 chances for successful completion of II / IV semester courses shall be permitted to attend V / VII semester classes ONLY during the subsequent academic year as the case may be. In simpler terms there shall NOT be any ODD BATCH for any semester.

Note: Grade AB should be considered as failed and treated as one head for deciding academic progression. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

17. Grading of performances

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – XII.

Table – XII: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called ‘Semester Grade Point Average’ (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C₁, C₂, C₃, C₄ and C₅ and the student’s grade points in these courses are G₁, G₂, G₃, G₄ and G₅, respectively, and then students’ SGPA is equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and AB grade awarded in that semester. For example if a learner has a F or AB grade in course 4, the SGPA shall then be computed as:

$$C_1G_1 + C_2G_2 + C_3G_3 + C_4* \text{ZERO} + C_5G_5$$

$$\text{SGPA} = \frac{\text{-----}}{C_1 + C_2 + C_3 + C_4 + C_5}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8}{\text{-----}}$$

$$C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8$$

where C₁, C₂, C₃,... is the total number of credits for semester I,II,III,... and S₁,S₂, S₃,... is the SGPA of semester I,II,III,....

20. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

- First Class with Distinction = CGPA of 7.50 and above
- First Class = CGPA of 6.00 to 7.49
- Second Class = CGPA of 5.00 to 5.99

21. Project work

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks

Total	75 Marks
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Evaluation of Presentation:

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks

Total	75 Marks
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Explanation: The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

22. Industrial training (Desirable)

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the Semester – VI and before the commencement of Semester – VII, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

23. Practice School

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.

24. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the B. Pharm program in minimum prescribed number of years, (four years) for the award of Ranks.

25. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

26. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

27. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of break up period and he/she has to rejoin the program by paying the required fees.

CHAPTER - II: SYLLABUS

Semester I

BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Course Content:

Unit I

10 hours

- **Introduction to human body**

Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

- **Cellular level of organization**

Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

- **Tissue level of organization**

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit II

10 hours

- **Integumentary system**

Structure and functions of skin

- **Skeletal system**

Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system

Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction

- **Joints**
Structural and functional classification, types of joints movements and its articulation

Unit III

10 hours

- **Body fluids and blood**
- Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.
- **Lymphatic system**
Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Unit IV

08 hours

Peripheral nervous system:

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system.

Origin and functions of spinal and cranial nerves.

- **Special senses**
Structure and functions of eye, ear, nose and tongue and their disorders.

Unit V

07 hours

- **Cardiovascular system**
Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones

6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA
4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.

6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books (Latest Editions)

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

BP102T. PHARMACEUTICAL ANALYSIS (Theory)

45 Hours

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

Objectives: Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- develop analytical skills

Course Content:

UNIT-I

10 Hours

(a) **Pharmaceutical analysis**- Definition and scope

- i) Different techniques of analysis
- ii) Methods of expressing concentration
- iii) Primary and secondary standards.
- iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

(b)**Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

(c)Pharmacopoeia, Sources of impurities in medicinal agents,limit tests.

UNIT-II

10 Hours

- **Acid base titration:** Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves
- **Non aqueous titration:** Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III

10 Hours

- **Precipitation titrations:** Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.
- **Complexometric titration:** Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
- **Gravimetry:** Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
- Basic Principles,methods and application of diazotisation titration.

UNIT-IV

08 Hours

Redox titrations

(a) Concepts of oxidation and reduction

(b) Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

UNIT-V

07 Hours

- **Electrochemical methods of analysis**
 - **Conductometry**- Introduction, Conductivity cell, Conductometric titrations, applications.
 - **Potentiometry** - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.
 - **Polarography** - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

BP108P. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours / Week

I Limit Test of the following

- (1) Chloride
- (2) Sulphate
- (3) Iron
- (4) Arsenic

II Preparation and standardization of

- (1) Sodium hydroxide
- (2) Sulphuric acid
- (3) Sodium thiosulfate
- (4) Potassium permanganate
- (5) Ceric ammonium sulphate

III Assay of the following compounds along with Standardization of Titrant

- (1) Ammonium chloride by acid base titration
- (2) Ferrous sulphate by Cerimetry
- (3) Copper sulphate by Iodometry
- (4) Calcium gluconate by complexometry
- (5) Hydrogen peroxide by Permanganometry
- (6) Sodium benzoate by non-aqueous titration
- (7) Sodium Chloride by precipitation titration

IV Determination of Normality by electro-analytical methods

- (1) Conductometric titration of strong acid against strong base
- (2) Conductometric titration of strong acid and weak acid against strong base
- (3) Potentiometric titration of strong acid against strong base

Recommended Books: (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

BP103T. PHARMACEUTICS- I (Theory)

45 Hours

Scope: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives: Upon completion of this course the student should be able to:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

Course Content:

UNIT – I

10 Hours

- **Historical background and development of profession of pharmacy:** History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
- **Dosage forms:** Introduction to dosage forms, classification and definitions
- **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.
- **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT – II

10 Hours

- **Pharmaceutical calculations:** Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.
- **Powders:** Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.
- **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

UNIT – III

08 Hours

- **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.
- **Biphasic liquids:**
- **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.
- **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

UNIT – IV

08 Hours

- **Suppositories:** Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.
- **Pharmaceutical incompatibilities:** Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

UNIT – V

07 Hours

- **Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosage forms

BP109P. PHARMACEUTICALS (Practical)

3 Hours / week

1. Syrups

- a) Syrup IP'66
- b) Compound syrup of Ferrous Phosphate BPC'68

2. Elixirs

- a) Piperazine citrate elixir
- b) Paracetamol pediatric elixir

3. Linctus

- a) Terpin Hydrate Linctus IP'66
- b) Iodine Throat Paint (Mandles Paint)

4. Solutions

- a) Strong solution of ammonium acetate
- b) Cresol with soap solution
- c) Lugol's solution

5. Suspensions

- a) Calamine lotion
- b) Magnesium Hydroxide mixture
- c) Aluminium Hydroxide gel

6. Emulsions

- a) Turpentine Liniment
- b) Liquid paraffin emulsion

7. Powders and Granules

- a) ORS powder (WHO)
- b) Effervescent granules
- c) Dusting powder
- d) Divided powders

8. Suppositories

- a) Glycero gelatin suppository
- b) Cocoa butter suppository
- c) Zinc Oxide suppository

8. Semisolids

- a) Sulphur ointment
- b) Non staining-iodine ointment with methyl salicylate
- c) Carbopal gel

9. Gargles and Mouthwashes

- a) Iodine gargle
- b) Chlorhexidine mouthwash

Recommended Books: (Latest Editions)

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Françoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

45 Hours

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Objectives: Upon completion of course student shall be able to

- know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

Course Content:

UNIT I

10 Hours

- **Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

General methods of preparation, assay for the compounds superscripted with **asterisk (*)**, properties and medicinal uses of inorganic compounds belonging to the following classes

UNIT II

10 Hours

- **Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
- **Major extra and intracellular electrolytes:** Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.
- **Dental products:** Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

UNIT III

10 Hours

- **Gastrointestinal agents**

Acidifiers: Ammonium chloride* and Dil. HCl

Antacid: Ideal properties of antacids, combinations of antacids, Sodium

Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture

Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations

UNIT IV

08 Hours

- **Miscellaneous compounds**

Expectorants: Potassium iodide, Ammonium chloride*.

Emetics: Copper sulphate*, Sodium potassium tartarate

Haematinics: Ferrous sulphate*, Ferrous gluconate

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite³³³

Astringents: Zinc Sulphate, Potash Alum

UNIT V

07 Hours

- **Radiopharmaceuticals:** Radio activity, Measurement of radioactivity, Properties of α , β , radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I^{131} , Storage conditions, precautions & pharmaceutical application of radioactive substances.

BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)

4 Hours / Week

I Limit tests for following ions

Limit test for Chlorides and Sulphates

Modified limit test for Chlorides and Sulphates

Limit test for Iron

Limit test for Heavy metals

Limit test for Lead

Limit test for Arsenic

II Identification test

Magnesium hydroxide

Ferrous sulphate

Sodium bicarbonate

Calcium gluconate

Copper sulphate

III Test for purity

Swelling power of Bentonite

Neutralizing capacity of aluminum hydroxide gel

Determination of potassium iodate and iodine in potassium Iodide

IV Preparation of inorganic pharmaceuticals

Boric acid

Potash alum

Ferrous sulphate

Recommended Books (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

BP105T.COMMUNICATION SKILLS (Theory)

30 Hours

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Objectives:

Upon completion of the course the student shall be able to

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

Course content:

UNIT – I

07 Hours

- **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context
- **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers
- **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

UNIT – II

07 Hours

- **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication
- **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT – III

07 Hours

- **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations
- **Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication
- **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

UNIT – IV

05 Hours

- **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview
- **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

UNIT – V

04 Hours

- **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

BP111P.COMMUNICATION SKILLS (Practical)

2 Hours / week

The following learning modules are to be conducted using wordsworth[®] English language lab software

Basic communication covering the following topics

Meeting People

Asking Questions

Making Friends

What did you do?

Do's and Dont's

Pronunciations covering the following topics

Pronunciation (Consonant Sounds)

Pronunciation and Nouns

Pronunciation (Vowel Sounds)

Advanced Learning

Listening Comprehension / Direct and Indirect Speech

Figures of Speech

Effective Communication

Writing Skills

Effective Writing

Interview Handling Skills

E-Mail etiquette

Presentation Skills

Recommended Books: (Latest Edition)

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009
12. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

BP 106RBT.REMEDIAL BIOLOGY (Theory)

30 Hours

Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

Objectives: Upon completion of the course, the student shall be able to

- know the classification and salient features of five kingdoms of life
- understand the basic components of anatomy & physiology of plant
- know understand the basic components of anatomy & physiology animal with special reference to human

UNIT I

07 Hours

Living world:

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus,

Morphology of Flowering plants

- Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.
- General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledones.

UNIT II

07 Hours

Body fluids and circulation

- Composition of blood, blood groups, coagulation of blood
- Composition and functions of lymph
- Human circulatory system
- Structure of human heart and blood vessels
- Cardiac cycle, cardiac output and ECG

Digestion and Absorption

- Human alimentary canal and digestive glands
- Role of digestive enzymes
- Digestion, absorption and assimilation of digested food

Breathing and respiration

- Human respiratory system
- Mechanism of breathing and its regulation
- Exchange of gases, transport of gases and regulation of respiration
- Respiratory volumes

UNIT III

07 Hours

Excretory products and their elimination

- Modes of excretion
- Human excretory system- structure and function
- Urine formation
- Rennin angiotensin system

Neural control and coordination

- Definition and classification of nervous system
- Structure of a neuron
- Generation and conduction of nerve impulse
- Structure of brain and spinal cord
- Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

Chemical coordination and regulation

- Endocrine glands and their secretions
- Functions of hormones secreted by endocrine glands

Human reproduction

- Parts of female reproductive system
- Parts of male reproductive system
- Spermatogenesis and Oogenesis
- Menstrual cycle

UNIT IV

05 Hours

Plants and mineral nutrition:

- Essential mineral, macro and micronutrients
- Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis

- Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

UNIT V

04 Hours

Plant respiration:Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development

- Phases and rate of plant growth, Condition of growth,Introduction to plant growth regulators

Cell - The unit of life

- Structure and functions of cell and cell organelles.Cell division

Tissues

- Definition, types of tissues, location and functions.

Text Books

- a. Text book of Biology by S. B. Gokhale
- b. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books

- a. A Text book of Biology by B.V. Sreenivasa Naidu
- b. A Text book of Biology by Naidu and Murthy
- c. Botany for Degree students By A.C.Dutta.
- d.Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthkrishnan.
- e. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

BP112RBP.REMEDIAL BIOLOGY (Practical)

30 Hours

1. Introduction to experiments in biology
 - a) Study of Microscope
 - b) Section cutting techniques
 - c) Mounting and staining
 - d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root
Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

Reference Books

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava.
3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi

BP 106RMT.REMEDIAL MATHEMATICS (Theory)

30 Hours

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

Objectives: Upon completion of the course the student shall be able to:-

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

Course Content:

UNIT – I

06 Hours

- **Partial fraction**

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

- **Logarithms**

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

- **Function:**

Real Valued function, Classification of real valued functions,

- **Limits and continuity :**

Introduction, Limit of a function, Definition of limit of a function ($\epsilon - \delta$

definition), $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$,

UNIT –II

06 Hours

- **Matrices and Determinant:**

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley-Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations

UNIT – III

06 Hours

- **Calculus**

Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of x^n w.r.t x , where n is any rational number, Derivative of e^x , Derivative of $\log_e x$, Derivative of a^x , Derivative of trigonometric functions from first principles (**without Proof**), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

UNIT – IV

06 Hours

- **Analytical Geometry**

Introduction: Signs of the Coordinates, Distance formula,

Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line

Integration:

Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

UNIT-V

06 Hours

- **Differential Equations** : Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, **Application in solving Pharmacokinetic equations**
- **Laplace Transform** : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, **Application in solving Chemical kinetics and Pharmacokinetics equations**

Recommended Books (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal

Semester II

BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to:

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

Course Content:

Unit I

10 hours

- **Nervous system**

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

Unit II

06 hours

- **Digestive system**

Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine

and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

- **Energetics**

Formation and role of ATP, Creatinine Phosphate and BMR.

Unit III

- **Respiratory system** **10 hours**

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration

Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

- **Urinary system**

Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

Unit IV

10 hours

- **Endocrine system**

Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Unit V

09 hours

- **Reproductive system**

Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

- **Introduction to genetics**

Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance

BP 207 P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.

11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA

4. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterje ,Academic Publishers Kolkata

BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY –I (Theory)

45 Hours

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives: Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. identify/confirm the identification of organic compound

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT-I

07 Hours

- **Classification, nomenclature and isomerism**

Classification of Organic Compounds

Common and IUPAC systems of nomenclature of organic compounds

(up to 10 Carbons open chain and carbocyclic compounds)

Structural isomerisms in organic compounds

UNIT-II 10 Hours

- **Alkanes*, Alkenes* and Conjugated dienes***

SP³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins.

Stabilities of alkenes, SP² hybridization in alkenes

E₁ and E₂ reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E₁ versus E₂ reactions, Factors affecting E₁ and E₂ reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT-III 10 Hours

- **Alkyl halides***

SN₁ and SN₂ reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

SN₁ versus SN₂ reactions, Factors affecting SN₁ and SN₂ reactions

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

- **Alcohols***- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-IV 10 Hours

- **Carbonyl compounds* (Aldehydes and ketones)**

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT-V

08 Hours

- **Carboxylic acids***

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

- **Aliphatic amines*** - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical)

4 Hours / week

1. Systematic qualitative analysis of unknown organic compounds like
 1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
 2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
 3. Solubility test
 4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
 5. Melting point/Boiling point of organic compounds
 6. Identification of the unknown compound from the literature using melting point/ boiling point.
 7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
 8. Minimum 5 unknown organic compounds to be analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwalia/Chatwal.

BP203 T. BIOCHEMISTRY (Theory)

45 Hours

Scope: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives: Upon completion of course student shall be able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Content:

UNIT I

08 Hours

- **Biomolecules**

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

- **Bioenergetics**

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP

UNIT II

10 Hours

- **Carbohydrate metabolism**

Glycolysis – Pathway, energetics and significance

Citric acid cycle- Pathway, energetics and significance

HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

Glycogen metabolism Pathways and glycogen storage diseases (GSD)

Gluconeogenesis- Pathway and its significance

Hormonal regulation of blood glucose level and Diabetes mellitus

- **Biological oxidation**

Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate level phosphorylation

Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT III

10 Hours

- **Lipid metabolism**

- Oxidation of saturated fatty acid (Palmitic acid)

Formation and utilization of ketone bodies; ketoacidosis

De novo synthesis of fatty acids (Palmitic acid)

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

- **Amino acid metabolism**

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alcaptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

UNIT IV

10 Hours

- **Nucleic acid metabolism and genetic information transfer**

Biosynthesis of purine and pyrimidine nucleotides

Catabolism of purine nucleotides and Hyperuricemia and Gout disease

Organization of mammalian genome

Structure of DNA and RNA and their functions

DNA replication (semi conservative model)

Transcription or RNA synthesis

Genetic code, Translation or Protein synthesis and inhibitors

UNIT V

07 Hours

- **Enzymes**

Introduction, properties, nomenclature and IUB classification of enzymes

Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

Enzyme inhibitors with examples

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation

Therapeutic and diagnostic applications of enzymes and isoenzymes

Coenzymes –Structure and biochemical functions

BP 209 P. BIOCHEMISTRY (Practical)

4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Recommended Books (Latest Editions)

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murray, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

BP 204T.PATHOPHYSIOLOGY (THEORY)

45Hours

Scope: Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives: Upon completion of the subject student shall be able to –

1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

Course content:

Unit I

10Hours

- **Basic principles of Cell injury and Adaptation:**
Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance

- **Basic mechanism involved in the process of inflammation and repair:**

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

Unit II

10Hours

- **Cardiovascular System:**
Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)
- **Respiratory system:** Asthma, Chronic obstructive airways diseases.
- **Renal system:** Acute and chronic renal failure .

Unit II

10Hours

- **Haematological Diseases:**
Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia
- **Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormones
- **Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.
- **Gastrointestinal system:** Peptic Ulcer
-

Unit IV

8 Hours

- Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.
- **Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout
- **Principles of cancer:** classification, etiology and pathogenesis of cancer
- **Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, Gout
- **Principles of Cancer:** Classification, etiology and pathogenesis of Cancer

Unit V

7 Hours

- **Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis

Urinary tract infections

- **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhoea

Recommended Books (Latest Editions)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
5. William and Wilkins, Baltimore; 1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Recommended Journals

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hrs (2 Hrs/Week)

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Objectives: Upon completion of the course the student shall be able to

1. know the various types of application of computers in pharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

Course content:

UNIT – I

06 hours

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division

Concept of Information Systems and Software : Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

UNIT –II

06 hours

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

UNIT – III

06 hours

Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

UNIT – IV

06 hours

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V

06 hours

Computers as data analysis in Preclinical development:
Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMMS)

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Recommended books (Latest edition):

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

BP 206 T. ENVIRONMENTAL SCIENCES (Theory)

30 hours

Scope:Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives: Upon completion of the course the student shall be able to:

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Course content:

Unit-I

10hours

The Multidisciplinary nature of environmental studies

Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

Unit-II

10hours

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit- III

10hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books (Latest edition):

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clarendon Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment

SEMESTER III

BP301T. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)

45 Hours

Scope: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

Objectives: Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. prepare organic compounds

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT I

10 Hours

- **Benzene and its derivatives**

- A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule
- B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.
- C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction
- D. Structure and uses of DDT, Saccharin, BHC and Chloramine

UNIT II

10 Hours

- **Phenols*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols
- **Aromatic Amines*** - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts
- **Aromatic Acids*** -Acidity, effect of substituents on acidity and important reactions of benzoic acid.

UNIT III

10 Hours

- **Fats and Oils**
 - a. Fatty acids – reactions.

- b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
- c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

UNIT IV

08 Hours

- **Polynuclear hydrocarbons:**

- a. Synthesis, reactions
- b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

UNIT V

07 Hours

- **Cyclo alkanes***

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

4 Hrs/week

- I Experiments involving laboratory techniques
- Recrystallization
 - Steam distillation
- II Determination of following oil values (including standardization of reagents)
- Acid value
 - Saponification value
 - Iodine value
- III Preparation of compounds
- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
 - 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/
 - Acetanilide by halogenation (Bromination) reaction.
 - 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
 - Benzoic acid from Benzyl chloride by oxidation reaction.
 - Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
 - 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions.
 - Benzil from Benzoin by oxidation reaction.
 - Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction
 - Cinnamic acid from Benzaldehyde by Perkin reaction
 - *P*-Iodo benzoic acid from *P*-amino benzoic acid

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.

8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

BP302T. PHYSICAL PHARMACEUTICS-I (Theory)

45Hours

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I

10 Hours

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

UNIT-II

10Hours

States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT-III

08 Hours

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions,

surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

UNIT-IV**08Hours**

Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

UNIT-V**07 Hours**

pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

BP306P. PHYSICAL PHARMACEUTICS – I (Practical)

4 Hrs/week

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl₄ and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene, Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
9. Physical Pharmaceutics by C.V.S. Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar

BP 303 T. PHARMACEUTICAL MICROBIOLOGY (Theory)

45Hours

Scope:

- Study of all categories of microorganisms especially for the production of alcohol antibiotics, vaccines, vitamins enzymes etc..

Objectives: Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Course content:

Unit I

10 Hours

Introduction, history of microbiology, its branches, scope and its importance.

Introduction to Prokaryotes and Eukaryotes

Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).

Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.

Unit II

10 Hours

Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC).

Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization.

Evaluation of the efficiency of sterilization methods.

Equipments employed in large scale sterilization.

Sterility indicators.

Unit III

10 Hours

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants

Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions

Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit IV

08 Hours

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.

Assessment of a new antibiotic.

Unit V

07Hours

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

BP 307P.PHARMACEUTICAL MICROBIOLOGY (Practical)

4 Hrs/week

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Recommended Books (Latest edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Pepler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

BP 304 T. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Objectives: Upon completion of the course student shall be able:

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course content:

UNIT-I

10 Hours

- **Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.
- **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.
- **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

UNIT-II

10 Hours

- **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

- **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.
- **Distillation:** Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT- III

08 Hours

- **Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.
- **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

UNIT-IV

08 Hours

- **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.
- **Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT- V

07 Hours

- **Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchemo, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – McCabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

BP308P - PHARMACEUTICAL ENGINEERING (Practical)

4 Hours/week

- I. Determination of radiation constant of brass, iron, unpainted and painted glass.
- II. Steam distillation – To calculate the efficiency of steam distillation.
- III. To determine the overall heat transfer coefficient by heat exchanger.
- IV. Construction of drying curves (for calcium carbonate and starch).
- V. Determination of moisture content and loss on drying.
- VI. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
- VII. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
- VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
- IX. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
- X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
- XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
- XII. To study the effect of time on the Rate of Crystallization.
- XIII. To calculate the uniformity Index for given sample by using Double Cone Blender.

SEMESTER IV

BP401T. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)

45 Hours

Scope: This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Objectives: At the end of the course, the student shall be able to

1. understand the methods of preparation and properties of organic compounds
2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. know the medicinal uses and other applications of organic compounds

Course Content:

Note: To emphasize on definition, types, mechanisms, examples, uses/applications

UNIT-I

10 Hours

Stereo isomerism

Optical isomerism –

Optical activity, enantiomerism, diastereoisomerism, meso compounds

Elements of symmetry, chiral and achiral molecules

DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers

Reactions of chiral molecules

Racemic modification and resolution of racemic mixture.

Asymmetric synthesis: partial and absolute

UNIT-II

10 Hours

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems)

Methods of determination of configuration of geometrical isomers.

Conformational isomerism in Ethane, n-Butane and Cyclohexane.

Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

Stereospecific and stereoselective reactions

UNIT-III

10 Hours

Heterocyclic compounds:

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives

Pyrrole, Furan, and Thiophene

Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

UNIT-IV**8 Hours**

Synthesis, reactions and medicinal uses of following compounds/derivatives

Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine

Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

UNIT-V**07 Hours****Reactions of synthetic importance**

Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.

Oppenauer-oxidation and Dakin reaction.

Beckmanns rearrangement and Schmidt rearrangement.

Claisen-Schmidt condensation

Recommended Books (Latest Editions)

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

BP402T. MEDICINAL CHEMISTRY – I (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

1. understand the chemistry of drugs with respect to their pharmacological activity
2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. know the Structural Activity Relationship (SAR) of different class of drugs
4. write the chemical synthesis of some drugs

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I

10 Hours

Introduction to Medicinal Chemistry

History and development of medicinal chemistry

Physicochemical properties in relation to biological action

Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

Drug metabolism

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

UNIT- II

10 Hours

Drugs acting on Autonomic Nervous System

Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine.

Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine,

Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III

10 Hours

Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorophate, Echothiophate iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

UNIT- IV

08 Hours

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturates: SAR of barbiturates, Barbitol*, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital, Secobarbital

Miscellaneous:

Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meprobamate, Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazines: SAR of Phenothiazines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluoro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

C. Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methobarbital. **Hydantoins:**

Phenytoin*, Mephenytoin, Ethotoin **Oxazolindione diones:**

Trimethadione, Paramethadione **Succinimides:**

Phensuximide, Methsuximide, Ethosuximide* **Urea and**

monoacylureas: Phenacemide, Carbamazepine*

Benzodiazepines: Clonazepam

Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate

UNIT – V

07 Hours

Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbiturates: Methohexital sodium*, Thiopental sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepiac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

BP406P. MEDICINAL CHEMISTRY – I (Practical)

4 Hours/Week

I Preparation of drugs/ intermediates

- 1 1,3-pyrazole
- 2 1,3-oxazole
- 3 Benzimidazole
- 4 Benztriazole
- 5 2,3- diphenyl quinoxaline
- 6 Benzocaine
- 7 Phenytoin
- 8 Phenothiazine
- 9 Barbiturate

II Assay of drugs

- 1 Chlorpromazine
- 2 Phenobarbitone
- 3 Atropine
- 4 Ibuprofen
- 5 Aspirin
- 6 Furosemide

III Determination of Partition coefficient for any two drugs

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BP 403 T. PHYSICAL PHARMACEUTICS-II (Theory)

45Hours

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I

07 Hours

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action.

UNIT-II

10 Hours

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III

10 Hours

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

UNIT-IV**10Hours**

Micromeritics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT-V**10 Hours**

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

BP 407P. PHYSICAL PHARMACEUTICS- II (Practical)

3 Hrs/week

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceuticals by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

BP 404 T. PHARMACOLOGY-I (Theory)

45 Hrs

Scope: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

Objectives: Upon completion of this course the student should be able to

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Course Content:

UNIT-I

08 hours

1. General Pharmacology

- a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.
- b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT-II

12 Hours

General Pharmacology

- a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
- b. Adverse drug reactions.
- c. Drug interactions (pharmacokinetic and pharmacodynamic)
- d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT-III**10 Hours****2. Pharmacology of drugs acting on peripheral nervous system**

- a. Organization and function of ANS.
- b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.
- c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.
- d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
- e. Local anesthetic agents.
- f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV**08 Hours****3. Pharmacology of drugs acting on central nervous system**

- a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
- b. General anesthetics and pre-anesthetics.
- c. Sedatives, hypnotics and centrally acting muscle relaxants.
- d. Anti-epileptics
- e. Alcohols and disulfiram

UNIT-V**07 Hours****3. Pharmacology of drugs acting on central nervous system**

- a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
- b. Drugs used in Parkinsons disease and Alzheimer's disease.
- c. CNS stimulants and nootropics.
- d. Opioid analgesics and antagonists
- e. Drug addiction, drug abuse, tolerance and dependence.

BP 408 P.PHARMACOLOGY-I (Practical)

4Hrs/Week

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology

6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

BP 405 T.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)

45 Hours

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

Objectives: Upon completion of the course, the student shall be able

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

Course Content:

UNIT-I

10 Hours

Introduction to Pharmacognosy:

- (a) Definition, history, scope and development of Pharmacognosy
- (b) Sources of Drugs – Plants, Animals, Marine & Tissue culture
- (c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

UNIT-II

10 Hours

Cultivation, Collection, Processing and storage of drugs of natural origin:

Cultivation and Collection of drugs of natural origin

Factors influencing cultivation of medicinal plants.

Plant hormones and their applications.

Polyploidy, mutation and hybridization with reference to medicinal plants

Conservation of medicinal plants

UNIT-III

07 Hours

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy.

Edible vaccines

UNIT IV**10 Hours****Pharmacognosy in various systems of medicine:**

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

UNIT V**08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey

Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

BP408 P. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)

4 Hours/Week

1. Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and palisade ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

SEMESTER V

BP501T. MEDICINAL CHEMISTRY – II (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I

10 Hours

Antihistaminic agents: Histamine, receptors and their distribution in the humanbody

H₁-antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines succinate, Clemastine fumarate, Diphenylpyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

H₂-antagonists: Cimetidine*, Famotidine, Ranitidin.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan,

Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Miscellaneous: Cisplatin, Mitotane.

UNIT – II

10 Hours

Anti-anginal:

Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.

Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

Diuretics:

Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT- III

10 Hours

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcaïnide hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol

Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

UNIT- IV**08 Hours****Drugs acting on Endocrine system**

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progesterones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol

Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT – V**07 Hours****Antidiabetic agents:**

Insulin and its preparations

Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone.

Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acarbose, Voglibose.

Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

Miscellaneous: Phenacaine, Dipiperodon, Dibucaine.*

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BP 502 T. Industrial PharmacyI (Theory)

45 Hours

Scope: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

Objectives: Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course content:

3 hours/ week

UNIT-I

07 Hours

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization

BCS classification of drugs & its significant

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT-II

10 Hours

Tablets:

- a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
- b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.
- c. Quality control tests: In process and finished product tests

Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT-III

08 Hours

Capsules:

- a. **Hard gelatin capsules:** Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.
- b. **Soft gelatin capsules:** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

UNIT-IV

10 Hours

Parenteral Products:

- a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity
- b. Production procedure, production facilities and controls, aseptic processing
- c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.
- d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-V

10 Hours

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

BP 506 P. Industrial PharmacyI (Practical)

4 Hours/week

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

BP503.T. PHARMACOLOGY-II (Theory)

45 Hours

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

Objectives: Upon completion of this course the student should be able to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Course Content:

UNIT-I

10hours

1. Pharmacology of drugs acting on cardio vascular system

- a. Introduction to hemodynamic and electrophysiology of heart.
- b. Drugs used in congestive heart failure
- c. Anti-hypertensive drugs.
- d. Anti-anginal drugs.
- e. Anti-arrhythmic drugs.
- f. Anti-hyperlipidemic drugs.

UNIT-II

10hours

1. Pharmacology of drugs acting on cardio vascular system

- a. Drug used in the therapy of shock.
- b. Hematinics, coagulants and anticoagulants.
- c. Fibrinolytics and anti-platelet drugs
- d. Plasma volume expanders

2. Pharmacology of drugs acting on urinary system

- a. Diuretics
- b. Anti-diuretics.

UNIT-III

10hours

3. Autocoids and related drugs

- a. Introduction to autocoids and classification
- b. Histamine, 5-HT and their antagonists.
- c. Prostaglandins, Thromboxanes and Leukotrienes.
- d. Angiotensin, Bradykinin and Substance P.
- e. Non-steroidal anti-inflammatory agents
- f. Anti-gout drugs
- g. Antirheumatic drugs

UNIT-IV**08hours****5. Pharmacology of drugs acting on endocrine system**

- a. Basic concepts in endocrine pharmacology.
- b. Anterior Pituitary hormones- analogues and their inhibitors.
- c. Thyroid hormones- analogues and their inhibitors.
- d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.
- d. Insulin, Oral Hypoglycemic agents and glucagon.
- e. ACTH and corticosteroids.

UNIT-V**07hours****5. Pharmacology of drugs acting on endocrine system**

- a. Androgens and Anabolic steroids.
- b. Estrogens, progesterone and oral contraceptives.
- c. Drugs acting on the uterus.

6. Bioassay

- a. Principles and applications of bioassay.
- b. Types of bioassay
- c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT

BP 507 P. PHARMACOLOGY-II (Practical)

4Hrs/Week

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA₂ value of prazosin using rat anococcygeus muscle (by Schild's plot method).
12. Determination of PD₂ value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

BP504 T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

45Hours

Scope: The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

Objectives: Upon completion of the course, the student shall be able

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbal formulation.
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents

Course Content:

UNIT-I

7 Hours

Metabolic pathways in higher plants and their determination

- a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.
- b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

UNIT-II

14 Hours

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,

Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta

Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis

Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,

Tannins: Catechu, Pterocarpus

Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony

Glycosides: Senna, Aloes, Bitter Almond

Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

UNIT-III

06 Hours

Isolation, Identification and Analysis of Phytoconstituents

- a) Terpenoids: Menthol, Citral, Artemisin
- b) Glycosides: Glycyrrhetic acid & Rutin
- c) Alkaloids: Atropine, Quinine, Reserpine, Caffeine
- d) Resins: Podophyllotoxin, Curcumin

UNIT-IV

10 Hours

Industrial production, estimation and utilization of the following phytoconstituents:

Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

UNIT V

8 Hours

Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

BP 508 P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)

4 Hours/Week

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
 - a. Caffeine - from tea dust.
 - b. Diosgenin from Dioscorea
 - c. Atropine from Belladonna
 - d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstituents by TLC
6. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, 1st edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

BP 505 T. PHARMACEUTICAL JURISPRUDENCE (Theory)

45 Hours

Scope: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

Objectives: Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT-I

10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT-II

10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

UNIT-III

10 Hours

- **Pharmacy Act –1948:** Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and

Penalties

- **Medicinal and Toilet Preparation Act –1955:** Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.
- **Narcotic Drugs and Psychotropic substances Act-1985 and Rules:** Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV

08 Hours

- **Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties
- **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties
- **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

UNIT-V

07 Hours

- **Pharmaceutical Legislations** – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee
- **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath
- **Medical Termination of Pregnancy Act**
- **Right to Information Act**
- **Introduction to Intellectual Property Rights (IPR)**

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh

2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9. Bare Acts of the said laws published by Government. Reference books (Theory)

SEMESTER VI

BP601T. MEDICINAL CHEMISTRY – III (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

Objectives: Upon completion of the course student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

UNIT – I

10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

-Lactam antibiotics: Penicillin, Cephalosporins, - Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin

Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT – II

10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

Macrolide: Erythromycin Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrugs design.

Antimalarials: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunate, Artemether, Atovaquone.

UNIT – III

10 Hours

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniazid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycin, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents:

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

UNIT – IV

08 Hours

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconazole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxazole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

UNIT – V

07 Hours

Introduction to Drug Design

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammett's electronic parameter, Taft's steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

BP607P. MEDICINAL CHEMISTRY- III (Practical)

4 Hours / week

I Preparation of drugs and intermediates

- 1 Sulphanilamide
- 2 7-Hydroxy, 4-methyl coumarin
- 3 Chlorobutanol
- 4 Triphenyl imidazole
- 5 Tolbutamide
- 6 Hexamine

II Assay of drugs

- 1 Isonicotinic acid hydrazide
- 2 Chloroquine
- 3 Metronidazole
- 4 Dapsone
- 5 Chlorpheniramine maleate
- 6 Benzyl penicillin

III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique

IV Drawing structures and reactions using chem draw®

V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BP602 T. PHARMACOLOGY-III (Theory)

45 Hours

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and chronopharmacology.

Objectives: Upon completion of this course the student should be able to:

1. understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. comprehend the principles of toxicology and treatment of various poisonings and
3. appreciate correlation of pharmacology with related medical sciences.

Course Content:

UNIT-I

10hours

1. Pharmacology of drugs acting on Respiratory system

- a. Anti -asthmatic drugs
- b. Drugs used in the management of COPD
- c. Expectorants and antitussives
- d. Nasal decongestants
- e. Respiratory stimulants

2. Pharmacology of drugs acting on the Gastrointestinal Tract

- a. Antiulcer agents.
- b. Drugs for constipation and diarrhoea.
- c. Appetite stimulants and suppressants.
- d. Digestants and carminatives.
- e. Emetics and anti-emetics.

UNIT-II

10hours

3. Chemotherapy

- a. General principles of chemotherapy.
- b. Sulfonamides and cotrimoxazole.
- c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

UNIT-III

10hours

3. Chemotherapy

- a. Antitubercular agents
- b. Antileprotic agents

- c. Antifungal agents
- d. Antiviral drugs
- e. Anthelmintics
- f. Antimalarial drugs
- g. Antiamoebic agents

UNIT-IV

08hours

3. Chemotherapy

- l. Urinary tract infections and sexually transmitted diseases.
- m. Chemotherapy of malignancy.

4. Immunopharmacology

- a. Immunostimulants
- b. Immunosuppressant

Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

UNIT-V

07hours

5. Principles of toxicology

- a. Definition and basic knowledge of acute, subacute and chronic toxicity.
- b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
- c. General principles of treatment of poisoning
- d. Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning.

6. Chronopharmacology

- a. Definition of rhythm and cycles.
- b. Biological clock and their significance leading to chronotherapy.

BP 608 P. PHARMACOLOGY-III (Practical)

4Hrs/Week

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

**Experiments are demonstrated by simulated experiments/videos*

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

BP 603 T. HERBAL DRUG TECHNOLOGY (Theory)

45 hours

Scope: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

Objectives: Upon completion of this course the student should be able to:

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

Course content:

UNIT-I

11 Hours

Herbs as raw materials

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation

Source of Herbs

Selection, identification and authentication of herbal materials

Processing of herbal raw material

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

UNIT-II

7 Hours

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-III

10 Hours

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations :

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT- IV

10 Hours

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs
Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products:

- a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy
- b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

UNIT-V

07 Hours

General Introduction to Herbal Industry

Herbal drugs industry: Present scope and future prospects.

A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

Schedule T – Good Manufacturing Practice of Indian systems of medicine

Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

BP 609 P. HERBAL DRUG TECHNOLOGY (Practical)

4 hours/ week

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

**BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS
(Theory)**

45 Hours

Scope: This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arising therein.

Objectives: Upon completion of the course student shall be able to:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

**Course
Content:**

**UNIT-I
Hours**

10

**Introduction to
Biopharmaceutics**

Absorption: Mechanisms of drug absorption through GIT, factors influencing drug absorption through GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

**UNIT- II
Hours**

10

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- III

10 Hours

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - K_E , $t_{1/2}$, V_d , AUC , K_a , Cl_t and CL_R - definitions methods of eliminations, understanding of their significance and application

UNIT- IV**08 Hours**

Multicompartment models: Two compartment open model. IV bolus

Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

UNIT- V**07 Hours**

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition, Prentice-Hall International edition. USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Gibaldi Donald, R. Mercei Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Robert F Notari Marcel Dekker Inc, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania

BP 605 T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)

45 Hours

Scope:

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

Objectives: Upon completion of the subject student shall be able to;

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

Unit I

10 Hours

- a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
- b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
- c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
- d) Brief introduction to Protein Engineering.
- e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
- f) Basic principles of genetic engineering.

Unit II

10 Hours

- a) Study of cloning vectors, restriction endonucleases and DNA ligase.
- b) Recombinant DNA technology. Application of genetic engineering in medicine.
- c) Application of r DNA technology and genetic engineering in the production of:
 - i) Interferon
 - ii) Vaccines- hepatitis- B
 - iii) Hormones-Insulin.
- d) Brief introduction to PCR

Unit III

10 Hours

Types of immunity- humoral immunity, cellular immunity

- a) Structure of Immunoglobulins
- b) Structure and Function of MHC
- c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
- d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
- e) Storage conditions and stability of official vaccines
- f) Hybridoma technology- Production, Purification and Applications
- g) Blood products and Plasma Substitutes.

Unit IV

08Hours

- a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
- b) Genetic organization of Eukaryotes and Prokaryotes
- c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
- d) Introduction to Microbial biotransformation and applications.
- e) Mutation: Types of mutation/mutants.

Unit V

07 Hours

- a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.
- b) Large scale production fermenter design and its various controls.
- c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,
- d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal

Society of Chemistry.

5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

BP606TPHARMACEUTICAL QUALITY ASSURANCE (Theory)

45 Hours

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Objectives: Upon completion of the course student shall be able to:

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

Course content:

UNIT – I

10 Hours

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines

Quality by design (QbD): Definition, overview, elements of QbD program, tools

ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration

NABL accreditation : Principles and procedures

UNIT - II

10 Hours

Organization and personnel: Personnel responsibilities, training, hygiene and personal records.

Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

UNIT – III

10 Hours

Quality Control: Quality control test for containers, rubber closures and secondary packing

materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

UNIT – IV

08 Hours

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

UNIT – V

07 Hours

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

Warehousing: Good warehousing practice, materials management

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

SEMESTER VII

BP701T. INSTRUMENTAL METHODS OF ANALYSIS (Theory)

45 Hours

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives: Upon completion of the course the student shall be able to

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

Course Content:

UNIT –I

10 Hours

UV Visible spectroscopy

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi component analysis

Fluorimetry

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

UNIT –II

10 Hours

IR spectroscopy

Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations

Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

Flame Photometry-Principle, interferences, instrumentation and applications

Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications

Nepheloturbidometry- Principle, instrumentation and applications

UNIT –III

10 Hours

Introduction to chromatography

Adsorption and partition column chromatography-Methodology, advantages, disadvantages and applications.

Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.

Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications

Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

UNIT –IV

08 Hours

Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.

UNIT –V

07 Hours

Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications

Gel chromatography- Introduction, theory, instrumentation and applications

Affinity chromatography- Introduction, theory, instrumentation and applications

BP705P. INSTRUMENTAL METHODS OF ANALYSIS (Practical)

4 Hours/Week

- 1 Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
- 2 Estimation of dextrose by colorimetry
- 3 Estimation of sulfanilamide by colorimetry
- 4 Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
- 5 Assay of paracetamol by UV- Spectrophotometry
- 6 Estimation of quinine sulfate by fluorimetry
- 7 Study of quenching of fluorescence
- 8 Determination of sodium by flame photometry
- 9 Determination of potassium by flame photometry
- 10 Determination of chlorides and sulphates by nephelo turbidometry
- 11 Separation of amino acids by paper chromatography
- 12 Separation of sugars by thin layer chromatography
- 13 Separation of plant pigments by column chromatography
- 14 Demonstration experiment on HPLC
- 15 Demonstration experiment on Gas Chromatography

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

BP 702 T. INDUSTRIAL PHARMACYII (Theory)

45 Hours

Scope: This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market

Objectives: Upon completion of the course, the student shall be able to:

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch
3. Know different Laws and Acts that regulate pharmaceutical industry
4. Understand the approval process and regulatory requirements for drug products

Course Content:

UNIT-I

10 Hours

Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

UNIT-II

10 Hours

Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

UNIT-III

10 Hours

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

UNIT-IV**08 Hours**

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

UNIT-V**07 Hours**

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Recommended Books: (Latest Editions)

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http://en.wikipedia.org/wiki/Regulatory_Affairs.
2. International Regulatory Affairs Updates, 2005. available at <http://www.iraup.com/about.php>
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available at <http://www.cgmp.com/ra.htm>.

BP 703T. PHARMACY PRACTICE (Theory)

45 Hours

Scope: In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

Objectives: Upon completion of the course, the student shall be able to

1. know various drug distribution methods in a hospital
2. appreciate the pharmacy stores management and inventory control
3. monitor drug therapy of patient through medication chart review and clinical review
4. obtain medication history interview and counsel the patients
5. identify drug related problems
6. detect and assess adverse drug reactions
7. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. know pharmaceutical care services
9. do patient counseling in community pharmacy;
10. appreciate the concept of Rational drug therapy.

Unit I:

10 Hours

a) Hospital and its organization

Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

b) Hospital pharmacy and its organization

Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

c) Adverse drug reaction

Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting

drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

d) Community Pharmacy

Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

Unit II:

10 Hours

a) Drug distribution system in a hospital

Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

b) Hospital formulary

Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

c) Therapeutic drug monitoring

Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

d) Medication adherence

Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

e) Patient medication history interview

Need for the patient medication history interview, medication interview forms.

f) Community pharmacy management

Financial, materials, staff, and infrastructure requirements.

Unit III:

10 Hours

a) Pharmacy and therapeutic committee

Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

b) information services

Drug

Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

c) Patient counseling

Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist

d) Education and training program in the hospital

Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.

e) Prescribed medication order and communication skills

Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

Unit IV 8 Hours

a) Budget preparation and implementation

Budget preparation and implementation

b) Clinical Pharmacy

Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care.

Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

c) Over the counter (OTC) sales

Introduction and sale of over the counter, and Rational use of common over the counter medications.

Unit V 7 Hours

a) Drug store management and inventory control

Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

b) Investigational use of drugs

Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

c) Interpretation of Clinical Laboratory Tests

Blood chemistry, hematology, and urinalysis

Recommended Books (Latest Edition):

1. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills*, 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger; 1986.
4. Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
5. Scott LT. *Basic skills in interpreting laboratory data*, 4th ed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. *Health Education and Community Pharmacy*, 18th ed. India: CBS Publishers & Distributers; 2008.

Journals:

1. Therapeutic drug monitoring. ISSN: 0163-4356
2. Journal of pharmacy practice. ISSN : 0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900 (online)
4. Pharmacy times (Monthly magazine)

BP 704T: NOVEL DRUG DELIVERY SYSTEMS (Theory)

45 Hours

Scope: This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

Objectives: Upon completion of the course student shall be able

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

Course content:

Unit-I

10 Hours

Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

Unit-II

10 Hours

Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump

Unit-III

10 Hours

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

Unit-IV

08 Hours

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

Unit-V

07 Hours

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts

Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

Recommended Books: (Latest Editions)

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

Journals

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian Drugs (IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel & Decker)
5. International Journal of Pharmaceutics (Elsevier Sciences)

SEMESTER VIII

BP801T. BIOSTATISTICS AND RESEARCH METHODOLOGY (Theory)

45 Hours

Scope: To understand the applications of Biostatistics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel.

Objectives: Upon completion of the course the student shall be able to

- Know the operation of M.S. Excel, SPSS, R and MINITAB[®], DoE (Design of Experiment)
- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems.

Course content:

Unit-I

10 Hours

Introduction: Statistics, Biostatistics, Frequency distribution

Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples

Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems

Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

Unit-II

10 Hours

Regression: Curve fitting by the method of least squares, fitting the lines $y = a + bx$ and $x = a + by$, Multiple regression, standard error of regression- Pharmaceutical Examples

Probability: Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems

Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples

Parametric test: t-test(Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference

Unit-III

10 Hours

Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test

Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph

Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

Unit-IV

8 Hours

Blocking and confounding system for Two-level factorials

Regression modeling: Hypothesis testing in Simple and Multiple regression models

Introduction to Practical components of Industrial and Clinical Trials Problems:

Statistical Analysis Using Excel, SPSS, MINITAB[®], DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach

Unit-V

7Hours

Design and Analysis of experiments:

Factorial Design: Definition, 2^2 , 2^3 design. Advantage of factorial design

Response Surface methodology: Central composite design, Historical design, Optimization Techniques

Recommended Books (Latest edition):

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. New York.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

BP 802T SOCIAL AND PREVENTIVE PHARMACY

Hours: 45

Scope:

The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Objectives:

After the successful completion of this course, the student shall be able to:

- Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related to health and pharmaceutical issues

Course content:

Unit I:

10 Hours

Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health

Hygiene and health: personal hygiene and health care; avoidable habits

Unit II:

10 Hours

Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

Unit III:

10 Hours

National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National

programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

Unit IV:

08 Hours

National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program

Unit V:

07 Hours

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Recommended Books (Latest edition):

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

Recommended Journals:

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland

BP803ET. PHARMA MARKETING MANAGEMENT (Theory)

45 Hours

Scope:

The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.

Course Objective: The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

Unit I

10 Hours

Marketing:

Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.

Pharmaceutical market:

Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation & targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.

Unit II

10 Hours

Product decision:

Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.

Unit III

10 Hours

Promotion:

Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

Unit IV**10 Hours****Pharmaceutical marketing channels:**

Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR):

Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

Unit V**10 Hours****Pricing:**

Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).

Emerging concepts in marketing:

Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.

Recommended Books: (Latest Editions)

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, IndianContext,Macmilan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.

BP804 ET: PHARMACEUTICAL REGULATORY SCIENCE (Theory)

45Hours

Scope: This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.

Objectives: Upon completion of the subject student shall be able to;

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets

Course content:

Unit I

10Hours

New Drug Discovery and development

Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

Unit II

10Hours

Regulatory Approval Process

Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA.

Regulatory authorities and agencies

Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

Unit III

10Hours

Registration of Indian drug product in overseas market

Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical

Document (eCTD), ASEAN Common Technical Document (ACTD)research.

Unit IV

08Hours

Clinical trials

Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials

Unit V

07Hours

Regulatory Concepts

Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book

Recommended books (Latest edition):

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
9. Drugs: From Discovery to Approval, Second Edition By Rick Ng

BP 805T: PHARMACOVIGILANCE (Theory)

45 hours

Scope: This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection. This paper also develops the skills of classifying drugs, diseases and adverse drug reactions.

Objectives:

At completion of this paper it is expected that students will be able to (know, do, and appreciate):

1. Why drug safety monitoring is important?
2. History and development of pharmacovigilance
3. National and international scenario of pharmacovigilance
4. Dictionaries, coding and terminologies used in pharmacovigilance
5. Detection of new adverse drug reactions and their assessment
6. International standards for classification of diseases and drugs
7. Adverse drug reaction reporting systems and communication in pharmacovigilance
8. Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle
9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
12. CIOMS requirements for ADR reporting
13. Writing case narratives of adverse events and their quality.

Course Content

Unit I

10 Hours

Introduction to Pharmacovigilance

- History and development of Pharmacovigilance
- Importance of safety monitoring of Medicine
- WHO international drug monitoring programme
- Pharmacovigilance Program of India(PvPI)

Introduction to adverse drug reactions

- Definitions and classification of ADRs
- Detection and reporting
- Methods in Causality assessment
- Severity and seriousness assessment
- Predictability and preventability assessment
- Management of adverse drug reactions

Basic terminologies used in pharmacovigilance

- Terminologies of adverse medication related events
- Regulatory terminologies

Unit II

10 hours

Drug and disease classification

- Anatomical, therapeutic and chemical classification of drugs
- International classification of diseases
- Daily defined doses
- International Non proprietary Names for drugs

Drug dictionaries and coding in pharmacovigilance

- WHO adverse reaction terminologies
- MedDRA and Standardised MedDRA queries
- WHO drug dictionary
- Eudravigilance medicinal product dictionary

Information resources in pharmacovigilance

- Basic drug information resources
- Specialised resources for ADRs

Establishing pharmacovigilance programme

- Establishing in a hospital
- Establishment & operation of drug safety department in industry
- Contract Research Organisations (CROs)
- Establishing a national programme

Unit III

10 Hours

Vaccine safety surveillance

- Vaccine Pharmacovigilance
- Vaccination failure
- Adverse events following immunization

Pharmacovigilance methods

- Passive surveillance – Spontaneous reports and case series
- Stimulated reporting
- Active surveillance – Sentinel sites, drug event monitoring and registries
- Comparative observational studies – Cross sectional study, case control study and cohort study
- Targeted clinical investigations

Communication in pharmacovigilance

- Effective communication in Pharmacovigilance
- Communication in Drug Safety Crisis management
- Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media

Unit IV

8 Hours

Safety data generation

- Pre clinical phase
- Clinical phase
- Post approval phase (PMS)

ICH Guidelines for Pharmacovigilance

- Organization and objectives of ICH
- Expedited reporting
- Individual case safety reports
- Periodic safety update reports
- Post approval expedited reporting
- Pharmacovigilance planning
- Good clinical practice in pharmacovigilance studies

Unit V

7 hours

Pharmacogenomics of adverse drug reactions

- Genetics related ADR with example focusing PK parameters.

Drug safety evaluation in special population

- Paediatrics
- Pregnancy and lactation
- Geriatrics

CIOMS

- CIOMS Working Groups
- CIOMS Form

CDSCO (India) and Pharmacovigilance

- D&C Act and Schedule Y
- Differences in Indian and global pharmacovigilance requirements

Recommended Books (Latest edition):

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones & Bartlett Publishers.
7. Textbook of Pharmacoepidemiology edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills: G. Parthasarathi, Karin Nyfort Hansen, Milap C. Nahata
9. National Formulary of India
10. Text Book of Medicine by Yashpal Munjal

11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna

12. <http://www.who/umc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297>
13. <http://www.ich.org/>
14. <http://www.cioms.ch/>
15. <http://cdsco.nic.in/>
16. http://www.who.int/vaccine_safety/en/
17. http://www.ipc.gov.in/PvPI/pv_home.html

**BP 806 ET. QUALITY CONTROL AND STANDARDIZATION OF HERBALS
(Theory)**

Scope: In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

Objectives: Upon completion of the subject student shall be able to;

1. know WHO guidelines for quality control of herbal drugs
2. know Quality assurance in herbal drug industry
3. know the regulatory approval process and their registration in Indian and international markets
4. appreciate EU and ICH guidelines for quality control of herbal drugs

Unit I

10 hours

Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms
WHO guidelines for quality control of herbal drugs.
Evaluation of commercial crude drugs intended for use

Unit II

10 hours

Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine.

WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines
WHO Guidelines on GACP for Medicinal Plants.

Unit III

10 hours

EU and ICH guidelines for quality control of herbal drugs.
Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

Unit IV

08 hours

Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products.
Preparation of documents for new drug application and export registration
GMP requirements and Drugs & Cosmetics Act provisions.

Unit V

07 hours

Regulatory requirements for herbal medicines.

WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems

Comparison of various Herbal Pharmacopoeias.

Role of chemical and biological markers in standardization of herbal products

Recommended Books: (Latest Editions)

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , Carrier Pub., 2006.
4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.
8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.
9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
10. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
11. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
12. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

BP 807 ET. COMPUTER AIDED DRUG DESIGN (Theory)

45 Hours

Scope: This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

Objectives: Upon completion of the course, the student shall be able to understand

- Design and discovery of lead molecules
- The role of drug design in drug discovery process
- The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
- The design of new drug molecules using molecular modeling software

Course Content:

UNIT-I

10 Hours

Introduction to Drug Discovery and Development

Stages of drug discovery and development

Lead discovery and Analog Based Drug Design

Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

UNIT-II

10 Hours

Quantitative Structure Activity Relationship (QSAR)

SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammett's substituent constant and Taft's steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

UNIT-III

10 Hours

Molecular Modeling and virtual screening techniques

Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,

Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.

UNIT-IV**08 Hours****Informatics & Methods in drug design**

Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT-V**07 Hours**

Molecular Modeling: Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Recommended Books (Latest Editions)

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Park Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Delgado JN, Remers WA eds "Wilson & Gisvold's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
4. Foye WO "Principles of Medicinal chemistry 'Lea & Febiger.
5. Koro Ikovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
6. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" John Wiley & Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
8. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
9. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York.

BP808ET: CELL AND MOLECULAR BIOLOGY (Elective subject)

45 Hours

Scope:

- Cell biology is a branch of biology that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function.
- This is done both on a microscopic and molecular level.
- Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organisms such as humans, plants, and sponges.

Objectives: Upon completion of the subject student shall be able to;

- Summarize cell and molecular biology history.
- Summarize cellular functioning and composition.
- Describe the chemical foundations of cell biology.
- Summarize the DNA properties of cell biology.
- Describe protein structure and function.
- Describe cellular membrane structure and function.
- Describe basic molecular genetic mechanisms.
- Summarize the Cell Cycle

Course content:

Unit I

10Hours

- a) Cell and Molecular Biology: Definitions theory and basics and Applications.
- b) Cell and Molecular Biology: History and Summation.
- c) Properties of cells and cell membrane.
- d) Prokaryotic versus Eukaryotic
- e) Cellular Reproduction
- f) Chemical Foundations – an Introduction and Reactions (Types)

Unit II

10 Hours

- a) DNA and the Flow of Molecular Information
- b) DNA Functioning
- c) DNA and RNA
- d) Types of RNA
- e) Transcription and Translation

Unit III

10 Hours

- a) Proteins: Defined **and** Amino Acids
- b) Protein Structure

- c) Regularities in Protein Pathways
- d) Cellular Processes
- e) Positive Control and significance of Protein Synthesis

Unit IV

08 Hours

- a) Science of Genetics
- b) Transgenics and Genomic Analysis
- c) Cell Cycle analysis
- d) Mitosis and Meiosis
- e) Cellular Activities and Checkpoints

Unit V

07 Hours

- a) Cell Signals: Introduction
- b) Receptors for Cell Signals
- c) Signaling Pathways: Overview
- d) Misregulation of Signaling Pathways
- e) Protein-Kinases: Functioning

Recommended Books (latest edition):

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Pepler: Microbial Technology.
9. Edward: Fundamentals of Microbiology.
10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
12. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
13. RA Goldshy et. al., : Kuby Immunology.

BP809ET. COSMETIC SCIENCE(Theory)

45Hours

UNIT I

10Hours

Classification of cosmetic and cosmeceutical products

Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs

Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application

Skin: Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem associated with teeth and gums.

UNIT II

10 Hours

Principles of formulation and building blocks of skin care products:

Face wash,

Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals.

Antiperspirants & deodorants- Actives & mechanism of action.

Principles of formulation and building blocks of Hair care products:

Conditioning shampoo, Hair conditioner, anti-dandruff shampoo.

Hair oils.

Chemistry and formulation of Para-phenylene diamine based hair dye.

Principles of formulation and building blocks of oral care products:

Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

UNIT III

10 Hours

Sun protection, Classification of Sunscreens and SPF.

Role of herbs in cosmetics:

Skin Care: Aloe and turmeric

Hair care: Henna and amla.

Oral care: Neem and clove

Analytical cosmetics: BIS specification and analytical methods for shampoo, skin-cream and toothpaste.

UNIT IV

08 Hours.

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties

Soaps, and syndet bars. Evolution and skin benefits.

UNIT V

07 Hours

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.

Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes

Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor.

Antiperspirants and Deodorants- Actives and mechanism of action

References

- 1) Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
- 2) Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
- 3) Text book of cosmeticology by Sanju Nanda & Roop K. Khar, Tata Publishers.

BP810 ET. PHARMACOLOGICAL SCREENING METHODS

45 Hours

Scope: This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.

Objectives

Upon completion of the course the student shall be able to,

- Appreciate the applications of various commonly used laboratory animals.
- Appreciate and demonstrate the various screening methods used in preclinical research
- Appreciate and demonstrate the importance of biostatistics and research methodology
- Design and execute a research hypothesis independently

Unit –I	08 Hours
Laboratory Animals: Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.	
Unit –II	10 Hours
Preclinical screening models a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study. b. Study of screening animal models for Diuretics, nootropics, anti-Parkinson's, antiasthmatics, Preclinical screening models: for CNS activity- analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease	

<p>Unit –III</p> <p>Preclinical screening models: for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics</p>	
<p>Unit –IV</p> <p>Preclinical screening models: for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslipidemic, anti aggregatory, coagulants, and anticoagulants</p> <p>Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.</p>	
<p>Research methodology and Bio-statistics</p> <p>Selection of research topic, review of literature, research hypothesis and study design</p> <p>Pre-clinical data analysis and interpretation using Students ‘t’ test and One-way ANOVA. Graphical representation of data</p>	05 Hours

Recommended Books (latest edition):

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. CPCSEA guidelines for laboratory animal facility.
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

BP 811 ET. ADVANCED INSTRUMENTATION TECHNIQUES

45 Hours

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives: Upon completion of the course the student shall be able to

- understand the advanced instruments used and its applications in drug analysis
- understand the chromatographic separation and analysis of drugs.
- understand the calibration of various analytical instruments
- know analysis of drugs using various analytical instruments.

Course Content:

UNIT-I

10 Hours

Nuclear Magnetic Resonance spectroscopy

Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

Mass Spectrometry- Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications

UNIT-II

10 Hours

Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X-ray

Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.

UNIT-III

10 Hours

Calibration and validation-as per ICH and USFDA guidelines

Calibration of following Instruments

Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer,

Fluorimeter, Flame Photometer, HPLC and GC

UNIT-IV

08 Hours

Radio immune assay:Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

Extraction techniques:General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

UNIT-V

07 Hours

Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

BP 812 ET. DIETARY SUPPLEMENTS AND NUTRACEUTICALS

No. of hours :3

Tutorial:1

Credit point:4

Scope :

This subject covers foundational topic that are important for understanding the need and requirements of dietary supplements among different groups in the population.

Objective:

This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to :

1. Understand the need of supplements by the different group of people to maintain healthy life.
2. Understand the outcome of deficiencies in dietary supplements.
3. Appreciate the components in dietary supplements and the application.
4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

UNIT I

07 hours

- a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.
- b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.
- c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

UNIT II

15 hours

Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following

- a) Carotenoids- and -Carotene, Lycopene, Xanthophylls, leutin
- b) Sulfides: Diallyl sulfides, Allyl trisulfide.
- c) Polyphenolics: Reservetrol
- d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones
- e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum
- f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans
- g) Tocopherols
- h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.

UNIT III

07 hours

- a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.

- b) Dietary fibres and complex carbohydrates as functional food ingredients..

UNIT IV

10 hours

- a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.
- b) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, - Lipoic acid, melatonin
Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole.
- c) Functional foods for chronic disease prevention

UNIT V

06 hours

- a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.
- b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.
- c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

References:

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K.T Agusti and P.Faizal: BSPublication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2nd Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C.williams Editors *2000 Functional foods* Woodhead Publ.Co.London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M.K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

Semester VIII – Elective course on Pharmaceutical Product Development

No of Hours: 3

Tutorial:1

Credit points:4

Unit-I

10 Hours

Introduction to pharmaceutical product development, objectives, regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms

Unit-II

10 Hours

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories

- i. Solvents and solubilizers
- ii. Cyclodextrins and their applications
- iii. Non - ionic surfactants and their applications
- iv. Polyethylene glycols and sorbitols
- v. Suspending and emulsifying agents
- vi. Semi solid excipients

Unit-III

10 Hours

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories

- i. Tablet and capsule excipients
- ii. Directly compressible vehicles
- iii. Coat materials
- iv. Excipients in parenteral and aerosols products
- v. Excipients for formulation of NDDS

Selection and application of excipients in pharmaceutical formulations with specific industrial applications

Unit-IV

08 Hours

Optimization techniques in pharmaceutical product development. A study of various optimization techniques for pharmaceutical product development with specific examples. Optimization by factorial designs and their applications. A study of QbD and its application in pharmaceutical product development.

Unit-V

07 Hours

Selection and quality control testing of packaging materials for pharmaceutical product development- regulatory considerations.

Recommended Books (Latest editions)

1. Pharmaceutical Statistics Practical and Clinical Applications by Stanford Bolton, CharlesBon; Marcel Dekker Inc.
2. Encyclopedia of Pharmaceutical Technology, edited by James swarbrick, Third Edition, Informa Healthcare publishers.
3. Pharmaceutical Dosage Forms, Tablets, Volume II, edited by Herbert A. Lieberman andLeon Lachman; Marcel Dekker, Inc.
4. The Theory and Practice of Industrial Pharmacy, Fourth Edition, edited by Roop kKhar, S P Vyas, Farhan J Ahmad, Gaurav K Jain; CBS Publishers and Distributors Pvt.Ltd. 2013.
5. Martin's Physical Pharmacy and Pharmaceutical Sciences, Fifth Edition, edited by Patrick J. Sinko, BI Publications Pvt. Ltd.
6. Targeted and Controlled Drug Delivery, Novel Carrier Systems by S. P. Vyas and R. K.Khar, CBS Publishers and Distributors Pvt. Ltd, First Edition 2012.
7. Pharmaceutical Dosage Forms and Drug Delivery Systems, Loyd V. Allen Jr., Nicholas B.Popovich, Howard C. Ansel, 9th Ed. 40
8. Aulton's Pharmaceutics – The Design and Manufacture of Medicines, Michael E. Aulton,3rd Ed.
9. Remington – The Science and Practice of Pharmacy, 20th Ed.
10. Pharmaceutical Dosage Forms – Tablets Vol 1 to 3, A. Liberman, Leon Lachman andJoseph B. Schwartz
11. Pharmaceutical Dosage Forms – Disperse Systems Vol 1 to 3, H.A. Liberman, Martin, M.R and Gilbert S. Banker.
12. Pharmaceutical Dosage Forms – Parenteral Medication Vol 1 & 2, Kenneth E. Avis andH.A. Libermann.
13. Advanced Review Articles related to the topics.

2016

THE MASTER OF PHARMACY (M. PHARM.) COURSE REGULATION 2014

(BASED ON NOTIFICATION IN THE GAZETTE OF INDIA No. 362, DATED DECEMBER 11, 2014)

SCHEME AND SYLLABUS



PHARMACY COUNCIL OF INDIA

Combined Council's Building, Kotla Road,
Aiwan-E-Ghalib Marg, New Delhi-110 002.
Website : www.pci.nic.

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भारत का राजपत्र The Gazette of India

असाधारण

EXTRAORDINARY

भाग III—खण्ड 4

PART III—Section 4

प्रधिकार से प्रकाशित

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PHARMACY COUNCIL OF INDIA NOTIFICATION

New Delhi, the 10th December, 2014

The Master of Pharmacy (M.Pharm) Course Regulations, 2014

No. 14-136/ 2014-PCI.—In exercise of the powers conferred by Sections 10 and 18 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government hereby makes the following regulations: namely—

CHAPTER –I:REGULATIONS

1. Short Title and Commencement

These regulations shall be called as “The Revised Regulations for the Master of Pharmacy (M. Pharm.)Degree Program - Credit Based Semester System (CBSS) of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by the authorities of the university.

2. Minimum qualification for admission

A Pass in the following examinations

a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B.Pharm.)

b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

3. Duration of the program

The program of study for M.Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from the month of December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

7.2. Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments, Research work, Discussions with the supervisor, Journal club and Co-Curricular activities over the duration of four semesters. The credits

are distributed semester-wise as shown in Table 14. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

9. Course of study

The specializations in M.Pharm program is given in Table 1.

Table – 1: List of M.Pharm. Specializations and their Code

S. No.	Specialization	Code
1.	Pharmaceutics	MPH
2.	Industrial Pharmacy	MIP
3.	Pharmaceutical Chemistry	MPC
4.	Pharmaceutical Analysis	MPA
5.	Pharmaceutical Quality Assurance	MQA
6.	Pharmaceutical Regulatory Affairs	MRA
7.	Pharmaceutical Biotechnology	MPB
8.	Pharmacy Practice	MPP
9.	Pharmacology	MPL
10.	Pharmacognosy	MPG

The course of study for M.Pharm specializations shall include Semester wise Theory & Practical as given in Table – 2 to 11. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table – 2 to 11.

Table – 2: Course of study for M. Pharm. (Pharmaceutics)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MPH101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPH102T	Drug Delivery System	4	4	4	100
MPH103T	Modern Pharmaceutics	4	4	4	100
MPH104T	Regulatory Affair	4	4	4	100
MPH105P	Pharmaceutics Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	4	4	100
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	4	4	4	100
MPH203T	Computer Aided Drug Delivery System	4	4	4	100
MPH204T	Cosmetic and Cosmeceuticals	4	4	4	100
MPH205P	Pharmaceutics Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 3: Course of study for M. Pharm. (Industrial Pharmacy)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MIP101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MIP102T	Pharmaceutical Formulation Development	4	4	4	100
MIP103T	Novel drug delivery systems	4	4	4	100
MIP104T	Intellectual Property Rights	4	4	4	100
MIP105P	Industrial Pharmacy Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MIP201T	Advanced Biopharmaceutics and Pharmacokinetics	4	4	4	100
MIP202T	Scale up and Technology Transfer	4	4	4	100
MIP203T	Pharmaceutical Production Technology	4	4	4	100
MIP204T	Entrepreneurship Management	4	4	4	100
MIP205P	Industrial Pharmacy Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table - 4: Course of study for M. Pharm. (Pharmaceutical Chemistry)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MPC101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPC1012T	Advanced Organic Chemistry -I	4	4	4	100
MPC103T	Advanced Medicinal chemistry	4	4	4	100
MPC104T	Chemistry of Natural Products	4	4	4	100
MPC105P	Pharmaceutical Chemistry Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPC201T	Advanced Spectral Analysis	4	4	4	100
MPC202T	Advanced Organic Chemistry -II	4	4	4	100
MPC203T	Computer Aided Drug Design	4	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table - 5: Course of study for M. Pharm. (Pharmaceutical Analysis)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPA101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPA102T	Advanced Pharmaceutical Analysis	4	4	4	100
MPA103T	Pharmaceutical Validation	4	4	4	100
MPA104T	Food Analysis	4	4	4	100
MPA105P	Pharmaceutical Analysis Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPA201T	Advanced Instrumental Analysis	4	4	4	100
MPA202T	Modern Bio-Analytical Techniques	4	4	4	100
MPA203T	Quality Control and Quality Assurance	4	4	4	100
MPA204T	Herbal and Cosmetic Analysis	4	4	4	100
MPA205P	Pharmaceutical Analysis Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table - 6: Course of study for M. Pharm. (Pharmaceutical Quality Assurance)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MQA101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MQA102T	Quality Management System	4	4	4	100
MQA103T	Quality Control and Quality Assurance	4	4	4	100
MQA104T	Product Development and Technology Transfer	4	4	4	100
MQA105P	Pharmaceutical Quality Assurance Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MQA201T	Hazards and Safety Management	4	4	4	100
MQA202T	Pharmaceutical Validation	4	4	4	100
MQA203T	Audits and Regulatory Compliance	4	4	4	100
MQA204T	Pharmaceutical Manufacturing Technology	4	4	4	100
MQA205P	Pharmaceutical Quality Assurance Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 7: Course of study for M. Pharm. (Regulatory Affairs)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MRA 101T	Good Regulatory Practices	4	4	4	100
MRA 102T	Documentation and Regulatory Writing	4	4	4	100
MRA 103T	Clinical Research Regulations	4	4	4	100
MRA 104T	Regulations and Legislation for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals In India and Intellectual Property Rights	4	4	4	100
MRA 105P	Regulatory Affairs Practical I	12	6	12	150
	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650
Semester II					
MRA 201T	Regulatory Aspects of Drugs & Cosmetics	4	4	4	100
MRA 202T	Regulatory Aspects of Herbal & Biologicals	4	4	4	100
MRA 203T	Regulatory Aspects of Medical Devices	4	4	4	100
MRA 204T	Regulatory Aspects of Food & Nutraceuticals	4	4	4	100
MRA 205P	Regulatory Affairs Practical II	12	6	12	150
	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 8: Course of study for M. Pharm. (Pharmaceutical Biotechnology)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MPB 101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPB 102T	Microbial And Cellular Biology	4	4	4	100
MPB 103T	Bioprocess Engineering and Technology	4	4	4	100
MPB 104T	Advanced Pharmaceutical Biotechnology	4	4	4	100
MPB 105P	Pharmaceutical Biotechnology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPB 201T	Proteins and protein Formulation	4	4	4	100
MPB 202T	Immunotechnology	4	4	4	100
MPB 203T	Bioinformatics and Computer Technology	4	4	4	100
MPB 204T	Biological Evaluation of Drug Therapy	4	4	4	100
MPB 205P	Pharmaceutical Biotechnology Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table - 9: Course of study for M. Pharm. (Pharmacy Practice)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPP 101T	Clinical Pharmacy Practice	4	4	4	100
MPP 102T	Pharmacotherapeutics-I	4	4	4	100
MPP 103T	Hospital & Community Pharmacy	4	4	4	100
MPP 104T	Clinical Research	4	4	4	100
MPP 105P	Pharmacy Practice Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPP 201T	Principles of Quality Use of Medicines	4	4	4	100
MPP 102T	Pharmacotherapeutics II	4	4	4	100
MPP 203T	Clinical Pharmacokinetics and Therapeutic Drug Monitoring	4	4	4	100
MPP 204T	Pharmacoepidemiology & Pharmacoeconomics	4	4	4	100
MPP 205P	Pharmacy Practice Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table - 10: Course of study for (Pharmacology)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPL 101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPL 102T	Advanced Pharmacology-I	4	4	4	100
MPL 103T	Pharmacological and Toxicological Screening Methods-I	4	4	4	100
MPL 104T	Cellular and Molecular Pharmacology	4	4	4	100
MPL 105P	Pharmacology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPL 201T	Advanced Pharmacology II	4	4	4	100
MPL 202T	Pharmacological and Toxicological Screening Methods-II	4	4	4	100
MPL 203T	Principles of Drug Discovery	4	4	4	100
MPL 204T	Experimental Pharmacology practical- II	4	4	4	100
MPL 205P	Pharmacology Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table - 11: Course of study for M. Pharm. (Pharmacognosy)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPG101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPG102T	Advanced Pharmacognosy-I	4	4	4	100
MPG103T	Phytochemistry	4	4	4	100
MPG104T	Industrial Pharmacognostical Technology	4	4	4	100
MPG105P	Pharmacognosy Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPG201T	Medicinal Plant biotechnology	4	4	4	100
MPG102T	Advanced Pharmacognosy-II	4	4	4	100
MPG203T	Indian system of medicine	4	4	4	100
MPG204T	Herbal cosmetics	4	4	4	100
MPG205P	Pharmacognosy Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 12: Course of study for M. Pharm. III Semester
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
MRM 301T	Research Methodology and Biostatistics*	4	4
-	Journal club	1	1
-	Discussion / Presentation (Proposal Presentation)	2	2
-	Research Work	28	14
Total		35	21

* Non University Exam

Table – 13: Course of study for M. Pharm. IV Semester
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
-	Journal Club	1	1
-	Research Work	31	16
-	Discussion/Final Presentation	3	3
Total		35	20

Table – 14: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*
Total Credit Points	Minimum=95 Maximum=100*

*Credit Points for Co-curricular Activities

Table – 15: Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit Points Eligible / Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	01
Participation in international Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	02
Academic Award/Research Award from State Level/National Agencies	01
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	01
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science)	02

Note: International Conference: Held Outside India

International Journal: The Editorial Board Outside India

*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

10. Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Programme Committee shall be as follows:
A teacher at the cadre of Professor shall be the Chairperson; One Teacher from each M.Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.

3. Duties of the Programme Committee:
 - i. Periodically reviewing the progress of the classes.
 - ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
 - iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Programme Committee shall meet at least twice in a semester preferably at the end of each sessionalexam and before the end semester exam.

11. Examinations/Assessments

The schemes for internal assessment and end semester examinations are given in Table - 16.

11.1. End semester examinations

The End Semester Examinations for each theory and practical coursethrough semesters I to IVshall beconducted by the respective university except for the subject with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables - 1616 : Schemes for internal assessments and end semester
(Pharmaceutics- MPH)

Course Code	Course	Internal Assessment			End Semester Exams			Total Marks
		Continu- ous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPH 101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPH 102T	Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH 103T	Modern Pharmaceutics	10	15	1 Hr	25	75	3 Hrs	100
MPH 104T	Regulatory Affair	10	15	1 Hr	25	75	3 Hrs	100
MPH 105P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPH 201T	Molecular Pharmaceutics(Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100
MPH 202T	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MPH 203T	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH	Cosmetic	10	15	1 Hr	25	75	3 Hrs	100

204T	and Cosmeceuticals							
MPH 205P	Pharmaceuti cs Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables - 1717 : Schemes for internal assessments and end semester
(Industrial Pharmacy- MIP)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MIP101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MIP102T	Pharmaceutical Formulation Development	10	15	1 Hr	25	75	3 Hrs	100
MIP103T	Novel drug delivery systems	10	15	1 Hr	25	75	3 Hrs	100
MIP104T	Intellectual Property Rights	10	15	1 Hr	25	75	3 Hrs	100
MIP105P	Industrial Pharmacy Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MIP201T	Advanced Biopharmaceutics and Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MIP202T	Scale up and Technology Transfer	10	15	1 Hr	25	75	3 Hrs	100
MIP203T	Pharmaceutical Production Technology	10	15	1 Hr	25	75	3 Hrs	100
MIP204T	Entrepreneurship Management	10	15	1 Hr	25	75	3 Hrs	100

MIP205P	Industrial Pharmacy Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

(Pharmaceutical Chemistry-MPC)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuos Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPC101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPC102T	Advanced Organic Chemistry -I	10	15	1 Hr	25	75	3 Hrs	100
MPC103T	Advanced Medicinal chemistry	10	15	1 Hr	25	75	3 Hrs	100
MPC104T	Chemistry of Natural Products	10	15	1 Hr	25	75	3 Hrs	100
MPC105P	Pharmaceutical Chemistry Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPC201T	Advanced Spectral Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPC202T	Advanced Organic Chemistry -II	10	15	1 Hr	25	75	3 Hrs	100
MPC203T	Computer Aided Drug Design	10	15	1 Hr	25	75	3 Hrs	100
MPC204T	Pharmaceutical Process Chemistry	10	15	1 Hr	25	75	3 Hrs	100
MPC205P	Pharmaceutical	20	30	6 Hrs	50	100	6	150

	al Chemistry Practical II						Hrs	
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 19: Schemes for internal assessments and end semester examinations
(Pharmaceutical Analysis-MPA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continu- ous Mode	Sessional Exams		Tot- al	Mark- s	Dura- tion	
			Mark- s	Durati- on				
SEMESTER I								
MPA101T	Modern Pharmaceuti- cal Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA102T	Advanced Pharmaceuti- cal Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA103T	Pharmaceuti- cal Validation	10	15	1 Hr	25	75	3 Hrs	100
MPA104T	Food Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA105P	Pharmaceuti- cal Analysis-I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPA201T	Advanced Instrumental Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA202T	Modern Bio- Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPA203T	Quality Control and Quality	10	15	1 Hr	25	75	3 Hrs	100

	Assurance							
MPA204T	Herbal and Cosmetic analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA205P	Pharmaceuti cal Analysis- II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 20: Schemes for internal assessments and end semester examinations
(Pharmaceutical Quality Assurance-MQA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MQA101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MQA102T	Quality Management System	10	15	1 Hr	25	75	3 Hrs	100
MQA103T	Quality Control and Quality Assurance	10	15	1 Hr	25	75	3 Hrs	100
MQA104T	Product Development and Technology Transfer	10	15	1 Hr	25	75	3 Hrs	100
MQA105P	Pharmaceutical Quality Assurance Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MQA201T	Hazards and Safety Management	10	15	1 Hr	25	75	3 Hrs	100
MQA202T	Pharmaceutical Validation	10	15	1 Hr	25	75	3 Hrs	100
MQA203T	Audits and Regulatory Compliance	10	15	1 Hr	25	75	3 Hrs	100
MQA204T	Pharmaceutical Manufacturing Technology	10	15	1 Hr	25	75	3 Hrs	100
MQA205P	Pharmaceutical Quality Assurance Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 21: Schemes for internal assessments and end semester examinations
(Pharmaceutical Regulatory Affairs-MRA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuo us Mod e	Sessional Exams		Tot al	Mar ks	Dura tion	
			Mar ks	Durati on				
SEMESTER I								
MRA10 1T	Good Pharmaceutical Practices	10	15	1 Hr	25	75	3 Hrs	100
MRA10 2T	Documentation and Regulatory Writing	10	15	1 Hr	25	75	3 Hrs	100
MRA10 3T	Clinical Research Regulations	10	15	1 Hr	25	75	3 Hrs	100
MRA10 4T	Regulations and Legislation for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals In India and Intellectual Property Rights	10	15	1 Hr	25	75	3 Hrs	100
MRA10 5T	Pharmaceutical Regulatory Affairs Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MRA20 1T	Regulatory Aspects of Drugs & Cosmetics	10	15	1 Hr	25	75	3 Hrs	100

MRA20 2T	Regulatory Aspects of Herbal & Biologicals	10	15	1 Hr	25	75	3 Hrs	100
MRA20 3T	Regulatory Aspects of Medical Devices	10	15	1 Hr	25	75	3 Hrs	100
MRA20 4T	Regulatory Aspects of Food & Nutraceuticals	10	15	1 Hr	25	75	3 Hrs	100
MRA20 5P	Pharmaceutical Regulatory Affairs Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 22: Schemes for internal assessments and end semester examinations
(Pharmaceutical Biotechnology-MPB)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPB10 1T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPB10 2T	Microbial And Cellular Biology	10	15	1 Hr	25	75	3 Hrs	100
MPB10 3T	Bioprocess Engineering and Technology	10	15	1 Hr	25	75	3 Hrs	100
MPB10 4T	Advanced Pharmaceutical Biotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPB10 5P	Pharmaceutical Biotechnology Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPB20 1T	Proteins and protein Formulation	10	15	1 Hr	25	75	3 Hrs	100
MPB20 2T	Immunotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPB20 3T	Bioinformatics and Computer Technology	10	15	1 Hr	25	75	3 Hrs	100
MPB20 4T	Biological Evaluation of Drug Therapy	10	15	1 Hr	25	75	3 Hrs	100
MPB20 5P	Pharmaceutical Biotechnology Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 23: Schemes for internal assessments and end semester examinations
(Pharmacy Practice-MPP)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPP10 1T	Clinical Pharmacy Practice	10	15	1 Hr	25	75	3 Hrs	100
MPP10 2T	Pharmacotherapeutics-I	10	15	1 Hr	25	75	3 Hrs	100
MPP10 3T	Hospital & Community Pharmacy	10	15	1 Hr	25	75	3 Hrs	100
MPP10 4T	Clinical Research	10	15	1 Hr	25	75	3 Hrs	100
MPP10 5P	Pharmacy Practice Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPP20 1T	Principles of Quality Use of Medicines	10	15	1 Hr	25	75	3 Hrs	100
MPP10 2T	Pharmacotherapeutics II	10	15	1 Hr	25	75	3 Hrs	100
MPP20 3T	Clinical Pharmacokinetics and Therapeutic Drug Monitoring	10	15	1 Hr	25	75	3 Hrs	100
MPP20 4T	Pharmacoepidemiology & Pharmacoeconomics	10	15	1 Hr	25	75	3 Hrs	100
MPP20 5P	Pharmacy Practice Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 24: Schemes for internal assessments and end semester examinations
(Pharmacology-MPL)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPL10 1T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPL10 2T	Advanced Pharmacology-I	10	15	1 Hr	25	75	3 Hrs	100
MPL10 3T	Pharmacological and Toxicological Screening Methods-I	10	15	1 Hr	25	75	3 Hrs	100
MPL10 4T	Cellular and Molecular Pharmacology	10	15	1 Hr	25	75	3 Hrs	100
MPL10 5P	Experimental Pharmacology - I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPL20 1T	Advanced Pharmacology II	10	15	1 Hr	25	75	3 Hrs	100
MPL10 2T	Pharmacological and Toxicological Screening Methods-II	10	15	1 Hr	25	75	3 Hrs	100
MPL20 3T	Principles of Drug Discovery	10	15	1 Hr	25	75	3 Hrs	100
MPL20 4T	Clinical research and pharmacovigilance	10	15	1 Hr	25	75	3 Hrs	100
MPL20 5P	Experimental Pharmacology - II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 25: Schemes for internal assessments and end semester examinations
(Pharmacognosy-MPG)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPG10 1T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPG10 2T	Advanced Pharmacognosy-I	10	15	1 Hr	25	75	3 Hrs	100
MPG10 3T	Phytochemistry	10	15	1 Hr	25	75	3 Hrs	100
MPG10 4T	Industrial Pharmacognostical Technology	10	15	1 Hr	25	75	3 Hrs	100
MPG10 5P	Pharmacognosy Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPG20 1T	Medicinal Plant biotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPG10 2T	Advanced Pharmacognosy-II	10	15	1 Hr	25	75	3 Hrs	100
MPG20 3T	Indian system of medicine	10	15	1 Hr	25	75	3 Hrs	100
MPG20 4T	Herbal cosmetics	10	15	1 Hr	25	75	3 Hrs	100
MPG20 5P	Pharmacognosy Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 26: Schemes for internal assessments and end semester examinations (Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER III								
MRM301T	Research Methodology and Biostatistics*	10	15	1 Hr	25	75	3 Hrs	100
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	50	-	-	50
-	Research work*	-	-	-	-	350	1 Hr	350
Total								525
SEMESTER IV								
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75
-	Research work and Colloquium	-	-	-	-	400	1 Hr	400
Total								500

*Non University Examination

11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table – 27: Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria	Maximum Marks
Attendance (Refer Table – 28)	8
Student – Teacher interaction	2
Total	10
Practical	
Attendance (Refer Table – 28)	10
Based on Practical Records, Regular viva voce, etc.	10
Total	20

Table – 28: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	8	10
90 – 94	6	7.5
85 – 89	4	5
80 – 84	2	2.5
Less than 80	0	0

11.2.1. Sessional Exams

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given in the table. The average marks of two sessional exams shall be computed for internal assessment as per the requirements given in tables.

12. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of M.Pharm. programme if he/she secures at least 50% marks in that particular course including internal assessment.

13. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next end semester theory examinations.

15. Reexamination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table 29. The exact dates of examinations shall be notified from time to time.

Table – 29: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I and III	November / December	May / June
II and IV	May / June	November / December

16. Allowed to keep terms (ATKT):

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. ATKT rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I and II semesters till the III semester examinations. However, he/she shall not be eligible to attend the courses of IV semester until all the courses of I, II and III semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters within the stipulated time period as per the norms.

Note: Grade AB should be considered as failed and treated as one head for deciding ATKT. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

17. Grading of performances

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – 30.

Table – 30: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C₁, C₂, C₃ and C₄ and the student's grade points in these courses are G₁, G₂, G₃ and G₄, respectively, and then students' SGPA is equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4}{C_1 + C_2 + C_3 + C_4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4^* \text{ZERO}}{C_1 + C_2 + C_3 + C_4}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the IV semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all IV semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA

shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4}{C_1 + C_2 + C_3 + C_4}$$

where C_1, C_2, C_3, \dots is the total number of credits for semester I, II, III, ... and S_1, S_2, S_3, \dots is the SGPA of semester I, II, III,

20. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	= CGPA of 7.50 and above
First Class	= CGPA of 6.00 to 7.49
Second Class	= CGPA of 5.00 to 5.99

21. Project work

All the students shall undertake a project under the supervision of a teacher in Semester III to IV and submit a report. 4 copies of the project report shall be submitted (typed & bound copy not less than 75 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done	50 Marks
Methodology adopted	150 Marks
Results and Discussions	250 Marks
Conclusions and Outcomes	50 Marks
Total	500 Marks

Evaluation of Presentation:

Presentation of work	100 Marks
Communication skills	50 Marks
Question and answer skills	100 Marks
Total	250 Marks

22. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the M.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the M. Pharm program in minimum prescribed number of years, (two years) for the award of Ranks.

23. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

24. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

25. Revaluation I Retotaling of answer papers

There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for retotaling by paying prescribed fee.

26. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

PHARMACEUTICS(MPH)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPH 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 HOURS

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, 11
Instrumentation associated with UV-Visible spectroscopy, Hrs
Choice of solvents and solvent effect and Applications of UV-
Visible spectroscopy.
 - b. IR spectroscopy: Theory, Modes of Molecular vibrations,
Sample handling, Instrumentation of Dispersive and Fourier -
Transform IR Spectrometer, Factors affecting vibrational
frequencies and Applications of IR spectroscopy
 - c. Spectrofluorimetry: Theory of Fluorescence, Factors
affecting fluorescence, Quenchers, Instrumentation and
Applications of fluorescence spectrophotometer.
 - d. Flame emission spectroscopy and Atomic absorption
spectroscopy: Principle, Instrumentation, Interferences and
Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, 11
Principle, Instrumentation, Solvent requirement in NMR, Hrs
Relaxation process, NMR signals in various compounds,
Chemical shift, Factors influencing chemical shift, Spin-Spin
coupling, Coupling constant, Nuclear magnetic double resonance,
Brief outline of principles of FT-NMR and ¹³C NMR. Applications
of NMR spectroscopy.

- 3 Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy 11 Hrs
- 4 Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: 11 Hrs
 a) Paper chromatography b) Thin Layer chromatography
 c) Ion exchange chromatography d) Column chromatography
 e) Gas chromatography f) High Performance Liquid chromatography
 g) Affinity chromatography
- 5 a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: 11 Hrs
 a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing
 b. X ray Crystallography: Production of X rays, Different X ray diffraction methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.
- 6 Immunological assays : RIA (Radio immuno assay), ELISA, Bioluminescence assays. 5 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods - Part B - J W Munson, Volume 11, Marcel Dekker Series

DRUG DELIVERY SYSTEMS (MPH 102T)

SCOPE

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

OBJECTIVES

Upon completion of the course, student shall be able to understand

The various approaches for development of novel drug delivery systems.

The criteria for selection of drugs and polymers for the development of delivering system

The formulation and evaluation of Novel drug delivery systems..

THEORY

60 Hrs

- | | | |
|----|--|-----------|
| 1. | Sustained Release(SR) and Controlled Release (CR) formulations: Introduction & basic concepts, advantages/disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation. Polymers: introduction, definition, classification, properties and application Dosage Forms for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, Telepharmacy. | 10
Hrs |
| 2 | Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modulated Drug Delivery Systems; Mechanically activated, pH activated, Enzyme activated, and Osmotic activated Drug Delivery Systems Feedback regulated Drug Delivery Systems; Principles & Fundamentals. | 10
Hrs |
| 3 | Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages, Modulation of GI transit time approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of muco adhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations. | 10
Hrs |
| 4 | Ocular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers. | 06
Hrs |

- | | | |
|---|--|-----------|
| 5 | Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation. | 10
Hrs |
| 6 | Protein and Peptide Delivery: Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules. | 08
Hrs |
| 7 | Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines. | 06
Hrs |

REFERENCES

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by WileyInterscience Publication, John Wiley and Sons, Inc, New York! Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002

JOURNALS

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian drugs (IDMA)
3. Journal of controlled release (Elsevier Sciences) desirable
4. Drug Development and Industrial Pharmacy (Marcel & Decker) desirable

MODERN PHARMACEUTICS
(MPH 103T)

Scope

Course designed to impart advanced knowledge and skills required to learn various aspects and concepts at pharmaceutical industries

Objectives

Upon completion of the course, student shall be able to understand

- The elements of preformulation studies.
- The Active Pharmaceutical Ingredients and Generic drug Product development
- Industrial Management and GMP Considerations.
- Optimization Techniques & Pilot Plant Scale Up Techniques
- Stability Testing, sterilization process & packaging of dosage forms.

THEORY

60 HRS

- | | | |
|----|---|-----------|
| 1. | a. Preformation Concepts – Drug Excipient interactions - different methods, kinetics of stability, Stability testing. Theories of dispersion and pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability Large and small volume parental – physiological and formulation consideration, Manufacturing and evaluation. | 10
Hrs |
| | b. Optimization techniques in Pharmaceutical Formulation: Concept and parameters of optimization, Optimization techniques in pharmaceutical formulation and processing. Statistical design, Response surface method, Contour designs, Factorial designs and application in formulation | 10
Hrs |
| 2 | Validation : Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equipments, Validation of specific dosage form, Types of validation. Government regulation, Manufacturing Process Model, URS, DQ, IQ, OQ & P.Q. of facilities. | 10
Hrs |
| 3 | cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipments and their maintenance Production management: Production organization, , materials management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship. Concept of Total Quality Management. | 10
Hrs |

- 4 Compression and compaction: Physics of tablet compression, 10
compression, consolidation, effect of friction, distribution of Hrs
forces, compaction profiles. Solubility.
- 5 Study of consolidation parameters; Diffusion parameters, 10
Dissolution parameters and Pharmacokinetic parameters, Heckel Hrs
plots, Similarity factors – f_2 and f_1 , Higuchi and Peppas plot,
Linearity Concept of significance, Standard deviation, Chi square
test, students T-test, ANOVA test.

REFERENCES

1. Theory and Practice of Industrial Pharmacy By Lachmann and Libermann
2. Pharmaceutical dosage forms: Tablets Vol. 1-3 by Leon Lachmann.
3. Pharmaceutical Dosage forms: Disperse systems, Vol, 1-2; By Leon Lachmann.
4. Pharmaceutical Dosage forms: Parenteral medications Vol. 1-2; By Leon Lachmann.
5. Modern Pharmaceutics; By Gillbert and S. Banker.
6. Remington's Pharmaceutical Sciences.
7. Advances in Pharmaceutical Sciences Vol. 1-5; By H.S. Bean & A.H. Beckett.
8. Physical Pharmacy; By Alfred martin
9. Bentley's Textbook of Pharmaceutics – by Rawlins.
10. Good manufacturing practices for Pharmaceuticals: A plan for total quality control, Second edition; By Sidney H. Willig.
11. Quality Assurance Guide; By Organization of Pharmaceutical producers of India.
12. Drug formulation manual; By D.P.S. Kohli and D.H. Shah. Eastern publishers, New Delhi.
13. How to practice GMPs; By P.P. Sharma. Vandhana Publications, Agra.
14. Pharmaceutical Process Validation; By Fra. R. Berry and Robert A. Nash.
15. Pharmaceutical Preformulations; By J.J. Wells.
16. Applied production and operations management; By Evans, Anderson, Sweeney and Williams.
17. Encyclopaedia of Pharmaceutical technology, Vol I – III.

REGULATORY AFFAIRS (MPH 104T)

Scope

Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development, various regulatory filings in different countries, different phases of clinical trials and submitting regulatory documents : filing process of IND, NDA and ANDA

- To know the approval process of
- To know the chemistry, manufacturing controls and their regulatory importance
- To learn the documentation requirements for
- To learn the importance and

Objectives:

Upon completion of the course, it is expected that the students will be able to understand

- The Concepts of innovator and generic drugs, drug development process
- The Regulatory guidance's and guidelines for filing and approval process
- Preparation of Dossiers and their submission to regulatory agencies in different countries
- Post approval regulatory requirements for actives and drug products
- Submission of global documents in CTD/ eCTD formats
- Clinical trials requirements for approvals for conducting clinical trials
- Pharmacovigilence and process of monitoring in clinical trials.

THEORY

60 Hrs

1. a. Documentation in Pharmaceutical industry: Master formula record, DMF (Drug Master File), distribution records. Generic drugs product development Introduction , Hatch-Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION) ,drug product performance, in-vitro, ANDA regulatory approval process, NDA approval process, BE and drug product assessment, in -vivo, scale up process approval changes, post marketing surveillance, outsourcing BA and BE to CRO. 12 Hrs
- b. Regulatory requirement for product approval: API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs

- | | | |
|---|---|-----------|
| 2 | CMC, post approval regulatory affairs. Regulation for combination products and medical devices.CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Regulatory requirements of EU, MHRA, TGA and ROW countries. | 12
Hrs |
| 3 | Non clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB). | 12
Hrs |
| 4 | Clinical trials: Developing clinical trial protocols. Institutional review board/ independent ethics committee Formulation and working procedures informed Consent process and procedures. HIPAA- new, requirement to clinical study process, pharmacovigilance safety monitoring in clinical trials. | 12
Hrs |

REFERENCES

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and IsaderKaufer,Marcel Dekker series, Vol.143
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P.Martin, Drugs and the Pharmaceutical Sciences,Vol.185, Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD,5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons.Inc.
5. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics/edited By Douglas J. Pisano, David Mantus.
6. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A.Rozovsky and Rodney K. Adams
7. www.ich.org/
8. www.fda.gov/
9. europa.eu/index_en.htm
10. <https://www.tga.gov.au/tga-basics>

PHARMACEUTICS PRACTICALS - I
(MPH 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry
7. To perform In-vitro dissolution profile of CR/ SR marketed formulation
8. Formulation and evaluation of sustained release matrix tablets
9. Formulation and evaluation osmotically controlled DDS
10. Preparation and evaluation of Floating DDS- hydro dynamically balanced DDS
11. Formulation and evaluation of Muco adhesive tablets.
12. Formulation and evaluation of trans dermal patches.
13. To carry out preformulation studies of tablets.
14. To study the effect of compressional force on tablets disintegration time.
15. To study Micromeritic properties of powders and granulation.
16. To study the effect of particle size on dissolution of a tablet.
17. To study the effect of binders on dissolution of a tablet.
18. To plot Heckal plot, Higuchi and peppas plot and determine similarity factors.

**MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY &
TARGETED DDS) (NTDS)
(MPH 201T)**

Scope

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

Objectives

Upon completion of the course student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of NTDS
- The formulation and evaluation of novel drug delivery systems.

THEORY

60 Hrs

- | | | |
|----|--|-----------|
| 1. | Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain specific delivery. | 12
Hrs |
| 2 | Targeting Methods: introduction preparation and evaluation. Nano Particles & Liposomes: Types, preparation and evaluation. | 12
Hrs |
| 3 | Micro Capsules / Micro Spheres: Types, preparation and evaluation , Monoclonal Antibodies ; preparation and application, preparation and application of Niosomes, Aquasomes, Phytosomes, Electrosomes. | 12
Hrs |
| 4 | Pulmonary Drug Delivery Systems : Aerosols, propellents, ContainersTypes, preparation and evaluation, Intra Nasal Route Delivery systems; Types, preparation and evaluation. | 12
Hrs |
| 5 | Nucleic acid based therapeutic delivery system : Gene therapy, introduction (ex-vivo & in-vivo gene therapy). Potential target diseases for gene therapy (inherited disorder and cancer). Gene expression systems (viral and nonviral gene transfer). Liposomal gene delivery systems. Biodistribution and Pharmacokinetics. knowledge of therapeutic antisense molecules and aptamers as drugs of future. | 12
Hrs |

REFERENCES

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, VallabhPrakashan, New Delhi, First edition 2002.
3. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, NewDelhi, First edition 1997 (reprint in 2001).

ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS (MPH 202T)

Scope

This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of biopharmaceutics and pharmacokinetics are provided to help the students' to clarify the concepts.

Objectives

Upon completion of this course it is expected that students will be able understand,

- The basic concepts in biopharmaceutics and pharmacokinetics.
- The use raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
- The critical evaluation of biopharmaceutic studies involving drug product equivalency.
- The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
- The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic

THEORY

60 Hrs

1. Drug Absorption from the Gastrointestinal Tract: 12 Hrs
Gastrointestinal tract, Mechanism of drug absorption, Factors affecting drug absorption, pH-partition theory of drug absorption. Formulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes-Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form, Suspension as a dosage form, Capsule as a dosage form, Tablet as a dosage form, Dissolution methods, Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex.

- | | | |
|---|---|-----------|
| 2 | Biopharmaceutic considerations in drug product design and In Vitro Drug Product Performance: Introduction, biopharmaceutic factors affecting drug bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, in vitro: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing, meeting dissolution requirements, problems of variable control in dissolution testing performance of drug products. In vitro–in vivo correlation, dissolution profile comparisons, drug product stability, considerations in the design of a drug product. | 12
Hrs |
| 3 | Pharmacokinetics: Basic considerations, pharmacokinetic models, compartment modeling: one compartment model- IV bolus, IV infusion, extra-vascular. Multi compartment model: two compartment - model in brief, non-linear pharmacokinetics: cause of non-linearity, Michaelis – Menten equation, estimation of k_{max} and v_{max} . Drug interactions: introduction, the effect of protein-binding interactions, the effect of tissue-binding interactions, cytochrome p450-based drug interactions, drug interactions linked to transporters. | 12
Hrs |
| 4 | Drug Product Performance, In Vivo: Bioavailability and Bioequivalence: drug product performance, purpose of bioavailability studies, relative and absolute availability. methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. biopharmaceutics classification system, methods. Permeability: In-vitro, in-situ and In-vivo methods. generic biologics (biosimilar drug products), clinical significance of bioequivalence studies, special concerns in bioavailability and bioequivalence studies, generic substitution. | 12
Hrs |
| 5 | Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Introduction to Pharmacokinetics and pharmacodynamic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies. | 12
Hrs |

REFERENCES

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, 4th edition, Philadelphia, Lea and Febiger, 1991
2. Biopharmaceutics and Pharmacokinetics, A. Treatise, D .M. Brahmarkar and Sunil B. Jaiswal., VallabPrakashan, Pitampura, Delhi
3. Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land YuABC, 2nd edition, Connecticut Appleton Century Crofts, 1985
4. Textbook of Biopharmaceutics and Pharmacokinetics, Dr. Shobha Rani R. Hiremath, Prism Book
5. Pharmacokinetics by Milo Gibaldi and D. Perrier, 2nd edition, Marcel Dekker Inc., New York, 1982
6. Current Concepts in Pharmaceutical Sciences: Biopharmaceutics, Swarbrick. J, Lea and Febiger, Philadelphia, 1970
7. Clinical Pharmacokinetics, Concepts and Applications 3rd edition by Malcolm Rowland and Thom~N. Tozer, Lea and Febiger, Philadelphia, 1995
8. Dissolution, Bioavailability and Bioequivalence, Abdou. H.M, Mack Publishing Company, Pennsylvania 1989
9. Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition, revised and expanded by Robert. E. Notari, Marcel Dekker Inc, New York and Basel, 1987.
10. Biopharmaceutics and Relevant Pharmacokinetics by John. G Wagner and M. Pamarowski, 1st edition, Drug Intelligence Publications, Hamilton, Illinois, 1971.
11. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G. Boylan, Marcel Dekker Inc, New York, 1996.
12. Basic Pharmacokinetics, 1st edition, Sunil S Jambhekar and Philip J Breen, pharmaceutical press, RPS Publishing, 2009.
13. Absorption and Drug Development- Solubility, Permeability, and Charge State, Alex Avdeef, John Wiley & Sons, Inc, 2003.

COMPUTER AIDED DRUG DEVELOPMENT (MPH 203T)

Scope

This course is designed to impart knowledge and skills necessary for computer Applications in pharmaceutical research and development who want to understand the application of computers across the entire drug research and development process. Basic theoretical discussions of the principles of more integrated and coherent use of computerized information (informatics) in the drug development process are provided to help the students to clarify the concepts.

Objectives

Upon completion of this course it is expected that students will be able to understand,

- History of Computers in Pharmaceutical Research and Development
- Computational Modeling of Drug Disposition
- Computers in Preclinical Development
- Optimization Techniques in Pharmaceutical Formulation
- Computers in Market Analysis
- Computers in Clinical Development
- Artificial Intelligence (AI) and Robotics
- Computational fluid dynamics(CFD)

THEORY

60 Hrs

1. a. Computers in Pharmaceutical Research and Development: A General Overview: History of Computers in Pharmaceutical Research and Development. Statistical modeling in Pharmaceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Parameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling
b. Quality-by-Design In Pharmaceutical Development: Introduction, ICH Q8 guideline, Regulatory and industry views on QbD, Scientifically based QbD - examples of application. 12 Hrs
2. Computational Modeling Of Drug Disposition: Introduction ,Modeling Techniques: Drug Absorption, Solubility, Intestinal Permeation, Drug Distribution ,Drug Excretion, Active Transport; P-gp, BCRP, Nucleoside Transporters, hPEPT1, ASBT, OCT, OATP, BBB-Choline Transporter. 12 Hrs

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|---|--|-----------|
| 3 | Computer-aided formulation development:: Concept of optimization, Optimization parameters, Factorial design, Optimization technology & Screening design. Computers in Pharmaceutical Formulation: Development of pharmaceutical emulsions, microemulsion drug carriers Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis | 12
Hrs |
| 4 | <p>a. Computer-aided biopharmaceutical characterization: Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in vitro-in vivo correlation, Biowaiver considerations</p> <p>b. Computer Simulations in Pharmacokinetics and Pharmacodynamics: Introduction, Computer Simulation: Whole Organism, Isolated Tissues, Organs, Cell, Proteins and Genes.</p> <p>c. Computers in Clinical Development: Clinical Data Collection and Management, Regulation of Computer Systems</p> | 12
Hrs |
| 5 | Artificial Intelligence (AI), Robotics and Computational fluid dynamics: General overview, Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages. Current Challenges and Future Directions. | 12
Hrs |

REFERENCES

1. Computer Applications in Pharmaceutical Research and Development, Sean Ekins, 2006, John Wiley & Sons.
2. Computer-Aided Applications in Pharmaceutical Technology, 1st Edition, Jelena Djuris, Woodhead Publishing
3. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan, Marcel Dekker Inc, New York, 1996.

COSMETICS AND COSMECEUTICALS (MPH 204T)

Scope

This course is designed to impart knowledge and skills necessary for the fundamental need for cosmetic and cosmeceutical products.

Objectives

Upon completion of the course, the students shall be able to understand

- Key ingredients used in cosmetics and cosmeceuticals.
- Key building blocks for various formulations.
- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and cosmeceuticals
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

THEORY

60 Hrs

- | | | |
|----|--|-----------|
| 1. | Cosmetics – Regulatory : Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics., Misbranded and spurious cosmetics. Regulatory provisions relating to manufacture of cosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties. | 12
Hrs |
| 2 | Cosmetics - Biological aspects : Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm. | 12
Hrs |
| 3 | Formulation Building blocks: Building blocks for different product formulations of cosmetics/cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndetbars. Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation. | 12
Hrs |

Controversial ingredients: Parabens, formaldehyde liberators, dioxane.

- | | | |
|---|---|-----------|
| 4 | Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor., dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations. | 12
Hrs |
| 5 | Herbal Cosmetics : Herbal ingredients used in Hair care, skin care and oral care. Review of guidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics. | 12
Hrs |

REFERENCES

1. Harry's Cosmeticology. 8th edition.
2. Poucher's perfume cosmetics and Soaps, 10th edition.
3. Cosmetics - Formulation, Manufacture and quality control, PP.Sharma, 4th edition
4. Handbook of cosmetic science and Technology A.O.Barel, M.Paye and H.I. Maibach. 3rd edition
5. Cosmetic and Toiletries recent suppliers catalogue.
6. CTFA directory.

PHARMACEUTICS PRACTICALS - II
(MPH 205P)

1. To study the effect of temperature change , non solvent addition, incompatible polymer addition in microcapsules preparation
2. Preparation and evaluation of Alginate beads
3. Formulation and evaluation of gelatin /albumin microspheres
4. Formulation and evaluation of liposomes/niosomes
5. Formulation and evaluation of spherules
6. Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique.
7. Comparison of dissolution of two different marketed products /brands
8. Protein binding studies of a highly protein bound drug & poorly protein bound drug
9. Bioavailability studies of Paracetamol in animals.
10. Pharmacokinetic and IVIVC data analysis by Winnoline[®] software
11. In vitro cell studies for permeability and metabolism
12. DoE Using Design Expert[®] Software
13. Formulation data analysis Using Design Expert[®] Software
14. Quality-by-Design in Pharmaceutical Development
15. Computer Simulations in Pharmacokinetics and Pharmacodynamics
16. Computational Modeling Of Drug Disposition
17. To develop Clinical Data Collection manual
18. To carry out Sensitivity Analysis, and Population Modeling.
19. Development and evaluation of Creams
20. Development and evaluation of Shampoo and Toothpaste base
21. To incorporate herbal and chemical actives to develop products
22. To address Dry skin, acne, blemish, Wrinkles, bleeding gums and dandruff

INDUSTRIAL PHARMACY (MIP)
MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES
(MIP 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know,

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 HOURS

1. UV-Visible spectroscopy: Introduction, Theory, Laws, 11
Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. Hrs

IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy

Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy. 11 Hrs

- 3 Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy 11 Hrs
- 4 Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: 11 Hrs
 a) Paper chromatography b) Thin Layer chromatography
 c) Ion exchange chromatography d) Column chromatography
 e) Gas chromatography f) High Performance Liquid chromatography
 g) Affinity chromatography
- 5 Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: 11 Hrs
 a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing
- X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.
6. Immunological Assays: Radioimmunity assay (RIA), ELISA (Theory & practical) and knowledge on Bioluminescence assays. 5 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, 6th edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods - Part B - J W Munson, Volume 11, Marcel Dekker Series

PHARMACEUTICAL FORMULATION DEVELOPMENT (MIP 102T)

Scope

This course is designed to impart knowledge and skills necessary to train the students on par with the routine of Industrial activities in R&D and F&D.

Objectives

On completion of this course it is expected that students will be able to understand-

- The scheduled activities in a Pharmaceutical firm.
- The pre formulation studies of pilot batches of pharmaceutical industry.
- The significance of dissolution and product stability

THEORY

60 Hrs

1. **Preformulation Studies:** Molecular optimization of APIs (drug substances), crystal morphology and variations, powder flow, structure modification, drug-excipient compatibility studies, methods of determination. 12 Hrs
2. **Formulation Additives:** Study of different formulation additives, factors influencing their incorporation, role of formulation development and processing, new developments in excipient science. Design of experiments – factorial design for product and process development. 12 Hrs
3. **Solubility:** Importance, experimental determination, phase-solubility analysis, pH-solubility profile, solubility techniques to improve solubility and utilization of analytical methods – cosolvency, salt formation, complexation, solid dispersion, micellar solubilization and hydrotrophy. 12 Hrs
4. **Dissolution:** Theories, mechanisms of dissolution, in-vitro dissolution testing models – sink and non-sink. Factors influencing dissolution and intrinsic dissolution studies. Dissolution test apparatus – designs, dissolution testing for conventional and controlled release products. Data handling and correction factor. Biorelevant media, in-vitro and in-vivo correlations, levels of correlations. 12 Hrs

- 5 Product Stability: Degradation kinetics, mechanisms, stability testing of drugs and pharmaceuticals, factors influencing-media effects and pH effects, accelerated stability studies, interpretation of kinetic data (API & tablets). Solid state stability and shelf life assignment. Stability protocols, reports and ICH guidelines. 12 Hrs

REFERENCES

1. Lachman L, Lieberman HA, Kanig JL. The Theory and Practice Of Industrial Pharmacy, 3rd ed., Varghese Publishers, Mumbai 1991.
2. Sinko PJ. Martin's physical pharmacy and pharmaceutical sciences, 5th ed., B.I. Publications Pvt. Ltd, Noida, 2006.
3. Lieberman HA, Lachman L, Schwartz JB. Pharmaceutical dosage forms: tablets Vol. I-III, 2nd ed., CBS Publishers & distributors, New Delhi, 2005.
4. Connors KA. A Text book of pharmaceutical analysi Wells JI. Pharmaceutical preformulation: The physicochemical properties of drug substances. Ellis Horwood Ltd., England, 1998.
5. Yalkowsky SH. Techniques of solubilization of drugs. Vol-12. Marcel Dekker Inc., New York, 1981
6. Dressman J, Kramer J. Pharmaceutical dissolution testing. Saurah printer pvt. Ltd., New Delhi, 2005.
7. Sethi PD. Quantitative analysis of drugs in pharmaceutical formulations, 3rd ed., CBS publications, New Delhi, 2008.
8. Carstensen JT, Rhodes CT. Drug stability principles and practices, 3rd ed., CBS Publishers & distributors, New Delhi, 2005.
9. Yoshioka S, Stella VJ. Stability of drugs and dosage forms, Springer (India) Pvt. Ltd., New Delhi, 2006.
10. Banker GS, Rhodes CT. Modern Pharmaceutics, 4th ed., Marcel Dekker Inc, New York, 2005.
11. W. Grimm - Stability testing of drug products.
12. Mazzo DJ. International stability testing. Eastern Press Pvt. Ltd., Bangalore, 1999.
13. Beckett AH, Stenlake JB. Practical pharmaceutical chemistry, Part I & II., 4th ed., CBS Publishers & distributors, New Delhi, 2004.
14. Indian Pharmacopoeia. Controller of Publication. Delhi, 1996.
15. British Pharmacopoeia. British Pharmacopoeia Commission Office, London, 2008.
16. United States Pharmacopoeia. United States Pharmacopoeial Convention, Inc, USA, 2003.
17. Encyclopaedia of Pharm. Technology, Vol I - III.
18. Wells J. I. Pharmaceutical Preformulation : The physicochemical properties of drug substances, Ellis Horwood Ltd. England, 1988.

NOVEL DRUG DELIVERY SYSTEMS

(MIP 103T)

Scope

This course is designed to impart knowledge and skills necessary to train the students in the area of novel drug delivery systems.

Objective

On completion of this course it is expected that students will be able to understand,

- The need, concept, design and evaluation of various customized, sustained and controlled release dosage forms.
- To formulate and evaluate various novel drug delivery systems

THEORY

60 Hrs

1. Concept & Models for NDDS: Classification of rate controlled drug delivery systems (DDS), rate programmed release, activation modulated & feedback regulated DDS, effect of system parameters in controlled drug delivery, computation of desired release rate and dose for controlled release DDS, pharmacokinetic design for DDS – intermittent, zero order & first order release. 12 Hrs

Carriers for Drug Delivery: Polymers / co-polymers- introduction, classification, characterization, polymerization techniques, application in CDDS / NDDS, biodegradable & natural polymers.

- 2 Study of Various DDS: Concepts, design, formulation & evaluation of controlled release oral DDS, Mucoadhesive DDS (buccal, nasal, pulmonary) Pulsatile, colon specific, liquid sustained release systems, Ocular delivery systems 12 Hrs
- 3 Transdermal Drug Delivery Systems: Theory, design, formulation & evaluation including iontophoresis and other latest developments in skin delivery systems. 08 Hrs
- 4 Sub Micron Cosmeceuticals: Biology, formulation science and evaluation of various cosmetics for skin, hair, nail, eye etc and it's regulatory aspects. 04 Hrs

- 5 Targeted Drug Delivery Systems: Importance, concept, biological process and events involved in drug targeting, design, formulation & evaluation, methods in drug targeting – nanoparticles, liposomes, niosomes, pharmacosomes, resealed erythrocytes, microspheres, magnetic microspheres. Specialized pharmaceutical emulsions – multiple emulsions, micro-emulsions. 12 Hrs
- 6 Protein / Peptide Drug Delivery Systems: Concepts, delivery techniques, formulation, stability testing, causes of protein destabilization, stabilization methods.
- 7 Biotechnology in Drug Delivery Systems: Brief review of major areas-recombinant DNA technology, monoclonal antibodies, gene therapy. 06 Hrs
- 8 New trends for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, Telepharmacy. 06 Hrs

REFERENCES

1. Novel Drug Delivery System, Y.W. Chein, Vol 50, Marcel Dekker, NY.
2. Controlled Drug Delivery Systems, Robinson, Vol 29, Marcel Dekker, NY.
3. Transdermal Controlled Systemic Medications, YW Chein, Vol 31, Marcel Dekker, NY.
4. Bioadhesive DDS, E. Mathiowitz, Vol 98, Marcel Dekker, NY.
5. Nasal System Drug Delivery, K.S.E. Su, Vol 39, Marcel Dekker, NY.
6. Drug Delivery Devices, Vol 32, P Tyle Marcel Dekker, NY.
7. Polymers for Controlled Drug Delivery, P.J. Tarcha, CRC Press.
8. Pharmaceutical Biotechnology, Vyas, CBS, Delhi.
9. Biotechnology of Industrial Antibiotics, E.J. Vandamme, Marcel Dekker, NY.
10. Protein Formulation & Delivery, E.J. McNally, Vol 99, Marcel Dekker, NY.
11. Drug Targeting, M.H. Rubinstein, John Wiley, NY.

INTELLECTUAL PROPERTY RIGHTS (MIP 104T)

Scope

This course is designed to impart knowledge and skills necessary to train the students to be on par with the routine of Industrial activities in drug regulatory affairs

Objectives

On completion of this course it is expected that students will be able to understand,

- Assist in Regulatory Audit process.
- Establish regulatory guidelines for drug and drug products
- The Regulatory requirements for contract research organization

THEORY

60 Hrs

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|----|---|--------|
| 1. | Definition, Need for patenting, Types of Patents, Conditions to be satisfied by an invention to be patentable, Introduction to patent search. Parts of patents. Filing of patents. The essential elements of patent; Guidelines for preparation of laboratory note book, Non-obviousness in Patent. | 12 Hrs |
| 2 | Role of GATT, TRIPS, and WIPO | 12 Hrs |
| 3 | Brief introduction to Trademark protection and WHO Patents. IPR's and its types, Major bodies regulating Indian Pharmaceutical sector. | 12 Hrs |
| 4 | Brief introduction to CDSCO. WHO, USFDA, EMEA, TGA, MHRA, MCC, ANVISA | 12 Hrs |
| 5 | Regulatory requirements for contract research organization. Regulations for Biosimilars. | 12 Hrs |

REFERENCES :

1. Pharmaceutical Process Validation: By Fra R. Berry and Robert A. Nash, Vol 57, 2nd Edition
2. Applied Production and Operation Management By Evans, Anderson and Williams
3. GMP for pharmaceuticals Material Management by K.K. Ahuja Published by CBS publishers
4. ISO 9000-Norms and explanations
5. GMP for pharmaceuticals- Willing S.H. Marcel and Dekker

INDUSTRIAL PHARMACY PRACTICAL - I
(MIP 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC / GC
4. Estimation of riboflavin/quinine sulphate by fluorimetry
5. Estimation of sodium/potassium by flame photometry
6. Effect of surfactants on the solubility of drugs.
7. Effect of pH on the solubility of drugs.
8. Stability testing of solution and solid dosage forms for photo degradation..
9. Stability studies of drugs in dosage forms at 25 °C, 60% RH and 40 °C, 75% RH.
10. Compatibility evaluation of drugs and excipients (DSC & FTIR).
11. Preparation and evaluation of different polymeric membranes.
12. Formulation and evaluation of sustained release oral matrix tablet/ oral reservoir system.
13. Formulation and evaluation of microspheres / microcapsules.
14. Formulation and evaluation of transdermal drug delivery systems.
15. Design and evaluation of face wash, body- wash, creams, lotions, shampoo, toothpaste, lipstick.
16. Electrophoresis of protein solution.
17. Preparation and evaluation of Liposome delivery system.

ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS (MIP 201T)

Scope

This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply Biopharmaceutics theories in practical problem solving.

Objectives

On completion of this course it is expected that students will be able to understand,

- The basic concepts in Biopharmaceutics and pharmacokinetics.
- The use of raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
- To critically evaluate Biopharmaceutics studies involving drug product equivalency.
- To design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.

THEORY

60 Hrs

1. Drug Absorption From The Gastrointestinal Tract: 12 Hrs
Gastrointestinal tract, Mechanism of drug absorption, Factors affecting, pH-partition theory, Formulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes-Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form, Suspension as a dosage form, Capsule as a dosage form, Tablet as a dosage form, Dissolution methods, Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex. Solubility: Experimental methods. Permeability: In-vitro, in-situ and In-vivo methods.
2. Biopharmaceutic Considerations in Drug Product Design and In Vitro Drug Product Performance: 12 Hrs
Introduction, Biopharmaceutic Factors Affecting Drug Bioavailability, Rate-Limiting Steps in Drug Absorption, Physicochemical Nature of the

- Drug Formulation Factors Affecting Drug Product Performance, In Vitro: Dissolution and Drug Release Testing, Compendial Methods of Dissolution, Alternative Methods of Dissolution Testing, Meeting Dissolution Requirements, Problems of Variable Control in Dissolution Testing Performance of Drug Products: In Vitro–In Vivo Correlation, Dissolution Profile Comparisons, Drug Product Stability, Considerations in the Design of a Drug Product.
- 3 Pharmacokinetics: Basic considerations, Pharmacokinetic models, Compartment modeling: One compartment model- IV bolus, IV infusion, Extra-vascular; Multi Compartment model: Two compartment - model in brief, Non-Linear Pharmacokinetics: Cause of non-linearity, Michaelis – Menten equation, Estimation K_{max} and V_{max} . Drug interactions: Introduction, The effect of protein-binding interactions, The effect of tissue-binding interactions, Cytochrome P450-based drug interactions, Drug interactions linked to transporters. 12 Hrs
 - 4 Drug Product Performance, In Vivo: Bioavailability and Bioequivalence: Drug Product Performance, Purpose of Bioavailability Studies, Relative and Absolute Availability, , Methods for Assessing Bioavailability, Bioequivalence Studies, Design and Evaluation of Bioequivalence Studies, Study Designs, Crossover Study Designs, Evaluation of the Data, Bioequivalence Example, Study Submission and Drug Review Process, The Biopharmaceutics Classification System, Generic Biologics (Biosimilar Drug Products), Clinical Significance of Bioequivalence Studies, Special Concerns in Bioavailability and Bioequivalence Studies, Generic Substitution. 12 Hrs
 - 5 Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Relationship between Pharmacokinetics including Pharmacodynamics: Generation of a pharmacokinetic–pharmacodynamic (PKPD) equation, Pharmacokinetic and pharmacodynamic, interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs: Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies. 12 Hrs

REFERENCES

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, 4th edition, Philadelphia, Lea and Febiger, 1991
2. Biopharmaceutics and Pharmacokinetics, A. Treatise, D .M. Brahmarkar and Sunil B. Jaiswal., Vallab Prakashan, Pitampura, Delhi
3. Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land YuABC, 2nd edition, Connecticut Appleton Century Crofts, 1985
4. Textbook of Biopharmaceutics and Pharmacokinetics, Dr. Shobha Rani R. Hiremath, Prism Book
5. Pharmacokinetics by Milo Gibaldi and D. Perrier, 2nd edition, Marcel Dekker Inc., New York, 1982
6. Current Concepts in Pharmaceutical Sciences: Biopharmaceutics, Swarbrick. J, Lea and Febiger, Philadelphia, 1970
7. Clinical Pharmacokinetics, Concepts and Applications 3rd edition by Malcolm Rowland and Thom~ N. Tozer, Lea and Febiger, Philadelphia, 1995
8. Dissolution, Bioavailability and Bioequivalence, Abdou. H.M, Mack Publishing Company, Pennsylvania 1989
9. Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition, revised and expanded by Robert. E. Notari, Marcel Dekker Inc, New York and Basel, 1987.
10. Biopharmaceutics and Relevant Pharmacokinetics by John. G Wagner and M. Pamarowski, 1st edition, Drug Intelligence Publications, Hamilton, Illinois, 1971.
11. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G. Boylan, Marcel Dekker Inc, New York, 1996.
12. Basic Pharmacokinetics, 1st edition, Sunil S Jambhekar and Philip J Breen, pharmaceutical press, RPS Publishing, 2009.
13. Absorption and Drug Development- Solubility, Permeability, and Charge State, Alex Avdeef, John Wiley & Sons, Inc, 2003.

SCALE UP AND TECHNOLOGY TRANSFER (MIP 202T)

Scope

This course is designed to impart knowledge and skills necessary to train the students to be on scale up, technology transfer process and industrial safety issues.

Objectives:

On completion of this course it is expected that students will be able to understand,

- Manage the scale up process in pharmaceutical industry.
- Assist in technology transfer.
- To establish safety guidelines, which prevent industrial hazards.

THEORY

60 Hrs

1. Pilot plant design: Basic requirements for design, facility, equipment selection, for tablets, capsules, liquid orals, parenteral and semisolid preparations. 12 Hrs

Scale up: Importance, Technology transfer from R & D to pilot plant to plant scale, process scale up for tablets, capsules, liquid orals, semisolids, parenteral, NDDS products – stress on formula, equipments, product uniformity, stability, raw materials, physical layout, input, in-process and finished product specifications, problems encountered during transfer of technology

- 2 Validation: General concepts, types, procedures & protocols, documentation, VMF. Analytical method validation, cleaning validation and vender qualification. 12 Hrs
- 3 Equipment Qualification: Importance, IQ, OQ, PQ for equipments – autoclave, DHS, membrane filter, rapid mixer granulator, cone blender, FBD, tablet compression machine, liquid filling and sealing machine. Aseptic room validation. 12 Hrs
- 4 Process validation: Importance, validation of mixing, granulation, drying, compression, tablet coating, liquid filling and sealing, sterilization, water process systems, environmental control. 12 Hrs

- 5 Industrial safety: Hazards – fire, mechanical, electrical, 12 chemical and pharmaceutical, Monitoring & prevention systems, Hrs industrial effluent testing & treatment. Control of environmental pollution.

REFERENCES

1. Pharmaceutical process validation, JR Berry, Nash, Vol 57, Marcel Dekker, NY.
2. Pharmaceutical Production facilities, design and applications, by GC Cole, Taylor and Francis.
3. Pharmaceutical project management, T.Kennedy, Vol 86, Marcel Dekker, NY.
4. The theory & Practice of Industrial Pharmacy, L.Lachman, H.A.Lieberman, Varghese Publ. Bombay.
5. Tablet machine instruments in pharmaceuticals, PR Watt, John Wiloy.
6. Pharmaceutical dosage forms, Tablets, Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
7. Pharmaceutical dosage forms, Parental medications, Vol 1, 2 by K.E. Avis, Marcel Dekker, NY.
8. Dispersed system Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
9. Subrahmanyam, CVS, Pharmaceutical production and Management, 2007, Vallabh Prakashan,Dehli.

PHARMACEUTICAL PRODUCTION TECHNOLOGY (MIP 203T)

Scope

This course is designed to impart knowledge and skills necessary to train the students to be on par with the routine of Industrial activities in Production

Objectives

On completion of this course it is expected that students will be able to understand,

Handle the scheduled activities in a Pharmaceutical firm.
Manage the production of large batches of pharmaceutical formulations.

THEORY

60 Hrs

1. Improved Tablet Production: Tablet production process, unit operation improvements, granulation and pelletization equipments, continuous and batch mixing, rapid mixing granulators, rota granulators, spheronizers and marumerisers, and other specialized granulation and drying equipments. Problems encountered. 12 Hrs
 - Coating Technology: Process, equipments, particle coating, fluidized bed coating, application techniques. Problems encountered.
 - 2 Parenteral Production: Area planning & environmental control, wall and floor treatment, fixtures and machineries, change rooms, personnel flow, utilities & utilities equipment location, engineering and maintenance. 12 Hrs
 - 3 Lyophilization & Spray drying Technology: Principles, process, freeze-drying and spray drying equipments. 12 Hrs
 - 4 Capsule Production: Production process, improved capsule manufacturing and filling machines for hard and soft gelatin capsules. Layout and problems encountered. 12 Hrs
- Disperse Systems Production: Production processes, applications of mixers, mills, disperse equipments including fine solids dispersion, problems encountered.

Packaging Technology: Types of packaging materials, machinery, labeling, package printing for different dosage forms.

- 5 Air Handling Systems: Study of AHUs, humidity & temperature control, air filtration systems, dust collectors. Water Treatment Process: Techniques and maintenance - RO, DM, ultra - filtration, WFI. 12 Hrs

REFERENCES

1. The Theory & Practice of Industrial Pharmacy, L. Lachman, Varghese Publ, Bombay.
2. Modern Pharmaceutics by Banker, Vol 72, Marcel Dekker, NY.
3. Pharmaceutical Dosage Forms, Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
4. Pharmaceutical Dosage Forms, Parenteral medications, Vol 1, 2 by K.E. Avis, Marcel Dekker, NY.
5. Pharmaceutical Production Facilities, design and applications, by G.C. Cole, Taylor and Francis.
6. Dispersed System Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
7. Product design and testing of polymeric materials by N.P. Chezerisionoff.
8. Pharmaceutical Project Management, T.Kennedy, Vol 86, Marcel Dekker, NY.
9. Packaging Pharmaceutical and Health Care, H.Lockhard.
10. Quality Control of Packaging Materials in Pharmaceutical Industry, .Kharburn, Marcel Dekker, NY.
11. Freeze drying / Lyophilization of Pharmaceuticals & Biological Products, L. Ray, Vol 96, Marcel Dekker, NY.
12. Tablet Machine Instrumentation In Pharmaceuticals, PR Watt, Ellis Horwoods, UK.

ENTREPRENEURSHIP MANAGEMENT (MIP 204T)

Scope

This course is designed to impart knowledge and skills necessary to train the students on entrepreneurship management.

Objectives:

On completion of this course it is expected that students will be able to understand,

- The Role of enterprise in national and global economy
- Dynamics of motivation and concepts of entrepreneurship
- Demands and challenges of Growth Strategies And Networking

THEORY

60 Hrs

- | | | |
|----|--|-----------|
| 1. | Conceptual Frame Work: Concept need and process in entrepreneurship development. Role of enterprise in national and global economy. Types of enterprise – Merits and Demerits. Government policies and schemes for enterprise development. Institutional support in enterprise development and management. | 12
Hrs |
| 2 | Entrepreneur: Entrepreneurial motivation – dynamics of motivation. Entrepreneurial competency –Concepts. Developing Entrepreneurial competencies - requirements and understanding the process of entrepreneurship development, self-awareness, interpersonal skills, creativity, assertiveness, achievement, factors affecting entrepreneur role. | 12
Hrs |
| 3 | Launching And Organising An Enterprise: Environment scanning – Information, sources, schemes of assistance, problems. Enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis. Resource mobilisation - finance, technology, raw material, site and manpower. Costing and marketing management and quality control. Feedback, monitoring and evaluation. | 12
Hrs |
| 4 | Growth Strategies And Networking: Performance appraisal and assessment. Profitability and control measures, demands and challenges. Need for diversification. Future Growth – Techniques of expansion and diversification, vision strategies. Concept and dynamics. Methods, Joint venture, co-ordination and feasibility study. | 12
Hrs |

5	Preparing Project Proposal To Start On New Enterprise Project work – Feasibility report; Planning, resource mobilisation and implementation.	12 Hrs
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REFERENCES

1. Akhauri, M.M.P.(1990): Entrepreneurship for Women in India, NIESBUD, New Delhi.
2. Hisrich, R.D & Brush, C.G.(1996) The Women Entrepreneurs, D.C. Health & Co., Toronto.
3. Hisrich, R.D. and Peters, M.P. (1995): Entrepreneurship – Starting, Developing and Managing a New Enterprise, Richard D., Inwin, INC, USA.
4. Meredith, G.G. etal (1982): Practice of Entrepreneurship, ILO, Geneva.
5. Patel, V.C. (1987): Women Entrepreneurship – Developing New Entrepreneurs, Ahmedabad EDII.

INDUSTRIAL PHARMACY PRACTICAL - II
(MIP 205P)

1. Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique.
2. Comparison of dissolution of two different marketed products /brands
3. Protein binding studies of a highly protein bound drug & poorly protein bound drug
4. Bioavailability studies of Paracetamol (Animal).
5. Pharmacokinetic and IVIVC data analysis by WinnolineR software
6. In vitro cell studies for permeability and metabolism
7. Formulation and evaluation of tablets
8. Formulation and evaluation of capsules
9. Formulation and evaluation of injections
10. Formulation and evaluation of emulsion
11. Formulation and evaluation of suspension.
12. Formulation and evaluation of enteric coating tablets.
13. Preparation and evaluation of a freeze dried formulation.
14. Preparation and evaluation of a spray dried formulation.

PHARMACEUTICAL CHEMISTRY (MPC)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPC 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about chemicals and excipients

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 Hrs

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. 10 Hrs
b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.
c. Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.
d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy. 10 Hrs

- 3 Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy. 10 Hrs
- 4 Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: 10 Hrs
- Thin Layer chromatography
 - High Performance Thin Layer Chromatography
 - Ion exchange chromatography
 - Column chromatography
 - Gas chromatography
 - High Performance Liquid chromatography
 - Ultra High Performance Liquid chromatography
 - Affinity chromatography
 - Gel Chromatography
- 5 a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: 10 Hrs
- Paper electrophoresis
 - Gel electrophoresis
 - Capillary electrophoresis
 - Zone electrophoresis
 - Moving boundary electrophoresis
 - Iso electric focusing
- b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.
- 6 a. Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. 10 Hrs
- b. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation

and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods - Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

ADVANCED ORGANIC CHEMISTRY - I
(MPC 102T)

Scope

The subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery.

Objectives

Upon completion of course, the student shall be to understand

- The principles and applications of retrosynthesis
- The mechanism & applications of various named reactions
- The concept of disconnection to develop synthetic routes for small target molecule.
- The various catalysts used in organic reactions
- The chemistry of heterocyclic compounds

THEORY

60 Hrs

- | | | |
|----|--|-----------|
| 1. | Basic Aspects of Organic Chemistry: | 12
Hrs |
| | 1. Organic intermediates: Carbocations, carbanions, free radicals, carbenes and nitrenes. Their method of formation, stability and synthetic applications. | |
| | 2. Types of reaction mechanisms and methods of determining them, | |
| | 3. Detailed knowledge regarding the reactions, mechanisms and their relative reactivity and orientations. | |
| | Addition reactions | |
| | a) Nucleophilic uni- and bimolecular reactions (SN1 and SN2) | |
| | b) Elimination reactions (E1 & E2; Hoffman & Saytzeff's rule) | |
| | c) Rearrangement reaction | |
| 2 | Study of mechanism and synthetic applications of following named Reactions: | 12
Hrs |
| | Ugi reaction, Brook rearrangement, Ullmann coupling reactions, Dieckmann Reaction, Doebner-Miller Reaction, Sandmeyer Reaction, Mitsunobu reaction, Mannich reaction, Vilsmeier-Haack Reaction, Sharpless asymmetric epoxidation, Baeyer-Villiger oxidation, Shapiro & Suzuki reaction, Ozonolysis and Michael addition reaction | |

- 3 Synthetic Reagents & Applications: 12 Hrs
Aluminiumisopropoxide, N-bromosuccinamide, diazomethane, dicyclohexylcarbodimide, Wilkinson reagent, Witting reagent. Osmium tetroxide, titanium chloride, diazopropane, diethyl azodicarboxylate, Triphenylphosphine, Benzotriazol-1-yloxy tris (dimethylamino) phosphonium hexafluoro-phosphate (BOP).

Protecting groups

- a. Role of protection in organic synthesis
 - b. Protection for the hydroxyl group, including 1,2-and 1,3-diols: ethers, esters, carbonates, cyclic acetals & ketals
 - c. Protection for the Carbonyl Group: Acetals and Ketals
 - d. Protection for the Carboxyl Group: amides and hydrazides, esters
 - e. Protection for the Amino Group and Amino acids: carbamates and amides
- 4 Heterocyclic Chemistry: 12 Hrs
Organic Name reactions with their respective mechanism and application involved in synthesis of drugs containing five, six membered and fused heterocyclics such as Debus-Radziszewski imidazole synthesis, Knorr Pyrazole Synthesis Pinner Pyrimidine Synthesis, Combes Quinoline Synthesis, Bernthsen Acridine Synthesis, Smiles rearrangement and Traube purine synthesis.

Synthesis of few representative drugs containing these heterocyclic nucleus such as Ketoconazole, Metronidazole, Miconazole, celecoxib, antipyrin, Metamizole sodium, Terconazole, Alprazolam, Triamterene, Sulfamerazine, Trimethoprim, Hydroxychloroquine, Quinine, Chloroquine, Quinacrine, Amsacrine, Prochlorperazine, Promazine, Chlorpromazine, Theophylline, Mercaptopurine and Thioguanine.

- 5 Synthons approach and retrosynthesis applications 12 Hrs
- i. Basic principles, terminologies and advantages of retrosynthesis; guidelines for dissection of molecules. Functional group interconversion and addition (FGI and FGA)
 - ii. C-X disconnections; C-C disconnections – alcohols and carbonyl compounds; 1,2-, 1,3-, 1,4-, 1,5-, 1,6-difunctionalized compounds
 - iii. Strategies for synthesis of three, four, five and six-membered ring.

REFERENCES

1. "Advanced Organic chemistry, Reaction, Mechanisms and Structure", J March, John Wiley and Sons, New York.
2. "Mechanism and Structure in Organic Chemistry", ES Gould, Hold Rinchart and Winston, New York.
3. "Organic Chemistry" Clayden, Greeves, Warren and Wothers., Oxford University Press 2001.
4. "Organic Chemistry" Vol I and II. I.L. Finar. ELBS, Pearson Education Ltd, Dorling Kindersley (India) Pvt. Ltd.,
5. A guide to mechanisms in Organic Chemistry, Peter Skyes (Orient Longman, New Delhi).
6. Reactive Intermediates in Organic Chemistry, Tandon and Gowel, Oxford & IBH Publishers.
7. Combinational Chemistry - Synthesis and applications - Stephen R Wilson & Anthony W Czarnik, Wiley - Blackwell.
8. Carey, Organic Chemistry, 5th Edition (Viva Books Pvt. Ltd.)
9. Organic Synthesis - The Disconnection Approach, S. Warren, Wiley India
10. Principles of Organic Synthesis, ROC Norman and JM Coxan, Nelson Thorns.
11. Organic Synthesis - Special Techniques. VK Ahluwalia and R Agarwal, Narosa Publishers.
12. Organic Reaction Mechanisms IVth Edtn, VK Ahluwalia and RK Parashar, Narosa Publishers.

ADVANCED MEDICINAL CHEMISTRY (MPC 103T)

Scope

The subject is designed to impart knowledge about recent advances in the field of medicinal chemistry at the molecular level including different techniques for the rational drug design.

Objectives

At completion of this course it is expected that students will be able to understand

- Different stages of drug discovery
- Role of medicinal chemistry in drug research
- Different techniques for drug discovery
- Various strategies to design and develop new drug like molecules for biological targets
- Peptidomimetics

THEORY

60 Hrs

1. Drug discovery: Stages of drug discovery, lead discovery; identification, validation and diversity of drug targets. 12 Hrs

Biological drug targets: Receptors, types, binding and activation, theories of drug receptor interaction, drug receptor interactions, agonists vs antagonists, artificial enzymes.

- 2 Prodrug Design and Analog design: 12 Hrs
- a) Prodrug design: Basic concept, Carrier linked prodrugs/ Bioprecursors, Prodrugs of functional group, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.
 - b) Combating drug resistance: Causes for drug resistance, strategies to combat drug resistance in antibiotics and anticancer therapy, Genetic principles of drug resistance.
 - c) Analog Design: Introduction, Classical & Non classical, Bioisosteric replacement strategies, rigid analogs,

alteration of chain branching, changes in ring size, ring position isomers, design of stereo isomers and geometric isomers, fragments of a lead molecule, variation in inter atomic distance.

- 3 a) Medicinal chemistry aspects of the following class of drugs 12 Hrs
- Systematic study, SAR, Mechanism of action and synthesis of new generation molecules of following class of drugs:
- a) Anti-hypertensive drugs, Psychoactive drugs, Anticonvulsant drugs, H1 & H2 receptor antagonist, COX1 & COX2 inhibitors, Adrenergic & Cholinergic agents, Antineoplastic and Antiviral agents.
- b) Stereochemistry and Drug action: Realization that stereo selectivity is a pre-requisite for evolution. Role of chirality in selective and specific therapeutic agents. Case studies, Enantio selectivity in drug adsorption, metabolism, distribution and elimination.
- 4 Rational Design of Enzyme Inhibitors 12 Hrs
- Enzyme kinetics & Principles of Enzyme inhibitors, Enzyme inhibitors in medicine, Enzyme inhibitors in basic research, rational design of non-covalently and covalently binding enzyme inhibitors.
- 5 Peptidomimetics 12 Hrs
- Therapeutic values of Peptidomimetics, design of peptidomimetics by manipulation of the amino acids, modification of the peptide backbone, incorporating conformational constraints locally or globally. Chemistry of prostaglandins, leukotrienes and thromboxones.

REFERENCES

1. Medicinal Chemistry by Burger, Vol I –VI.
2. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, 12th Edition, Lppincott Williams & Wilkins, Woltess Kluwer (India) Pvt.Ltd, New Delhi.
3. Comprehensive Medicinal Chemistry – Corwin and Hansch.
4. Computational and structural approaches to drug design edited by Robert M Stroud and Janet. F Moore

5. Introduction to Quantitative Drug Design by Y.C. Martin.
6. Principles of Medicinal Chemistry by William Foye, 7th Edition, Ippincott Williams & Wilkins, Woltest Kluwer (India) Pvt.Ltd, New Delhi.
7. Drug Design Volumes by Arienes, Academic Press, Elsevier Publishers, Noida, Uttar Pradesh..
8. Principles of Drug Design by Smith.
9. The Organic Chemistry of the Drug Design and Drug action by Richard B.Silverman, II Edition, Elsevier Publishers, New Delhi.
10. An Introduction to Medicinal Chemistry, Graham L.Patrick, III Edition, Oxford University Press, USA.
11. Biopharmaceutics and pharmacokinetics, DM.Brahmankar, Sunil B. Jaiswal II Edition, 2014, Vallabh Prakashan, New Delhi.
12. Peptidomimetics in Organic and Medicinal Chemistry by Antonio Guarna and Andrea Trabocchi, First edition, Wiley publishers.

CHEMISTRY OF NATURAL PRODUCTS (MPC 104T)

Scope

The subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds. It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.

Objectives

At completion of this course it is expected that students will be able to understand-

- Different types of natural compounds and their chemistry and medicinal importance
- The importance of natural compounds as lead molecules for new drug discovery
- The concept of rDNA technology tool for new drug discovery
- General methods of structural elucidation of compounds of natural origin
- Isolation, purification and characterization of simple chemical constituents from natural source

THEORY	60 Hrs
1. Study of Natural products as leads for new pharmaceuticals for the following class of drugs	12 Hrs
a) Drugs Affecting the Central Nervous System: Morphine Alkaloids	
b) Anticancer Drugs: Paclitaxel and Docetaxel, Etoposide, and Teniposide	
c) Cardiovascular Drugs: Lovastatin, Teprotide and Dicoumarol	
d) Neuromuscular Blocking Drugs: Curare alkaloids	
e) Anti-malarial drugs and Analogues	
f) Chemistry of macrolid antibiotics (Erythromycin, Azithromycin, Roxithromycin, and Clarithromycin) and β - Lactam antibiotics (Cephalosporins and Carbapenem)	
2. a) Alkaloids	12 Hrs
General introduction, classification, isolation, purification, molecular modification and biological activity of alkaloids, general methods of structural determination of alkaloids, structural elucidation and stereochemistry of ephedrine, morphine, ergot, emetine and reserpine.	

- b) Flavonoids
Introduction, isolation and purification of flavonoids, General methods of structural determination of flavonoids; Structural elucidation of quercetin.
- c) Steroids
General introduction, chemistry of sterols, sapogenin and cardiac glycosides. Stereochemistry and nomenclature of steroids, chemistry of contraceptive agents male & female sex hormones (Testosterone, Estradiol, Progesterone), adrenocorticoids (Cortisone), contraceptive agents and steroids (Vit - D).
- 3 a) Terpenoids 12 Hrs
- Classification, isolation, isoprene rule and general methods of structural elucidation of Terpenoids; Structural elucidation of drugs belonging to mono (citral, menthol, camphor), di (retinol, Phytol, taxol) and tri terpenoids (Squalene, Ginsenoside) carotinoids (β carotene).
- b) Vitamins
Chemistry and Physiological significance of Vitamin A, B1, B2, B12, C, E, Folic acid and Niacin.
- 4 a). Recombinant DNA technology and drug discovery 12 Hrs
rDNA technology, hybridoma technology, New pharmaceuticals derived from biotechnology; Oligonucleotide therapy. Gene therapy: Introduction, Clinical application and recent advances in gene therapy, principles of RNA & DNA estimation
- b). Active constituent of certain crude drugs used in Indigenous system Diabetic therapy - *Gymnema sylvestre*, *Salacia reticulata*, *Pterocarpus marsupium*, *Swertia chirata*, *Trigonella foenum graecum*; Liver dysfunction - *Phyllanthus niruri*; Antitumor - *Curcuma longa* Linn.
- 5 Structural Characterization of natural compounds 12 Hrs
Structural characterization of natural compounds using IR, ¹HNMR, ¹³CNMR and MS Spectroscopy of specific drugs e.g., Penicillin, Morphine, Camphor, Vit-D, Quercetin and Digitalis glycosides.

REFERENCES

1. Modern Methods of Plant Analysis, Peech and M.V.Tracey, Springer – Verlag, Berlin, Heidelberg.
2. Phytochemistry Vol. I and II by Miller, Jan Nostrant Rein Hld.
3. Recent advances in Phytochemistry Vol. I to IV – Scikel Runeckles, Springer Science & Business Media.
4. Chemistry of natural products Vol I onwards IWPAC.
5. Natural Product Chemistry Nakanishi Gggolo, University Science Books, California.
6. Natural Product Chemistry “A laboratory guide” – Rapheal Khan.
7. The Alkaloid Chemistry and Physiology by RHF Manske, Academic Press.
8. Introduction to molecular Phytochemistry – CHJ Wells, Chapmanstall.
9. Organic Chemistry of Natural Products Vol I and II by Gurdeep and Chatwall, Himalaya Publishing House.
10. Organic Chemistry of Natural Products Vol I and II by O.P. Agarwal, Krishan Prakashan.
11. Organic Chemistry Vol I and II by I.L. Finar, Pearson education.
12. Elements of Biotechnology by P.K. Gupta, Rastogi Publishers.
13. Pharmaceutical Biotechnology by S.P.Vyas and V.K.Dixit, CBS Publishers.
14. Biotechnology by Purohit and Mathur, Agro-Bios, 13th edition.
15. Phytochemical methods of Harborne, Springer, Netherlands.
16. Burger’s Medicinal Chemistry.

PHARMACEUTICAL CHEMISTRY PRACTICAL - I
(MPC 105P)

1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer, RNA & DNA estimation
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on Column chromatography
4. Experiments based on HPLC
5. Experiments based on Gas Chromatography
6. Estimation of riboflavin/quinine sulphate by fluorimetry
7. Estimation of sodium/potassium by flame photometry

To perform the following reactions of synthetic importance

1. Purification of organic solvents, column chromatography
2. Claisen-schimidt reaction.
3. Benzylic acid rearrangement.
4. Beckmann rearrangement.
5. Hoffmann rearrangement
6. Mannich reaction
7. Synthesis of medicinally important compounds involving more than one step along with purification and Characterization using TLC, melting point and IR spectroscopy (4 experiments)
8. Estimation of elements and functional groups in organic natural compounds
9. Isolation, characterization like melting point, mixed melting point, molecular weight determination, functional group analysis, co-chromatographic technique for identification of isolated compounds and interpretation of UV and IR data.
10. Some typical degradation reactions to be carried on selected plant constituents

ADVANCED SPECTRAL ANALYSIS
(MPC 201T)

Scope

This subject deals with various hyphenated analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are LC-MS, GC-MS, ATR-IR, DSC etc.

Objectives

At completion of this course it is expected that students will be able to understand-

- Interpretation of the NMR, Mass and IR spectra of various organic compounds
- Theoretical and practical skills of the hyphenated instruments
- Identification of organic compounds

THEORY	60Hrs
1. UV and IR spectroscopy: Wood ward – Fieser rule for 1,3- butadienes, cyclic dienes and α , β -carbonyl compounds and interpretation compounds of enones. ATR-IR, IR Interpretation of organic compounds.	12 Hrs
2 NMR spectroscopy: 1-D and 2-D NMR, NOESY and COSY, HECTOR, INADEQUATE techniques, Interpretation of organic compounds.	12 Hrs
3 Mass Spectroscopy Mass fragmentation and its rules, Fragmentation of important functional groups like alcohols, amines, carbonyl groups and alkanes, Meta stable ions, Mc Lafferty rearrangement, Ring rule, Isotopic peaks, Interpretation of organic compounds.	12 Hrs
4 Chromatography: Principle, Instrumentation and Applications of the following : a) GC-MS b) GC-AAS c) LC-MS d) LC-FTIR e) LC-NMR f) CE-MS g) High Performance Thin Layer chromatography h) Super critical fluid chromatography i) Ion Chromatography j) I-EC (Ion-Exclusion Chromatography) k) Flash chromatography	12 Hrs

- 5 a). Thermal methods of analysis 12
Introduction, principle, instrumentation and application of DSC, Hrs
DTA and TGA.
- b). Raman Spectroscopy
Introduction, Principle, Instrumentation and Applications.
- c). Radio immuno assay
Biological standardization , bioassay, ELISA, Radioimmuno
assay of digitalis and insulin.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
5. Quantitative analysis of Pharmaceutical formulations by HPTLC - P D Sethi, CBS Publishers, New Delhi.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods - Part B - J W Munson, Volume 11, Marcel Dekker Series

ADVANCED ORGANIC CHEMISTRY - II
(MPC 202T)

Scope

The subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery.

Objectives

Upon completion of course, the student shall be able to understand

- The principles and applications of Green chemistry
- The concept of peptide chemistry.
- The various catalysts used in organic reactions
- The concept of stereochemistry and asymmetric synthesis.

THEORY	60 Hrs
1. Green Chemistry:	12 Hrs
a. Introduction, principles of green chemistry	
b. Microwave assisted reactions: Merit and demerits of its use, increased reaction rates, mechanism, superheating effects of microwave, effects of solvents in microwave assisted synthesis, microwave technology in process optimization, its applications in various organic reactions and heterocycles synthesis	
c. Ultrasound assisted reactions: Types of sonochemical reactions, homogenous, heterogeneous liquid-liquid and liquid-solid reactions, synthetic applications	
d. Continuous flow reactors: Working principle, advantages and synthetic applications.	
2. Chemistry of peptides	12 Hrs
a. Coupling reactions in peptide synthesis	
b. Principles of solid phase peptide synthesis, t-BOC and FMOC protocols, various solid supports and linkers: Activation procedures, peptide bond formation, deprotection and cleavage from resin, low and high HF cleavage protocols, formation of free peptides and peptide amides, purification and case studies, site-specific chemical modifications of peptides	
c. Segment and sequential strategies for solution phase peptide synthesis with any two case studies	
d. Side reactions in peptide synthesis: Deletion peptides, side	

reactions initiated by proton abstraction, protonation, over-activation and side reactions of individual amino acids.

- | | | |
|---|---|-----------|
| 3 | Photochemical Reactions
Basic principles of photochemical reactions. Photo-oxidation, photo-addition and photo-fragmentation. | 12
Hrs |
| | <p>Pericyclic reactions
Mechanism, Types of pericyclic reactions such as cyclo addition, electrocyclic reaction and sigmatropic rearrangement reactions with examples</p> | |
| 4 | Catalysis:
a. Types of catalysis, heterogeneous and homogenous catalysis, advantages and disadvantages
b. Heterogeneous catalysis - preparation, characterization, kinetics, supported catalysts, catalyst deactivation and regeneration, some examples of heterogeneous catalysis used in synthesis of drugs.
c. Homogenous catalysis, hydrogenation, hydroformylation, hydrocyanation, Wilkinson catalysts, chiral ligands and chiral induction, Ziegler-Natta catalysts, some examples of homogenous catalysis used in synthesis of drugs
d. Transition-metal and Organo-catalysis in organic synthesis: Metal-catalyzed reactions
e. Biocatalysis: Use of enzymes in organic synthesis, immobilized enzymes/cells in organic reaction.
f. Phase transfer catalysis - theory and applications | 12
Hrs |
| 5 | Stereochemistry & Asymmetric Synthesis
a. Basic concepts in stereochemistry - optical activity, specific rotation, racemates and resolution of racemates, the Cahn, Ingold, Prelog (CIP) sequence rule, meso compounds, pseudo asymmetric centres, axes of symmetry, Fischers D and L notation, cis-trans isomerism, E and Z notation.
b. Methods of asymmetric synthesis using chiral pool, chiral auxiliaries and catalytic asymmetric synthesis, enantiopure separation and Stereo selective synthesis with examples. | 12
Hrs |

REFERENCES

1. "Advanced Organic chemistry, Reaction, mechanisms and structure", J March, John Wiley and sons, New York.
2. "Mechanism and structure in organic chemistry", ES Gould, Hold Rinchart and Winston, New York.
3. "Organic Chemistry" Clayden, Greeves, Warren and Wothers., Oxford University Press 2001.
4. "Organic Chemistry" Vol I and II. I.L. Finar. ELBS, Sixth ed., 1995.
5. Carey, Organic chemistry, 5th edition (Viva Books Pvt. Ltd.)
6. Organic synthesis-the disconnection approach, S. Warren, Wily India
7. Principles of organic synthesis, ROC Norman and JMCoxan, Nelson thorns
8. Organic synthesis- Special techniques VK Ahluwalia and R Aggarwal, Narosa Publishers.
9. Organic reaction mechanisms IV edtn, VK Ahluwalia and RK Parashar, Narosa Publishers.

COMPUTER AIDED DRUG DESIGN (MPC 203T)

Scope

The subject is designed to impart knowledge on the current state of the art techniques involved in computer assisted drug design.

Objectives

At completion of this course it is expected that students will be able to understand

- Role of CADD in drug discovery
- Different CADD techniques and their applications
- Various strategies to design and develop new drug like molecules.
- Working with molecular modeling softwares to design new drug molecules
- The in silico virtual screening protocols

Theory	60 Hrs
1. Introduction to Computer Aided Drug Design (CADD)	12 Hrs
History, different techniques and applications. Quantitative Structure Activity Relationships: Basics History and development of QSAR: Physicochemical parameters and methods to calculate physicochemical parameters: Hammett equation and electronic parameters (σ), lipophilicity effects and parameters ($\log P$, π -substituent constant), steric effects (Taft steric and MR parameters) Experimental and theoretical approaches for the determination of these physicochemical parameters.	
2 Quantitative Structure Activity Relationships: Applications	12 Hrs
Hansch analysis, Free Wilson analysis and relationship between them, Advantages and disadvantages; Deriving 2D-QSAR equations. 3D-QSAR approaches and contour map analysis. Statistical methods used in QSAR analysis and importance of statistical parameters.	
3 Molecular Modeling and Docking	12 Hrs
a) Molecular and Quantum Mechanics in drug design. b) Energy Minimization Methods: comparison between global	

- minimum conformation and bioactive conformation
- c) Molecular docking and drug receptor interactions: Rigid docking, flexible docking and extra-precision docking. Agents acting on enzymes such as DHFR, HMG-CoA reductase and HIV protease, choline esterase (AchE & BchE)
- 4 Molecular Properties and Drug Design 12 Hrs
- a) Prediction and analysis of ADMET properties of new molecules and its importance in drug design.
- b) De novo drug design: Receptor/enzyme-interaction and its analysis, Receptor/enzyme cavity size prediction, predicting the functional components of cavities, Fragment based drug design.
- c) Homology modeling and generation of 3D-structure of protein.
- 5 Pharmacophore Mapping and Virtual Screening 12 Hrs
- Concept of pharmacophore, pharmacophore mapping, identification of Pharmacophore features and Pharmacophore modeling; Conformational search used in pharmacophore mapping.

In Silico Drug Design and Virtual Screening Techniques
 Similarity based methods and Pharmacophore based screening,
 structure based In-silico virtual screening protocols.

REFERENCES

1. Computational and structural approaches to drug discovery, Robert M Stroud and Janet. F Moore, RCS Publishers.
2. Introduction to Quantitative Drug Design by Y.C. Martin, CRC Press, Taylor & Francis group..
3. Drug Design by Ariens Volume 1 to 10, Academic Press, 1975, Elsevier Publishers.
4. Principles of Drug Design by Smith and Williams, CRC Press, Taylor & Francis.
5. The Organic Chemistry of the Drug Design and Drug action by Richard B. Silverman, Elsevier Publishers.
6. Medicinal Chemistry by Burger, Wiley Publishing Co.

7. An Introduction to Medicinal Chemistry –Graham L. Patrick, Oxford University Press.
8. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Ippincott Williams & Wilkins.
9. Comprehensive Medicinal Chemistry – Corwin and Hansch, Pergamon Publishers.
10. Computational and structural approaches to drug design edited by Robert M Stroud and Janet. F Moore

PHARMACEUTICAL PROCESS CHEMISTRY (MPC 204T)

Scope

Process chemistry is often described as scale up reactions, taking them from small quantities created in the research lab to the larger quantities that are needed for further testing and then to even larger quantities required for commercial production. The goal of a process chemist is to develop synthetic routes that are safe, cost-effective, environmentally friendly, and efficient. The subject is designed to impart knowledge on the development and optimization of a synthetic route/s and the pilot plant procedure for the manufacture of Active Pharmaceutical Ingredients (APIs) and new chemical entities (NCEs) for the drug development phase.

Objectives

At completion of this course it is expected that students will be able to understand

- The strategies of scale up process of APIs and intermediates
- The various unit operations and various reactions in process chemistry

THEORY	60 Hrs
1. Process chemistry	12
Introduction, Synthetic strategy	Hrs
Stages of scale up process: Bench, pilot and large scale process.	
In-process control and validation of large scale process.	
Case studies of some scale up process of APIs.	
Impurities in API, types and their sources including genotoxic impurities	
2 Unit operations	12
a) Extraction: Liquid equilibria, extraction with reflux, extraction with agitation, counter current extraction.	Hrs
b) Filtration: Theory of filtration, pressure and vacuum filtration, centrifugal filtration,	
c) Distillation: azeotropic and steam distillation	
d) Evaporation: Types of evaporators, factors affecting evaporation.	
e) Crystallization: Crystallization from aqueous, non-aqueous solutions factors affecting crystallization, nucleation. Principle and general methods of Preparation of polymorphs, hydrates, solvates and amorphous APIs.	

- | | | |
|---|---|-----------|
| 3 | <p>Unit Processes - I</p> <ul style="list-style-type: none"> a) Nitration: Nitrating agents, Aromatic nitration, kinetics and mechanism of aromatic nitration, process equipment for technical nitration, mixed acid for nitration, b) Halogenation: Kinetics of halogenations, types of halogenations, catalytic halogenations. Case study on industrial halogenation process. c) Oxidation: Introduction, types of oxidative reactions, Liquid phase oxidation with oxidizing agents. Nonmetallic Oxidizing agents such as H₂O₂, sodium hypochlorite, Oxygen gas, ozonolysis. | 12
Hrs |
| 4 | <p>Unit Processes - II</p> <ul style="list-style-type: none"> a) Reduction: Catalytic hydrogenation, Heterogeneous and homogeneous catalyst; Hydrogen transfer reactions, Metal hydrides. Case study on industrial reduction process. b) Fermentation: Aerobic and anaerobic fermentation. Production of <ul style="list-style-type: none"> i. Antibiotics; Penicillin and Streptomycin, ii. Vitamins: B2 and B12 iii. Statins: Lovastatin, Simvastatin c) Reaction progress kinetic analysis <ul style="list-style-type: none"> i. Streamlining reaction steps, route selection, ii. Characteristics of expedient routes, characteristics of cost-effective routes, reagent selection, families of reagents useful for scale-up. | 12
Hrs |
| 5 | <p>Industrial Safety</p> <ul style="list-style-type: none"> a) MSDS (Material Safety Data Sheet), hazard labels of chemicals and Personal Protection Equipment (PPE) b) Fire hazards, types of fire & fire extinguishers c) Occupational Health & Safety Assessment Series 1800 (OHSAS-1800) and ISO-14001 (Environmental Management System), Effluents and its management | 12
Hrs |

REFERENCES

1. Process Chemistry in the Pharmaceutical Industry: Challenges in an Ever-Changing Climate-An Overview; K. Gadamasetti, CRC Press.
2. Pharmaceutical Manufacturing Encyclopedia, 3rd edition, Volume 2.
3. Medicinal Chemistry by Burger, 6th edition, Volume 1-8.
4. W.L. McCabe, J.C Smith, Peter Harriott. Unit operations of chemical engineering, 7th edition, McGraw Hill
5. Polymorphism in Pharmaceutical Solids .Dekker Series Volume 95 Ed: H G Brittain (1999)
6. Regina M. Murphy: Introduction to Chemical Processes: Principles, Analysis, Synthesis
7. Peter J. Harrington: Pharmaceutical Process Chemistry for Synthesis: Rethinking the Routes to Scale-Up
8. P.H.Groggins: Unit processes in organic synthesis (MGH)
9. F.A.Henglein: Chemical Technology (Pergamon)
10. M.Gopal: Dryden's Outlines of Chemical Technology, WEP East-West Press
11. Clausen, Mattson: Principle of Industrial Chemistry, Wiley Publishing Co.,
12. Lowenheim & M.K. Moran: Industrial Chemicals
13. S.D. Shukla & G.N. Pandey: A text book of Chemical Technology Vol. II, Vikas Publishing House
14. J.K. Stille: Industrial Organic Chemistry (PH)
15. Shreve: Chemical Process, Mc Grawhill.
16. B.K.Sharma: Industrial Chemistry, Goel Publishing House
17. ICH Guidelines
18. United States Food and Drug Administration official website www.fda.gov

PHARMACEUTICAL CHEMISTRY PRACTICALS – II
(MPC 205P)

1. Synthesis of organic compounds by adapting different approaches involving (3 experiments)
 - a) Oxidation
 - b) Reduction/hydrogenation
 - c) Nitration
2. Comparative study of synthesis of APIs/intermediates by different synthetic routes (2 experiments)
3. Assignments on regulatory requirements in API (2 experiments)
4. Comparison of absorption spectra by UV and Wood ward – Fieser rule
5. Interpretation of organic compounds by FT-IR
6. Interpretation of organic compounds by NMR
7. Interpretation of organic compounds by MS
8. Determination of purity by DSC in pharmaceuticals
9. Identification of organic compounds using FT-IR, NMR, CNMR and Mass spectra
10. To carry out the preparation of following organic compounds
11. Preparation of 4-chlorobenzhydrylpiperazine. (an intermediate for cetirizine HCl).
12. Preparation of 4-iodotoluene from p-toluidine.
13. NaBH₄ reduction of vanillin to vanillyl alcohol
14. Preparation of umbelliferone by Pechhman reaction
15. Preparation of triphenyl imidazole
16. To perform the Microwave irradiated reactions of synthetic importance (Any two)
17. Determination of log P, MR, hydrogen bond donors and acceptors of selected drugs using softwares
18. Calculation of ADMET properties of drug molecules and its analysis using softwares
Pharmacophore modeling
19. 2D-QSAR based experiments
20. 3D-QSAR based experiments
21. Docking study based experiment
22. Virtual screening based experiment

PHARMACEUTICAL ANALYSIS (MPA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPA 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about chemicals and excipients

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 Hrs

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. 10 Hrs
b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.
c. Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.
d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy. 10 Hrs
3. Mass Spectroscopy: Principle, Theory, Instrumentation of Mass 10

	Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: <ul style="list-style-type: none"> a. Thin Layer chromatography b. High Performance Thin Layer Chromatography c. Ion exchange chromatography d. Column chromatography e. Gas chromatography f. High Performance Liquid chromatography g. Ultra High Performance Liquid chromatography h. Affinity chromatography i. Gel Chromatography 	10 Hrs
5	a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: <ul style="list-style-type: none"> a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction	10 Hrs
6	Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry.	10 Hrs
	Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation	

and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods - Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

ADVANCED PHARMACEUTICAL ANALYSIS (MPA 102T)

Scope

This subject deals with the various aspects of Impurity, Impurities in new drug products, in residual solvents, Elemental impurities, Impurity profiling and characterization of degradants, Stability testing of phytopharmaceuticals and their protocol preparation. It also covers the biological testing of various vaccines and their principle and procedure.

Objective

After completion of the course students shall able to know,

- Appropriate analytical skills required for the analytical method development.
- Principles of various reagents used in functional group analysis that renders necessary support in research methodology and demonstrates its application in the practical related problems.
- Analysis of impurities in drugs, residual solvents and stability studies of drugs and biological products

THEORY	60 Hrs
1. Impurity and stability studies: Definition, classification of impurities in drug Substance or Active Pharmaceutical Ingredients and quantification of impurities as per ICH guidelines Impurities in new drug products: Rationale for the reporting and control of degradation products, reporting degradation products content of batches, listing of degradation products in specifications, qualification of degradation products Impurities in residual solvents: General principles, classification of residual solvents, Analytical procedures, limits of residual solvents, reporting levels of residual solvents	10 Hrs
2 Elemental impurities: Element classification, control of elemental impurities, Potential Sources of elemental Impurities, Identification of Potential Elemental Impurities, analytical procedures, instrumentation & C, H, N and S analysis	10 Hrs

Stability testing protocols:

Selection of batches, container orientation, test parameters, sampling frequency, specification, storage conditions, recording of results, concept of stability, commitment etc. Important mechanistic and stability related information provided by results of study of factors like temperature, pH, buffering species ionic strength and dielectric constant etc. on the reaction rates. With practical considerations.

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| 3 | Impurity profiling and degradant characterization: Method development, Stability studies and concepts of validation accelerated stability testing & shelf life calculation, WHO and ICH stability testing guidelines, Stability zones, steps in development, practical considerations. Basics of impurity profiling and degradant characterization with special emphasis. Photostability testing guidelines, ICH stability guidelines for biological products | 10
Hrs |
| 4 | Stability testing of phytopharmaceuticals: Regulatory requirements, protocols, HPTLC/HPLC finger printing, interactions and complexity. | 10
Hrs |
| 5 | Biological tests and assays of the following:
a. Adsorbed Tetanus vaccine b. Adsorbed Diphtheria vaccine
c. Human anti haemophilic vaccine d. Rabies vaccine e. Tetanus Anti toxin
f. Tetanus Anti serum g. Oxytocin h. Heparin sodium IP
i. Antivenom. PCR, PCR studies for gene regulation, instrumentation (Principle and Procedures) | 10
Hrs |
| 6 | Immunoassays (IA)
Basic principles, Production of antibodies, Separation of bound and unbound drug, Radioimmunoassay, Optical IA, Enzyme IA, Fluoro IA, Luminisence IA, Quantification and applications of IA. | 10
Hrs |

REFERENCES

1. Vogel's textbook of quantitative chemical analysis - Jeffery J Bassett, J. Mendham, R. C. Denney, 5th edition, ELBS, 1991.
2. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th Edition, CBS publishers, New Delhi, 1997.
3. Textbook of Pharmaceutical Analysis - K A Connors, 3rd Edition, John Wiley & Sons, 1982.

4. Pharmaceutical Analysis - Higuchi, Brochmman and Hassen, 2nd Edition, Wiley – Inter science Publication, 1961.
5. Quantitative Analysis of Drugs in Pharmaceutical formulation – P D Sethi, 3rd Edition, CBS Publishers New Delhi, 1997.
6. Pharmaceutical Analysis- Modern methods - J W Munson – Part B, Volume 11, Marcel Dekker Series.
7. The Quantitative analysis of Drugs - D C Carratt, 3rd edition, CBS Publishers, NewDelhi, 1964.
8. Indian Pharmacopoeia Vol I , II & III 2007, 2010, 2014.
9. Methods of sampling and microbiological examination of water, first revision, BIS
10. Practical HPLC method development – Snyder, Kirkland, Glajch, 2nd edition, John Wiley & Sons.
11. Analytical Profiles of drug substances – Klaus Florey, Volume 1 – 20, Elsevier, 2005
12. Analytical Profiles of drug substances and Excipients – Harry G Brittan, Volume 21 – 30, Elsevier, 2005.
13. The analysis of drugs in biological fluids - Joseph Chamberlain, 2nd edition, CRC press, London.
14. ICH Guidelines for impurity profiles and stability studies.

PHARMACEUTICAL VALIDATION (MPA 103T)

Scope

The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Objectives

Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments
- Validate the manufacturing facilities

THEORY

60 Hrs

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|----|--|-----------|
| 1. | Introduction: Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan.
Qualification: User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re- Qualification (Maintaining status-Calibration Preventive Maintenance, Change management), Qualification of Manufacturing Equipments, Qualification of Analytical Instruments and Laboratory equipments. | 12
Hrs |
| 2 | Qualification of analytical instruments: Electronic balance, pH meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC
Qualification of Glassware: Volumetric flask, pipette, Measuring cylinder, beakers and burette. | 12
Hrs |
| 3 | Validation of Utility systems: Pharmaceutical Water System & pure steam, HVAC system, Compressed air and nitrogen.
Cleaning Validation: Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP). | 12
Hrs |
| 4 | Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP. | 12
Hrs |

Computerized system validation: Electronic records and digital significance-21 CFR part 11 and GAMP 5.

- 5 General Principles of Intellectual Property: Concepts of Intellectual Property (IP), Intellectual Property Protection (IPP), Intellectual Property Rights (IPR); Economic importance, mechanism for protection of Intellectual Property –patents, Copyright, Trademark; Factors affecting choice of IP protection; Penalties for violation; Role of IP in pharmaceutical industry; Global ramification and financial implications. Filing a patent applications; patent application forms and guidelines. Types patent applications-provisional and non-provisional, PCT and convention patent applications; International patenting requirement procedures and costs; Rights and responsibilities of a patentee; Practical aspects regarding maintaining of a Patent file; Patent infringement meaning and scope. Significance of transfer technology (TOT), IP and ethics-positive and negative aspects of IPP; Societal responsibility, avoiding unethical practices. 12 Hrs

REFERENCES

1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).
5. Michael Levin, Pharmaceutical Process Scale-Up||, Drugs and Pharm. Sci. Series, Vol. 157,2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Inter Science.

FOOD ANALYSIS (MPA 104T)

Scope

This course is designed to impart knowledge on analysis of food constituents and finished food products. The course includes application of instrumental analysis in the determination of pesticides in variety of food products.

Objectives

At completion of this course student shall be able to understand various analytical techniques in the determination of

- Food constituents
- Food additives
- Finished food products
- Pesticides in food
- And also student shall have the knowledge on food regulations and legislations

THEORY

60 Hrs

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| 1. | Carbohydrates: classification and properties of food carbohydrates, General methods of analysis of food carbohydrates, Changes in food carbohydrates during processing, Digestion, absorption and metabolism of carbohydrates, Dietary fibre, Crude fibre and application of food carbohydrates
Proteins: Chemistry and classification of amino acids and proteins, Physico-Chemical properties of protein and their structure, general methods of analysis of proteins and amino acids, Digestion, absorption and metabolism of proteins. | 12
Hrs |
| 2 | Lipids: Classification, general methods of analysis, refining of fats and oils; hydrogenation of vegetable oils, Determination of adulteration in fats and oils, Various methods used for measurement of spoilage of fats and fatty foods.
Vitamins: classification of vitamins, methods of analysis of vitamins, Principles of microbial assay of vitamins of B-series. | 12
Hrs |
| 3 | Food additives: Introduction, analysis of Preservatives, antioxidants, artificial sweeteners, flavors, flavor enhancers, stabilizers, thickening and jelling agents.
Pigments and synthetic dyes: Natural pigments, their occurrence and characteristic properties, permitted synthetic | 12
Hrs |

dyes, Non-permitted synthetic dyes used by industries, Method of detection of natural, permitted and non-permitted dyes.

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| 4 | General Analytical methods for milk, milk constituents and milk products like ice cream, milk powder, butter, margarine, cheese including adulterants and contaminants of milk.
Analysis of fermentation products like wine, spirits, beer and vinegar. | 12
Hrs |
| 5 | Pesticide analysis: Effects of pest and insects on various food, use of pesticides in agriculture, pesticide cycle, organophosphorus and organochlorine pesticides analysis, determination of pesticide residues in grain, fruits, vegetables, milk and milk products.
Legislation regulations of food products with special emphasis on BIS, Agmark, FDA and US-FDA. | 12
Hrs |

REFERENCES

1. The chemical analysis of foods – David Pearson, Seventh edition, Churchill Livingstone, Edinburgh London, 1976
2. Introduction to the Chemical analysis of foods – S. Nielsen, Jones & Bartlett publishers, Boston London, 1994.
3. Official methods of analysis of AOAC International, sixth edition, Volume I & II, 1997.
4. Analysis of Food constituents – Multon, Wiley VCH.
5. Dr. William Horwitz, Official methods of analysis of AOAC International, 18th edition, 2005.

PHARMACEUTICAL ANALYSIS PRACTICALS - II
(MPA 105P)

1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry
7. Assay of official compounds by different titrations
8. Assay of official compounds by instrumental techniques.
9. Quantitative determination of hydroxyl group.
10. Quantitative determination of amino group
11. Colorimetric determination of drugs by using different reagents
12. Impurity profiling of drugs
13. Calibration of glasswares
14. Calibration of pH meter
15. Calibration of UV-Visible spectrophotometer
16. Calibration of FTIR spectrophotometer
17. Calibration of GC instrument
18. Calibration of HPLC instrument
19. Cleaning validation of any one equipment
20. Determination of total reducing sugar
21. Determination of proteins
22. Determination of saponification value, Iodine value, Peroxide value, Acid value in food products
23. Determination of fat content and rancidity in food products
24. Analysis of natural and synthetic colors in food
25. Determination of preservatives in food
26. Determination of pesticide residue in food products
27. Analysis of vitamin content in food products
28. Determination of density and specific gravity of foods
29. Determination of food additives

ADVANCED INSTRUMENTAL ANALYSIS (MPA 201T)

Scope

This subject deals with various hyphenated analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are LC-MS, GC-MS, and hyphenated techniques.

Objectives

After completion of course student is able to know,

- interpretation of the NMR, Mass and IR spectra of various organic compounds
- theoretical and practical skills of the hyphenated instruments
- identification of organic compounds

THEORY

60 Hrs

1. HPLC: Principle, instrumentation, pharmaceutical applications, peak shapes, capacity factor, selectivity, plate number, plate height, resolution, band broadening, pumps, injector, detectors, columns, column problems, gradient HPLC, HPLC solvents, trouble shooting, sample preparation, method development, New developments in HPLC-role and principles of ultra, nano liquid chromatography in pharmaceutical analysis. Immobilized polysaccharide CSP's: Advancement in enantiomeric separations, revised phase Chiral method development and HILIC approaches. HPLC in Chiral analysis of pharmaceuticals. Preparative HPLC, practical aspects of preparative HPLC. 12 Hrs
- 2 Biochromatography: Size exclusion chromatography, ion exchange chromatography, ion pair chromatography, affinity chromatography general principles, stationary phases and mobile phases. 12 Hrs
Gas chromatography: Principles, instrumentation, derivatization, head space sampling, columns for GC, detectors, quantification.
High performance Thin Layer chromatography: Principles, instrumentation, pharmaceutical applications.
- 3 Super critical fluid chromatography: Principles, instrumentation, pharmaceutical applications. 12 Hrs
Capillary electrophoresis: Overview of CE in pharmaceutical analysis, basic configuration, CE characteristics, principles of CE, methods and modes of CE. General considerations and method

development in CE, Crown ethers as buffer additives in capillary electrophoresis. CE-MS hyphenation.

- 4 Mass spectrometry: Principle, theory, instrumentation of mass spectrometry, different types of ionization like electron impact, chemical, field, FAB and MALD, APCI, ESI, APPI mass fragmentation and its rules, meta stable ions, isotopic peaks and applications of mass spectrometry. LC-MS hyphenation and DART MS analysis. Mass analysers (Quadrpole, Time of flight, FT-ICR, ion trap and Orbitrap) instruments. MS/MS systems (Tandem: QqQ, TOF-TOF; Q-IT, Q-TOF, LTQ-FT, LTQ-Orbitrap. 12 Hrs
- 5 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR with reference to ¹³CNMR: Spin spin and spin lattice relaxation phenomenon. ¹³C NMR, 1-D and 2-D NMR, NOESY and COSY techniques, Interpretation and Applications of NMR spectroscopy. LC-NMR hyphenations. 12 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
5. Quantitative analysis of Pharmaceutical formulations by HPTLC - P D Sethi, CBS Publishers, New Delhi.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods - Part B - J W Munson, Volume 11, Marcel Dekker Series.
8. Organic Spectroscopy by Donald L. Paviya, 5th Edition.

MODERN BIO-ANALYTICAL TECHNIQUES (MPA 202T)

Scope

This subject is designed to provide detailed knowledge about the importance of analysis of drugs in biological matrices.

Objectives

Upon completion of the course, the student shall be able to understand

- Extraction of drugs from biological samples
- Separation of drugs from biological samples using different techniques
- Guidelines for BA/BE studies.

THEORY

60 Hrs

1. Extraction of drugs and metabolites from biological matrices: 12 Hrs
General need, principle and procedure involved in the Bioanalytical methods such as Protein precipitation, Liquid - Liquid extraction and Solid phase extraction and other novel sample preparation approach.
Bioanalytical method validation: USFDA and EMEA guidelines.
2. Biopharmaceutical Consideration: 12 Hrs
Introduction, Biopharmaceutical Factors Affecting Drug Bioavailability, In Vitro: Dissolution and Drug Release Testing, Alternative Methods of Dissolution Testing Transport models, Biopharmaceutics Classification System. Solubility: Experimental methods. Permeability: In-vitro, in-situ and In-vivo methods.
3. Pharmacokinetics and Toxicokinetics: 12 Hrs
Basic consideration, Drug interaction (PK-PD interactions), The effect of protein-binding interactions, The effect of tissue-binding interactions, Cytochrome P450-based drug interactions, Drug interactions linked to transporters. Microsomal assays Toxicokinetics-Toxicokinetic evaluation in preclinical studies, Importance and applications of toxicokinetic studies. LC-MS in bioactivity screening and proteomics.
4. Cell culture techniques 12 Hrs
Basic equipments used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of

cells and their applications. Principles and applications of cell viability assays (MTT assays), Principles and applications of flow cytometry.

- 5 Metabolite identification: 12 Hrs
In-vitro / in-vivo approaches, protocols and sample preparation.
Microsomal approaches (Rat liver microsomes (RLM) and Human liver microsomes (HLM) in Met-ID. Regulatory perspectives.
In-vitro assay of drug metabolites & drug metabolizing enzymes.

Drug Product Performance, In Vivo: Bioavailability and Bioequivalence:

Drug Product Performance, Purpose of Bioavailability Studies, Relative and Absolute Availability. Methods for Assessing Bioavailability, Bioequivalence Studies, Design and Evaluation of Bioequivalence Studies, Study Designs, Crossover Study Designs, Generic Biologics (Biosimilar Drug Products), Clinical Significance of Bioequivalence Studies.

REFERENCES

1. Analysis of drugs in Biological fluids - Joseph Chamberlain, 2nd Edition. CRC Press, Newyork. 1995.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Pharmaceutical Analysis - Higuchi, Brochmman and Hassen, 2nd Edition, Wiley - Interscience Publications, 1961.
4. Pharmaceutical Analysis- Modern methods - Part B - J W Munson, Volume 11, Marcel Dekker Series
5. Practical HPLC method Development - Snyder, Kirkland, Glaich, 2nd Edition, John Wiley & Sons, New Jercey. USA.
6. Chromatographic Analysis of Pharmaceuticals - John A Adamovics, 2nd Edition, Marcel Dekker, Newyork, USA. 1997.
7. Chromatographic methods in clinical chemistry & Toxicology - Roger L Bertholf, Ruth E Winecker, John Wiley & Sons, New Jercey, USA. 2007.
8. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
9. Good laboratory Practice Regulations - Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
10. ICH, USFDA & CDSCO Guidelines.
11. Palmer

QUALITY CONTROL AND QUALITY ASSURANCE (MPA 203T)

Scope

This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications, GLP and regulatory affairs.

Objectives

At the completion of this subject it is expected that the student shall be able to know

- the cGMP aspects in a pharmaceutical industry
- to appreciate the importance of documentation
- to understand the scope of quality certifications applicable to Pharmaceutical industries
- to understand the responsibilities of QA & QC departments

THEORY

- | | |
|---|--------|
| | 60 hrs |
| 1. Concept and Evolution of Quality Control and Quality Assurance | 12 Hrs |
| Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q-series guidelines. | |
| Good Laboratory Practices: Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non clinical testing, control on animal house, report preparation and documentation. | |
| 2. cGMP guidelines according to schedule M, USFDA (inclusive of CDER and CBER) Pharmaceutical Inspection Convention (PIC), WHO and EMEA covering: Organization and personnel responsibilities, training, hygiene and personal records, drug industry location, design, construction and plant lay out, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination and Good Warehousing Practice. CPCSEA guidelines. | 12 Hrs |
| 3. Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), Developing specification (ICH Q6 and Q3) | 12 Hrs |

Purchase specifications and maintenance of stores for raw materials. In process quality control and finished products quality control for following formulation in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenterals, ophthalmic and surgical products (How to refer pharmacopoeias), Quality control test for containers, closures and secondary packing materials.

4. Documentation in pharmaceutical industry: Three tier documentation, Policy, Procedures and Work instructions, and records (Formats), Basic principles- How to maintain, retention and retrieval etc. Standard operating procedures (How to write), Master Formula Record, Batch Formula Record, Quality audit plan and reports. Specification and test procedures, Protocols and reports. Distribution records. Electronic data. 12 Hrs
5. Manufacturing operations and controls: Sanitation of manufacturing premises, mix-ups and cross contamination, processing of intermediates and bulk products, packaging operations, IPQC, release of finished product, process deviations, charge-in of components, time limitations on production, drug product inspection, expiry date calculation, calculation of yields, production record review, change control, sterile products, aseptic process control, packaging. 12 Hrs

REFERENCES

1. Quality Assurance Guide by organization of Pharmaceutical Procedures of India, 3rd revised edition, Volume I & II, Mumbai, 1996.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
3. Quality Assurance of Pharmaceuticals- A compedium of Guide lines and Related materials Vol I & II, 2nd edition, WHO Publications, 1999.
4. How to Practice GMP's – P P Sharma, Vandana Publications, Agra, 1991.
5. The International Pharmacopoeia – vol I, II, III, IV & V - General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms, 3rd edition, WHO, Geneva, 2005.
6. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
7. ICH guidelines
8. ISO 9000 and total quality management

9. The drugs and cosmetics act 1940 – Deshpande, Nilesh Gandhi, 4th edition, Susmit Publishers, 2006.
10. QA Manual – D.H. Shah, 1st edition, Business Horizons, 2000.
11. Good Manufacturing Practices for Pharmaceuticals a plan for total quality control – Sidney H. Willig, Vol. 52, 3rd edition, Marcel Dekker Series.
12. Steinborn L. GMP/ISO Quality Audit Manual for Healthcare Manufacturers and Their Suppliers, Sixth Edition, (Volume 1 - With Checklists and Software Package). Taylor & Francis; 2003.
13. Sarker DK. Quality Systems and Controls for Pharmaceuticals. John Wiley & Sons; 2008.

HERBAL AND COSMETIC ANALYSIS (MPA 204T)

Scope

This course is designed to impart knowledge on analysis of herbal products. Regulatory requirements, herbal drug interaction with monographs. Performance evaluation of cosmetic products is included for the better understanding of the equipments used in cosmetic industries for the purpose.

Objectives

At completion of this course student shall be able to understand

- Determination of herbal remedies and regulations
- Analysis of natural products and monographs
- Determination of Herbal drug-drug interaction
- Principles of performance evaluation of cosmetic products.

THEORY

60 Hrs

1. Herbal remedies- Toxicity and Regulations: Herbals vs Conventional drugs, Efficacy of herbal medicine products, Validation of Herbal Therapies, Pharmacodynamic and Pharmacokinetic issues. Herbal drug standardization: WHO and AYUSH guidelines. 12 Hrs

2. Adulteration and Deterioration: Introduction, types of adulteration/substitution of herbal drugs, Causes and Measure of adulteration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, heavy metals, pesticide residues, phototoxin and microbial contamination in herbal formulations. Regulatory requirements for setting herbal drug industry: Global marketing management, Indian and international patent law as applicable herbal drugs and natural products and its protocol. 12 Hrs

3. Testing of natural products and drugs: Effect of herbal medicine on clinical laboratory testing, Adulterant Screening using modern analytical instruments, Regulation and dispensing of herbal drugs, Stability testing of natural products, protocol. 12 Hrs

Monographs of Herbal drugs: Study of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic

Pharmacopoeia, American herbal Pharmacopoeia, British herbal Pharmacopoeia, Siddha and Unani Pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.

- 4 Herbal drug-drug interaction: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for bio drug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples. Challenges in monitoring the safety of herbal medicines. 12 Hrs
- 5 Evaluation of cosmetic products: Determination of acid value, ester value, saponification value, iodine value, peroxide value, rancidity, moisture, ash, volatile matter, heavy metals, fineness of powder, density, viscosity of cosmetic raw materials and finished products. Study of quality of raw materials and general methods of analysis of raw material used in cosmetic manufacture as per BIS. 12 Hrs
- Indian Standard specification laid down for sampling and testing of various cosmetics in finished forms such as baby care products, skin care products, dental products, personal hygiene preparations, lips sticks. Hair products and skin creams by the Bureau Indian Standards.

REFERENCES

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Quality Control Methods for Medicinal Plant, WHO, Geneva
4. Pharmacognosy & Pharmacobiotechnology by Ashutosh Kar
5. Essential of Pharmacognosy by Dr.S.H.Ansari
6. Cosmetics - Formulation, Manufacturing and Quality Control, P.P. Sharma, 4th edition, Vandana Publications Pvt. Ltd., Delhi
7. Indian Standard specification, for raw materials, BIS, New Delhi.
8. Indian Standard specification for 28 finished cosmetics BIS, New Delhi
9. Harry's Cosmeticology 8th edition
10. Suppliers catalogue on specialized cosmetic excipients
11. Wilkinson, Moore, seventh edition, George Godwin. Poucher's Perfumes, Cosmetics and Soaps
12. Hilda Butler, 10th Edition, Kluwer Academic Publishers. Handbook of Cosmetic Science and Technology, 3rd Edition,

PHARMACEUTICAL ANALYSIS PRACTICALS - I
(MPA 205P)

1. Comparison of absorption spectra by UV and Wood ward – Fiesure rule
2. Interpretation of organic compounds by FT-IR
3. Interpretation of organic compounds by NMR
4. Interpretation of organic compounds by MS
5. Determination of purity by DSC in pharmaceuticals
6. Identification of organic compounds using FT-IR, NMR, CNMR and Mass spectra
7. Bio molecules separation utilizing various sample preparation techniques and Quantitative analysis of components by gel electrophoresis.
8. Bio molecules separation utilizing various sample preparation techniques and Quantitative analysis of components by HPLC techniques.
9. Isolation of analgesics from biological fluids (Blood serum and urine).
10. Protocol preparation and performance of analytical/Bioanalytical method validation.
11. Protocol preparation for the conduct of BA/BE studies according to guidelines.
12. In process and finished product quality control tests for tablets, capsules, parenterals and creams
13. Quality control tests for Primary and secondary packing materials
14. Assay of raw materials as per official monographs
15. Testing of related and foreign substances in drugs and raw materials
16. Preparation of Master Formula Record.
17. Preparation of Batch Manufacturing Record.
18. Quantitative analysis of rancidity in lipsticks and hair oil
19. Determination of aryl amine content and Developer in hair dye
20. Determination of foam height and SLS content of Shampoo.
21. Determination of total fatty matter in creams (Soap, skin and hair creams)
22. Determination of acid value and saponification value.
23. Determination of calcium thioglycolate in depilatories

PHARMACEUTICAL QUALITY ASSURANCE (MQA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MQA 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about chemicals and excipients

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 Hrs

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. 12 Hrs
b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.
c. Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.
d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy. 12 Hrs

- 3 Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy. 12 Hrs
- 4 Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: 12 Hrs
- Thin Layer chromatography
 - High Performance Thin Layer Chromatography
 - Ion exchange chromatography
 - Column chromatography
 - Gas chromatography
 - High Performance Liquid chromatography
 - Ultra High Performance Liquid chromatography
 - Affinity chromatography
 - Gel Chromatography
- 5 a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: 12 Hrs
- a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing
- b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.
- 6 a. Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. 12 Hrs
- b. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation

and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods - Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.
10. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

QUALITY MANAGEMENT SYSTEMS (MQA 102T)

Scope

This course is designed to impart fundamental knowledge and concepts about various quality management principles and systems utilized in the manufacturing industry. It also aids in understanding the quality evaluation in the pharmaceutical industries.

Objectives

At completion of this course it is expected that students will be able to understand-

- The importance of quality
- ISO management systems
- Tools for quality improvement
- Analysis of issues in quality
- Quality evaluation of pharmaceuticals
- Stability testing of drug and drug substances
- Statistical approaches for quality

THEORY

60 Hrs

1. Introduction to Quality: Evolution of Quality, Definition of Quality, Dimensions of Quality 12 Hrs
Quality as a Strategic Decision: Meaning of strategy and strategic quality management, mission and vision statements, quality policy, Quality objectives, strategic planning and implementation, McKinsey 7s model, Competitive analysis, Management commitment to quality
Customer Focus: Meaning of customer and customer focus, Classification of customers, Customer focus, Customer perception of quality, Factors affecting customer perception, Customer requirements, Meeting customer needs and expectations, Customer satisfaction and Customer delight, Handling customer complaints, Understanding customer behavior, concept of internal and external customers. Case studies.
Cost of Quality: Cost of quality, Categories of cost of Quality, Models of cost of quality, Optimising costs, Preventing cost of quality.

- | | | |
|---|--|-----------|
| 2 | Pharmaceutical quality Management: Basics of Quality Management, Total Quality Management (TQM), Principles of Six sigma, ISO 9001:2008, 9001:2015, ISO 14001:2004, Pharmaceutical Quality Management – ICH Q10, Knowledge management, Quality Metrics, Operational Excellence and Quality Management Review. OSHAS guidelines, NABL certification and accreditation, CFR-21 part 11, WHO-GMP requirements. | 12
Hrs |
| 3 | Six System Inspection model: Quality Management system, Production system, Facility and Equipment system, Laboratory control system, Materials system, Packaging and labeling system. Concept of self inspection.
Quality systems: Change Management/ Change control. Deviations, Out of Specifications (OOS), Out of Trend (OOT), Complaints - evaluation and handling, Investigation and determination of root cause, Corrective & Preventive Actions (CAPA), Returns and Recalls, Vendor Qualification, Annual Product Reviews, Batch Review and Batch Release. Concept of IPQC, area clearance/ Line clearance. | 12
Hrs |
| 4 | Drug Stability: ICH guidelines for stability testing of drug substances and drug products.
Study of ICH Q8, Quality by Design and Process development report
Quality risk management: Introduction, risk assessment, risk control, risk review, risk management tools, HACCP, risk ranking and filtering according to ICH Q9 guidelines. | 12
Hrs |
| 5 | Statistical Process control (SPC): Definition and Importance of SPC, Quality measurement in manufacturing, Statistical control charts - concepts and general aspects, Advantages of statistical control, Process capability, Estimating Inherent or potential capability from a control chart analysis, Measuring process control and quality improvement, Pursuit of decreased process variability. | 8 Hrs |
| 6 | Regulatory Compliance through Quality Management and development of Quality Culture
Benchmarking: Definition of benchmarking, Reasons for benchmarking, Types of Benchmarking, Benchmarking process, Advantages of benchmarking, Limitations of benchmarking. | 4 Hrs |

REFERENCES

1. Implementing Juran's Road Map for Quality Leadership: Benchmarks and Results, By Al Endres, Wiley, 2000
2. Understanding, Managing and Implementing Quality: Frameworks, Techniques and Cases, By Jiju Antony; David Preece, Routledge, 2002
3. Organizing for High Performance: Employee Involvement, TQM, Reengineering, and Knowledge Management in the Fortune 1000: The CEO Report By Edward E. Lawler; Susan Albers Mohrman; George Benson, Jossey-Bass, 2001
4. Corporate Culture and the Quality Organization By James W. Fairfield-Sonn, Quorum Books, 2001
5. The Quality Management Sourcebook: An International Guide to Materials and Resources By Christine Avery; Diane Zabel, Routledge, 1997
6. The Quality Toolbox, Second Edition, Nancy R. Tague, ASQ Publications
7. Juran's Quality Handbook, Sixth Edition, Joseph M. Juran and Joseph A. De Feo, ASQ Publications
8. Root Cause Analysis, The Core of Problem Solving and Corrective Action, Duke Okes, 2009, ASQ Publications.

QUALITY CONTROL AND QUALITY ASSURANCE (MQA 103T)

Scope

This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications, GLP and regulatory affairs.

Objectives

Upon completion of this course the student should be able to

- Understand the cGMP aspects in a pharmaceutical industry
- To appreciate the importance of documentation
- To understand the scope of quality certifications applicable to Pharmaceutical industries
- To understand the responsibilities of QA & QC departments.

THEORY

60 Hrs

1. Introduction: Concept and evolution and scopes of Quality Control and Quality Assurance, Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q-series guidelines.
Good Laboratory Practices: Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non clinical testing, control on animal house, report preparation and documentation. CPCSEA guidelines. 12 Hrs

2. cGMP guidelines according to schedule M, USFDA (inclusive of CDER and CBER) Pharmaceutical Inspection Convention(PIC), WHO and EMEA covering: Organization and personnel responsibilities, training, hygiene and personal records, drug industry location, design, construction and plant lay out, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination and Good Warehousing Practice. 12 Hrs

3. Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), Developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials. 12 Hrs

In process quality control and finished products quality control for following dosage forms in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenterals, ophthalmic and surgical products (How to refer pharmacopoeias).

- 4 Documentation in pharmaceutical industry: Three tier documentation, Policy, Procedures and Work instructions, and records (Formats), Basic principles- How to maintain, retention and retrieval etc. Standard operating procedures (How to write), Master Batch Record, Batch Manufacturing Record, Quality audit plan and reports. Specification and test procedures, Protocols and reports. Distribution records. Electronic data handling. Concepts of controlled and uncontrolled documents. Submission documents for regulators DMFs, as Common Technical Document and Electronic Common Technical Documentation (CTD, eCTD). Concept of regulated and non regulated markets. 12 Hrs
- 5 Manufacturing operations and controls: Sanitation of manufacturing premises, mix-ups and cross contamination, processing of intermediates and bulk products, packaging operations, IPQC, release of finished product, process deviations, charge-in of components, time limitations on production, drug product inspection, expiry date calculation, calculation of yields, production record review, change control, sterile products, aseptic process control, packaging, reprocessing, salvaging, handling of waste and scrap disposal. 12 Hrs
- Introduction, scope and importance of intellectual property rights. Concept of trade mark, copyright and patents.

REFERENCES

1. Quality Assurance Guide by organization of Pharmaceutical Procedures of India, 3rd revised edition, Volume I & II, Mumbai, 1996.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
3. Quality Assurance of Pharmaceuticals- A compedium of Guide lines and Related materials Vol I & II, 2nd edition, WHO Publications, 1999.
4. How to Practice GMP's - P P Sharma, Vandana Publications, Agra, 1991.

5. The International Pharmacopoeia – vol I, II, III, IV & V - General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms, 3rd edition, WHO, Geneva, 2005.
6. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
7. ICH guidelines
8. ISO 9000 and total quality management
9. The drugs and cosmetics act 1940 – Deshpande, Nilesh Gandhi, 4th edition, Susmit Publishers, 2006.
10. QA Manual – D.H. Shah, 1st edition, Business Horizons, 2000.
11. Good Manufacturing Practices for Pharmaceuticals a plan for total quality control – Sidney H. Willig, Vol. 52, 3rd edition, Marcel Dekker Series.
12. Steinborn L. GMP/ISO Quality Audit Manual for Healthcare Manufacturers and Their Suppliers, Sixth Edition, (Volume 1 - With Checklists and Software Package). Taylor & Francis; 2003.
13. Sarker DK. Quality Systems and Controls for Pharmaceuticals. John Wiley & Sons; 2008.
14. Packaging of Pharmaceuticals.
15. Schedule M and Schedule N.

PRODUCT DEVELOPMENT AND TECHNOLOGY TRANSFER (MQA 104T)

Scope

This deal with technology transfer covers the activities associated with Drug Substance, Drug Product and analytical tests and methods, required following candidate drug selection to completion of technology transfer from R&D to the first receiving site and technology transfer related to post-marketing changes in manufacturing places.

Objectives

Upon completion of this course the student should be able to

- To understand the new product development process
- To understand the necessary information to transfer technology from R&D to actual manufacturing by sorting out various information obtained during R&D
- To elucidate necessary information to transfer technology of existing products between various manufacturing places

THEORY

60 Hrs

1. Principles of Drug discovery and development: Introduction, Clinical research process. Development and informational content for Investigational New Drugs Application (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Supplemental New Drug Application (SNDA), Scale Up Post Approval Changes (SUPAC) and Bulk active chemical Post approval changes (BACPAC), Post marketing surveillance, Product registration guidelines – CDSCO, USFDA. 12 Hrs
- 2 Pre-formulation studies: Introduction/concept, organoleptic properties, purity, impurity profiles, particle size, shape and surface area. Solubility, Methods to improve solubility of Drugs: Surfactants & its importance, co-solvency. Techniques for the study of Crystal properties and polymorphism. Pre-formulation protocol, Stability testing during product development. 12 Hrs
- 3 Pilot plant scale up: Concept, Significance, design, layout of pilot plant scale up study, operations, large scale manufacturing techniques (formula, equipment, process, stability and quality control) of solids, liquids, semisolid and parenteral dosage forms. New era of drug products: opportunities and challenges. 12 Hrs

- 4 Pharmaceutical packaging: Pharmaceutical dosage form and their packaging requirements, Pharmaceutical packaging materials, Medical device packaging, Enteral Packaging, Aseptic packaging systems, Container closure systems, Issues facing modern drug packaging, Selection and evaluation of Pharmaceutical packaging materials. 12 Hrs
Quality control test: Containers, closures and secondary packing materials.
- 5 Technology transfer: Development of technology by R & D, Technology transfer from R & D to production, Optimization and Production, Qualitative and quantitative technology models. 12 Hrs
Documentation in technology transfer: Development report, technology transfer plan and Exhibit.

REFERENCES

1. The process of new drug discovery and development. I and II Edition (2006) by Charles G. Smith, James T and O. Donnell. CRC Press, Group of Taylor and Francis.
2. Leon Lac Lachman, Herbert A. Liberman, Theory and Practice of Industrial Pharmacy. Marcel Dekker Inc. New York.
3. Sidney H Willing, Murray M, Tuckerman. Williams Hitchings IV, Good manufacturing of pharmaceuticals (A Plan for total quality control) 3rd Edition. Bhalani publishing house Mumbai.
4. Tablets Vol. I, II, III by Leon Lachman, Herbert A. Liberman, Joseph B. Schwartz, 2nd Edn. (1989) Marcel Dekker Inc. New York.
5. Text book of Bio- Pharmaceutics and clinical Pharmacokinetics by Milo Gibaldi, 3rd Edn, Lea & Febriger, Philadelphia.
6. Pharmaceutical product development. Vandana V. Patrevala. John I. Disouza. Maharukh T.Rustomji. CRC Press, Group of Taylor and Francis.
7. Dissolution, Bioavailability and Bio-Equivalence by Abdou H.M, Mack Publishing company, Eastern Pennsylvania.
8. Remingtons Pharmaceutical Sciences, by Alfonso & Gennaro, 19th Edn.(1995)OO2C Lippincott; Williams and Wilkins A Wolters Kluwer Company, Philadelphia.
9. The Pharmaceutical Sciences; the Pharma Path way 'Pure and applied Pharmacy' by D. A Sawant, Pragathi Books Pvt. Ltd.
10. Pharmaceutical Packaging technology by D.A. Dean. E.R. Evans, I.H. Hall. 1st Edition(Reprint 2006). Taylor and Francis. London and New York.

QUALITY ASSURANCE PRACTICAL - I
(MQA 105P)

PRACTICALS

1. Analysis of Pharmacopoeial compounds in bulk and in their formulations (tablet/ capsules/ semisolids) by UV Vis spectrophotometer
2. Simultaneous estimation of multi-drug component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry or AAS
7. Case studies on
 - Total Quality Management
 - Six Sigma
 - Change Management/ Change control. Deviations,
 - Out of Specifications (OOS)
 - Out of Trend (OOT)
 - Corrective & Preventive Actions (CAPA)
 - Deviations
8. Development of Stability study protocol
9. Estimation of process capability
10. In process and finished product quality control tests for tablets, capsules, parenterals and semisolid dosage forms.
11. Assay of raw materials as per official monographs
12. Testing of related and foreign substances in drugs and raw materials
13. To carry out pre formulation study for tablets, parenterals (2 experiment).
14. To study the effect of pH on the solubility of drugs, (1 experiment)
15. Quality control tests for Primary and secondary packaging materials
16. Accelerated stability studies (1 experiment)
17. Improved solubility of drugs using surfactant systems (1 experiment)
18. Improved solubility of drugs using co-solvency method (1 experiment)
19. Determination of Pka and Log p of drugs.

HAZARDS AND SAFETY MANAGEMENT (MQA 201T)

Scope

This course is designed to convey the knowledge necessary to understand issues related to different kinds of hazard and their management. Basic theoretical and practical discussions integrate the proficiency to handle the emergency situation in the pharmaceutical product development process and provides the principle based approach to solve the complex tribulations.

Objectives

At completion of this course it is expected that students will be able to

- Understand about environmental problems among learners.
- Impart basic knowledge about the environment and its allied problems.
- Develop an attitude of concern for the industry environment.
- Ensure safety standards in pharmaceutical industry
- Provide comprehensive knowledge on the safety management
- Empower an ideas to clear mechanism and management in different kinds of hazard management system
- Teach the method of Hazard assessment, procedure, methodology for provide safe industrial atmosphere.

THEORY

60Hrs

- | | | |
|----|---|-----------|
| 1. | Multidisciplinary nature of environmental studies: Natural Resources, Renewable and non-renewable resources, Natural resources and associated problems,
a) Forest resources; b) Water resources; c) Mineral resources; d) Energy resources; e) Land resources
Ecosystems: Concept of an ecosystem and Structure and function of an ecosystem. Environmental hazards: Hazards based on Air, Water, Soil and Radioisotopes. | 12
Hrs |
| 2 | Air based hazards: Sources, Types of Hazards, Air circulation maintenance industry for sterile area and non sterile area, Preliminary Hazard Analysis (PHA) Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system. | 12
Hrs |
| 3 | Chemical based hazards: Sources of chemical hazards, Hazards of Organic synthesis, sulphonating hazard, Organic solvent hazard, Control measures for chemical hazards, | 12
Hrs |

Management of combustible gases, Toxic gases and Oxygen displacing gases management, Regulations for chemical hazard, Management of over-Exposure to chemicals and TLV concept.

- 4 Fire and Explosion: Introduction, Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system mechanical and chemical explosion, multiphase reactions, transport effects and global rates. Preventive and protective management from fires and explosion-electricity passivation, ventilation, and sprinkling, proofing, relief systems -relief valves, flares, scrubbers. 12 Hrs
- 5 Hazard and risk management: Self-protective measures against workplace hazards. Critical training for risk management, Process of hazard management, ICH guidelines on risk assessment and Risk management methods and Tools
Factory act and rules, fundamentals of accident prevention, elements of safety programme and safety management, Physicochemical measurements of effluents, BOD, COD, Determination of some contaminants, Effluent treatment procedure, Role of emergency services. 12 Hrs

REFERENCES

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. "Quantitative Risk Assessment in Chemical Process Industries" American Institute of Chemical Industries, Centre for Chemical Process safety.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India,
4. Hazardous Chemicals: Safety Management and Global Regulations, T.S.S. Dikshith, CRC press

PHARMACEUTICAL VALIDATION (MQA 202T)

Scope

The main purpose of the subject is to understand about validation and how it can be applied to industry and thus improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Objectives

At completion of this course, it is expected that students will be able to understand

- The concepts of calibration, qualification and validation
- The qualification of various equipments and instruments
- Process validation of different dosage forms
- Validation of analytical method for estimation of drugs
- Cleaning validation of equipments employed in the manufacture of pharmaceuticals

THEORY

60 Hrs

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|----|--|-----------|
| 1. | Introduction to validation: Definition of Calibration, Qualification and Validation, Scope, frequency and importance. Difference between calibration and validation. Calibration of weights and measures. Advantages of Validation, scope of Validation, Organization for Validation, Validation Master plan, Types of Validation, Streamlining of qualification & Validation process and Validation Master Plan.
Qualification: User requirement specification, Design qualification, Factory Acceptance Test (FAT)/Site Acceptance Test (SAT), Installation qualification, Operational qualification, Performance qualification, Re-Qualification (Maintaining status-Calibration Preventive Maintenance, Change management). | 10
Hrs |
| 2 | Qualification of manufacturing equipment: Dry Powder Mixers, Fluid Bed and Tray dryers, Tablet Compression (Machine), Dry heat sterilization/Tunnels, Autoclaves, Membrane filtration, Capsule filling machine.
Qualification of analytical instruments: UV-Visible spectrophotometer, FTIR, DSC, GC, HPLC, HPTLC, LC-MS. | 10
Hrs |

- 3 Qualification of laboratory equipments: Hardness tester, Friability test apparatus, tap density tester, Disintegration tester, Dissolution test apparatus
Validation of Utility systems: Pharmaceutical water system & pure steam, HVAC system, Compressed air and nitrogen. 10 Hrs
- 4 Process Validation: Concept, Process and documentation of Process Validation. Prospective, Concurrent & Retrospective Validation, Re validation criteria, Process Validation of various formulations (Coated tablets, Capsules, Ointment/Creams, Liquid Orals and aerosols.), Aseptic filling: Media fill validation, USFDA guidelines on Process Validation- A life cycle approach. Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP. 10 Hrs
- 5 Cleaning Validation: Cleaning Method development, Validation of analytical method used in cleaning, Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP). Validation of facilities in sterile and non-sterile plant. Computerized system validation: Electronic records and digital signature - 21 CFR Part 11 and GAMP 10 Hrs
- 6 General Principles of Intellectual Property: Concepts of Intellectual Property (IP), Intellectual Property Protection (IPP), Intellectual Property Rights (IPR); Economic importance, mechanism for protection of Intellectual Property –patents, Copyright, Trademark; Factors affecting choice of IP protection; Penalties for violation; Role of IP in pharmaceutical industry; Global ramification and financial implications. Filing a patent applications; patent application forms and guidelines. Types patent applications-provisional and non provisional, PCT and convention patent applications; International patenting requirement procedures and costs; Rights and responsibilities of a patentee; Practical aspects regarding maintaining of a Patent file; Patent infringement meaning and scope. Significance of transfer technology (TOT), IP and ethics-positive and negative aspects of IPP; Societal responsibility, avoiding unethical practices. 10 Hrs

REFERENCES

1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco,
5. (Marcel Dekker).
6. Michael Levin, Pharmaceutical Process Scale-Up", Drugs and Pharm. Sci. Series, Vol. 157, 2nd Ed., Marcel Dekker Inc., N.Y.
7. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
8. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
9. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker
10. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Interscience.
11. Huber L. Validation and Qualification in Analytical Laboratories. Informa Healthcare
12. Wingate G. Validating Corporate Computer Systems: Good IT Practice for Pharmaceutical Manufacturers. Interpharm Press
13. LeBlanc DA. Validated Cleaning Technologies for Pharmaceutical Manufacturing. Interpharm Press

AUDITS AND REGULATORY COMPLIANCE (MPA 203T)

Scope

This course deals with the understanding and process for auditing in pharmaceutical industries. This subject covers the methodology involved in the auditing process of different in pharmaceutical industries.

Objectives

Upon completion of this course the student should be able to

- To understand the importance of auditing
- To understand the methodology of auditing
- To carry out the audit process
- To prepare the auditing report
- To prepare the check list for auditing

THEORY

60 Hrs

- | | | |
|----|---|-----------|
| 1. | Introduction: Objectives, Management of audit, Responsibilities, Planning process, information gathering, administration, Classifications of deficiencies | 12
Hrs |
| 2 | Role of quality systems and audits in pharmaceutical manufacturing environment: cGMP Regulations, Quality assurance functions, Quality systems approach, Management responsibilities, Resource, Manufacturing operations, Evaluation activities, Transitioning to quality system approach, Audit checklist for drug industries. | 12
Hrs |
| 3 | Auditing of vendors and production department: Bulk Pharmaceutical Chemicals and packaging material Vendor audit, Warehouse and weighing, Dry Production: Granulation, tableting, coating, capsules, sterile production and packaging. | 12
Hrs |
| 4 | Auditing of Microbiological laboratory: Auditing the manufacturing process, Product and process information, General areas of interest in the building raw materials, Water, Packaging materials. | 12
Hrs |

- 5 Auditing of Quality Assurance and engineering department: 12
Quality Assurance Maintenance, Critical systems: HVAC, Water, Hrs
Water for Injection systems, ETP.

REFERENCES

1. Compliance auditing for Pharmaceutical Manufacturers. Karen Ginsbury and Gil Bismuth, Interpharm/CRC, Boca Raton, London New York, Washington D.C.
2. Pharmaceutical Manufacturing Handbook, Regulations and Quality by Shayne Cox Gad. Wiley-Interscience, A John Wiley and sons, Inc., Publications.
3. Handbook of microbiological Quality control. Rosamund M. Baird, Norman A. Hodges, Stephen P. Denyar. CRC Press. 2000.
4. Laboratory auditing for quality and regulatory compliance. Donald C. Singer, Raluca-loana Stefan, Jacobus F. Van Staden. Taylor and Francis (2005).

PHARMACEUTICAL MANUFACTURING TECHNOLOGY (MQA 204T)

Scope

This course is designed to impart knowledge and skills necessary to train the students with the industrial activities during Pharmaceutical Manufacturing.

Objectives

At completion of this course it is expected that students will be able to understand,

- The common practice in the pharmaceutical industry developments, plant layout and production planning
- Will be familiar with the principles and practices of aseptic process technology, non sterile manufacturing technology and packaging technology.
- Have a better understanding of principles and implementation of Quality by design (QbD) and process analytical technology (PAT) in pharmaceutical manufacturing

THEORY

60 Hrs

1. Pharmaceutical industry developments: Legal requirements and Licenses for API and formulation industry, Plant location-Factors influencing. 12 Hrs
Plant layout: Factors influencing, Special provisions, Storage space requirements, sterile and aseptic area layout.
Production planning: General principles, production systems, calculation of standard cost, process planning, routing, loading, scheduling, dispatching of records, production control.
- 2 Aseptic process technology: Manufacturing, manufacturing flowcharts, in process-quality control tests for following sterile dosage forms: Ointment, Suspension and Emulsion, Dry powder, Solution (Small Volume & large Volume). 12 Hrs
Advanced sterile product manufacturing technology : Area planning & environmental control, wall and floor treatment, fixtures and machineries, change rooms, personnel flow, utilities & utilities equipment location, engineering and maintenance.
Process Automation in Pharmaceutical Industry: With specific reference to manufacturing of sterile semisolids, Small Volume Parenterals & Large Volume Parenterals (SVP & LVP), Monitoring of Parenteral manufacturing facility, Cleaning in Place (CIP),

Sterilization in Place (SIP), Prefilled Syringe, Powdered Jet, Needle Free Injections, and Form Fill Seal Technology (FFS).
Lyophilization technology: Principles, process, equipment.

- 3 Non sterile manufacturing process technology: 12 Hrs
Manufacturing, manufacturing flowcharts, in process-quality control tests for following Non-Sterile solid dosage forms: Tablets (compressed & coated), Capsules (Hard & Soft).
Advance non-sterile solid product manufacturing technology: Process Automation in Pharmaceutical Industry with specific reference to manufacturing of tablets and coated products, Improved Tablet Production: Tablet production process, granulation and pelletization equipments, continuous and batch mixing, rapid mixing granulators, rota granulators, spheronizers and marumerisers, and other specialized granulation and drying equipments. Problems encountered.
Coating technology: Process, equipments, particle coating, fluidized bed coating, application techniques. Problems encountered.
- 4 Containers and closures for pharmaceuticals: Types, 12 Hrs
performance, assuring quality of glass; types of plastics used, Drug plastic interactions, biological tests, modification of plastics by drugs; different types of closures and closure liners; film wrapper; blister packs; bubble packs; shrink packaging; foil / plastic pouches, bottle seals, tape seals, breakable seals and sealed tubes; quality control of packaging material and filling equipment, flexible packaging, product package compatibility, transit worthiness of package, Stability aspects of packaging. Evaluation of stability of packaging material.
- 5 Quality by design (QbD) and process analytical technology 12 Hrs
(PAT): Current approach and its limitations. Why QbD is required, Advantages, Elements of QbD, Terminology: QTPP. CMA, CQA, CPP, RLD, Design space, Design of Experiments, Risk Assessment and mitigation/minimization. Quality by Design, Formulations by Design, QbD for drug products, QbD for Drug Substances, QbD for Excipients, Analytical QbD. FDA initiative on process analytical technology. PAT as a driver for improving quality and reducing costs: quality by design (QbD), QA, QC and GAMP. PAT guidance, standards and regulatory requirements.

REFERENCES

1. Lachman L, Lieberman HA, Kanig J L. The theory and practice of industrial pharmacy, 3rd ed., Varghese Publishers, Mumbai 1991.
2. Sinko P J. Martin's physical pharmacy and pharmaceutical sciences, 5th ed., B.I. Publications Pvt. Ltd, Noida, 2006.
3. Lieberman HA, Lachman L, Schwartz J B. Pharmaceutical dosage forms: tablets Vol. I-III, 2nd ed., CBS Publishers & distributors, New Delhi, 2005.
4. Banker GS, Rhodes CT. Modern Pharmaceutics, 4th ed., Marcel Dekker Inc, New York, 2005.
5. Sidney H Willing, Murray M, Tuckerman. Williams Hitchings IV, Good manufacturing of pharmaceuticals (A Plan for total quality control) 3rd Edition. Bhalani publishing house Mumbai.
6. Indian Pharmacopoeia. Controller of Publication. Delhi, 1996.
7. British Pharmacopoeia. British Pharmacopoeia Commission Office, London, 2008.
8. United States Pharmacopoeia. United States Pharmacopoeial Convention, Inc, USA, 2003.
9. Dean D A, Evans E R and Hall I H. Pharmaceutical Packaging Technology. London, Taylor & Francis, 1st Edition. UK.
10. Edward J Bauer. Pharmaceutical Packaging Handbook. 2009. Informa Health care USA Inc. New york.
11. Shaybe Cox Gad. Pharmaceutical Manufacturing Handbook. John Willey and Sons, New Jersey, 2008.

QUALITY ASSURANCE PRACTICAL – II PRACTICALS
(MQA 205P)

1. Organic contaminants residue analysis by HPLC
2. Estimation of Metallic contaminants by Flame photometer
3. Identification of antibiotic residue by TLC
4. Estimation of Hydrogen Sulphide in Air.
5. Estimation of Chlorine in Work Environment.
6. Sampling and analysis of SO₂ using Colorimetric method
7. Qualification of following Pharma equipment
 - a. Autoclave
 - b. Hot air oven
 - c. Powder Mixer (Dry)
 - d. Tablet Compression Machine
8. Validation of an analytical method for a drug
9. Validation of a processing area
10. Qualification of at least two analytical instruments
11. Cleaning validation of one equipment
12. Qualification of Pharmaceutical Testing Equipment (Dissolution testing apparatus, Friability Apparatus, Disintegration Tester)
13. Check list for Bulk Pharmaceutical Chemicals vendors
14. Check list for tableting production.
15. Check list for sterile production area
16. Check list for Water for injection.
17. Design of plant layout: Sterile and non-sterile
18. Case study on application of QbD
19. Case study on application of PAT

PHARMACEUTICAL REGULATORY AFFAIRS (MRA)

GOOD REGULATORY PRACTICES (MRA 101T)

Scope

This course is designed to impart fundamental knowledge on various Good Regulatory Practices viz., cGMP, GLP, GALP and GDP for Pharmaceuticals, Cosmetics, Food & Nutraceuticals, Medical devices, In-vitro Diagnostic Medical Devices (IVDs) and biological products and understand the rationale behind these requirements and will propose ways and means of complying with them.

Objectives

At completion of this course it is expected that students will be able to understand,

- The key regulatory and compliance elements with respect to Good Manufacturing Practices, Good Laboratory Practices, Good Automated Laboratory Practices and Good Documentation Practices.
- Prepare and implement the check lists and SOPs for various Good Regulatory Practices
- Implement Good Regulatory Practices in the Healthcare and related Industries
- Prepare for the readiness and conduct of audits and inspections.

THEORY

60 Hrs

1. Current Good Manufacturing Practices: Introduction, US cGMP Part 210 and Part 211.EC Principles of GMP (Directive 91/356/EEC) Article 6 to Article 14 and WHO cGMP guidelines GAMP-5; Medical device and IVDs Global Harmonization Task Force(GHTF) Guidance docs. 12 Hrs
2. Good Laboratory Practices: Introduction, USFDA GLP Regulations (Subpart A to Subpart K), Controlling the GLP inspection process, Documentation, Audit, goals of Laboratory Quality Audit, Audit tools, Future of GLP regulations, relevant ISO and Quality Council of India(QCI) Standards 12 Hrs
3. Good Automated Laboratory Practices: Introduction to GALP, Principles of GALP, GALP Requirements, SOPs of GALP, Training Documentation, 21 CFR Part 11, General check list of 21CFR Part 11, Software Evaluation checklist, relevant ISO and QCI Standards. 12 Hrs

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| 4 | Good Distribution Practices: Introduction to GDP, Legal GDP requirements put worldwide, Principles, Personnel, Documentation, Premises and Equipment, Deliveries to Customers, Returns, Self-Inspection, Provision of information, Stability testing principles, WHO GDP, USP GDP (Supply chain integrity), relevant CDSCO guidance and ISO standards | 12
Hrs |
| 5 | Quality management systems: Concept of Quality, Total Quality Management, Quality by design, Six Sigma concept, Out of Specifications (OOS), Change control. Validation: Types of Validation, Types of Qualification, Validation master plan (VMP), Analytical Method Validation. Validation of utilities, [Compressed air, steam, water systems, Heat Ventilation and Air conditioning (HVAC)]and Cleaning Validation. The International Conference on Harmonization (ICH) process, ICH guidelines to establish quality, safety and efficacy of drug substances and products, ISO 13485, Sch VIII and other relevant CDSCO regulatory guidance documents. | 12
Hrs |

REFERENCES

1. Good Laboratory Practice Regulations, by Sandy Weinberg, Fourth Edition Drugs and the Pharmaceutical Sciences, Vol.168
2. Good Pharmaceutical Manufacturing practice, Rational and compliance by John Sharp, CRC Press
3. Establishing a cGMP Laboratory Audit System, A practical Guide by David M.Bleisner, Wiley Publication.
4. How to practice GLP by PP Sharma, Vandana Publications.
5. Laboratory Auditing for Quality and Regulatory compliance bu Donald C.Singer, Drugs and the Pharmaceutical Sciences, Vol.150.
6. Drugs & Cosmetics Act, Rules & Amendments

DOCUMENTATION AND REGULATORY WRITING (MRA 102T)

Scope

This course is designed to impart fundamental knowledge on documentation and general principles involved in regulatory writing and submission to agencies.

Objectives

Upon completion of the course the student shall be able to,

- Know the various documents pertaining to drugs in pharmaceutical industry
- Understand the basics of regulatory compilation
- Create and assemble the regulation submission as per the requirements of agencies
- Follow up the submissions and post approval document requirements

THEORY

60 Hrs

1. Documentation in pharmaceutical industry: Exploratory Product Development Brief (EPDB) for Drug substance and Drug product, Product Development Plan (PDP), Product Development Report (PDR), Master Formula Record, Batch Manufacturing Record and its calculations, Batch Reconciliation, Batch Packaging Records, Print pack specifications, Distribution records, Certificate of Analysis (CoA), Site Master File and Drug Master Files (DMF). 12 Hrs

2. Dossier preparation and submission: Introduction and overview of dossiers, contents and organization of dossier, binders and sections, compilation and review of dossier. Paper submissions, overview and modules of CTD, electronic CTD submissions; Electronic submission: Planning electronic submission, requirements for submission, regulatory bindings and requirements, Tool and Technologies, electronic dossier submission process and validating the submission, Electronic Submission Gateway (ESG). Non eCTD electronic submissions (NeeS), Asian CTD formats (ACTD) submission. Organizing, process and validation of submission. Submission in Sugam system of CDSCO. 12 Hrs

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| 3 | Audits: Introduction, Definition, Summary, Types of audits, GMP compliance audit, Audit policy, Internal and External Audits, Second Party Audits, External third party audits, Auditing strategies, Preparation and conducting audit, Auditing strategies, audit analysis, audit report, audit follow up. Auditing/inspection of manufacturing facilities by regulatory agencies. Timelines for audits/inspection. GHTF study group 4 guidance document. ISO 13485. | 12
Hrs |
| 4 | Inspections: Pre-approval inspections, Inspection of pharmaceutical manufacturers, Inspection of drug distribution channels, Quality systems requirements for national good manufacturing practice inspectorates, inspection report, model certificate of good manufacturing practices, Root cause analysis, Corrective and Preventive action (CAPA). | 12
Hrs |
| 5 | Product life cycle management: Prior Approval Supplement (PAS), Post Approval Changes [SUPAC], Changes Being Effected in 30 Days (CBE-30), Annual Report, Post marketing Reporting Requirements, Post approval Labeling Changes, Lifecycle Management, FDA Inspection and Enforcement, Establishment Inspection Report (EIR), Warning Letters, Recalls, Seizure and Injunctions. ISO Risk Management Standard | 12
Hrs |

REFERENCES

1. Compliance auditing for Pharmaceutical Manufacturers. Karen Ginsbury and Gil Bismuth, Interpharm/CRC, Boca Raton, London New York, Washington D.C.
2. Pharmaceutical Manufacturing Handbook, Regulations and Quality by Shayne Cox Gad. Wiley-Interscience, A John Wiley and sons, Inc., Publications.
3. Handbook of microbiological Quality control. Rosamund M. Baird, Norman A. Hodges, Stephen P. Denyar. CRC Press. 2000.
4. Laboratory auditing for quality and regulatory compliance. Donald C. Singer, Raluca-loana Stefan, Jacobus F. Van Staden. Taylor and Francis (2005).
5. Implementing Juran's Road Map for Quality Leadership: Benchmarks and Results, By Al Endres, Wiley, 2000
6. Understanding, Managing and Implementing Quality: Frameworks, Techniques and Cases, By Jiju Antony; David Preece, Routledge, 2002

7. Organizing for High Performance: Employee Involvement, TQM, Reengineering, and Knowledge Management in the Fortune 1000: The CEO Report By Edward E. Lawler; Susan Albers Mohrman; George Benson, Jossey-Bass, 2001
8. Corporate Culture and the Quality Organization By James W. Fairfield-Sonn, Quorum Books, 2001
9. The Quality Management Sourcebook: An International Guide to Materials and Resources By Christine Avery; Diane Zabel, Routledge, 1997
10. The Quality Toolbox, Second Edition, Nancy R. Tague, ASQ Publications
11. Juran's Quality Handbook, Sixth Edition, Joseph M. Juran and Joseph A. De Feo, ASQ Publications
12. Root Cause Analysis, The Core of Problem Solving and Corrective Action, Duke Okes, 2009, ASQ Publications
13. International Medical Device Regulators Forum (IMDRF) Medical Device Single Audit Program (MDSAP)

CLINICAL RESEARCH REGULATIONS (MRA 103T)

Scope

This course is designed to impart the fundamental knowledge on the clinical development process of drugs, pharmaceuticals and Medical Devices, phases and conduct of clinical trials and research, regulations and guidance governing the conduct of clinical research in India, USA and EU. It prepares the students to learn in detail on various laws, legislations and guidance related to safety, efficacy, ethical conduct and regulatory approval of clinical research.

Objectives

Upon completion of the course, the student shall be able to (know, do and appreciate)

- History, origin and ethics of clinical and biomedical research and evaluation
- Clinical drug, medical device development process and different types and phases of clinical trials
- Regulatory requirements and guidance for conduct of clinical trials and research

Theory

60 Hrs

1. Clinical Drug Development Process

12

- Different types of Clinical Studies
- Phases of clinical trials, Clinical Trial protocol
- Phase 0 studies
- Phase I and subtype studies (single ascending, multiple ascending, dose escalation, methods, food effect studies, drug – drug interaction, PK end points)
- Phase II studies (proof of concept or principle studies to establish efficacy)
- Phase III studies (Multi ethnicity, global clinical trial, registration studies)
- Phase IV studies (Post Marketing Studies; PSUR)

Hrs

Clinical Investigation and Evaluation of Medical Devices & IVDs

Different Types of Studies

Key Concepts of Medical Device Clinical Evaluation

Key concepts of Clinical Investigation

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|---|---|-----------|
| 2 | <p>Ethics in Clinical Research:</p> <ul style="list-style-type: none"> • Historical Perspectives: Nuremberg Code, Thalidomide study , Nazis Trials, Tuskegee Syphilis Study, The Belmont Report, The declaration of Helsinki • Origin of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines. • The ethics of randomized clinical trials • The role of placebo in clinical trials • Ethics of clinical research in special population • Institutional Review Board/Independent Ethics Committee/Ethics Committee – composition, roles, responsibilities, review and approval process and ongoing monitoring of safety data • Data safety monitoring boards. • Responsibilities of sponsor, CRO, and investigator in ethical conduct of clinical research <ul style="list-style-type: none"> • Ethical principles governing informed consent process • Patient Information Sheet and Informed Consent Form • The informed consent process and documentation | 12
Hrs |
| 3 | <p>Regulations governing Clinical Trials</p> <p>India: Clinical Research regulations in India – Schedule Y & Medical Device Guidance</p> <p>USA: Regulations to conduct drug studies in USA (FDA)</p> <ul style="list-style-type: none"> • NDA 505(b)(1) of the FD&C Act (Application for approval of a new drug) • NDA 505(b)(2) of the FD&C Act (Application for approval of a new drug that relies, at least in part, on data not developed by the applicant) • ANDA 505(j) of the FD&C Act (Application for approval of a generic drug product) • FDA Guidance for Industry - Acceptance of Foreign Clinical Studies • FDA Clinical Trials Guidance Document: Good Clinical Practice <p>EU: Clinical Research regulations in European Union (EMA)</p> | 12
Hrs |

4	<p>Clinical Research Related Guidelines</p> <ul style="list-style-type: none"> • Good Clinical Practice Guidelines (ICH GCP E6) • Indian GCP Guidelines • ICMR Ethical Guidelines for Biomedical Research • CDSCO guidelines <p>GHTF study group 5 guidance documents</p> <p>Regulatory Guidance on Efficacy and Safety ICH Guidance's</p> <ul style="list-style-type: none"> • E4 – Dose Response Information to support Drug Registration • E7 – Studies in support of General Population: Geriatrics • E8 – General Considerations of Clinical Trials • E10 – Choice of Control Groups and Related Issues in Clinical Trials, • E 11 – Clinical Investigation of Medicinal Products in the Pediatric Population • General biostatistics principle applied in clinical research 	12 Hrs
5	<p>USA & EU Guidance</p> <p>USA: FDA Guidance</p> <ul style="list-style-type: none"> • CFR 21Part 50: Protection of Human Subjects • CFR 21Part 54: Financial Disclosure by Clinical Investigators • CFR 21Part 312: IND Application • CFR 21Part 314: Application for FDA Approval to Market a New Drug • CFR 21Part 320: Bioavailability and bioequivalence requirements • CFR 21Part 812: Investigational Device Exemptions • CFR 21Part 822: Post-market surveillance • FDA Safety Reporting Requirements for INDs and BA/BE Studies • FDA Med Watch • Guidance for Industry: Good Pharmacovigilance Practices and Pharmacoepidemiologic Assessment <p>European Union: EMA Guidance</p> <ul style="list-style-type: none"> • EU Directives 2001 • EudraLex (EMA) Volume 3 – Scientific guidelines for medicinal products for human use • EU Annual Safety Report (ASR) • Volume 9A – Pharmacovigilance for Medicinal Products for Human Use • EU MDD with respect to clinical research • ISO 14155 	12 Hrs

REFERENCES

1. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
2. HIPAA and Human Subjects Research: A Question and Answer Reference Guide By Mark Barnes, JD, LLM and Jennifer Kulynych, JD, PhD
3. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
4. Reviewing Clinical Trials: A Guide for the Ethics Committee; Johan PE Karlberg and Marjorie A Speers; Karlberg, Johan Petter Einar, Hong Kong.
5. International Pharmaceutical Product Registration: Aspects of Quality, Safety and Efficacy; Anthony C. Cartwright; Taylor & Francis Inc., USA.
6. New Drug Approval Process: The Global Challenge; Guarino, Richard A; Marcel Dekker Inc., NY.
7. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics; Douglas J. Pisano, David Mantus; CRC Press, USA
8. Country Specific Guidelines from official websites.
9. Drugs & Cosmetics Act & Rules and Amendments

RECOMMENDED WEBSITES:

1. EU Clinical Research Directive 2001: <http://www.eortc.be/services/doc/clinical-eudirective-04-april-01.pdf>
2. Code of Federal Regulations, FDA: <http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcr/cfrsearch.cfm>
3. Guidelines of International Conference on Harmonization: <http://www.ich.org/products/guidelines.html>
4. Eudralex Guidelines: <http://www.gmpcompliance.info/euguide.htm>
5. FDA New Drug Application:
6. <http://www.fda.gov/regulatoryinformation/legislation/FederalFoodDrugandCosmeticActFDCAct/FDCActChapterVDrugsandDevices/ucm108125.htm>
7. Medicines and Healthcare products Regulatory Agency: <http://www.mhra.gov.uk>
8. Central Drugs Standard Control Organization Guidance for Industry: <http://cdsco.nic.in/CDSCO-GuidanceForIndustry.pdf>
9. ICMR Ethical Guidelines for Biomedical Research: http://icmr.nic.in/ethical_guidelines.pdf

**REGULATIONS AND LEGISLATION FOR DRUGS & COSMETICS,
MEDICAL DEVICES, BIOLOGICALS & HERBALS, AND FOOD &
NUTRACEUTICALS IN INDIA AND INTELLECTUAL PROPERTY
RIGHTS
(MRA 104T)**

Scope

This course is designed to impart fundamental knowledge on regulations and legislation in India w.r.t. Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals. It prepares the students for basic regulatory requirements in India of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals. for manufacture, import & registration, export, sale, marketing authorization, clinical trials and intellectual property rights.

Objectives

Upon the completion of the course the student shall be able to:

- Know different Acts and guidelines that regulate Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals industry in India.
- Understand the approval process and regulatory requirements for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals

THEORY

60 Hrs

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|----|--|-----------|
| 1. | Biologicals & Herbals, and Food & Nutraceuticals Acts and Rules (with latest amendments): | 12
Hrs |
| | 1. Drugs and Cosmetics Act 1940 and Rules 1945: DPCO and NPPA | |
| | 2. Other relevant provisions (rules schedules and guidelines for approval of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals in India | |

Other relevant Acts: Narcotics Drugs and Psychotropic Substances Act; Medicinal and Toilet Preparations (Excise Duties) Act, 1955; Pharmacy Act, 1948; Drugs and Magic Remedies (Objectionable Advertisements) Act, 1955; Prevention of Cruelty to Animals Act.

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|---|---|-----------|
| 2 | Regulatory requirements and approval procedures for Drugs & Cosmetics Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals
CDSCO (Central Drug Standard Control Organization) and State Licensing Authority: Organization, Responsibilities <ul style="list-style-type: none"> • Rules, regulations, guidelines and standards for regulatory filing of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals • Format and contents of Regulatory dossier filing Clinical trial/ investigations | 12
Hrs |
| 3 | Indian Pharmacopoeial Standards, BIS standards and ISO and other relevant standards | 12
Hrs |
| 4 | Bioavailability and Bioequivalence data (BA &BE), BCS Classification of Drugs, Regulatory Requirements for Bioequivalence study
Stability requirements: ICH and WHO

Guidelines for Drug testing in animals/Preclinical Studies

Animal testing: Rationale for conducting studies, CPCSEA Guidelines
Ethical guidelines for human participants
ICMR-DBT Guidelines for Stem Cell Research | 12
Hrs |
| 5 | Intellectual Property Rights: Patent, Trademark, Copyright, Industrial Designs and Geographical Indications, Indian Patent Scenario. IPR vs Regulatory Affairs | 12
Hrs |

REFERENCES

1. Manual of Patent Practice & Procedure, 3rd Edition, by The Patent Office of India
2. Patent Failure How Judges, Bureaucrats, and Lawyers put innovators at risk by James Bessen and Michael J. Meurer
3. Principles and Practice of Clinical Trial Medicine by Richard Chin and Bruce Y. Lee
4. Ethical Guidelines for Biomedical Research on Human Participants by Indian Council of Medical Research New delhi 2006.
5. CPCSEA Guidelines for Laboratory Animal Facility by Committee for the purpose of control and supervision on experiments on animals (CPCSEA)

6. ICH E6 Guideline — Good Clinical Practice|| by ICH Harmonised Tripartite
7. Guidance for Industry on Submission of Clinical Trial Application for Evaluating Safety and Efficacy by CDSCO (Central Drug Standard Control Organisation)
8. Guidance for Industry on Requirement of Chemical & Pharmaceutical Information including Stability Study Data before approval of clinical trials / BE studies by CDSCO
9. Guidelines for Import and Manufacture of Medical Devices by CDSCO
10. Guidelines from official website of CDSCO

REGULATORY AFFAIRS PRACTICAL - I
(MRA 105P)

1. Case studies (4 Nos.) of each of Good Pharmaceutical Practices.
2. Documentation for in process and finished products Quality control tests for Solid, liquid, Semisolid and Sterile preparations.
3. Preparation of SOPs, Analytical reports (Stability and validation)
4. Protocol preparation for documentation of various types of records (BMR, MFR, DR)
5. Labeling comparison between brand & generics.
6. Preparation of clinical trial protocol for registering trial in India
7. Registration for conducting BA/ BE studies in India
8. Import of drugs for research and developmental activities
9. Preparation of regulatory dossier as per Indian CTD format and submission in SUGAM
10. Registering for different Intellectual Property Rights in India
11. GMP Audit Requirements as per CDSCO
12. Preparation and documentation for Indian Patent application.
13. Preparation of checklist for registration of IND as per ICH CTD format.
14. Preparation of checklist for registration of NDA as per ICH CTD format.
15. Preparation of checklist for registration of ANDA as per ICH CTD format.
16. Case studies on response with scientific rationale to USFDA Warning Letter
17. Preparation of submission checklist of IMPD for EU submission.
18. Comparison study of marketing authorization procedures in EU.
19. Comparative study of DMF system in US, EU and Japan
20. Preparation of regulatory submission using eCTD software
21. Preparation of Clinical Trial Application (CTA) for US submission
22. Preparation of Clinical Trial Application (CTA) for EU submission
23. Comparison of Clinical Trial Application requirements of US, EU and Japan of a dosage form.
24. Regulatory requirements checklist for conducting clinical trials in India.
25. Regulatory requirements checklist for conducting clinical trials in Europe.
26. Regulatory requirements checklist for conducting clinical trials in USA

SEMESTER II
REGULATORY ASPECTS OF DRUGS & COSMETICS
(MRA 201T)

Scope

This course is designed to impart the fundamental knowledge on the drug development process, regulatory requirements for approval of new drugs, drug products and cosmetics in regulated and semi-regulated countries. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products and cosmetics in regulated and semi-regulated countries.

Objectives

Upon completion of the course, the student shall be able to know

- process of drug discovery and development and generic product development
- regulatory approval process and registration procedures for API and drug products in US, EU
- Cosmetics regulations in regulated and semi-regulated countries
- A comparative study of India with other global regulated markets

Theory	60 Hrs
1. USA & CANADA: Organization structure and functions of FDA. Federal register and Code of Federal Regulations (CFR), History and evolution of United States Federal, Food, Drug and Cosmetic Act (FFDCA), Hatch Waxman act and Orange book, Purple book, Drug Master Files (DMF) system in US, Regulatory Approval Process for Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Supplemental New Drug Application (SNDA); Regulatory requirements for Orphan drugs and Combination Products, Changes to an approved NDA / ANDA. Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in USA. Legislation and regulations for import, manufacture, distribution and sale of cosmetics in USA and Canada.	12 Hrs
2. European Union & Australia: Organization and structure of EMA & EDQM, General guidelines, Active Substance Master Files (ASMF) system in EU, Content and approval process of IMPD, Marketing Authorization procedures in EU (Centralized procedure,	12 Hrs

- Decentralized procedure, Mutual recognition procedure and National Procedure). Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in EU, Eudralex directives for human medicines, Variations & extensions, Compliance of European Pharmacopoeia (CEP)/ Certificate of Suitability (CoS), Marketing Authorization (MA) transfers, Qualified Person (QP) in EU. Legislation and regulations for import, manufacture, distribution and sale of cosmetics in European Union & Australia.
- 3 Japan: Organization of the PMDA, Pharmaceutical Laws and regulations, types of registration applications, DMF system in Japan, drug regulatory approval process, Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in Japan, Post marketing surveillance in Japan. Legislation and regulations for import, manufacture, distribution and sale of cosmetics in Japan 12 Hrs
- 4 Emerging Market: Introduction, Countries covered, Study of the world map, study of various committees across the globe (ASEAN, APEC, EAC, GCC, PANDRH, SADC) 12 Hrs
 WHO: WHO, GMP, Regulatory Requirements for registration of drugs and post approval requirements in WHO through prequalification programme, Certificate of Pharmaceutical Product (CoPP) - General and Country Specific (South Africa, Egypt, Algeria and Morocco, Nigeria, Kenya and Botswana)
- 5 Brazil, ASEAN, CIS and GCC Countries: 12 Hrs
 ASIAN Countries: Introduction to ACTD, Regulatory Requirements for registration of drugs and post approval requirements in China and South Korea & Association of Southeast Asian Nations (ASEAN) Region i.e. Vietnam, Malaysia, Philippines, Singapore and Thailand.
 CIS (Commonwealth Independent States): Regulatory pre-requisites related to Marketing authorization requirements for drugs and post approval requirements in CIS countries i.e. Russia, Kazakhstan and Ukraine GCC (Gulf Cooperation Council) for Arab states: Regulatory pre-requisites related to Marketing authorization requirements for drugs and post approval requirements in Saudi Arabia and UAE
 Legislation and regulations for import, manufacture, distribution and sale of cosmetics in Brazil, ASEAN, CIS and GCC Countries.

REFERENCES :

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
2. The Pharmaceutical Regulatory Process, Edited by Ira R. Berry Marcel Dekker Series, Vol.144
3. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185 Informa Health care Publishers.
4. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
5. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
6. Drugs: From Discovery to Approval, Second Edition By Rick Ng
7. New Drug Development: A Regulatory Overview, Eighth Edition By Mark Mathieu
8. Pharmaceutical Risk Management By Jeffrey E. Fetterman, Wayne L. Pines and Gary H. Slatko
9. Preparation and Maintenance of the IND Application in eCTD Format By William K. Sietsema
10. Country Specific Guidelines from official websites.
11. http://www.who.int/medicines/areas/quality_safety/regulation_legislation/ListMRAWbsites.pdf
12. Roadmap to an ASEAN economic community Edited by Denis Hew. ISEAS Publications, Singapore 2005, ISBN981-230-347-2
13. ASEAN, Rodolfo C. Severino, ISEAS Publications, Singapore 2005, ISBN 978-981-230-750-7
14. Building a Future with Brics: The Next Decade for Offshoring, Mark Kobayashi-Hillary, Springer
15. Outsourcing to India: The Offshore Advantage, Mark Kobayashi-Hillary, Springer Trade performance and Regional Integration of the CIS Countries, Lev Freinkman,
16. The world Bank, Washington, DC, ISBN: 0-8212-5896-0
17. Global Pharmaceutical Policy: Ensuring Medicines for Tomorrow's World ByFrederick M. Abbott, Graham Dukes, Maurice Nelson Graham Dukes 139
18. The Gulf Cooperation Council: A Rising Power and Lessons for ASEAN by Linda Low and Lorraine Carlos Salazar (Nov 22, 2010)
19. Doing Business in the Asean Countries, Balbir Bhasin, Business Expert Press ISBN:13:978-1-60649-108-9
20. Realizing the ASEAN Economic Community: A Comprehensive Assessment, Michael G Plummer (Editor), Chia Siow Yue (Editor), Institute of South east asian studies, Singapore

REGULATORY ASPECTS OF HERBAL AND BIOLOGICALS (MRA 202T)

Scope

This course is designed to impart fundamental knowledge on Regulatory Requirements, Licensing and Registration, Regulation on Labelling of Biologics in India, USA and Europe

It prepares the students to learn in detail on Regulatory Requirements for biologics, Vaccines and Blood Products

Objectives

Upon the completion of the course the student shall be able to :

- Know the regulatory Requirements for Biologics and Vaccines
- Understand the regulation for newly developed biologics and biosimilars
- Know the pre-clinical and clinical development considerations of biologics
- Understand the Regulatory Requirements of Blood and/or Its Components Including Blood Products and label requirements

Theory

60 Hrs

1. India : Introduction, Applicable Regulations and Guidelines , 12 Hrs
Principles for Development of Similar Biologics, Data Requirements for Preclinical Studies, Data Requirements for Clinical Trial Application, Data Requirements for Market Authorization Application, Post-Market Data for Similar Biologics, Pharmacovigilance. GMP and GDP.
- 2 USA: Introduction to Biologics; biologics, biological and biosimilars, different biological products, difference between generic drug and biosimilars, laws, regulations and guidance on biologics/ biosimilars, development and approval of biologics and biosimilars (IND, PMA, BLA, NDA, 510(k), pre-clinical and clinical development considerations, advertising, labelling and packing of biologics 12 Hrs
- 3 European Union: Introduction to Biologics; directives, scientific guidelines and guidance related to biologics in EU, comparability/ biosimilarity assessment, Plasma master file, TSE/ BSE evaluation, development and regulatory approval of biologics (Investigational medicinal products and biosimilars), pre-clinical 12 Hrs

and clinical development considerations; stability, safety, advertising, labelling and packing of biologics in EU

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|---|--|-----------|
| 4 | Vaccine regulations in India, US and European Union: Clinical evaluation, Marketing authorisation, Registration or licensing, Quality assessment, Pharmacovigilance, Additional requirements Blood and Blood Products Regulations in India, US and European Union: Regulatory Requirements of Blood and/or Its Components Including Blood Products, Label Requirements, ISBT (International Society of Blood Transfusion) and IHN (International Haemovigilance Network) | 12
Hrs |
| 5 | Herbal Products: Quality, safety and legislation for herbal products in India, USA and European Union. | 12
Hrs |

REFERENCES

1. FDA Regulatory Affairs: A Guide for Prescription Drugs, Medical Devices, and Biologics, Douglas J. Pisano , David S. Mantus ; Informa ,2008
2. Biological Drug Products: Development and Strategies; Wei Wang , Manmohan Singh ; wiley ,2013
3. Development of Vaccines: From Discovery to Clinical Testing; Manmohan Singh , Indresh K. Srivastava ;Wiley, 2011
4. www.who.int/biologicals/en
5. www.fda.gov/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/
6. www.ihn-org.com
7. www.isbtweb.org
8. Guidelines on Similar Biologics: Regulatory Requirements for Marketing Authorization in India
9. www.cdsc.nic.in
10. www.ema.europa.eu > scientific guidelines > Biologics
11. www.fda.gov/biologicsbloodvaccines/guidancecomplianceinformation (Biologics) Regulatory Information

REGULATORY ASPECTS OF MEDICAL DEVICES (MRA 203T)

Scope

This course is designed to impart the fundamental knowledge on the medical devices and in vitro diagnostics, basis of classification and product life cycle of medical devices, regulatory requirements for approval of medical devices in regulated countries like US, EU and Asian countries along with WHO regulations. It prepares the students to learn in detail on the harmonization initiatives, quality and ethical considerations, regulatory and documentation requirements for marketing medical devices and IVDs in regulated countries.

Objectives

Upon completion of the course, the student shall be able to know

- basics of medical devices and IVDs, process of development, ethical and quality considerations
- harmonization initiatives for approval and marketing of medical devices and IVDs
- regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN
- clinical evaluation and investigation of medical devices and IVDs

Theory

60 Hrs

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| 1. | Medical Devices: Introduction, Definition, Risk based classification and Essential Principles of Medical Devices and IVDs. Differentiating medical devices IVDs and Combination Products from that of pharmaceuticals, History of Medical Device Regulation, Product Lifecycle of Medical Devices and Classification of Medical Devices.
IMDRF/GHTF: Introduction, Organizational Structure, Purpose and Functions, Regulatory Guidelines, Working Groups, Summary Technical Document (STED), Global Medical Device Nomenclature (GMDN). | 12
Hrs |
| 2 | Ethics: Clinical Investigation of Medical Devices, Clinical Investigation Plan for Medical Devices, Good Clinical Practice for Clinical Investigation of medical devices (ISO 14155:2011)
Quality: Quality System Regulations of Medical Devices: ISO 13485, Quality Risk Management of Medical Devices: ISO 14971, Validation and Verification of Medical device, Adverse Event Reporting of Medical device | 12
Hrs |

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| 3 | USA: Introduction, Classification, Regulatory approval process for Medical Devices (510k) Premarket Notification, Pre-Market Approval (PMA), Investigational Device Exemption (IDE) and In vitro Diagnostics, Quality System Requirements 21 CFR Part 820, Labeling requirements 21 CFR Part 801, Post marketing surveillance of MD and Unique Device Identification (UDI). Basics of In vitro diagnostics, classification and approval process. | 12
Hrs |
| 4 | European Union: Introduction, Classification, Regulatory approval process for Medical Devices (Medical Device Directive, Active Implantable Medical Device Directive) and In vitro Diagnostics (In Vitro Diagnostics Directive), CE certification process. Basics of In vitro diagnostics, classification and approval process. | 12
Hrs |
| 5 | ASEAN, China & Japan: Medical Devices and IVDs, Regulatory registration procedures, Quality System requirements and clinical evaluation and investigation. IMDRF study groups and guidance documents. | 12
Hrs |

REFERENCES

1. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics by Douglas J. Pisano, David Mantus.
2. Medical Device Development: A Regulatory Overview by Jonathan S. Kahan
3. Medical Product Regulatory Affairs: Pharmaceuticals, Diagnostics, Medical Devices by John J. Tobin and Gary Walsh
4. Compliance Handbook for Pharmaceuticals, Medical Devices and Biologics by Carmen Medina
5. Country Specific Guidelines from official websites.

REGULATORY ASPECTS OF FOOD & NUTRACEUTICALS (MRA 204T)

Scope

This course is designed to impart the fundamental knowledge on Regulatory Requirements, Registration and Labeling Regulations of Nutraceuticals in India, USA and Europe.

It prepares the students to learn in detail on Regulatory Aspects for nutraceuticals and food supplements.

Objectives

Upon completion of the course, the student shall be able to

- Know the regulatory Requirements for nutraceuticals
- Understand the regulation for registration and labeling of nutraceuticals and food supplements in India, USA and Europe.

Theory

60 Hrs

1. Nutraceuticals: Introduction, History of Food and Nutraceutical Regulations, Meaning of Nutraceuticals, Dietary Supplements, Functional Foods, Medical Foods, Scope and Opportunities in Nutraceutical Market. 12 Hrs
2. Global Aspects: WHO guidelines on nutrition. NSF International: Its Role in the Dietary Supplements and Nutraceuticals Industries, NSF Certification, NSF Standards for Food And Dietary Supplements. Good Manufacturing Practices for Nutraceuticals. 12 Hrs
3. India : Food Safety and Standards Act, Food Safety and Standards Authority of India: Organization and Functions, Regulations for import, manufacture and sale of nutraceutical products in India, Recommended Dietary Allowances (RDA) in India. 12 Hrs
4. USA: US FDA Food Safety Modernization Act, Dietary Supplement Health and Education Act. U.S. regulations for manufacture and sale of nutraceuticals and dietary supplements, Labelling Requirements and Label Claims for Dietary Supplements, Recommended Dietary Allowances (RDA) in the U.S 12 Hrs

- 5 European Union: European Food Safety Authority (EFSA): 12 Hrs
Organization and Functions. EU Directives and regulations for
manufacture and sale of nutraceuticals and dietary supplements.
Nutrition labelling. European Regulation on Novel Foods and
Novel Food Ingredients. Recommended Dietary Allowances
(RDA) in Europe.

REFERENCES

1. Regulation of Functional Foods and Nutraceuticals: A Global Perspective by Clare M. Hasler (Wiley Online Library)
2. Nutraceutical and Functional Food Regulations in the United States and Around the World by Debasis Bagchi (Academic Press, Elsevier)
3. <http://www.who.int/publications/guidelines/nutrition/en/>
4. [http://www.europarl.europa.eu/RegData/etudes/STUD/2015/536324/IPOL_STU\(2015\)536324_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2015/536324/IPOL_STU(2015)536324_EN.pdf)
5. Handbook of Nutraceuticals by Yashwant Pathak (CRC Press)
6. Food Regulation: Law, Science, Policy and Practice by Neal D. Fortin (Wiley)
7. Country Specific Guidelines from official websites.

REGULATORY AFFAIRS PRACTICAL - II
(MRA 205P)

1. Case studies on
2. Change Management/ Change control. Deviations
3. Corrective & Preventive Actions (CAPA)
4. Documentation of raw materials analysis as per official monographs
5. Preparation of audit checklist for various agencies
6. Preparation of submission to FDA using eCTD software
7. Preparation of submission to EMA using eCTD software
8. Preparation of submission to MHRA using eCTD software
9. Preparation of Biologics License Applications (BLA)
10. Preparation of documents required for Vaccine Product Approval
11. Comparison of clinical trial application requirements of US, EU and India of Biologics
12. Preparation of Checklist for Registration of Blood and Blood Products
13. Registration requirement comparison study in 5 emerging markets (WHO) and preparing check list for market authorization
14. Registration requirement comparison study in emerging markets (BRICS) and preparing check list for market authorization
15. Registration requirement comparison study in emerging markets (China and South Korea) and preparing check list for market authorization
16. Registration requirement comparison study in emerging markets (ASEAN) and preparing check list for market authorization
17. Registration requirement comparison study in emerging markets (GCC) and preparing check list for market authorization
18. Checklists for 510k and PMA for US market
19. Checklist for CE marking for various classes of devices for EU
20. STED Application for Class III Devices
21. Audit Checklist for Medical Device Facility
22. Clinical Investigation Plan for Medical Devices

PHARMACEUTICAL BIOTECHNOLOGY (MPB)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPB 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know,

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 Hrs

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. 12 Hrs
IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy
b. Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.
c. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy. 12 Hrs

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| 3 | Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy | 12
Hrs |
| 4 | Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following:
a) Paper chromatography b) Thin Layer chromatography
c) Ion exchange chromatography d) Column chromatography
e) Gas chromatography f) High Performance Liquid chromatography
g) Affinity chromatography | 12
Hrs |
| 5 | a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following:
a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing
b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder diffraction technique, Types of crystals and applications of X-ray diffraction. | 12
Hrs |

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi.
7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series

MICROBIAL AND CELLULAR BIOLOGY (MPB 102T)

Scope

This subject is designed to provide the advanced knowledge to the biotechnology students in invaluable areas of advanced microbiology which plays a crucial role in determining its future use and applications in medicine, drug discovery and in pharmaceutical industry.

Objective

At the completion of this course it is expected that the students will get an understanding about the following aspects;

- Importance of Microorganisms in Industry
- Central dogma of molecular biology
- Structure and function of cell and cell communication
- Cell culture technology and its applications in pharmaceutical industries.
- Microbial pathogenesis and correlating it to rational use of antimicrobial agents.

THEORY	60Hrs
1. Microbiology	12
Introduction – Prokaryotes and Eukaryotes. Bacteria, fungi, actinomycetes and virus - structure, chemistry and morphology, cultural, physiological and reproductive features. Methods of isolation, cultivation and maintenance of pure cultures. Industrially important microorganisms - examples and applications	Hrs
2 Molecular Biology: Structure of nucleus and chromosome, Nucleic acids and composition, structure and types of DNA and RNA. Central dogma of molecular biology: Replication, Transcription and translation.	12
Gene regulation	Hrs
Gene copy number, transcriptional control and translational control.	
RNA processing	
Modification and Maturation, RNA splicing, RNA editing, RNA amplification. Mutagenesis and repair mechanisms, types of mutants, application of mutagenesis in stain improvement, gene mapping of plasmids- types purification and application. Phage genetics, genetic organization, phage mutation and lysogeny.	

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| 3 | <p>Cell structure and function
 Cell organelles, cytoskeleton & cell movements, basic aspects of cell regulation, bioenergetics and fuelling reactions of aerobics and anaerobics, secondary metabolism & its applications. Cell communication, cell cycle and apoptosis, mechanism of cell division. Cell junctions/adhesion and extra cellular matrix, germ cells and fertilization, histology – the life and death of cells in tissues.</p> <p>Cell Cycle and Cytoskeleton
 Cell Division and its Regulation, G-Protein Coupled Receptors, Kinases, Nuclear receptors, Cytoskeleton & cell movements, Intermediate Filaments.</p> <p>Apoptosis and Oncogenes
 Programmed Cell Death, Tumor cells, carcinogens & repair.</p> <p>Differentiation and Developmental Biology
 Fertilization, Events of Fertilization, In vitro Fertilization, Embryonic Germ Cells, Stem Cells and its Application.</p> | 12
Hrs |
| 4 | <p>Principles of microbial nutrition
 Physical and chemical environment for microbial growth, Stability and degeneration of microbial cultures.</p> <p>Growth of animal cells in culture
 General procedure for cell culture, Nutrient composition, Primary, established and transformed cell cultures, applications of cell cultures in pharmaceutical industry and research. Growth of viruses in cell culture propagation and enumeration. In-vitro screening techniques- cytotoxicity, anti-tumor, anti-viral assays.</p> | 12
Hrs |
| 5 | <p>Microbial pathology
 Identifying the features of pathogenic bacteria, fungi and viruses. Mechanism of microbial pathogenicity, etiology and pathology of common microbial diseases and currently recommended therapies for common bacterial, fungal & viral infections. Mechanism of action of antimicrobial agents and possible sites of chemotherapy.</p> | 12
Hrs |

REFERENCES

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn, Industrial Microbiology, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. David Freifelder, Molecular Biology, 2nd edition, Narosa Publishing House.
5. R. Ian Freshney, Culture of animal cells – A manual of Basic techniques, 6th edition, Wileys publication house.
6. David Baltimore, Molecular cell biology, W H Freeman & Co publishers.
7. Cell biology vol-I,II,III by Julio E.Cells
8. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company.

BIOPROCESS ENGINEERING AND TECHNOLOGY (MPB 103T)

Scope

This paper has been designed to provide the knowledge to the biotechnology students in invaluable areas of bioprocess technology to develop skills to modify, design and operate different types of fermenters, to understand and implement various fermentation procedures, to train students in scale up fermentation operations.

Objective

At the completion of this subject it is expected that students will be able to,

- Understand basics and design of fermentation technology
- Scale up and scale down processing of fermentation technology
- Bioprocessing of the industrially important microbial metabolites in industries and R & D organizations.
- Regulation governing the manufacturing of biological products
- Understand and conduct fermentation process kinetics.

THEORY	60 Hrs
1. Introduction to fermentation technology	12
Basic principles of fermentation	Hrs
Study of the design and operation of bioreactor	
Ancillary parts and function, impeller design and agitation, power requirements on measurements and control of dissolved oxygen, carbon dioxide, temperature, pH and foam.	
Types of bioreactor	
CSTR, tower, airlift, bubble column, packed glass bead, hollow fiber, configuration and application	
Computer control of fermentation process	
System configuration and application	
2. Mass transfer	12
Theory, diffusional resistance to oxygen requirements of microorganisms, measurements of mass transfer co- efficient and factor affecting them, effects of aeration and agitation on mass transfer, supply of air, air compressing, cleaning and sterilization of air and plenum ventilation, air sampling and testing standards for air purity.	Hrs

	Rheology Rheological properties of fermentation system and their importance in bioprocessing.	
3	Scale up of fermentation process Principles, theoretical considerations, techniques used, media for fermentation, HTST sterilization, advantage and disadvantage, liquid sterilization. Cultivation and immobilized culture system Cultivation system - batch culture, continuous culture, synchronous cultures, fed batch culture. Graphical plot representing the above systems. Introduction to immobilization Techniques, immobilization of whole cell, immobilized culture system to prepare fine chemicals. Immobilization of enzymes and their applications in the industry. Reactors for immobilized systems and perspective of enzyme engineering.	12 Hrs
4	Scale down of fermentation process Theory, equipment design and operation, methods of filtration, solvent extraction, chromatographic separation, crystallization turbidity analysis and cell yield determination, metabolic response assay, enzymatic assay, bioautographic techniques and disruption of cells for product recovery. Isolation and screening Primary and secondary, maintenance of stockculture, strain improvement for increased yield.	12 Hrs
5	Bioprocessing of the industrially important microbial metabolites a) Organic solvents – Alcohol and Glycerol b) Organic acids - Citric acids, Lactic acids, c) Amino acids - Glutamic acids, Lysine, Cyclic AMP and GMP d) Antibiotics - Penicillin, Streptomycin, Griseofulvin, e) Vitamins - B12, Riboflavin and Vitamin C Biosynthetic pathways for some secondary metabolites, microbial transformation of steroids and alkaloids Regulation governing the manufacturing of biological products .	12 Hrs

REFERENCES

1. Peter Stanbury, Allan Whitaker, Stephen Hall, Principles of Fermentation technology, Elsevier stores.
2. L.E. Casida, Industrial Microbiology, John Wiley & sons Inc.
3. F.M. Asubel, Current protocols in molecular biology, volume I and II, John Wiley Publishers.
4. Biotol Board, Bioreactor design and product yield, Butterworth and Helhemann Publishers.
5. H. Patel, Industrial microbiology, Macmillan India Limited.

**ADVANCED PHARMACEUTICAL BIOTECHNOLOGY
(MPB 104T)**

Scope

This paper has been designed to provide the knowledge to the students to develop skills of advanced techniques of isolation and purification of enzymes, to enrich students with current status of development of vaccines and economic importance of biotechnology products.

Objective

At the completion of this subject it is expected that students will be able to

- Understand about the latest technology development in biotechnology technique, tools and their uses in drug and vaccine development.
- Identify appropriate sources of enzymes.
- Understand and perform genetic engineering techniques in gene manipulation, r-DNA technology and gene amplification.
- Understand the overview of pharmacogenomics.
- Learn the regulatory approval process and key regulatory agencies for new drugs, biologics, devices, and drug-device combinations.

THEORY

60 Hrs

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| 1. | Enzyme Technology
Classification, general properties of enzymes, dynamics of enzymatic activity, sources of enzymes, extraction and purification, pharmaceutical, therapeutic and clinical application. Production of amyloglucosidase, glucose isomerase, amylase and trypsin. | 12
Hrs |
| 2 | Genetic Engineering
Techniques of gene manipulation, cloning strategies, procedures, cloning vectors expression vectors, recombinant selection and screening, expression in E.coli and yeast.
Site directed mutagenesis, polymerase chain reaction, and analysis of DNA sequences.
Gene library and cDNA
Applications of the above technique in the production of, <ul style="list-style-type: none">• Regulatory proteins - Interferon, Interleukins• Blood products - Erythropoietin• Vaccines - Hepatitis-B• Hormones - Insulin | 12
Hrs |

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| 3 | <p>Therapeutic peptides
 Study on controlled and site specified delivery of therapeutic peptides and proteins through various routes of administration.
 Transgenic animals
 Production of useful proteins in transgenic animals and gene therapy.
 Human Genome
 The human genome project-a brief study, Human chromosome – Structure and classification, chromosomal abnormalities – Syndromes</p> | 12
Hrs |
| 4 | <p>Signal transduction
 Introduction, cell signaling pathways, Ion channels, Sensors and effectors, ON and OFF mechanisms, Spatial and temporal aspects of signaling, cellular process, development, cell cycle and proliferation, neuronal signaling, cell stress, inflammatory responses and cell death, signaling defects and diseases.
 Oncogenes
 Introduction, definition, various oncogenes and their proteins.</p> | 12
Hrs |
| 5 | <p>Microbial Biotransformation
 Biotransformation for the synthesis of chiral drugs and steroids.
 Microbial Biodegradation
 Biodegradation of xenobiotics, chemical and industrial wastes, Production of single-cell protein, Applications of microbes in environmental monitoring.
 Biosensors
 Definition, characteristics of ideal biosensors, types of biosensors, biological recognition elements, transducers, application of biosensors.</p> | 12
Hrs |

REFERENCES

1. Biotechnology-The biological principles: MD Trevan, S Boffey, KH Goulding and P.F. Stanbury.
2. Immobilization of cells and enzymes: HosevearKennadycabral& Bicker staff
3. Principles of Gene Manipulating: RW Old and S.B.Primrose.
4. Molecular Cell Biology: Harvey Lodish, David Baltimore, Arnold Berk, S LawenceZipursky, Paul Matsudaira, James Darnell.
5. Modern Biotechnology: S.B Primrose

6. Gene transfer and expression protocols-methods in Molecular Biology, vol. VII, Edit E.T. Murray
7. Current protocols in Molecular Biology, Vo1.I & II:F.M. Asubel, John wiley Publishers
8. Current protocols in cellular biology, Vo1.1 & II John wiley publishers.
9. Principles of human genetics; by Curt Stern, published by W.H. Freeman.

PHARMACEUTICAL BIOTECHNOLOGY PRACTICAL - I
(MPB 105P)

1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry
7. Isolation and Purification of microorganism from the soil
8. Microbial contamination of Water and biochemical parameters.
9. Determination of Minimum Inhibitory concentration by gradient plate technique and serial dilution method.
10. UV- survival curve and Dark repair
11. Sterility test for pharmaceutical preparations
12. Sub culturing of cells and cytotoxicity assays.
13. Construction of growth curve and determination of specific growth rate and doubling time
14. Fermentation process of alcohol and wine production
15. Fermentation of vitamins and antibiotics
16. Whole cell immobilization engineering
17. Thermal death kinetics of bacteria
18. Replica plating
19. Bio-autography.
20. Isolation and estimation of DNA
21. Isolation and estimation of RNA
22. Isolation of plasmids
23. Agarose gel electrophoresis.
24. Transformation techniques
25. SDS - polyacrylamide gel electrophoresis for proteins
26. Polymerase chain reaction technique.

PROTEINS AND PROTEIN FORMULATIONS (MPB 201T)

Scope

This course is designed to impart knowledge and skills necessary for knowing fundamental aspects of proteins and their formulations is a part of drug research and development process. Basic theoretical discussions of the principles of more integrated and coherent use of information for protein formulation and design are provided to help the students to clarify the various biological concepts of protein.

Objective

At the completion of this course it is expected that students will be able to understand,

- Various methods of purification of proteins
- Peptides in drug development
- Protein identification and characterization
- Protein based formulations
- Sequencing proteins

THEORY		60 Hrs
1.	Protein engineering Concepts for protein engineering. Isolation and purification of proteins, Stability and activity based approaches of protein engineering, Chemical and Physical Considerations in Protein and Peptide Stability, Different methods for protein engineering, gene shuffling, and direct evolution.	12 Hrs
2	Peptidomimetics Introduction, classification; Conformationally restricted peptides, design, pseudopeptides, peptidomimetics and transition state analogs; Biologically active template; Amino acid replacements; Peptidomimetics and rational drug design; CADD techniques in peptidomimetics; Development of non peptide peptidomimetics.	12 Hrs
3	Proteomics Protein identification and characterization: Methods/strategies, protein identification, de novo protein characterization, Isotope labelling, N- and C-terminal tags.	12 Hrs

	2-Dimensional gel electrophoresis	
	Methods including immobilized pH gradients (IPGs), resolution, reproducibility and image analysis, future developments	
4	Protein formulation	12 Hrs
	Different strategies used in the formulation of DNA and proteins, Analytical and biophysical parameters of proteins and DNA in pre-formulation, Liposomes, Neon-spears, Neon-particulate system, PEGylation, Biological Activity, Biophysical Characterization Techniques, Forced degradation studies of protein.	
5	Methods of protein sequencing	12 Hrs
	Various methods of protein sequencing, characterisation, Edman degradation, Tryptic and/or Chymotryptic Peptide Mapping.	

REFERENCES

1. H. Lodhishet. Al. Molecular Cell Biology, W. H. Freeman and Company
2. Protein Purification – Hand Book, Amersham pharmacia biotech
3. EngelbertBuxbaum, Fundamentals of Protein Structure and Function, Springer Science
4. Sheldon J. Park, Jennifer R. Cochran, Protein Engineering and Design, CRC press.
5. Robert K. Skopes. Protein purification, principle and practice, springer link.
6. David Whitford, Proteins-Structure and Function, John Wiley & Sons Ltd.
7. James Swarbrick, Protein Formulation and Delivery Informa Healthcare USA, Inc.
8. Rodney Pearlman, Y. John Wang Formulation, Characterization, and Stability of Protein Drugs, Kluwer Academic Publishers.

IMMUNOTECHNOLOGY (MPB 202T)

Scope

This course is designed to impart knowledge on production and engineering of antibodies, the application of antigens, the design of (recombinant) vaccines, strategies for immune intervention, etc. The Immunotechnology - based techniques will be used for therapeutics and diagnostics, industries in the production, quality control and quality assurance, and in R&D.

Objective

After this course, the students will be able to:-

- Understand the techniques like immunodiagnostic tests,
- Characterization of lymphocytes, purification of antigens and antibody, etc.
- Access health problems with immunological background;
- Develop approaches for the immune intervention of diseases

THEORY

60 Hrs

- | | | |
|----|---|-----------|
| 1. | Fundamental aspects of immunology
Introduction, cells and organs of the immune system, cellular basis of Immune response, primary and secondary lymphoid organs, antigen antibody and their structure.
Types of immune responses, anatomy of immune response.
Overview of innate and adaptive Immunity.
Humoral Immunity
B - Lymphocytes and their activation. Structure and function of immunoglobulins, idiotypes and anti idiotypic antibodies.
Cell mediated Immunity
Thymus derived lymphocytes (T cells) - their ontogeny and types, MHC complex, antigen presenting cells (APC), mechanisms of T cell activation, macrophages, dendritic cells, langerhans cells, mechanism of phagocytosis | 12
Hrs |
| 2 | Immune Regulation and Tolerance
Complement activation and types and their biological functions, cytokines and their role in immune response. | 12
Hrs |

Hypersensitivity

Hypersensitivity Types I-IV, Hypersensitivity reactions and treatment

Autoimmune diseases

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| 3 | <p>Vaccine technology
 Vaccine and their types, conventional vaccines, novel methods for vaccine production, antiidiotypic vaccine, DNA vaccine, genetically engineered vaccine, iscoms, synthetic peptides, and immunodiagnostics.
 Stem cell technology
 Stem cell technology and applications to immunology</p> | 12
Hrs |
| 4 | <p>Hybridoma Technology
 Hybridoma techniques – fusion methods for myeloma cells and B-Lymphocytes, selection and screening techniques. Production and purification of monoclonal antibodies and their applications in Pharmaceutical industry.</p> | 12
Hrs |
| 5 | <p>Immunological Disorder
 Autoimmune disorders and types, pathogenic mechanisms, treatment, experimental models of auto immune diseases, primary and secondary immunodeficiency disorders.
 Immunodiagnosis
 Antigen antibody interaction – Precipitation reaction, Agglutination reactions, Principles and applications of ELISA, Radio Immuno Assay, Western blot analysis, immune-electrophoresis, immuno fluorescence, chemiluminescence assay, complement fixation reaction.</p> | 12
Hrs |

REFERENCES

1. J. Kubey, Immunology – an Introduction.
2. S.C. Rastogi, Immunodiagnosis, New Age International.
3. Ashim Chakravarty, Immunology and Immunotechnology, Oxford University Press.
4. E. Benjamini, Molecular Immunology.

BIOINFORMATICS AND COMPUTATIONAL BIOTECHNOLOGY (MPB 203T)

Scope

This paper has been designed to provide the advanced knowledge to the biotechnology students in invaluable areas of advanced bioinformatics which plays a crucial role in determining its future use and applications in medicine, drug discovery and in pharmaceutical industry.

Objectives

Upon completion of this course it is expected that the students will be able to understand,

- Use of computers in developing a new drugs
- Biological concepts for bioinformatics
- Proteins and their diversity
- Various gene finding methods
- Searching the biological databases
- Target searching
- Various methods of drug designing

THEORY		60 Hrs
1.	Introduction to Bioinformatics Definition and History of Bioinformatics, Internet and Bioinformatics, Introduction to Data Mining, Applications of Data Mining to Bioinformatics, Biological Database Protein and nucleic acid databases. Structural data bases. Collecting and storing the sequence and Applications of Bioinformatics.	12 Hrs
2	Sequence analysis Sequence alignment, pair wise alignment techniques, multiple sequence analysis, multiple sequence alignment; Flexible sequence similarity searching with the FAST3 program package, the use of CLUSTAL W and CLUSTAL X for the multiple sequence alignment. Tools used for sequence analysis.	12 Hrs
3	Protein informatics Introduction; Force field methods; Energy, buried and exposed residues, side chains and neighbours; Fixed regions, hydrogen bonds, mapping properties onto surfaces; Fitting monomers, R &	12 Hrs

S fit of conformers, assigning secondary structures; Sequence alignment-methods, evaluation, scoring; Protein completion, backbone construction and side chain addition; Small peptide methodology, software accessibility, building peptides; Protein displays; Substructure manipulations, annealing.

Protein structure prediction

Protein folding and model generation; Secondary structure prediction, analyzing secondary structures; Protein loop searching, loop generating methods, loop analysis; Homology modeling, concepts of homology modeling, potential applications, description, methodology, homologous sequence identification; Align structures, align model sequence; Construction of variable and conserved regions, threading techniques, Topology fingerprint approach for prediction, evaluation of alternate models; Structure prediction on a mystery sequence, structure aided sequence techniques of structure prediction, structural profiles, alignment algorithms, mutation tables, prediction, validation, sequence based methods of structure prediction, prediction using inverse folding, fold prediction; Significance analysis, scoring techniques, sequence- sequence scoring.

Docking

Docking problems, methods for protein- ligand docking, validation studies and applications; Screening small molecule databases, docking of combinatorial libraries, input data, analyzing docking results.

- 4 Diversity of Genomes 12 Hrs
Prokaryotic and Eukaryotic Gene Families. Genome Analysis: Introduction, Gene prediction methods, Gene mapping and applications- Genetic and Physical Mapping, Integrated map, Sequence assembly and gene expression.
Completed Genomes
Bacterium, Nematode, Plant and Human
Evolution of Genomes
Lateral or Horizontal Transfer among Genomes, Transcriptome and Proteome-General Account
Phylogenetic analysis
Evolutionary Change in Nucleotide Sequences, Rates and Patterns of Nucleotide Substitution, Models for Nucleotide Substitution, Construction of Phylogenetic Tree, Genome Annotation technique.

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| 5 | Target searching and Drug Designing
Target and lead, timeline for drug development, target discovery, target modulators, In-silico gene expression, microarray, and lead discovery, libraries of ligands, active site analysis, and prediction of drug quality. | 12
Hrs |
|---|--|-----------|

REFERENCES

1. David W. Mount, Bioinformatics Sequence and Genome Analysis, CBS Publishers and Distributors
2. S. C. Rastogiet. al. Bioinformatics- Concepts Skill and Applications, CBS Publishers and Distributors
3. T. E. Creighton, Protein Structure and Molecular Properties, W. H. Freeman and Company
4. Andreas D. Baxevanis, B. F. Francis Ouellette, Bioinformatics; A Practical Guide to the Analysis of Genes and Proteins, John Wiley & Sons, Inc.
5. Arthur M. Lesk, Introduction to Bioinformatics, Oxford University Press.
6. Shui Qing Ye. Bioinformatics: A Practical Approach, Chapman & Hall/CRC.
7. David Posada, Bioinformatics for DNA Sequence Analysis, Humana press.
8. Lesk, A.M. Introduction to Bioinformatics. Oxford University Press.
9. Letovsky, S.I. Bioinformatics. Kluwer Academic Publishers.
10. Baldi, P. and Brunak, S. Bioinformatics. The MIT Press.

BIOLOGICAL EVALUATION OF DRUG THERAPY (MPB 204T)

Scope

This paper has been designed to provide the knowledge to the biotechnology students to understand the importance of biological and evaluation of drug therapy of biological medicines.

Objective

At the completion of this subject it is expected that students will be able to,

- Understand about the general concept of standardization of biological.
- Understand the importance of transgenic animals and knockout animals.
- Understand the biological medicines in development of various diseases.
- Learn the biological evaluation of drugs in vitro and in vivo

THEORY

60 Hrs

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|----|--|-----------|
| 1. | Biological Standardization
General principles, Scope and limitation of bio-assay, bioassay of some official drugs.
Preclinical drug evaluation
Preclinical drug evaluation of its biological activity, potency and toxicity-Toxicity test in animals including acute, sub-acute and chronic toxicity, ED50 and LD50 determination, special toxicity test like teratogenicity and mutagenicity.
Guidelines for toxicity studies
Various guidelines for toxicity studies. Animal experiments assessing safety of packaging materials. | 12
Hrs |
| 2 | Pyrogens
Pyrogens: Sources, Chemistry and properties of bacterial pyrogens and endotoxins, Official pyrogen tests.
Microbiological assay
Assay of antibiotics and vitamins.
Biological evaluation of drugs
Screening and evaluation (including principles of screening, development of models for diseases: In vivo models / In vitro models / cell line study). | 12
Hrs |

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| 3 | <p>Biologic Medicines in Development for various diseases -
By Therapeutic Category</p> <ul style="list-style-type: none"> • Genetic Disorders • Eye related Disorders • Digestive Disorders • Diabetes/Related Conditions • Cardiovascular Disease • Cancer/Related Conditions • Blood Disorders • Autoimmune Disorders • Infectious Diseases • Neurologic Disorders • Skin Diseases • Organe Transplantation <p>Biologic Medicines in Development for various diseases –
by Product Category</p> <ul style="list-style-type: none"> • Antisense • Vaccines • Recombinant Hormones/Proteins • Monoclonal Antibodies (mAb) • Interferons • Growth Factors • Gene Therapy • RNA Interference | 12
Hrs |
| 4 | <p>Regulatory aspects : drugs, biologics and medical devices
An introduction to the regulations and documents necessary for
approval of a medical product.
Regulatory consideration
Regulatory consideration for pre-clinical testing and clinical testing
of drugs, biologics and medical devices.
New Drug Applications for Global Pharmaceutical Product
Approvals</p> | 12
Hrs |
| 5 | <p>Bioavailability
Objectives and consideration in bio-availability studies of
Biopharmaceuticals, Concept of equivalents, Measurements of
bio-availability.</p> | 12
Hrs |

Determination of the rate of absorption, Bioequivalence and its importance, Regulatory aspects of bio-availability and bioequivalence studies for conventional dosage forms and controlled drug delivery systems of Biopharmaceuticals.
Pharmacokinetics

Pharmacokinetics:- Basic consideration, Pharmacokinetic models, Application of Pharmacokinetics in new drug development of Biopharmaceuticals and designing of dosage forms and Novel drug delivery systems of Biopharmaceuticals.

REFERENCES

1. Perkins F.T., Hennesen W. Standardization and Control of Biologicals Produced by Recombinant DNA Technology, International Association of Biological Standardization
2. J.H. Burn., Biological Standardization, Oxford University Press
3. Drug Discovery and Evaluation in Pharmacology assay: Vogel
4. Chow, Shein, Ching, Design and analysis of animal studies in pharmaceutical development,
5. Nodine and Siegler, Animal and Clinical pharmacologic Techniques in Drug Evaluation.
6. Screening methods in pharmacology (vol I & II), R.A. Turner.

PHARMACEUTICAL BIOTECHNOLOGY PRACTICAL - II
(MPB 205P)

1. Protein identification
2. Protein characterization
3. Protein biochemistry
4. Recombinant DNA Technology
5. Protein expression
6. Protein formulations
7. Database searching
8. Sequence analysis methods
9. Protein structure prediction
10. Gene annotation methods
11. Phylogenetic analysis
12. Protein, DNA binding studies
13. Preparation of DNA for PCR applications – Isolation, Purity and Quantification
14. Introduction to PCR – working of PCR, Programming.
15. Introduction to RT-PCR – working, programming.
16. Primer design using softwares.
17. Gene DNA amplification by random / specific primers.
18. Southern Hybridization
19. Western Blotting
20. Gene transformation

PHARMACY PRACTICE (MPP)

CLINICAL PHARMACY PRACTICE (MPP 101T)

Scope

This course is designed to impart the basic knowledge and skills that are required to practice pharmacy including the provision of pharmaceutical care services to both healthcare professionals and patients in clinical settings.

Objectives

Upon completion of this course it is expected that students shall be able to :

- Understand the elements of pharmaceutical care and provide comprehensive patient care services
- Interpret the laboratory results to aid the clinical diagnosis of various disorders
- Provide integrated, critically analyzed medicine and poison information to enable healthcare professionals in the efficient patient management

THEORY

60 Hrs

1. Introduction to Clinical Pharmacy: Definition, evolution and scope of clinical pharmacy, International and national scenario of clinical pharmacy practice, Pharmaceutical care
Clinical Pharmacy Services: Ward round participation, Drug therapy review (Drug therapy monitoring including medication order review, chart endorsement, clinical review and pharmacist interventions) 12 Hrs
2. Clinical Pharmacy Services: Patient medication history interview, Basic concept of medicine and poison information services, Basic concept of pharmacovigilance, Hemovigilance, Materiovigilance and AEFI, Patient medication counselling, Drug utilisation evaluation, Documentation of clinical pharmacy services, Quality assurance of clinical pharmacy services. 12 Hrs
3. Patient Data Analysis: Patient Data & Practice Skills: Patient's case history - its structure and significances in drug therapy management, Common medical abbreviations and terminologies used in clinical practice, Communication skills: verbal and non-verbal communications, its applications in patient care services. 12 Hrs

Lab Data Interpretation: Hematological tests, Renal function tests, Liver function tests

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| 4 | Lab Data Interpretation: Tests associated with cardiac disorders, Pulmonary function tests, Thyroid function tests, Fluid and electrolyte balance, Microbiological culture sensitivity tests | 12
Hrs |
| 5 | Medicines & Poison Information Services
Medicine Information Service: Definition and need for medicine information service, Medicine information resources, Systematic approach in answering medicine information queries, Preparation of verbal and written response, Establishing a drug information centre.
Poison Information Service: Definition, need, organization and functions of poison information centre. | 12
Hrs |

REFERENCES

1. A Textbook of Clinical Pharmacy Practice – Essential concepts and skills – Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata
2. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia
3. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc
4. Relevant review articles from recent medical and pharmaceutical literature.

PHARMACOTHERAPEUTICS-I (MPP 102T)

Scope

This course aims to enable the students to understand the different treatment approaches in managing various disease conditions. Also, it imparts knowledge and skills in optimizing drug therapy of a patient by individualizing the treatment plan through evidence-based medicines.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Describe and explain the rationale for drug therapy
- Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence
- Discuss the clinical controversies in drug therapy and evidence based medicine
- Prepare individualized therapeutic plans based on diagnosis
- Identify the patient specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time- course of clinical and laboratory indices of therapeutic response and adverse effect/s)

THEORY

60 Hrs

Etiopathogenesis and pharmacotherapy of diseases associated with following systems

- | | | |
|----|--|-----------|
| 1. | Cardiovascular system: Hypertension, Congestive cardiac failure, Acute coronary syndrome, Arrhythmias, Hyperlipidemias. | 12
Hrs |
| 2 | Respiratory system: Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases
Endocrine system: Diabetes, Thyroid diseases | 12
Hrs |
| 3 | Gastrointestinal system: Peptic ulcer diseases, Reflux esophagitis, Inflammatory bowel diseases, Jaundice & hepatitis | 12
Hrs |
| 4 | Gastrointestinal system: Cirrhosis, Diarrhea and Constipation, Drug-induced liver disease | 12
Hrs |

Hematological diseases: Anemia, Deep vein thrombosis, Drug induced hematological disorders

- 5 Bone and joint disorders: Rheumatoid arthritis, Osteoarthritis, Gout, Osteoporosis 12 Hrs

Dermatological Diseases: Psoriasis, Eczema and scabies, impetigo, drug induced skin disorders

Ophthalmology: Conjunctivitis, Glaucoma

REFERENCES

1. Roger and Walker. Clinical Pharmacy and Therapeutics - Churchill Livingstone publication
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach- Appleton & Lange
3. Robins SL. Pathologic basis of disease -W.B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm- Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice-- McGraw Hill Publication
7. Carol Mattson Porth. Principles of Pathophysiology- Lippincott Williams and Wilkins
8. Harrison's. Principles of Internal Medicine - McGraw Hill
9. Relevant review articles from recent medical and pharmaceutical literature

HOSPITAL & COMMUNITY PHARMACY (MPP 103T)

Scope

This course is designed to impart basic knowledge and skills that are required to practice pharmacy in both hospital and community settings.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Understand the organizational structure of hospital pharmacy
- Understand drug policy and drug committees
- Know about procurement & drug distribution practices
- Know the admixtures of radiopharmaceuticals
- Understand the community pharmacy management
- Know about value added services in community pharmacies

THEORY

60 Hrs

- | | | |
|----|---|-----------|
| 1. | Introduction to Hospitals - Definition, classification, organizational structure
Hospital Pharmacy: Definition, Relationship of hospital pharmacy department with other departments, Organizational structure, legal requirements, work load statistics, Infrastructural requirements, Hospital Pharmacy Budget and Hospital Pharmacy management
Hospital Drug Policy: Pharmacy & Therapeutics Committee, Infection Control committee, Research & Ethics Committee, Management of Medicines as per NABH | 12
Hrs |
| 2 | Hospital Formulary Guidelines and its development, Developing Therapeutic guidelines, Drug procurement process, and methods of Inventory control, Methods of Drug distribution, Intravenous admixtures, Hospital Waste Management | 12
Hrs |
| 3 | Education and training: Training of technical staff, training and continuing education for pharmacists, Pharmacy students, Medical staff and students, Nursing staff and students, Formal and informal meetings and lectures, Drug and therapeutics newsletter.
Community Pharmacy Practice: Definition, roles & responsibilities of community pharmacists, and their relationship with other health care providers. | 12
Hrs |

Community Pharmacy management: Legal requirements to start community pharmacy, site selection, lay out & design, drug display, super drug store model, accounts and audits, Good dispensing practices, Different softwares & databases used in community pharmacies. Entrepreneurship in community pharmacy.

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|---|--|-----------|
| 4 | <p>Prescription – Legal requirements & interpretation, prescription related problems</p> <p>Responding to symptoms of minor ailments: Head ache, pyrexia, menstrual pains, food and drug allergy, OTC medication: Rational use of over the counter medications</p> <p>Medication counseling and use of patient information leaflets</p> <p>Medication adherence – Definition, factors influencing adherence behavior, strategies to improve medication adherence</p> <p>Patient referrals to the doctors</p> <p>ADR monitoring in community pharmacies</p> | 12
Hrs |
| 5 | <p>Health Promotion – Definition and health promotion activities, family planning, Health screening services, first aid, prevention of communicable and non-communicable diseases, smoking cessation, Child & mother care</p> <p>National Health Programs- Role of Community Pharmacist in Malaria and TB control programs</p> <p>Home Medicines review program – Definition, objectives, Guidelines, method and outcomes</p> <p>Research in community pharmacy Practice</p> | 12
Hrs |

REFERENCES

1. Hospital Pharmacy - Hassan WE. Lea and Febiger publication.
2. Textbook of hospital pharmacy - Allwood MC and Blackwell.
3. Avery's Drug Treatment, Adis International Limited.
4. Community Pharmacy Practice – Ramesh Adepu, BSP Publishers, Hyderabad
5. Remington Pharmaceutical Sciences.
6. Relevant review articles from recent medical and pharmaceutical literature

CLINICAL RESEARCH (MPP 104T)

Scope

This course aims to provide the students an opportunity to learn drug development process especially the phases of clinical trials and also the ethical issues involved in the conduct of clinical research. Also, it aims to impart knowledge and develop skills on conceptualizing, designing, conducting and managing clinical trials.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Know the new drug development process.
- Understand the regulatory and ethical requirements.
- Appreciate and conduct the clinical trials activities
- Know safety monitoring and reporting in clinical trials
- Manage the trial coordination process

THEORY

60 Hrs

- | | | |
|----|--|-----------|
| 1. | Drug development process: Introduction, various approaches to drug discovery, Investigational new drug application submission
Ethics in Biomedical Research: Ethical Issues in Biomedical Research – Principles of ethics in biomedical research, Ethical committee [institutional review board] - its constitution and functions, Challenges in implementation of ethical guidelines, ICH GCP guidelines and ICMR guidelines in conduct of Clinical trials, Drug Safety Reporting. | 12
Hrs |
| 2 | Types and Designs used in Clinical Research: Planning and execution of clinical trials, Various Phases of clinical trials, Bioavailability and Bioequivalence studies, Randomization techniques (Simple randomization, restricted randomization, blocking method and stratification), Types of research designs based on Controlling Method (Experimental, Quasi experimental, and Observational methods) Time Sequences (Prospective and Retrospective), Sampling methods (Cohort study, case Control study and cross sectional study), Health outcome measures (Clinical & Physiological, Humanistic and economic)
Clinical Trial Study team: Roles and responsibilities of: Investigator, Study Coordinator, Sponsor, Monitor, Contract Research Organization. | 12
Hrs |

- 3 Clinical trial Documents: Guidelines to the preparation of following documents: Protocols, Investigator's Brochure, Informed Consent Form, Case report forms, Contracts and agreements, Dairy Cards 12 Hrs
 Clinical Trial Start up activities: Site Feasibility Studies, Site/Investigator selection, Pre-study visit, Investigator meeting, Clinical trial agreement execution, Ethics committee document preparation and submission
- 4 Investigational Product: Procurement and Storage of investigation product 12 Hrs
 Filing procedures: Essential documents for clinical trial, Trial Master File preparation and maintenance, Investigator Site File, Pharmacy File, Site initiation visit, Conduct, Report and Follow up Clinical Trial Monitoring and Close out:
 Preparation and conduct of monitoring visit: Review of source documents, CRF, ICF, IP storage, accountability and reconciliation, Study Procedure, EC communications, Safety reporting, Monitoring visit reporting and follow-up
 Close-Out visit: Study related documents collection, Archival requirement, Investigational Product reconciliation and destruction, Close-Out visit report.
- 5 Quality Assurance and Quality Control in Clinical Trials: 12 Hrs
 Types of audits, Audit criteria, Audit process, Responsibilities of stakeholders in audit process, Audit follow-up and documentation, Audit resolution and Preparing for FDA inspections, Fraud and misconduct management
 Data Management
 Infrastructure and System Requirement for Data Management: Electronic data capture systems, Selection and implementation of new systems, System validation and test procedures, Coding dictionaries, Data migration and archival
 Clinical Trial Data Management: Standard Operating Procedures, Data management plan, CRF & Data base design considerations, Study set-up, Data entry, CRF tracking and corrections, Data cleaning, Managing laboratory and ADR data, Data transfer and database lock, Quality Control and Quality Assurance in CDM, Data mining and warehousing.

REFERENCES

1. Principles and practice of pharmaceutical medicine, Second edition. Authors: Lionel D. Edward, Andrew J. Flether Anthony W Fos , Peter D Sloaier Publisher: Wiley;
2. Handbook of clinical research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone
3. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
4. Central Drugs Standard Control Organization. Good Clinical Practices- Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health.
5. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.
6. Ethical Guidelines for Biomedical Research on Human Subjects. Indian Council of Medical Research, New Delhi.
7. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, John Wiley and Sons.
8. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
9. Goodman & Gilman: JG Hardman, LE Limbard, McGraw Hill Publications.
10. Relevant review articles from recent medical and pharmaceutical literature.

PHARMACY PRACTICE PRACTICAL – I
(MPP 105P)

Pharmacy Practice practical component includes experiments covering important topics of the courses Clinical Pharmacy Practice, Pharmacotherapeutics-I, Hospital & Community Pharmacy and Clinical Research.

List of Experiments (24)

1. Treatment Chart Review (one)
2. Medication History Interview (one)
3. Patient Medication Counseling (two)
4. Drug Information Query (two)
5. Poison Information Query (one)
6. Lab Data Interpretation (two)
7. Presentation of clinical cases of various disease conditions adopting Pharmaceutical Care Plan Model (eight)
8. ABC Analysis of a given list of medications (one)
9. Preparation of content of a medicine, with proper justification, for the inclusion in the hospital formulary (one)
10. Formulation and dispensing of a given IV admixtures (one)
11. Preparation of a patient information leaflet (two)
12. Preparation of Study Protocol (one)
13. Preparation of Informed Consent Form (one)

PRINCIPLES OF QUALITY USE OF MEDICINES (MPP 201T)

Scope:

This course is designed to impart basic knowledge and skills that are required to practice quality use of medicines (QUM) in different healthcare settings and also to promote quality use of medicines, in clinical practice, through evidence-based medicine approach.

Objectives:

Upon completion of this course it is expected that students shall be able to:

- Understand the principles of quality use of medicines
- Know the benefits and risks associated with use of medicines
- Understand regulatory aspects of quality use of medicines
- Identify and resolve medication related problems
- Promote quality use of medicines
- Practice evidence-based medicines

THEORY	60 Hrs
1. Introduction to Quality use of medicines (QUM): Definition and Principles of QUM, Key partners and responsibilities of the partners, Building blocks in QMC, Evaluation process in QMC, Communication in QUM, Cost effective prescribing.	12 Hrs
2. Concepts in QUM Evidence based medicine: Definition, concept of evidence based medicine, Approach and practice of evidence based medicine in clinical settings Essential drugs: Definition, need, concept of essential drug, National essential drug policy and list Rational drug use: Definition, concept and need for rational drug use, Rational drug prescribing, Role of pharmacist in rational drug use.	12 Hrs
3. QUM in various settings: Hospital settings, Ambulatory care/Residential care, Role of health care professionals in promoting the QUM, Strategies to promote the QUM, Impact of QUM on E-health, integrative medicine and multidisciplinary care. QUM in special population: Pediatric prescribing, Geriatric prescribing, Prescribing in pregnancy and lactation, Prescribing in immune compromised and organ failure patients.	12 Hrs

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| 4 | Regulatory aspects of QUM in India: Regulation including scheduling, Regulation of complementary medicines, Regulation of OTC medicines, Professional responsibility of pharmacist, Role of industry in QUM in medicine development. | 12
Hrs |
| 5 | Medication errors: Definition, categorization and causes of medication errors, Detection and prevention of medication errors, Role of pharmacist in monitoring and management of medication errors
Pharmacovigilance: Definition, aims and need for pharmacovigilance, Types, predisposing factors and mechanism of adverse drug reactions (ADRs), Detection, reporting and monitoring of ADRs, Causality assessment of ADRs, Management of ADRs, Role of pharmacist in pharmacovigilance. | 12
Hrs |

REFERENCES:

1. A Textbook of Clinical Pharmacy Practice – Essential concepts and skills – Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata
2. Andrews EB, Moore N. Mann's Pharmacovigilance
3. Dipiro JT, Talbert RL, Yee GC. Pharmacotherapy: A Pathophysiologic Approach
4. Straus SE, Richardson WS, Glasziou P, Haynes RB. Evidence-Based Medicine: How to practice and teach it
5. Cohen MR. Medication Errors
6. Online:
 - http://medicinesaustralia.com.au/files/2012/05/MA_QUM_External_Reduced.pdf
 - <http://curriculum.racgp.org.au/statements/quality-use-of-medicines/>
 - http://www.rug.nl/research/portal/files/14051541/Chapter_2.pdf
7. Relevant review articles from recent medical and pharmaceutical literature.

PHARMACOTHERAPEUTICS II (MPP 202T)

Scope

This course aims to enable the students to understand the different treatment approaches in managing various disease conditions. Also, it imparts knowledge and skills in optimizing drug therapy of a patient by individualizing the treatment plan through evidence-based medicines.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Describe and explain the rationale for drug therapy
- Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence
- Discuss the clinical controversies in drug therapy and evidence based medicine
- Prepare individualized therapeutic plans based on diagnosis
- Identify the patient specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time- course of clinical and laboratory indices of therapeutic response and adverse effect/s)

THEORY	60 Hrs
1. Nervous system: Epilepsy, Parkinson's disease, Stroke, Headache, Alzheimer's disease, Neuralgias and Pain pathways and Pain management.	12 Hrs
2. Psychiatric disorders: Schizophrenia, Depression, Anxiety disorders, Sleep disorders, Drug induced psychiatric disorders Renal system: Acute renal failure, Chronic renal failure, Renal dialysis, Drug induced renal disease	12 Hrs
3. Infectious diseases: General guidelines for the rational use of antibiotics and surgical prophylaxis, Urinary tract infections, Respiratory tract infections, Gastroenteritis, Tuberculosis, Malaria, Bacterial endocarditis, Septicemia.	12 Hrs
4. Infectious diseases: Meningitis, HIV and opportunistic infections, Rheumatic fever, Dengue fever, H1N1, Helmenthiasis, Fungal infections Gynecological disorders: Dysmenorrhea, Hormone replacement therapy.	12 Hrs

- 5 Oncology: General principles of cancer chemotherapy, 12 pharmacotherapy of breast cancer, lung cancer, head & neck Hrs cancer, hematological malignancies, Management of nausea and vomiting, Palliative care

REFERENCES

1. Roger and Walker. Clinical Pharmacy and Therapeutics - Churchill Livingstone publication.
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach- Appleton & Lange
3. Robins SL. Pathologic basis of disease -W.B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm- Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice-- McGraw Hill Publication
7. Carol Mattson Porth. Principles of Pathophysiology- Lippincott Williams and Wilkins
8. Harrison's. Principles of Internal Medicine - McGraw Hill
9. Relevant review articles from recent medical and pharmaceutical literature

CLINICAL PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING (MPP 203T)

Scope

This course is designed to enable students to understand the basic principles and applications of pharmacokinetics in designing the individualized dosage regimen, to interpret the plasma drug concentration profile in altered pharmacokinetics, drug interactions and in therapeutic drug monitoring processes to optimize the drug dosage regimen. Also, it enables students to understand the basic concepts of pharmacogenetics, pharmacometrics for modeling and simulation of pharmacokinetic data.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Design the drug dosage regimen for individual patients
- Interpret and correlate the plasma drug concentrations with patients' therapeutic outcomes
- Recommend dosage adjustment for patients with renal/ hepatic impairment
- Recommend dosage adjustment for paediatrics and geriatrics
- Manage pharmacokinetic drug interactions
- Apply pharmacokinetic parameters in clinical settings
- Interpret the impact of genetic polymorphisms of individuals on pharmacokinetics and or pharmacodynamics of drugs
- Do pharmacokinetic modeling for the given data using the principles of pharmacometrics

THEORY

60 Hrs

1. Introduction to Clinical pharmacokinetics: Compartmental and Non compartmental models, Renal and non-renal clearance, Organ extraction and models of hepatic clearance, Estimation and determinants of bioavailability, Multiple dosing, Calculation of loading and maintenance doses
Designing of dosage regimens: Determination of dose and dosing intervals, Conversion from intravenous to oral dosing, Nomograms and Tabulations in designing dosage regimen. 12 Hrs

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| 2 | <p>Pharmacokinetics of Drug Interaction: Pharmacokinetic drug interactions, Inhibition and Induction of Drug metabolism, Inhibition of Biliary Excretion</p> <p>Pharmacogenetics: Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes, Genetic Polymorphism in Drug Transport and Drug Targets, Pharmacogenetics and Pharmacokinetic / Pharmacodynamic considerations</p> <p>Introduction to Pharmacometrics: Introduction to Bayesian Theory, Adaptive method or Dosing with feedback, Analysis of Population pharmacokinetic Data.</p> | 12
Hrs |
| 3 | <p>Non Linier Mixed Effects Modelling: The Structural or Base Model, Modeling Random Effects, Modeling Covariate Relationships, Mixture Model, Estimation Methods, Model Building Techniques, Covariate Screening Methods, Testing the model assumptions, Precision of the parameter estimates and confidence intervals, Model misspecification and violation of the model assumptions, Model Validation, Simulation of dosing regimens and dosing recommendations, Pharmacometrics software.</p> | 12
Hrs |
| 4 | <p>Altered Pharmacokinetics: Drug dosing in the elderly, Drug dosing in the paediatrics, Drug dosing in the obese patients, Drug dosing in the pregnancy and lactation, Drug dosing in the renal failure and extracorporeal removal of drugs, Drug dosing in the in hepatic failure.</p> | 12
Hrs |
| 5 | <p>Therapeutic Drug monitoring: Introduction, Individualization of drug dosage regimen (Variability – Genetic, age, weight, disease and Interacting drugs), Indications for TDM, Protocol for TDM, Pharmacokinetic/Pharmacodynamic Correlation in drug therapy, TDM of drugs used in the following conditions: Cardiovascular disease: Digoxin, Lidocaine, Amiodarone; Seizure disorders: Phenytoin, Carbamazepine, Sodium Valproate; Psychiatric conditions: Lithium, Fluoxetine, Amitriptyline; Organ transplantations: Cyclosporine; Cytotoxic Agents: Methotrexate, 5-FU, Cisplatin; Antibiotics: Vancomycin, Gentamicin, Meropenem.</p> | 12
Hrs |

REFERENCES

1. Leon Shargel, Susanna Wu-Pong, Andrew Yu. Applied Biopharmaceutics & Pharmacokinetics. New York: Mc Graw Hill.
2. Peter L. Bonate. Pharmacokinetic - Pharmacodynamic Modeling and Simulation. Springer Publications.
3. Michael E. Burton, Leslie M. Shaw, Jerome J. Schentag, William E. Evans. Applied Pharmacokinetics & Pharmacodynamics: Principles of Therapeutic Drug Monitoring. lippincott Williams & Wilkins.
4. Steven How-Yan Wong, Irving Sunshine. Handbook of Analytical Therapeutic Drug Monitoring and Toxicology. CRC Press, USA.
5. Soraya Dhillon, Andrzej Kostrzewski. Clinical pharmacokinetics. 1st edition. London: Pharmaceutical Press.
6. Joseph T. Dipiro, William J. Spruill, William E. Wade, Robert A. Blouin and Jane M. Pruemmer. Concepts in Clinical Pharmacokinetics. American Society of Health-System Pharmacists, USA.
7. Malcolm Rowland, Thomas N. Tozer. Clinical Pharmacokinetics and pharmacodynamics: concepts and applications. lippincott Williams & Wilkins, USA.
8. Evans, Schentag, Jusko. Applied pharmacokinetics. American Society of Health system Pharmacists, USA.
9. Michael E. Winter. Basic Clinical Pharmacokinetics. lippincott Williams & Wilkins, USA.
10. Milo Gibaldi. Biopharmaceutics and Clinical Pharmacokinetics. Pharma Book Syndicate, USA.
11. Dhillon and Kostrzewski. Clinical pharmacokinetics. Pharmaceutical Press, London.
12. John E. Murphy. Clinical Pharmacokinetics. 5th edition. US: American Society of Health- System Pharmacist, USA.
13. Relevant review articles from recent medical and pharmaceutical literature

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS (MPP 204T)

Scope

This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

THEORY

60 Hrs

1. Introduction to Pharmacoepidemiology: Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio 12 Hrs
2. Pharmacoepidemiological Methods: Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event 12 Hrs

monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

- 3 Introduction to Pharmacoeconomics: Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. 12 Hrs
Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs.
Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.
- 4 Pharmacoeconomic evaluations: Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA). 12 Hrs
- 5 Definition, Steps involved, Applications, Advantages and disadvantages of the following: 12 Hrs
Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures.
Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in pharmacoeconomic analysis, Applications of Pharmacoeconomics.

REFERENCES

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.

5. George E Mackinnon III. Understanding health outcomes and pharmacoconomics.
6. Graker, Dennis. Pharmacoconomics and outcomes.
7. Walley, Pharmacoconomics.
8. Pharmacoconomic - ed. by Nowakowska - University of Medical Sciences, Poznan.
9. Relevant review articles from recent medical and pharmaceutical literature

PHARMACY PRACTICE PRACTICAL - II (MPP 205P)

Pharmacy Practice practical component includes experiments covering important topics of the courses Principles of Quality Use of Medicines, Pharmacotherapeutics-II, Clinical Pharmacokinetics & Therapeutic Drug Monitoring and Pharmacoepidemiology and Pharmacoeconomics.

List of Experiments (24)

1. Causality assessment of adverse drug reactions (three)
2. Detection and management of medication errors (three)
3. Rational use of medicines in special population (three)
4. Presentation of clinical cases of various disease conditions adopting Pharmaceutical Care Plan Model (eight)
5. Calculation of Bioavailability and Bioequivalence from the given data (two)
6. Interpretation of Therapeutic Drug Monitoring reports of a given patient (three)
7. Calculation of various Pharmacoeconomic outcome analysis for the given data (two)

PHARMACOLOGY (MPL)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPL 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 Hrs

1. UV-Visible spectroscopy: Introduction, Theory, Laws, 10
Instrumentation associated with UV-Visible spectroscopy, Choice Hrs
of solvents and solvent effect and Applications of UV-Visible
spectroscopy, Difference/ Derivative spectroscopy.
IR spectroscopy: Theory, Modes of Molecular vibrations, Sample
handling, Instrumentation of Dispersive and Fourier - Transform
IR Spectrometer, Factors affecting vibrational frequencies and
Applications of IR spectroscopy, Data Interpretation.
Spectrofluorimetry: Theory of Fluorescence, Factors affecting
fluorescence (Characteristics of drugs that can be analysed by
fluorimetry), Quenchers, Instrumentation and Applications of
fluorescence spectrophotometer.
Flame emission spectroscopy and Atomic absorption
spectroscopy: Principle, Instrumentation, Interferences and
Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, 10
Principle, Instrumentation, Solvent requirement in NMR, Hrs
Relaxation process, NMR signals in various compounds,
Chemical shift, Factors influencing chemical shift, Spin-Spin
coupling, Coupling constant, Nuclear magnetic double resonance,
Brief outline of principles of FT-NMR and ¹³C NMR. Applications
of NMR spectroscopy.

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|---|---|-----------|
| 3 | <p>Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.</p> | 10
Hrs |
| 4 | <p>Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following:</p> <ul style="list-style-type: none"> j) Thin Layer chromatography k) High Performance Thin Layer Chromatography l) Ion exchange chromatography m) Column chromatography n) Gas chromatography o) High Performance Liquid chromatography p) Ultra High Performance Liquid chromatography q) Affinity chromatography r) Gel Chromatography | 10
Hrs |
| 5 | <p>Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following:</p> <ul style="list-style-type: none"> a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing <p>X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.</p> | 10
Hrs |
| 6 | <p>Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry.</p> <p>Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications.</p> <p>Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.</p> | 10
Hrs |

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods - Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

ADVANCED PHARMACOLOGY - I
(MPL 102T)

Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved

Objectives

Upon completion of the course the student shall be able to :

- Discuss the pathophysiology and pharmacotherapy of certain diseases
- Explain the mechanism of drug actions at cellular and molecular level
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

THEORY

60 Hrs

- | | | |
|----|---|-----------------|
| 1. | General | Pharmacology 12 |
| | a. | 12 |
| | Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding. | |
| | b. | |
| | Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors, quantitation of drug receptors interaction and elicited effects. | |
| 2 | Neurotransmission | 12 |
| | a. | Hrs |
| | General aspects and steps involved in neurotransmission. | |
| | b. | |
| | Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetyl choline). | |
| | c. | |
| | Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and glycine). | |
| | d. | |
| | Non adrenergic non cholinergic transmission (NANC). Co-transmission | |

Systemic Pharmacology

A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems

Autonomic Pharmacology

Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction

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| 3 | Central nervous system Pharmacology
General and local anesthetics
Sedatives and hypnotics, drugs used to treat anxiety.
Depression, psychosis, mania, epilepsy, neurodegenerative diseases.
Narcotic and non-narcotic analgesics. | 12
Hrs |
| 4 | Cardiovascular Pharmacology
Diuretics, antihypertensives, antiischemics, anti-arrhythmics, drugs for heart failure and hyperlipidemia.
Hematinics, coagulants, anticoagulants, fibrinolytics and anti-platelet drugs | 12
Hrs |
| 5 | Autocoid Pharmacology
The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autocoids.
Pharmacology of antihistamines, 5HT antagonists. | 12
Hrs |

REFEERENCES

1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Basic and Clinical Pharmacology by B.G Katzung
4. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Graham Smith. Oxford textbook of Clinical Pharmacology.
7. Avery Drug Treatment
8. Dipiro Pharmacology, Pathophysiological approach.
9. Green Pathophysiology for Pharmacists.

10. Robbins & Cortan Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)
11. A Complete Textbook of Medical Pharmacology by Dr. S.K. Srivastava published by APC Avichal Publishing Company
12. K.D. Tripathi. Essentials of Medical Pharmacology.
13. Modern Pharmacology with Clinical Applications, Craig Charles R. & Stitzel Robert E., Lippincott Publishers.
14. Clinical Pharmacokinetics & Pharmacodynamics : Concepts and Applications – Malcolm Rowland and Thomas N. Tozer, Wolters Kluwer, Lippincott Williams & Wilkins Publishers.
15. Applied biopharmaceutics and Pharmacokinetics, Pharmacodynamics and Drug metabolism for industrial scientists.
16. Modern Pharmacology, Craig CR. & Stitzel RE, Little Brown & Company.

**PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING
METHODS - I
(MPL 103T)**

Scope

This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes

Objectives

Upon completion of the course the student shall be able to,

- Appraise the regulations and ethical requirement for the usage of experimental animals.
- Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals
- Describe the various newer screening methods involved in the drug discovery process
- Appreciate and correlate the preclinical data to humans

THEORY

60 Hrs

1. Laboratory Animals 12 Hrs
Common laboratory animals: Description, handling and applications of different species and strains of animals.
Transgenic animals: Production, maintenance and applications
Anaesthesia and euthanasia of experimental animals.
Maintenance and breeding of laboratory animals.
CPCSEA guidelines to conduct experiments on animals
Good laboratory practice.
Bioassay-Principle, scope and limitations and methods
2. Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. 12 Hrs
General principles of preclinical screening. CNS Pharmacology: behavioral and muscle co ordination, CNS stimulants and

depressants, anxiolytics, anti-psychotics, anti epileptics and
nootropics. Drugs for neurodegenerative diseases like
Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on
Autonomic Nervous System.

- 3 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

Respiratory Pharmacology: anti-asthmatics, drugs for COPD and
anti allergics. Reproductive Pharmacology: Aphrodisiacs and
antifertility agents Analgesics, antiinflammatory and antipyretic
agents. Gastrointestinal drugs: anti ulcer, anti -emetic, anti-
diarrheal and laxatives.

- 4 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

Cardiovascular Pharmacology: antihypertensives, antiarrhythmics,
antianginal, antiatherosclerotic agents and diuretics. Drugs for
metabolic disorders like anti-diabetic, antidyslipidemic agents.
Anti cancer agents. Hepatoprotective screening methods.

- 5 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

Immunomodulators, Immunosuppressants and immunostimulants

General principles of immunoassay: theoretical basis and
optimization of immunoassay, heterogeneous and homogenous
immunoassay systems. Immunoassay methods evaluation;
protocol outline, objectives and preparation. Immunoassay for
digoxin and insulin

Limitations of animal experimentation and alternate animal
experiments.

Extrapolation of in vitro data to preclinical and preclinical to
humans

REFERENCES

1. Biological standardization by J.H. Burn D.J. Finney and I.G. Goodwin
2. Screening methods in Pharmacology by Robert Turner. A
3. Evaluation of drugs activities by Laurence and Bachrach
4. Methods in Pharmacology by Arnold Schwartz.
5. Fundamentals of experimental Pharmacology by M.N.Ghosh
6. Pharmacological experiment on intact preparations by Churchill Livingstone
7. Drug discovery and Evaluation by Vogel H.G.
8. Experimental Pharmacology by R.K.Goyal.
9. Preclinical evaluation of new drugs by S.K. Guta
10. Handbook of Experimental Pharmacology, SK.Kulkarni
11. Practical Pharmacology and Clinical Pharmacy, SK.Kulkarni, 3rd Edition.
12. David R.Gross. Animal Models in Cardiovascular Research, 2nd Edition, Kluwer Academic Publishers, London, UK.
13. Screening Methods in Pharmacology, Robert A.Turner.
14. Rodents for Pharmacological Experiments, Dr.Tapan Kumar chatterjee.
15. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author)

CELLULAR AND MOLECULAR PHARMACOLOGY
(MPL 104T)

Scope:

The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the receptor signal transduction processes.
- Explain the molecular pathways affected by drugs.
- Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.
- Demonstrate molecular biology techniques as applicable for pharmacology

THEORY	60 Hrs
1. Cell biology	12 Hrs
Structure and functions of cell and its organelles	
Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing	
Cell cycles and its regulation.	
Cell death– events, regulators, intrinsic and extrinsic pathways of apoptosis.	
Necrosis and autophagy.	
2 Cell signaling	12 Hrs
Intercellular and intracellular signaling pathways.	
Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors.	
Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP3), NO, and diacylglycerol.	
Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway.	

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| 3 | <p>Principles and applications of genomic and proteomic tools
 DNA electrophoresis, PCR (reverse transcription and real time),
 Gene sequencing, micro array technique, SDS page, ELISA and
 western blotting,
 Recombinant DNA technology and gene therapy
 Basic principles of recombinant DNA technology-Restriction
 enzymes, various types of vectors. Applications of recombinant
 DNA technology.
 Gene therapy- Various types of gene transfer techniques, clinical
 applications and recent advances in gene therapy.</p> | 12
Hrs |
| 4 | <p>Pharmacogenomics
 Gene mapping and cloning of disease gene.
 Genetic variation and its role in health/ pharmacology
 Polymorphisms affecting drug metabolism
 Genetic variation in drug transporters
 Genetic variation in G protein coupled receptors
 Applications of proteomics science: Genomics, proteomics,
 metabolomics, functionomics, nutrigenomics
 Immunotherapeutics
 Types of immunotherapeutics, humanisation antibody therapy,
 Immunotherapeutics in clinical practice</p> | 12
Hrs |
| 5 | <p>a. Cell culture techniques
 Basic equipments used in cell culture lab. Cell culture media,
 various types of cell culture, general procedure for cell cultures;
 isolation of cells, subculture, cryopreservation, characterization of
 cells and their application.
 Principles and applications of cell viability assays, glucose uptake
 assay, Calcium influx assays
 Principles and applications of flow cytometry</p> <p>b. Biosimilars</p> | 12
Hrs |

REFERENCES:

1. The Cell, A Molecular Approach. Geoffrey M Cooper.
2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong
3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
5. Basic Cell Culture protocols by Cheril D.Helgason and Cindy L.Miller
6. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
8. Current porotocols in molecular biology vol I to VI edited by Frederick M.Ausuvet et la.

PHARMACOLOGICAL PRACTICAL - I
(MPL 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry

Handling of laboratory animals.

1. Various routes of drug administration.
2. Techniques of blood sampling, anesthesia and euthanasia of experimental animals.
3. Functional observation battery tests (modified Irwin test)
4. Evaluation of CNS stimulant, depressant, anxiogenics and anxiolytic, anticonvulsant activity.
5. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activity.
6. Evaluation of diuretic activity.
7. Evaluation of antiulcer activity by pylorus ligation method.
8. Oral glucose tolerance test.
9. Isolation and identification of DNA from various sources (Bacteria, Cauliflower, onion, Goat liver).
10. Isolation of RNA from yeast
11. Estimation of proteins by Bradford/Lowry's in biological samples.
12. Estimation of RNA/DNA by UV Spectroscopy
13. Gene amplification by PCR.
14. Protein quantification Western Blotting.
15. Enzyme based in-vitro assays (MPO, AChEs, α amylase, α glucosidase).
16. Cell viability assays (MTT/Trypan blue/SRB).
17. DNA fragmentation assay by agarose gel electrophoresis.
18. DNA damage study by Comet assay.
19. Apoptosis determination by fluorescent imaging studies.
20. Pharmacokinetic studies and data analysis of drugs given by different routes of administration using softwares
21. Enzyme inhibition and induction activity
22. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (UV)
23. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (HPLC)

REFERENCES

1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
2. Fundamentals of experimental Pharmacology by M.N.Ghosh
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
4. Drug discovery and Evaluation by Vogel H.G.
5. Spectrometric Identification of Organic compounds - Robert M Silverstein,
6. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman,
7. Vogel's Text book of quantitative chemical analysis - Jeffery, Basset, Mendham, Denney,
8. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L.Mille
9. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
10. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
11. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi(Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

ADVANCED PHARMACOLOGY - II
(MPL 201T)

Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, the subject helps the student to understand the concepts of drug action and mechanism involved

Objectives

Upon completion of the course the student shall be able to:

- Explain the mechanism of drug actions at cellular and molecular level
- Discuss the Pathophysiology and pharmacotherapy of certain diseases
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

THEORY		60 Hrs
1.	Endocrine Pharmacology Molecular and cellular mechanism of action of hormones such as growth hormone, prolactin, thyroid, insulin and sex hormones Anti-thyroid drugs, Oral hypoglycemic agents, Oral contraceptives, Corticosteroids. Drugs affecting calcium regulation	12 Hrs
2	Chemotherapy Cellular and molecular mechanism of actions and resistance of antimicrobial agents such as β -lactams, aminoglycosides, quinolones, Macrolide antibiotics. Antifungal, antiviral, and anti-TB drugs.	12 Hrs
3	Chemotherapy Drugs used in Protozoal Infections Drugs used in the treatment of Helminthiasis Chemotherapy of cancer Immunopharmacology Cellular and biochemical mediators of inflammation and immune response. Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD. Immunosuppressants and Immunostimulants	12 Hrs

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| 4 | <p>GIT Pharmacology
 Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheals and drugs for constipation and irritable bowel syndrome.
 Chronopharmacology
 Biological and circadian rhythms, applications of chronotherapy in various diseases like cardiovascular disease, diabetes, asthma and peptic ulcer</p> | 12
Hrs |
| 5 | <p>Free radicals Pharmacology
 Generation of free radicals, role of free radicals in etiopathology of various diseases such as diabetes, neurodegenerative diseases and cancer.
 Protective activity of certain important antioxidant
 Recent Advances in Treatment:
 Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus</p> | 12
Hrs |

REFERENCES

1. The Pharmacological basis of therapeutics- Goodman and Gill man's
2. Principles of Pharmacology. The Pathophysiologic basis of drug therapy by David E Golan et al.
3. Basic and Clinical Pharmacology by B.G -Katzung
4. Pharmacology by H.P. Rang and M.M. Dale.
5. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
6. Text book of Therapeutics, drug and disease management by E T. Herfindal and Gourley.
7. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
8. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists
9. Robbins & Cortan Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)
10. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastava published by APC Avichal Publishing Company.
11. KD.Tripathi. Essentials of Medical Pharmacology
12. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING
METHODS-II
(MPL 202T)

Scope:

This subject imparts knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity. This knowledge will make the student competent in regulatory toxicological evaluation.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the various types of toxicity studies.
- Appreciate the importance of ethical and regulatory requirements for toxicity studies.
- Demonstrate the practical skills required to conduct the preclinical toxicity studies.

THEORY	60 Hrs
1. Basic definition and types of toxicology (general, mechanistic, regulatory and descriptive) Regulatory guidelines for conducting toxicity studies OECD, ICH, EPA and Schedule Y OECD principles of Good laboratory practice (GLP) History, concept and its importance in drug development	12 Hrs
2. Acute, sub-acute and chronic- oral, dermal and inhalational studies as per OECD guidelines. Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity studies. Test item characterization- importance and methods in regulatory toxicology studies	12 Hrs
3. Reproductive toxicology studies, Male reproductive toxicity studies, female reproductive studies (segment I and segment III), teratogenicity studies (segment II) Genotoxicity studies (Ames Test, in vitro and in vivo Micronucleus and Chromosomal aberrations studies) In vivo carcinogenicity studies	12 Hrs
4. IND enabling studies (IND studies)- Definition of IND, importance of IND, industry perspective, list of studies needed for IND submission.	12 Hrs

Safety pharmacology studies- origin, concepts and importance of safety pharmacology.

Tier1- CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2- GI, renal and other studies

- 5 Toxicokinetics- Toxicokinetic evaluation in preclinical studies, 12 saturation kinetics Importance and applications of toxicokinetic studies.
Alternative methods to animal toxicity testing.

REFERENCES

1. Hand book on GLP, Quality practices for regulated non-clinical research and development (<http://www.who.int/tdr/publications/documents/glp-handbook.pdf>).
2. Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, ministry of health and family welfare (department of health) New Delhi
3. Drugs from discovery to approval by Rick NG.
4. Animal Models in Toxicology, 3rd Edition, Lower and Bryan
5. OECD test guidelines.
6. Principles of toxicology by Karen E. Stine, Thomas M. Brown.
7. Guidance for Industry M3(R2) Nonclinical Safety Studies for the Conduct of Human Clinical Trials and Marketing Authorization for Pharmaceuticals (<http://www.fda.gov/downloads/drugs/guidancecomplianceregulatoryinformation/guidances/ucm073246.pdf>)

PRINCIPLES OF DRUG DISCOVERY (MPL 203T)

Scope:

The subject imparts basic knowledge of drug discovery process. This information will make the student competent in drug discovery process

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the various stages of drug discovery.
- Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
- Explain various targets for drug discovery.
- Explain various lead seeking method and lead optimization
- Appreciate the importance of the role of computer aided drug design in drug discovery

THEORY	60 Hrs
1. An overview of modern drug discovery process: Target identification, target validation, lead identification and lead Optimization. Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.	12 Hrs
2 Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques, Assay development for hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modeling methods. Application of NMR and X-ray crystallography in protein structure prediction	12 Hrs
3 Rational Drug Design Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches	12 Hrs

- Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,
- 4 Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis and relationship between them. 12 Hrs
- 5 QSAR Statistical methods – regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design 12 Hrs

REFERENCES

1. MouldySioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targets and Treatment Options. 2007 Humana Press Inc.
2. Darryl León. Scott Markelln. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC.
3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
6. Abby L . Parrill. M . Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
7. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley & Sons, Inc., New Jersey.

CLINICAL RESEARCH AND PHARMACOVIGILANCE (MPL 204T)

Scope:

This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of Pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in Pre-clinical, Clinical phases of Drug development and post market surveillance.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance

THEORY		60 Hrs
1.	Regulatory Perspectives of Clinical Trials: Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process	12 Hrs
2	Clinical Trials: Types and Design Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management	12 Hrs

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| 3 | Clinical Trial Documentation- Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring-Safety Monitoring in CT
Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. Predictability and preventability assessment, Management of adverse drug reactions; Terminologies of ADR. | 12
Hrs |
| 4 | Basic aspects, terminologies and establishment of pharmacovigilance
History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance | 12
Hrs |
| 5 | Methods, ADR reporting and tools used in Pharmacovigilance
International classification of diseases, International Non-proprietary names for drugs, Passive and Active surveillance, Comparative observational studies, Targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety data. | 12
Hrs |
| 6 | Pharmacoepidemiology, pharmacoconomics, safety pharmacology | 12
Hrs |

REFERENCES

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health;2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.

3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

PHARMACOLOGICAL PRACTICAL - II
(MPL 205P)

1. To record the DRC of agonist using suitable isolated tissues preparation.
2. To study the effects of antagonist/potentiating agents on DRC of agonist using suitable isolated tissue preparation.
3. To determine the strength of unknown sample by matching bioassay by using suitable tissue preparation.
4. To determine the strength of unknown sample by interpolation bioassay by using suitable tissue preparation.
5. To determine the strength of unknown sample by bracketing bioassay by using suitable tissue preparation.
6. To determine the strength of unknown sample by multiple point bioassay by using suitable tissue preparation.
7. Estimation of PA_2 values of various antagonists using suitable isolated tissue preparations.
8. To study the effects of various drugs on isolated heart preparations.
9. Recording of rat BP, heart rate and ECG.
10. Recording of rat ECG.
11. Drug absorption studies by averted rat ileum preparation.
12. Acute oral toxicity studies as per OECD guidelines.
13. Acute dermal toxicity studies as per OECD guidelines.
14. Repeated dose toxicity studies- Serum biochemical, haematological, urine analysis, functional observation tests and histological studies.
15. Drug mutagenicity study using mice bone-marrow chromosomal aberration test.
16. Protocol design for clinical trial.(3 Nos.)
17. Design of ADR monitoring protocol.
18. In-silico docking studies. (2 Nos.)
19. In-silico pharmacophore based screening.
20. In-silico QSAR studies.
21. ADR reporting

REFERENCES

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. Text book of in-vitro practical Pharmacology by Ian Kitchen
4. Bioassay Techniques for Drug Development by Atta-ur-Rahman, Iqbal choudhary and William Thomsen
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists.

PHARMACOGNOSY (MPG)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPG 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know,

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 Hrs

1. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. 12 Hrs
IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy
Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.
Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy. 12 Hrs

- 3 Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy. 10 Hrs
- 4 Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: 10 Hrs
- Thin Layer chromatography
 - High Performance Thin Layer Chromatography
 - Ion exchange chromatography
 - Column chromatography
 - Gas chromatography
 - High Performance Liquid chromatography
 - Ultra High Performance Liquid chromatography
 - Affinity chromatography
 - Gel Chromatography
- 5 Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: 10 Hrs
- Paper electrophoresis
 - Gel electrophoresis
 - Capillary electrophoresis
 - Zone electrophoresis
 - Moving boundary electrophoresis
 - Iso electric focusing
- X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.
- 6 Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. 10 Hrs
- Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and

cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods - Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.

ADVANCED PHARMACOGNOSY - I (MPG 102T)

SCOPE

To learn and understand the advances in the field of cultivation and isolation of drugs of natural origin, various phytopharmaceuticals, nutraceuticals and their medicinal use and health benefits.

OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- advances in the cultivation and production of drugs
- various phyto-pharmaceuticals and their source, its utilization and medicinal value.
- various nutraceuticals/herbs and their health benefits
- Drugs of marine origin
- Pharmacovigilance of drugs of natural origin

THEORY

60 Hrs

1. Plant drug cultivation: General introduction to the importance of Pharmacognosy in herbal drug industry, Indian Council of Agricultural Research, Current Good Agricultural Practices, Current Good Cultivation Practices, Current Good Collection Practices, Conservation of medicinal plants- Ex-situ and In-situ conservation of medicinal plants. 12 Hrs
2. Marine natural products: General methods of isolation and purification, Study of Marine toxins, Recent advances in research in marine drugs, Problems faced in research on marine drugs such as taxonomical identification, chemical screening and their solution. 12 Hrs
3. Nutraceuticals: Current trends and future scope, Inorganic mineral supplements, Vitamin supplements, Digestive enzymes, Dietary fibres, Cereals and grains, Health drinks of natural origin, Antioxidants, Polyunsaturated fatty acids, Herbs as functional foods, Formulation and standardization of nutraceuticals, Regulatory aspects, FSSAI guidelines, Sources, name of marker compounds and their chemical nature, medicinal uses and health benefits of following 12 Hrs
 - i) Spirulina
 - ii) Soya bean
 - iii) Ginseng
 - iv) Garlic
 - v) Broccoli
 - vi) Green and Herbal Tea
 - vii) Flax seeds
 - viii) Black cohosh
 - ix) Turmeric.

- 4 Phytopharmaceuticals: Occurrence, isolation and characteristic 12 features (Chemical nature, uses in pharmacy, medicinal and Hrs health benefits) of following.
- a) Carotenoids – i) α and β - Carotene ii) Xanthophyll (Lutein)
 - b) Limonoids – i) d-Limonene ii) α - Terpeneol
 - c) Saponins – i) Shatavarins
 - d) Flavonoids – i) Resveratrol ii) Rutin iii) Hesperidin iv) Naringin v) Quercetin
 - e) Phenolic acids- Ellagic acid
 - f) Vitamins
 - g) Tocotrienols and Tocopherols
 - h) Andrographolide, Glycolipids, Gugulipids, Withanolides, Vascine, Taxol
 - i) Miscellaneous
- 5 Pharmacovigilance of drugs of natural origin: WHO and 12 AYUSH guidelines for safety monitoring of natural medicine, Hrs Spontaneous reporting schemes for biodrug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples.

REFERENCES (Latest Editions of)

1. Pharmacognosy - G. E. Trease and W.C. Evans. Saunders Edinburgh, New York.
2. Pharmacognosy-Tyler, Brady, Robbers
3. Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II
4. Text Book of Pharmacognosy by T.E. Wallis
5. Marine Natural Products-Vol.I to IV.
6. Natural products: A lab guide by Raphael Ikan , Academic Press 1991.
7. Glimpses of Indian Ethano Pharmacology, P. Pushpangadam. Ulf Nyman. V.George Tropical Botanic Garden & Research Institute, 1995.
8. Medicinal natural products (a biosynthetic approach), Paul M. Dewick, John Wiley & Sons Ltd., England, 1998.
9. Chemistry of Marine Natural Products- Paul J. Schewer 1973.
10. Herbal Drug Industry by RD. Choudhary, Eastern Publisher, New Delhi, 1996.
11. Cultivation of Medicinal Plants by C.K. Atal & B.M. Kapoor.
12. Cultivation and Utilization of Aromatic Plants, C.K. Atal & B.M. Kapoor
13. Cultivation of medicinal and aromatic crops, AA Farooqui and B.S. Sreeramu. University Press, 2001.

14. Natural Products from Plants, 1st edition, by Peter B. Kaufman, CRC Press, New York, 1998
15. Recent Advances in Phytochemistry- Vol. 1&4: Scikel Runeckles- Appleton Century crofts.
16. Text book of Pharmacognosy, C.K.Kokate, Purohit, Ghokhale, Nirali Prakasshan, 1996.
17. Pharmacognosy and Pharmacobiotechnology, Ashutoshkar, New Age Publications, New Delhi.

PHYTOCHEMISTRY (MPG 103T)

SCOPE

Students shall be equipped with the knowledge of natural product drug discovery and will be able to isolate, identify and extract and the phyto-constituents

OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- different classes of phytoconstituents, their biosynthetic pathways, their properties, extraction and general process of natural product drug discovery
- phytochemical fingerprinting and structure elucidation of phytoconstituents.

THEORY

60 Hrs

1. Biosynthetic pathways and Radio tracing techniques: 12 Hrs
Constituents & their Biosynthesis, Isolation, Characterization and purification with a special reference to their importance in herbal industries of following phyto-pharmaceuticals containing drugs:
 - a) Alkaloids: Ephedrine, Quinine, Strychnine, Piperine, Berberine, Taxol, Vinca alkaloids.
 - b) Glycosides: Digitoxin, Glycyrrhizin, Sennosides, Bacosides, Quercitin.
 - c) Steroids: Hecogenin, guggulosterone and withanolides
 - d) Coumarin: Umbelliferone.
 - e) Terpenoids: Cucurbitacins

- 2 Drug discovery and development: History of herbs as source of drugs and drug discovery, the lead structure selection process, structure development, product discovery process and drug registration, Selection and optimization of lead compounds with suitable examples from the following source : artemesin, andrographolides. Clinical studies emphasising on phases of clinical trials, protocol design for lead molecules. 12 Hrs

- 3 Extraction and Phytochemical studies: Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave 12 Hrs

assisted extraction, Methods of fractionation. Separation of phytoconstituents by latest CCCET, SCFE techniques including preparative HPLC and Flash column chromatography.

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| 4 | Phytochemical finger printing: HPTLC and LCMS/GCMS applications in the characterization of herbal extracts. Structure elucidation of phytoconstituents. | 12
Hrs |
| 5 | Structure elucidation of the following compounds by spectroscopic techniques like UV, IR, MS, NMR (1H, 13C)
a. Carvone, Citral, Menthol
b. Luteolin, Kaempferol
c. Nicotine, Caffeine iv) Glycyrrhizin. | 12
Hrs |

REFERENCES (Latest Editions of)

1. Organic chemistry by I.L. Finar Vol.II
2. Pharmacognosy by Trease and Evans, ELBS.
3. Pharmacognosy by Tylor and Brady.
4. Text book of Pharmacognosy by Wallis.
5. Clark's isolation and Identification of drugs by A.C. Mottal.
6. Plant Drug Analysis by Wagner & Bladt.
7. Wilson and Gisvolds text book of Organic Medicinnal and Pharmaceutical Chemistry by Deorge. R.F.
8. The Chemistry of Natural Products, Edited by R.H. Thomson, Springer International Edn. 1994.
9. Natural Products Chemistry Practical Manual by Anees A Siddiqui and SeemiSiddiqui
10. Organic Chemistry of Natural Products, Vol. 1&2. Gurdeep R Chatwal.
11. Chemistry of Natural Products- Vol. 1 onwards IWPAC.
12. Modem Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II
13. Medicinal Natural products – a biosynthetic approach, Dewick PM, John Wiley & Sons, Toronto, 1998.
14. Chemistry of Natural Products, Bhat SV, Nagasampagi BA, Meenakshi S, Narosa Publishing House, New Delhi.
15. Pharmacognosy & Phytochemistry of Medicinal Plants, 2nd edition, Bruneton J, Interceptt Ltd., New York, 1999.

INDUSTRIAL PHARMACOGNOSTICAL TECHNOLOGY (MPG 104T)

SCOPE

To understand the Industrial and commercial potential of drugs of natural origin, integrate traditional Indian systems of medicine with modern medicine and also to know regulatory and quality policy for the trade of herbals and drugs of natural origin.

OBJECTIVES

By the end of the course the student shall be able to know,

- the requirements for setting up the herbal/natural drug industry.
- the guidelines for quality of herbal/natural medicines and regulatory issues.
- the patenting/IPR of herbals/natural drugs and trade of raw and finished materials.

THEORY

60 Hrs

1. Herbal drug industry: Infrastructure of herbal drug industry 12 Hrs
involved in production of standardized extracts and various dosage forms. Current challenges in upgrading and modernization of herbal formulations. Entrepreneurship Development, Project selection, project report, technical knowledge, Capital venture, plant design, layout and construction. Pilot plant scale –up techniques, case studies of herbal extracts. Formulation and production management of herbals.
- 2 Regulatory requirements for setting herbal drug industry: 12 Hrs
Global marketing management. Indian and international patent law as applicable herbal drugs and natural products. Export - Import (EXIM) policy, TRIPS.
Quality assurance in herbal/natural drug products.
Concepts of TQM, GMP, GLP, ISO-9000.
- 3 Monographs of herbal drugs: General parameters of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic Pharmacopoeia, Siddha and Unani Pharmacopoeia, American herbal pharmacopoeia, British herbal pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.

- 4 Testing of natural products and drugs: Herbal medicines - 12
clinical laboratory testing. Stability testing of natural products, Hrs
protocols.
- 5 Patents: Indian and international patent laws, proposed 12
amendments as applicable to herbal/natural products and Hrs
process. Geographical indication, Copyright, Patentable subject
matters, novelty, non obviousness, utility, enablement and best
mode, procedure for Indian patent filing, patent processing, grant
of patents, rights of patents, cases of patents, opposition and
revocation of patents, patent search and literature, Controllers of
patents.

REFERENCES (Latest Editions of)

1. Herbal drug industry by R.D. Choudhary (1996), Eastern Publisher, New Delhi.
2. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), 1st Edition, Business horizons Robert Verpoorte, New Delhi.
3. Quality control of herbal drugs by Pulok K Mukarjee (2002), Business Horizons Pharmaceutical Publisher, New Delhi.
4. PDR for Herbal Medicines (2000), Medicinal Economic Company, New Jersey.
5. Indian Herbal Pharmacopoeia (2002), IDMA, Mumbai.
6. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (1996), Nirali Prakashan, New Delhi.
7. Text book of Pharmacognosy and Phytochemistry by Vinod D. Rangarl (2002), Part I & II, Career Publication, Nasik, India.
8. Plant drug analysis by H.Wagner and S.Bladt, Springer, Berlin.
9. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol.I, Eastern Publisher, New Delhi.
10. Phytochemical Dictionary. Handbook of Bioactive Compounds from Plants by J.B.Harborne, (1999), 11nd Edition, Taylor and Francis Ltd, UK.
11. Herbal Medicine. Expanded Commission E Monographs by M.Blumenthal, (2004), IST Edition,
12. Drug Formulation Manual by D.P.S.Kohli and D.H.Shah (1998), Eastern Publisher, New Delhi.

PHARMACOGNOSY PRACTICAL - I
(MPG I05P)

1. Analysis of Pharmacopoeial compounds of natural origin and their formulations by UV Vis spectrophotometer
2. Analysis of recorded spectra of simple phytoconstituents
3. Experiments based on Gas Chromatography
4. Estimation of sodium/potassium by flame photometry
5. Development of fingerprint of selected medicinal plant extracts commonly used in herbal drug industry viz. Ashwagandha, Tulsi, Bael, Amla, Ginger, Aloe, Vidang, Senna, Lawsonia by TLC/HPTLC method.
6. Methods of extraction
7. Phytochemical screening
8. Demonstration of HPLC- estimation of glycerrhizin
9. Monograph analysis of clove oil
10. Monograph analysis of castor oil.
11. Identification of bioactive constituents from plant extracts
12. Formulation of different dosage forms and their standardisation.

MEDICINAL PLANT BIOTECHNOLOGY (MPG 201T)

SCOPE

To explore the knowledge of Biotechnology and its application in the improvement of quality of medicinal plants

OBJECTIVES

Upon completion of the course, the student shall be able to,

- Know the process like genetic engineering in medicinal plants for higher yield of Phytopharmaceuticals.
- Use the biotechnological techniques for obtaining and improving the quality of natural products/medicinal plants

THEORY

60 Hrs

1. Introduction to Plant biotechnology: Historical perspectives, 12 Hrs
prospects for development of plant biotechnology as a source of medicinal agents. Applications in pharmacy and allied fields. Genetic and molecular biology as applied to pharmacognosy, study of DNA, RNA and protein replication, genetic code, regulation of gene expression, structure and complicity of genome, cell signaling, DNA recombinant technology.
2. Different tissue culture techniques: Organogenesis and 15 Hrs
embryogenesis, synthetic seed and monoclonal variation, Protoplast fusion, Hairy root multiple shoot cultures and their applications. Micro propagation of medicinal and aromatic plants. Sterilization methods involved in tissue culture, gene transfer in plants and their applications.
3. Immobilisation techniques & Secondary Metabolite 15 Hrs
Production: Immobilization techniques of plant cell and its application on secondary metabolite Production. Cloning of plant cell: Different methods of cloning and its applications. Advantages and disadvantages of plant cell cloning. Secondary metabolism in tissue cultures with emphasis on production of medicinal agents. Precursors and elicitors on production of secondary metabolites.
4. Biotransformation and Transgenesis: Biotransformation, 13 Hrs
bioreactors for pilot and large scale cultures of plant cells and retention of biosynthetic potential in cell culture. Transgenic

plants, methods used in gene identification, localization and sequencing of genes. Application of PCR in plant genome analysis.

- 5 Fermentation technology: Application of Fermentation 05 technology, Production of ergot alkaloids, single cell proteins, Hrs enzymes of pharmaceutical interest.

REFERENCES (Latest Editions of)

1. Plant tissue culture, Bhagwani, vol 5, Elsevier Publishers.
2. Plant cell and Tissue Culture (Lab. Manual), JRMM. Yeoman.
3. Elements in biotechnology by PK. Gupta, Rastogi Publications, New Delhi.
4. An introduction to plant tissue culture by MK. Razdan, Science Publishers.
5. Experiments in plant tissue culture by John HD and Lorin WR., Cambridge University Press.
6. Pharmaceutical biotechnology by SP. Vyas and VK. Dixit, CBS Publishers.
7. Plant cell and tissue culture by Jeffrey W. Pollard and John M Walker, Humana press.
8. Plant tissue culture by Dixon, Oxford Press, Washington DC, 1985
9. Plant tissue culture by Street.
10. Pharmacognosy by G. E. Trease and WC. Evans, Elsevier.
11. Biotechnology by Purohit and Mathur, Agro-Bio, 3rd revised edition.
12. Biotechnological applications to tissue culture by Shargool, Peter D, Shargoal, CKC Press.
13. Pharmacognosy by Varo E. Tyler, Lynn R. Brady and James E. Robbert, That Tjen, NGO.
14. Plant Biotechnology, Ciddi Veerasham.

ADVANCED PHARMACOGNOSY - II
(MPG 202T)

SCOPE

To know and understand the Adulteration and Deterioration that occurs in herbal/natural drugs and methods of detection of the same. Study of herbal remedies and their validations, including methods of screening

OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- validation of herbal remedies
- methods of detection of adulteration and evaluation techniques for the herbal drugs
- methods of screening of herbals for various biological properties

THEORY

60 Hrs

- | | | |
|----|--|--------|
| 1. | Herbal remedies – Toxicity and Regulations: Herbals vs Conventional drugs, Efficacy of Herbal medicine products, Validation of herbal therapies, Pharmacodynamic and Pharmacokinetic issues. | 12 Hrs |
| 2 | Adulteration and Deterioration: Introduction, Types of Adulteration/ Substitution of Herbal drugs, Causes and Measures of Adulteration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, detection of heavy metals, pesticide residues, phytotoxin, microbial contamination in herbs and their formulations. | 12 Hrs |
| 3 | Ethnobotany and Ethnopharmacology: Ethnobotany in herbal drug evaluation, Impact of Ethnobotany in traditional medicine, New development in herbals, Bio-prospecting tools for drug discovery, Role of Ethnopharmacology in drug evaluation, Reverse Pharmacology. | 12 Hrs |
| 4 | Analytical Profiles of herbal drugs: <i>Andrographis paniculata</i> , <i>Boswellia serata</i> , <i>Coleus forskholii</i> , <i>Curcuma longa</i> , <i>Embelica officinalis</i> , <i>Psoralea corylifolia</i> . | 12 Hrs |
| 5 | Biological screening of herbal drugs: Introduction and Need for Phyto-Pharmacological Screening, New Strategies for evaluating | 12 Hrs |

Natural Products, In vitro evaluation techniques for Antioxidants, Antimicrobial and Anticancer drugs. In vivo evaluation techniques for Anti-inflammatory, Antiulcer, Anticancer, Wound healing, Antidiabetic, Hepatoprotective, Cardio protective, Diuretics and Antifertility, Toxicity studies as per OECD guidelines.

REFERENCES (Latest Editions of)

1. Glimpses of Indian Ethano Pharmacology by P. Pushpangadam. Ulf Nyman. V.George Tropical Botanic Garden & Research Institute.
2. Natural products: A lab guide by Raphael Ikan, Academic Press.
3. Pharmacognosy - G. E. Trease and W.C. Evans. WB. Saunders Edinburgh, New York.
4. Pharmacognosy-Tyler, Brady, Robbers, Lee & Fetiger.
5. Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I & II, Springer Publishers.
6. Herbal Drug Industry by RD. Choudhary, Eastern Publishers, New Delhi.
7. Text book of Pharmacognosy by C.K.Kokate, Purohit, Ghokhale, Nirali Prakashan.
8. Text Book of Pharmacognosy by T.E. Wallis, J & A Churchill Ltd., London.
9. Quality control of herbal drugs by Pulk K Mukherjee, Business Horizons Pharmaceutical Publishers, New Delhi.
10. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
11. Text book of Pharmacognosy and Phytochemistry by Vinod D. Rangarl, Part I & II, Career Publication, Nasik, India.
12. Plant drug analysis by H.Wagner and S.Bladt, 2nd edition, Springer, Berlin.
13. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol.I, Eastern PublisherS, New Delhi.
14. Herbal Medicine. Expanded Commission E Monographs, M.Blumenthal.

INDIAN SYSTEMS OF MEDICINE (MPG 203T)

SCOPE

To make the students understand thoroughly the principles, preparations of medicines of various Indian systems of medicine like Ayurveda, Siddha, Homeopathy and Unani. Also focusing on clinical research of traditional medicines, quality assurance and challenges in monitoring the safety of herbal medicines.

OBJECTIVES

After completion of the course, student is able to

- To understand the basic principles of various Indian systems of medicine
- To know the clinical research of traditional medicines, Current Good Manufacturing Practice of Indian systems of medicine and their formulations.

THEORY	60 Hrs
1. Fundamental concepts of Ayurveda, Siddha, Unani and Homoeopathy systems of medicine Different dosage forms of the ISM. Ayurveda: Ayurvedic Pharmacopoeia, Analysis of formulations and bio crude drugs with references to: Identity, purity and quality. Siddha: Gunapadam (Siddha Pharmacology), raw drugs/Dhatu/Jeevam in Siddha system of medicine, Purification process (Suddhi).	12 Hrs
2 Naturopathy, Yoga and Aromatherapy practices a) Naturopathy - Introduction, basic principles and treatment modalities. b) Yoga - Introduction and Streams of Yoga. Asanas, Pranayama, Meditations and Relaxation techniques. c) Aromatherapy - Introduction, aroma oils for common problems, carrier oils.	12 Hrs
3 Formulation development of various systems of medicine Salient features of the techniques of preparation of some of the important class of Formulations as per Ayurveda, Siddha, Homeopathy and Unani Pharmacopoeia and texts. Standardization, Shelf life and Stability studies of ISM formulations.	12 Hrs

- | | | |
|---|---|-----------|
| 4 | <p>Schedule T – Good Manufacturing Practice of Indian systems of medicine</p> <p>Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.</p> <p>Quality assurance in ISM formulation industry - GAP, GMP and GLP. Preparation of documents for new drug application and export registration.</p> <p>Challenges in monitoring the safety of herbal medicines: Regulation, quality assurance and control, National/Regional Pharmacopoeias.</p> | 12
Hrs |
| 5 | <p>TKDL, Geographical indication Bill, Government bills in AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU</p> | 12
Hrs |

REFERENCES (Latest Editions of)

1. Ayurvedic Pharmacopoeia, The Controller of Publications, Civil Lines, Govt. of India, New Delhi.
2. Hand Book on Ayurvedic Medicines, H. Panda, National Institute of Industrial Research, New Delhi.
3. Ayurvedic System of Medicine, Kaviraj Nagendranath Sengupata, Sri Satguru Publications, New Delhi.
4. Ayurvedic Pharmacopoeia. Formulary of Ayurvedic Medicines, IMCOPS, Chennai.
5. Homeopathic Pharmacopoeia. Formulary of Homeopathic Medicines, IMCOPS, Chennai.
6. Homeopathic Pharmacy : An introduction & Hand book, Steven B. Kayne, Churchill Livingstone, New York.
7. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
8. British Herbal Pharmacopoeia, bBRITISH Herbal Medicine Association, UK.
9. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Pulok K Mukharjee, Business Horizons, New Delhi.
10. Indian System of Medicine and Homeopathy in India, Planning and Evaluation Cell, Govt. of India, New Delhi.
11. Essential of Food and Nutrition, Swaminathan, Bappco, Bangalore.
12. Clinical Dietetics and Nutrition, F.P. Antia, Oxford University Press, Delhi.
13. Yoga - The Science of Holistic Living by V.K.Yoga, Vivekananda Yoga Prakashna Publishing, Bangalore.

HERBAL COSMETICS (MPG 204T)

SCOPE

This subject deals with the study of preparation and standardization of herbal/natural cosmetics. This subject gives emphasis to various national and international standards prescribed regarding herbal cosmeceuticals.

OBJECTIVES

After completion of the course, student shall be able to,

- understand the basic principles of various herbal/natural cosmetic preparations
- current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities

THEORY

60 Hrs

1. Introduction: Herbal/natural cosmetics, Classification & Economic aspects. 12 Hrs
Regulatory Provisions relation to manufacture of cosmetics: - License, GMP, offences & Penalties, Import & Export of Herbal/natural cosmetics, Industries involved in the production of Herbal/natural cosmetics.
2. Commonly used herbal cosmetics, raw materials, preservatives, surfactants, humectants, oils, colors, and some functional herbs, preformulation studies, compatibility studies, possible interactions between chemicals and herbs, design of herbal cosmetic formulation. 12 Hrs
3. Herbal Cosmetics : Physiology and chemistry of skin and pigmentation, hairs, scalp, lips and nail, Cleansing cream, Lotions, Face powders, Face packs, Lipsticks, Bath products, soaps and baby product, Preparation and standardisation of the following : 12 Hrs
Tonic, Bleaches, Dentifrices and Mouth washes & Tooth Pastes, Cosmetics for Nails.
4. Cosmeceuticals of herbal and natural origin: Hair growth formulations, Shampoos, Conditioners, Colorants & hair oils, Fairness formulations, vanishing & foundation creams, anti-sun burn preparations, moisturizing creams, deodorants. 12 Hrs

- 5 Analysis of Cosmetics, Toxicity screening and test methods: 12
Quality control and toxicity studies as per Drug and Cosmetics Hrs
Act.

REFERENCES (Latest Editions of)

1. Panda H. Herbal Cosmetics (Hand book), Asia Pacific Business Press Inc, New Delhi.
2. Thomson EG. Modern Cosmetics, Universal Publishing Corporation, Mumbai.
3. P.P.Sharma. Cosmetics - Formulation, Manufacturing & Quality Control, Vandana Publications, New Delhi.
4. Supriya K B. Handbook of Aromatic Plants, Pointer Publishers, Jaipur.
5. Skaria P. Aromatic Plants (Horticulture Science Series), New India Publishing Agency, New Delhi.
6. Kathi Keville and Mindy Green. Aromatherapy (A Complete Guide to the Healing Art), Sri Satguru Publications, New Delhi.
7. Chattopadhyay PK. Herbal Cosmetics & Ayurvedic Medicines (EOU), National Institute of Industrial Research, Delhi.
8. Balsam MS & Edward Sagarin. Cosmetics Science and Technology, Wiley Interscience, New York.

HERBAL COSMETICS PRACTICALS
(MPG 205P)

1. Isolation of nucleic acid from cauliflower heads
2. Isolation of RNA from yeast
3. Quantitative estimation of DNA
4. Immobilization technique
5. Establishment of callus culture
6. Establishment of suspension culture
7. Estimation of aldehyde contents of volatile oils
8. Estimation of total phenolic content in herbal raw materials
9. Estimation of total alkaloid content in herbal raw materials
10. Estimation of total flavonoid content in herbal raw materials
11. Preparation and standardization of various simple dosage forms from Ayurvedic, Siddha, Homoeopathy and Unani formulary
12. Preparation of certain Aromatherapy formulations
13. Preparation of herbal cosmetic formulation such as lip balm, lipstick, facial cream, herbal hair and nail care products
14. Evaluation of herbal tablets and capsules
15. Preparation of sunscreen, UV protection cream, skin care formulations.
16. Formulation & standardization of herbal cough syrup.

Semester III
MRM 301T - Research Methodology & Biostatistics

UNIT – I

General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.

UNIT – II

Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxon rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.

UNIT – III

Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.

UNIT – IV

CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.

UNIT – V

Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care.



PHARMACY COUNCIL OF INDIA

Combined Council's Building, Kotla Road,
Aiwan-E-Ghalib Marg, New Delhi-110 002.
Website : www.pci.nic.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones

6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
 2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
 3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
 4. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
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ADVANCED PHARMACOLOGY - I (MPL 102T)

Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved

Objectives

Upon completion of the course the student shall be able to :

- Discuss the pathophysiology and pharmacotherapy of certain diseases
- Explain the mechanism of drug actions at cellular and molecular level
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

THEORY

60 Hrs

- | | | | |
|----|-------------------|---|-----|
| 1. | General | Pharmacology | 12 |
| | a. | Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding. | Hrs |
| | b. | Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors, quantitation of drug receptors interaction and elicited effects. | |
| 2 | Neurotransmission | | 12 |
| | a. | General aspects and steps involved in neurotransmission. | Hrs |
| | b. | Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetyl choline). | |
| | c. | Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and glycine). | |
| | d. | Non adrenergic non cholinergic transmission (NANC). Co-transmission | |

Systemic Pharmacology

A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems

Autonomic Pharmacology

Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction

- | | | |
|---|---|-----------|
| 3 | Central nervous system Pharmacology
General and local anesthetics
Sedatives and hypnotics, drugs used to treat anxiety.
Depression, psychosis, mania, epilepsy, neurodegenerative diseases.
Narcotic and non-narcotic analgesics. | 12
Hrs |
| 4 | Cardiovascular Pharmacology
Diuretics, antihypertensives, antiischemics, anti-arrhythmics, drugs for heart failure and hyperlipidemia.
Hematinics, coagulants, anticoagulants, fibrinolytics and antiplatelet drugs | 12
Hrs |
| 5 | Autocoid Pharmacology
The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autocoids.
Pharmacology of antihistamines, 5HT antagonists. | 12
Hrs |

REFEERENCES

1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Basic and Clinical Pharmacology by B.G Katzung
4. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Graham Smith. Oxford textbook of Clinical Pharmacology.
7. Avery Drug Treatment
8. Dipiro Pharmacology, Pathophysiological approach.
9. Green Pathophysiology for Pharmacists.

**PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING
METHODS - I
(MPL 103T)**

Scope

This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes

Objectives

Upon completion of the course the student shall be able to,

- Appraise the regulations and ethical requirement for the usage of experimental animals.
- Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals
- Describe the various newer screening methods involved in the drug discovery process
- Appreciate and correlate the preclinical data to humans

THEORY

60 Hrs

1. Laboratory Animals 12 Hrs
Common laboratory animals: Description, handling and applications of different species and strains of animals.
Transgenic animals: Production, maintenance and applications
Anaesthesia and euthanasia of experimental animals.
Maintenance and breeding of laboratory animals.
CPCSEA guidelines to conduct experiments on animals

Good laboratory practice.
Bioassay-Principle, scope and limitations and methods
2. Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. 12 Hrs
General principles of preclinical screening. CNS Pharmacology: behavioral and muscle coordination, CNS stimulants and

depressants, anxiolytics, anti-psychotics, anti epileptics and
nootropics. Drugs for neurodegenerative diseases like
Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on
Autonomic Nervous System.

- 3 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

Respiratory Pharmacology: anti-asthmatics, drugs for COPD and
anti allergics. Reproductive Pharmacology: Aphrodisiacs and
antifertility agents Analgesics, antiinflammatory and antipyretic
agents. Gastrointestinal drugs: anti ulcer, anti -emetic, anti-
diarrheal and laxatives.

- 4 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

Cardiovascular Pharmacology: antihypertensives, antiarrhythmics,
antianginal, antiatherosclerotic agents and diuretics. Drugs for
metabolic disorders like anti-diabetic, antidyslipidemic agents.
Anti cancer agents. Hepatoprotective screening methods.

- 5 Preclinical screening of new substances for the 12
pharmacological activity using in vivo, in vitro, and other Hrs
possible animal alternative models.

immunomodulators, Immunosuppressants and immunostimulants

General principles of immunoassay: theoretical basis and
optimization of immunoassay, heterogeneous and homogenous
immunoassay systems. Immunoassay methods evaluation;
protocol outline, objectives and preparation. Immunoassay for
digoxin and insulin

Limitations of animal experimentation and alternate animal
experiments.

Extrapolation of in vitro data to preclinical and preclinical to
humans

CELLULAR AND MOLECULAR PHARMACOLOGY (MPL 104T)

Scope:

The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the receptor signal transduction processes.
- Explain the molecular pathways affected by drugs.
- Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.
- Demonstrate molecular biology techniques as applicable for pharmacology

THEORY

60 Hrs

1. Cell biology 12 Hrs
Structure and functions of cell and its organelles
Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing
Cell cycles and its regulation.
Cell death- events, regulators, intrinsic and extrinsic pathways of apoptosis.
Necrosis and autophagy.
- 2 Cell signaling 12 Hrs
Intercellular and intracellular signaling pathways.
Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors.
Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP3), NO, and diacylglycerol.
Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway.

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|---|--|-----------|
| 3 | <p>Principles and applications of genomic and proteomic tools
 DNA electrophoresis, PCR (reverse transcription and real time),
 Gene sequencing, micro array technique, SDS page, ELISA and
 western blotting,
 Recombinant DNA technology and gene therapy
 Basic principles of recombinant DNA technology-Restriction
 enzymes, various types of vectors. Applications of recombinant
 DNA technology.
 Gene therapy- Various types of gene transfer techniques, clinical
 applications and recent advances in gene therapy.</p> | 12
Hrs |
| 4 | <p>Pharmacogenomics
 Gene mapping and cloning of disease gene.
 Genetic variation and its role in health/ pharmacology
 Polymorphisms affecting drug metabolism
 Genetic variation in drug transporters
 Genetic variation in G protein coupled receptors
 Applications of proteomics science: Genomics, proteomics,
 metabolomics, functionomics, nutrigenomics
 Immunotherapeutics
 Types of immunotherapeutics, humanisation antibody therapy,
 Immunotherapeutics in clinical practice</p> | 12
Hrs |
| 5 | <p>a. Cell culture techniques
 Basic equipments used in cell culture lab. Cell culture media,
 various types of cell culture, general procedure for cell cultures;
 isolation of cells, subculture, cryopreservation, characterization of
 cells and their application.
 Principles and applications of cell viability assays, glucose uptake
 assay, Calcium influx assays
 Principles and applications of flow cytometry</p> <p>b. Biosimilars</p> | 12
Hrs |

REFERENCES:

1. The Cell, A Molecular Approach. Geoffrey M Cooper.
2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong
3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
5. Basic Cell Culture protocols by Cheril D.Helgason and Cindy L.Miller
6. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
8. Current protocols in molecular biology vol I to VI edited by Frederick M.Ausuvel et la.

PHARMACOLOGICAL PRACTICAL - I
(MPL 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry

Handling of laboratory animals.

1. Various routes of drug administration.
2. Techniques of blood sampling, anesthesia and euthanasia of experimental animals.
3. Functional observation battery tests (modified Irwin test)
4. Evaluation of CNS stimulant, depressant, anxiogenics and anxiolytic, anticonvulsant activity.
5. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activity.
6. Evaluation of diuretic activity.
7. Evaluation of antiulcer activity by pylorus ligation method.
8. Oral glucose tolerance test.
9. Isolation and identification of DNA from various sources (Bacteria, Cauliflower, onion, Goat liver).
10. Isolation of RNA from yeast
11. Estimation of proteins by Bradford/Lowry's in biological samples.
12. Estimation of RNA/DNA by UV Spectroscopy
13. Gene amplification by PCR.
14. Protein quantification Western Blotting.
15. Enzyme based in-vitro assays (MPO, AChEs, α amylase, α glucosidase).
16. Cell viability assays (MTT/Trypan blue/SRB).
17. DNA fragmentation assay by agarose gel electrophoresis.
18. DNA damage study by Comet assay.
19. Apoptosis determination by fluorescent imaging studies.
20. Pharmacokinetic studies and data analysis of drugs given by different routes of administration using softwares
21. Enzyme inhibition and induction activity
22. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (UV)
23. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (HPLC)

Guidelines for Pharm.D internship

1. In the Final year of academic program, each student will be posted to at least four different specialties during the internship period (12 months) on roster basis.
2. Out of the total internship duration of 12 months, 6 months training in General Medicine, two months training each in Pediatrics and O&G shall be made compulsory and evaluation of the training should be done through maintenance of a log book.
3. During internship each intern is expected to provide the following services in the ward independently.
 - Ward round participation
 - Treatment chart review
 - Medication history interview
 - Drugs and poison information
 - Detection and management of Adverse drug reactions
 - Patient counseling
 - Therapeutic interventions
4. Each student is required to maintain the log book of services provided on daily basis.
5. The internship work log book should be signed by a preceptor (Teacher – Practitioner) on weekly basis and provide feedback to the intern.
6. The internship work of the student should be assessed by testing the knowledge, skills and attitude during and also at the end of internship.
7. The evaluation of satisfactory completion of the internship is done based on
 - Proficiency of knowledge
 - Competency
 - Responsibility and punctuality
 - Involvement in patient care.
 - Team behavior
 - Initiative and participation in active discussions and research.

8. Evaluation Criterion

Intern's performance is evaluated using the following scoring system

Poor	Fair	Below Average	Average	Above average	Excellent
0	1	2	3	4	5

A score of 3 and above represents satisfactory completion of internship for the issue of internship completion certificate.

9. However, if the candidates work is not satisfactory & the scoring is less than 3 he/she has to continue the internship to the satisfaction of the Preceptors.

CERTIFICATE OF INTERNSHIP

(on the institution letter head)

This is to certify that Mr/Ms _____
of _____ [Institution name and address] has
successfully completed the Internship in the following
units/departments as prescribed under regulation 16 and
Appendix C of Pharm D Regulations 2008.

Department	Date		Total duration [in months]
	From	To	
Medicine [Six Months compulsory]			
Any 3 of the following			
Surgery			
Paediatrics			
OB &G			
Psychiatry			
Skin and VD			
Orthopaedics			

Preceptor

Head of the Institution

Seal of the Institution

Second year

2.1 PATHOPHYSIOLOGY (THEORY)

Theory : 3 Hrs. /Week

- 1. Scope of the Subject:** This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic Pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge of its application in other subject of pharmacy.
- 2. Objectives of the Subject :** Upon completion of the subject student shall be able to –
 - a. describe the etiology and pathogenesis of the selected disease states;
 - b. name the signs and symptoms of the diseases; and
 - c. mention the complications of the diseases.

Text books (Theory)

- a. Pathologic basis of disease by- Cotran, Kumar, Robbins
- b. Text book of Pathology- Harsh Mohan
- c. Text book of Pathology- Y.M. Bhide

Reference books (Theory)

- a. Clinical Pharmacy and Therapeutics; Second edition; Roger Walker; Churchill Livingstone publication

3. Detailed syllabus and lecture wise schedule :

Chapter

- 1 Basic principles of cell injury and Adaptation**
 - a) Causes, Pathogenesis and morphology of cell injury
 - b) Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen infiltration and glycogen infiltration and glycogen storage diseases
- 2 Inflammation**
 - a) Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation
 - b) Repairs of wounds in the skin, factors influencing healing of wounds
- 3 Diseases of Immunity**
 - a) Introduction to T and B cells
 - b) MHC proteins or transplantation antigens
 - c) Immune tolerance
 - Hypersensitivity
Hypersensitivity type I, II, III, IV, Biological significance, Allergy due to food, chemicals and drugs
 - Autoimmunity
Criteria for autoimmunity, Classifications of autoimmune diseases in man, mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft.
 - Acquired immune deficiency syndrome (AIDS)

- Amyloidosis

- 4 **Cancer:** differences between benign and malignant tumors, Histological diagnosis of malignancy, invasions and metastasis, patterns of spread, disturbances of growth of cells, classification of tumors, general biology of tumors, spread of malignant tumors, etiology and pathogenesis of cancer.
- 5 Types of shock, mechanisms, stages and management
- 6 Biological effects of radiation
- 7 Environmental and nutritional diseases
 - i) Air pollution and smoking- SO₂,NO, NO₂, and CO
 - ii) Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.
- 8 Pathophysiology of common diseases
 - a. Parkinsonism
 - b. Schizophrenia
 - c. Depression and mania
 - d. Hypertension,
 - e. Stroke (ischaemic and hemorrhage)
 - f. Angina, CCF, Atherosclerosis, Myocardial infarction
 - g. Diabetes Mellitus
 - h. Peptic ulcer and inflammatory bowel diseases
 - i. Cirrhosis and Alcoholic liver diseases
 - j. Acute and chronic renal failure
 - k. Asthma and chronic obstructive airway diseases
- 9 Infectious diseases :
Sexually transmitted diseases (HIV,Syphilis,Gonorrhoea), Urinary tract infections, Pneumonia, Typhoid, Tuberculosis, Leprosy, Malaria Dysentery (bacterial and amoebic), Hepatitis- infective hepatitis.

4. Assignments :

Title of the Experiment

- 1 Chemical Mediators of inflammation
- 2 Drug Hypersensitivity
- 3 Cigarette smoking & its ill effects
- 4 Biological Effects of Radiation
- 5 Etiology and hazards of obesity
- 6 Complications of diabetes
- 7 Diagnosis of cancer
- 8 Disorders of vitamins
- 9 Methods in Pathology-Laboratory values of clinical significance
- 10 Pathophysiology of Dengue Hemorrhagic Fever (DHF)

Format of the assignment

- 1 Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year
4. It shall be computer draft copy.
5. Name and signature of the student
6. Time allocated for presentation may be 8+2 Min.

2.2 PHARMACEUTICAL MICROBIOLOGY (THEORY)

Theory : 3 Hrs. /Week

- 1. Scope of the Subject:** Microbiology has always been an essential component of pharmacy curriculum. This is because of the relevance of microbiology to pharmaceutical sciences and more specifically to pharmaceutical industry. Pharmaceutical biotechnology is the logical extension of pharmaceutical microbiology, which is expected to change the complete drug product scenario in the future.

This course deals with the various aspects of microorganisms, its classification, morphology, laboratory cultivation identification and maintenance. It also discusses with sterilization of pharmaceutical products, equipment, media etc. The course further discusses the immunological preparations, diseases its transmission, diagnosis, control and immunological tests.

2. Objectives of the Subject :

Upon completion of the subject student shall be able to –

- know the anatomy, identification, growth factors and sterilization of microorganisms;
- know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
- do estimation of RNA and DNA and there by identifying the source;
- do cultivation and identification of the microorganisms in the laboratory;
- do identification of diseases by performing the diagnostic tests; and
- appreciate the behavior of motility and behavioral characteristics of microorganisms.

Text books (Theory)

- Vanitha Kale and Kishor Bhusari “ Applied Microbiology ” Himalaya Publishing house Mumbai.
- Mary Louis Turgeon “ Immunology and Serology in Laboratory Medicines” 2nd edition, 1996 Mosby- Year book inc St. Louis Missouri 63146.
- Harsh Mohan, “ Text book of Pathology” 3rd edition, 1998, B-3 Ansari road Darya ganj N. Delhi.

Reference books (Theory)

- Prescot L.M., Jarley G.P Klein D.A “Microbiology” 2nd- edition Mc Graw Hill Company Inc
- Rawlins E.A.”Bentley’s Text Book of Pharmaceutics” B ailliere Tindals 24-28 London 1988
- Forbisher “ Fundamentals of Microbiology” Philidelphia W.B. Saunders.
- Prescott L.M. Jarley G.P., Klein.D.A. “ Microbiology.”2nd edition WMC Brown Publishers, Oxford. 1993
- War Roitt, Jonathan Brostoff, David male, “ Immunology”3rd edition 1996, Mosby-year book Europe Ltd, London.
- Pharmacopoeia of India, Govt of India, 1996.

3. Detailed syllabus and lecture wise schedule :

Title of the topic

- 1 Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them.
- 2 Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae, Spirochetes.
- 3 Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures.
- 4 Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. Counting of bacteria -Total and Viable counting techniques.
- 5 Detailed study of different methods of sterilization including their merits and demerits. Sterilization methods for all pharmaceutical products. Detailed study of sterility testing of different pharmaceutical preparations . Brief information on Validation.
- 6 Disinfectants- Study of disinfectants, antiseptics, fungicidal and virucidal agents factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteristatic, , virucidal activities, evaluation of preservatives in pharmaceutical preparations.
- 7 Immunology- Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity(active and passive) . Antigens, chemical nature of antigens structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization programme, and importance of booster dose.
- 8 Diagnostic tests : Schick's Test, Elisa test, Western Blot test, Southern Blot PCR Widal, QBC, Mantoux Peripheral smear. Study of malarial parasite.
- 9 Microbial culture sensitivity Testing: Interpretation of results Principles and methods of different microbiological assays, microbiological assay of Penicillin, Streptomycin and vitamin B₂ and B₁₂. Standardisation of vaccines and sera.
- 10 Study of infectious diseases: Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis & Gonorrhoea and HIV.

2.2 PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)

Practical : 3 Hrs./Week

Title of the Experiment:

- 1 Study of apparatus used in experimental microbiology*.
- 2 Sterilisation of glass ware's. Preparation of media and sterilisation.*
- 3 Staining techniques – Simple staining ; Gram's staining ; Negative staining**
- 4 Study of motility characters*.
- 5 Enumeration of micro-organisms (Total and Viable)*
- 6 Study of the methods of isolation of pure culture.*
- 7 Bio chemical testing for the identification of micro*-organisms.

- 8 Cultural sensitivity testing for some micro-organisms.*
- 9 Sterility testing for powders and liquids.*
- 10 Determination of minimum inhibitory concentration.*
- 11 Microbiological assay of antibiotics by cup plate method.*
- 12 Microbiological assay of vitamins by Turbidometric method**
- 13 Determination of RWC.**
- 14 Diagnostic tests for some common diseases, Widal, malarial parasite.**

* Indicate minor experiment & ** indicate major experiment

Assignments:

- 1 Visit to some pathological laboratories & study the activities and equipment/instruments used and reporting the same.
2. Visit to milk dairies (Pasturization) and microbial laboratories(other sterization methods) & study the activities and equipment/instruments used and reporting the same.
3. Library assignments
 - a. Report of recent microbial techniques developed in diagnosing some common diseases.
 - b. Latest advancement developed in identifying, cultivating & handling of microorganisms.

Format of the assignment:

1. Minimum & Maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.
4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

2.3 PHARMACOGNOSY & PHYTOPHARMACEUTICALS (THEORY)

Theory : 3 Hrs. /Week

1. **Scope and objectives:** This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.
2. **Upon completion of the course student shall be able to:**
 - a. under stand the basic principles of cultivation, collection and storage of crude drugs;
 - b. know the source, active constituents and uses of crude drugs; and
 - c. appreciate the applications of primary and secondary metabolites of the plant.

3. Course materials:

Text books

- a. Pharmacognosy by G.E. Trease & W.C.Evans.
- b. Pharmacognosy by C.K.Kokate,Gokhale & A.C.Purohit.

Reference books

- a. Pharmacognosy by Brady &Tyler.E.
- b. Pharmacognosy by T.E.Wallis.
- c. Pharmacognosy by C.S. Shah & Qadery.
- d. Pharmacognosy by M.A. Iyengar.

4. Lecture wise programme:

Topics

- 1 Introduction.
- 2 Definition, history and scope of Pharmacognosy.
- 3 Classification of crude drugs.
- 4 Cultivation, collection, processing and storage of crude drugs.
- 5 Detailed method of cultivation of crude drugs.
- 6 Study of cell wall constituents and cell inclusions.
- 7 Microscopical and powder Microscopical study of crude drugs.
- 8 Study of natural pesticides.
- 9 Detailed study of various cell constituents.
- 10 Carbohydrates and related products.
- 11 Detailed study carbohydrates containing drugs.(11 drugs)
- 12 Definition sources, method extraction, chemistry and method of analysis of lipids.
- 13 Detailed study of oils.
- 14 Definition, classification, chemistry and method of analysis of protein.
- 15 Study of plants fibers used in surgical dressings and related products.
- 16 Different methods of adulteration of crude drugs.

2.3 PHARMACOGNOSY & PHYTOPHARMACEUTICALS (PRACTICAL)

Practical : 3 Hrs./Week

General Requirements: Laboratory Napkin, Observation Book 150 pages Zero brush, Needle, Blade, Match box.

List of experiments:

- 1 Introduction of Pharmacognosy laboratory and experiments.
- 2 Study of cell wall constituents and cell inclusions.
- 3 Macro, powder and microscopic study of Datura.
- 4 Macro, powder and microscopic study of Senna.
- 5 Macro, powder and microscopic study of Cassia.cinnamon.
- 6 Macro, powder and microscopic study of Cinchona.
- 7 Macro, powder and microscopic study of Ephedra.
- 8 Macro, powder and microscopic study of Quassia.
- 9 Macro, powder and microscopic study of Clove
- 10 Macro, powder and microscopic study of Fennel.
- 11 Macro, powder and microscopic study of Coriander.
- 12 Macro, powder and microscopic study of Isapgol.
- 13 Macro, powder and microscopic study of Nux vomica.
- 14 Macro, powder and microscopic study of Rauwolfia.
- 15 Macro, powder and microscopic study of Liquorice.
- 16 Macro, powder and microscopic study of Ginger.
- 17 Macro, powder and microscopic study of Podophyllum.
- 18 Determination of Iodine value.
- 19 Determination of Saponification value and unsaponifiable matter.
- 20 Determination of ester value.
- 21 Determination of Acid value.
- 22 Chemical tests for Acacia.
- 23 Chemical tests for Tragacanth.
- 24 Chemical tests for Agar.
- 25 Chemical tests for Starch.
- 26 Chemical tests for Lipids.(castor oil,sesame oil, shark liver oil,bees wax)
- 27 Chemical tests for Gelatin.

Scheme of Practical Examination:

	Sessionals	Annual
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance.

2.4 PHARMACOLOGY – I (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, apart from general pharmacology, drugs acting on autonomic nervous system, cardiovascular system, central nervous system, blood and blood forming agents and renal system will be taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.
2. **Objectives of the Subject :** Upon completion of the subject student shall be able to (Know, do, appreciate) –
 - a. understand the pharmacological aspects of drugs falling under the above mentioned chapters;
 - b. handle and carry out the animal experiments;
 - c. appreciate the importance of pharmacology subject as a basis of therapeutics; and
 - d. correlate and apply the knowledge therapeutically.

Text books (Theory) (Author, Title, Edition, Publication Place, Publisher, Year of Publication)

- a. Tripathi, K. D. Essentials of medical pharmacology. 4th Ed, 1999. Publisher: Jaypee, Delhi.
- b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16th edition (single volume), 1999. Publisher: Popular, Dubai.
- c. Rang, H.P. & Dale, M.M. Pharmacology. 4th edition, 1999. Publisher: Churchill Living stone.

Reference books (Theory)(Author, Title, Edition, Publication Place, Publisher, Publication Year)

- a. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9th Ed, 1996. Publisher Mc Graw Hill, Pergamon press.
- b. Craig, C.R.&Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown.Co
- c. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, Int.
- d. Shargel and Leon. Applied Biopharmaceutics and pharmacokinetics. Latest edition. Publisher: Prentice Hall, London.

Text books (Practical) :

Kulkarni, S. K. and Dandia, P. C. Hand book of experimental pharmacology. Latest edition, Publisher: Vallab, Delhi.

Reference books (Practical)

- a. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.

- b. Macleod, L.J. Pharmacological experiments on isolated preparations. Latest edition, Publisher: Churchill livingstone.
- c. Ghosh, M.N. Fundamentals of experimental pharmacology. Latest edition, Publisher: Scientific book agency, Kolkata.
- d. Ian Kitchen. Textbook of in vitro practical pharmacology. Latest edition, Publisher: Black well Scientific.

3. Detailed syllabus and lecture wise schedule :

Title of the topic

1. **General Pharmacology**

- a) Introduction, definitions and scope of pharmacology
- b) Routes of administration of drugs
- c) Pharmacokinetics (absorption, distribution, metabolism and excretion)
- d) Pharmacodynamics
- e) Factors modifying drug effects
- f) Drug toxicity - Acute, sub-acute and chronic toxicity.
- g) Pre-clinical evaluations
- h) Drug interactions

Note: The term Pharmacology used here refers to the classification, mechanism of action, pharmacokinetics, pharmacodynamics, adverse effects, contraindications, Therapeutic uses, interactions and dose and route of administration.

2. **Pharmacology of drugs acting on ANS**

- a) Adrenergic and antiadrenergic drugs
- b) Cholinergic and anticholinergic drugs
- c) Neuromuscular blockers
- d) Mydriatics and miotics
- e) Drugs used in myasthenia gravis
- f) Drugs used in Parkinsonism

3. **Pharmacology of drugs acting on cardiovascular system**

- a) Antihypertensives
- b) Anti-anginal drugs
- c) Anti-arrhythmic drugs
- d) Drugs used for therapy of Congestive Heart Failure
- e) Drugs used for hyperlipidaemias

4. **Pharmacology of drugs acting on Central Nervous System**
 - a) General anesthetics
 - b) Sedatives and hypnotics
 - c) Anticonvulsants
 - d) Analgesic and anti-inflammatory agents
 - e) *Psychotropic drugs*
 - f) Alcohol and methyl alcohol
 - g) CNS stimulants and cognition enhancers
 - h) Pharmacology of local anaesthetics

5. **Pharmacology of Drugs acting on Respiratory tract**
 - a) Bronchodilators
 - b) Mucolytics
 - c) Expectorants
 - d) Antitussives
 - e) Nasal Decongestants

6. **Pharmacology of Hormones and Hormone antagonists**
 - a) Thyroid and Antithyroid drugs
 - b) Insulin, Insulin analogues and oral hypoglycemic agents
 - c) Sex hormones and oral contraceptives
 - d) Oxytocin and other stimulants and relaxants

7. **Pharmacology of autocooids and their antagonists**
 - a) Histamines and Antihistaminics
 - b) 5-Hydroxytryptamine and its antagonists
 - c) Lipid derived autocooids and platelet activating factor

2.5 COMMUNITY PHARMACY (THEORY)

Theory : 2 Hrs. /Week

1. **Scope:** In the changing scenario of pharmacy practice in India, Community Pharmacists are expected to offer various pharmaceutical care services. In order to meet this demand, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling, health screening services for improved patient care in the community set up.
2. **Objectives:** Upon completion of the course, the student shall be able to –
 - a. know pharmaceutical care services;
 - b. know the business and professional practice management skills in community pharmacies;
 - c. do patient counselling & provide health screening services to public in community pharmacy;
 - d. respond to minor ailments and provide appropriate medication;
 - e. show empathy and sympathy to patients; and
 - f. appreciate the concept of Rational drug therapy.

Text Books:

- a. Health Education and Community Pharmacy by N.S.Parmar.
- b. WHO consultative group report.
- c. Drug store & Business management by Mohammed Ali & Jyoti.

Reference books:

- a. Handbook of pharmacy – health care. Edt. Robin J Harman. The Pharmaceutical press.
- b. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams & Wilkins.

Special requirements:

1. Either the college is having model community pharmacy (meeting the schedule N requirement) or sign MoU with at least 4-5 community pharmacies nearby to the college for training the students on dispensing and counselling activities.
2. Special equipments like B.P apparatus, Glucometer, Peak flow meter, and apparatus for cholesterol estimation.

3. Scheme of evaluation (80 Marks)

- | | |
|---|----|
| 1. Synopsis | 10 |
| 2. Major Experiment
(Counselling of patients with specific diseases – emphasis should be given on Counselling introduction, content, process and conclusion) | 30 |
| 3. Minor Experiment (Ability to measure B.P/ CBG / Lung function) | 15 |
| 4. Prescription Analysis (Analyzing the prescriptions for probable drug interaction and ability to tell the management) | 15 |
| 5. Viva – Voce | 10 |

4. Lecture wise programme :

Topics

- 1 **Definition, scope, of community pharmacy
Roles and responsibilities of Community pharmacist**
- 2 **Community Pharmacy Management**
 - a) Selection of site, Space layout, and design
 - b) Staff, Materials- coding, stocking
 - c) Legal requirements
 - d) Maintenance of various registers
 - e) Use of Computers: Business and health care soft wares
- 3 **Prescriptions – parts of prescription, legality & identification of medication related problems like drug interactions.**
- 4 **Inventory control in community pharmacy**
Definition, various methods of Inventory Control
ABC, VED, EOQ, Lead time, safety stock
- 5 **Pharmaceutical care**
Definition and Principles of Pharmaceutical care.
- 6 **Patient counselling**
Definition, outcomes, various stages, barriers, Strategies to overcome barriers
Patient information leaflets- content, design, & layouts, advisory labels
- 7 **Patient medication adherence**
Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.
- 8 **Health screening services**
Definition, importance, methods for screening
Blood pressure/ blood sugar/ lung function and Cholesterol testing
- 9 **OTC Medication- Definition, OTC medication list & Counselling**
- 10 **Health Education**
WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.
Commonly occurring Communicable Diseases, causative agents, Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhoea and AIDS
Balance diet, and treatment & prevention of deficiency disorders
Family planning – role of pharmacist
- 11 **Responding to symptoms of minor ailments**
Relevant pathophysiology, common drug therapy to, Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Pyrexia, Ophthalmic symptoms, worms infestations.
- 12 **Essential Drugs concept and Rational Drug Therapy**
Role of community pharmacist
- 13 **Code of ethics for community pharmacists**

2.6 PHARMACOTHERAPEUTICS - I (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives:** At completion of this subject it is expected that students will be able to understand –
 - a. the pathophysiology of selected disease states and the rationale for drug therapy;
 - b. the therapeutic approach to management of these diseases;
 - c. the controversies in drug therapy;
 - d. the importance of preparation of individualised therapeutic plans based on diagnosis;
 - e. needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
 - f. describe the pathophysiology of selected disease states and explain the rationale for drug therapy;
 - g. summarise the therapeutic approach to management of these diseases including reference to the latest available evidence;
 - h. discuss the controversies in drug therapy;
 - i. discuss the preparation of individualised therapeutic plans based on diagnosis; and
 - j. identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

Text Books

- a. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication.
- b. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange.

Reference Books

- a. Pathologic basis of disease - Robins SL, W.B.Saunders publication.
- b. Pathology and therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice - Green and Harris, Chapman and Hall publication.
- c. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication.
- d. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA
- e. Avery's Drug Treatment, 4th Edn, 1997, Adis International Limited.
- f. Relevant review articles from recent medical and pharmaceutical literature.

3. Detailed syllabus and lecture wise schedule :

Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases

Title of the topic

- 1 Cardiovascular system:** Hypertension, Congestive cardiac failure, failure, Angina Pectoris, Myocardial infarction, Hyperlipidaemias, Hyperlipidaemias, Electrophysiology of heart and Arrhythmias
- 2 Respiratory system :** Introduction to Pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases. **Endocrine system :** Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis
- 3 General prescribing guidelines for**
 - a. Paediatric patients
 - b. Geriatric patients
 - c. Pregnancy and breast feeding
- 4 Ophthalmology:** Glaucoma, Conjunctivitis- viral & bacterial
- 5 Introduction to rational drug use**
Definition, Role of pharmacist Essential drug concept Rational drug formulations

2.6 PHARMACOTHERAPEUTICS - I (PRACTICAL)

Practical : 3 Hrs./Week

Practicals :

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation. A minimum of 20 cases should be presented and recorded covering most common diseases.

Assignments :

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

Format of the assignment:

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

Third Year

3.1 PHARMACOLOGY – II (THEORY)

Theory : 3 Hrs. /Week

- 1. Scope of the Subject:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, drugs acting on autacoids, respiratory system, GIT, immune system and hormones, and pharmacology of autocoids and hormones will be concentrated. In addition, pharmacology of chemotherapeutic agents, vitamins, essential minerals and principles of toxicology are also taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.
- 2. Objectives of the Subject Upon completion of the subject student shall be able to:**
 - a. understand the pharmacological aspects of drugs falling under the above mentioned chapters,
 - b. carry out the animal experiments confidently,
 - c. appreciate the importance of pharmacology subject as a basis of therapeutics, and
 - d. correlate and apply the knowledge therapeutically.

Text books (Theory)

- a. Tripathi, K. D. Essentials of medical pharmacology. 4th edition, 1999. Publisher: Jaypee, Delhi.
- b. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 16th edition (single volume), 1999. Publisher: Popular, Dubai.
- c. Rang, H.P. and Dale, M.M. Pharmacology. 4th edition, 1999. Publisher: Churchill Living stone.

Reference books (Theory)

- a. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological Basis of therapeutics. 9th edition, 1996. Publisher: Mc Graw Hill, Pergamon press.
- b. Craig, C.R. and Stitzel, R.E. Modern Pharmacology. Latest edition. Publisher: Little Brown and company.
- c. Katzung, B.G. Basic and clinical pharmacology. Latest edition. Publisher: Prentice Hall, International.
- d. Gupta, P.K. and Salunkhe, D.K. Modern Toxicology. Volume I, II and III. Latest edition. Publisher: B.V. Gupta, Metropolitan Book Co. (p) Ltd, New Delhi.

Text books (Practical)

Kulkarni, S. K. and Dandia, P. C. Hand book of experimental pharmacology. Latest edition, Publisher: Vallab, Delhi.

Reference books (Practical) :

- a. Macleod, L.J. Pharmacological experiments on intact preparations. Latest edition, Publisher: Churchill livingstone.
- b. Macleod, L.J. Pharmacological experiments on isolated preparations. Latest edition, Publisher: Churchill livingstone.
- c. Ghosh, M.N. Fundamentals of experimental pharmacology. Latest edition, Publisher: Scientific book agency, Kolkata.
- d. Ian Kitchen. Textbook of in vitro practical pharmacology. Latest edition, Publisher: Black well Scientific.

3. Detailed syllabus and lecture wise schedule:**Title of the topic**

1. **Pharmacology of Drugs acting on Blood and blood forming agents**
 - a) Anticoagulants
 - b) Thrombolytics and antiplatelet agents
 - c) Haemopoietics and plasma expanders
2. **Pharmacology of drugs acting on Renal System**
 - a) Diuretics
 - b) Antidiuretics
3. **Chemotherapy**
 - a) Introduction
 - b) Sulfonamides and co-trimoxazole
 - c) Penicillins and Cephalosporins
 - d) Tetracyclins and Chloramphenicol
 - e) Macrolides, Aminoglycosides, Polyene & Polypeptide antibiotics
 - f) Quinolines and Fluroquinolines
 - g) Antifungal antibiotics
 - h) Antiviral agents
 - i) Chemotherapy of tuberculosis and leprosy
 - j) Chemotherapy of Malaria
 - k) Chemotherapy of protozoal infections (amoebiasis, Giardiasis)
 - l) Pharmacology of Anthelmintic drugs
 - m) Chemotherapy of cancer (Neoplasms)
4. **Immunopharmacology**
Pharmacology of immunosuppressants and stimulants
5. **Principles of Animal toxicology**
Acute, sub acute and chronic toxicity

6. **The dynamic cell: The structures and functions of the components of the cell**

- a) Cell and macromolecules: Cellular classification, subcellular organelles, macromolecules, large macromolecular assemblies
- b) Chromosome structure: Pro and eukaryotic chromosome structures, chromatin structure, genome complexity, the flow of genetic information.
- c) DNA replication: General, bacterial and eukaryotic DNA replication.
- d) The cell cycle: Restriction point, cell cycle regulators and modifiers.
- e) Cell signaling: Communication between cells and their environment, ion-channels, signal transduction pathways (MAP kinase, P38 kinase, JNK, Ras and PI3-kinase pathways, biosensors).

The Gene: Genome structure and function:

- a) Gene structure: Organization and elucidation of genetic code.
- b) Gene expression: Expression systems (pro and eukaryotic), genetic elements that control gene expression (nucleosomes, histones, acetylation, HDACS, DNA binding protein families.
- c) Transcription and Transcription factors: Basic principles of transcription in pro and eukaryotes. Transcription factors that regulate transcription in pro and eukaryotes.

RNA processing: rRNA, tRNA and mRNA processing.

Protein synthesis: Mechanisms of protein synthesis, initiation in eukaryotes, translation control and post-translation events

Altered gene functions: Mutations, deletions, amplifications, LOH, traslocations, trinucleotide repeats and other genetic abnormalities.

Oncogenes and tumor suppressor genes.

The gene sequencing, mapping and cloning of human disease genes.

Introduction to gene therapy and targeting.

Recombinant DNA technology: principles. Processes (gene transfer technology) and applications

Books:

- 1 Molecular Biology of the Cell by Alberts B., Bray, D., Lewis, J., Raff M., Roberts, K and Watson, JD, 3rd edition.
- 2 Molecular Cell Biology By Lodish, H., Baltimore, D., Berk, A et al., 5th edition.
- 3 Molecular Biology by Turner, PC., McLennan, AG., Bates, AD and White MRH 2nd edition.
- 4 Genes VIII by Lewin, B., (2004)
- 5 Pharmaceutical Biotechnology, by Crommelin, DJA and Sindelar RD (1997)
- 6 Recombinant DNA by Watson, JD., Gilman, M., et al., (1996)
- 7 Biopharmaceutical: Biochemistry and Biotechnology by Walsh, G., (1998)

3.1 PHARMACOLOGY – II (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments:

1. Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits).
2. Study of physiological salt solutions used in experimental pharmacology.
3. Study of laboratory appliances used in experimental pharmacology.
4. Study of use of anesthetics in laboratory animals.
5. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation.
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method.
7. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method.
8. To record the dose response curve of Histamine using isolated guinea-pig ileum preparation.
9. Study of agonistic and antagonistic effects of drugs using isolated guinea-pig ileum preparation.
10. To carry out bioassay of Histamine using isolated guinea-pig ileum preparation by interpolation method.
11. To carry out bioassay of Histamine using guinea-pig ileum preparation by three point method.
12. To study the routes of administration of drugs in animals (Rats, Mice, Rabbits).
13. Study of theory, principle, procedure involved and interpretation of given results for the following experiments:
 - a) Analgesic property of drug using analgesiometer.
 - b) Antiinflammatory effect of drugs using rat-paw edema method.
 - c) Anticonvulsant activity of drugs using maximal electroshock and pentylene tetrazole methods.
 - d) Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone induced sleeping time methods.
 - e) Locomotor activity evaluation of drugs using actophotometer and rotorod.
 - f) Cardiotonic activity of drugs using isolated frog heart and mammalian heart preparations.

Scheme of Practical Examination:

	Sessionals	Annual
Identification	02	10
Synopsis	04	10
Major Experiment (Bioassay)	08	30
Minor Experiment (Interpretation of given Graph or simulated experiment)	04	10
Viva	02	10
Max Marks	20	70
Duration	3hrs	4hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

3.2 PHARMACEUTICAL ANALYSIS (THEORY)

Theory : 3 Hrs. /Week

1. Quality Assurance:

- a. Introduction, sources of quality variation, control of quality variation.
- b. Concept of statistical quality control.
- c. Validation methods- quality of equipment, validation of equipment and validation of analytical instruments and calibration.
- d. GLP, ISO 9000.
- e. Total quality management, quality review and documentation.
- f. ICH- international conference for harmonization-guidelines.
- g. Regulatory control.

2. Chromatography:

Introduction, history, classification, separation techniques, choice of methods. The following techniques be discussed with relevant examples of pharmaceutical products involving principles and techniques of separation of drugs from excipients.

- a. **Column Chromatography:** Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography.
- b. **TLC:** Introduction, principle, techniques, R_f value and applications.
- c. **PC:** Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications.
- d. **Ion-exchange chromatography:** Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.
- e. **HPLC:** Introduction, theory, instrumentation, and applications.
- f. **HPTLC:** Introduction, theory, instrumentation, and applications.
- g. **Gas Chromatography:** Introduction, theory, instrumentation-carrier gases, types of columns, stationary phases in GLC & GSC. Detectors- Flame ionization detectors, electron capture detector, thermal conductivity detector. Typical gas chromatogram, derivatisation techniques, programmed temperature gas chromatography, applications.
- h. **Electrophoresis:** Principles of separation, equipment for paper and gel electrophoresis, and application.
- i. **Gel filtration and affinity chromatography:** Introduction, technique, applications.

3. **Electrometric Methods:**

Theoretical aspects, instrumentation, interpretation of data/spectra and analytical applications be discussed on the following topics.

- a. **Potentiometry:** Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, Potentiometric titrations, methods of detecting end point, Karl Fischer titration.
- b. **Conductometry:** Introduction, conductivity cell, conductometric titrations and applications.
- c. **Polarography:** Instrumentation, DME, residual current, diffusion current and limiting current, polarographic wave, Ilkovic's equation, Effect of oxygen on polarographic wave, Polarographic maxima and suppressors and applications.
- d. **Amperometric Titrations:** Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of Amperometry over potentiometry. Pharma applications.

4. **Spectroscopy:**

Theoretical aspects, instrumentation, elements of interpretation of data/spectra and application of analytical techniques be discussed on:

a. **Absorption Spectroscopy:**

- Theory of electronic, atomic and molecular spectra. Fundamental laws of photometry, Beer-Lambert's Law, application and its deviation, limitation of Beer law, application of the law to single and multiple component analysis, measurement of equilibrium constant and rate constant by spectroscopy. Spectra of isolated chromophores, auxochromes, batho-chromic shift, hypsochromic shift, hyperchromic and hypochromic effect, effect of solvent on absorption spectra, molecular structure and infrared spectra.
Instrumentation – Photometer, U.V.-Visible spectrophotometer – sources of U.V.-Visible radiations, collimating systems, monochromators, samples cells and following detectors-Photocell, Barrier layer cell, Phototube, Diode array, applications of U.V.-Visible spectroscopy in pharmacy and spectrophotometric titrations.
- **Infrared Spectroscopy:** Vibrational transitions, frequency – structure correlations, Infrared absorption bands, Instrumentation–IR spectrometer – sources of IR, Collimating systems, monochromators, sample cells, sample handling in IR spectroscopy and detectors– Thermocouple, Golay Cells, Thermistor, Bolometer, Pyroelectric detector, Applications of IR in pharmacy.

- **Fluorimetric Analysis:** Theory, luminescence, factors affecting fluorescence, quenching. Instrumentation, Applications, fluorescent indicators, study of pharmaceutically important compounds estimated by fluorimetry.
- b. **Flame Photometry:** Theory, nebulisation, flame and flame temperature, interferences, flame spectrometric techniques and instrumentation and pharmaceutical applications.
- c. **Atomic Absorption Spectrometry:** Introduction, Theory, types of electrodes, instrumentation and applications.
- d. **Atomic Emission Spectroscopy:** Spectroscopic sources, atomic emission spectrometers, photographic and photoelectric detection.
- e. **NMR & ESR (introduction only):** Introduction, theoretical aspects and applications.
- f. **Mass Spectroscopy: (Introduction only)** – Fragmentation, types of ions produced mass spectrum and applications.
- g. **Polarimetry: (Introduction only)** – Introduction to optical rotatory dispersion, circular dichroism, polarimeter.
- h. **X-RAY Diffraction: (Introduction only)** – Theory, reciprocal lattice concept, diffraction patterns and applications.
- i. **Thermal Analysis:** Introduction, instrumentation, applications, and DSC and DTA.

3.2 PHARMACEUTICAL ANALYSIS (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments:

1. Separation and identification of Amino Acids by Paper Chromatography.
2. Separation and identification of Sulpha drugs by TLC technique.
3. Effect of pH and solvent on the UV spectrum of given compound.
4. Comparison of the UV spectrum of a compound with that of its derivatives.
5. Determination of dissociation constant of indicators using UV-Visible spectroscopy.
6. Conductometric titration of mixture of acids with a strong base.
7. Potentiometric titration of a acid with a strong base.
8. Estimation of drugs by Fluorimetric technique.
9. Study of quenching effect in fluorimetry.
10. Colourimetric estimation of Supha drugs using BMR reagent.

11. Simultaneous estimation of two drugs present in given formulation.
12. Assay of Salicylic Acid by colourimetry.
13. Determination of Chlorides and Sulphates in Calcium gluconate by Nepheloturbidimetric Method.
14. Determination of Na/K by Flame Photometry.
15. Determination of pKa using pH meter.
16. Determination of specific rotation.
17. Comparison of the IR spectrum of a compound with that of its derivatives.
18. Demonstration of HPLC.
19. Demonstration of HPTLC.
20. Demonstration of GC-MS.
21. Demonstration of DSC.
22. Interpretation of NMR spectra of any one compound.

Reference Books:

1. Text Book of Pharm. Analysis by Higuchi. T and Hasen. E. B., New York Inter Science Publishers.
2. Quantitative Pharma. Analysis by Jenkins, The Blakiston division, New York.
3. Quantitative Drug Analysis, by Garrot. D, Chapman & Hall Ltd., London.
4. Undergraduate Instrumental Analysis by James. E., CBS Publishers.
5. Instrumental Analysis by Willard and Merritt, EWP, East West Press Ltd., Delhi/Madras.
6. Pharm Analysis by Skoog and West, Sounders Manipal College Publishing.
7. Text Book of Chemical Analysis, by A.I.Vogel, ELBS with Macmillan press, Hampshire.
8. Textbook of Pharm. Analysis by K.A.Connors, John Wiley & Sons, New York, Brisbane, Singapore.
9. Textbook of Pharm. Analysis (Practical) by Beckett & Stenlake, CBS Publishers, Delhi.
10. Textbook of Drug Analysis by P.D. Sethi., CBS Publishers, Delhi.
11. Spectroscopy by Silverstein, John & Wiley & Sons. Inc., Canada & Singapore.
12. How to practise GMP-A Plan for total quality control by P.P. Sharma, Vandana Publications, Agra.
13. The Science & Practice of Pharmacy by Remington Vol-I & II, Mack Publishing Co. Pennsylvania.
14. TLC by Stahl, Spring Verlay.
15. Text Book of Pharm. Chemistry by Chatten, CBS Publications.
16. Spectroscopy by William Kemp, ELBS with Macmillan Press, Hampshire.
17. I.P.-1996, The Controller of Publications, New Delhi.
18. BPC- Dept. of Health, U.K. for HMSO.
19. USP - Mack Publishing Co., Easton, PA.
20. The Extra Pharmacopoeia – The Pharm. Press, London.

Practicals

Title of the Experiment:

- 1 Study of agonistic and antagonistic effects of drugs using Guinea-pig ileum preparation.**
- 2 To study the effects of drugs on intestinal motility using frog's esophagus model*
- 3 To study the effects of drugs using rat uterus preparation.**
- 4 To study the anticonvulsant property of drugs (any one model).*
- 5 To study antihistaminic property of drug using histamine induced anaphylactic reaction in guinea pigs.
- 6 To study the apomorphine-induced compulsive behaviour (stereotypy) in mice.*
- 7 To study the muscle relaxant property of diazepam in mice using rotarod apparatus.*
- 8 To study the antiinflammatory property of indomethacin against carrageenan-induced paw oedema.**
- 9 To study the anxiolytic effect of diazepam in mice using mirrored-chamber apparatus.**
- 10 To demonstrate the effect of various drugs on the blood pressure and respiration of anaesthetized dog.
- 11 To study the effect of anthelmintics on earthworms.
- 12 To study the taming effect of chlorpromazine.*
- 13 To study the effects of drugs on vas deferense of the male rat.**
- 14 To study the effect of drugs on pesticide toxicity using rats as model.
- 15 To study the effect of drugs on heavy metal toxicity.

** indicate major experiment & * indicate minor experiment

Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

3.3 PHARMACOTHERAPEUTICS – II (THEORY)

Theory : 3 Hrs. /Week

1. **Scope of the Subject:** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives of the Subject Upon completion of the subject student shall be able to –**
 - a. know the pathophysiology of selected disease states and the rationale for drug therapy
 - b. know the therapeutic approach to management of these diseases;
 - c. know the controversies in drug therapy;
 - d. know the importance of preparation of individualised therapeutic plans based on diagnosis; and
 - e. appreciate the needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

Text books (Theory)

Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone publication

Reference books (Theory)

- a. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
- b. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication
- c. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble MA]

3. Detailed syllabus and lecture wise schedule :

Etiopathogenesis and pharmacotherapy of diseases associated with following systems / diseases –

Title of the topic

1. **Infectious disease:** Guidelines for the rational use of antibiotics and surgical Prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection- Malaria, HIV & Opportunistic infections, Fungal infections, Viral infections, Gonorrhoea and Syphilis
2. **Musculoskeletal disorders**
Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus.
3. **Renal system**
Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug induced renal disorders;

- 4 **Oncology:** Basic principles of Cancer therapy, General introduction to cancer chemotherapy, chemotherapeutic agents, Chemotherapy of breast cancer, leukemia. Management of chemotherapy nausea and emesis
- 5 **Dermatology:** Psoriasis, Scabies, Eczema, Impetigo

3.3 PHARMACOTHERAPEUTICS – II (PRACTICAL)

Practical : 3 Hrs./Week

Practicals :

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation.

The student shall be trained to understand the principle and practice involved in selection of drug therapy including clinical discussion.

A minimum of 20 cases should be presented and recorded covering most common diseases.

Assignments :

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

Format of the assignment :

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination :

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

3.4 PHARMACEUTICAL JURISPRUDENCE (THEORY)

Theory : 2 Hrs. /Week

1. **Scope of the Subject:** (4-6 lines): This course exposes the student to several important legislations related to the profession of pharmacy in India. The Drugs and Cosmetics Act, along with its amendments are the core of this course. Other acts, which are covered, include the Pharmacy Act, dangerous drugs, medicinal and toilet preparation Act etc. Besides this the new drug policy, professional ethics, DPCO, patent and design Act will be discussed.
2. **Objectives of the Subject:** Upon completion of the subject student shall be able to (Know, do, and appreciate) –
 - a. practice the Professional ethics;
 - b. understand the various concepts of the pharmaceutical legislation in India;
 - c. know the various parameters in the Drug and Cosmetic Act and rules;
 - d. know the Drug policy, DPCO, Patent and design act;
 - e. understand the labeling requirements and packaging guidelines for drugs and cosmetics;
 - f. be able to understand the concepts of Dangerous Drugs Act, Pharmacy Act and Excise duties Act; and
 - g. other laws as prescribed by the Pharmacy Council of India from time to time including International Laws.

Text books (Theory)

Mithal , B M. Textbook of Forensic Pharmacy. Calcutta :National; 1988.

Reference books (Theory)

- a. Singh, KK, editor. Beotra's the Laws of Drugs, Medicines & cosmetics. Allahabad: Law Book House; 1984.
- b. Jain, NK. A Textbook of forensic pharmacy. Delhi: Vallabh prakashan ; 1995.
- c. Reports of the Pharmaceutical enquiry Committee
- d. I.D.M.A., Mumbai. DPCO 1995
- e. Various reports of Amendments.
- f. Deshapande, S.W. The drugs and magic remedies act 1954 and rules 1955. Mumbai: Susmit Publications; 1998.
- g. Eastern Book Company .The narcotic and psychotropic substances act 1985, Lucknow: Eastern; 1987.

3. Detailed syllabus and lecture wise schedule:

Title of the topic

1. **Pharmaceutical Legislations** – A brief review.
2. Principle and Significance of professional ethics. Critical study of the code of pharmaceutical ethics drafted by PCI.
3. **Drugs and Cosmetics Act, 1940, and its rules 1945.**
Objectives, Legal definition, Study of Schedule's with reference to Schedule B, C&C1, D, E1, F&F1, F2, F3, FF, G, H, J, K, M, N, P, R, V, W, X, Y.
Sales, Import, labeling and packaging of Drugs And Cosmetics
Provisions Relating to Indigenous Systems.
Constitution and Functions of DTAB, DCC, CDL.
Qualification and duties –Govt. analyst and Drugs Inspector.

4. **Pharmacy Act –1948.**
Objectives Legal Definitions, General Study, Constitution and Functions of State & Central Council, Registration & Procedure, ER.
5. **Medicinal and Toilet Preparation Act –1955.**
Objectives, Legal Definitions, Licensing, Bonded and Non Bonded Laboratory, Ware Housing, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations.
6. **Narcotic Drugs and Psychotropic substances Act-1985 and Rules.** Objectives, Legal Definitions, General Study, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and regulations, Schedules to the Act.
7. **Study of Salient Features of Drugs and magic remedies Act and its rules.**
8. **Study of essential Commodities Act Relevant to drugs price control Order.**
9. **Drug Price control Order & National Drug Policy (Current).**
10. **Prevention Of Cruelty to animals Act-1960.**
11. **Patents & design Act-1970.**
12. **Brief study of prescription and Non-prescription Products.**

4. Assignments:

Format of the assignment

1. Minimum & Maximum number of pages
2. It shall be a computer draft copy
3. Reference(s) shall be included at the end.
4. Name and signature of the student
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min

Case studies relating to

1. Drugs and Cosmetics Act and rules along with its amendments, Dangerous Drugs Act, Medicinal and Toilet preparation Act, New Drug Policy, Professional Ethics, Drugs (Price control) Order, Patent and Design Act.
2. Various prescription and non-prescription products.
3. Medical and surgical accessories.
4. Diagnostic aids and appliances available in the market.

3.5 MEDICINAL CHEMISTRY (THEORY)

Theory : 3 Hrs. /Week

1. Modern concept of rational drug design: A brief introduction to Quantitative Structure Activity Relationship (QSAR), prodrug, combinatorial chemistry and computer aided drug design (CADD) and concept of antisense molecules.

A study of the development of the following classes of drugs including SAR, mechanism of action, synthesis of important compounds, chemical nomenclature, brand names of important marketed products and their side effects.

2. Anti-infective agents
 - a) Local anti-infective agents
 - b) Preservatives
 - c) Antifungal agents
 - d) Urinary tract anti-infectives
 - e) Antitubercular agents
 - f) Antiviral agents and Anti AIDS agents
 - g) Antiprotozoal agents
 - h) Anthelmintics
 - i) Antiscabies and Antipedicular agents
3. Sulphonamides and sulphones
4. Antimalarials
5. Antibiotics
6. Antineoplastic agents
7. Cardiovascular agents
 - a) Antihypertensive agents
 - b) Antianginal agents and vasodilators
 - c) Antiarrhythmic agents
 - d) Antihyperlipidemic agents
 - e) Coagulants and Anticoagulants
 - f) Endocrine
8. Hypoglycemic agents
9. Thyroid and Antithyroid agents
10. Diuretics
11. Diagnostic agents
12. Steroidal Hormones and Adrenocorticoids

3.5 MEDICINAL CHEMISTRY (PRACTICAL)

Practical : 3 Hrs./Week

1. Assays of important drugs from the course content.
2. Preparation of medicinally important compounds or intermediates required for synthesis of drugs.
3. Monograph analysis of important drugs.
4. Determination of partition coefficients, dissociation constants and molar refractivity of compounds for QSAR analysis.

Reference Books:

- a. Wilson and Gisvold's Text book of Organic, Medicinal and Pharmaceutical Chemistry, Lippincott-Raven Publishers-New York, Philadelphia.
- b. William.O.Foye, Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd., New Delhi.
- c. Burgers, Medicinal Chemistry, M.E., Welly Med.Chemistry M.E. Walffed Johnwilley and Sons, Wiley-interscience Publication, New York, Toranto.
- d. A Text Book of Medicinal Chemistry Vol. I and II by Surendra N. Pandeya, S.G. Publisher, 6, Dildayal Nagar, Varanasi -10.
- e. Indian Pharmacopoeia 1985 and 1996. The Controller of Publications, Civil Lines, Delhi - 54.
- f. Current Index of Medical Specialities (CIMS) and MIMS India, MIMS, A.E. Morgan Publications (I) Pvt. Ltd, New Delhi-19.
- g. Organic Drug Synthesis-Ledniser Mitzsher Vol. I and II.
- h. Pharmaceutical Chemistry drug Synthesis Vol. I and II by H. J. Roth and A. Kleemann.
- i. The Science and Practice of Pharmacy Vol. 1 and 2, Remington, MACK Publishing Company, Easton, Pennsylvania.

3.6 PHARMACEUTICAL FORMULATIONS (THEORY)

Theory : 2 Hrs. /Week

1. **Scope of the Subject:** Scope and objectives of the course: Subject deals with the formulation and evaluation of various pharmaceutical dosage forms.
2. **Objectives of the Subject:** Upon completion of the subject student shall be able to (Know, do, appreciate) –
 - a. understand the principle involved in formulation of various pharmaceutical dosage forms;
 - b. prepare various pharmaceutical formulation;
 - c. perform evaluation of pharmaceutical dosage forms; and
 - d. understand and appreciate the concept of bioavailability and bioequivalence, their role in clinical situations.

Text books (Theory)

- a. Pharmaceutical dosage forms, Vol, I,II and III by lachman
- b. Rowlings Text book of Pharmaceutics
- c. Tutorial Pharmacy – Cooper & Gun

Reference books (Theory)

- a. Remington's Pharmaceutical Sciences
- b. USP/BP/IP

3. Detailed syllabus and lecture wise schedule:

Title of the topic

1. Pharmaceutical dosage form- concept and classification
2. **Tablets:** Formulation of different types of tablets, tablet excipients, granulation techniques quality control and evaluation of tablets. Tablet coating, Type of coating, quality control tests for coated tablet.
3. **Capsules;** Production and filling of hard gelatin capsules, Raw material for shell, finishing, quality control tests for capsules. Production and filling of soft gelatin capsules, quality control tests for soft gelatin capsules.
4. **Liquid orals:** Formulation and evaluation of suspensions, emulsions and solutions. Stability of these preparations
5. **Parenterals** Introduction Containers used for Parenterals (including official tests) Formulation of large and small volume Parenterals Sterilization
6. **Ophthalmic preparations (Semi – Solids):** Introduction and classification Factors affecting absorption and anatomy of skin Packaging storage and labeling, Ointments Types of Ointment Base Preparation of ointment, Jellies Types of jellies Formulation of jellies Suppositories, Method of preparation, Types Packaging
7. Definition and concept of **Controlled and novel Drug delivery systems** with available examples, viz. parenteral, trans dermal, buccal, rectal, nasal, implants, ocular

3.6 PHARMACEUTICAL FORMULATIONS (PRACTICAL)

Practical : 3 Hrs./Week

List of Experiments :

1. **Manufacture of Tablets**
 - a. Ordinary compressed tablet-wet granulation
 - b. Tablets prepared by direct compression.
 - c. Soluble tablet.
 - d. Chewable tablet.
2. **Formulation and filling of hard gelatin capsules**
3. **Manufacture of parenterals**
 - a. Ascorbic acid injection
 - b. Calcium gluconate injection
 - c. Sodium chloride infusion.
 - d. Dextrose and Sodium chloride injection/ infusion.
4. **Evaluation of Pharmaceutical formulations (QC tests)**
 - a. Tablets
 - b. Capsules
 - c. Injections
5. **Formulation of two liquid oral preparations and evaluation by assay**
 - a. Solution: Paracetamol Syrup
 - b. Antacid suspensions- Aluminum hydroxide gel
6. **Formulation of semisolids and evaluation by assay**
 - a. Salicylic acid and benzoic acid ointment
 - b. Gel formulation Diclofenac gel
7. **Cosmetic preparations**
 - a. Lipsticks
 - b. Cold cream and vanishing cream
 - c. Clear liquid shampoo
 - d. Tooth paste and tooth powders.
8. **Tablet coating (demonstration)**

Scheme of Practical Examination :

	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	20	70
Duration	03hrs	04hrs

Note : Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

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BP 505 T. PHARMACEUTICAL JURISPRUDENCE (Theory) 45 Hours

Scope: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

Objectives: Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT-I 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:
Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs.

Conditions for grant of license and conditions of license for manufacture of drugs; Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT-II 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:
Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs

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4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT I 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:
Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs.

Conditions for grant of license and conditions of license for manufacture of drugs; Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT-II 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:
Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysis, Licensing authorities, controlling authorities, Drugs Inspectors

UNIT-III 10 Hours

- **Pharmacy Act –1948:** Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and

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Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV 08 Hours

- **Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties
- **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties.
- **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)-2013, Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

UNIT-V 07 Hours

- **Pharmaceutical Legislations** – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Modular committee
- **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath
- **Medical Termination of Pregnancy Act**
- **Right to Information Act**
- **Introduction to Intellectual Property Rights (IPR)**

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh

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BP006T PHARMACEUTICAL QUALITY ASSURANCE (Theory) 45 Hours

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Objectives: Upon completion of the course student shall be able to:

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

Course contents:

UNIT – I 10 Hours
Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP
Total Quality Management (TQM): Definition, elements, philosophies
ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines
Quality by design (QbD): Definition, overview, elements of QbD program, tools
ISO 9000 & ISO 14000: Overview, Benefits, Elements, steps for registration
NABL accreditation: Principles and procedures]

UNIT - II 10 Hours
Organization and personnel: Personnel responsibilities, training, hygiene and personal records.
Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.
Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

UNIT – III 10 Hours
Quality Control: Quality control test for containers, rubber closures and secondary packing

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Organization and personnel: Personnel responsibilities, training, hygiene and personal records.
Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.
Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

UNIT – III 10 Hours
Quality Control: Quality control test for containers, rubber closures and secondary packing

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materials.
Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

UNIT – IV 08 Hours
Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.
Document maintenance in pharmaceutical industry: Batch, Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

UNIT – V 07 Hours
Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan, Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.
Warehousing: Good warehousing practice, materials management

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.

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Unit III

10 Hours

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants

Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions

Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit IV

08 Hours

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.

Assessment of a new antibiotic.

Unit V

07Hours

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

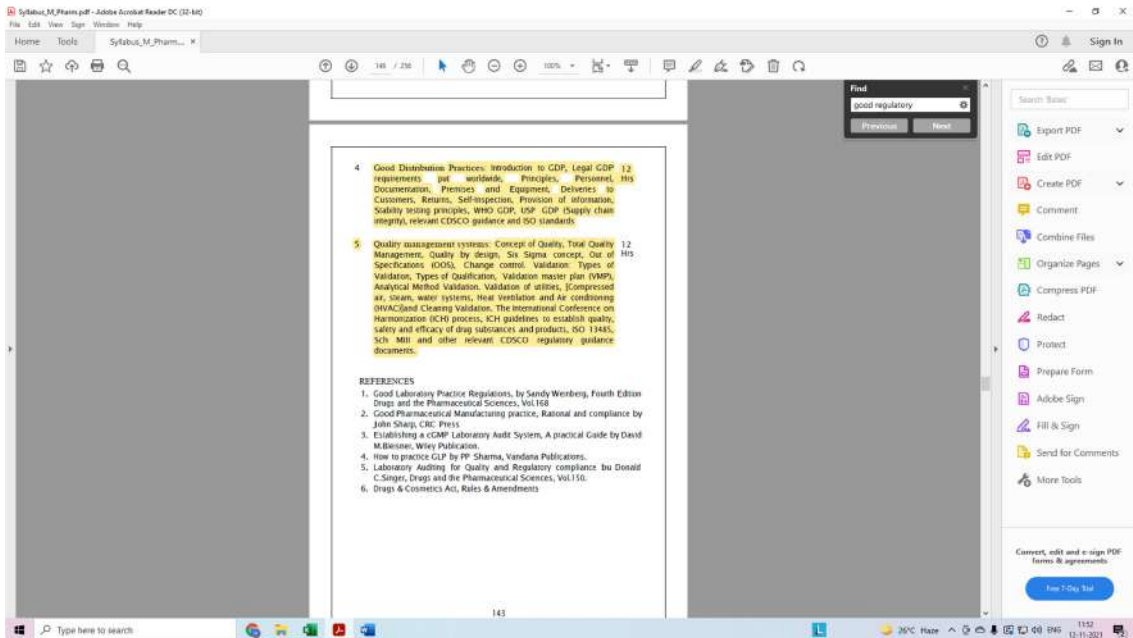
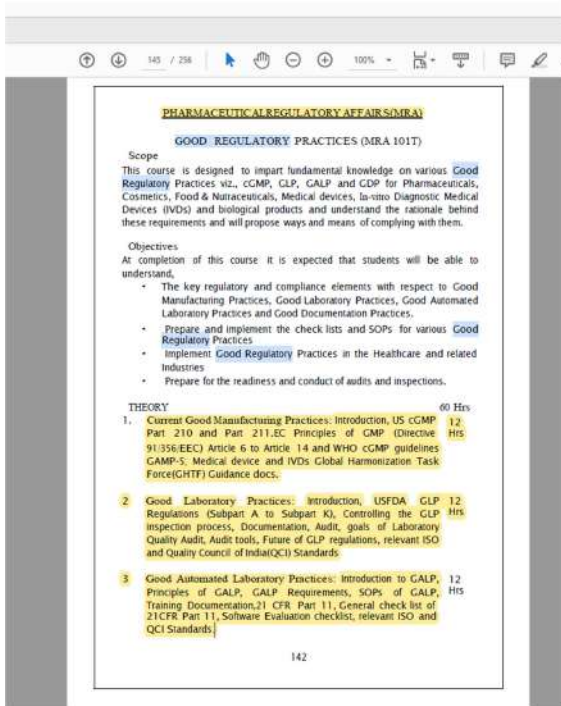
Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Recommended Books (Latest edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Pepler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company



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DOCUMENTATION AND REGULATORY WRITING (DRLA 1022)

Scope
This course is designed to impart fundamental knowledge on documentation and general principles involved in regulatory writing and submission to agencies.

Objectives
Upon completion of the course the student shall be able to:

- Know the various documents pertaining to drugs in pharmaceutical industry
- Understand the basics of regulatory compilation
- Create and assemble the regulation submission as per the requirements of agencies.
- Follow up the submissions and post approval document requirements.

TIBORY 09 Hrs

1. **Documentation in pharmaceutical industry** 12 Hrs
 Exploratory Product Development Brief (EPDB) for Drug substance and Drug product, Product Development Plan (PDP), Product Development Report (PDR), Master Formula Record, Batch Manufacturing Record and its calculations, Batch Reconciliation, Batch Packaging Records, Plant pack specifications, Distribution records, Certificate of Analysis (COA), Site Master File and Drug Master File (DMF).
2. **Dossier preparation and submission: introduction and overview of dossiers, contents and organization of dossier, binders and sections, compilation and review of dossier, Paper submissions, overview and modules of CTD, electronic CTD submissions, Electronic submission Planning electronic submission, requirements for submission, regulatory bindings and requirements, Tool and Technologies, electronic dossier submission process and validating the submission, Electronic Submission Gateway (ESG), Non eCTD electronic submissions (NecS), Atrial CTD format (ACTD) submission, Organizing process and validation of submission, Submission in Sigam system of CDSCO** 12 Hrs

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3. **Regulations governing Clinical Trials** 12 Hrs
 India: Clinical Research regulations in India - Schedule Y & Medical Device Guidance
 USA: Regulations to conduct drug studies in USA (FDA)
 • NDA 505(b)(1) of the FD&C Act (Application for approval of a new drug)
 • NDA 505(b)(2) of the FD&C Act (Application for approval of a new drug that relies, at least in part, on data not developed by the applicant)
 • ANDA 505(b) of the FD&C Act (Application for approval of a generic drug product)
 • FDA Guidance for Industry - Acceptance of Foreign Clinical Studies
 • FDA Clinical Trials Guidance Document: Good Clinical Practice
 EU: Clinical Research regulations in European Union (EMA)
4. **Clinical Research Related Guidelines** 12 Hrs
 • Good Clinical Practice Guidelines (ICH GCP E6)
 • Indian GCP Guidelines
 • ICMR Ethical Guidelines for Biomedical Research
 • CDSCO guidelines
 CHTR study group guidance documents
 Regulatory Guidance in Efficacy and Safety III Guidance's
 • E4 - Dose Response: Information to support Drug Registration
 • E7 - Studies in support of General Population, Genetics
 • E8 - General Considerations of Clinical Trials
 • E10 - Choice of Control Groups and Related Issues in Clinical Trials
 • E 11 - Clinical Investigation of Medical Products in the Pediatric Population
 • General biometrics principle applied in clinical research
5. **USA & EU Guidance** 12 Hrs
 USA: FDA Guidance
 • CFR 312.61 Protection of Human Subjects
 • CFR 312.61. Financial Incentives for Clinical Investigations

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- Know different Acts and guidelines that regulate Drugs & Cosmetics, Medical Devices, Biologics & Herbs, and Food & Nutraceuticals industry in India.
- Understand the approval process and regulatory requirements for Drugs & Cosmetics, Medical Devices, Biologics & Herbs, and Food & Nutraceuticals.

THEORY

1. Biologics & Herbs, and Food & Nutraceuticals Acts and Rules (with latest amendments) 12 HS

1. Drugs and Cosmetics Act 1984 and Rules 1985: DPCO and MPPS
2. Other relevant provisions (inert schedules and guidelines for approval of Drugs & Cosmetics, Medical Devices, Biologics & Herbs, and Food & Nutraceuticals in India)

Other relevant Acts: Narcotics Drugs and Psychotropic Substances Act, Medical and Toilet Preparations (Essence Codes) Act, 1955; Pharmacy Act, 1948; Drugs and Magic Remedies (Objectionable Advertisements) Act, 1955; Prevention of Cruelty to Animals Act.

2. Regulatory requirements and approval procedures for Drugs & Cosmetics, Medical Devices, Biologics & Herbs, and Food & Nutraceuticals 12 HS

CDSCO (Central Drug Standard Control Organization) and State Licensing Authority: Organization, Responsibilities:

- Rules, regulations, guidelines and standards for regulatory filing of Drugs & Cosmetics, Medical Devices, Biologics & Herbs, and Food & Nutraceuticals
- Format and contents of Regulatory dossier filing

Clinical trial investigators:

3. Indian Pharmacopoeial Standards, BIS standards and ISO and other relevant standards 12 HS

4. Bioavailability and Bioequivalence data (BA, BE), BCS Classification of Drugs, Regulatory Requirements for HS 12 HS

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REGULATORY AFFAIRS PRACTICAL - I (DIBA 1009)

1. Case studies (4 Nos.) of each of Good Pharmaceutical Practices.
2. Documentation for in process and finished products: Quality control tests for Solid, Liquid, Semisolid and Sterile preparations.
3. Preparation of SOPs, Analytical reports (Stability and validation)
4. Protocol preparation for documentation of various types of records (BMR, MPR, DR)
5. Labeling comparison between brand & generic.
6. Preparation of clinical trial protocol for registering trial in India
7. Registration for conducting BA, BE studies in India
8. Import of drugs for research and developmental activities
9. Preparation of regulatory dossier as per Indian CTD format and submission in SUGAM
10. Registering for different Intellectual Property Rights in India
11. GMP Audit Requirements as per CDSCO
12. Preparation and documentation for Indian Patent application.
13. Preparation of checklist for registration of NDA as per ICH CTD format.
14. Preparation of checklist for registration of NDA as per ICH CTD format.
15. Preparation of checklist for registration of ANDA as per ICH CTD format.
16. Case studies on response with scientific rationale to USFDA Warning Letter
17. Preparation of submission checklist of IMPD for EU submission.
18. Comparison study of marketing authorization procedures in EU.
19. Comparative study of DMF system in US, EU and Japan
20. Preparation of regulatory submission using eCTD software
21. Preparation of Clinical Trial Application (CTA) for US submission
22. Preparation of Clinical Trial Application (CTA) for EU submission
23. Comparison of Clinical Trial Application requirements of US, EU and Japan of a dosage form.
24. Regulatory requirements checklist for conducting clinical trials in India.
25. Regulatory requirements checklist for conducting clinical trials in Europe.
26. Regulatory requirements checklist for conducting clinical trials in USA.

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REGULATORY ASPECTS OF DRUGS & COSMETICS (MIRA 2017)

SEMESTER II

Scope
This course is designed to impart the fundamental knowledge on the drug development process, regulatory requirements for approval of new drugs, drug products and cosmetics in regulated and semi-regulated countries prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products and cosmetics in regulated and semi-regulated countries.

Objectives
Upon completion of the course, the student shall be able to know

- process of drug discovery and development and generic product development
- regulatory approval process and registration procedures for API and drug products in US, EU
- Cosmetics regulations in regulated and semi-regulated countries
- A comparative study of India with other global regulated markets

Theory 60 Hrs

1. USA & CANADA: Organization structure and functions of FDA, Federal register and Code of Federal Regulations (CFR), History and evolution of United States Federal, Food, Drug and Cosmetic Act (FDCA), Hatch Waxman act and Orange book, Purple Book, Drug Master Files (DMF) system in US, Regulatory Approval Process for Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Supplemental New Drug Application (sNDA), Regulatory requirements for Ocular drugs and Combination Products, Changes to an approved NDA, ANDA, Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in USA, Legislative and regulations for import, manufacture, distribution and sale of cosmetics in USA and Canada. 12 Hrs
2. European Union & Australia: Organization and structure of EMA & ECDM, General guidelines, Active Substance Master File (ASMF) system in EU, Content and approval process of IMPD, Marketing Authorization procedures in EU (Centralized procedure, 12 Hrs

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REGULATORY ASPECTS OF HERBAL AND BIOLOGICALS (MIRA 2017)

Scope
This course is designed to impart fundamental knowledge on Regulatory Requirements, Licensing and Registration, Regulation on Labeling of Biologics in India, USA and Europe. It prepares the students to learn in detail on Regulatory Requirements for Biologics, Vaccines and Blood Products.

Objectives
Upon the completion of the course the student shall be able to:

- know the regulatory Requirements for Biologics and Vaccines
- Understand the regulation for newly developed biologics and biosimilars
- Know the pre-clinical and clinical development considerations of biologics
- Understand the Regulatory Requirements of Blood and/or its Components including Blood Products and label requirements

Theory 60 Hrs

1. India: Introduction, Applicable Regulations and Guidelines, Principles for Development of Similar Biologics, Data Requirements for Pre-clinical Studies, Data Requirements for Clinical Trial Application, Data Requirements for Market Authorization Application, Pre-Market Data for Similar Biologics, Pharmacovigilance, GMP and GDP. 12 Hrs
2. USA: Introduction to Biologics: biologics, biological and biosimilars, different biological products, difference between generic drug and biosimilars, laws, regulations and guidance on biologics: biosimilars, development and approval of biologics and biosimilars (IND, PMA, BLA, NDA, 310(a)), pre-clinical and clinical development considerations, advertising, labelling and packing of biologics. 12 Hrs
3. European Union: Introduction to Biologics: directives, scientific guidelines and guidance related to biologics in EU, comparability biosimilarity assessment, Plasma master file, TSE, BSE evaluation, development and regulatory approval of biologics (Investigational medicinal products and biosimilars), pre-clinical 12 Hrs

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REGULATORY ASPECTS OF MEDICAL DEVICES (DMRA 2013)

Scope
This course is designed to impart the fundamental knowledge on the medical devices and/or in-vitro diagnostics, basis of classification and product life cycle of medical devices, regulatory requirements for approval of medical devices in regulated countries like US, EU and Asian countries along with WHO regulations. It prepares the students to learn in detail on the harmonization initiatives, quality and ethical considerations, regulatory and documentation requirements for marketing medical devices and IVDs in regulated countries.

Objectives
Upon completion of the course, the student shall be able to know

- basics of medical devices and IVDs, process of development, ethical and quality considerations
- harmonization initiatives for approval and marketing of medical devices and IVDs
- regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN
- clinical evaluation and investigation of medical devices and IVDs

Theory 60 Hrs

1. **Medical Devices: Introduction, Definition, Risk based Classification and Essential Principles of Medical Devices and IVDs, Differentiating medical devices, IVDs and Combination Products from that of pharmaceuticals, History of Medical Device Regulation, Product Lifecycle of Medical Devices and Classification of Medical Devices.** 12 Hrs
 IVDs: IVDs: Introduction, Organizational Structure, Purpose and Functions, Regulatory Guidelines, Working Groups, Summary Technical Document (STED), Global Medical Device Nomenclature (GMDN).
2. **Ethics: Clinical Investigation of Medical Devices, Clinical Investigation Plan for Medical Devices, Good Clinical Practice for Clinical Investigation of medical devices (ISO 14155:2011) Quality System Regulations of Medical Devices: ISO 13485, Quality Risk Management of Medical Devices: ISO 14971, Validation and Verification of Medical device, Adverse Event Reporting of Medical device.** 12 Hrs

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REGULATORY ASPECTS OF FOOD & NUTRACEUTICALS (DMRA 2014)

Scope
This course is designed to impart the fundamental knowledge on Regulatory Requirements, Registration and Labeling Regulations of Nutraceuticals in India, USA and Europe. It prepares the students to learn in detail on Regulatory Aspects for nutraceuticals and food supplements.

Objectives
Upon completion of the course, the student shall be able to

- Know the regulatory Requirements for nutraceuticals
- Understand the regulation for registration and labeling of nutraceuticals and food supplements in India, USA and Europe.

Theory 60 Hrs

1. **Nutraceuticals: Introduction, History of Food and Nutraceutical Regulations, Meaning of Nutraceuticals, Dietary Supplements, Functional Foods, Medical Foods, Scope and Opportunities in Nutraceutical Market.** 12 Hrs
2. **Global Aspects: WHO guidelines on nutrition, NSF International's Role in the Dietary Supplements and Nutraceuticals Industries, NSF Certification, NSF Standards for Food And Dietary Supplements, Good Manufacturing Practices for Nutraceuticals.** 12 Hrs
3. **India: Food Safety and Standards Act, Food Safety and Standards Authority of India, Organization and Functions, Regulations for import, manufacture and sale of nutraceutical products in India, Recommended Dietary Allowances (RDA) in India.** 12 Hrs
4. **USA: US FDA Food Safety Modernization Act, Dietary Supplements Health and Education Act, U.S. regulations for manufacture and sale of nutraceuticals and dietary supplements, Labeling Requirements and Label Claims for Dietary Supplements, Recommended Dietary Allowances (RDA) in the US.** 12 Hrs

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REGULATORY AFFAIRS PRACTICAL - II
(MRA 2013P)

1. Case studies on
2. Change Management (Change control, Deviations
3. Corrective & Preventive Actions (CAPA)
4. Documentation of raw materials analysis as per official monographs
5. Preparation of audit checklists for various agencies
6. Preparation of submission to FDA using eCTD software
7. Preparation of submission to EMA using eCTD software
8. Preparation of submission to MHRA using eCTD software
9. Preparation of Biologics License Applications (BLA)
10. Preparation of documents required for Vaccine Product Approval
11. Comparison of clinical trial application requirements of US, EU and India of Biologics
12. Preparation of Checklist for Registration of Blood and Blood Products
13. Registration requirement comparison study in 5 emerging markets (WHICH) and preparing check list for market authorization
14. Registration requirement comparison study in emerging markets (BRICS) and preparing check list for market authorization
15. Registration requirement comparison study in emerging markets (China and South Korea) and preparing check list for market authorization
16. Registration requirement comparison study in emerging markets (ASIAN) and preparing check list for market authorization
17. Registration requirement comparison study in emerging markets (GCC) and preparing check list for market authorization
18. Checklists for 510k and PMA for US market
19. Checklist for CE marking for various classes of devices for EU
20. STED Application for Class III Devices
21. Audit Checklists for Medical Device Facility
22. Clinical Investigation Plan for Medical Devices

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Pharmacognosy and Phytochemistry I Theory

BP 405 T.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)

45 Hours

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

Objectives: Upon completion of the course, the student shall be able

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

Course Content:

UNIT-I Introduction to Pharmacognosy: 10 Hours

- (a) Definition, history, scope and development of Pharmacognosy
(b) Sources of Drugs – Plants, Animals, Marine & Tissue culture
(c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo-gum-resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

UNIT-II Cultivation, Collection, Processing and storage of drugs of natural origin: 10 Hours

Cultivation and Collection of drugs of natural origin
Factors influencing cultivation of medicinal plants.
Plant hormones and their applications.
Polyploidy, mutation and hybridization with reference to medicinal plants

Conservation of medicinal plants

UNIT-III Plant tissue culture: 07 Hours

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.
Applications of plant tissue culture in pharmacognosy.
Edible vaccines

Pharmacognosy and Phytochemistry I – Practical

BP408 P. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)

4 Hours/Week

1. Analysis of crude drugs by chemical tests: (i) Tragacanth (ii) Acacia (iii) Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and palisade ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, 11nd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

Pharmacognosy and Phytochemistry II theory

b) study of utilization of radioactive isotopes in the investigation of biogenetic studies.

UNIT-II General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites: Alkaloids: Vinca, Rauwolfia, Belladonna, Opium, Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander, Tannins: Catechu, Pterocarpus Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony Glycosides: Senna, Aloes, Bitter Almond Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids	14 Hours
UNIT-III Isolation, Identification and Analysis of Phytoconstituents a) Terpenoids: Menthol, Citral, Artemisin b) Glycosides: Glycyrrhizinic acid & Rutin c) Alkaloids: Atropine, Quinine, Reserpine, Caffeine d) Resins: Podophyllotoxin, Curcumin	06 Hours
UNIT-IV Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine	10 Hours
UNIT V Basics of Phytochemistry Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.	8 Hours

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Pharmacognosy and Phytochemistry II Practical

BP 508 P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical) 4 Hours/Week
<ol style="list-style-type: none">Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and CorianderExercise involving isolation & detection of active principles<ol style="list-style-type: none">Caffeine - from tea dust.Diosgenin from DioscoreaAtropine from BelladonnaSennosides from SennaSeparation of sugars by Paper chromatographyTLC of herbal extractDistillation of volatile oils and detection of phytoconstituents by TLCAnalysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh
Recommended Books: (Latest Editions) <ol style="list-style-type: none">W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th Edition, Nirali Prakashan, New Delhi.Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi.Essentials of Pharmacognosy, Dr.SH.Ansari, 11nd edition, Birla publications, New Delhi, 2007Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.The formulation and preparation of cosmetic, fragrances and flavours.Remington's Pharmaceutical sciences.Text Book of Biotechnology by Vyas and Dixit.Text Book of Biotechnology by R.C. Dubey.

Herbal Drug technology Theory

UNIT-II Nutraceuticals General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases. Study of following herbs as health food: Alfalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina	7 Hours
Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions; Hypericum, kava-kava, Ginkgobiloba, Ginseng, Garlic, Pepper & Ephedra.	
UNIT-III Herbal Cosmetics	10 Hours

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Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:
Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations :
Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT-IV **10 Hours**
Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs
Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products:
a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy
b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of

Herbal Drug technology Practical

BP 609 P. HERBAL DRUG TECHNOLOGY (Practical)

4 hours/ week

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

Advanced Pharmacognosy I

ADVANCED PHARMACOGENOSY - I (MPG 102T)	
<p>SCOPE To learn and understand the advances in the field of cultivation and isolation of drugs of natural origin, various phytopharmaceuticals, nutraceuticals and their medicinal use and health benefits.</p> <p>OBJECTIVES Upon completion of the course, the student shall be able to know the,</p> <ul style="list-style-type: none"> advances in the cultivation and production of drugs various phyto-pharmaceuticals and their source, its utilization and medicinal value. various nutraceuticals herbs and their health benefits Drugs of marine origin Pharmacovigilance of drugs of natural origin 	
<p>THEORY 60 Hrs</p>	
1.	<p>Plant drug cultivation: General introduction to the importance of Pharmacognosy in herbal drug industry, Indian Council of Agricultural Research, Current Good Agricultural Practices, Current Good Cultivation Practices, Current Good Collection Practices, Conservation of medicinal plants- Ex-situ and In-situ conservation of medicinal plants. 12 Hrs</p>
2.	<p>Marine natural products: General methods of isolation and purification, Study of Marine toxins, Recent advances in research in marine drugs, Problems faced in research on marine drugs such as taxonomical identification, chemical screening and their solution. 12 Hrs</p>
3.	<p>Nutraceuticals: Current trends and future scope, Inorganic mineral supplements, Vitamin supplements, Digestive enzymes, Dietary fibres, Cereals and grains, Health drinks of natural origin, Antioxidants, Polyunsaturated fatty acids, Herbs as functional foods, Formulation and standardization of nutraceuticals, Regulatory aspects, FSSAI guidelines, Sources, name of marker compounds and their chemical nature, medicinal uses and health benefits of following 12 Hrs</p>
4.	<p>Phytopharmaceuticals: Occurrence, isolation and characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of following. 12 Hrs</p> <ol style="list-style-type: none"> Carotenoids - i) α and β- Carotene ii) Xanthophyll (Lutein) Limonoids - i) d-Limonene ii) α - Terpineol Saponins - i) Shatavarins Flavonoids - i) Resveratrol ii) Rutin iii) Hesperidin iv) Naringin v) Quercetin Phenolic acids- Ellagic acid Vitamins Tocotrienols and Tocopherols Andrographolide, Glycolipids, Guggulipids, Withanolides, Vascine, Taxol Miscellaneous
5.	<p>Pharmacovigilance of drugs of natural origin: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for biodrug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples. 12 Hrs</p>
<p>REFERENCES (Latest Editions of)</p> <ol style="list-style-type: none"> Pharmacognosy - G. F. Trease and W.C. Evans. Saunders Edinburgh, New York. Pharmacognosy-Tyler, Brady, Robbers Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II Text Book of Pharmacognosy by T.E. Wallis Marine Natural Products-Vol.I to IV. Natural products: A lab guide by Raphael Ikan, Academic Press 1991. Glimpses of Indian Ethano Pharmacology, P. Pushpangadam, Ulf Nyman. V.George Tropical Botanic Garden & Research Institute, 1995. Medicinal natural products (a biosynthetic approach), Paul M. Dewick, John Wiley & Sons Ltd., England, 1998. Chemistry of Marine Natural Products- Paul J. Schewer 1973. 	

Phytochemistry

PHYTOCHEMISTRY (MPG 103T)	
<p>SCOPE Students shall be equipped with the knowledge of natural product drug discovery and will be able to isolate, identify and extract and the phyto-constituents</p> <p>OBJECTIVES Upon completion of the course, the student shall be able to know the,</p> <ul style="list-style-type: none"> different classes of phytoconstituents, their biosynthetic pathways, their properties, extraction and general process of natural product drug discovery phytochemical fingerprinting and structure elucidation of phytoconstituents. 	
<p>THEORY 60 Hrs</p>	
1.	<p>Biosynthetic pathways and Radio tracing techniques: Constituents & their Biosynthesis, Isolation, Characterization and purification with a special reference to their importance in herbal industries of following phyto-pharmaceuticals containing drugs: 12 Hrs</p> <ol style="list-style-type: none"> Alkaloids: Ephedrine, Quinine, Strychnine, Pterine, Berberine, Taxol, Vinca alkaloids. Glycosides: Digitoxin, Glycyrrhizin, Sennosides, Bacosides, Quercetin. Steroids: Hecogenin, guggulosterone and withanolides Coumarin: Umbelliferone. Terpenoids: Cucurbitacins
2.	<p>Drug discovery and development: History of herbs as source of drugs and drug discovery, the lead structure selection process, structure development, product discovery process and drug registration, Selection and optimization of lead compounds with suitable examples from the following source : artemisin, andrographolides. Clinical studies emphasising on phases of clinical trials, protocol design for lead molecules. 12 Hrs</p>
3.	<p>Extraction and Phytochemical studies: Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave 12 Hrs</p>
<p>assisted extraction, Methods of fractionation. Separation of phytoconstituents by latest CCCET, SCFE techniques including preparative HPLC and Flash column chromatography.</p>	
4.	<p>Phytochemical finger printing: HPTLC and LCMS/GCMS applications in the characterization of herbal extracts. Structure elucidation of phytoconstituents. 12 Hrs</p>
5.	<p>Structure elucidation of the following compounds by spectroscopic techniques like UV, IR, MS, NMR (1H, 13C) 12 Hrs</p> <ol style="list-style-type: none"> Carvone, Citral, Menthol Luteolin, Kaempferol Nicotine, Caffeine iv) Glycyrrhizin.
<p>REFERENCES (Latest Editions of)</p> <ol style="list-style-type: none"> Organic chemistry by I.L. Finar Vol.II Pharmacognosy by Trease and Evans, ELBS. Pharmacognosy by Tylor and Brady. Text book of Pharmacognosy by Wallis. Clark's isolation and Identification of drugs by A.C. Mottal. Plant Drug Analysis by Wagner & Bladt. Wilson and Gisvolds text book of Organic Medicinal and Pharmaceutical Chemistry by Deorge. R.F. The Chemistry of Natural Products, Edited by R.H. Thomson, Springer International Edn. 1994. Natural Products Chemistry Practical Manual by Anees A Siddiqui and SeemiSiddiqui Organic Chemistry of Natural Products, Vol. 1&2. Gurdeep R Chatwal. Chemistry of Natural Products- Vol. 1 onwards IWPAAC. Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II Medicinal Natural products - a biosynthetic approach, Dewick PM, John Wiley & Sons, Toronto, 1998. Chemistry of Natural Products, Bhat SV, Nagasampagi BA, Meenakshi S, Narosa Publishing House, New Delhi. 	

Quality Control and Standardization of Herbals – Theory

BP 806 ET. QUALITY CONTROL AND STANDARDIZATION OF HERBALS (Theory)

Scope: In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

Objectives: Upon completion of the subject student shall be able to;

1. know WHO guidelines for quality control of herbal drugs
2. know Quality assurance in herbal drug industry
3. know the regulatory approval process and their registration in Indian and international markets
4. appreciate EU and ICH guidelines for quality control of herbal drugs

Unit I **10 hours**

Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms

WHO guidelines for quality control of herbal drugs.

Evaluation of commercial crude drugs intended for use

Unit II **10 hours**

Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine.

WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines

WHO Guidelines on GACP for Medicinal Plants.

Unit III **10 hours**

EU and ICH guidelines for quality control of herbal drugs.

Research Guidelines for Evaluating the **Safety and Efficacy of Herbal Medicines**

Unit IV **08 hours**

Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products.

Preparation of documents for new drug application and export registration

GMP requirements and Drugs & Cosmetics Act provisions.

Industrial Pharmacognostical Technology

INDUSTRIAL PHARMACOGNOSTICAL TECHNOLOGY (MPG 104T)

SCOPE

To understand the Industrial and commercial potential of drugs of natural origin, integrate traditional Indian systems of medicine with modern medicine and also to know regulatory and quality policy for the trade of herbals and drugs of natural origin.

OBJECTIVES

- By the end of the course the student shall be able to know,
- the requirements for setting up the herbal/natural drug industry.
 - the guidelines for quality of herbal/natural medicines and regulatory issues.
 - the patenting/IPR of herbals/natural drugs and trade of raw and finished materials.

THEORY

60 Hrs

1. **Herbal drug industry:** Infrastructure of herbal drug industry 12 Hrs
Involved in production of standardized extracts and various dosage forms. Current challenges in upgrading and modernization of herbal formulations. Entrepreneurship Development, Project selection, project report, technical knowledge, Capital venture, plant design, layout and construction. Pilot plant scale -up techniques, case studies of herbal extracts. Formulation and production management of herbals.
2. **Regulatory requirements for setting herbal drug industry:** 12 Hrs
Global marketing management. Indian and international patent law as applicable herbal drugs and natural products. Export - Import (EXIM) policy, TRIPS. Quality assurance in herbal/natural drug products. Concepts of TQM, GMP, GLP, ISO-9000.
3. **Monographs of herbal drugs:** General parameters of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic Pharmacopoeia, Siddha and Unani Pharmacopoeia, American herbal pharmacopoeia, British herbal pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.

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4. **Testing of natural products and drugs:** Herbal medicines - 12 Hrs
clinical laboratory testing. Stability testing of natural products, protocols.

5. **Patents:** Indian and International patent laws, proposed 12 Hrs
amendments as applicable to herbal/natural products and process. Geographical indication, Copyright, Patentable subject matters, novelty, non obviousness, utility, enablement and best mode, procedure for Indian patent filing, patent processing, grant of patents, rights of patents, cases of patents, opposition and revocation of patents, patent search and literature, Controllers of patents.

REFERENCES (Latest Editions of)

1. Herbal drug industry by R.D. Choudhary (1996), Eastern Publisher, New Delhi.
2. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), 1st Edition, Business horizons Robert Verpoorte, New Delhi.
3. Quality control of herbal drugs by Pulok K Mukharjee (2002), Business Horizons Pharmaceutical Publisher, New Delhi.
4. PDR for Herbal Medicines (2000), Medicinal Economic Company, New Jersey.
5. Indian Herbal Pharmacopoeia (2002), IDMA, Mumbai.
6. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (1996), Nirali Prakashan, New Delhi.
7. Text book of Pharmacognosy and Phytochemistry by Vinod D. Rangari (2002), Part I & II, Career Publication, Nasik, India.
8. Plant drug analysis by H.Wagner and S.Biadt, Springer, Berlin.
9. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol.1, Eastern Publisher, New Delhi.
10. Phytochemical Dictionary. Handbook of Bioactive Compounds from Plants by J.B.Harborne, (1999), 11nd Edition, Taylor and Francis Ltd, UK.
11. Herbal Medicine. Expanded Commission E Monographs by M.Blumenthal, (2004), 1ST Edition.
12. Drug Formulation Manual by D.P.S.Kohli and D.H.Shah (1998), Eastern Publisher, New Delhi.

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Pharmacognosy Practical I

PHARMACOGNOSY PRACTICAL - I (MPG I05P)

1. Analysis of Pharmacopoeial compounds of natural origin and their formulations by UV Vis spectrophotometer
2. Analysis of recorded spectra of simple phytoconstituents
3. Experiments based on Gas Chromatography
4. Estimation of sodium/potassium by flame photometry
5. Development of fingerprint of selected medicinal plant extracts commonly used in herbal drug industry viz. Ashwagandha, Tulsi, Bael, Amla, Ginger, Aloe, Vidang, Senna, Lawsonia by TLC/HPTLC method.
6. Methods of extraction
7. Phytochemical screening
8. Demonstration of HPLC- estimation of glycerrhizin
9. Monograph analysis of clove oil
10. Monograph analysis of castor oil.
11. Identification of bioactive constituents from plant extracts
12. Formulation of different dosage forms and their standardisation.

Medicinal Plant biotechnology

MEDICINAL PLANT BIOTECHNOLOGY
(MPG 201T)

SCOPE

To explore the knowledge of Biotechnology and its application in the improvement of quality of medicinal plants

OBJECTIVES

Upon completion of the course, the student shall be able to,

- Know the process like genetic engineering in medicinal plants for higher yield of Phytopharmaceuticals.
- Use the biotechnological techniques for obtaining and improving the quality of natural products/medicinal plants

THEORY

60 Hrs

1. Introduction to Plant biotechnology: Historical perspectives, 12 prospects for development of plant biotechnology as a source of medicinal agents. Applications in pharmacy and allied fields. Genetic and molecular biology as applied to pharmacognosy, study of DNA, RNA and protein replication, genetic code, regulation of gene expression, structure and complicity of genome, cell signaling, DNA recombinant technology. Hrs
2. Different tissue culture techniques: Organogenesis and embryogenesis, synthetic seed and monoclonal variation, Protoplast fusion, Hairy root multiple shoot cultures and their applications. Micro propagation of medicinal and aromatic plants. Sterilization methods involved in tissue culture, gene transfer in plants and their applications. 15 Hrs
3. Immobilisation techniques & Secondary Metabolite Production: Immobilization techniques of plant cell and its application on secondary metabolite Production. Cloning of plant cell: Different methods of cloning and its applications. Advantages and disadvantages of plant cell cloning. Secondary metabolism in tissue cultures with emphasis on production of medicinal agents. Precursors and elicitors on production of secondary metabolites. 15 Hrs
4. Biotransformation and Transgenesis: Biotransformation, bioreactors for pilot and large scale cultures of plant cells and retention of biosynthetic potential in cell culture. Transgenic 13 Hrs

Advanced Pharmacognosy-II

ADVANCED PHARMACOGNOSY - II (MPG 202T)	
SCOPE	
To know and understand the Adulteration and Deterioration that occurs in herbal/natural drugs and methods of detection of the same. Study of herbal remedies and their validations, including methods of screening	
OBJECTIVES	
Upon completion of the course, the student shall be able to know the,	
<ul style="list-style-type: none"> • validation of herbal remedies • methods of detection of adulteration and evaluation techniques for the herbal drugs • methods of screening of herbals for various biological properties 	
THEORY 60 Hrs	
1. Herbal remedies – Toxicity and Regulations: Herbals vs Conventional drugs, Efficacy of Herbal medicine products, Validation of herbal therapies, Pharmacodynamic and Pharmacokinetic issues.	12 Hrs
2. Adulteration and Deterioration: Introduction, Types of Adulteration: Substitution of Herbal drugs, Causes and Measures of Adulteration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, detection of heavy metals, pesticide residues, phytotoxin, microbial contamination in herbs and their formulations.	12 Hrs
3. Ethnobotany and Ethnopharmacology: Ethnobotany in herbal drug evaluation, Impact of Ethnobotany in traditional medicine, New development in herbals, Bio-prospecting tools for drug discovery, Role of Ethnopharmacology in drug evaluation, Reverse Pharmacology.	12 Hrs
4. Analytical Profiles of herbal drugs: Andrographis paniculata, Boswellia serata, Coleus forskholii, Curcuma longa, Embelica officinalis, Psoralea corylifolia.	12 Hrs
5. Biological screening of herbal drugs: Introduction and Need for Phyto-Pharmacological Screening, New Strategies for evaluating	12 Hrs
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Indian system of medicine

a) Naturopathy - Introduction, basic principles and treatment modalities.	12 Hrs
b) Yoga - Introduction and Streams of Yoga. Asanas, Pranayama, Meditations and Relaxation techniques.	
c) Aromatherapy – Introduction, aroma oils for common problems, carrier oils.	
3. Formulation development of various systems of medicine	12 Hrs
Salient features of the techniques of preparation of some of the important class of Formulations as per Ayurveda, Siddha, Homeopathy and Unani Pharmacopoeia and texts. Standardization, Shelf life and Stability studies of ISM formulations.	
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4. Schedule T - Good Manufacturing Practice of Indian systems of medicine	12 Hrs
Components of GMP (Schedule - T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records. Quality assurance in ISM formulation industry - GAP, GMP and GLP. Preparation of documents for new drug application and export registration. Challenges in monitoring the safety of herbal medicines; Regulation, quality assurance and control, National/Regional Pharmacopoeias.	
5. TKDL, Geographical indication Bill, Government bills in AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU	12 Hrs

Herbal Cosmetics

HERBAL COSMETICS (MPG 204T)

SCOPE

This subject deals with the study of preparation and standardization of herbal/natural cosmetics. This subject gives emphasis to various national and international standards prescribed regarding herbal cosmeceuticals.

OBJECTIVES

After completion of the course, student shall be able to,

- understand the basic principles of various herbal/natural cosmetic preparations
- current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities

THEORY

60 Hrs

1. Introduction: Herbal/natural cosmetics, Classification & Economic aspects. 12 Hrs
Regulatory Provisions relation to manufacture of cosmetics: - License, GMP, offences & Penalties, Import & Export of Herbal/natural cosmetics, Industries involved in the production of Herbal/natural cosmetics.
2. Commonly used herbal cosmetics, raw materials, preservatives, surfactants, humectants, oils, colors, and some functional herbs, preformulation studies, compatibility studies, possible interactions between chemicals and herbs, design of herbal cosmetic formulation. 12 Hrs
3. Herbal Cosmetics : Physiology and chemistry of skin and pigmentation, hairs, scalp, lips and nail, Cleansing cream, Lotions, Face powders, Face packs, Lipsticks, Bath products, soaps and baby product. Preparation and standardisation of the following : Tonic, Bleaches, Dentifrices and Mouth washes & Tooth Pastes, Cosmetics for Nails. 12 Hrs
4. Cosmeceuticals of herbal and natural origin: Hair growth formulations, Shampoos, Conditioners, Colorants & hair oils, Fairness formulations, vanishing & foundation creams, anti-sun burn preparations, moisturizing creams, deodorants. 12 Hrs

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Herbal cosmetics Practical

HERBAL COSMETICS PRACTICALS (MPG 205P)

1. Isolation of nucleic acid from cauliflower heads
2. Isolation of RNA from yeast
3. Quantitative estimation of DNA
4. Immobilization technique
5. Establishment of callus culture
6. Establishment of suspension culture
7. Estimation of aldehyde contents of volatile oils
8. Estimation of total phenolic content in herbal raw materials
9. Estimation of total alkaloid content in herbal raw materials
10. Estimation of total flavonoid content in herbal raw materials
11. Preparation and standardization of various simple dosage forms from Ayurvedic, Siddha, Homoeopathy and Unani formulary
12. Preparation of certain Aromatherapy formulations
13. Preparation of herbal cosmetic formulation such as lip balm, lipstick, facial cream, herbal hair and nail care products
14. Evaluation of herbal tablets and capsules
15. Preparation of sunscreen, UV protection cream, skin care formulations.
16. Formulation & standardization of herbal cough syrup.

Pharm D

Pharmacognosy & Phytopharmaceuticals

2.3 PHARMACOGNOSY & PHYTOPHARMACEUTICALS (PRACTICAL)

Practical : 3 Hrs./Week

General Requirements: Laboratory Napkin, Observation Book 150 pages Zero brush, Needle, Blade, Match box.

List of experiments:

- 1 Introduction of Pharmacognosy laboratory and experiments.
 - 2 Study of cell wall constituents and cell inclusions.
 - 3 Macro, powder and microscopic study of Datura.
 - 4 Macro, powder and microscopic study of Senna.
 - 5 Macro, powder and microscopic study of Cassia.cinnamon.
 - 6 Macro, powder and microscopic study of Cinchona.
 - 7 Macro, powder and microscopic study of Ephedra.
 - 8 Macro, powder and microscopic study of Quassia.
 - 9 Macro, powder and microscopic study of Clove
 - 10 Macro, powder and microscopic study of Fennel.
 - 11 Macro, powder and microscopic study of Coriander.
 - 12 Macro, powder and microscopic study of Isapgol.
 - 13 Macro, powder and microscopic study of Nux vomica.
 - 14 Macro, powder and microscopic study of Rauwolfia.
 - 15 Macro, powder and microscopic study of Liquorice.
 - 16 Macro, powder and microscopic study of Ginger.
 - 17 Macro, powder and microscopic study of Podophyllum.
 - 18 Determination of Iodine value.
 - 19 Determination of Saponification value and unsaponifiable matter.
 - 20 Determination of ester value.
 - 21 Determination of Acid value.
 - 22 Chemical tests for Acacia.
 - 23 Chemical tests for Tragacanth.
 - 24 Chemical tests for Agar.
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Computer Applications in Pharmacy – Theory

BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hrs (2 Hrs/Week)

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Objectives: Upon completion of the course the student shall be able to

1. know the various types of application of computers in pharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

Course content:

UNIT – I 06 hours

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division

Concept of Information Systems and Software : Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

UNIT –II 06 hours

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products
Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

UNIT – III 06 hours

Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

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UNIT – IV 06 hours

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V 06 hours

Computers as data analysis in Preclinical development:
Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMMS)

Computer Applications in Pharmacy – Practical

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Recommended books (Latest edition):

1. Computer Application in Pharmacy – William E Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES

PHARMACEUTICAL QUALITY ASSURANCE (MQA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MQA 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about chemicals and excipients

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY

60 Hrs

1. a. **UV-Visible spectroscopy:** Introduction, Theory, Laws, 12 Hrs
Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy.
b. **IR spectroscopy:** Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.
c. **Spectrofluorimetry:** Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.
d. **Flame emission spectroscopy and Atomic absorption spectroscopy:** Principle, Instrumentation, Interferences and Applications.
2. **NMR spectroscopy:** Quantum numbers and their role in NMR, 12 Hrs
Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³C NMR. Applications of NMR spectroscopy.

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|---|---|-----------|
| 3 | <p>Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.</p> | 12
Hrs |
| 4 | <p>Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following:</p> <ul style="list-style-type: none"> • Thin Layer chromatography • High Performance Thin Layer Chromatography • Ion exchange chromatography • Column chromatography • Gas chromatography • High Performance Liquid chromatography • Ultra High Performance Liquid chromatography • Affinity chromatography • Gel Chromatography | 12
Hrs |
| 5 | <p>a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following:</p> <p>a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing</p> <p>b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.</p> | 12
Hrs |
| 6 | <p>a. Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry.</p> <p>b. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation</p> | 12
Hrs |

Quality Management System

QUALITY MANAGEMENT SYSTEMS (MQA 102T)

Scope

This course is designed to impart fundamental knowledge and concepts about various quality management principles and systems utilized in the manufacturing industry. It also aids in understanding the quality evaluation in the pharmaceutical industries.

Objectives

At completion of this course it is expected that students will be able to understand-

- The importance of quality
- ISO management systems
- Tools for quality improvement
- Analysis of issues in quality
- Quality evaluation of pharmaceuticals
- Stability testing of drug and drug substances
- Statistical approaches for quality

THEORY

60 Hrs

1. Introduction to Quality: Evolution of Quality, Definition of Quality, Dimensions of Quality 12 Hrs
Quality as a Strategic Decision: Meaning of strategy and strategic quality management, mission and vision statements, quality policy, Quality objectives, strategic planning and implementation, McKinsey 7s model, Competitive analysis, Management commitment to quality
Customer Focus: Meaning of customer and customer focus, Classification of customers, Customer focus, Customer perception of quality, Factors affecting customer perception, Customer requirements, Meeting customer needs and expectations, Customer satisfaction and Customer delight, Handling customer complaints, Understanding customer behavior, concept of internal and external customers. Case studies.
Cost of Quality: Cost of quality, Categories of cost of Quality, Models of cost of quality, Optimising costs, Preventing cost of quality.

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| 2 | Pharmaceutical quality Management: Basics of Quality Management, Total Quality Management (TQM), Principles of Six sigma, ISO 9001:2008, 9001:2015, ISO 14001:2004, Pharmaceutical Quality Management - ICH Q10, Knowledge management, Quality Metrics, Operational Excellence and Quality Management Review. OSHAS guidelines, NABL certification and accreditation, CFR-21 part 11, WHO-GMP requirements. | 12
Hrs |
| 3 | Six System Inspection model: Quality Management system, Production system, Facility and Equipment system, Laboratory control system, Materials system, Packaging and labeling system. Concept of self inspection. Quality systems: Change Management/ Change control. Deviations, Out of Specifications (OOS), Out of Trend (OOT), Complaints - evaluation and handling, Investigation and determination of root cause, Corrective & Preventive Actions (CAPA), Returns and Recalls, Vendor Qualification, Annual Product Reviews, Batch Review and Batch Release. Concept of IPQC, area clearance/ Line clearance. | 12
Hrs |
| 4 | Drug Stability: ICH guidelines for stability testing of drug substances and drug products. Study of ICH Q8, Quality by Design and Process development report Quality risk management: Introduction, risk assessment, risk control, risk review, risk management tools, HACCP, risk ranking and filtering according to ICH Q9 guidelines. | 12
Hrs |
| 5 | Statistical Process control (SPC): Definition and Importance of SPC, Quality measurement in manufacturing, Statistical control charts - concepts and general aspects, Advantages of statistical control, Process capability, Estimating Inherent or potential capability from a control chart analysis, Measuring process control and quality improvement, Pursuit of decreased process variability. | 8 Hrs |
| 6 | Regulatory Compliance through Quality Management and development of Quality Culture Benchmarking: Definition of benchmarking, Reasons for benchmarking, Types of Benchmarking, Benchmarking process, Advantages of benchmarking, Limitations of benchmarking. | 4 Hrs |

Quality Control and Quality Assurance

QUALITY CONTROL AND QUALITY ASSURANCE (MQA 103T)

Scope

This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications, GLP and regulatory affairs.

Objectives

Upon completion of this course the student should be able to

- Understand the cGMP aspects in a pharmaceutical industry
- To appreciate the importance of documentation
- To understand the scope of quality certifications applicable to Pharmaceutical industries
- To understand the responsibilities of QA & QC departments.

THEORY

60 Hrs

1. Introduction: Concept and evolution and scopes of Quality Control and Quality Assurance, Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q-series guidelines. 12 Hrs
Good Laboratory Practices: Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non clinical testing, control on animal house, report preparation and documentation. CPCSEA guidelines.
2. cGMP guidelines according to schedule M, USFDA (inclusive of CDER and CBER) Pharmaceutical Inspection Convention(PIC), WHO and EMEA covering: Organization and personnel responsibilities, training, hygiene and personal records, drug industry location, design, construction and plant lay out, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination and Good Warehousing Practice. 12 Hrs
3. Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), Developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials. 12 Hrs

In process quality control and finished products quality control for following dosage forms in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenterals, ophthalmic and surgical products (How to refer pharmacopoeias).

- 4 Documentation in pharmaceutical industry: Three tier 12 Hrs
documentation, Policy, Procedures and Work instructions, and records (Formats), Basic principles- How to maintain, retention and retrieval etc. Standard operating procedures (How to write), Master Batch Record, Batch Manufacturing Record, Quality audit plan and reports. Specification and test procedures, Protocols and reports. Distribution records. Electronic data handling. Concepts of controlled and uncontrolled documents.
Submission documents for regulators DMFs, as Common Technical Document and Electronic Common Technical Documentation (CTD, eCTD). Concept of regulated and non regulated markets.
- 5 Manufacturing operations and controls: Sanitation of 12 Hrs
manufacturing premises, mix-ups and cross contamination, processing of intermediates and bulk products, packaging operations, IPQC, release of finished product, process deviations, charge-in of components, time limitations on production, drug product inspection, expiry date calculation, calculation of yields, production record review, change control, sterile products, aseptic process control, packaging, reprocessing, salvaging, handling of waste and scrap disposal.
Introduction, scope and importance of intellectual property rights. Concept of trade mark, copyright and patents.]

REFERENCES

1. Quality Assurance Guide by organization of Pharmaceutical Procedures of India, 3rd revised edition, Volume I & II, Mumbai, 1996.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
3. Quality Assurance of Pharmaceuticals- A compedium of Guide lines and Related materials Vol I & II, 2nd edition, WHO Publications, 1999.
4. How to Practice GMP's - P P Sharma, Vandana Publications, Agra, 1991.

**PRODUCT DEVELOPMENT AND TECHNOLOGY TRANSFER
(MQA 104T)**

Scope

This deal with technology transfer covers the activities associated with Drug Substance, Drug Product and analytical tests and methods, required following candidate drug selection to completion of technology transfer from R&D to the first receiving site and technology transfer related to post-marketing changes in manufacturing places.

Objectives

Upon completion of this course the student should be able to

- To understand the new product development process
- To understand the necessary information to transfer technology from R&D to actual manufacturing by sorting out various information obtained during R&D
- To elucidate necessary information to transfer technology of existing products between various manufacturing places

THEORY

60 Hrs

1. Principles of Drug discovery and development: Introduction, Clinical research process. Development and informational content for Investigational New Drugs: Application (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Supplemental New Drug Application (SNDA), Scale Up Post Approval Changes (SUPAC) and Bulk active chemical Post approval changes (BACPAC), Post marketing surveillance, Product registration guidelines - CDSCO, USFDA. 12 Hrs
2. Pre-formulation studies: Introduction/concept, organoleptic properties, purity, impurity profiles, particle size, shape and surface area. Solubility, Methods to improve solubility of Drugs: Surfactants & its importance, co-solvency. Techniques for the study of Crystal properties and polymorphism. Pre-formulation protocol, Stability testing during product development. 12 Hrs
3. Pilot plant scale up: Concept, Significance, design, layout of pilot plant scale up study, operations, large scale manufacturing techniques (formula, equipment, process, stability and quality control) of solids, liquids, semisolid and parenteral dosage forms. New era of drug products: opportunities and challenges. 12 Hrs

- 4 **Pharmaceutical packaging:** Pharmaceutical dosage form and their packaging requirements, Pharmaceutical packaging materials, Medical device packaging, Enteral Packaging, Aseptic packaging systems, Container closure systems, Issues facing modern drug packaging, Selection and evaluation of Pharmaceutical packaging materials. 12 Hrs
 Quality control test: Containers, closures and secondary packing materials.
- 5 **Technology transfer:** Development of technology by R & D, Technology transfer from R & D to production, Optimization and Production, Qualitative and quantitative technology models. 12 Hrs
 Documentation in technology transfer: Development report, technology transfer plan and Exhibit.

REFERENCES

1. The process of new drug discovery and development. I and II Edition (2006) by Charles G. Smith, James T and O. Donnell. CRC Press, Group of Taylor and Francis.
2. Leon Lac Lachman, Herbert A. Liberman, Theory and Practice of Industrial Pharmacy. Marcel Dekker Inc. New York.
3. Sidney H Willing, Murray M. Tuckerman. Williams Hitchings IV, Good manufacturing of pharmaceuticals (A Plan for total quality control) 3rd Edition. Bhalani publishing house Mumbai.
4. Tablets Vol. I, II, III by Leon Lachman, Herbert A. Liberman, Joseph B. Schwartz, 2nd Edn. (1989) Marcel Dekker Inc. New York.
5. Text book of Bio-Pharmaceutics and clinical Pharmacokinetics by Milo Gibaldi, 3rd Edn, Lea & Febriger, Philadelphia.
6. Pharmaceutical product development. Vandana V. Patrevala. John I. Disouza. Maharukh T.Rustomji. CRC Press, Group of Taylor and Francis.
7. Dissolution, Bioavailability and Bio-Equivalence by Abdou H.M. Mack Publishing company, Eastern Pennsylvania.
8. Remingtons Pharmaceutical Sciences, by Alfonso & Gennaro, 19th Edn.(1995)OO2C Lippincott; Williams and Wilkins A Wolters Kluwer Company, Philadelphia.
9. The Pharmaceutical Sciences; the Pharma Path way 'Pure and applied Pharmacy' by D. A Sawant, Pragathi Books Pvt. Ltd.
10. Pharmaceutical Packaging technology by D.A. Dean. E.R. Evans, I.H. Hall. 1st Edition(Reprint 2006). Taylor and Francis. London and New York.

Quality Assurance Practical I

QUALITY ASSURANCE PRACTICAL - I (MQA 105P)

PRACTICALS

1. Analysis of Pharmacopoeial compounds in bulk and in their formulations (tablet/ capsules/ semisolids) by UV Vis spectrophotometer
2. Simultaneous estimation of multi-drug component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry or AAS
7. Case studies on
 - Total Quality Management
 - Six Sigma
 - Change Management/ Change control. Deviations,
 - Out of Specifications (OOS)
 - Out of Trend (OOT)
 - Corrective & Preventive Actions (CAPA)
 - Deviations
8. Development of Stability study protocol
9. Estimation of process capability
10. In process and finished product quality control tests for tablets, capsules, parenterals and semisolid dosage forms.
11. Assay of raw materials as per official monographs
12. Testing of related and foreign substances in drugs and raw materials
13. To carry out pre formulation study for tablets, parenterals (2 experiment).
14. To study the effect of pH on the solubility of drugs, (1 experiment)
15. Quality control tests for Primary and secondary packaging materials
16. Accelerated stability studies (1 experiment)
17. Improved solubility of drugs using surfactant systems (1 experiment)
18. Improved solubility of drugs using co-solvency method (1 experiment)
19. Determination of Pka and Log p of drugs.

HAZARDS AND SAFETY MANAGEMENT

HAZARDS AND SAFETY MANAGEMENT (MQA 201T)

Scope

This course is designed to convey the knowledge necessary to understand issues related to different kinds of hazard and their management. Basic theoretical and practical discussions integrate the proficiency to handle the emergency situation in the pharmaceutical product development process and provides the principle based approach to solve the complex tribulations.

Objectives

- At completion of this course it is expected that students will be able to
- Understand about environmental problems among learners.
 - Impart basic knowledge about the environment and its allied problems.
 - Develop an attitude of concern for the industry environment.
 - Ensure safety standards in pharmaceutical industry
 - Provide comprehensive knowledge on the safety management
 - Empower an ideas to clear mechanism and management in different kinds of hazard management system
 - Teach the method of Hazard assessment, procedure, methodology for provide safe industrial atmosphere.

THEORY

60Hrs

1. Multidisciplinary nature of environmental studies: Natural Resources, Renewable and non-renewable resources, Natural resources and associated problems, a) Forest resources; b) Water resources; c) Mineral resources; d) Energy resources; e) Land resources
Ecosystems: Concept of an ecosystem and Structure and function of an ecosystem. Environmental hazards: Hazards based on Air, Water, Soil and Radioisotopes. 12 Hrs
2. Air based hazards: Sources, Types of Hazards, Air circulation maintenance industry for sterile area and non sterile area, Preliminary Hazard Analysis (PHA) Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system. 12 Hrs
3. Chemical based hazards: Sources of chemical hazards, Hazards of Organic synthesis, sulphonating hazard, Organic solvent hazard, Control measures for chemical hazards, 12 Hrs

Management of combustible gases, Toxic gases and Oxygen displacing gases management, Regulations for chemical hazard, Management of over-Exposure to chemicals and TLV concept.

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| 4 | Fire and Explosion: Introduction, Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system mechanical and chemical explosion, multiphase reactions, transport effects and global rates. Preventive and protective management from fires and explosion- electricity passivation, ventilation, and sprinkling, proofing, relief systems -relief valves, flares, scrubbers. | 12
Hrs |
| 5 | Hazard and risk management: Self-protective measures against workplace hazards. Critical training for risk management, Process of hazard management, ICH guidelines on risk assessment and Risk management methods and Tools
Factory act and rules, fundamentals of accident prevention, elements of safety programme and safety management, Physicochemical measurements of effluents, BOD, COD, Determination of some contaminants, Effluent treatment procedure, Role of emergency services. | 12
Hrs |

REFERENCES

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. "Quantitative Risk Assessment in Chemical Process Industries" American Institute of Chemical Industries, Centre for Chemical Process safety.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India.
4. Hazardous Chemicals: Safety Management and Global Regulations, T.S.S. Dikshith, CRC press

PHARMACEUTICAL VALIDATION

PHARMACEUTICAL VALIDATION
(MQA 202T)

Scope

The main purpose of the subject is to understand about validation and how it can be applied to industry and thus improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Objectives

At completion of this course, it is expected that students will be able to understand

- The concepts of calibration, qualification and validation
- The qualification of various equipments and instruments
- Process validation of different dosage forms
- Validation of analytical method for estimation of drugs
- Cleaning validation of equipments employed in the manufacture of pharmaceuticals

THEORY

60 Hrs

1. **Introduction to validation:** Definition of Calibration, Qualification and Validation, Scope, frequency and importance. Difference between calibration and validation. Calibration of weights and measures. Advantages of Validation, scope of Validation, Organization for Validation, Validation Master plan, Types of Validation, Streamlining of qualification & Validation process and Validation Master Plan.
Qualification: User requirement specification, Design qualification, Factory Acceptance Test (FAT)/Site Acceptance Test (SAT), Installation qualification, Operational qualification, Performance qualification, Re-Qualification (Maintaining status-Calibration Preventive Maintenance, Change management). 10 Hrs
2. **Qualification of manufacturing equipment:** Dry Powder Mixers, Fluid Bed and Tray dryers, Tablet Compression (Machine), Dry heat sterilization/Tunnels, Autoclaves, Membrane filtration, Capsule filling machine. 10 Hrs
Qualification of analytical instruments: UV-Visible spectrophotometer, FTIR, DSC, GC, HPLC, HPTLC, LC-MS.

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| 3 | <p>Qualification of laboratory equipments: Hardness tester, Friability test apparatus, tap density tester, Disintegration tester, Dissolution test apparatus</p> <p>Validation of Utility systems: Pharmaceutical water system & pure steam, HVAC system, Compressed air and nitrogen.</p> | 10
Hrs |
| 4 | <p>Process Validation: Concept, Process and documentation of Process Validation. Prospective, Concurrent & Retrospective Validation, Re validation criteria, Process Validation of various formulations (Coated tablets, Capsules, Ointment/Creams, Liquid Orals and aerosols.), Aseptic filling: Media fill validation, USFDA guidelines on Process Validation- A life cycle approach. Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.</p> | 10
Hrs |
| 5 | <p>Cleaning Validation: Cleaning Method development, Validation of analytical method used in cleaning, Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP). Validation of facilities in sterile and non-sterile plant. Computerized system validation: Electronic records and digital signature - 21 CFR Part 11 and GAMP</p> | 10
Hrs |
| 6 | <p>General Principles of Intellectual Property: Concepts of Intellectual Property (IP), Intellectual Property Protection (IPP), Intellectual Property Rights (IPR); Economic importance, mechanism for protection of Intellectual Property -patents, Copyright, Trademark; Factors affecting choice of IP protection; Penalties for violation; Role of IP in pharmaceutical industry; Global ramification and financial implications. Filing a patent applications; patent application forms and guidelines. Types patent applications-provisional and non provisional, PCT and convention patent applications; International patenting requirement procedures and costs; Rights and responsibilities of a patentee; Practical aspects regarding maintaining of a Patent file; Patent infringement meaning and scope. Significance of transfer technology (TOT), IP and ethics-positive and negative aspects of IPP; Societal responsibility, avoiding unethical practices.</p> | 10
Hrs |

AUDITS AND REGULATORY COMPLIANCE

AUDITS AND REGULATORY COMPLIANCE
(MPA 203T)

Scope

This course deals with the understanding and process for auditing in pharmaceutical industries. This subject covers the methodology involved in the auditing process of different in pharmaceutical industries.

Objectives

Upon completion of this course the student should be able to

- To understand the importance of auditing
- To understand the methodology of auditing
- To carry out the audit process
- To prepare the auditing report
- To prepare the check list for auditing

THEORY

60 Hrs

1. Introduction: Objectives, Management of audit, Responsibilities, Planning process, information gathering, administration, Classifications of deficiencies 12 Hrs
2. Role of quality systems and audits in pharmaceutical manufacturing environment: cGMP Regulations, Quality assurance functions, Quality systems approach, Management responsibilities, Resource, Manufacturing operations, Evaluation activities, Transitioning to quality system approach, Audit checklist for drug industries. 12 Hrs
3. Auditing of vendors and production department: Bulk Pharmaceutical Chemicals and packaging material Vendor audit, Warehouse and weighing, Dry Production: Granulation, tableting, coating, capsules, sterile production and packaging. 12 Hrs
4. Auditing of Microbiological laboratory: Auditing the manufacturing process, Product and process information, General areas of interest in the building raw materials, Water, Packaging materials. 12 Hrs
5. Auditing of Quality Assurance and engineering department: Quality Assurance Maintenance, Critical systems: HVAC, Water, Water for Injection systems, ETP. 12 Hrs

REFERENCES

1. Compliance auditing for Pharmaceutical Manufacturers. Karen Ginsbury and Gil Bismuth, Interpharm/CRC, Boca Raton, London New York, Washington D.C.
2. Pharmaceutical Manufacturing Handbook, Regulations and Quality by Shayne Cox Gad. Wiley-Interscience, A John Wiley and sons, Inc., Publications.
3. Handbook of microbiological Quality control. Rosamund M. Baird, Norman A. Hodges, Stephen P. Denyar. CRC Press. 2000.
4. Laboratory auditing for quality and regulatory compliance. Donald C. Singer, Raluca-Ioana Stefan, Jacobus F. Van Staden. Taylor and Francis (2005).

PHARMACEUTICAL MANUFACTURING TECHNOLOGY
(MQA 204T)

Scope

This course is designed to impart knowledge and skills necessary to train the students with the industrial activities during Pharmaceutical Manufacturing.

Objectives

At completion of this course it is expected that students will be able to understand,

- The common practice in the pharmaceutical industry developments, plant layout and production planning
- Will be familiar with the principles and practices of aseptic process technology, non sterile manufacturing technology and packaging technology.
- Have a better understanding of principles and implementation of Quality by design (QbD) and process analytical technology (PAT) in pharmaceutical manufacturing

THEORY

60 Hrs

1. **Pharmaceutical industry developments: Legal requirements and Licenses for API and formulation industry, Plant location- Factors influencing. Plant layout: Factors influencing, Special provisions, Storage space requirements, sterile and aseptic area layout. Production planning: General principles, production systems, calculation of standard cost, process planning, routing, loading, scheduling, dispatching of records, production control.** 12 Hrs

2. **Aseptic process technology: Manufacturing, manufacturing flowcharts, in process-quality control tests for following sterile dosage forms: Ointment, Suspension and Emulsion, Dry powder, Solution (Small Volume & large Volume). Advanced sterile product manufacturing technology : Area planning & environmental control, wall and floor treatment, fixtures and machineries, change rooms, personnel flow, utilities & utilities equipment location, engineering and maintenance. Process Automation in Pharmaceutical Industry: With specific reference to manufacturing of sterile semisolids, Small Volume Parenterals & Large Volume Parenterals (SVP & LVP), Monitoring of Parenteral manufacturing facility, Cleaning in Place (CIP).** 12 Hrs

Sterilization in Place (SIP), Prefilled Syringe, Powdered Jet, Needle Free Injections, and Form Fill Seal Technology (FFS).
Lyophilization technology: Principles, process, equipment.

- 3 **Non sterile manufacturing process technology:** 12 Hrs
Manufacturing, manufacturing flowcharts, in process-quality control tests for following Non-Sterile solid dosage forms: Tablets (compressed & coated), Capsules (Hard & Soft).
Advance non-sterile solid product manufacturing technology: Process Automation in Pharmaceutical Industry with specific reference to manufacturing of tablets and coated products, Improved Tablet Production: Tablet production process, granulation and pelletization equipments, continuous and batch mixing, rapid mixing granulators, rota granulators, spheronizers and marumerisers, and other specialized granulation and drying equipments. Problems encountered.
Coating technology: Process, equipments, particle coating, fluidized bed coating, application techniques. Problems encountered.
- 4 **Containers and closures for pharmaceuticals:** Types, 12 Hrs
performance, assuring quality of glass; types of plastics used, Drug plastic interactions, biological tests, modification of plastics by drugs; different types of closures and closure liners; film wrapper; blister packs; bubble packs; shrink packaging; foil / plastic pouches, bottle seals, tape seals, breakable seals and sealed tubes; quality control of packaging material and filling equipment, flexible packaging, product package compatibility, transit worthiness of package, Stability aspects of packaging. Evaluation of stability of packaging material.
- 5 **Quality by design (QbD) and process analytical technology (PAT):** 12 Hrs
Current approach and its limitations. Why QbD is required, Advantages, Elements of QbD, Terminology: QTPP, CMA, CQA, CPP, RLD, Design space, Design of Experiments, Risk Assessment and mitigation/minimization. Quality by Design, Formulations by Design, QbD for drug products, QbD for Drug Substances, QbD for Excipients, Analytical QbD. FDA initiative on process analytical technology. PAT as a driver for improving quality and reducing costs: quality by design (QbD), QA, QC and GAMP. PAT guidance, standards and regulatory requirements.

QUALITY ASSURANCE PRACTICAL – II PRACTICALS

QUALITY ASSURANCE PRACTICAL – II PRACTICALS
(MQA 205P)

1. Organic contaminants residue analysis by HPLC
2. Estimation of Metallic contaminants by Flame photometer
3. Identification of antibiotic residue by TLC
4. Estimation of Hydrogen Sulphide in Air.
5. Estimation of Chlorine in Work Environment.
6. Sampling and analysis of SO₂ using Colorimetric method
7. Qualification of following Pharma equipment
 - a. Autoclave
 - b. Hot air oven
 - c. Powder Mixer (Dry)
 - d. Tablet Compression Machine
8. Validation of an analytical method for a drug
9. Validation of a processing area
10. Qualification of at least two analytical instruments
11. Cleaning validation of one equipment
12. Qualification of Pharmaceutical Testing Equipment (Dissolution testing apparatus, Friability Apparatus, Disintegration Tester)
13. Check list for Bulk Pharmaceutical Chemicals vendors
14. Check list for tableting production.
15. Check list for sterile production area
16. Check list for Water for injection.
17. Design of plant layout: Sterile and non-sterile
18. Case study on application of QbD
19. Case study on application of PAT

BHARATI VIDYAPEETH (DEEMED TO BE) UNIVERSITY, PUNE

Syllabus for
MASTER OF SCIENCE
M.Sc. in ENVIRONMENT SCIENCE AND TECHNOLOGY
Under
FACULTY OF SCIENCE

Course Structure and Detailed Syllabus
Semester I, II, III and IV
(UNDER CHOICE BASED CREDIT SYSTEM)
Effective from the Academic Year 2019-2020

SEMESTER WISE COURSE INFORMATION

Semester I

Course Number	Course Title	Credit Value	Hours per week	Weightage (UE)	Weightage (IA)	EoTM
	Core Courses					
EST 101	Ecosystem Studies	3	3	60	40	University
EST 102	Environmental Chemistry and Microbiology	3	3	60	40	University
GEO 102	Fundamentals of Geoinformatics	3	3	60	40	University
EST 103	Sustainable development	3	3	60	40	University
EST 111	Field techniques - I	2	3	60	40	University
EST 112	Lab Analytical techniques - I	2	3	60	40	University
GEO 112	Techniques in Geographical Information Systems	2	3	60	40	University
	Pre-requisites					
EST 104	Basic Statistical Methods	3	3		100	Continuous
EST 105	Introduction to Data Analysis	3	3		100	Continuous
	Total Credits / Hours	22	27			

From the core courses:

Course Nos EST 101, EST 102, Geo 102, EST 103 are theory courses

Course Nos EST 111, EST 112, GEO 112 are practical courses

Total credits offered in Semester I : 22

Semester II

Course Number	Course Title	Credit Value	Hours per week	Weightage (UE)	Weightage (IA)	EoTM
	Core Courses					
EST 201	Biodiversity Assessment and Conservation	3	3	60	40	University

EST 202	Engineered Systems for Water and Waste Water	3	3	60	40	University
EST 203	Solid and Hazardous Waste Management	3	3	60	40	University
EST 204	Air and Noise Pollution Management	3	3	60	40	University
EST 205	Research Methodology	2	3		100	Continuous
EST 211	Field Techniques - II	2	3	60	40	University
EST 212	Lab Analytical techniques - II	2	3	60	40	University
EST 213	Field Work	2	60 (cumulative)		100	Continuous
	Electives (any two)					
EST 206	Natural Resource Management	3	3		100	Continuous
EST 207	Environment and Health	3	3		100	Continuous
EST 208	Climate Change Science and Strategies	3	3		100	Continuous
EST 209	Data Analysis with R	3	3		100	Continuous
EST 210	Instrumentation and Lab Management for environmental analysis	3	3		100	Continuous
EST 211	Environmental biotechnology	3	3		100	Continuous
	General Courses (any one)					
GEN 201	General English	2	2		50	Continuous
GEN 202	Project Management	2	2		50	Continuous
	Total	28	32			

From the core courses:

Course Nos EST 201, EST 202, EST 203, EST 204 and EST 205 are theory courses

Course Nos EST 211, EST 212, EST 213 are practical courses

Total Credits offered in Semester II : 28

Semester III

Course Number	Course Title	Credit Value	No. of hours per week	Weightage		EoTM
				UE	IE	
	Core Courses					
EST 301	Integrated Impact Assessment	3	3	60	40	University
EST 302	Environmental Policies and Law	3	3	60	40	University
EST 311	Dissertation	12	14	60	40	University
EST 303	Technical Writing	2	3		100	Continuous
	Electives (any three)					
EST 304	Environment Management Techniques	3	3		100	Continuous
EST 305	Water Management	3	3		100	Continuous
GEO 303	Applications of geospatial technologies	3	3		100	Continuous
EST 306	Urban Environment Management	3	3		100	Continuous
EST 307	Advanced Pollution Control Technology	3	3		100	Continuous
	General Courses (any one)					
GEN 301	Swaach Bharat Abhiyan Internship	2	2		50	Continuous
GEN 302	Education for Sustainable Development	2	2		50	Continuous
	Total	31	34			

From the core courses:

Course Nos EST 301, EST 302, EST 303 are theory courses

Course Nos EST 311 is dissertation.

Total Credits offered in Semester III : 31

Semester IV

Course Number	Course Title	Credit Value	Hours per week	Weightage	Weightage	EoTM
				UE	IA	
	Core Courses					
EST 411	Dissertation	12	14	60	40	University
	Electives (any four)					
EST 401	Ecorestoration	3	3		100	Continuous
EST 402	Corporate Social Responsibility and Sustainability	3	3		100	Continuous
EST 403	Certification for ISO 14001	3	3		100	Continuous
EST 404	Urban Sustainability	3	3		100	Continuous
EST 405	Industrial Safety and Occupational Health (certifications)	3	3		100	Continuous
EST 406	Green technology and Management	3	3		100	Continuous
EST 407	Green Buildings	3	3		100	Continuous
	General Courses (any one)					Continuous
GEN 401	Entrepreneurship Development	2	2		50	Continuous
GEN 402	Soft Skills	2	2		50	Continuous
	Total	26	28			

From the core courses:

Course Nos EST 411 is dissertation.

Total Credits offered in Semester IV : 30

BHARATI VIDYAPEETH (DEEMED TO BE) UNIVERSITY, PUNE

Syllabus for
MASTER OF SCIENCE
M.Sc. in GEOINFORMATICS
Under
FACULTY OF INTERDISCIPLINARY STUDIES

Course Structure and Detailed Syllabus

Semester I, II, III and IV

(UNDER CHOICE BASED CREDIT SYSTEM)

Effective from the Academic Year 2019-2020

SEMESTER WISE COURSE INFORMATION

Semester I

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	Core Courses					
GEO101	Fundamentals of remote sensing	3	3	60	40	University
GEO 102	Fundamentals of Geoinformatics	3	3	60	40	University
GEO 103	Fundamentals of programming	3	3	60	40	University
EST 101	Ecosystem Studies	3	3	60	40	University
EST 306	Urban Environment Management	3	3	60	40	University
EST 111	Field techniques –I	2	3	60	40	University
GEO 111	Techniques in image interpretation and remote sensing	2	3	60	40	University
GEO 112	Techniques in Geographical Information Systems	2	3	60	40	University
	Pre-requisites					
EST 104	Basic Statistical Methods	3	3		100	Continuous
EST 105	Introduction to Data Analysis	3	3		100	Continuous
	Total	27	30			

From the core courses:

Course Nos GEO 101, GEO 102, Geo 103, EST 101, EST 306 are theory courses

Course Nos EST 111, GEO 111, GEO 112 are practical courses

Total credits offered in Semester I : 27

Semester II

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	Core Courses					
GEO 201	Geodatabase Management	3	3	60	40	University
GEO 202	Advanced Remote Sensing	3	3	60	40	University
GEO 203	Digital Image Processing	3	3	60	40	University
GEO 204	WebGIS	3	3	60	40	University
GEO 205	Research Methodology	2	2		100	Continuous
GEO 211	Techniques in database management	2	3	60	40	University
EST 212	Techniques in digital image processing	2	3	60	40	University
GEO 213	Programming for GIS-I	2	3	60	40	University
GEO 214	Field Work	2	60 (cumulative)		100	Continuous
	Electives (any two)					
EST 201	Biodiversity assessment and conservation	3	3		100	Continuous
Est 206	Natural resource management	3	3		100	Continuous
EST 207	Health GIS	3	3		100	Continuous
EST 208	Climate change science and strategies	3	3		100	Continuous
EST 209	Data Analysis with R	3	3		100	Continuous
	General Courses (any					

	one)					
GEN 201	General English	2	2		100	Continuous
GEN 202	Project Management	2	2		100	Continuous
	Total	30	31			

From the core courses:

Course Nos GEO 201, GEO 202, GEO 203, GEO 204, are theory courses

Course Nos GEO 211, GEO 212, Geo 213, GEO 214 are practical courses

Total Credits offered in Semester II : 30

Semester III

Course Number	Course Title	Credit Value	No. of Hours/ week	Weightage UE	Weightage IA	EoTM
	Core Courses					
GEO 301	Spatial analysis and modeling	3	3	60	40	University
GEO 311	Programming for GIS-II	3	3	60	40	University
GEO 312	Dissertation	12	14	60	40	University
GEO 313	Programming for GIS-III	2	3	60	40	University
GEO 314	Techniques in Spatial Statistics, Analysis and Modeling	2	3	60	40	University
	Electives (any two)					
GEO 302	Geospatial Modeling	3	3		100	Continuous
GEO 303	Applications of geospatial technologies	3	3		100	Continuous
GEO 304	Photogrammetry	3	3		100	Continuous
GEO 305	Water management and Geospatial Technologies	3	3		100	Continuous
	General Courses (any one)					
GEN 301	Technical Writing	2	2		100	Continuous
GEN 302	Soft Skills	2	2		100	Continuous
	Total	30	34			

From the core courses:

Course Nos GEO 301 is a theory course.

Course Nos GEO 311, GEO 313, GEO 314 are practical courses

Total Credits offered in Semester III : 30

Semester IV

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	Core Courses					
GEO 411	Dissertation	12	14	60	40	University
GEO 412	Internship	10	20	60	40	University
	General Courses (any one)					
GEN 401	Entrepreneurship Development	2	2		100	Continuous
	Total	24	36			

Total Credits offered in Semester IV : 24

**BHARATI VIDYAPEETH (DEEMED TO BE) UNIVERSITY,
PUNE**

Faculty Of Interdisciplinary Studies

M.Sc. (Wildlife Conservation Action)

**COURSE STRUCTURE AND DETAILED SYLLABUS
OF
SEMESTER I, II, III and IV (UNDER CREDIT SYSTEM)
EFFECTIVE FROM 2019-2020 AT SEMESTER I**

At the
INSTITUTE OF ENVIRONMENT EDUCATION AND RESEARCH
BHARATI VIDYAPEETH UNIVERSITY, PUNE
In collaboration with
WILDLIFE TRUST OF INDIA, NEW DELHI

SEMESTER WISE COURSE INFORMATION

Semester I

Course Number	Course Title	Credit Value	Hours per week	Weightage	Weightage	EoTM
				UE	IA	
EST 101	Ecosystem Studies	3	3	60	40	University
CA 101	Sustainability Of Socio-Ecological Systems	3	3	60	40	University
CA 102	Wildlife Law And Trade Control	3	3	60	40	University
CA 103	Conservation Problems And Practices	3	3	60	40	University
GEO 102	Fundamentals Of Geoinformatics	3	3	60	40	University
EST 111	Field Techniques I	2	3	60	40	University
GEO 112	Techniques In Geographical Information Systems	2	3	60	40	University
CA 104	Research Methodology	2	2		100	Continuous
CA 111	Field Taxonomy I	2	60 hours cumulative		100	Continuous
General Courses						
EST 104	Statistical Methods	3	3		100	Continuous
EST 105	Introduction To Data Analysis	3	3		100	Continuous
	Total	29	32			

From the core courses:

Course Nos EST 101, CA 101, CA 102, CA 103, GEO 102, CA 104 are theory courses

Course Nos EST 111, GEO 112, CA 111 are practical courses

Total Credits offered in Semester I : 29

Semester II

Course Number	Course Title	Credit Value	Hours per week	Weightage	Weightage	EoTM
				UE	IA	
EST 201	Biodiversity Assessment And Conservation	3	3	60	40	University
CA 201	Wildlife Health, Rescue And Rehabilitation	3	3	60	40	University
CA 202	Behavioural Ecology	3	3	60	40	University
CA 211	Advanced Statistics	2	3		100	Continuous
CA 212	Field Techniques II	2	3	60	40	University
CA 213	Field Taxonomy II	2				
CA 214	Field Work	2	60 (cumulative)		100	Continuous
	Electives (any two)					
EST 206	Natural Resource Management	3	3		100	Continuous
EST 401	Ecorestoration	3	3		100	Continuous
CA 203	Urban Biodiversity	3	3		100	Continuous
	General Courses					
GEN 201	General English	2	2		100	Continuous
GEN 202	Technical Writing	2	2		100	Continuous
	Total	25	26			

From the core courses:

Course Nos EST 201, CA 201, CA 202 are theory courses

Course Nos CA 211, CA 212, CA 213, CA 214 are practical courses

Total Credits offered in Semester II: 24

Semester III

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	Core Courses					
CA 311	Dissertation	24	40	60	40	University
	General Courses					
GEN 301	Project Management	2	2		100	Continuous
	Total	26	42			

Total Credits offered in Semester III : 26

Semester IV

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	Core Courses					
CA 411	Internship	10	40	60	40	University
	Electives (any three)					
CA 401	Conservation Leadership	3	3		100	Continuous
CA 402	Conservation Communication, Education And Public Awareness	3	3		100	Continuous
CA 403	Conservation Management	3	3		100	Continuous
EST 208	Climate Change Science And Strategies	3	3		100	Continuous
	General Credit Course					
GEN 401	Entrepreneurship Development	2	2		100	Continuous
GEN 402	Soft Skills	2	2		100	Continuous
	Total	24	54			

Total Credits offered in Semester IV : 24

UNIVERSITY GRANTS COMMISSION

Ability Enhancement Compulsory Course (AECC – Environment Studies)

Unit 1 : Introduction to environmental studies

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

(2 lectures)

Unit 2 : Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :
 - a) Forest ecosystem
 - b) Grassland ecosystem
 - c) Desert ecosystem
 - d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit 3 : Natural Resources : Renewable and Non-renewable Resources

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water : Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

(8 lectures)

Unit 4 : Biodiversity and Conservation

- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity : Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

(8 lectures)

Unit 5 : Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management : Control measures of urban and industrial waste.
- Pollution case studies.

(8 lectures)

Unit 6 : Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture

- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context. (7 lectures)

Unit 7 : Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management : floods, earthquake, cyclones and landslides.
- Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

(6 lectures)

Unit 8 : Field work

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

(Equal to 5 lectures)

Suggested Readings:

1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36-37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams* (pp. 29-64). Zed Books.
8. McNeill, John R. 2000. *Something New Under the Sun: An Environmental History of the Twentieth Century*.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. *Environmental and Pollution Science*. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzuhl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. Tripathi 1992.
14. Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development*. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
20. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.



BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

PUNE, 411030 (INDIA)

(Established under section 3 of the
UGC Act, 1956

Vide notification No.F.9-15/95-U.3 of the
Government of India)

**‘A’Grade University Status by Ministry of HRD,
Govt.Of India**

**Re-Accredited by NAAC with
‘A’Grade**

**FOUR YEARS PROGRAMME IN
BACHELOR IN HOTEL
MANAGEMENT & CATERING TECHNOLOGY
(BHMCT)**

CHOICE BASED CREDIT SYSTEM

SYLLABUS

**To be implemented from the Academic Year
2018 - 2019**

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY) PUNE

(Established u/s 3 of the UGC Act, 1956 Vide Notification No.F.9-15/95-U.3 of the Govt. Of India)

Faculty of Management

Syllabus for Bachelor in Hotel Management and Catering Technology BHMCT

Bharati Vidyapeeth, the parent body of Bharati Vidyapeeth University was established on 10th May 1964, by Dr. Patangrao Kadam with the objective of bringing about intellectual awakening and all side development of the people of our country through dynamic education.

Bharati Vidyapeeth is now a leading educational institution in the country, which has created a history by establishing, within a short span of 52 years or so, 180 educational institutions imparting education from the pre-primary stage to postgraduate stage. Our college and institutions of higher education impart education in different disciplines including Medicine, Dentistry, Ayurved, Homeopathy, Nursing, Arts, Science, Commerce, Engineering, Pharmacy, Management, Social Sciences, Law, Environmental Science, Hotel Management and Catering Technology, Architecture, Physical Education, Journalism, Photography, Computer Science and Information Technology, Biotechnology & Agriculture.

These educational institutions which have achieved acclaimed academic excellence also cater to the educational needs of thousands of students coming from various states and abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student caring teachers. These educational institutions are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Sangli, Karad, Panchgani, Jawahar and New Delhi. This spectacular success achieved by Bharati Vidyapeeth is mainly a creation of unusual foresight, exceptionally dynamic leadership and able guidance of the founder of the Vidyapeeth, Dr. Patangrao Kadam. It has been our constant endeavor to impart high quality education and training to our students and so, no wonder that our institutions have been nationally known for their academic excellence. In recognition of the academic merit achieved by these institutions and their potential for development which they have, the Department of Human Resource Development, Government of India and the University Grants Commission of India have accorded the status of a deemed to be university to Bharati Vidyapeeth with its twenty nine constituent units. Besides these 180 educational institutions, Bharati Vidyapeeth has also been running a Co-operative Bank, Co-operative Consumer Stores, Co-operative Poultry, Co-operative Sugar Factory, Charitable Hospitals and Medical Research Centre and the like

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE

Bharati Vidyapeeth, the parent organization of this University is one of the largest educational organizations in the country. It has 171 educational units under its umbrella including 67 Colleges and Institutes of conventional and professional disciplines.

The Department of Human Resource Development, Government of India on the recommendations of the University Grants Commission accorded the status of "Deemed to be University" initially to a cluster of 12 units of Bharati Vidyapeeth. Subsequently, 17 additional colleges/institutes were brought within the ambit of Bharati Vidyapeeth Deemed University vide various notifications of the Government of India. Bharati Vidyapeeth Deemed University commenced its functioning on 26th April, 1996. Constituent Units of Bharati Vidyapeeth Deemed University

1. BVDU Medical College, Pune.
2. BVDU Dental College & Hospital, Pune
3. BVDU College of Ayurved, Pune
4. BVDU Homoeopathic Medical College, Pune
5. BVDU College of Nursing, Pune
6. BVDU Yashwantrao Mohite College of Arts, Science & Commerce, Pune.
7. BVDU New Law College, Pune
8. BVDU Social Sciences Centre (M.S.W.), Pune
9. BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune.
10. BVDU Centre for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
11. BVDU College of Physical Education, Pune.
12. BVDU Institute of Environment Education & Research, Pune
13. BVDU Institute of Management & Entrepreneurship Development, Pune
14. BVDU Poona College of Pharmacy, Pune
15. BVDU College of Engineering, Pune
16. BVDU Interactive Research School in Health Affairs (IRSHA), Pune
17. BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
18. BVDU College of Architecture, Pune
19. BVDU Abhijit Kadam Institute of Management & Social Sciences, Solapur
20. BVDU Institute of Management, Kolhapur
21. BVDU Institute of Management & Rural Development administration, Sangli
22. BVDU Institute of Management & Research, New Delhi
23. BVDU Institute of Hotel Management & Catering Technology, Pune
24. BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
25. BVDU Medical College & Hospital, Sangli

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE

- 26. BVDU Dental College & Hospital, Mumbai
- 27. BVDU Dental College & Hospital, Sangli

- 28. BVDU College of Nursing, Sangli
 - 29. BVDU College of Nursing, Navi Mumbai
- Approval

This University has come into being as per the provisions in the Act of the University Grants Commission (Section 3 of the UGCA ct of 1956) and by the notification of Government of India. It has the same legal status as that of the other statutory Universities in India.

**BHARATIVIDYAPEETH (DEEMED TO BE
UNIVERSITY)**

INSTITUTE OF HOTEL MANAGEMENT AND CATERING TECHNOLOGY Pune
A Great Choice:

BVDUIHMCT is an institute dedicated to providing quality professional hospitality education. We teach our students the knowledge & specific skills necessary to live successful and to grow into positions of influence & leadership in their chosen profession. BVIHMCT has been engaged in preparing students to make successful careers for the last 27 years, along the way, we have developed our own way of doing things. Things that our students like, and things that the employer's like & appreciate too.

Our Vision: Our vision is "To make education affordable and accessible to masses".

Our Mission: As a part of Bharati Vidyapeeth, we contribute in our own way to the vision of our founder, Dr. Patangrao Kadam "Social transformation through dynamic education", by nurturing the spirit of professional education as a source and a system to enhance equality of life in society.

Our Goal: To ensure professional approach to teaching with an excellent environment for students to gain an international awareness of the industry through effective communication techniques.

Our Objectives:

- To offer students the opportunity to develop their practical, management, and communication abilities.
- To provide each individual student with the training know how for a successful career in the highly competitive industry.
- To develop the personality of a student as required by the hospitality industry.
- To make students worthy citizens of the nation.

Increasingly selective hotels target BVDUIHMCT students not only for their achievements but also for their attitude which is vital in today's competitive world.

Realising the increasing importance of Hotel Management and Tourism as a profession and industry and also the need to make arrangements for Hotel Management and Tourism

Education Dr. Patangrao Kadam, the founder of Bharati Vidyapeeth with his unusual futuristic vision established the Institute of Hotel Management & Catering Technology in the year 1992.

Over the years, the institution has established itself as an ideal centre of Hotel Management education.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
Faculty of Management Studies
Bachelor in Hotel management and Catering Technology
Revised Course Structure to be implemented from 2018-2019

I. Title:

- a) **Name of the Programme:** Bachelor in Hotel Management and Catering Technology
- b) **Nature and Duration of Programme:** Full Time under Graduate Programme of 04 Years
(Approved by A.I.C.T. E)

II. Introduction:

Bachelor in Hotel Management and Catering Technology is a Full Time Four-year programme offered by Bharati Vidyapeeth Deemed University and conducted at Bharati Vidyapeeth Deemed University-Institute of Hotel Management & Catering Technology, Pune. The institute has experienced faculty members, excellent infrastructure, well stocked library and Computer Lab with LAN/Internet facility and other facilities to provide a conducive environment for learning and development.

III. Rationale for Syllabus Revision

The curriculum of the of the Four years programme in hotel management and catering technology is devised to incorporate changes in the hospitality and tourism industry and to keep abreast with the current trends in the hospitality industry. In view of the dynamic nature of the hospitality industry and the evolving expectations of the stakeholders such as the students, parents and the society, need was felt for the revision of the syllabus and to introduce a Choice Based Credit system.

Over the period of two years the faculty members of the institute, adjunct faculty members and industry experts have been involved in the framing of the structure and course content.

The revised syllabus is designed to equip the students with the essential knowledge, skills and attitudinal orientation vital for successful careers in the hospitality industry.

Attempt has been made to incorporate the current trends such as Environmental studies, Safety and security, Application of Computers in Hotels, Skill enhancement for Media and Journalism in Hospitality. Other relevant courses such as Retail Management, Event Management, Entrepreneurship Development, Hotel Economics, first aid have also been incorporated. The Curriculum provides students with an opportunity to select an area of specialization among the Discipline Specific electives.

IV. Objectives and Framework of the curriculum of BHMCT programme

1. The basic objectives of the **BHMCT** programme is to provide to the hospitality industry a steady stream of competent young men and women with the necessary knowledge, skills, values and attitudes to occupy key operational positions.
2. The course structure of the **BHMCT** programme is designed keeping in view with the objectives stated above. Consequently, certain essential features of such model programmes structure would be:

- a) To impart to the student latest and relevant theoretical and practical knowledge for deloping their competencies to work in the field of hospitality services.
- b) To provide opportunities to the students within and outside the institute for for developing necessary operational skills necessary for the hospitality industry.
- c) To develop the right kind of values and attitudes to function effectively in the hospitality industry.

3. The following considerations have been taken into account:

- a) The knowledge inputs and opportunities for skill development have been offered in an evenly distributed and logically sequenced manner.
- b) The design is simple and logical.

4. The relative importance of skill development and attitudinal oreination in management education suggest that the instituons offering **BHMCT**programmes should have some freedom on course development in chooosing methods of instuctions and internal assesment in abroad frame world of objectives and cirriculum structure.

5. A weightage of 40 percent is given to Internal Assessment, consisting of tasks like classroom exercises, tests, seminars, presentations. quizzes, group tasks, self study assignments, class room discusiion etc.

6. The External Assessment (University Examination) has a weightage of 60 percent.

This full time Three Year programme BHMCT has 8semesters. Each semester has a total of 20 academic weeks of which 16 weeks's comprises instructional weeks.

V. Eligibility for Admission

Admission to the **BHMCT** programme is open to anycandidate having passed the H.S.C.(ClassXII) examination or its equivalent in academic streams of Science, Arts, Commerce or vocation from any recognized board.

Candidates who have taken admission to Four Years BHMCT and would like to change over to

B. Sc(H&HA) after first year of BHMCT can do so subject to availability of seats and provided the candidate has passed all the subjects in First Year of BHMCT.

Candidates who have appeared for class XII Re-examination may also apply for admission. Admission of such candidates will remain provisional until submission of the H.S.C (Class XII) Mark list and passing Certificate in original.

Subject to the above conditions, the final admission is based solely on:

- i) Merit in the Entrance Examination conducted by Bharati Vidyapeeth Deemed University
- ii) Submission of College Leaving/Transfer/ Migration Certificate and Anti Ragging Affidavit.

VI. Structure of the Programme

1. **BHMCT** is a four years programme divided into eight semesters.
2. A student of **BHMCT** programme must take 200 credits to full fill the total number of credits required for the completion of the academic programme
3. The curriculum requires the students to spend at least 32 hours per semester for non credit course options such as Community Service, Sports Activities, Cultural Activities, General Interest Activities during Semester III **BHMCT** and in order to encourage participation in extra curricular activities which is aimed at developing an all rounded personality of the students.
4. After imparting general understanding of the hotel operations during the first two years of the academic programme, the students are provided with an opportunity to select areas of specialization in the fourth semester from amongst the Discipline Specific Elective courses in the fifth semester and in detail in the subsequent semesters.
5. Students have to choose and study at least any two courses from among the list of Ability Enhancing Elective Courses and at least any two courses from among the list of Skill Enhancing Elective Courses of their choice during the third and fourth year of **BHMCT** Ability Enhancing Elective course and Skill Enhancing Elective course carries 04 credits each.
6. The programme includes on the job learning in the form of Industrial Exposure for a period of 21 weeks in a classified hotel of 3-star category and above in the elected discipline of specialization during eight semesters with 21 credits.
7. The medium of instruction and examination will be English.

8. A student would be required to complete the course within 08 academic years from the date of admission.

9. Outline of the Structure of **BHMCT** programme is given in Appendix I and Detailed Syllabus is given in Annexure II.

VII. Attendance

The students are required to have atleast 75% attendance in each course. The students who fail to comply with the above requirement shall not be allowed to appear for the University examinations. Such students shall have to seek readmission in the same class of the succeeding year.

VIII. Choice Based Credit System

In the credits system, each course is defined in terms of expected learning outcomes. The study load (The average number of clock hours spend per student is needed to achieve the Expected learning outcomes) determines the assigned credit value for each course. The total assigned credits of all courses are the assigned credit for the programme and this total constitutes the minimum credits required to be earned to complete the programme and obtain the degree from the university. The minimum credits to complete **BHMCT** programme shall be 200 credits.

The courses in **BHMCT** programmes are of various kinds and include:

DSC Discipline Specific Compulsory Course

DSE Discipline Specific Elective Course

AEC Ability Enhancing Compulsory Course

AEE Ability Enhancing Elective Course

SEC Skill Enhancing Compulsory Course

SEE Skill Enhancing Elective Course

LEC Language Enhancing Compulsory Course

LEE Language Enhancing Elective Course

NC Non-Credit Course

In terms of a semester of 15/16 weeks, Every One-hour session per week of theory / lecture = One Credit per semester. Every Two hours Session per week of practice = One Credit per semester. Discipline Specific courses are about 70% of the minimum credits that constitute the programme.

Assessment

1. The final total assessment of the candidates shall be made in terms of an Internal Assessment (IA) and External Assessment (EA) with the exception of Ability Enhancing Elective courses and Skill Enhancing Elective Courses which will be made in terms of continuous Assessment only. The internal assessment will be conducted by the institute and external assessment will be conducted by the university. The external assessment will be based on the entire Syllabus. Internal Assessment (IA), Continuous Assessment (CA) and External Assessment (EA) will constitute as separate heads of passing and they will be shown separately in the transcripts.

2. For each course, the ratio of internal assessment in relation to the external assessment shall be 40:60.

3. Internal assessment (IA) will be calculated as follows: 50% based on Attendance, class participation, performance, journal work, classroom exercises, presentations, quizzes, group tasks, self-study assignments, classroom discussion etc, and 50% based on the performance in minimum two class tests during the semester.

4. External Assessment (EA) will be based on the examinations conducted by the University at the end of each semester.

5. Ability Enhancing Elective courses and Skill Enhancing Elective Courses will have only Continuous Assessment (CA) based on the performance in minimum two class tests and submission of minimum 04 assignments during the semester.

6. Industrial Exposure will have Continuous Assessment and External Assessment.

Continuous Assessment will be based on the Performance Appraisal filled by the departmental heads of the various Operational Departments of the Hotel in which the student undergoes Industrial Exposure. The Training Report has to be prepared and submitted to the Principal within the stipulated time for assessment. The training report will be assessed by a panel of examiners appointed by the University, comprising of one internal examiner and one external examiner preferably HOD of a classified hotel of 3 Star category and above or a Senior faculty from any recognized Institute of Hotel Management.

7. Non-Credit courses will be assessed as 'Satisfactory' or 'Unsatisfactory' Performance based on completion of assigned activities/tasks and submission of the report there of.

8. Students have to complete the Compulsory Core Module in Environmental Studies and will be assessed as 'Pass' or 'Fail' based on their performance in the examination conducted by the University.

9. Re-assessment of Internal Marks: In case of those students who have secured less than 5 grade points in internal assessment the intitue shall adminster additional internal assessment test, the result of which shall be conveyed to the University as revised internal marks. In case the result of the internal test as above results in lower marks than the original figure of marks shall prevail, in short, the rule is that the higher of the two figures of the marks, shall be taken into consideration.

10. The Grades obtained in Internal Assessment/ContinuousAssessment will communicated to the University at the end of each semester. These marks will be considered for the declaration of the results.

Standard of passing

For all courses, both internal assessment and External assessment constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the students must obtain a minimum grade point of 5(40%marks) at External Assesment and also a minimum of grade point of 5(40%marks) for Internal Assesment.

In order to pass in curses which are assessed on the bais of continuous assessment the student must secure at least Pass Grade equivalent to 5 grade points.

A student who fails at External Assessment (EA) of a course has to reappear only for External assessment and clear the head of passing, Similarly a student who fails in internal Assessment/ContinuousAssessment of a course has to appear only for Internal Assesment /Continious Assesment as a backlog student and clear the head of passing to secure the Grade Point Average (GPA) required for passing. The performance of Inernal assessment and continuous assessment will be combined to obtain Grade Point Average for the course the weights for performance at External Assesment and Internal Assesment shall be 60 % and40 % respectively. Students can avail the verification/revaluation facility as per the prevailing policy, guidelines and norms of the University.

GradingSystem

10-point Grading System for grading in each head of passing shall be adopted as suggested

By the Bharati Vidyapeeth University.

The grading system shall be as shown in the Table1 below

Range of Marks (out of 100)	GradePoint	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} < 80$	9	A+
$60 \leq \text{Marks} < 70$	8	A
$55 \leq \text{Marks} < 60$	7	B+
$50 \leq \text{Marks} < 55$	6	B
$40 \leq \text{Marks} < 50$	5	C
Marks < 40	0	D

The performance at Internal Assessment /Continuous Assessment will be combined to abating the Grade Point Average (GPA) and EA will be combined to obtain the Grade Point Average (GPA) for the course. The Weights for performance at External Assessment and Continuous Assessment shall be 60 % and 40% respectively.

The GP for a course shall be calculated by first finding the totalmarks for the course. The corresponding GPAverage as per the table below shall be the GPA for the course.

The Formula to calculate the GradePoint (GP) -

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which Grade point will be computed. In order to determine the GP, set $x = \text{Max}/10$ (since we have adopted 10 Points system) The GP is calculated by the formula as shown in the Table2.

After computing the grade point, the grade can be found from Table1.

Table2: Formula to calculate Grade Point in individual evaluations.

Range of Marks at the valuation	Formula for the Grade Point
$8x \leq M \leq 10x$	10
$5.5x \leq M < 8x$	Truncate (M/x) +2
$4x \leq M < 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators namely Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of the learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment. The

CGPA of a learner when he or she completes the programme is the final result of the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$$

Where C_k is the credit value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken overall courses that the learner has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent.

Formula to compute equivalent percentage marks for specified CGPA.

	$10 \times CGPA - 10$, if $5.00 \leq CGPA \leq 6.00$
	$05 \times CGPA + 10$, if $6.00 \leq CGPA \leq 8.00$
%Marks (CGPA) =	$10 \times CGPA - 20$, if $8.00 \leq CGPA \leq 9.00$
	$20 \times CGPA - 110$, if $9.00 \leq CGPA \leq 9.50$
	$40 \times CGPA - 300$, if $9.50 \leq CGPA \leq 10.00$

ATKT Rules:

A student is allowed to keep term for semester III if he/she has a backlog of not more than eleven courses (Theory as well as Practical) in Semester I and Semester II together

A student shall be allowed to keep term for semester V, if he/she has a backlog of not more (Theory as well as Practical) in Semester III and IV together and should pass all the subjects of Semester I and Semester II.

Award of Honours

A student who has completed the minimum credit specified for the programmes shall be declared to have passed in the programme.

The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed.

The criteria for the award of honours are given in the table below.

Question Paper Pattern for External Assessment conducted by the University

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks
9.50 ≤ CGPA ≤ 10.00	O	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤ CGPA ≤ 9.49	A+	Excellent	70 ≤ Marks ≤ 80
8.00 ≤ CGPA ≤ 8.99	A	Very Good	60 ≤ Marks ≤ 70
7.00 ≤ CGPA ≤ 7.99	B+	Good	55 ≤ Marks ≤ 60
6.00 ≤ CGPA ≤ 6.99	B	Average	50 ≤ Marks ≤ 55
5.00 ≤ CGPA ≤ 5.99	C	Satisfactory	40 ≤ Marks ≤ 50
CGPA below ≤ 5.00	F	Fail	Marks below 40

The pattern of Question Paper for External Assessment (60 Marks) of Theory subjects conducted by the University will be as follows:

1. The Question Paper will be divided into 02 Sections, Section I and Section II.
2. Each Section will consist of 03 Questions and all questions will be compulsory.
3. Question 1 of each Section shall be Objective in nature (Multiple Choice Question, fill in the Blanks, Match the Pairs, True or False etc.) and carry a total of 06 marks only.
4. Question 2 and Question 3 will be of 12 marks each with internal choice. A question may be subdivided into sub-question a, b, c ... and the allocation of marks will depend on the weightage given to the topic.
5. Questions shall be set to assess the basic knowledge acquired, comprehension and application of knowledge in a given situation.
6. The Chairman of Board of Paper Setters for each course shall ensure that the questions cover the entire syllabus as per the weightage of marks indicated in the syllabus.
7. The duration of written examination shall be 2 ½ hours.

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS/WE EK	CREDITS
				IA	EA	CA	TOTAL		
I	DSC 101	BASIC INDIAN FOOD PRODUCTION (THEORY)	COMPULSORY	40	60	--	100	03	03
	DSC 101 A	BASIC INDIAN FOOD PRODUCTION (PRACTICAL)	COMPULSORY	40	60	--	100	08	04
	DSC 102	BASIC FOOD & BEVERAGE SERVICE I (THEORY)	COMPULSORY	40	60	--	100	03	03
	DSC 102 A	BASIC FOOD & BEVERAGE SERVICE I (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC 103	BASIC HOUSEKEEPING OPERATIONS (THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC 103 A	BASIC HOUSEKEEPING OPERATIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC 104	BASIC FRONT OFFICE OPERATIONS (THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC 104 A	BASIC FRONT OFFICE OPERATIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	AEC 101	FOOD COMMODITIES	COMPULSORY	20	30	--	50	02	02
	LEE 101	BUSINESS COMMUNICATION*(THEORY)	ANY ONE	40	60	--	100	02	02
LEE 102	BASIC FRENCH (THEORY)								

LEE 101 A	BUSINESS COMMUNICATION (PRACTICAL)	ANY ONE*	20	30	--	50	04 **	02
LEE 102 A	BASIC FRENCH (PRACTICAL)							
			40 0	60 0	--	1000	30	23

*EXEMPTION OF BUSINESS COMMUNICATION ONLY IF THE CANDIDATE HAS SECURED MINIMUM 60 %
& ABOVE IN QUALIFYING
EXAMINATION.

** INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE CLASS

SE M	SUBJEC T CODE	SUBJECT NAME	CHOICE	MARKS				HOURS/WE E K	CREDIT S
				IA	EA	C A	TOTA L		
	DSC 201	BASIC CONTINENTAL FOOD PRODUCTION (THEORY)	COMPULSOR Y	40	60	--	100	03	03
	DSC 201A	BASIC CONTINENTAL FOOD PRODUCTION (PRACTICAL)	COMPULSOR Y	40	60	--	100	08	04
	DSC 202	BASIC FOOD & BEVERAGE SERVICE II (THEORY)	COMPULSOR Y	40	60	--	100	03	03
	DSC 202A	BASIC FOOD & BEVERAGE SERVICE II (PRACTICAL)	COMPULSOR Y	40	60	--	100	02	01
	DSC 203	MANAGING HOUSEKEEPIN G OPERATIONS (THEORY)	COMPULSOR Y	40	60	--	100	02	02

II	DSC 203A	MANAGING HOUSEKEEPING OPERATIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC 204	MANAGING FRONT OFFICE OPERATIONS (THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC 204 A	MANAGING FRONT OFFICE OPERATIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	SEC 101	PERSONALITY SKILLS FOR HOSPITALITY INDUSTRY (THEORY)	COMPULSORY	40	60	--	100	03	03
	SEC 101A	PERSONALITY SKILLS FOR HOSPITALITY INDUSTRY (PRACTICAL)	COMPULSORY	20	30	--	50	04 *	02
				380	570		950	31	22

*** INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE CLASS**

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS/ WEEK	CREDITS
				IA	EA	CA	TOTAL		
	DSC 301	QUANTITY FOOD PRODUCTION & BASIC BAKING (THEORY)	COMPULSORY	40	60	--	100	04	04
	DSC 301A	QUANTITY FOOD PRODUCTION & BASIC BAKING (PRACTICAL)	COMPULSORY	40	60	--	100	08	04
	DSC 302	INTRODUCTION TO BEVERAGE	COMPULSORY	40	60	--	100	03	03

III		SERVICE (THEORY)	RY						
	DSC 302A	INTRODUCTION TO BEVERAGE SERVICE (PRACTICAL)	COMPULSO RY	40	60	--	100	02	01
	DSC 303	ALLIED HOUSEKEEPING FUNCTIONS(THEO RY)	COMPULSO RY	40	60	--	100	02	02
	DSC 303A	ALLIED HOUSEKEEPING FUNCTIONS (PRACTICAL)	COMPULSO RY	40	60	--	100	02	01
	DSC 304	FRONT OFFICE ACCOUNTING (THEORY)	COMPULSO RY	40	60	--	100	02	02
	DSC304 A	FRONT OFFICE ACCOUNTING (PRACTICAL)	COMPULSO RY	40	60	--	100	02	01
	LEC 101	HOTEL FRENCH (THEORY)	COMPULSO RY	20	30	--	50	03	03
	LEC 101A	HOTEL FRENCH (PRACTICAL)	COMPULSO RY	20	30	--	50	04 *	02
	NC 101A	COMMUNITY SERVICE	ANY ONE**	--	--	--	--	02	00
	NC 102A	SPORTS ACTIVITIES							
NC 103A	CULTURAL ACTIVITIES								
NC 104A	GENERAL INTEREST ACTIVITIES								
			36 0	54 0	--	900	34	23	

* INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE CLASS

** STUDENTS ARE REQUIRED TO TAKE ANY ONE OF THE NON CREDIT COURSES WHICH WILL BE ASSESSED AS SATISFACTORY OR UNSATISFACTORY PERFORMANCE BASED ON COMPLETION OF ASSIGNED ACTIVITIES / TASKS AND SUBMISSION OF REPORT THERE OF

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS / WEEK	CREDITS
				IA	EA	CA	TOTAL		
IV	DSC 401 (I)	INDUSTRY EXPOSURE & REPORT – I	COMPULSORY	--	120	80	200	54	37
				--	120	80	200	54	37

THE STUDENT IS REQUIRED TO UNDERTAKE 22 WEEKS OF INDUSTRIAL EXPOSURE WITH A CLASSIFIED HOTEL (3 STAR AND ABOVE) IN THE FOLLOWING OPERATIONAL DEPARTMENTS:

- FOOD PRODUCTION OPERATIONS
- FOOD & BEVERAGE OPERATIONS
- HOUSEKEEPING / ACCOMODATION OPERATIONS
- FRONT OFFICE OPERATIONS

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS/WE EK	CREDIT S
				IA	EA	CA	TOTAL		
V	DSE 101	LARDER (THEORY)	ANY ONE	40	60	--	100	04	04
	DSE 102	ALCOHOLIC BEVERAGES I							
	DSE 103	(THEORY) ACCOMMODATI ON OPERATIONS (THEORY)							
	DSE 101A	LARDER (PRACTICAL)							
	DSE 102A	ALCOHOLIC BEVERAGES I						08 08*	04

	DSE 103A	(PRACTICAL) ACCOMMODATION OPERATIONS (PRACTICAL)						08*	04
	SEC 102	ACCOUNTING SKILLS FOR HOTELS (THEORY)	COMPULSORY	40	60	--	100	03	03
	AEC 102	RESEARCHING FOR HOSPITALITY & TOURISM MANAGEMENT (THEORY)	COMPULSORY	40	60	--	100	02	02
	AEC 102A	RESEARCHING FOR HOSPITALITY & TOURISM MANAGEMENT (PRACTICAL)	COMPULSORY	40	60	--	100	08**	04
	AEC 103	HOSPITALITY LAW (THEORY)	COMPULSORY	40	60	--	100	03	03
	AEE 101-107	SELECT FROM LIST	ANY ONE	--	--	50** *	50	04	04
				240	360	50	650	32	24

*INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE THE CLASS
STUDENTS OPTING FOR DSE 102 A MAY UNDERTAKE MINIMUM 08 ODC OR PART TIME / WEEKEND JOB WITH REPUTED HOTELS / RESTAURANTS FOR MINIMUM 64 HOURS IN THE SEMESTER
STUDENTS OPTING FOR DSE 103 A MAY ENGAGE THEMSELVES IN PRACTICAL TRAINING / PART TIME JOB / WITH REPUTED HOTELS FOR MINIMUM 64 HOURS IN THE SEMESTER.

** INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE CLASS

***ABILITY ENHANCING ELECTIVE COURSES WILL HAVE CONTINUOUS ASSESSMENT BASED ON PERFORMANCE IN THE TWO CLASS TESTS AND SUBMISSION OF MINIMUM FOUR ASSIGNMENTS.

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS/WEEEK	CREDITS
				IA	EA	CA	TOTAL		
VI	DSE 201	REGIONAL CUISINES OF INDIA (THEORY)	ANY ONE	40	60	--	100	04	04
	DSE 202	ALCOHOLIC BEVERAGES II (THEORY)							
	DSE 203	TRENDS IN HOUSEKEEPING (THEORY)							
	DSE 201A	REGIONAL CUISINES OF INDIA (PRACTICAL)	ANY ONE*	40	60	--	100	08	04
	DSE 202A	ALCOHOLIC BEVERAGES II (PRACTICAL)						08*	04
	DSE 203A	TRENDS IN HOUSEKEEPING (PRACTICAL)						08*	04
	SEC 103	TOURISM OPERATIONS (THEORY)	COMPULSORY	40	60	--	100	03	03
DSCP	PROJECT WORK	COMPULSORY	40	60	--	100	12**	06	
AEC 104	HOSPITALITY MARKETING (THEORY)	COMPULSORY	40	60		100	03	03	
SEE 101-107	SELECT FROM LIST	ANY ONE	--	--	50** *	50	04	04	

				20 0	30 0	50	550	34	24

*INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE THE CLASS
STUDENTS OPTING FOR DSE 202 A MAY UNDERTAKE MINIMUM 08 ODC OR PART TIME / WEEKEND JOB
WITH REPUTED HOTELS / RESTAURANTS FOR MINIMUM 64 HOURS IN THE SEMESTER.

STUDENTS OPTING FOR DSE 203 A MAY ENGAGE THEMSELVES IN PRACTICAL TRAINING / PART TIME
JOB / WITH REPUTED HOTELS FOR MINIMUM 64 HOURS IN THE SEMESTER

.** INCLUDES CLASS HOURS AS WELL AS HOURS SPENT OUTSIDE THE CLASS FOR PROJECT RELATED
WORK

***SKILL ENHANCING ELECTIVE COURSES WILL HAVE CONTINUOUS ASSESSMENT BASED ON
PERFORMANCE IN THE TWO CLASS TESTS AND SUBMISSION OF MINIMUM FOUR ASSIGNMENTS

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS/WEEK	CREDITS
				IA	EA	CA	TOTAL		
VII	DSE 301 DSE 302 DSE 303	SELECT FROM THE LIST	ANY ONE	40	60	--	100	04	04
	DSE 301A DSE 302A DSE 303A		ANY ONE	40	60	--	100	08 08* 08*	04 04 04
	SEC 104	APPLICATION OF COMPUTERS IN HOTELS (THEORY)	COMPULSORY	20	30	--	50	02	02
	SEE104 A	APPLICATION OF COMPUTERS IN HOTELS	COMPULSORY	40	60	--	100	04	02

	(PRACTICAL)								
AEC 105	HUMAN RESOURCE MANAGEMENT (THEORY)	COMPULSORY	40	60	--	100	03	03	
AEC 106	TOTAL QUALITY MANAGEMENT (THEORY)	COMPULSORY	40	60	--	100	03	03	
AEE 101 -107	SELECT FROM LIST (THEORY)	ANY ONE	--	--	50* *	50	04	04	
			220	330	50	600	28	22	

*INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE THE CLASS
 STUDENTS OPTING FOR DSE 302 A MAY UNDERTAKE MINIMUM 08 ODC OR PART TIME / WEEKEND JOB WITH REPUTED HOTELS / RESTAURANTS FOR MINIMUM 64 HOURS IN THE SEMESTER.
 STUDENTS OPTING FOR DSE 303 A MAY ENGAGE THEMSELVES IN PRACTICAL TRAINING / PART TIME JOB / WITH REPUTED HOTELS FOR MINIMUM 64 HOURS IN THE SEMESTER

** ABILITY ENHANCING ELECTIVE COURSES WILL HAVE CONTINUOUS ASSESSMENT BASED ON PERFORMANCE IN THE TWO CLASS TESTS AND SUBMISSION OF MINIMUM FOUR ASSIGNMENTS

LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSE (THEORY)

- DSE 301 ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT (THEORY)
- DSE 302 FOOD & BEVERAGE OPERATIONS & MANAGEMENT (THEORY)
- DSE 303 ACCOMMODATION MANAGEMENT (THEORY)

LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSE (PRACTICAL)

- DSE 301 A ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT (PRACTICAL)
- DSE 302 A FOOD & BEVERAGE OPERATIONS & MANAGEMENT (PRACTICAL)
- DSE 303 A ACCOMMODATION MANAGEMENT (PRACTICAL)

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS	CREDITS
				IA	EA	CA	TOTAL		
VIII	SEE 101- 107	SELECT FROM LIST	ANY ONE	-	-	50**	50	04	04
	DSE 401 I	INDUSTRY EXPOSURE & REPORT – II	ANY ONE	-	120	80	200	54	21
				-	120	80	250	54	25

*SKILL ENHANCING ELECTIVE COURSES WILL HAVE CONTINUOUS ASSESSMENT BASED ON PERFORMANCE IN THE TWO CLASS TESTS AND SUBMISSION OF MINIMUM FOUR ASSIGNMENTS

STUDENTS ARE REQUIRED TO UNDERTAKE 11 WEEKS OF INDUSTRIAL EXPOSURE WITH ANY REPUTED HOSPITALITY ORGANISATION

LIST OF ABILITY ENHANCING ELECTIVE COURSES

AEE 101 CATERING SCIENCE
AEE 102 DIETITICS & NUTRITION
AEE 103 FOOD & BEVERAGECONTROLS
AEE 104 PRINCIPLES OF MANAGEMENT
AEE 105 ORGANISATION BEHAVIOR
AEE 106 HOTEL ECONOMICS
AEE 107 FINANCIALMANAGEMENT

LIST OF SKILL ENHANCING ELECTIVE COURSES

SEE 101 FIRST AID
SEE 102 HOTEL MAINTENANCE
SEE 103 RETAIL MANAGEMENT
SEE 104 EVENT MANAGEMENT
SEE 105 ENTREPRENUERSHIP DEVELOPMENT
SEE 106 FACILITY PLANNING
SEE 107 SKILL ENHANCEMENT FOR MEDIA & JOURNALISM IN HOSPITALITY (PRACTICAL)

SEMESTER- I

SUBJECT CODE: DSC 101 SUBJECT : BASIC INDIAN FOOD PRODUCTION (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

This subject intends to develop knowledge and basic culinary skills, which will help students to develop a comprehensive insight into culinary history, ingredients and their uses, methods of cooking, basic cooking equipment and tools.

		Hours	Marks
Chapter 1	Introduction to art of cookery	06	08
1.1	Culinary History		
1.2	Origins of classical and modern cuisine		
1.3	Classical kitchen brigade for a five star hotel		
1.4	Duties and responsibilities of Executive Chef and various chefs		
1.5	Organization of modern kitchen		
1.6	Standards of professionalism		
1.7	Kitchen Uniforms		
1.8	Inter departmental co-ordination		
Chapter 2	Mise-en-place	04	08
2.1	Importance		
2.2	Weighing and measuring ingredients-weight and volume consideration		
2.3	Preparation of ingredients		
2.4	Methods of mixing food		
Chapter 3	Equivalents of ingredients	04	04
3.1	Equivalents of various ingredients used in the kitchen-cereals, pulses, vegetables, fruits, nuts, fish, meat.		
Chapter 4	Methods of Cooking	14	16
4.1	Aims and Objectives of cooking food		
4.2	Effects of heat on food- proteins, carbohydrates, vitamins, fats, minerals, fruit and vegetable fiber, flavor components		
4.3	Types of pigments in vegetables, fruits and animal products		
4.4	Effects of heat, acid, alkali, oxidation and metal on pigments		

4.5	Precautions for enhancing and retention of colour.		
4.6	Methods of heat transfer- conduction, convection, radiation.		
4.7	Cooking methods- Moist & Dry (Salient features of various cooking methods, temperature precaution) Steaming, braising, stewing, poaching, boiling, baking, roasting, grilling, frying, broiling, microwave and solar.		
Chapter 5	Tools & Equipments	04	06
5.1	Introduction to various types of Knives, Hand tools and Small equipments, Measuring devices, Pots, Pans and Containers		
5.2	Use and maintenance of Equipment- Cooking range, Mixer, OTG, Refrigerator.		
5.3	Properties, Advantages and Disadvantage of various materials used in tools and equipment		
Chapter 6	Sanitation and Safety	08	08
6.1	Personnel Hygiene		
6.2	Food Storage		
6.3	Hygiene & safe practices in food handling and preparation		
6.4	Cleaning and Sanitizing Equipments		
6.5	Rodent and insect control		
6.6	Safety practices at work place, preventing cuts & burns, falls & injuries		
6.7	Fire prevention.		
6.8	HACCP system.		
Chapter 7	Standard Recipe	04	06
7.1	Definition		
7.2	Uses & Limitations		
7.3	Structure		
Chapter 8	Culinary Terms	04	04

Raita	Payassam	Do pyaza
Murabba	Korma	Bharwaan
Phirnee	Kofta	Bhurta
Chenna	Khoya	Pakora
Rabarhi	Kachumber	Kadhi
Khichri	Kachori	Baghar
Achar	Boti	Bhujjia
Halwa	Bonda	Foogath
Bhunnana	Bhunao	Vindaloo
Boondi	Kheema	Burfi
Pachadi	Dhansak	Chikki
Kulfi	Pulao	Falooda

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Professional Cooking	Wayne Gisselen	John Weily & Sons , N.Y
2	Modern cookery for Teaching and Trade	Thangam E. Philip	Orient Longman Ltd.Mumbai
3	Theory of cookery	Krishna Arora	Frank Bros & Co. Ltd. New Delhi
4	Theory of Catering	Kinton Ceserani	ELBS
5	Practical cookery	Kinton Ceserani	ELBS
6	The book of ingredients	Jane Grigson	Pengiun Books ,England
7	Basic Cookery	Richard Maetland & Derek Welsby	Heinemann Professional
8	Food Commodities	Bernard Davis	Heinemann Professional
9	Food Commodities For Cookery	Lingard & Sizer	Butterworth & Heinemann

SUBJECT CODE:DSC101A					
SUBJECT: BASIC INDIAN FOOD PRODUCTION (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	02

Minimum 20 practicals of Indian menus to be conducted and should include basic rice/ Indian bread meat, vegetable and sweet dishes.

It is recommended that demonstrations be conducted in the initial stages to familiarise the students with the following:

1. Introduction of various tools and their usage.
 2. Familiarization and identification of commonly used ingredients–weights and volume conversion, yield testing.
 3. Basic hygiene practices to be observed in the kitchen.
 4. Safety practices in the kitchen.
 5. Food storage.
 6. Use of knife and cutting techniques, cuts of vegetables.
 7. Pre-preparations, mixing methods.
 8. Basic Cooking methods.
- Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSC102					
SUBJECT: BASIC FOOD & BEVERAGE SERVICE-I (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

To impart comprehensive knowledge and develop technical skills in basic aspects of Food & Beverage operations in the hotel industry.

		Hours	Marks
Chapter 1	The Food & Beverage Industry	06	08
1.1	Introduction to Food & Beverage Industry		
1.2	Classification of Catering Establishments		
1.3	Introduction to Food & Beverage Operations		
Chapter 2	Food & Beverage Service Areas in the Hotel	08	10
2.1	Restaurant , Coffee Shop, Room Service, Bars, Banquets, Snack Bars, Executives lounges,		
2.2	Business Centre & Night Clubs Auxiliary Areas		
Chapter 3	Food & Beverage Service Equipments	06	10
3.1	Types & Usage of Equipments , Furniture, Chinaware, Silverware, Glassware, Linen and Disposables		
3.2	Special Equipments,Care and maintenance of Equipments		
Chapter 4	Food & Beverage Service Personnel	08	12
4.1	Food & Beverage Service Organizations		
4.2	Job Description & Job Specification of Food & Beverage Staff		
4.3	Attitudes & attributes of Food & Beverage service personnel, competencies		
4.4	Basic etiquettes for service staff, Interdepartmental relationship		
Chapter 5	Food & Beverage Service Methods	12	12
5.1	Table Service- Silver / English, Butler / French, Russian, American		
5.2	Self Service , Buffet & Cafeteria		

5.3	Specialized Service- Gueridon , Tray, Trolley, Lounge, Room		
5.4	Single Point Service – Take away, Vending Machine,		
5.5	Food Courts, Bars& Automats		
5.6	Mise-en-place & Mise-en-scene		
Chapter 6	In Room Dining-IRD	08	08
6.1	Introduction		
6.2	Equipments Required for IRD–Trays& Trolleys		
6.3	In Room Dining Procedures-Misen place activities		
6.4	Order Taking for IRD and Execution of IRD order		
6.5	Collecting the order and Carryingit to the Room		
6.6	Other Services		

Glossary of Terms

Popular catering	Mise – en- place	Crumb Down
Fast Food	Deferred Wash	Waiter’s Friend
Take Away	Aboyer	Café Complet
Gastrodome	Bus Boy	Still Set
Gastropubs	Sommelier	Evian
Table Service	Gueridon Service	Still Room
Silver Service	Russian Service	Café Simple
English Service	Americain Service	EPNS
Dummy Waiter	Drive- In	Industrial Catering
Mise –en –scene	Food Court	ODC
Tray Jack	Kiosk	Bistro
Off Board	Drive Through	Brasserie
Hot Plate	Echelon	Self service
Chef d’etage	Carvery	Assited Service
Single Point Service	Transport Catering	Maitre d’hotel
In Situ Service	Welafare Catering	Chef de rang
Debarrasseur	Perrier	Barista
Still Room	EPOS	Polivit
Carte du jour	Tisane	Cover
Demi Chef de Rang	Station	Commis de Rang

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Food & Beverage Service	Denis Lillycrap Cousins	Book Power
2	Modern Restaurant Service	John Fuller	Hutchinson

3	Food & Beverage Service	Sudhir Andrews	Tata McGraw Hill
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SUBJECT CODE: DSC 102 A					
SUBJECT: BASIC FOOD & BEVERAGE SERVICE– I (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	01

1. Restaurant Etiquettes
2. Restaurant Hygiene Practices
3. Mise en place & Mise en scene
4. Identification of Equipments
5. Laying & relaying of tablecloths
6. Napkin Folds
7. Service of Water ,Carrying a salver/ tray
8. Room Service Order taking Procedure, Tray Set-ups
9. Handling service gear
10. Carrying plates, glasses & other Equipments
11. Setting of table d'hôte&A'la carte cover
12. Changing of Ashtray
13. Planning & Writing Indian Menus
14. Laying cover for Indian menu
15. Service of Indian Food & Accompaniments. Clearance following the same
16. Laying the cover for a three course continental menu (Starter, Main Courses, Sweets)

Assignments:

- A minimum of **2 assignments** based on the following topics to be given to individual student and the marks to be considered in internal marks.
- a. Identify various outlets providing different types of service in the city.
 - b. Identify different brands of various F & B service outlets in the city.
 - c. Various F & B equipments with sizes, capacity, picture –in form of Power Point Presentation.
 - d. Making various creative napkin folds.

SUBJECT CODE: DSC103					
SUBJECT : BASIC HOUSEKEEPING OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	02

Rationale

The subject aims to establish the importance of Housekeeping and its role in the hospitality Industry. It prepares the student to acquire basic knowledge and skills necessary for different tasks and aspects of housekeeping

		Hours	Marks
Chapter 1	Introduction to Hotel House Keeping	04	08
1.1	Importance of Housekeeping.		
1.2	Functions of Housekeeping.		
1.3	Areas of House Keeping responsibility		
1.4	Types of Guest Rooms		
1.5	Standard Guest Room amenities & facilities for regular and VIP rooms		
Chapter 2	Layout of House Keeping Department	04	06
2.1	Section of the housekeeping department		
2.2	Layout of Housekeeping Department		
2.3	Functions of each section		
2.4	Maids Service room - Location, Function		
Chapter 3	Organization of House Keeping Department	04	08
3.1	Hierarchy of Large, medium and small hotel's Housekeeping department		
3.2	Attributes of Housekeeping staff		
3.3	Job Description and Job Specification of House Keeping Personnel		
Chapter 4	Cleaning Equipment used in Housekeeping Operations	04	06
4.1	Classification, Use, care & maintenance		
Chapter 5	Cleaning Agents	04	06
5.1	Classification , Use, care and Storage, Distribution & Control		

Chapter 6	Co-ordination of Rooms division with other Departments	02	06
6.1	Departments like Front Office, Engineering, F & B, Kitchen, Security, Purchase, HRD, Accounts		
Chapter 7	Cleaning Routine of Housekeeping Department	04	06
7.1	General principles of cleaning		
7.2	Work routine for Housekeeping department floor supervisors and chamber maids		
7.3	Rules of the floor		
Chapter 8	Cleaning Routine of Guest Rooms	04	08
8.1	Daily cleaning of occupied, departure, vacant, under repair, VIP		
8.2	Evening service & second service procedures		
8.3	Weekly cleaning / periodic cleaning. Spring Cleaning tasks to be carried out		
Chapter 9	Cleaning Routine of Public Areas	02	06
9.1	Areas to be maintained		
9.2	Daily, weekly cleaning procedures for various Public areas such as Lobby/ Lounge, Restaurants, Bar, Banquet Halls, Swimming Pool, Elevators, and staircase and Corridors		

Glossary of Terms

WC	Maid's service room	Cabana
Hollywood room	Lanai	Suite
Interconnecting room	Efficiency room	Pent house
Duplex	Hospitality suite	Murphy bed
U/R	Z -bed	Duvet
King bed	Queen bed	Aerosols
Bidet	Abrasives	Hand caddy
Blade dispenser	Coverlet	Chamois
Buffing	Burnishing	Shams
Crib	Dustette	Dust ruffle
Disinfectants	Drugget	Jewelers' rouge
Dutch wife	Vanity unit	Dust sheet
Shoe mitt	Johnny mop	Tent card
Squeegee	Upholstery	Deodorizers
Lint	Glass cloth	Swab
Wringer mop	Foot fold	Feather brush
Scrim	Orthodox cleaning	Linen chute
Block cleaning	Turndown service	Re-sheeting
Mitring	Damp dusting	Spring cleaning
Second service	Team cleaning	Jacuzzis
Sauna	Powder room	

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management	Sudhir Andrews	Tata McGraw Hill
2	Hotel Housekeeping & Management	G Raghubalan Smritee Raghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	E L B S
4	Accomodation Management	Rosemary Hurst	Heinemann publishing

SUBJECT CODE: DSC 103A					
SUBJECT : BASIC HOUSEKEEPING OPERATIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IAMarks	EAMarks	CA Marks	TotalMarks	Credits
02	40	60	--	100	01

1. Introduction to the Housekeeping department.

- Identifying various sections of the Housekeeping department
- Introduction to the various types of Guest rooms and Public areas in the Hospitality Training centre
- Introduction to Guest room supplies and their placement.

2. Introduction to Cleaning Equipment's and cleaning agents.

- Identification of manual and mechanical cleaning equipment.
- Different parts of equipment.
- Function of cleaning equipments.
- Care and maintenance.
- Introduction to Cleaning Agents as per their classification and function.

3. Cleaning and Polishing of Laminated surfaces.

- Cleaning and polishing of plastic and acrylic surfaces.
- Cleaning and polishing of oil painted surfaces.

4. Polishing of Brass Articles.

- Cleaning and polishing of Brass Ornamental and utility articles.

5. Polishing of Silver articles

- Cleaning and polishing of Silver articles.

6. Cleaning of Glass surfaces

- Cleaning and polishing of window panes.
- Cleaning and polishing of glass counters.

7. Polishing of Wooden surfaces

- Cleaning and polishing of wooden surfaces sand papering and French polishing, Waxpolishing, Mansion polishing
- Cleaning of wooden and metal frames of furniture.

8. Cleaning of different floor finishes

- Cleaning and scrubbing of Kota, Ceramic, Wooden, Stone and Marble floor finishes.

9. Cleaning of different wall finishes

- Cleaning and scrubbing of Kota, Ceramic, Wooden, Stone and Marble wall finishes.

10. Bed making

- Different styles of making a bed- Day bed, Evening bed.
- Cleaning of Guest room- Morning service and Evening service.

11. Daily Cleaning of Guest rooms - Departure, Occupied and Vacant rooms.**12. Weekly Cleaning of Guest rooms.**

- Super Cleaning and scrubbing of various surfaces in a guest room.

13. Daily, Weekly cleaning of Public Areas (Corridors, Restaurant, Administrative Offices, Staircases and Elevators, Exterior areas)

SUBJECT CODE: DSC104					
SUBJECT : BASIC FRONT OFFICE OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	02

Rationale

The subject aims to establish the importance of Front office and its role in the hospitality Industry. It prepares the student to acquire basic knowledge and skills necessary to identify the required standards.

		Hours	Marks
Chapter 1	Introduction To Hospitality Industry	06	10
1.1	Evolution to Hotel Industry		
1.2	Classification of Hotels (Based on various categories like size, location, theme, clientele, length of stay, facilities, ownership)		
Chapter 2	Front office Organisation	06	10
2.1	Introduction to Front office Department		
2.2	Layout of Front office Department		
2.3	Equipment's used in Front office department.		
2.4	Essential Attributes and Qualities of Front Office staff		
2.5	Organizational Chart of Front office department in hotels (Large, Medium, Small)		
2.6	Duties and Responsibilities of Front office staff		
Chapter 3	Room Rates & Tariff	06	12
3.1	Types of Guests		
3.2	Types of room		
3.3	Room Tariff (factors affecting room Tariff, Establishing the end of the day)		
3.4	Types of Rates		
3.5	Types of Meal Plans		
3.6	Basis of charging Tariff		
Chapter 4	Bell Desk & Concierge	04	10
4.1	Procedure for Guest Arrival & Departure		

4.2	Procedure for Left luggage & Scanty Baggage		
4.3	Paging & Luggage Handling		
4.4	Other Duties of Bell desk staff		
4.5	Valet service		
Chapter 5	Guest Cycle and Room Reservations	08	12
5.1	Guest Cycle		
5.2	Modes and Sources of reservation		
5.3	Importance of reservation		
5.4	Procedure for taking reservation		
5.5	Records used in reservation		
5.6	Types of reservation		
5.7	Computerized reservation system		
5.8	Overbooking		
Chapter 6	Interdepartmental communication	02	06
6.1	Coordination of Front office department with other departments (Housekeeping, Food and Beverage department, Sales and Marketing department Engineering and Maintenance department, Security department , Accounts department, Human Resource department)		

Glossary of Terms

Resort	Motel	Transit hotel
Convention hotel	Timeshare hotel	Casino hotel
Boutique hotel	Heritage hotel	Budget hotel
American Plan	Modified American Plan	Continental Plan
Bermuda Plan	Go plan	Walk in
Check in	Checkout	Walkout
No show	Overstay	Under stay
Crib rate	Corporate rate	CVGR
Rack rate	Day rate	GDS
CRS	Amendment	Guaranteed booking
Confirmed reservation	GIT	SB
Concierge	Waitlist	PBX
Paging	Retention charge	Sleep out
NB	Left luggage	Studio
PABX	EPABX	Valet
Skipper	Quad room	

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel Front Office Operations & Management	Sudhir Andrews.	Tata McGraw Hill
2	Check-in Check -out	Jerome Vallen	WM.C Brown IOWA
3	Principles of Hotel Front Office Operations	Sue Baker,P.Bradley, J.Huyton	Continuum
4	Hotel Front Office	Bruce Graham Stanley	Thornes
5	Managing Front Office operations	Michael KasavannaRichard Brooks Charles Steadmon	AH&LA,
6	Front Office Procedures & Management	Peter Abott.& Sue Lewry	Butterworth & Heinemann
7	Front Office operations	Colin Dix, Chris Baird	Pearson
8	Front Office Operations and Administration	Dennis foster	Glencoe.

SUBJECT CODE: DSC 104 A					
SUBJECT : BASIC FRONT OFFICE OPERATIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
02	40	60	--	100	01

1. Telephone Etiquettes and mannerisms

Role play of situations pertaining to Telephone handling

2. Handling guest mail

Role play of situations pertaining to handling guest mails (in-house, expected and checked out guests)

3. Handling guest messages

Role play of situations pertaining to handling guest message (Telephonic, In Person)

4. Situations on basis of charging Room tariff

5. Handling Arrival and Departure procedure at bell desk

6. Handling Scanty baggage and Left luggage procedure at bell desk

7. Handling Guest enquires and providing information

8. Procedure for receiving reservations

Procedure for determining room availability using conventional charts

9. Procedure for receiving reservations

Procedure for determining room availability using software

10. Procedure for receiving reservations

Procedure for Amendments & Cancellation

11. Handling guest who are blacklisted

ASSIGNMENTS

- Country, Capital, Currencies & Airlines
- India – States and Capitals
- 10 Tourist destination of Maharashtra
- 10 Tourist destination of India
- Metro cities information (Location, Shopping, Facilities, Restaurants, Places of interest, Historical Monuments)
- Information on National and International chain of Hotels

Presentation on assignments with the use of audio visual aids

SUBJECT CODE: AEC 101					
SUBJECT : FOOD COMMODITIES (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	20	30	--	50	02

Rationale

This subject intends to develop help students to develop an understanding into ingredients used in the kitchen, their types, uses, and storage.

		Hours	Marks
Chapter 1	Vegetables and Fruits	04	04
1.1	Classification and Uses		
1.2	Purchasing and Storage		
Chapter 2	Cereals and Pulses	04	04
2.1	Wheat – Composition and Structure, Flour Milling and Types of Flours		
2.2	Rice – Types of Rice and Rice Products		
2.3	Introduction to maize, barley and oats		
2.4	Pulses – Types, method of sprouting and cooking		
Chapter 3	Fats and Oils	03	03
3.1	Sources and Properties		
3.2	Manufacture and Uses		
3.3	Rendering of fats		
3.4	Rancidity in fats and oils		
Chapter 4	Sugar	03	03
4.1	Sources		
4.2	Types		
4.3	Functions		
4.4	Storage		
Chapter 5	Raising Agents	02	02
5.1	Definition		
5.2	Principle		
5.3	Classification		
Chapter 6	Herbs, Spices and Condiments	03	02
6.1	Functions and Storage		
6.2	Difference between Herbs and Spices		
6.3	Condiments		
Chapter 7	Colours and Flavours, Gels and Gelling Agents, Preserves	03	02
7.1	Colours – Forms, Instructions for use		

7.2	Flavours – Types		
7.3	Examples of commonly used colours, flavours and essences		
7.4	Classification, Types and Uses of Edible gums		
7.5	Preserves – Types		
Chapter 8	Milk	03	03
8.1	Composition		
8.2	Types		
8.3	Uses and Storage		
Chapter 9	Cheese	04	03
9.1	Classification		
9.2	Manufacturing of Cheddar Cheese		
9.3	Uses, Purchasing and Storage of Cheese		
Chapter 10	Butter, Cream and Yoghurt	03	04
10.1	Butter – Manufacturing, Types and Uses		
10.2	Cream – Types and Uses		
10.3	Yoghurt – Types and Uses		

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Food Commodities	Bernard Davis	Heinemann Professional
2	Food Commodities For Cookery	Lingard & Sizer	Butterworth & Heinemann
3	The Book of Ingredients	Jane Grigson	Pengiu Books ,England

SUBJECT CODE: LEE101					
SUBJECT : BUSINESS COMMUNICATION (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	02

Rationale

To introduce students to the communication and presentation skills needed by hospitality professional

		Hours	Marks
Chapter 1	The Communication Process	06	15
1.1	Definition and importance of communication.		
1.2	Elements of communication/process of communication		
1.3	Formal and informal communication-		
1.4	Types of communication– Flow of communication (vertical, horizontal, lateral),		
1.5	Barriers to effective communication		
1.6	How to overcome communication barriers		
Chapter 2	Oral communication	04	10
2.1	Advantages and disadvantages		
2.2	Articulation and delivery		
2.3	Making speeches and presentations		
2.4	Telephone etiquettes		
2.5	Standard phrases used in hotels and restaurants.		
Chapter 3	Written communication	14	35
3.1	Advantages & disadvantages		
3.2	Letter of enquiry, Letter of complaint, Letter of apology, Letter of order, Letter of application Accompanied by bio-data, Letter of resignation, Letter of collection & sales		
3.3	Writing a logbook		
3.4	Paragraph structure		
3.5	Report writing (incidents, visits)		
3.6	Memos, notices, circulars		
3.7	Notes Making		

REFERENCE BOOKS

Sr.No	Name of the Book	Author	Publisher
1	TechnicalCommunication Principlesand Practice	MeenakshiRamanan, Sangeeta Sharma	Oxford University Press
2	Technicalcommunication	Urmila Rai & S.M Rai,	Himalaya Publication
3	Essentials of Technical Communication	Sunil Gokhale	Himalaya Publication
4	EnglishGrammar & Composition	Wren & Martin	Orient Longman

SUBJECTCODE:LEE 101A**SUBJECT:BUSINESS COMMUNICATION(PRACTICAL)**

Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	--	50	02

1. Self introduction.
2. Extempore on various topics
3. Presentations on various topics
4. Group Discussion.
5. Telephone etiquettes and handling telephones.
6. Practice of Standard phrases used in hotels and restaurants
7. Preparation for interviews.
8. Importance of Bodylanguage informal situations
9. Conduct of Meeting/briefing
10. Preparing Reports-Visit/incident
11. Presentation of Reports.
12. Formal Speeches
13. Reading
14. Vocabulary development
15. Debate
16. Book reading and Discussion

SUBJECT CODE: LEE 102					
SUBJECT: BASIC FRENCH (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	02

Rationale

To introduce basic knowledge of French language to the students of Hotel management

		Hours	Marks
Chapter1	INTRODUCTION	10	12
1.1	Alphabet		
1.2	Accents		
1.3	Articles:Definite,Indefinite,		
1.4	Partitive and contracted articles		
1.5	Subject Pronouns		
1.6	Basic greetings		
1.7	Vocabulary related to classroom		
1.8	Cardinal Numbers (0-100) & Ordinal Numbers		
1.9	Time,days of a week, months		
	Vocabulary related to seasons, weather		
Chapter2	Conjugation– PresentTense	08	08
2.1	Conjugation of verbs être and avoir		
2.2	Conjugation of first regular group '-er'(Ex.Parleretc)		
2.3	Conjugation of second regular group '-ir'(Ex.firir)		
2.4	Conjugation of third regular group '-re'(ex.attendre)		
2.5	Conjugation of third regular group'oir'(ex.Vouloir)		
Chapter3	Grammar	06	12
3.1	Adjectives : Qualifying, Demonstrative, Possessive		
3.2	Preposition		
3.3	Plural		
3.4	Masculine and Feminine		
3.5	Negations		
3.6	Pronouns:Subject, object ,en, y, reflexive		

Chapter4	Personal Life	03	10
4.1	Self Introduction		
4.2	Vocabulary related to family		
4.3	Hobbies,daily routine		
Chapter5	At work	01	08
5.1	Professions		
5.2	Vocabulary related to professions		
Chapter 6	Translation	04	10
6.1	English to French		
6.2	French to English		

REFERENCEBOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Basic French for Hotel Industry	Vaishali Mankikar	Continental, Prakashan, Pune
2	Basic French course for the Hotel Industry	Catherine Lobo, Sonali Jadhav	Tanay Enterprises, Pune

SUBJECT CODE: LEE 102A					
SUBJECT: BASIC FRENCH (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	--	50	02

1. Alphabets
2. Basic greetings
3. Numbers
4. Days of the week, Date, Months
5. Vocabulary related to Classroom
6. Question & Answers related to classroom
7. Time– Clock, Questions and Answers related to time
8. Seasons and weather
9. Question & Answers related to seasons and weather
10. Vocabulary related Professions
11. Questions & Answers related to professions
12. Vocabulary related to family
13. Questions & Answers related to family
14. Vocabulary related to hobbies and daily routine
15. Questions & Answers related to hobbies and daily routine
16. Self Introduction

SEMESTER II

SUBJECT CODE: DSC 201					
SUBJECT : BASIC CONTINENTAL FOOD PRODUCTION (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale:

This subject intends to develop knowledge of stocks, soups, sauces, egg and fish cookery, salads and potato preparations and its application in continental cooking.

		Hours	Marks
Chapter 1	Stocks , Essences and Glazes	06	06
1.1	Definition of stock		
1.2	Ingredients used in stock making		
1.3	Care and rules of stock making		
1.4	Recipes of one litre of various stocks. (White stock, Brown stock, Fish stock and Vegetable stock)		
1.5	Storage of Stocks.		
1.6	Essences, Glazes & Convenience bases.		
Chapter 2	Soups	06	08
2.1	Classification of Soup with 5 examples each (Consommé, Cream, Puree, Broths, Chowder, Veloute, Bisque, National Soup)		
2.2	Consommé- Definition, Ingredients, Clarification, Recipe for one litre and five variations.		
2.3	Garnishes and Accompaniments for Soups & Consommés.		
Chapter 3	Sauces	08	10
3.1	Definition of Sauces. Structure & Functions of Sauces.		
3.2	Thickening agents – Roux: preparation and types, Beurre Manie, White Wash, Cornstarch, Arrowroot, Waxymaize, Instant Starches, Liaison.		
3.3	Classification of sauces.		
3.4	Recipes of Mother sauces – 1 litre&five derivatives of each sauce.		
3.5	Butter sauces – types		
3.6	Dessert sauces – types. Miscellaneous sauces.		
Chapter 4	Textures	03	04

4.1	Definition and Characteristics		
4.2	Types – Desirable and Undesirable		
Chapter 5	Eggs	06	08
5.1	Composition, Structure & Selection		
5.2	Uses in cookery		
5.3	General cooking principles - Effect of heat, acid, salt & sugar		
5.4	Cooking eggs – boiling, poaching, frying , shirred eggs, scrambled eggs, omelets, soufflés		
5.5	Types and Storage		
Chapter 6	Fish	06	08
6.1	Classification of fish with examples & characteristics.		
6.2	Selection of fish & shellfish		
6.3	Cuts of fish.		
6.4	Cooking of fish.		
6.5	Handling & Storage of fish		
6.6	Local equivalents of fish varieties.		
Chapter 7	Salads	04	06
7.1	Definition of salad, Classification and structure of salad		
7.2	Rules for salad making		
7.3	Salad dressings – Definition, Ingredients used for salad dressing, Types of salad dressings		
7.4	Different types of Salad – Caesar Waldorf Nicoise Russian Cole slaw Tossed Florida German Japonaise Mimosa Raphael Andalouse Eve		
Chapter 8	Potatoes and other starches	03	06
8.1	Various styles of potato preparations: Parsley Potato Potato Lyonnaise Potato Marquise Potato Duchesse French Fries Fried Potato Dauphinois Potato Potato Croquettes Potato Lorette Anna Potato Macairepotato Potato Brioche Chester Potato Hashed Brown Jacket Baked		
8.2	Cooking Rice. - Boiling & steaming, Reheating.		
8.3	Pasta – Varieties and Cooking of Pasta.		

Chapter 9	Culinary Terms			06	04
9.1	Bain Marie	Appetizer	Baste		
	Blend	Blanched	Bouquet garni		
	Caramel	Bouillon	Garniture		
	Consommé	Dough	Estouffade		
	Court Bouillon	Cutlet	Garnish		
	Beurre Manie	Fumet	Glaze		
	Concasse	Liason	Mire Poix		
	Hors d'œuvre	Julienne	Knead		
	Mis – en- Place	Marinate	Matignon		
	Paysanne	Paner	Parboil		
	Poach	Puree	Sabayon		
	Ragout	Potage	Roux		
	Simmer	Royale	Stew		
	Infusion	Au gratin	Sear		
	Bisque	Macedione	Zest		
	Fricasse	Pare	Souffle		
	Barbeque	Croutons	Printaniere		
	Beurre Noir	Espagnole	Brunoise		
	Maitre – d- hotel butter				

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Professional Cooking	Wayne Gisselen	John Weily& Sons , N.Y
2	Modern cookery for Teaching and Trade	Thangam E. Philip	Orient Longman Ltd.Mumbai
3	Theory of cookery	Krishna Arora	Frank Bros & Co. Ltd. New Delhi
4	Theory of Catering	KintonCeserani	ELBS
5	Practical cookery	KintonCeserani	ELBS
6	The book of ingredients	Jane Grigson	Pengiuin Books ,England
7	Basic Cookery	Richard Maetland& Derek Welsby	Heinemann Professional
8	Food Commodities	Bernard Davis	Heinemann Professional
9	Food Commodities For Cookery	Lingard & Sizer	Butterworth & Heinemann

SUBJECT CODE: DSC 201A					
SUBJECT : BASIC CONTINENTAL FOOD PRODUCTION (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	02

Minimum 20 practicals of Continental menus to be conducted and should include the following : basic soups, sauces, egg preparations, fish preparations, stews, vegetables, potatoes, salads, basic custard, puddings and mousses.

- Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSC 202					
SUBJECT: BASIC FOOD & BEVERAGE SERVICE II (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

This subject aims to provide fundamental knowledge of Food & Beverage Menus with purpose to apply knowledge & skills required to provide immense services to the guest.

		Hours	Marks
Chapter 1	The Service Sequence	10	12
1.1	Taking Bookings		
1.2	Preparation for service		
1.3	Methods of Order Taking		
1.4	Types of KOT, BOT		
1.5	Service of Food & Beverage		
1.6	Clearing Following Services		
1.7	Billing Methods, dealing with discrepancies		
1.8	Feedback system		
Chapter 2	Types of Meals	10	14
2.1	Breakfast- Types & Service methods		
2.2	Brunch		
2.3	Lunch		
2.4	Afternoon Teas, High Tea		
2.5	Dinner		
2.6	Supper		
Chapter 3	Menu Knowledge	12	14
3.1	Introduction		
3.2	Menu Types – Table d’ hote & A ’la carte’ menu		
3.3	Menu Planning, Considerations & Constraints		
3.4	Menu Terms		
3.5	French Classical Menu		
3.6	Classical Foods, Accompaniments , cover & service		
Chapter 4	Control Methods	06	08
4.1	Necessity & Functions of Control System		
4.2	Objectives of Control System		

4.3	Flow chart of F&B system		
4.4	Purpose of Revenue control system		
Chapter 5	Non Alcoholic Beverages	10	12
5.1	Classification		
5.2	Hot Beverages-Types, Production, Service		
5.3	Cold Beverages-Types, Production, Service		

Glossary of Terms

Gueridon Service	Single Point Service	Debarrasseur
Trancheur	Chef d'etage	Chef de sale
Sommelier	Mixologist	Barista
Bus Boy	Hot Plate	Still Room
Aboyer	Off Board	EPOS
Deffered Wash	Tray Jack	Plat du jour
Mise – en- place	Mise –en –scene	Carte du jour
Crumb Down	Dumb Waiter	Tisane
Waiters Friend	EPNS	Cover
BOT	KOT	Accompaniments

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Food & Beverage Service	Denis Lillicrap, Cousins	Book Power
2	Modern Restaurant Service	John Fuller	Hutchinson
3	Food & Beverage Service- Training Manual	Sudhir Andrews	Tata McGraw Hill
4	The Restaurant (from Concept to operation)	John Walker Donald Lundberg	John Wiley & Sons

SUBJECT CODE: DSC 202A					
SUBJECT: BASIC FOOD & BEVERAGE SERVICE– II (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	01

- 1 Mise- en- place & Mise –en- scene
- 2 Taking an Order for meal and writing KOT
- 3 Sequence of Service (Clearing , Crumbing & service of coffee and presenting the bill)
- 4 Restaurant Reservation System
- 5 Breakfast Menu Planning, Cover Layup & Service : Continental, American Breakfast
- 6 Service of non alcoholic beverages
- 7 Breakfast Menu Planning, Cover Layup & Service : Full English Breakfast
- 8 Menu Planning, Cover Layup & Service: Full Afternoon Tea & High Tea
- 9 Menu Planning, Cover Layup & Service: Brunch & Supper
- 10 Menu Planning, Cover Layup & Service:17 Course French Classical menu
- 11 Menu Planning, Cover Layup & Service: Hor-d’oeuvres, Potage, Oeuf, Farineaux
- 12 Menu Planning, Cover Layup & Service: Poisson, Entree´ , Sorbet, Releve´ , Roti, Legume, Salade
- 13 Menu Planning, Cover Layup & Service: Buffetfroid, Entremets, Savoureux, Fromage, Dessert
- 14 Menu Planning, Cover Layup & Service:5-7 Course French Classical Menu
- 15 Menu Planning, Cover Layup & Service:3- 4 Course French Classical menu
- 16 Menu Planning, Cover Layup & Service: Indian Lunch & Dinner Menu

Assignments

Minimum of **2 Assignments** based on the following topics to be given to individual student and the marks to be considered in internal marks.

1. Collect Menus of Fine Dining Restaurants, QSR, 5 Star Hotel, Coffee Shop
2. Prepare a chart of food and accompaniments for French and Indian menu.
3. Prepare one menu each of Fixed, Cyclic for Cafeteria.

SUBJECT CODE: DSC 203					
SUBJECT : MANAGING HOUSEKEEPING OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	02

Rationale

The subject aims to establish the importance of House keeping and their role in the Hospitality Industry. It also prepares the student to acquire basic knowledge and skills necessary for different tasks and aspects of housekeeping.

		Hours	Marks
Chapter 1	Housekeeping Supervision	04	08
1.1	Importance of supervision		
1.2	Checklist for inspection		
1.3	Dirty Dozen		
Chapter 2	Control Desk	06	12
2.1	Importance and functions of Control Desk		
2.2	Records maintained		
2.3	Key Control- Computerized keys, Manual keys,		
2.4	Key Control Procedures		
2.5	Lost & Found Procedures- Procedure for Guest articles Procedure for lost Hotel Property, Records maintained		
Chapter 3	Linen, Uniform Room & sewing room	08	14
3.1	Layout of Linen Room		
3.2	Classification and sizes of Linen		
3.3	Calculation of Linen requirement		
3.4	Discard management		
3.5	Issue & exchange of uniforms		
3.6	Activities & Equipments in sewing room		
Chapter 4	Textiles	06	12
4.1	Classification of fibers with examples		
4.2	Characteristics and uses of fabrics used in Hotel Industry		
Chapter 5	Laundry Management	08	14
5.1	In - house laundry v/s Contract Laundry- Merits & Demerits		
5.2	Layout, Equipment's & Agents		
5.3	Laundry procedure : Guest, House		
5.4	Stains and Stain removal		
5.5	Dry-cleaning - Agents and procedures		

Glossary of Terms

Dirty dozen	Tarnish	Guestroom inspection
Inspection checklist	Log book	Vanity unit
Vestibule	White ragging	Gate pass
Scheduled Maintenance	Antichlor	Calender
Contingency plan	Cutting down	Damask
Laundromats	Linen	OPL
Light linen	Linen Par	Sizing
Seersucker	Selvedge	Suds
Soft furnishing	Stock taking	Thread count
Tensile strength	Togs	Gaberdine
Drill	Dungarees	Seams
Toque	Darning	Dry cleaning
Shirring	Thimbles	Selvedge
Weft	Warp	Flannelette
Thread count	Flax	Napery
Mercerization	Saniforization	Seersucker
Napping	Pile weave	Sericulture
Yarn	Spining	Bleach
Felt	Weighting	Absorbents
Hydro extractor	Tumble dryer	Flat bed press
Suzie	Discard/ Condemned linen	

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management	Sudhir Andrews	Tata Mc Graw Hill
2	Hotel Housekeeping & Management	G Raghubalan, Smritee Raghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	E L B S
4	Accommodation Management	Rosemary Hurst	Heinemann publishing
5	Accommodation Management	Rosemary Hurst	Heinemann publishing

SUBJECT : MANAGING HOUSEKEEPING OPERATIONS (PRACTICAL)

Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	01

- 1. Using a Room and public area inspection checklist**
- 2. Various forms, formats maintained at control desk**
- 3. Linen Room inventory**
- 4. Monogramming**
Monogramming of linen and uniforms using chain stitch and satin stitch
- 5. Mending**
Mending of torn linen and repair of uniforms- Button and hook stitching.
- 6. Identification and construction of weaves**
Plain weave
Basket weave
Figured weave
Pile weave
- 7. Identification and construction of weaves**
Satin weave
Twill weave
Sateen weave
- 8. Stain Removal**
Identification, classification and stain removal procedures for-
Animal, vegetable, mineral, metalloid.
- 9. Stain Removal**
Identification, classification and stain removal procedures for acidic, alkaline,
pigments and miscellaneous stains.
- 10. Laundering Procedure**
Prewashing, washing, rinsing
Starching
Blueing
- 11. Laundering Procedure**
Washing, ironing of cotton, silk and synthetic fabrics.

ASSIGNMENTS

- Fabrics used in Hotel Industry (Samples to be collected)
Presentation on assignments with the use of audio visual aids.

SUBJECT CODE: DSC 204					
SUBJECT :MANAGING FRONT OFFICE OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	02

Rationale

The subject aims to establish the importance of Front office and their role in the Hospitality Industry. It also prepares the student to acquire basic knowledge and skills necessary for different tasks and aspects related to arrival and Departure.

		Hours	Marks
Chapter 1	Pre- arrival Procedure	02	08
1.1	Pre Arrival activities- Preparing an arrival list		
1.2	Pre Arrival Procedure for FIT/FFIT, VIP		
1.3	Pre Arrival Procedure for group arrival (Special arrangements, meal coupons etc.)		
Chapter 2	Arrival procedures for various categories	08	12
2.1	Types of Registration & its importance		
2.2	Procedure for Arrival for FIT / FFIT/ Walk-in		
2.3	Procedure for Arrival for VIP		
2.4	Procedure for Arrival for Group		
2.5	Dealing with overbooking situations and walking a guest		
Chapter 3	Procedures at Front Desk	06	10
3.1	Room change Procedure		
3.2	Safe deposit lockers		
3.3	Handling Guest Complaints		
3.4	Dealing with Emergencies,Medical,Theft, Fire, Bomb threat, Robbery, Terrorist attacks		
Chapter 4	Guest Departure	06	10
4.1	Summary of Front office Duties at checkout		
4.2	Tasks performed at Bell Desk, Cashier & Reception.		
4.3	Late checkout & Late charge		
4.4	Express checkout		
4.5	Departure Notification		

4.6	Soliciting guest comments		
4.7	Creating a good lasting Impression		
4.8	Onward & Future Reservations		
4.9	Updating Front Office Records		
Chapter 5	Methods of Payment	08	12
5.1	Handling Cash, Credit Cards		
5.2	Handling Foreign Currency, Travellers Cheques , Bills to company, Travel Agent		
5.3	Foreign Currency Regulations pertaining to payment of bills		
Chapter 6	Guest Relations	02	08
6.1	Hospitality Desk - Its Functions & role		
6.2	Standard Operating Procedures at Hospitality Desk		

Glossary of Terms

Float	FIT	FEEC
Overbooking	Voucher	Allowances
C Form	VPO	Cut off time
Guest folio	House limit	Floor limit
Late charge	Late checkout charge	Petty cash
Posting	Transient guest	Cancellation bulletin
Sold out	House guest	Blacklist
Double occupancy	Departure	Crew
House count	No show	GRC
Room rack	Sleep out	Stay over
Under stay	Walk in	Walking a guest
Cut off time	Check out	Retention charge

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Hotel Front Office Operations & Management	Sudhir Andrews.	Tata Mc Graw Hill
2	Check-in Check –out	Jerome Vallen	WM.C Brown IOWA
3	Principles of Hotel Front Office Operations	Sue Baker, P. Bradley J. Huyton	Continuum
4	Hotel Front Office	Bruce Graham Stanley	Thornes
5	Managing Front Office operations	Michael Kasavanna Richard Brooks Charles Steadmon	AH & LA
6	Front Office Procedures & Management	Peter Abott.& Sue Lewry	Butterworth & Heinemann
7	Front Office operations	Colin Dix, Chris Baird	Pearson
8	Front Office Operations and administration	Dennis foster	Glencoe

SUBJECT CODE: DSC 204 A					
SUBJECT : MANAGING FRONT OFFICE OPERATIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	01

1. Procedure for check-in walk in guests.

Role play of situations pertaining to arrival and receiving of walk-in guests.

2. Procedure for check-in of reserved guests.

Role play of situations pertaining to arrival and receiving of guests with confirmed reservations.

3. Procedure for check-in of foreigners.

Role play of situations pertaining to arrival and receiving of foreign guests.

4. Procedure for Group Check-in

Role play of situations pertaining to Pre-arrival, arrival and receiving of groups.

5. Procedure for VIP Check-in

Role play of situations pertaining to Pre-arrival, arrival and receiving of VIP guests.

6. Handling overbooked situations and walking a guest

Role play of situations pertaining to overbooking and walking a guest.

7. Procedure for room change

Role play of situations pertaining to guests request for a room change.

8. Procedure for checking out a guest

Role play of situations pertaining to checking out of a guest.

9. Procedure for accepting various forms of settlements

Role play of situations pertaining to settlement by Cash.

Role play of situations pertaining to settlement by credit card.

10. Procedure for accepting various forms of settlements

Role play of situations pertaining to settlement by BTC.

Role play of situations pertaining to settlement by Travel agent.

Role play of situations pertaining to settlement by Travellers'cheque.

11. .Procedure for accepting various forms of settlements

Role play of situations pertaining to settlement by foreign currency

12. The Hospitality desk

Role play of situations pertaining to complaint handling at hospitality desk.

13. Standard operating Procedure at front desk

Role play of situations pertaining to SOP's to be followed during reservation, occupancy and checkout.

ASSIGNMENTS

1. Metro cities information (Location, Shopping, Facilities, Restaurants, Places of interest, Historical Monuments)
2. Information on National and International chain of Hotels
3. Collection of brochures and tariff card of different types of Hotel.

Presentation on assignments with the use of audio visual aids.

SUBJECT CODE:SEC 101					
SUBJECT : PERSONALITY SKILLS FOR HOPITALITY INDUSTRY					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CAMarks	Total Marks	Credits
03	40	60	--	100	03

Rationale

The subject is designed to make students understand the concept and components of personality, thereby to apply the acquired knowledge towards achieving excellence in their respective academic careers.

		Hours	Marks
Chapter 1	Introduction to Personality Development	02	02
Chapter 2	Communication Skills	06	08
2.1	Modes of communication		
2.2	Verbal and Non-verbal communication		
2.3	Professional presentations(Types, Use of A/V aids)		
Chapter 3	Impression Management	06	06
3.1	Importance of Physical Appearance and Grooming (presentable and attractive appearance, dressing, make up, poise and posture)		
3.2	Importance of Physical Fitness		
3.3	Body Language-Kinesics,Haptics,Vocalics ,Proxemicsand Chronemics		
Chapter 4	Personality profile and Self development	06	12
4.1	Elements of Personality		
4.2	Determinants of Personality		
4.3	Personal goal setting and action plan		
4.4	Areas of self development		
4.5	Self Analysis (Self esteem, Motivation, Attitude)		
4.6	SWOT Analysis- Concept		
Chapter 5	Time Management	04	04
5.1	Time Planning		
5.2	Time Quadrant model		
5.3	Time Wasters and Robbers		

Chapter 6	Emotions	04	06
6.1	What are emotions?		
6.2	Emotions and Personality		
6.3	Emotional Stability		
6.4	Emotional Maturity		
6.5	Emotional Intelligence		
Chapter 7	Ethics	04	06
7.1	Introduction to Ethics and Values		
7.2	Code of ethics		
7.3	Ethics and positive human relationship		
7.4	Function of values		
7.5	Set of values for harmonious life		
Chapter 8	Skill development for personality enrichment	08	08
8.1	Identifying general and specific skills		
8.2	Human Skills		
8.3	Cognitive Skills		
8.4	Technical Skills		
8.5	Listening Skills		
8.6	Practical Skills		
Chapter 9	Stress Management	04	04
9.1	Introduction		
9.2	Management Strategies		
9.3	Stress Managers		
9.4	Stress Control		
Chapter10	Frustration	04	04
10.1	Introduction		
10.2	Causes of frustration		
10.3	Effects of frustration		
10.4	Solutions for avoiding frustration		

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Development of Generic Skills-I	K Sudesh	Nandu printers and publications
2	Development of Generic Skills-II	K Sudesh	Nandu printers and publications
3	Development of Generic Skills	M K MALKE	Central techno Publication
4	Basic Managerial skills for all Human learning	E H Mcgrath	Prentice Hall, India

SUBJECT CODE: SEC 101 A					
SUBJECT : PERSONALITY SKILLS FOR HOSPITALITY INDUSTRY (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	--	50	02

1. Development of proficiency in English

Practice on spoken communication skills and testing voice and accent, voice clarity, voice modulation and intonation.

2. Personal Introduction

Developing an Understanding of Social Etiquettes.

3. Business manners and etiquettes

To understand presenting oneself with finesse.

4. Debate

To understand subject knowledge, oral and leadership skills.

5. Group Discussion

To understand subject knowledge, oral and leadership skills.

6. Extempore

To understand subject knowledge, oral and leadership skills.

7. Body Language

Study of different pictorial expression of nonverbal communications and its analysis.

8. SWOT Analysis

- Self evaluation.
- Self discipline
- Recognition of one's own limits and deficiencies.
- Self Awareness.

9. Presentation skills

To understand Preparing and delivery of presentation.

10. Time Management techniques

To understand Time Quadrant model and its use.

11. Stress management techniques

To identify factors that causes stress though questionnaire/games.

12. Listening skills

To improve note making and listening skills.

13. Organizing a seminar

14. Guest lectures of hospitality professionals.

15. Field visits

Field visits to various sectors of the hospitality industry as a learning experience for students.

16. Report writing on guest lectures and field visits

Assignment

1. Make a SWOT Analysis to identify your strength, weaknesses, opportunity and threats
2. Identify your areas of self development and plan a strategy to improve.
3. Identify qualities, traits of a eminent admired personality
4. Prepare a tree of life to understand personality determinants
5. Identify your values and prepare a code of ethics for yourself
6. Presentation on your role model in hospitality industry

SEMESTER– III

SUBJECT CODE:DSC 301					
SUBJECT:QUANTITY FOOD PRODUCTION & BASIC BAKING (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Rationale:

This subject intends to develop knowledge & skills required for catering with emphasis on operational techniques practiced in quantity food production which will help students to produce quality food products in a large quantity. It also provides a detailed understanding of meat cookery.

		Hours	Marks
Chapter 1	Quantity Food Equipments	06	06
1.1	Selection criteria		
1.2	Classification, Use, Care & Maintenance Of following equipments: Cooking Equipments – range, oven, salamander, grill, griddle, rotisserie, deefryer, tilting pan, steam jacket kettle, tandoor, steam cooker. Processing equipments-Mixer, food cutter, Food Processor, food grinder, potato peeler. Holding & storage equipments-Steam table,bain marie, Over head infrared lamp, refrigerator, walk in cooler, deep freeze		
Chapter 2	Introduction to Catering Industry	06	08
2.1	Types of catering establishmens		
2.2	Commercial catering- Hotels & Resturants		
2.3	Institutional catering- Hospital, School, College		
2.4	Industrial catering- importance,types of management & functioning		
2.5	Transport catering- Air, Sea, Railway		
2.6	Outdoor catering		
Chapter 3	Kitchen Layout	06	06
3.1	Factors to be considered when planning a kitchen		
3.2	General layout of quantity kitchen- institutional kitchen, industrial kitchen, Flight, Kitchen, Five star deluxe hotel kitchen.		
Chapter 4	Menu Planning	06	08
4.1	Types of menu		

4.2	Principles of menu planning		
4.3	Planning of menus for various catering establishment		
Chapter 5	Food & Nutrition	04	04
5.1	Food Pyramid- Importance of balanced diet		
5.2	Points to be considered while preparing healthful meals		
Chapter 6	Elements of Costing	08	06
6.1	Objectives of Food cost Control		
6.2	Understanding Material cost, Labour cost, Overheads, Total cost.		
6.3	Food Cost calculation: Gross Profit, Net Margin, Net Profit.		
Chapter 7	Ingredients Used in Bakery	04	08
7.1	Flour- Functions		
7.2	Sugars- Functions		
7.3	Fats-Types, Functions		
7.4	Milk& milk products- Functions, guideline for usage		
7.5	Eggs- Functions, guidelines for usage		
7.6	Leavening agents- - Functions, guideline for usage		
7.7	Fruits and nuts-Types, Functions		
7.8	Salt-Functions, guidelines for usage		
7.9	Spices & Flavouring- Types, Functions.		
7.10	Chocolate & Cocoa- Types, Functions, guideline for usage		
Chapter 8	Basic Principles of Baking	08	14
8.1	Formulas and Measurements- Baker's Percentage		
8.2	Baking process		
8.3	Steps in bread making		
8.4	Make up methods of cookies- Rolled, Dropped, Moulded, Bagged and Ice box		
8.5	Cake making Methods- Sugar Batter, Flour Batter, Boiling, Sugar water, All in one		
8.6	Faults – Bread, Cake and cookies		

REFERENCE BOOKS

1	Modern Cookery for Teaching & Trade. Volume I	Thangam E. Philip	Orient Longman Ltd. Mumbai
2	Food Commodities	Bernard Davis	William Heinmen Ltd. London
3	Prasad Cooking with Indian Masters	J. Indersingh & Pradeep Das Gupta	Allied Publishers Ltd., New Delhi
4	Introduction to Catering Management	John fuller	John Wiley & Sons N.Y
5	Theory of Catering	Kinton Ceserani	ELBS
6	Food & Beverage Management	Bernard Davis, Shally Stone	William Heinmen Ltd. London
7	Theory of Cookery	Krishna Arora	Frank Bros & Co. Ltd. New Delhi
8	Practical Cookery	Kinton Ceserani	ELBS
9	Menu Planning	John Kivela	Hospitality Press
10	Food and Beverage Controls	Richard Kotas & Davis Bernard	International, Text Book Co. Ltd, Glasgow
11	Food & Beverage Costing	Jagmohan Negi	Himalaya Publishing
12	Basic Baking	S.C.Dubey	The Society of Indian Bakers
13	Understanding Baking	Joseph Amendola & Donald Lundberg	John Wiley & Sons, N.Y
14	Professional Baking	Wayne Gisselen	John Wiley & Sons, N.Y

SUBJECT CODE:DSC 301 A					
SUBJECT:QUANTITY FOOD PRODUCTION & BASIC BAKING (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	-	100	04

- Minimum 10 menus to be conducted in Quantity Kitchen.
Menus should comprise of 08 Indian menus for Industrial and Institutional purpose and 02 snacks menus.
- Minimum 10 Bakery practicals to be conducted and should include atleast 10 varieties of Bread, 10 varieties of cookies and also introduce them to basic cake making.
- Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSC 302					
SUBJECT:INTRODUCTION TO BEVERAGE SERVICE (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Rationale

To impart comprehensive knowledge about various fermented & distilled alcoholic beverages such as wines, aperitifs, spirits, liqueurs & bitters.

		Hours	Marks
Chapter 1	Non Alcoholic Beverages	10	20
1.1	Classification		
1.2	Hot Beverages- Types, Production and Service		
1.3	Cold Beverages- Types, Production and Service		
Chapter 2	Aperitifs	04	04
2.1	Definition		
2.2	Types-Wine Based, Spirit Based		
2.3	Service of Aperitifs		
2.4	Brands		
Chapter 3	Introduction to Fermented Alcoholic Beverages	06	08
3.1	Wine- Classification , Brands		
3.2	Beer- Classification, Brands		
3.4	Sake- Classification, Brands		
Chapter 4	Introduction to Distilled Alcoholic Beverages	10	12
4.1	Brandy- Classification, Brands		
4.2	Rum- Classification, Brands		
4.3	Vodka-Classification, Brands		
4.4	Gin- Classification, Brands		
4.5	Whisky- Classification, Brands		
4.6	Tequila- Classification, Brands		
Chapter 5	Introduction to Cocktails	06	06
5.1	Methods of Making Cocktails		
5.2	Golden Rules		
5.3	Classification of Cocktails		
5.4	Examples of Cocktails		

Chapter 6	Introduction to Other Beverages	06	06
6.1	Arrack, Aquavit, Schnapps, Fruit Brandies, Pastis, Kirsch		
6.2	Feni, Calvados, Korn, Doppelkorn, Cordials		
Chapter 7	Introduction to Liqueur	03	05
7.1	Introduction , Manufacturing		
7.2	Types		
7.3	Brands		
Chapter 8	Introduction to Bitter	03	04
8.1	Introduction, Manufacturing		
8.2	Types		
8.3	Brands		
Chapter 9	Tobacco	03	05
9.1	Introduction to Tobacco		
9.2	Types of Tobacco		
9.3	Manufacturing of Tobacco		
9.4	Cigar and Cigarettes		
9.5	Brands		
9.6	Service		

Glossary of Terms

Perrier	Angostura Bitters	Amer Picon
Underberg	Fernet Branca	Campari
Pernod	Aperitif	Unicorn
Pastis	Bitters	Malt
Grist	Kilning	Draft beer
Wort	Hops	Weissbier / Weizenbier
Mash	Lager	Cider
Mash –Tun	Ale	Perry
Brewing	Stouts	Sake
Micro – brewery	Porter	Calvados
Hops	Bottle-conditioned beer	Esters

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Food & Beverage Service	Dennis Lillicrap, Cousins	Book Power
2	Modern Restaurant Service	John Fuller	Hutchinson
3	Food & Beverage Service Training Manual	Sudhir Andrews	Tata Mc Graw Hill
4	The Restaurant (from Concept to operation)	John Walker, Donald Lundberg	John Wiley & Sons
5	The Beverage Book	Duncan & Cousins	Hodder & Stoughton
6	Professional Guide to Alcoholic Beverages	Lipinski	Van Nostrand Reinhold
7	Oxford Companion to Wines	Jancis Robinson	Oxford University Press

SUBJECT CODE:DSC 302					
SUBJECT:INTRODUCTION TO BEVERAGE SERVICE (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Sr.no	Topic
1	Types of Glassware used in beverage Service
2	Service of Non Alcoholic Beverages (Hot & Cold)
3	Service of Aperitifs
4	Service of Wines Setting up cover for menu with wines
5	Service of Beer – Service Temperature, Equipment, Procedure, Brands
6	Service of Brandy
7	Service of Rum
8	Service of Vodka
9	Service of Tequila
10	Service of Gin
11	Service of Whisky
12	Service of Liqueur
13	Compiling a Wine & other drink list
14	Service of Cocktails
15	Types of bitter and service of bitter & other alcoholic beverages
16	Service of Cigar & Cigar

Assignment

Minimum of two assignments to be submitted by students by the end of the semester.

- 1)Wines from New world countries (USA, Australia, Africa and New Zealand)
- 2)Price list of wines from two outlets.
- 3)Indian wines brand names and prices
- 4)Price list of Beer from two outlets
- 5)Prepare a wine & other alcoholic beverages list.
- 6)List & give recipe of 10 cocktails of different base : Vodka, Rum, Tequila, Brandy, Whisky

SUBJECT CODE:DSC 303 A					
SUBJECT: ALLIED HOUSEKEEPING FUNCTIONS (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60		100	01

Rationale

The Subject aims to establish the importance of housekeeping operations and its role in the hospitality industry. It also prepares the student to acquire knowledge of the operational aspects in housekeeping.

		Hours	Marks
Chapter 1	Hospitality and Flower Arrangement	06	12
1.1	Concept and importance		
1.2	Principles, Types and Shapes of flower arrangement		
1.3	Types of Indoor and Outdoor plants used in hotels		
1.4	Tools, equipments and accessories used in horticulture and flower arrangements		
1.5	Conditioning of plant material		
Chapter 2	Pest Control	04	08
2.1	Types of Pest		
2.2	Preventive and control measures		
Chapter 3	Contract Cleaning	04	08
3.1	Definition, concept		
3.2	Jobs given on contract by Housekeeping		
3.3	Advantages and disadvantages		
3.4	Pricing of Contracts		
Chapter 4	Safety and Security Processes	06	10
4.1	Safety of guest and guest property		
4.2	Safety of hotel property and employees		
4.3	Prevention of accidents		
Chapter 5	Purchasing Systems	06	10
5.1	Types of purchasing		
5.2	Purchase procedure for housekeeping supplies, linen, cleaning agents and cleaning equipments		
Chapter 6	Housekeeping Stores	06	10
6.1	Store requisition		
6.2	Issuing and control of materials		
6.3	Inventory Control and Stock taking		

Glossary of Terms

Conditioning	Fillers	Foliage
Kenzan	Ikebana	Hogarth curve
Mechanics	Moribana	Nagiere
Oasis	Bonsai	Hardscape
Perennials	Horticulture	Landscape
Trellis	Patio	Deck
Turf	Pest	Fumigation
Dry rot	Rodent	Pesticutor
Wet rot	Silver fish	Osh Standards
Recycled	NonRecycled	Store indent
inventory items	inventory items	Lead time
Purchase order	Stores requisition	Pass key
Grand master key	Emergency key	Floor master key
Contract	Stocktaking	Outsourcing
Charge Back	Contract Specification	

REFERENCE BOOKS

Sr. No	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management -	Sudhir Andrews	Tata McGraw Hill
2	Hotel Housekeeping & Management	G Raghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	E L B S
4	Accomodation Management	Rosemary Hurst	Heinemann Publishing
5	Accomodation Management	Rosemary Hurst	Heinemann Publishing

SUBJECT CODE:DSC 303 A					
SUBJECT: ALLIED HOUSEKEEPING FUNCTIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60		100	01

1. Using a Room and public area inspection checklist
 - Cleaning of a Guest room and public area.
 - Checking of the Guest room and public area using a check list.
2. Flower Arrangements
 - Demonstration of various styles and shapes of flower arrangements.
3. Flower Arrangements
 - Preparation of various styles and shapes of flower arrangements.
4. Introduction to Horticultural aspects.
 - Visit to green house for identification of indoor plants used in hotels.
 - Identification fo outdoor plants used in hotels.
 - Identification and use of foliage in flower arrangements.
5. Special decorations for functions in hotel
 - Preparations for events organized in hotels – floral rangolis, garlands, tinsel and miscellaneous decorations.
6. Inventory and stocktaking of room and cleaning supplies
 - Requisition procedure
 - Calculating par stock
 - Stock Taking or physical inventory of room and cleaning supplies.
 - Documentation of supplies inventory.
 - Cleaning of housekeeping stores.
7. Using housekeeping software for material management
8. Various methods of pricing contract
9. Pest control demonstration.
10. Standard operating Procedure at housekeeping
 - Handing of keys
 - Safety of Guests & Guests Property

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-
- Safety of Hotel Property & employees
- 11. Standard operating Procedure at housekeeping**
- To eliminate workplace hazards

ASSIGNMENTS

1. Indoor and outdoor plants used in hotels.
2. Presentation on assignments with the use of Audio Visual aids

SUBJECT CODE:DSC 304					
SUBJECT: FRONT OFFICE ACCOUNTING (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60		100	0

Rationale

It prepares the student to acquire knowledge of the operational aspects in front office. It also prepares the student to acquire basic skills and knowledge necessary related to front office accounting.

		Hours	Marks
Chapter 1	Front Office Accounting	06	10
1.1	Importance of the front office accounting system		
1.2	Types of accounts		
1.3	Vouchers		
1.4	Folios		
1.5	Ledger		
1.6	The front office accounting cycle		
1.7	Use of computers in front office accounting		
Chapter 2	Credit Control practices at front desk	06	10
2.1	Objective of credit control		
2.2	Hotel credit control policy		
2.3	Credit control measures at check-in		
2.4	Credit control measures during occupancy		
2.5	Credit control measures at check out and after guest departure		
Chapter 3	Calculation of various Statistical data using formula	06	10
3.1	ARR, Room Occupancy %, Double Occupancy %, Bed Occupancy %, Foreign occupancy%, Local		
3.2	Occupancy % House Count, House Position, etc.		

3.3	Reports – DRR, Revenue Report, Daily Occupancy Report		
Chapter 4	Night Auditor	04	10
4.1	Concept of Night Audit & Role of Night Auditor		
4.2	Night Auditors Report		
Chapter 5	Establishing Room Rates	06	10
5.1	Rule of Thumb		
5.2	Hubbart's formula		
5.3	Market condition Approach		
Chapter 6	Forecasting Room Availability	04	10
6.1	Benefits of forecasting		
6.2	Data Required for forecasting		
6.3	Records Required for forecasting		
6.4	Room Availability forecast.		
6.5	Types of forecast & their sample format		

Glossary of Terms

ARR	Rev Par	Yield
ARG	DRR	Re-capitulation sheet
Transcript	High Balance	High Debt
House count	City Ledger	House limit
Overstay	No show	Understay
Stayover	CashPaid out	Rule of Thumb
Hubbart's Formula	Forecasting	
Management Account		
Market Condition approach		

REFERENCE BOOKS

Sr no	Name of the Book	Author	Publication
1	Hotel Front Office Operations & Management	Sudhir Andrews	Tata McGraw Hill
2	Check – in Check – out	Jerome Vallen	WMC Brown Jowa
3	Principles of Hotel Front Office	Sue Baker, P. Bradley,	Continuum
4	Hotel Front Office	Bruce Graham Stanley	Thornes
5	Managing Front Office operations	Michael Kasavanna	AH&LA,
6	Front Office Procedures & Management	Peter Abott. & Sue Lewry	Butterworth & Heinemann
7	Front Office operations	Colin Dix, Chris Baird	Pearson
8	Front Office Operations and administration	Dennis Foster	Glencoe.
9	Hotel Accounting & Financial Control	OziD’Cunha	Dickey Enterprises

SUBJECT CODE:DSC 304 A					
SUBJECT: FRONT OFFICE ACCOUNTING (PRACTICAL)					
Teaching	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60		100	01

1. Use of computers in front office accounting
Practice on use of front office software for accounting at front desk.
2. Using and making various vouchers used at front desk
Role play of situations pertaining to using and making vouchers like Allowance voucher, VPO, Cash voucher and miscellaneous vouchers.
3. Credit control practices at front desk
Role play of situations pertaining to credit control practices during reservations. Role play of situations pertaining to credit control practices during arrival.
4. Credit control practices at front desk
Role play of situations pertaining to credit control practices during occupancy. Role play of situations pertaining to credit control practices during checkout.
5. Preparing a Night Auditors Report.
6. Calculations of various statistical data using Formulae
ARR, Rev Par, Room Occupancy %, Double Occupancy %
Bed Occupancy%, foreign occupancy %, Local Occupancy %
7. Calculations of various statistical data using Formulae
Bed Occupancy %, Foreign occupancy %, Local Occupancy %, Graphical presentation.
8. Preparing Weekly & Monthly forecasts.
9. Using Hubbart's formula for calculating room rate
10. Using front office software for MIS reports
Budgetary reports, Occupancy reports, Income and expenditure reports, forecasting reports etc.

11. Situations dealing with guest problems

Role play of situations pertaining to guest problems and emergency situations like bomb, terrorist attack, fire, death and natural disasters.

ASSIGNMENTS

1. Calculation of various statistical data using formula and graphical representation.
2. Hubbart's Formula for calculating Room rate.

SUBJECT CODE: LEC 101					
SUBJECT: HOTEL FRENCH(THEORY)					
Teaching	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

To introduce basic knowledge of French language to the students of Hotel Management

		Hours	Marks
Chapter1	INTRODUCTION	10	12
1.1	Alphabet		
1.2	Accents		
1.3	Articles:Definite,Indefinite, Partitive and Contracted articles		
1.4	Subject Pronouns		
1.5	Basic greetings		
1.6	Vocabulary related to classroom		
1.7	Cardinal Numbers (0-100) & Ordinal Numbers		
1.8	Time,days of a week, months		
1.9	Vocabulary related to seasons, weather		
Chapter2	Conjugation– PresentTense	08	08
2.1	Conjugation of verbs être and avoir		
2.2	Conjugation of first regular group ‘-er’(Ex.Parleretc)		
2.3	Conjugation of second regular group ‘-ir’(Ex.firir)		
2.4	Conjugation of third regular group ‘-re’(ex.attendre)		
2.5	Conjugation of third regular group ‘-oir’(ex.Vouloir)		
Chapter 3	Food & Beverage Service	06	12
3.1	Equivalents		
3.2	Restaurant Brigade		
3.3	French Classical menu (17 course) with classic examples of each course & meanings in brief		
3.4	Wines <ul style="list-style-type: none"> • Wine of France • Wine Terminology 		

3.5	<ul style="list-style-type: none"> • Reading a wine label • Wine regions French Cheese		
Chapter 4	Kitchen	10	12
4.1	Equivalents of Kitchen Tools Dairy Products Vegetables Fruits Herbs and spices Meat, fish, Poultry Cereals Seasoning		
4.2	Weights and Measurements		
4.3	The Kitchen Brigade		
4.4	French Culinary Terms and the meaning in		
4.5	English		
4.6	Recipe of any five basic food preparations (Cream of Tomato, Egg Omelette, Salad, Cake, Grilled Chicken)		
	Translation of recipe from French to English		
Chapter 5	House keeping	01	04
5.1	Vocabulary related Guest room and hotel Floor		
Chapter 6	Front Office	01	04
6.1	Vocabulary related to Front Office operations		
Chapter 7	Standard Phrases used in a hotel	04	08
7.1	Translation from English to French		
7.2	Translation from French to English		

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Basic French for Hotel Industry	Vaishali Mankikar	Continental, Prakashan, Pune
2	Basic French course for the Hotel Industry	Catherine Lobo, Sonali Jadhav	Tanay Enterprises, Pune

SUBJECT CODE:LEC 101A					
SUBJECT:HOTEL FRENCH (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	-	50	02

Rationale

To enable students to acquire correct pronunciation of French hotel terminology, to use standard phrase in French related to hotel operations and also practice spoken French skills.

- 1 Alphabets
- 2 Basic greetings, Days of the week, Date, Months– Question and Answers
- 3 Time– Clock, Questions and Answers related to time
- 4 Kitchen Equivalentents
- 5 Kitchen Equivalentents
- 6 Kitchen Equivalentents
- 7 To plan and read a menu in French and briefly describe the dishesin English
- 8 To read, translate and say the recipe for basic dishes covered in theory class
- 9 To read, translate and say the recipe for basic dishes covered in theory class-
Practice
- 10 Question and Answers related to Kitchen
- 11 Reading of a wine label
- 12 Dialogues related to F & B Service
- 13 Question and Answers related to F & B Service
- 14 Standard phrases used in House keeping and Front Office
- 15 Questions & Answers, Dialogues related to House keeping
- 16 Question & Answers, Dialogues related to Front Office

SEMESTER IV
Industrial Training

SUBJECT CODE:DSC 401-(I)					
SUBJECT:INDUSTRIAL EXPOSURE & REPORT					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
54	--	120	80	200	37

In the Fourth semester the student shall undertake industrial training for a period of 22 weeks, reputed hotel, and restaurant or hospitality organization.

The institute shall assist in the placement of students for training in various hotels. The student can make self arrangement to train in any hotel of his choice. The student will have to bear the necessary expenses involved for the same.

At the end of the industrial training the student shall submit Training Report along with the logbook maintained on a daily basis during the period of training and the performance appraisal from each department.

The training report is to be prepared by the student in two copies and to be submitted to the Training & Placement Officer within the stipulated time for assessment.

The report will be assessed by the internal examiner and only on the basis of a certificate of the examiner concerned that the training has been satisfactorily completed would the student be allowed to appear for the external assessment conducted by a panel of examiners comprising of one external examiner (the external would include preferably one from the hotel industry of the level of Head of the Department and above) and one internal examiner. The Continuous Assessment marks will be awarded based on the performance appraisals filled by the hotel managers.

The student is required to practice the discipline & norms laid down by the institute and also follow the rules and regulations of the hotel in which he/she is undergoing training.

Any adverse remark from the hotel will call for stringent action.

SEMESTER V

SUBJECT CODE:DSE 101					
SUBJECT: LARDER (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Rationale

This subject intends to develop knowledge and skills required for Garde Manger work and preparation of frozen desserts.

		Hours	Marks
Chapter 1	Le Garde Manger	04	06
1.1	Definition		
1.2	Functions of larder department		
1.3	Breakdown of larder department		
1.4	Responsibilities of Chef Grade Manger		
1.5	Larder Control		
1.6	Liason with Kitchen and Pastry department		
1.7	Layout of larder in a hotel		
1.8	Equipments and tools used in larder department		
Chapter 2	Horsd' oeuvres	03	04
2.1	Types of horsd' oeuvres: Hot and Cold-Canapes, Cocktails relishes		
2.2	Miscellaneous horsd' oeuvres-Antipasto, Bruschetta, Tapas, Amusebouche		
Chapter 3	Meat Cookery and Poultry	10	10
3.1	Composition & Structure		
3.2	Quality of Meat		
3.3	Factors affecting flavor and tenderness		
3.4	Cooking of meat		
3.5	Selection, Cuts, approximate weights and methods of cooking of the following- Lamb, Pork, Beef and Veal		
3.6	Poultry- Selection, Cuts and uses		

Chapter 4	Curing and Smoking	02	02
4.1	Ingredients used for curing foods		
4.2	Curing methods		
4.3	Smoking		
Chapter 5	Charcuterie	05	06
5.1	Bacon – Cuts & uses		
5.2	Ham – Types & uses		
5.3	Differentiation – Ham, Bacon & Gammon		
5.4	Forcemeats – Types		
5.5	Sausages – Composition, Classification & types		
Chapter 6	Pate, Terrines and other cold foods	05	06
6.1	Duties and responsibilities of Chef du Froid		
6.2	Aspic – Definition, function and types		
6.3	Chaufroid-definitions, types		
6.4	Using aspic jelly and chaudfroid sauce		
6.5	Pate and Terrines-definition, preparation and difference		
6.6	Gallantine and Ballotine- definition, preparation and difference		
6.7	Mousse and Mouselline- definition, preparation and difference		
6.8	Assembly of cold buffet		
6.9	Smorgasbord		
Chapter 7	Creams, Custard, Puddings and Frozen Desserts	04	06
7.1	Basic Custard		
7.2	Pastry cream- definition, preparation and variations		
7.3	Pudding types		
7.4	Bavarians, Chiffons, Mousses and Souffles		
7.5	Frozen desserts-classification, popular ice-cream desserts		
7.6	Dessert sauces		
Chapter 8	Culinary Terms	04	06

	Anglaise Assaisonner Ateraux Aspic Abattis Ballotine Barder Bavarois Beignet Bouchee Blondir Chantilly Charlotte Chiffonade Coulis Crecy Dariole Duxelle Panada Farcir Foie Gras Jardiniere Nori Jus-lie Meringue Navarin Papillote Parfait Praline Provencale Quenelle Quiche Rataouille Timbale Darois Crudite Force meat Rollmops Frizzling Baba Kedergree Rasping Jambonnette Fleuron Crepinetts Tournedos Zakuski Matellote Civet Tournedos Zakuski Taboulleh Macerate Gnocchi Sippets Tripe Muesli Neige Pastillage Dashi Bombe Compote Tapenade Zabaglion Lardons Panache Piquante Baron Sauerkarat Salsa Daube Shaslik Blanquette Sundae Crepes Falafel Qubus Moussaka Paella Truffles Baveuse Waffles Blackpudding		
Chaper 9	Meat Cookery and Poultry	12	12
9.1	Composition & structure		
9.2	Quality of meat		
9.3	Factors affecting flavor and tenderness		
9.4	Cooking of meat		
9.5	Selection, cuts, approximate weight and methods of cooking of the following: Lamb, Pork, Beef, Veal		
9.6	Poultry- Selection, cuts and uses		

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Professional Cooking	Wayne Gisselen	John Wiley & Sons, N.Y
2	Professional Baking	Wayne Gisselen	John Wiley & Sons, N.Y

3	Modern Cookery for Teaching & Trade (Volume I & II)	Thangam E. Philip	Orient Longman Ltd. Mumbai.
4	The Larder Chef	Leto. M.J.&Bode	K.H, Heinemann Professional
5	Larousse Gastronomique	Paul Hamlyn	
6	Practical Cookery	Kinton Ceserani	ELBS
7	Professional Chefs, Art of Garde Manger	Frederic.H&John Nicolas	John Wiley & Sons, N.Y
8	Kitchen Planning & Management	John Fuller & David Kirk	Heinemann, Butterworth
9	Classical Food Preparation & Presentation	W.K.H.Bode	Batsford

SUBJECT CODE:DSE 101A					
SUBJECT: LARDER (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Minimum 20 practicals of Advanced Continental menus to be conducted.

Menus may be designed so as to cover classical appetizers, soups, sandwiches, main course, accompaniments, salads and desserts relevant to the theory covered in classroom sessions.

Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSE 102					
SUBJECT: ALCOHOLIC BEVERAGES-I (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Rationale :

The students will gain comprehensive knowledge about various types of wines, aperitifs and beers.

		Hours	Marks
Chapter 1	Alcoholic Beverages	16	16
1.1	Introduction to alcoholic beverages		
1.2	Manufacturing process- Fermentation, Distillation and Brewing		
1.3	Classification of alcoholic beverages- Wines, Spirits and Brewed beverages		
1.4	Aperitifs- Wine based and spirit based		
1.5	Liqueurs- digestifs and after meal drinks		
Chapter 2	Fermented Alcoholic Beverages	16	16
2.1	Wines		
2.2	Viticulture and its methods, wine diseases		
2.3	Vinification –Still, Sparkling, Natural, Fortified and Aromatized wines.		
2.4	Wines of France, Italy, Spain, Africa, Australia, USA and India		
2.5	Food and wine Harmony		
2.6	Wine Glasses and equipments		
2.7	Storage and service of wine		
2.8	BOT and Beverage Control		
Chapter 3	Brewed Beverages- Beer	16	16
3.1	Manufacturing process of beer		
3.2	Types of Beer- Bottled, Canned and Draught		
3.3	Famous Brands- International and Indian		
3.4	Other Fermented and Brewed beverages- Cider, Perry		
3.5	Sake		

3.6	Glassware and equipments		
3.7	Service of Beer		
Chapter 4	Tobacco	08	06
4.1	Cigar and Cigarettes		
4.2	Types of Cigar and production of cigars		
4.3	Cigar- strength and sizes		
4.4	Brand names, Storage and service		
Chapter 5	Bitters	08	06
5.1	Introduction- Types and Classification of bitters.		
5.2	Manufacturing of bitters.		
5.3	Brands, use and service of bitters.		

Glossary of Terms

Distillation	Aqua – vitae	Fore shots
Congeners	Pot Still	Maturing
Blending	Coffee Still	Bonne chauffe
Cognac	Armagnac	Brouillis
Ageing	Angels Share	Fine Maison
Grande Fine Champagne	Fine Champagne	Old Liqueur Cognac
VSOP	Napolean Brandy	Grappa
Hors d’age	Marc	Peats reek
Grain Whiskey	Ouzo	Malt Whiskey
Single Malt	Blended Whisky	Rye Whisky
Dunder	Vatted Malt	Bagasse
Schnapps	White Rum	Dark Rum
Wine	Aromatised Wine	Agave
Blue Wine	Blush Wine	Vine
Champagne	Sparkling Wine	Fortified Wine
Asti Spumante	Vins mousseux	Jack Daniels
Vinho coto	Eau- de – vie	Arrack
Pisco	Bourbon	Pastis
London Dry	Gold Tequila	Silver Tequila
Old Tom Gin	Absinthe	Tiquira
	Ricard	

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Food and Beverage Service	Dennis Lillicrap, John Cousins	Power Book
2	Modern Restaurant Service	John Fuller	Hitchinson

3	Food and Beverage Service- Training Manual	Sudhir Andrews	Tata Mc Graw Hill
4	The Restaurant (From Concept to Operations)	John Walker Donald Lundberg	John Wiley & Sons
5	The Beverage Book	Dunkan & Cousins	Hodder & Stoughton
6	Professional Guide to Alcoholic Beverges	Lipinski	Van Nostrand Reinhold
7	Oxford Companion to Wines	Jancis Robinson	Oxford University Press

SUBJECT CODE:DSE 102 A**SUBJECT: ALCOHOLIC BEVERAGES-I (PRACTICAL)**

Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Sr no	Topic
1	Identification of of Glassware, Wine bottles and equipment's required for or service
2	Service of Aperitifs
3	Service of Liquors
4	Reading wine label
5	Service of wine red, white(temperature, equipment, procedure and brands)
6	Service of wine old old red wine(decanting of wine), (temperature, equipment, procedure and brands)
7	Service of wine rose,Fortified (temperature, equipment, procedure and brands)
8	Service of champagne(classification, temperature, equipment, procedure and brands)
9	Food and wine harmony traditional and modern approach to wine and food matching
10	Planning of French classical menu with wines
11	Service of cigars and cigarettes
12	Draught/ Draft beard and service of draft beer
13	Service of beer bottle, canned
14	Bitters types of bitters and uses of bitters
15	Preparing the Beverage Menu card
16	Preparing the beverage menu card role of Sommelier in taking wine orders preparing B.O.T

SUBJECT CODE:DSE 103**SUBJECT: ACCOMMODATION OPERATIONS (THEORY)**

Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

The subjects aims to introduce students to the elements of interior designing of guest rooms and public areas with respect to colour, lighting, window treatment, floor and wall finishes. It helps the student to understand sales techniques and role of sales and marketing department.

		Hours	Marks
Chapter 1	Parstock Calculation and Inventory	04	04
1.1	Linen		
1.2	Uniform		
1.3	Guest Supplies and consumables		
1.4	Cleaning supplies and consumables		
1.5	Stocktaking and inventory		
Chapter 2	Standard contents of a guest room	06	06
2.1	Guest room furniture		
2.2	Standard furniture and room sizes		
2.3	Furniture arrangement in guest rooms		
2.4	Guest room fixtures and fitting		
2.5	Beds, mattresses and bedding		
2.6	Soft furnishings		
2.7	Accessories		
Chapter 3	Interior Designing	06	06
3.1	Importance & Definition		
3.2	Principles of Design		
3.3	Elements of Design- Line/Form/colour /texture		
Chapter 4	Refurbishing & Redecoration	04	04
4.1	Definition		
4.2	Factors		
4.3	Snagging list		

Chapter 5	Interior Decoration	20	20
5.1	Colour :Colour Wheel, Colour schemes (used in hotel areas), Psychological effects of colour		
5.2	Lighting :Type / classification / importance, Lighting for guest rooms & public areas		
5.3	Window and Window Treatment : Different types of Windows, Curtains & Draperies, Valance, swags, Blinds		
5.4	Floor finishes & wall coverings: Classification /Types Characteristics & use Selection criteria Cleaning procedures- Agents used / polishing/ Burnishing, Floor seals Carpets - Types, selection, care & maintenance Types & functions of wall coverings		
Chapter 6	Hospitality	04	04
6.1	Importance of Hospitality		
6.2	Managing the delivery of Hospitality		
6.3	Developing a service management programme		
Chapter 7	Hotel Technology	06	06
7.1	Technology in guest room-cost & benefits		
7.2	Locking system		
7.3	Energy management and climate control system		
7.4	Network fire alarm system		
7.5	Communication systems		
7.6	Other technology-In room entertainment system, control panels		
Chapter 8	Sales Techniques	04	04
8.1	Various sales tools and sales techniques- Upselling & suggestive selling, offering alternatives		
8.2	Role of Front office staff to maximize occupancy		
8.3	Business related marketing techniques- CVGR, Tour,MICE business,handling of group and corporate sales		
Chapter 9	Managing Guest services	06	06
9.1	Total quality management in hotel		
9.2	The real components of Total Quality Management		
9.3	Measuring guest services		
9.4	Customer relationship management		

Glossary of Terms

Dado	Atrium	Valence
Cornice	Cascade	Swag
Pelmet	Terrazzo	Granolithic
Tessellated tiles	Anaglypta	Lincrusta
Anglepoise	CFL	LED
Parquet	Pile	Wilton
PVC	Chenille Axminster	Axminster
Shoji screen	Supaglypta	Tint
Tufted carpet	Broad loom carpet	Persian carpet
Pile bonded carpet	Bay window	Bow window
Plantation window	Dalhousie	Attic window
Louvers	Venetian blinds	Sky lights
Refurbishing	Renovation	Underlay
Soffit lighting	Diffused lighting	Incandescent lighting
Tertiary colours	Bolsters	Shams
Triad	Accents	Up selling
Upgrading	MICE	USP
Hospitality	Moment of truth	Point of sale
TQM	CRM	AIOD
ATM	EDP	HOBIC
HITIS	LEED	Moment of truth
Opaque	WATS	PIP
Quality assurance	Quality circle	VoIP
ELS	RFID	CAS
OTA	Biometric lock	

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management	Sudhir Andrews	Tata Mc Graw Hill
2	Hotel Housekeeping & Management	G Raghubalan Smritee Raghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	ELBS
4	Accomodation Management	Rosemary Hurst	Heinemann

5	Hotel Front Office Operations & Management	Sudhir Andrews	Tata Mc Graw Hill
6	Check-in check out	Jerome Vallen	WMC Brown IOWA
7	Principles of Hotel Front Office Operations	Sue Baker, P. Bradley J. Huyton	Continuum
8	Hotel Front Office	Bruce Graham Stanley	Thornes
9	Managing Front Office operations	Michael Kasavanna Richard Brooks Charles Steadmon	AH & LA
10	Front Office Procedures & Management	Peter Abott. & Sue Lewry	Butterworth & Heinemann
11	Front Office operations	Colin Dix, Chris Baird	Pearson
12	Front Office Operations and administration	Dennis foster	Glencoe.
13	Hotel Accounting & Financial Control	OxiD'Cunha	Dickey Enterprises

SUBJECTCODE:DSE 103 A					
SUBJECT: ACCOMMODATION OPERATION (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	--	100	02

1. Drawing of colour wheel, identification of different types of colours.
2. Identification of different types of colour schemes.
3. Planning and designing colour schemes for - Different types of rooms and suite rooms.
4. Planning and designing colour schemes for the public areas of a hotel.
5. Preparation of a Snagging list.
6. Designing of various floor coverings for guest rooms and public areas.
7. Designing of various wall coverings for guest rooms and public areas.
8. Designing of various curtains and draperies for guest rooms and public areas.
9. Designing a lighting plan for guest rooms and public areas.
10. Role play of situations pertaining to USP in selling rooms, Upgrading of guests.
11. Role play of situations pertaining to up selling, suggestive selling.
12. Role play of situations pertaining to Business techniques for CVGR and Groups.
13. Comparison of hotel Advertisements - Business hotel, Heritage hotel, Resort.
14. Comparative study of MICE destinations, Convention hotels.
15. Role play of situations pertaining to repeat clientele.
16. Role play of situations pertaining to offering alternatives to guests.

Assignments

1. Field visits related to above topics.
2. Assignment on floor finishes (samples to be collected)
3. Assignment on wall coverings (samples to be collected)
4. Assignment on soft furnishings. (samples to be collected)
5. Assignment on different types of windows and window treatments.
6. Assignment on lighting systems in guest rooms and public areas.
7. Collection of brochures and tariff cards of different types of hotels.
8. Designing a brochure for - A Business hotel, Heritage hotel, Resort.
9. Designing a model for guest room, rest room and public areas.

Presentation on above topics with use of audio visual aids.

SUBJECT CODE: SEC 102					
SUBJECT: ACCOUNTING SKILLS FOR HOTELS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

The course aims to help students to acquire the basic knowledge of accounting as practiced in hotels for the day-to-day operations of the organization. It would also prepare them to comprehend and utilize this knowledge in day-to-day accounting operations in hotels.

		Hours	Marks
Chapter 1	Introduction to Accounting	04	04
1.1	Terms and terminologies used in Accounting		
1.2	Definition, Objectives and Importance of Accounting and Hotel Accounting		
Chapter 2	Double Entry System of Book - Keeping	04	04
2.1	Nature, Advantages and Principles		
2.2	Classification of Accounts		
2.3	Golden rules of Debit and Credit		
2.4	Accounting Concepts and Convention		
Chapter 3	Journal and special function books	04	06
3.1	Practical problems on Journalizing – Simple entries		
3.2	Practical problems on special function books		
Chapter 4	Trial Balance	04	06
4.1	Definition, need and types of Trial Balance		
4.2	Practical problems on preparation of Trial balance		
Chapter 5	Final accounts of small hotels and restaurants	10	10
5.1	Need for preparation of Trading account, Profit and Loss account and Balance Sheet		
5.2	Practical problems on Trading account, Profit and Loss account and Balance Sheet with following adjustments only : Closing Stock, Depreciation of fixed assets and Staff meals		
Chapter 6	Allowances, Discount and Visitors Paid Out	04	06
6.1	Meaning and Types		
6.2	Formats of Allowance and VPO Vouchers		
6.3	Difference between Allowance & Discount		
6.4	Difference between Discount & VPO		

Chapter 7	Visitors Tabular Ledger	04	06
7.1	Format and Use of Visitors Tabular Ledger		
7.2	Practical Problems on Visitors Tabular Ledger		
Chapter 8	Guest Weekly Bill	06	08
8.1	Format and Use of Guest Weekly Bill		
8.2	Practical Problems on Guest Weekly Bill		
8.3	Difference between VTL and GWB		
Chapter 9	Uniform System of Accounting	08	10
9.1	Introduction to Uniform System of Accounting (Practical problems on Cost of Food and Beverage sales)		
9.2	Practical problems on preparation of Income Statement as per Uniform System of Account.		

REFERENCE BOOKS

Sr.No	Name of the Book	Author	Publisher
1	Managerial Accounting in the Hospitality Industry-	Peter. J. Harris and Peter A Hazzard	Stanley Thornes Publishers Ltd.
2	Hotel Accounting & Financial Control	Ozi D' Cunha Glesson Fist	Dickey Enterprises, Mumbai
3	Accounting in the Hotel & Catering Industry.	Richard Kotas	International Textbook Co.Ltd
4	Hotel Management	Dr. Jagmohan Negi	Himalaya, Publishing House, Mumbai -

SUBJECT CODE: AEC 102					
SUBJECT: RESEARCHING FOR HOSPITALITY & TOURISM MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	02

Rationale:

The students will be able to understand the process of Research and Report writing

		Hours	Marks
Chapter 1	Introduction to Research	06	08
1.1	Meaning and definition of research		
1.2	Purpose of research		
1.3	Significance of research		
1.4	Types of research(qualitative and quantitative)		
1.5	Steps in research proces		
Chapter 2	Research problem and designing the title of research	06	04
2.1	Problem identification and defining problem		
2.2	Points to be considered while selecting the topic and framing the title		
2.3	Formulation of objectives		
2.4	Hypothesis- definition ,meaning		
Chapter 3	Data	06	08
3.1	Primary data a.Definition and significance b.Sources		
3.2	Secondary data a.Definition and importance of sources b.Citation (bibliography in APA and MLA style for journal, books, newspaper, magazine) c.using e-resources		
Chapter 4	Reasearch Approach	06	08
4.1	Observations		
4.2	Focus group discussion		
4.3	Experimentation		
4.4	Survey		
Chapter 5	Research Instruments	04	08
5.1	Questionnaire- Essential of a good questionnaire		
5.2	Schedule- Advantages and Limitation		
Chapter 6	Sampling Techniques	06	08

6.1	Concept of sampling		
6.2	Population, Sample unit, Sampling size		
6.3	Sampling method-Probability and Non Probability		
Chapter 7	Processing and analyzing data	08	08
7.1	Data Processing(editing, classification, tabulation)		
7.2	Data Analysis(Qualitative and Quantative- manual and using a computer)		
Chapter 8	Report Writing	06	08
8.1	Steps in report writing		
8.2	Structure of Report		

SUBJECT CODE: AEC 102 A					
SUBJECT: RESEARCHING FOR HOSPITALITY & TOURISM MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	02

As a requirement of the Curriculum each student is required to undertake research in their Field of interest.

Students will have to spend the allotted hours for carrying out extensive literature review topic finalization, statement of objectives, setting of the hypothesis and developing a research plan.

Internal assessment will be on the basis of 3 presentations given during the semester.

- Literature review
- Approval of Objectives and Hypothesis
- Questionnaire Approval

External Assessment will be on the basis of presentation in front of the panel (one internal examiner and one external examiner) the presentation will include all the above as well as Research methodology.

SUBJECT CODE:AEC 102					
SUBJECT: HOSPITALITY LAW (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

The subject aims to provide information regarding the various laws pertaining to the hotel and catering industry.

		Hours	Marks
Chapter 1	The Indian Contract Act 1872	06	06
1.1	Definition and essentials of a contract		
1.2	Valid, Void and Voidable contracts		
1.3	Free consent and consideration		
1.4	Performance and discharge of contracts		
1.5	Breach of contract and remedies for breach of contract		
Chapter 2	The Sales of Goods Act 1932	04	04
2.1	Meaning of contract of sale		
2.2	Difference between sale and agreement to sale		
2.3	Rights and duties of seller and buyer		
2.4	Unpaid seller		
Chapter 3	The Partnership Act 1932	04	04
3.1	Nature of partners		
3.2	Rights and duties of partners		
Chapter 4	The Companies Act 1956	04	06
4.1	Essential features of company		
4.2	Legal aspects of corporate social responsibility		
Chapter 5	The Bombay Shop and Establishment Act	04	06
5.1	General Provisions applicable to the hotel industry		
5.2	Daily and weekly working hours, over time, annual leave with wages		
Chapter 6	The Industrial Dispute Act 1948	04	06
6.1	Definition of Industry		
6.2	Industrial disputes		
6.3	Settlement of industrial disputes		
6.4	Strike, lay-off, lock out, retrenchment and closure		
Chapter 7	The Payment of Wages Act 1936	04	06

7.1	Responsibility of payment of wages		
7.2	Rules for payment of wages		
7.3	Permissible deductions		
Chapter 8	Food Legislation	06	06
8.1	The prevention of Food Adulteration Act 1954		
8.2	Role of Food Inspector and Public Analyst		
8.3	Colouring, packing and labeling		
8.4	Prohibition and regulation of sales		
8.5	Preservatives		
8.6	Anti-oxidants, emulsifying, stabilizing and anti-caking agents		
Chapter 9	The Food Safety and Standards Act 2006	04	06
9.1	Food Safety and Standards Authority of India		
9.2	General Principles of Food Safety		
9.3	General Provisions as to Articles of Food		
9.4	Provisions Relating to Import		
9.5	Special responsibilities related to food safety		
9.6	Offences and penalties		
Chapter 10	The Consumer Protection Act	04	04
10.1	Rights of a consumer		
10.2	Redressal of consumer disputes		
Chapter 11	Licenses and Permits	04	06
11.1	Licenses and permits required for hotel and catering establishments		
11.2	Procedure for applying and renewal of licenses and Permits		
11.3	Provisions for suspension and cancellation of licenses		
11.4	By laws for operating Permit Rooms and Bar		

REFERENCE BOOKS

Sr.No	Name of the Book	Author	Publisher
1	Mercantile Law	B.D Joshi	Narendra Publication
2	Elements of Mercantile Law	B.D Joshi	Narendra Publication
3	Principles of Business Law	Ashwathappa. K	Tata Mac Graw Hill
4	Business Law	M.C. Kuchal	Vikas Publication
5	Various Bare Acts		

LIST OF ABILITY ENHANCING ELECTIVE COURSES

AEE	101	CATERING SCIENCE
AEE	102	DIETITICS & NUTRITION
AEE	103	FOOD & BEVERAGE CONTROLS
AEE	104	PRINCIPLES OF MANAGEMENT
AEE	105	ORGANISATION BEHAVIOR
AEE	106	HOTEL ECONOMICS
AEE	107	FINANCIAL MANAGEMENT

SUBJECT CODE: AEE 101					
SUBJECT: CATERING SCIENCE					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To develop awareness of the importance of hygiene, sanitation and food safety in hotel industry.

		Hours	Marks
Chapter 1	Importance of Hygiene in the Catering Industry	04	02
1.1	Introduction, Definitions: Hygiene & Sanitation		
1.2	Significance of hygiene & Sanitation in the food industry		
Chapter 2	Food Microbiology	08	06
2.1	Classification & Morphology of Microorganisms- Bacteria, Virus, Fungi, Algae, protozoa.		
2.2	Growth of Bacteria and its relevance to the food industry.		
2.3	Factors affecting microbial Growth. Moisture, Ph, Temperature, Oxygen, Time, Osmotic Pressure		
2.4	How food act as a substrate for micro organisms.		
2.5	Concept of food contamination, Sterility, Cross Contamination, Contamination from plants & fruits, animals, sewage, soil, water, air.		
2.6	Food spoilage, causes, chemical changes caused by microorganisms.		
Chapter 3	Food borne illnesses	08	04
3.1	Microbial action-Food Poisoning (Microorganisms involved, mode of transmission, control of food Borne illness)		
3.2	Food infection (Bacterial, Viral, Protozoal) (Micro organisms involved, mode of transmission, control of food borne illness)		
3.3	Toxic metals and chemicals		
3.4	Naturally occurring toxicants in food.		
3.5	Investigation of food- borne disease outbreak		
Chapter 4	Beneficial effects of micro organisms	06	04

4.1	Role of micro organisms in the manufacture of fermented foods, Dairy products, Vegetable preparations, Bakery products & Alcoholic beverages.		
Chapter 5	Hygienic food Handling	06	04
5.1	Importance of following sanitary procedures.		
5.2	Concept of danger zone		
5.3	Sanitary procedures while Preparation, Cooking,		
5.4	Mixing raw and cooked preparation, Holding: Hot holding, cooling, leftover		
5.5	Common Faults in food preparation		
Chapter 6	Environmental Sanitation. Hygiene in food production and service areas	08	04
6.1	Types of wastes in catering establishments the disposal methods. Food Contamination and spoilage due to kitchen pests and Pest control.	08	04
Chapter 7	HACCP	06	06
7.1	Hazard Analysis and critical control points,		
7.2	Importance, definition & usage of HACCP.		
Chapter 8	Sanitation Regulation & standards	06	06
8.1	Food adulteration. Simple tests to detect food adulterants in milk, sugar, turmeric, chilli powder, tea, coffee semolina, Ghee, butter margarine, oil		
8.2	Control of food quality– Indian Standards.		
Chapter 9	Food Preservation	06	06
9.1	Food Preservation by canning, drying, fermentation, Pickling and curing, chemical preservatives & by irradiation.		
Chapter 10	Food Science	06	06
10.1	pH-Definition and its relevance in industry.		
10.2	Browning reactions (desirable & undesirable, enzymatic and non enzymatic reactions of food).		
10.3	Concept of gelatinization, inversion and crystallization in starch.		
10.4	Definitions and relevance of Boiling point, Boiling under pressure, Melting Point, Smoking point, Flash Point, Surface Tension.		

REFERENCE BOOKS

Sr.No	Name Of theBook	Author	Publisher
1	Food Hygiene and Sanitation	Ms.S. Roday	Tata Mc Graw Hill
2	The Technology of Food Preservation	Norman Desrosier	CBS Publishers
3	Food Microbiology	William Frazier & Dennis Westhoff	Tata McGraw Hill
4	Food Science & Experimental foods	Dr. M.Swaminathan	Bappco Publishers
5	Prevention of Food Adulteration act,1954	Seth & Capoors	ILBS Publishers

SUBJECT CODE: AEE 102					
SUBJECT: DIETITICS & NUTRITION					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To develop basic awareness of important nutrients and knowledge of nutritional requirements for human beings & plan a balanced diet & understand the changes that occurs in the chemical components of food during preparation.

		Hours	Marks
Chapter 1	Introduction to nutrition	06	04
1.1	Definitions: Food, Diet, Nutrients, Nutrition, Malnutrition, Over and Under Nutrition/Energy, Energy requirements.		
1.2	Basal metabolic rate, factors affecting basal metabolic rate.		
1.3	Concept of digestion, absorption, metabolism.		
1.4	Objectives of cooking.		
Chapter 2	Carbohydrates	04	06
2.1	Definition, Composition, Classification		
2.2	Food sources, Functions		
2.3	RDA (Adolescents and Adults)		
2.4	Importance of fiber in the Diet		
2.5	Symptoms of Deficiency and Excess of Carbohydrates in diet		
2.6	Effect of heat on Carbohydrates		
Chapter 3	Proteins	06	06
3.1	Definition, Composition, Classification		
3.2	Food sources		
3.3	Essential and Non-essential Aminoacids		
3.4	RDA (Children and Adults)		
3.5	Effect of heat on Proteins		
Chapter 4	Lipids	06	06

4.1	Definition, Composition, Classification		
4.2	Food Sources		
4.3	RDA (Adolescents and Adults)		
4.4	Symptoms of deficiency and excess of fats		
4.5	Effect of heat on fats		
Chapter 5	Vitamins	06	04
5.1	Definition, Classification of Vitamins in to Fat Soluble And Water Soluble		
5.2	Functions, Sources, RDA, Symptoms of Deficiency and excess		
Chapter 6	Mineral	06	04
6.1	Classification, General Functions of Minerals- Calcium, Iron, Iodine, Sodium and Chlorine		
6.2	Food Sources, Symptoms of Deficiency and Excess		
6.3	RDA in Adolescents and Adults		
Chapter 7	Water	04	04
7.1	Sources, Functions of Water in human body, Sources Of Water		
7.2	Deficiency and Excess		
Chapter 8	Classification of Raw Materials into food groups	08	04
8.1	The nutritive values-cereals, pulses, nuts& Oil seeds milk & milk Products, eggs, flesh foods, Vegetables & fruits, fats & oils.		
Chapter 9	Formulation of balanced & Therapeutic Diet	10	08
9.1	Five food group's system diet therapeutic diet.		
9.2	Exchange list system		
9.3	Planning of a diet for normal adults (male & female)		
9.4	Concepts of Therapeutic diets, Foods to be avoided and recommended in Diabetes Mellitus, Cardiovascular disorders		
9.5	Gastro intestinal disorders, Kidney disorders and Liver disorders, Fevers and Infections		
9.6	New trends in Nutrition (importance of avoiding junk food, gluten free diet, transfatty acids, convenience food)		
Chapter 10	Food Additives	04	04
10.1	Definition, types and functions and various uses in food industry		

REFERENCE BOOKS

Sr.No	Name Of theBook	Author	Publisher
1	Nutrition and Dietetics	Ms. Shubhangini Joshi	Tata Mc Graw Hill
2	Diet and Nutrition	BN Tiwari	Pearl Books
3	Food Science	B.Srilakshmi	New Age International Publication
4	Hand Book of Food and Nutrition	Dr. M.S. Swaminathan	Bappco Publishers

SUBJECT CODE: AEE 103					
SUBJECT: FOOD & BEVERAGE CONTROLS					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To impart to students various cost, control and inventory concepts in a food and beverage operation, to understand the various techniques through which revenue can be increased and pilferage can be reduced and acquire knowledge on Management Information System

		Hours	Marks
Chapter 1	Introduction to Food & Beverage Management	08	06
	1.1 Sectors of Food & Beverage Industry 1.2 Cost and market orientation 1.3 Food & Beverage Management functions 1.4 Responsibilities of food and beverage management 1.5 Constraints to food and beverage management		
Chapter 2	An overview of Food and Beverage Control	06	04
	2.1 Food and beverage control defined 2.2 Objectives of food and beverage control 2.3 Problems of food and beverage control 2.4 The fundamentals of control		
Chapter 3	Cost, Profit and Sales concepts	10	06
	3.1 The elements of cost 3.2 Basic cost concepts - Fixed and variable costs, Direct and indirect costs, Controllable and uncontrollable costs, Estimated, budgeted and Standard costs Outlay and opportunity costs. 3.3 Kinds of profit. 3.4 Break even analysis		
Chapter 4	Budgeting for Food and Beverage Operations	10	06

4.1	Budgets defined		
4.2	Objectives of budgetary control		
4.3	Types of budgets		
4.4	Basic stages in the preparation of budgets		
4.5	Obstacles to control		
Chapter 5	Purchasing	06	06
5.1	The main duties of the purchasing manager		
5.2	The purchasing procedure for food and beverage		
5.3	The selection of a supplier		
5.4	Methods of purchasing food and beverage		
5.5	Purchase specifications for food and beverage		
Chapter 6	Receiving, Storing and Issuing	08	08
6.1	Objectives of receiving food		
6.2	The meat tag		
6.3	Stock taking of food		
6.4	Receiving of beverages.		
6.5	Storing and issuing of beverages.		
6.6	Cellar records		
6.7	Issuing beverages		
6.8	Stock taking of beverages		
Chapter 7	Control checklist	06	06
7.1	Food control checklist		
7.2	Beverage control checklist, bar procedures, beverage control procedures		
7.3	Prevention of fraud in the bar		
Chapter 8	Management information System	10	08
8.1	Various Reports		
8.2	Calculation of Actual Cost		
8.3	Daily Food Cost		
8.4	Monthly Food Cost		
8.5	Statistical Revenue Reports		
8.6	Cumulative and Non-Cumulative		

REFERENCE BOOKS

Sr. No	Name Of theBook	Author	Publisher
1	Food and Beverage Management	Bernard Davis, Sally Stone	Butter worth Heineman ltd
2	Food and Beverage Control	Richard Kotas Bernard Davis	International, Textbook, Glasgow
3	Cost accounting- Methods and Problems	BKBhar	Academic Publishing

SUBJECT CODE: AEE 104					
SUBJECT: PRINCIPLES OF MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To make the student understand the concepts of management and the irpractical application in the hospitality industry.

		Hours	Marks
Chapter 1	Introduction to management	06	04
	1.1 Management and Organization defined 1.2 Elements of an organization 1.3 Levels of management 1.4 External and internal factors that affect management		
Chapter 2	The Evolution of Management Theory	08	08
	2.1 Brief history of management thought 2.2 Taylor’s Scientific Management Theory 2.3 Fayol’s Classical Organization Theory		
Chapter 3	Planning and Decision Making	08	08
	3.1 Planning defined. 3.2 Importance of plans and goals. 3.3 Hierarchy of plans/Types of plans (Objectives,Strategies, Policies, Procedures, Methods, Rules, Programmes, Budgets) 3.4 Steps in planning. 3.5 The rational model of decision making		
Chapter 4	Organising & Staffing	12	08
	4.1 Organising defined and importance. 4.2 Formal and informal organization. 4.3 Span of management. 4.4 Departmentation. 4.5 Centralisation & Decentralisation. 4.6 Delegation of Authority.		

Chapter 5	Leadership	10	06
5.1 5.2	Leadership styles- Autocratic, Democratic, Laissez faire (Blake & Mouton's Managerial Contingency Theory)		
Chapter 6	Motivation	08	08
6.1 6.2 6.3 6.4 6.5	Motivation defined Nature and importance Theories of motivation i) Maslow's Hierarchy of Needs ii) McGregor's Theory X & Theory Y Morale Benefits of high morale/motivation		
Chapter 7	Co ordination	06	04
7.1 7.2 7.3 7.4	Co-ordination defined Need for Coordination Problems in achieving effective coordination Approaches to achieving effective coordination		
Chapter 8	Controlling		
8.1 8.2 8.3	Control defined Need for control Steps in the control process		

REFERENCE BOOKS

Sr.No	Name Of theBook	Author	Publisher
1	Management	Stoner and Freeman	Prentice Hall of India
2	Essentials of Management	Koontz,O' Donnell	Mac Graw Publishing Co.
3	The Best of Peter Drucker on Management	Peter Drucker	Mac Graw Publishing Co.
4	Management Process	R. Davar	Universal Books

SUBJECT CODE: AEE 105					
SUBJECT: ORGANIZATIONAL BEHAVIOUR					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

The subject aims to introduce students to the various elements and dynamics of organizational behavior.

		Hours	Marks
Chapter 1	Introduction to Organizational Behavior	05	04
1.1	Organizational behaviour defined.		
1.2	Relevance and scope.		
Chapter 2	Foundation of individual behaviour	08	06
2.1	Environmental factors		
2.2	Personal factors		
2.3	Organizational factors		
2.4	Psychological factors		
2.5	Personality, perception, attitudes and learning		
Chapter 3	Motivation	06	06
3.1	Nature of Motivation		
3.2	Theories of motivation-Maslow, Herzberg, Equity And Expectancy		
Chapter 4	Foundation of Group Behaviour	06	06
4.1	Group Dynamics		
4.2	Group Formation		
4.3	Group Task		
4.4	Group Decision making		
Chapter 5	Leadership	05	04
5.1	Nature of leadership		
Chapter 6	Communication	05	04

6.1	Inter personal communication		
6.2	Barriers and ways of overcoming barriers		
6.3	Organizational communication		
6.4	Informal communication		
Chapter 7	Conflicts	05	04
7.1	Causes of conflicts		
7.2	Ways of overcoming conflicts		
Chapter 8	Organization	08	04
8.1	Organizational structures		
8.2	Behavioral implications of different structures		
Chapter 9	Organizational Change	08	06
9.1	Factors responsible for change		
9.2	Resistance to change		
9.3	Implementation of the change process		
9.4	Ways of overcoming the resistance		
Chapter 10	Organizational Culture	08	06
10.1	Definition and importance of organizational culture		
10.2	Creation and sustenance of organizational culture		

REFERENCEBOOKS

Sr.No	Name Of theBook	Author	Publisher
1	Essentials of Organizational Behaviour	Stephen. P	Robbins Prentice Hall of India
2	Organisational Behaviour	Fred Luthans	McGraw Hill
3	Organisational Behaviour	Ashwathappa. K	Himalaya Publishing House
4	Organisational Behaviour	B.P.Singh	Dhanpat Rai & sons
5	Organisation Behaviour	Umashankaran	Tata McGraw Hill

SUBJECT CODE: AEE 106					
SUBJECT: HOTEL ECONOMICS					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

This subject helps the students to develop an understanding of the concept and theories of application of management techniques in the field of economics. Moreover they should be able to understand the Manager's role in the decision making process from economic view point.

		Hours	Marks
Chapter 1	Nature & Significance of Managerial Economics	04	08
1.1	Meaning, Features & Significance		
1.2	Functions of Managerial Economics		
Chapter 2	Basic Terms used in Economics	08	08
2.1	Micro & Macro Economics		
2.2	Problem of Scarcity – Lionel Robbins Definition of Economics		
2.3	Economic Tasks– Production & Distribution		
2.4	Economic Entities– Household & Firm		
2.5	Distinction between Plant, Firm & Industry		
Chapter 3	Demand Analysis	12	08
3.1	Meaning, Types & determinants of Demand		
3.2	Meaning & Determinants of Individual & Market Demand		
3.3	Demand Function & Demand Schedule		
3.4	The Law of Demand		
Chapter 4	Theory of Consumer Demand	10	06
4.1	Utility- Meaning & Types		
4.2	The Law of Diminishing Marginal Utility		
4.3	The Law of Equi-Marginal Utility		
Chapter 5	Elasticity of Demand	10	06
5.1	Concepts, Kinds & Types		
5.2	Measurement of Price Elasticity Demand		

Chapter 6	Production Analysis	08	06
6.1	Concepts & Attributes		
6.2	The Law of Variable Proportions		
6.3	The Law of Returns to Scale		
Chapter 7	Supply Analysis	06	04
7.1	Meaning & Determinants of Supply		
7.2	The Law of Supply		
7.3	Elasticity of Supply-meaning, measurement & factors affecting elasticity of Supply		
Chapter 8	Types of Market	06	04
8.1	Meaning & Classification of Market Structure		
8.2	Types of Market Structures Formed by the Nature of Competition		

REFERENCE BOOKS

Sr.No	Name Of theBook	Author	Publisher
1	Business Economics	V. G. Mankar	Himalaya Publishing House
2	Modern Micro Economics	Ahuja H. L	S. Chand Publishing
3	Business Economics (Micro)	Dr. (Ms). Girija Shamkar	Nirali Prakashan

SUBJECT CODE: AEE 107					
SUBJECT: FINANCIAL MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

This subject helps the students to develop an understanding of the concepts and theories of Financial Management in the Hospitality industry. This will also help the students in analyzing the financial statements and capital budgeting.

		Hours	Marks
Chapter 1	Financial Management	04	04
1.1	Definition, Scope and objectives-Branched of accounting		
1.2	Historical, cost, Financial control, Financial Management and Revenue.		
Chapter 2	Ratio Analysis	12	08
2.1	Meaning, Importance and limitations		
2.2	Practical problems on computation of Liquidity Ratios- Current and Quick Ratio. Activity /Turnover Ratios-Stock Turnover Ratio, Debtors Turnover Ratio, Creditors Turnover Ratio, Long-term Solvency Ratios-Proprietary Ratio, Debt Equity Ratio. Profitability Ratios-Gross Profit, Net Profit,		
2.3	Operating ratio, Return on Capital employed, Return on Proprietor's Fund Ratio. Practical problems on preparation of Balance sheet from given ratios.		
Chapter 3	Funds Flow and Cash Flow Statement	12	10
3.1	Nature, Importance and Uses		
3.2	Differences between Funds Flow and Cash Flow Statement		
3.3	Practical problems on preparation of Funds Flow considering following adjustment only: Depreciation on fixed assets, Dividend- Interim and Final and Taxation		

Chapter 4	Working Capital Management	08	06
4.1	Definition and Meaning		
4.2	Factors affecting working capital		
4.3	Working capital cycle		
4.4	Practical problems on determination of working capital		
Chapter 5	Capital Budgeting	10	06
5.1	Meaning and Importance		
5.2	Practical problems on capital budgeting : Payback period, Accounting Rate of return, Net Present Value		
Chapter 6	Budgets, Budgeting and Budgetary Control	08	08
6.1	Definition and Characteristics of Budgets		
6.2	Meaning and Advantages of Budgetary Controls		
6.3	Practical problems on Cash Budget, Flexible Budget		
Chapter 7	Introduction to Pricing and Value added Tax.	10	08
7.1	Importance of Pricing.		
7.2	Methods of Pricing- Cost plus, Rate of Return, Absorption Contribution and Backward.		
7.3	History, Meaning and Advantages of Value Added Tax in Hotel and Catering establishments		

The students may be assigned exercises related to Hotel Accounting to get hands on experience. They may be given assignments to collect various Formats used in the Hotel Industry and to present same in the class.

REFERENCE BOOKS

Sr.No	Name of theBook	Author	Publisher
1	Financial Management	M.Y.Khan & P.K.Jain	Tata McGraw Hill
2	Financial Management	Prof. Dr. S.V. Patankar	Everest Publishing House
3	Financial Management	Prof. N. M.Vechalekar	Nirali Publication
4	Financial Management	Satish M Inamdar	Everest Publishing House

5	Introduction To Management Accounting	L.N.Chopde and D.H.Choudhary	Sheth Publishers Pvt.Ltd
6	Financial and Cost Control Techniques	Dr. Jagmohan Negi, Gaurav Manohar	Metropolitan Book Co. Pvt. Ltd. New Delhi.

SEMESTER– VI

SUBJECT CODE:DSE 201					
SUBJECT: REGIONAL CUISINES OF INDIA (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale:- This object will give the students an insight into the Indian food ethos, indian spices, masalas, as well as promote and understanding of regional Indian cuisine

		Hours	Marks
Chapter 1	Indian Food Ethos	04	06
1.1	Indian food ethos- Jainism, Buddhism, Hinduism, Sikhism, Muslim, jewish,Christianity		
Chapter 2	Indian spices and ingredients	04	04
2.1	Role of Indian spices and ingredients in Indian cooking		
Chapter 3	Food and Ayurveda	04	06
3.1	Introduction to Ayurveda		
3.2	Body Constitution Types of Prakruti Tridosas – Vata, Pitta, Kapha		
3.3	Life style related eating habits – Healthy, eating habits Sativik, Rajas, Tamas diet Incompatible foods Fast Food		
Chapter 4	Basic Masalas	02	06
4.1	Role of masalas in Indian cuisine.		
4.2	Different masalas used in Indian cooking – wet and dry.		
4.3	Composition of different masalas – garam masala – garam masala, sambar masala, rasam powder, chat masala, dhansak masala,goda masala, malawanimasala, kashmiri masala.		
4.4	Proprietary masala blends		
Chapter 5	Regional Cooking Style	24	26
5.1	Cooking from different states with reference to		
5.2	• Geographical location		
5.3	• Historical background		
5.4	• Seasonal availability of raw material		
5.5	• Special equipments and fuels • Staple diet & popular food preparations. For the following cuisines / states		

	1) Goan 2) Maharashtra 3) Gujrati / Parsi 4) Karnataka 5) Bengali 6) Punjabi 7) Andhra / Hyderabad	8) Rajasthani 9) Tamilnadu 10) Kashmiri 11) Lucknowi 12) Kerala 13) Sindhi		
Chapter 6	Culinary Terms		04	06
	Kahwah Sandesh Loochi Sorpotel phoran Payassam Brista Raita Tikka Kari Khansamah Murabba Rista Chenna Mussallum Kabachini Kalan Kheema Tandoor Malpua Roganjosh Vindaloo Zarda Bhurta Rabarhi Pakora Shikampuri kebab Khichri Dosa Baghar Yakhni Achar Bhujjia Loab Galavat Chikki	Wazwan Toddy Shukto Appam Shikora Ponga Seekh Kebab Naan Saunth Gustaba Petha Do pyazaa Imarti Bhatara Ittr Burfi Moilee Kulfi Korma Kofta Khoya Kalia Kachumber Gil-e-hikmat Dhungar	Ver Panch Appam Dhansak Wark Raan Bharwaan Kachori Halwa Gujiya Moin doz Kadhi Pulao Salan Zamin	

	Mutanjan Bhunao Baffad Boondi Biryani Bonda	Pachadi Falooda Gajjac Boti Bisibele huliyana	Foogath Dum Mungodi		
Chapter 7	Indian Theme Lunches			06	06
7.1	Concept of theme lunches				
7.2	Factors to be considered when organizing theme lunches				

REFERENCE BOOKS

- 1 Historical Companion to Indian Food, K.T.Acharya, Oxford University Press
- 2 Modern Cookery for Teaching & Trade, Volume, I, Thangam E. Philip, Orient Longman Ltd. Mumbai
- 3 Ayurveda Ahara: Food, Diet, Dr.P.H.Kulkarni, India Sri Satguru Publications, New Delhi
- 4 Ayurvedic Indian Cooking, Dr. Sunanda Ranade, IAA

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- 5 Ayurvedic Concept of Diet and Nutrition, Dr. Sunanda Ranade, Dr. Rajendra, Deshpande, Dr. Arti Firke, IAA
 - 6 Ayurveda Nutrition and Cooking, Dr, Sunanda Ranade
 - 7 Zaika, Sonya Atal Sapru, Harper Collins.
 - 8 Prasad Cooking with Indian Masters, J.Indersingh & Prdeep Das Gupta, Allied Publishers Ltd. New Delhi
 - 9 Hyderabadi Cuisine, Pratibha Karan, Harper Collins.
 - 10 Dastarkhwan-e-Awadh, Sangeeta Bhatnagar & R.K.Saxena, Harper Collins
 - 11 Wazwaan, Rockey Mohan, Roli & Janseen.
 - 12 Punjabi Cuisine, Premjit Gill, Harper Business
 - 13 A Taste of India, Madhur Jaffrey, Mac Millan Publishing
 - 14 Tandoor, Ranjit Rai, Overlook Press
 - 15 The Bengal Book, Das Gupta, UBSPD
 - 16 Maharastrian Cuisine, Kaumudi Marathe, Zaika

SUBJECT CODE:DSE 201A				
SUBJECT: REGIONAL CUISINES OF INDIA (PRACTICAL)				
Teaching Scheme/Week	Examination Scheme			
Practical Hours	IA Marks	EA Marks	Total Marks	Credits
08	40	60	100	04

Minimum 20 Practicals including, Indian regional menus to be conducted.

The practicals should comprise dishes from the following states / cuisine:

- | | |
|------------------------|---------------|
| 1) Goan | 8) Rajasthani |
| 2) Maharashtra | 9) Tamilnadu |
| 3) Gujarati / Parsi | 10) Kashmiri |
| 4) Karnataka | 11) Lucknowi |
| 5) Bengali | 12) Kerela |
| 6) Punjabi | 13) Sindh |
| 7) Andhra / Hyderabadi | |

Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSE 102					
SUBJECT: ALCOHOLIC BEVERAGES II (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

To impart comprehensive knowledge of various spirits, liqueurs and cocktails.

		Hours	Marks
Chapter 1	Spirits	08	06
1.1	Introduction to Spirits		
1.2	Fermentation and Distillation Process		
1.3	Pot Still and Patent still.		
1.4	Various methods of Measuring Alcoholic Strength		
Chapter 2	Whisky	10	08
2.1	Ingredients used in making of Whisky.		
2.2	Manufacturing process of Whisky.		
2.3	Types of Whisky-Scotch and Irish Whisky		
2.4	Americal and Canadian Whisky		
2.5	International and IMFL Brand		
Chapter 3	Brandy	08	08
3.1	Ingredients used in making of Brandy		
3.2	Manufacturing process of Brandy		
3.3	Types of Brandy - Cognac and Armagnac		
3.4	Labeling Terminology		
3.5	Fruit and other Brandies.		
3.6	International and IMFL Brands.		
Chapter 4	Rum	06	06
4.1	Ingredients used in making of Rum		
4.2	Manufacturing process of Rum		
4.3	Tyype of Rum-White, dark and golden		
4.4	International and IMFL Brands		
Chapter 5	Gin	06	06
5.1	Ingredients used in making of Gin.		
5.2	Manufacturing process of Gin		
5.3	Types of Gin.		
5.4	International and IMFL Brands		
Chapter 6	Vodka	04	04
6.1	Ingredients used in making of Vodka		

6.2	Manufacturing process of Vodka.		
6.3	Types of Vodka		
6.4	International and IMFL Brands.		
Chapter 7	Tequila	06	04
7.1	Ingredients used in making of Tequila.		
7.2	Manufacturing process of Tequila		
7.3	Types of tequila		
7.4	Brands of Tequila		
Chapter 8	Other Alcoholic Beverages	04	06
8.1	Aquavit		
8.2	Schnapps		
8.3	Pastis		
8.4	Feni		
8.5	Arrack		
Chapter 9	Liqueurs	06	06
9.1	Definition and types of liqueurs		
9.2	Production methods		
9.3	Service of Liqueurs		
Chapter 10	Cocktails	06	06
10.1	Introduction and history of cocktails		
10.2	Methods of making cocktails and rules for making cocktails		
10.3	Equipments glassware, and garnishes used in making of cocktails, Cocktail recipe		

Glossary of Terms

Hors d'age	Marc	Grappa
Pisco	Ouzo	Peats Reek
Grain whisky	Blended whisky	Malt whisky
Single malt	Vatted malt	Rye whisky
Corn whisky	Bourbon	Jack Daniels
London dry gin	Plymouth	Steinhaeger
Old tom gin	Dutch gin	Bagasse
Dunder	White rum	Dark rum
Silver Tequila	Gold Tequila	Agave
Schnapps	Aquavit	Arrack
Tiquira	Absinthe	Pastis
Pernod	Ricard	Apertitifs
Angostura bitters	Cordials	Aromatized wines
Ale	Lager	Stout
Porter	Boquet	Burgundy
Aguardante	Grappa	Quetsch

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Food and Beverage Service	Dennis Lillicrap, John Cousins	Power Book
2	Modern Restaurant Service	John Fuller	Hutchinson
3	Food and Beverage Service	Sudhir Andrews	Tata Mc Graw Hill Edition
4	The Beverage Book	Durkan & Cousins, Hodder Arnold	H & S Toughton
5	Professional Guide to Alcoholic Beverages	Robert Lipinski, Bob Lipinski	Van Nostrand Reinhold
6	Oxford Companion to wines	Jancis Robinson	Oxford University Press
7	The Restaurant (From Concept to Operations)	Donald Lundberg	John Willey and Sons
8	The Ultimate Encyclopedia of Wines, Beer, Spirits and liqueues	Stuart Walton	Brain Glover Hermes house

SUBJECT CODE:DSE 102 A					
SUBJECT: ALCOHOLIC BEVERAGES II (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	--	100	04

1. Preparing a Beverage list
2. Preparing an Beverage order ticket
3. Service of Whisky
4. Service of Brandy
5. Service of Rum
6. Service of Gin
7. Service of Vodka
8. Service of Tequila
9. Service of other alcoholic beverages
10. Service of Liqueurs
11. Types of Cocktails
12. Methods of making cocktails-Buildup, Stirred
13. Methods of making cocktails-Layered, Floating
14. Menu planning and Service of food and alcoholic beverages
15. Preparing of Beverage List for a Specialty bar
16. Maintenance of statutory books

Field Visit

Students should be taken for visit to Winery and report must be submitted individually.
 Work Shop -A cocktail and mocktail workshop to be conducted and the report must be submitted individually.

Minimum of 02 assignments to be submitted by students by the end of these mester based on following topics.

- 1 Types of mocktail with recipes, glassware, method and presentation
- 2 Collecting themed bar menu cards (Minimum 5)
- 3 Price list of Spirits from 5 outlets

SUBJECT CODE:DSE 203					
SUBJECT: TRENDS IN HOUSEKEEPING (THEORY)					
Teaching Scheme/Week	Examination Scheme				
TheoryHours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale: The subject intends to familiarize the students with the current trends in housekeeping

		Hours	Marks
Chapter 1	Chaning trends in Housekeeping	06	06
1.1	Introduction		
1.2	Latest trends in Housekeeping with respect to Erogonomics Green housekeeping-Ecotel Facility management Technology		
Chapter 2	Erogonomics	08	08
2.1	Importance of Erogonomics in housekeeping		
2.2	Time and motion study in housekeeping routine		
2.3	Erogonomics design of furniture and fixtures		
2.4	Erogonomics design of equipments		
2.5	Erogonomics in housekeeping process		
Chapter 3	Introduction to Green housekeeping	08	06
3.1	Introduction to green housekeeping		
3.2	Ecotels		
3.3	Ecotel certification – 5 globes		
3.4	Role of housekeeping in environmental control		
3.5	Case study		
Chapter 4	Energy Conservation	08	06
4.1	Importance of Energy Conservation		
4.2	Energy Monitoring and Performance		
4.3	Guidelines for energy conservation		
4.4	Use of energy conserving products Educating and Sensitizing housekeeping staff regarding Importance of energy conservation		
Chapter 5	Water Conservation	08	06
5.1	Importance of Water Conservation		
5.2	General guidelines for water conservation		
5.3	Rainwater Harvesting		
5.4	Educating and Sensitizing housekeeping staff and guest		

Chapter 6	Waster Management	06	06
6.1	Importance of Waste Management		
6.2	3-R principle: Reduce, Reuse, Recycle		
6.3	Types of waste in hotels		
6.4	Waste disposal and control		
6.5	Sewage treatment plant in hotels		
6.6	Vermicomposting		
Chapter 7	Recent trends in Material planning for House Keeping	08	08
7.1	Bedding – Mattress, bed sheets, pillow menus Bedspreads, comforted and dust ruffle		
7.2	Bath Linen		
7.3	Table linen		
7.4	Uniforms		
Chapter 8	Facility management	06	06
8.1	Introduction to Facility Management		
8.2	Scope of Facility Management		
8.3	Outsourcing		
8.4	Housekeeping services in Facility Management		
8.5	Maintenance in Facility Management		
8.6	Security in Facility Management		
Chapter 9	Role of Technology in Housekeeping	06	08
9.1	Property Management System - PMS		
9.2	Familiarize with software used in housekeeping-		
9.3	Opera, Fidelio MIS-Definition, Concept and various reports generated		

Glossary of Terms

Atrium	Feasibility study	HVAC
Shotgun arrangement	Tower configuration	Facilities planning
Eva floors	Ergonomics	Skylit bathrooms
Jacuzzi	Luxmeter	Outsourcing
Pillow menu	Productivity standards	Slumber
Whirlpool	Workstudy	AAC Blocks
Biodegradables	CFCs	CFLs
Ecotels	Fly ash	Green building
Grey water	High albedo paint	HPMV's
HPSVs	MDF	Mulches
R-value	Trellises	Vermicompost
Dupion silk	Bast fibre	Damask
Tow yarn	Jacquard	Percale

Sericulture	FBAs	Filling yarn
Ergonomics	Tebilization	Anthropometry
Biogas	Power zone	Organic wastes

REFRENCES BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management -	Sudhir Andrews	Tata McGraw Hill
2	Hotel Housekeeping & Management	G Raghubalan	Oxford University
3	Hotel, Hostel & Hospital Hosuekeeping	Branson & Lennox	ELBS
4	Accomodation Management	Rosemary Hurst	Heinemann Publishing
5	Accomodation Management	Rosemary Hurst	Heinemann publishing

SUBJECT CODE:DSE 203A**SUBJECT: TRENDS IN HOUSEKEEPING (PRACTICAL)**

Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	--	100	04

1. Preparation of Time and motion study and practice in Housekeeping routines.
2. Preparation of sample format of ergonomic risk factor analysis for housekeeping staff.
3. Preparation of guidelines for energy conservation in housekeeping department.
4. Preparation of lighting system design for guest rooms and public areas.
5. Preparation of safety and security systems for guest rooms and public areas.
6. Calculation of energy cost in public areas for energy management.
7. Calculation of energy cost in public areas for energy management.
8. Preparation of checklist for eco friendly housekeeping in hotels.
9. Practice with computer & PMS handling related to Housekeeping.
10. Preparation of Housekeeping staff requirement and staff scheduling using housekeeping software.
11. Preparation of daily housekeeping schedules using housekeeping software.
12. Preparation of housekeeping history and staff performance reports using housekeeping software.
13. Planning of a Facility management project for various sectors.
14. Preparation of a feasibility study for outsourcing housekeeping jobs.
15. Designing of hotel staff uniforms.
16. Various reports generated for MIS in housekeeping.

Assignments :

1. Methods of pest control and chemicals used in hotels.
2. Project report on biogas and sewage treatment plants for waste disposal.
3. Project report on Vermicomposting.
4. Project report on Rain water harvesting.
5. Project report on Ecotel.

Visits :

1. Visit to an Ecotel.
2. Visit to a biogas and sewage treatment plant.
3. Visit to a Vermicomposting plant.
4. Visit to a Rain water harvesting system.
5. Visit to a facility management agency.

SUBJECT CODE: SEC 103					
SUBJECT: TOURISM OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

To inculcate a sense of importance and establish a link between the tourism industry and the hotel industry and to highlight tourism industry as an alternative career path.

		Hours	Marks
Chapter 1	The Tourism Phenomenon	04	03
1.1	Definition - Tourism, Tour; Tourist; Visitor; Excursionist; Domestic; International; Inbound; Outbound; Destination.		
1.2	Growth of Tourism / Evolution / History of Tourism.		
1.3	Present status of tourism in India		
Chapter 2	Constituents of Tourism Industry	04	05
2.1	Primary Constituents		
2.2	Secondary Constituents		
2.3	The 5 A's of Tourism - Attractions, Accessibility, Accommodation, Amenities, Activities.		
2.4	Career Opportunities for tourism professionals.		
Chapter 3	Infrastructure of Tourism	04	06
3.1	Role of Transport in Tourism		
3.2	Modes of Transport: Road, Rail, Air, Sea.		
3.3	Types of Accommodation- Main Alternate & Supplementary accommodation		
Chapter 4	Types of Tourism	04	06
4.1	Types of Tourism- Holiday, Social, Cultural, MICE, Religious, VFR (Visiting Friends and Relatives) Sports, Political, Health, Senior Citizen, Sustainable Tourism		
4.2	Alternative Tourism : Eco Tourism, Agro Rural Tourism		
Chapter 5	The Impact of Tourism	04	06
5.1	Economic Impact - Employment generation, Foreign Exchange earnings		
5.2			

5.3	Multiplier Effect, Leakage, Infrastructure Development		
5.4	Social, Cultural and Political Impact – Standard of living, Passport to Peace, International Understanding, Social Integration, Regional growth, National Integration		
	Environmental Impact – Tourism Pollution and Control, Wildlife and Bird Sanctuaries and their protection for tourist industry		
Chapter 6	The Tourism Organisations – Objectives, Role and Functions	06	06
6.1	Government organizations: DOT, ITDC, MTDC, ASI, TFCI.		
6.2	Domestic organisations: TAAI, FHRAI, IATO		
6.3	International organizations : WTO, IATA, PATA		
6.4	Non Government organizations : Role of NGO in making responsible tourists		
Chapter 7	The Travel Agency	06	06
7.1	Meaning & Definition of Travel Agent		
7.2	Types of Travel Agent : Retail and Wholesale Functions of a Travel Agent : Provision of travel information, Ticketing, Itinerary preparation, Planning and Costing, Settling of accounts. Liason with service providers		
7.3	Role of travel agents in promotion of tourism		
Chapter 8	The Tour Operator	06	06
8.1	Meaning & Definition		
8.2	Types of Tour Operator : Inbound, Outbound and Domestic		
8.3	Tour packaging : Definition, Components		
8.4	Types of Package Tour : Independent Tour, Inclusive Tour, Escorted Tour, Business Tour		
8.5	Guides and Escorts : Role and function Essential qualities to be a Guide or Escort.		
Chapter 9	Travel Formalities and Regulations	04	06
9.1	Passport : Definition, Issuing authority, Types of Passport and requirements for passport		
9.2	Visa : Definition, Issuing authority, Types of Visa and requirements for Visa		
9.3	Health Regulations		
9.4	Foreign Exchange		
Chapter 10	Itinerary Planning	04	06
10.1	Definition		

10.2	Steps to plan a Tour		
10.3	Route map		
10.4	Transport booking - reservation		
10.5	Accommodation - reservation		
10.6	Food facilities		
10.7	Local guide / escort		
10.8	Climate / seasonality		
10.9	Shopping & cultural show		
10.10	Costing		
Chapter 11	Technology in the Travel Industry	02	04
11.1	Relationship between Information Technology and Tourism Industry.		
11.2	Current Technology used - G.D.S (Global Distribution System)		
11.3	Use of Internet in tourism		

Assignments

1. Preparation of Itinerary - 2 days, 15 days, 21 days etc for well known tourist destinations in India and abroad.
2. Preparation of passport and visa - Documents and procedural requirements
3. Field visit to a Travel Agency, Airport etc.

REFERENCE BOOKS

Sr.No	Name of the Book	Author	Publisher
1	Introduction to Travel & Tourism	Michael M. Cottman	Van Nostrand Reinhold
2	Travel Agency & Tour Operation	Jagmohan Negi	Kanishka Publishers & Distributors
3	Concepts & Principles International Tourism	A.K. Bhatia	Sterling Publishers Pvt.Ltd.
4	Fundamentals & Practices A Textbook of Indian	B. K. Goswami G.Raveendran	Har Anand Publications Pvt
	Dynamics of Modern Tourism	Ratnadeep Singh	Kanishka Publishers & Distributors
	Tourism Development Principles and Practices	Fletcher & Cooper	ELBS

SUBJECT CODE: DSCP					
SUBJECT: PROJECT WORK					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
12	40	60	--	100	06

The students have to utilize the hours allotted for data collection, data analysis & preparing a detail project report at the end of the semester to record the process of the project and the findings thereon. The report should be in spiral bound format for the internal examination and hard bound with golden embossing for external examination.

The format of the project report is as detailed below

- Cover page
- Title Page
- Certificate
- Acknowledgements
- Index
- Introduction
- Aims & Objectives
- Theoretical framework of the topic (Background of the Topic, History, Contents from Secondary Data, Explanation of Terms)
- Research Methodology (Data collection method, Sampling method)
- Data Analysis & Data Interpretation (Graphical presentation of collected data)
- Suggestions / Recommendations
- Conclusions & Limitations
- Bibliography
- Appendix (Any relevant material to support the project)

Students have to present the process and findings of the project report to the panel examiners with the help of a Power Point presentation not exceeding 15 minutes. The examiners would evaluate the project based on the parameters of quality of the study, Project Report, presentation by the student & viva.

Note

The Project Report should be market research and field work oriented and preferably related to the Elective Course (Food Production / Food & Beverage Service / Accommodation Department).

SUBJECT CODE:AEC 103					
SUBJECT: HOSPITALITY MARKETING (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

This subject intends to promote and understanding of core concepts of marketing, current marketing environment, challenges in marketing of services and the marketing strategies to be adopted.

		Hours	Marks
Chapter 1	Introduction to Marketting	04	04
1.1	Defining Marketing		
1.2	Core concepts of Marketing		
1.3	Orientations towards Marketing:Production concept, Product concept, Selling concept, Marketing concept, Societal Marketing concept		
1.4	Difference between Selling and Marketing		
1.5	Marketing Mix		
Chapter 2	Introduction to Services Marketing	06	08
2.1	Definition		
2.2	Goods Vs. Service		
2.3	Characteristics of Services		
2.4	Problems in marketing of services and its solution		
2.5	Scope of Service		
Chapter 3	Customer Value and Satisfaction	04	04
3.1	Defining Customer Value and Satisfaction		
3.2	Delivering Customer Value and Satisfaction		
3.3	Attracting and Retaining customers		
3.4	Concept of Customer Profitability		
Chapter 4	Understanding the Marketing Environment	02	04
4.1	Demographic environment		
4.2	Economic environment		
4.3	Technological environment		
4.4	Political environment		
4.5	Social Cultural environment		
4.6	Business environment		

Chapter 5	Analyzing Consumer Markets and Buying Behavior	04	04
5.1	Consumer Behavior Model		
5.2	Factors influencing buyer behavior : Cultural, Social Personal, Psychological		
5.3	Buying decision process		
Chapter 6	Market Segmentation	04	04
6.1	Definition, Concept of market segmentation, target market and market positioning.		
6.2	Reasons for market segmentation.		
6.3	Basis for segmentation : Geographic, Demographic, Behavioral, Psychographic		
Chapter 7	Product Strategies	06	08
7.1	Levels of Product		
7.2	New Product Development		
7.3	Product Life cycle concept		
7.4	Product Differentiation		
7.5	Concept of Branding		
Chapter 8	Pricing Strategies	06	08
8.1	Price and its importance		
8.2	Internal and external factors affecting pricing decisions		
8.3	Pricing strategies adopted by hotel for : Room Tariff, F & B items, Functions & Packages.		
Chapter 9	Physical Distribution Strategies	06	08
9.1	Importance of distribution		
9.2	Channel Level		
9.3	Channels of distribution in the hospitality industry (Travel agents, Tour operators, Internet, Consortia, Hotel Representative, CRS etc.)		
9.4	Franchising		
9.5	Alliances		
9.6	Location of Services		
Chapter 10	Promotion Strategies	06	08
10.1	Definition, Characteristics of Promotional tools used in the hotel industry.		
10.2	Advertising		
10.3	Sales Promotion		
10.4	Publicity & Public Relations		
10.5	Personal Selling		
10.6	Direct Marketing.		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Marketing for Hospitality and Tourism	Philip Kotler	Pearson Education
2	Hotel Marketing	S M Jha	Himalaya Publishing
3	Hospitality Marketing	Neil Warne	Hospitality Press, Melbourne
4	Hospitality Marketing Management	Robert Reid,	CBS Publication

LIST OF SKILL ENHANCING ELECTIVE COURSES

SEE	101	FIRST AID
SEE	102	HOTEL MAINTENANCE
SEE	103	RETAIL MANAGEMENT
SEE	104	EVENT MANAGEMENT
SEE	105	ENTREPRENEURSHIP DEVELOPMENT
SEE	106	FACILITY PLANNING
SEE	107	SKILL ENHANCEMENT FOR MEDIA AND JOURNALISM IN HOSPITALITY

SUBJECT CODE: SEE 101					
SUBJECT: FIRST AID					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To introduce the students to first aid practices and managing emergency incidents until professional help is provided.

		Hours	Marks
Chapter 1	Introduction to First Aid	10	10
1.1	First Aid		
1.2	First aid priorities		
1.3	How to prepare yourself during an emergency		
1.4	Looking after yourself: Personal safety and protection from infections		
Chapter 2	Accidents and Injuries	12	10
2.1	Dealing with a casualty		
2.2	Requesting help		
2.3	Use of medication		
2.4	Assessing a casualty		
2.5	Method of assesment		
2.6	Head to toe examination		
2.7	Monitoring vital sign		

Chapter 3	Managing an incident	14	10
3.1	Removing clothing and headgear		
3.2	First aid materials: Dressing, Bandage, Slings.		
3.3	Action at an emergency		
3.4	Traffic incidents		
3.5	Fires		
3.6	Electrical incidents		
3.7	Water incidents		
Chapter 4	Emergency first aid for	14	10
4.1	Wounds and bleeding		
4.2	Shock		
4.3	Head injury		
4.4.	Spinal injury		
4.5	Broken bones		
4.6	Burns and scalds		
4.7	Poisoning		
4.8	Bites and Stings		
Chapter 5	Life saving procedures	14	10
5.1	Resuscitation		
5.2	Choking		
5.3	Hanging and Strangulation		
5.4	Drowning		
5.5	Inhalation of fumes		
5.6	Asthma		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	First aid manual	Written and endorsed by St John Ambulance	St Andrew's First Aid and the British Red Cross, DK
2	First aid Manual	St. John Ambulance (Author)	Dorling Kindersley Publishers Ltd 7 th Revised edition edition (1 May 1997)

SUBJECT CODE:SEE 102					
SUBJECT: HOTEL MAINTENANCE					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

The subject will provide information regarding the basic services and different types of engineering and maintenance systems in hotel industry. This subject will help students to understand various aspects and importance of the Engineering department in a hotel. At the end of the course students will be thorough with various machines and their working, fuels, electricity, safety and security, water distribution systems and energy conservation in hotel.

		Hours	Marks
Chapter 1	Maintenance & Replacement Policy	07	05
1.1	Definition of Maintenance		
1.2	Importance of Maintenance department in the hotel industry		
1.3	Organization chart of Maintenance department in 3/4/5 star hotels		
1.4	Duties and responsibilities of Chief Engineer of a hotel		
1.5	Types on maintenance and their advantages and disadvantages: Breakdown/Corrective, Preventive Predictive.		
1.6	Contract Maintenance: Need of contract maintenance. Types: Lumpsum, Unit Rate, Cost plus, Upper limit contract.		
1.7	Maintenance chart for Swimming Pool: Daily basis and Quarterly basis Kitchen: Daily basis and Quarterly basis		
1.8	Replacement of equipments: Reasons for replacement, economic replacement of equipments.		
Chapter 2	Refrigeration	08	08
2.1	Definitions: Heat, Temperature, Sensible Heat, Latent Heat, Relative Humidity, Zero Law of Thermodynamics, First Law of Thermodynamics.		
2.2	Methods of Heat Transfers: Conduction, Convection and Radiation.		
2.3			

	Refrigeration: Principles of refrigeration, Unit of refrigeration Refrigerants: Properties and types Block diagram of working of Vapour Compression Refrigeration System Domestic Refrigerator: Block diagram and working, Maintenance, Defrosting: Need and Methods Walk in Freezer/ Cold Storage: Block Diagram and working		
Chapter 3	Air Conditioning	06	06
3.1	Types of AC: Unitary AC, Window AC, Split AC, Block Diagram and working		
3.2	Factors affecting load on AC		
3.3	Factors affecting AC Comfort		
Chapter 4	Fuels	04	04
4.1	Types of Fuels		
4.2	Comparison of various fuels: Solid, Liquid and Gaseous		
4.3	Fuels used in hotel industry		
Chapter 5	Electricity	07	06
5.1	Types of Electricity supply: Single and Three Phase		
5.2	Types of Fuse: Re-wireable, Cartridge, MCB		
5.3	Importance and methods of Earthing		
5.4	Calculation of Electricity Bill		
Chapter 6	Water systems	08	07
6.1	Sources of water		
6.2	Adverse effects of hard water		
6.3	Methods of purification and Softening: Ion exchange, Limesoda		
6.4	Water distribution system: Up Feed, Down Feed		
6.5	Traps: Water Closets and Flushing Systems, Types, Diagram and functions		
6.6	Various plumbing fixtures		
Chapter 7	Energy and its Conservation	06	04

7.1	Various energy sources: Conventional and Non Conventional(Examples, Advantages and disadvantages)		
7.2	Need for for energy conservation		
7.3	Simple methods of energyconservations in Kitchen and Guest rooms.		
7.4	Use of Solar energy in a hotel.		
Chapter 8	Fire and Its Prevention	06	04
8.1	Fire Traingle		
8.2	Types of Fires: A,B,C, D, E and F		
8.3	Theory of Extinguishment: Staravation, Cooling and Smothering		
8.4	Various types of fire extinguishers		
8.5	Smoke Detectors and Fire Alarm system		
Chapter 9	Safety and Security in Hotel	06	03
9.1	Causes of Accidents		
9.2	Prevention/Control of Accidents		
9.3	Safety Issues in Hotel:Guest key Control, kitchen Safety, Slip and falls		
Chapter 10	Pollution and Control	06	03
10.1	Air Pollution:Causes and Effects		
10.2	Water Pollution: Causes and Effects		
10.3	Noise pollution: Causes and Effects		
10.4	Waste Management		

Note- Field visit to be arranged for students to engineering department of a five star hotel.working of AC plants and other aspects and systems of maintenance department to be shown to students. A report of the same must be submitted by students individually.

Assignments

1. Eco-friendly Refrigerant.
2. Centralized Air Conditioning in detail with block diagram
3. Working of Air filter, Humidifier and De-humidifier in AC
4. Water purification methods
5. Various lighting systems used in a hotel
6. Procedure to be followed in case of Fire alarm in hotel
7. Make a chart for various fire extinguishers with colour code and the type of fire it extinguishes.
8. Waste Disposal Methods– Incineration and Land Fill

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel Engineering	Sujit Ghosal	Oxford University Press
2	Hotel Engineering	R.K.Chhatwal	
3	Text book of Hotel Maintenance	Arora	Standard Publishers
4	Hospitality Facilities Management & Design	David m Stipnauk	EIAHMA

SUBJECT CODE: SEE 103					
SUBJECT: RETAIL MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

This subject helps the students to develop an understanding of the concepts and application of retail management techniques.

		Hours	Marks
Chapter 1	Retailing	04	04
1.1	Concept, importance, Functions		
1.2	Retailing as a career.		
Chapter 2	Retail formats	08	06
2.1	Store and non store		
2.2	Retailing		
2.3	Franchising		
2.4	Unconventional channels		
2.5	Retail expansion- need for foreign direct investment in Indian retail		
Chapter 3	Indian V/s Global Scenario in Retail	08	06
3.1	Evolution of retail in India		
3.2	Traditional business models in Indian retail		
3.3	Drivers of retail change in India		
3.4	Key sectors in Indian Retail		
3.5	International Retailing-factors contributing to its growth		
Chapter 4	The Retail Consumer	06	06
4.1	Need for understanding consumer buying behavior		
4.2	Customer decision making process		
4.3	Factors influencing the retail shopper		
Chapter 5	Retail Strategy	06	06
5.1	Importance of strategy from a retail perspective		
5.2	The strategic planning process		

Chapter 6	Retail location	06	06
6.1	Factors affecting location decision		
6.2	Site selection		
6.3	Store design		
Chapter 7	Basic of Retail Merchandising	08	06
7.1	Concept, Importance, Functions		
7.2	Functions and methods of buying for different types of organizations, introduction to Private label, Brands- concepts and needs		
Chapter 8	Retail Pricing	06	06
8.1	Factors affecting retail pricing decisions		
8.2	Pricing Strategies		
Chapter 9	Retail Store Operations	06	06
9.1	Concept		
9.2	Functional areas of retail operations		
9.3	Floor Space Management		
9.4	Managing store inventories and display		
Chapter 10	The Legal and Ethical aspects of retail business	06	04
10.1	Acts pertaining to the retail sector		
10.2	Taxation and its impact on retailing		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Retail Management	GibsonG	Vedamani and Jaico Publishing house
2	Retail Management	Chetan Baja	Oxford University Press
3	Retail Management Text & Cases	Sapna Pradhan	Tata Mc Graw Hill
4	Retail Management Text & Cases	UC Mathur	K. International Publishing house

SUBJECT CODE: SEE 104					
SUBJECT: EVENT MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

This subject helps the students to develop an understanding of the concepts and theories of application of management techniques inorganising of events.

		Hours	Marks
Chapter 1	Event Management	08	08
1.1	Introduction-Event Management		
1.2	Size of Event		
1.3	Types of Events-Cultural, Festivals, Religious, Business etc.		
1.4	Case study of some events		
Chapter 2	Planning an Event	08	08
2.1	Principles and steps in Planning		
2.2	Consultation with clients:Setting objectives, confirmation of date, list of guests, theme finalizations, event agenda		
Chapter 3	Concepts and Design	10	05
3.1	Developing the concept		
3.2	Analyzing the concept		
3.3	Designing the event		
3.4	Logistics of the concept		
3.5	Feasibility		
Chapter 4	Legal Compliance	06	05
4.1	Relevant legislations		
Chapter 5	Activities in Event Management	12	10
5.1	Pre event activities		
5.2	During event activities		
5.3	Post event activities		
5.4	Managing event-Planning, staging, organization		
5.5	Financial considerations		
5.6	Marketing and Promtion		

Chapter 6	Planning Venues	08	05
6.1	Finding venue, requirement of space		
6.2	Creating request for proposal		
6.3	Site inspection and confirmation		
6.4	Pre event meeting		
Chapter 7	Marketing of a Event	08	05
7.1	Tools used for marketing: Advertising, Publicity, Sponsor and media.		
Chapter 8	Dealing with the Vendors	04	04
8.1	Types of vendors, choosing vendors		
8.2	Vendor contracts		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Event planning: the ultimate guide to successful meetings, corporate events, fundrai singgal as, conferences, conventions, incentives	Allen,Judy, Mississauga,Ont	John Wiley & Sons Canada, c2009
2	The event manager's bible: how to planand deliver an event	Conway, Des	Oxford, 2006
3	Tony Rogers Conferences and Conventions: a global industry	Tony Roger	Elsevier, 2003
4	Marketing Destinations and Venues for Conferences, Conventions and Business Events	Tony Rogers & Rob, Davidson	Pearson, 1998

SUBJECT CODE: SEE 105					
SUBJECT: ENTREPRENEURSHIP DEVELOPMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale:

The subject aims to provide information regarding the various aspects pertaining to becoming a successful entrepreneur in the Hotel & Catering Industry.

		Hours	Marks
Chapter 1	Introduction to Entrepreneurship	10	08
1.1	Who is entrepreneurship?		
1.2	Definition of an Entrepreneur, Entrepreneurship and Intrapreneur Concept, Classification, Characteristics and skills of an Entrepreneur		
1.3	Skills of an Entrepreneur		
1.4	Qualities of an Entrepreneur		
1.5	Women Entrepreneurship		
Chapter 2	Introduction to Entrepreneurship	10	08
2.1	Entrepreneurship as a Career		
2.2	Role of an Entrepreneur and Economic development		
2.3	Various Entrepreneurs in India and Abroad		
2.4	Identifying the Opportunity (SWOT Analysis)		
Chapter 3	Market Assessment	10	08
3.1	Sources of Funding for a Business: Internal and External Funds, Personal Funds, Family and friends, Commercial banks and Financial institutions		
3.2	Procedure to get loan from various banks for business		
Chapter 4	Tools and Techniques of Ideation	12	10
4.1	Business plan- steps involved from concept to commissioning		
4.2	Project Report: Meaning and importance, components of a project report		
4.3	Project Appraisal: Meaning and definition, Technical, Economic feasibility and Cost- Benefit analysis		
4.4	Risktaking		

Chapter 5	Modern Trends in Entrepreneurship	10	08
5.1	E- Commerce		
5.2	Concept and Process		
5.3	Global Entrepreneur		
Chapter 6	Legal Acts prevailing in India	12	08
6.1	Various Acts applicable to business enterprises		
6.2	GST- Introduction		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Entrepreneurship Theory & Practice	J.S.Saini B.S.Rathore	Wheeler Publisher
2	Entrepreneurship Development	E.Gorden k.Natrajan	Himalaya Publishing
3	Entrepreneurship Development	J.B.Patel D.G.Allampally	Tata McGraw Hill
4	A Manual On How to Prepare a Project Reports	J.B.Patel S.S.Modi	EDI STUDY MATERIAL, Gujarat,India
5	Entrepreneurship	Rajiv Roy	Oxford Higher Education
6	Principals of Entrepreneurship	Prof.Satish C.Ailawadi Mrs.Romy Banerjee	Everest Publishing House
7	Entrepreneurship	Robert D Michael P.Peters Dean A Shepherd	Tata McGraw Hill Education Private Limited,NewDelhi,Sixth Edition

SUBJECT CODE : SEE 106

SUBJECT:FACILITY PLANNING (THEORY)

Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To introduce students to the fundamentals of planning and design related to hotel operation areas.

		Hours	Marks
Chapter 1	Introduction to Planning and Designing	08	10
1.1	Principles of planning and designing		
1.2	Trends in catering		
1.3	Time and motion study		
Chapter 2	Building and Exterior Facilities	08	10
2.1	Roof, exterior walls, windows and doors		
2.2	Structural frame & foundation		
2.3	Elevators.		
2.4	Storm water drainage systems, utilities.		
2.5	Landscaping and grounds		
Chapter 3	Parking Areas	08	10
3.1	Parking lots		
3.2	Structural features		
3.3	Lay out considerations		
3.4	Maintenance		
3.5	Parking garages		
3.6	Accessibility requirement for parking areas		
3.7	Valet parking		
Chapter 4	Lodging Planning and design	16	10
4.1	Development Process		
4.2	Feasibility studies		
4.3	Space allocation programme		
4.4	Operational criteria		
4.5	Budget		
4.6	Preliminary schedule		
4.7	Site design		

4.8	Hotel design		
4.9	Guestrooms and suites		
4.10	Lobby		
4.11	Food and beverage outlets		
4.12	Function areas		
4.13	Recreational facilities		
4.14	Back of the house areas		
Chapter 5	Food Service Planning and Design	08	10
5.1	Concept development		
5.2	Feasibility		
5.3	Regulations		
5.4	Planning layout		
5.5	Receiving areas		
5.6	Storage areas		
5.7	Kitchen		
5.8	Office space		
5.9	Sample blue print		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hospitality Facilities management	David M. Stipanuk	Educational Institute, and Design, Harold Roffmann, AHMA
2	How things work- The Universal Encyclopedia of Machines. Volume 1& 2		Paladin
3	The Management of Maintenance	Frank D. Borselink	John Willey
4	Air Conditioning Engineering	W.P.Jones	English Language Book, Society Edword Arnold
5	Building Construction	Sushil Kumar	Standard Publishers, Distributors, Delhi
6	The Complete Guide to DIY	Mike Lawrence	Orbis Publishing Ltd. UK, Maintenance Home
7	Engineering systems in hospitality industry	Allan .T	Status

Assignments

Assignments based on all the above topics to be done.

SUBJECT CODE:SEE107					
SUBJECT:SKILL ENHANCEMENT FOR MEDIA & JOURNALISM IN HOSPITALITY					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	--	--	50	50	04

Rationale

The subject in to develop creative writing skills among hospitality students

The students are expected to utilize the allotted hours in the following activities:

- Book reading and discussion (Atleast 2)
- Exploring journals/Literature in the digital /electronic media (Atleast 4)
- Writing a travelogue (Atleast2)
- Writing a review of a book or a restaurant (Atleast 4)
- Creating promotional material such as posters, pamphlets etc.for the various curricular as well as extra curricular events of the institute. (Atleast4)

SEMESTER VII

SUBJECT CODE:DSE 201					
SUBJECT: ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

The subject intends to provide indepth insight into international cuisine and develop an advanced understanding of technical as well as managerial skills for culinary professionals.

		Hours	Marks
Chapter 1	Production Management	02	04
1.1	Introduction to production management		
1.2	Kitchen organization		
1.3	Allocation of work, Job Description, Duty Roster		
1.4	Production Planning & Scheduling		
1.5	Production Quality & Quantity Control		
1.6	Forecasting and Budgeting		
Chapter 2	Nouvelle Cuisine	02	04
2.1	Evolution of Nouvelle cuisine		
2.2	Principles of Nouvelle cuisine		
Chapter 3	Food Presentations & Garnishes	02	04
3.1	Importance of food presentation		
3.2	Skills and techniques in food presentation		
3.3	Importance of garnishes		
3.4	Classical garnishes		
Chapter 4	International Cookery	20	20
4.1	Influence of historical background, geographical location on the staple food and cuisines of the following countries/ regions: France Japan Italy China Germany Tex Mex Spain Mediterranean Great Britan South East Asia		
Chapter 5	Meringues	02	02
5.1	Making of meringues		
5.2	Factors affecting stability of meringues Cooking of meringues Types and uses of meringue		

Chapter 6	Sugar	02	04
6.1	Tools required for sugar work		
6.2	Types of sugar as decorative work : Spun Sugar, Pulled Sugar, Poured sugar and Blown Sugar		
Chapter 7	Chocolate	02	04
7.1	Manufacture		
7.2	Couverture		
7.3	Tempering		
7.4	Molding		
7.5	Chocolate Decorations		
Chapter 8	Icings & Toppings	04	04
8.1	Types of icings – Flat, Butter cream, Royal, Marzipan, Nougatine, Pastillage, Ganache		
Chapter 9	Recipe Balancing	02	04
9.1	Importance		
9.2	Principles of recipe balancing in cake making and bakery		
Chapter 10	Pastries	05	06
10.1	Types: Short Crust, Flaky, Puff, Danish, Choux and Filo		
10.2	Faults and their causes		
Chapter 11	New Concepts in Culinary	05	04
11.1	Understanding basics of Molecular Gastronomy		
11.2	Organic foods		
11.3	Vegan cuisine		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Professional Cooking	Wayne Gisselen	John Wiley & Sons, N.Y
2	Practical Cookery	Kinton Ceserani	ELBS
3	Basic Cookery	Richard Maetland & Derek Welsby	Heinemann
4	Culinaria Volume I & II	Koneman	CBS Publication
5	Professional Baking	Wayne Gisselen	John Wiley & Sons, N.Y

6	International Cuisine and Food Production Management	Parvinder S Bali	Oxford Publications
7	Understanding Baking	Bernard Davis, Shally Stone	William Heinmen Ltd. London
8	Larousse Gastronomique	Krishna Arora	Frank Bros & Co. Ltd. New Delhi
9	Basic Baking	Kinton Ceserani	ELBS
10	Classical Food Preperation and Presentation	John Kivela	Hospitality Press
11	Theory of Cookery	Krishna Arora	Frank Bros & Co.Ltd, Delhi
12	Theory of Catering	Kinton Ceserani	Book Power
13	Professional Pastry Chef	Rocky Mohan	Roli & Janssen

SUBJECT CODE:DSE 201 (A)				
SUBJECT: ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT (PRACTICAL)				
Teaching Scheme/Week	Examination Scheme			
Practical Hours	IA Marks	EA Marks	Total Marks	Credits
08	40	60	100	04

Minimum 24 International menus to be conducted.

The menus should cover the following regions of the world :

1. Tex-Mex
2. France
3. Italy
4. China
5. Spain
6. Germany
7. Great Britain
8. Japan
9. Mediterranean region
10. South East Asia

Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSE 202					
SUBJECT: FOOD & BEVERAGE OPERATIONS & MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

To impart comprehensive knowledge about bar operation and management skills.

		Hours	Marks
Chapter 1	Introduction to Bar & Bar Beverages	12	12
1.1	Alcoholic Beverages		
1.2	Non Alcoholic Beverages		
1.3	Aerated Beverages, Bar Syrups, Squashes and Cordials		
1.4	Premixed Drinks Mineral, Spring water, Flavoured and Packaged waters.		
1.5	Aperitifs, Liqueurs and digestifs		
1.6	Types of Bars		
1.7	Role of Various bar personnel in the bar. Bar equipment's and their uses (Large and Small equipment's)		
Chapter 2	Planning of Bar	08	06
2.1	Layout of a bar		
2.2	Factors to be considered while planning a bar		
2.3	Safety and hygiene consideration		
2.4	Seating arrangements of various bars.		
Chapter 3	Bar Controls & Statutory Requirements	08	06
3.1	Purchasing, Receiving and storing of beverages		
3.2	Inventory/Stock Control methods.		
3.3	Calculation of Beverage cost Daily, Weekly Bar Reports.		
3.4	Sales Summary and Sales Analysis, Sales Mix.		
Chapter 4	Mixology	10	10
4.1	Introduction to the science of Mixology.		
4.2	Cocktail making		
4.3	Glassware and garnishes.		
4.4	Making of Traditional and Innovative cocktails.		
4.5	Flair bartending		
Chapter 5	Function and Event Catering	08	10

5.1	Definition of function catering and types of functions		
5.2	Organizational structure of Banquet department, duties and responsibilities of banquet		
5.3	Function catering administrative procedures		
5.4	Preparation of function prospectus.		
5.5	Menu planning for various types of functions		
5.6	Seating arrangement for various functions, Table plan and space considerations.		
5.7	Off premises / out-door catering		
Chapter 6	Gueridon Service	08	06
6.1	Origin and definition.		
6.2	Types of trolleys.		
6.3	Special equipments used in gueridon service care and maintenance.		
6.4	Service Procedure.		
6.5	Service of classical dishes		
Chapter 7	Buffets	04	04
7.1	Definition		
7.2	Types of Buffets		
7.3	Equipments and set up of buffets.		
Chapter 8	Menu Engineering	03	03
8.1	Concept and application.		
8.2	SWOT analysis of various food and beverage outlets.		
Chapter 9	Customer Relationship	03	03
9.1	Handling Customer Complaints.		
9.2	Customer Satisfaction		

Glossary of Terms

Fortified wines	Cobblers	Collins
Blended drinks	Coolers	Crustas
Cups	Daisies	Egg nogs
Fixes	Flips	Frappes
High ball	Juleps	Pick-me-up
Pousee-cafe	Smashes	Sours
Swizzles	Toddies	Amer-picon
Campari	Bar die	Hawthorne strainer
Boston shaker	Cassis	Cerise
Citronelle	Framboise	Gomme
Grenadine	Orgeat	Squashes
Bar-blade	Speed pourers	Bar optics

Front bar	Back bar	Kirsch
Generic liqueurs	Proprietary liqueurs	Pousee cafe
Jigger	Asian Buffet	Gala Reception
Dispense Bar	Smorgasbord	Easter Buffet
Brunch Buffet	Candelabra	Casserole Stations
Fork Buffet	Suzette Pans	Beverage Urns
Chafing Dish	Portion scale	Props
Floral Accessories	Skirting	Waffle Irons
Rechaud Stores	Trancheur	Carousal
Gueridon	Underbars	Over bar
Portable bar	Cobra Gun	IRD
Centralized Rook Service	RSOT	De-Centralized Room Service
California Menu	Cyclic Menu	EMT
PMT	Evlevenses	
SWOT		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Food and Beverage Service	Dennis Lillicrap, John Cousins	Power Book
2	Modern Restaurant Service	John Fuller	Hutchinson
3	Food and Beverage Service	Sudhir Andrews	Tata Mc Graw Hill Edition
4	The Beverage Book	Durkan & Cousins, Hodder Arnold	H & S Toughton
5	Professional Guide to Alcoholic Beverages	Robert Lipinski, Bob Lipinski	Van Nostrand Reinhold
6	Oxford Companion to wines	Jancis Robinson	Oxford University Press
7	The Restaurant (From Concept to Operations)	Donald Lundberg	John Willey and Sons
8	The Ultimate Encyclopedia of Wines, Beer, Spirits and liqueues	Stuart Walton	Brain Glover Hermes house
9	Food and Beverage Management	Bernard Davis Sally Stone	Butterworth Heineman Ltd

SUBJECT CODE:DSE 202A

SUBJECT: FOOD & BEVERAGE OPERATIONS & MANAGEMENT (PRACTICAL)

Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	--	100	04

- 1** Preparation of various types of Beverage lists
- 2** Service of various Spirits & Cocktails
- 3** Planning and layout of various types of bars
- 4** Maintenance of statutory records
- 5** Preparing of Daily/Weekly Bar Reports
- 6** Flair Bartending Principles : Types of Flair Bartending
- 7** Molecular Mixology
- 8** Innovative Cocktails & Mocktails
- 9** Filling up of Banquet Function Prospectus
- 10** Banquet seating arrangements, formal banquet service
- 11** Mise-en-place for service from gueridon trolley and service of dishes
- 12** Setting up of buffets and service procedures
- 13** Planning of Off premises catering functions
- 14** Menu Engineering
- 15** SWOT Analysis of fine dining establishment, QSR
- 16** Planning and service of food festivals and other promotional events

SUBJECT CODE:DSE 203					
SUBJECT: ACCOMMODATION MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

The subject aims to establish the importance of management in Accommodation Operations. This course aims to establish the importance of Front Office within the hospitality industry. It also prepares the student to acquire management skills and knowledge in the Department.

		Hours	Marks
Chapter 1	Pioneers of the hotel industry	04	02
1.1	Founders of the hotel industry		
1.2	Developments in hotel industry		
1.3	Indian hotel chains-History & growth		
Chapter 2	Social skills required for Rooms Division staff	06	06
2.1	Introduction and Importance of social skills		
2.2	Behaviorial skills - self presentation, body language		
2.3	Crossculture-Styles of welcoming, need for foreign language, global language		
Chapter 3	Budgeting in Rooms Division	06	08
3.1	Definition, concept & importance		
3.2	Type of budgets - capital & operating		
3.3	Budgeting for front office operations- Forecasting Revenue, Estimating Expenses, Refining Budget Plans		
Chapter 4	Revenue Management	06	06
4.1	Concept		
4.2	Measuring & maximizing Yield		
4.3	Elements of Revenue Management		
4.4	Using Revenue Management- concept of ARR and REV PAR		
4.5	Calculation of Yield Statistics and Yield Management		
Chapter 5	Evaluating Front Office Operations	06	06

5.1	Daily Operations Report		
5.2	Occupancy Ratios		
5.3	Rooms Revenue Analysis		
5.4	Hotel Income Statement		
5.5	Rooms Division Income Statement		
5.6	Rooms Division Budget Reports		
5.7	Operating Ratios		
5.8	Ratio Standards		
Chapter 6	Introduction to Management Information System	06	06
6.1	MIS-Introduction, Definition, Concept, understanding information system, MIS for key decisions		
6.2	Property Management System - Various modules related to Reservations, Registration, Cashiering, Telephones, Guest history		
Chapter 7	Managing Human Resource in Rooms Division Department	06	06
7.1	Determining manpower requirements.		
7.2	Recruitment		
7.3	Training		
7.4	Staff Scheduling		
7.5	Staff Motivation		
7.6	Performance Appraisal		
7.7	Effective use of SOP's in front office departments		
Chapter 8	New property operations	06	06
8.1	Starting up Rooms Division Operations		
8.2	Systems and procedures		
8.3	Staffing consideration		
8.4	Count down		
Chapter 9	Housekeeping in Allied sectors	08	08
9.1	Need & Importance		
9.2	Institutional Housekeeping-Hostels, guest houses & residential homes		
9.3	Housekeeping in Hospitals		
9.4	Housekeeping in Retail sectors		
9.5	Housekeeping in Art Gallery, Museum		
9.6	Housekeeping in Aircrafts, Airports		
9.7	Corporate Housekeeping		

Chapter 10	Customer Relationship Management in Rooms Division	06	06
10.1	Definition & concept		
10.2	Importance of loyalty programme		
10.3	Benefits of loyalty Programme		
10.4	Types of loyalty programme		

Glossary of Terms

Capital budget	Operating budget	Pre opening budget
Flexible bedget	Fixed budget	Master budget
Variable expenses	Semi variable expenses	Yield Management
GOPPAR	Performance Appraisal	Induction
Orientation	Cross training	Multi skilling
Time and motion study	Soft opening	Countdown
Zero base budgeting	Contingency plan	Graveyard shift
Job description	Job specification	Job analysis
Job assignment	Job breakdown	Productivity standard
Job assignment	Work study	Pre opening budget
Zero base budgeting	Job analysis	Facility management
Buddy system	Productivity standard	Countdown
Social Skills	Staffing guide	Graveyard shift
Behavioral skills		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management	Sudhir Andrews	Tata Mc Graw Hill
2	Hotel Housekeeping & Management	G Raghubalan, Smritee Raghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	ELBS
4	Accomodation Management	Rosemary Hurst	Heinemann publishing
5	Hotel Front Office Operations & Management	Sudhir Andrews.	ELBS

6	Check-in Check-out	Jerome Vallen	Heinemann publishing
7	Principles of Hotel Front Office Operations	Sue Baker, P. Bradly, J. Huyton	Tata Mc Graw Hill
8	Hotel Front Office	Bruce Graham Stanley	WM.C Brown IOWA
9	Managing Front Office operations	Michael Kasavanna Richard Brooks Charles Steadmon	Continuum Thornes
10	Front Office Procedures & Management	Peter Abott. & Sue Lewry	AH & LA Butterworth & Heinemann
11	Front Office operations	Colin Dix, Chris Baird	Pearson
12	Front Office Operations And administration	Dennis Foster	Glencoe.
13	Hotel Accounting & Financial Control	Ozi D'Cunha	Dickey Enterprises

SUBJECT CODE: DSE 203 A

SUBJECT: ACCOMMODATION MANAGEMENT (PRACTICAL)

Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	--	100	04

1.	Preparing of various budgets in Rooms Division department.
2.	Calculation of stocks and expenses for Rooms Division department.
3.	Preparation of Rooms division income statement.
4.	Preparation of reports for consumption of guest consumables.
5.	Calculations of various statistical data using Formulae: ARR, Room Occupancy Double Occupancy %, Bed Occupancy %, foreign occupancy %, Local Occupancy %
6.	Calculation of Yield Statistics and Yield Management.
7.	Calculation of staffing requirements and staff scheduling for the Rooms Division department in different types of hotels.
8.	Preparation of duty roster for Rooms Division department in different types of hotels.
9.	Preparation of orientation and training programme for new recruits in Rooms Division department.
10.	Preparation of format for performance appraisal and various rating systems.
11.	Preparation of Time and motion study for Rooms Division jobs.
12.	Practice with computer & PMS handling related to Rooms Division
13.	Practice of mock interviews of Rooms Division job positions.
14.	Preparation of a checklist for Rooms Division tasks in the countdown of a new property launch.
15.	Planning Start up systems and procedures in the Rooms Division department of a new start up property.
16.	Planning for housekeeping operations in Retail and Corporate sectors, Hostels, Guest houses and Hospitals.

Assignment

1. Preparation of job descriptions for housekeeping personnel
2. Preparation of orientation and induction training programme for housekeeping staff
3. Preparation of performance appraisal report

-
-
4. Preparation of SWOT analysis for Rooms Division Department
 5. Preparation of SOP's for front office department. Preparation of SOP's for Protocols of VVIP, VIP's and CIP's & traditional welcome amenities (Ministers, Dignitaries, Govt. Officials, Foreign delegates and others)
 6. Preparation of SOP's for different tasks in Rooms Division.

SUBJECT CODE:SEC 104					
SUBJECT: APPLICATION OF COMPUTERS IN HOTELS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	20	30	---	50	02

Rationale

The subject aims to give a basic knowledge of computers and its operations and enables the student to operate the computer with enough practice to get confidence.

		Hours	Marks
Chapter 1	Computer Fundamentals	03	03
1.1	Features of Computer System		
1.2	Block Diagram		
1.3	Hardware Input & Output Devices, CPU, RAM, ROM		
1.4	Software - System, Applications/W		
1.5	Networks - LAN, MAN, WAN, Topologies		
1.6	Viruses- Types, Precautions		
1.7	Types of Software- System & Application software's		
Chapter 2	Windows	03	03
2.1	Features		
2.2	Terminologies - Desktop, Windows, Wallpaper, Icons, File, Folder, etc. Windows Explorer - (Assignment with files, folders)		
2.3	Accessories - Paint, Notepad, Calculator,		
Chapter 3	MS Word	03	02
3.1	File Commands, Print, Page Setup		
3.2	Editing - Cut, Copy, Paste, Find, Replace,		
3.3	etc.		
3.4	Formatting Commands - Fonts, Bullets, Borders,		
3.5	Columns, Tabs, Indents. Tables, Auto Text, Auto Correct Mail Merge, Hyperlinks		
Chapter 4	MS Excel	03	03
4.1	Features, Auto Fill, Custom Listsetc		
4.2	Cell Reference - Relative & Absolute (s)		
4.3	Formulae, Functions (Math/Stats, Text, Date, IF)		
4.4			
4.5	Charts-Types, Parts of the Chart		

	Databases Create, Sort, Auto Filter,Sub Total)		
Chapter 5	MS Powerpoint	04	03
5.1 5.2 5.3	Slide Layout, Slidetransition Clip Art, Organizational Chart, Graphs, Tables. Custom Animations, Slide Timings.		
Chapter 6	Internet / Email	04	04
6.1 6.2 6.3 6.4 6.5	History, Pre-requisites for Internet, Role of Modem Services - Emailing, Chatting, Surfing, Blog Search Engines, Browsers, Dial Up, Domains Broadband, Concepts of Webupload, download Threats - Spyware, Adware, SPAM		
Chapter 7	E-Commerce And ERP Concepts	03	03
7.1 7.2 7.3	Concepts of B-to-B, B-to-C ERP Concept SAP Concepts		
Chapter 8	Hospitality Software	03	03
8.1 8.2 8.3 8.4 8.5 8.6 8.7	Shawman Hospitality Software- Point of Sale (VPOS - 9) Introduction Restaurant order taking Add on command prompt Cheque making -single, split etc. Bill settlement Availing Discounts		
Chapter 9	Hospitality software	03	03
9.1 9.2 9.3 9.4 9.5 9.6 9.7	Shawman Hospitality Software-Property Management System Introduction Room Reservations Group Booking Payment Settlement Adding Discounts Payroll Management System		
Chapter 10	Hospitality Software	03	03
10.1 10.2 10.3 10.4	Shawman Hospitality Software- Human Resource Management System Management System Sales & Catering Management System Wire data System		

10.5	Customer feedback system		
10.6	Introduction		
10.7	Payroll		
10.8	Customer Feedback		
10.9	Communication within the property & Outside the property Other Hospitality Software's Fidelio, Opera, Oracle, Micros		

REFERENCE BOOKS

1	Mastering MS-OFFICE, Lonnie E. Moseley & David M. Boodey, BPB Publication
2	Computer Fundamentals, P.K. Sinha, BPB Publication
3	Computer Fundamentals, Anita Goel, BPB Publication

SUBJECT CODE:SEC 104 - A					
SUBJECT: APPLICATION OF COMPUTERS IN HOTELS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
0	4	6	---	100	02

Practical 1

COMPUTER FUNDAMENTALS

Input Devices, Output devices,
LAN, WAN, MAN

Practical 2

WINDOWS

Change wallpaper, set screen saver, Create folders and files using Notepad.
Cut, copy and paste files to floppy/ pen drives.
Create images using Paint
Check free disk space and speed of processor.
Change date and time.

Practical 3, 4, 5, 6

WORD

Type recipe of any dish, with its image, with ingredients inatable.
Create KOT, Student's Resumes with students photograph.(WORLD Letter Writing)
KOT Making
Company Letter head making
File, Edit, View, Insert, Format, Tools, Table Commands Page Setup,
Print File, Edit, View, Insert, Format, Tools, Table Commands Page
Setup, Print Options, Setting Page Margins Clip Arts, Inserting
Pictures/Charts/Files Correcting Text, Cut, Paste, Undo, Redo, Deleting
Blank lines, Inserting A Page, Typing Over Text, Replacing Text,
Moving And Copying Text. menu Method, Key Board Method, Tool Bar
Method, Drag & Drop Method, Checking Text, The Spell Checker, Auto
Correct Check Up, The Grammar Checker, Formatting A Text, Changing
Type Style, Character Hiaghlighting, Alignment of Text, Left, Right
Center, Justifying Text-Types & Tab Setting, Setting Tab Using Ruler,
Indenting Paragraphs, Increasing And Decreasing Indents, Using Ruler
To set Indents, Spacing Paragraph Line Spacing, Spacing Between

Paragraphs, Page Views, Normal Views, Page Layout View, Outline View, Print Preview, "Full Screen View, Master Document View, Magnification, Page Formatting, Setting Margins, Paper Size, Printing in Landscape Or Portrait Orientation, Page Numbering, Adjoining Page

Numbering, Deleting Page Numbering, Header & Footer, Creating And Editing Inserting And Deleting Pages in A Document, Saving The Text, Saving The File To Disk, Closing A file, Opening A Non-Work document Printing Text.

Practical 7, 8, 9 EXCEL

List of employees, with salary, KOT, Report Card with Pass/Fail Result, Bills with details of Hotel Rooms, Charts, Data base of Employees with filters Processing With MS Excel, Starting Excel, Starting New Work Book, Entering And Editing Data, Formatting Work Sheet, Sorting The DATA, The Worksheet Selecting Cells And Ranges, Selecting With Mouse, Data Entry, Entering Numbers, Text, DATE & Time Entries, Entering Series, Filing A Text Series With Auto Fill, Filing A Number Series, Editing DATA, Clearance And Replacing Contents of A Cell, Deleting The Contents of A Range of Cell, Re-arranging Work sheet data, Copying Auto Correct, Spell Checking, File dose, Formatting Data, Font Selection, Aligning DATA, Format Style, Formatting Work Book, Arranging, Hiding, Unhiding, Inserting Columns And Rows, Adjusting Width, Copying And Moving, Inserting And Deleting Sheets From Work Book, Mathematical Operator, Exponentiation And Percentage Operators, Logical Or Comparison Operator, Exponentiation And Percentage Operators, Logical Or Comparison Operators, Using Mouse To Create A Formula. Inserting A Chart, Chart Types, Modifying Chart Adding Drawing To the Chart, Printing In Excel, Print Parameters, Default And Changing Default Settings, Sorting, Printing Etc.

Practical 10, 11 POWER POINT

To Present the above information as a presentation as an assignment.
Use different layout, organization chart, design templates, in the presentation.
Opening And Saving Presentations The Easy Way -Using Auto Content Wizard-Working With Blank Presentation -Using The Templates -Using The Slide Master Working with Color Schemes- Working with slides, Making A New Slide Move, Copy or Duplicate Slides Delete A Slide Copy A Slide From One Presentation To Another Go To Specific Slide-Change The Lay Out of A Slide Zoom In or Out of Slide Working With Text In Power Point Cutting, Copying and Pasting-Formatting Text, Change Font & Size, Shadowing, Embossing-Alignment The Text-Left, Center, Right And Justify-Power Of Graphics In Power Point Working With Clipart Picture- Using Microsoft Excel-Chart-Using Organization Charts-Power Point Drawings Ways To Draw- Adding Lines Connecting Lines Borders And Adding Curves - Creating Word Tables Making Great Looking Presentations (Putting On A Show)- Arranging, Creating Animated Slides -

Manually Advancing Slides-Adding And Removing Transitions - Running A Presentation
Continuously Printing The Presentation Elements.

Practical 12 INTERNET

To search and downloading formation from the internet as a topica and submit
(Hard/Softcopy)

Create email id, send mail to faculty as an assignment.

Practical 13, 14 - Shawman - Point of Sale

Shawman Hospitality Software - Point of Sale (VPOS9)

Introduction

Restaurant ordertaking

Add on command prompt

Cheque making - single, split etc.

Availing Discounts

Bill Printing, Re-printing, Bill settlement

Practical 15 Property Management System

Taking Rooms Booking Adding DiscountsBilling

Practical 16 Payroll System

Calculating Paryroll

Appraisal System

SUBJECT CODE: AEC 104					
SUBJECT: HUMAN RESOURCE MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

The student will be able to understand the role and importance of Human Resource Management in the modern hospitality environment.

		Hours	Marks
Chapter 1	Introduction to Human Resource Management	04	06
1.1	Human Resource Management defined		
1.2	Human Resource Management and Personnel Management		
1.3	Role, Nature and Characteristics of Human Resource Management		
1.4	Functions of Human Resource Management		
1.5	Challenges for Human Resource Management		
Chapter 2	Human Resource Planning	10	10
2.1	Man power planning - concept need and technique		
2.2	Process of manpower planning		
2.3	Job Analysis, Job Description, Job Specification		
2.4	Recruitment/Sources of recruitment		
2.5	Selection, orientation and induction process		
Chapter 3	Human Resource Development	06	06
3.1	Definition and elements of Human Resource Development		
3.2	Training - need and importance		
3.3	Assessment of training needs		
3.4	Difference between training and development		
Chapter 4	Performance Management and Appraisal	08	08
4.1	Performance Management - Need and importance		
4.2	Performance Appraisal - Purpose methods and errors		
4.3	Career Management Promotion and Transfers		
4.4	Career development and its benefits		
4.5	Need for career counselling		
Chapter 5	Performance and Job Evaluation	08	04

5.1	Performance evaluation and its objectives		
5.2	Job Evaluation-concept and objectives, methods of job evaluation and limitations of Job evaluation		
5.3	Competency matrix - concept, benefits and implementation in the hospitality industry		
Chapter 6	Compensation Administration	10	08
6.1	Objectives of compensation administration		
6.2	Types of compensation - direct and indirect		
6.3	Factors influencing compensation administration, concept of Cost to Company (CTC)		
6.4	Steps in formulation of compensation packages		
6.5	Current trend in compensation - Competency and Skill based pay, Broad banding		
Chapter 7	Incentives and Benefits	08	06
7.1	Objectives of wage incentives		
7.2	Wage incentives planning process		
7.3	Types of incentive schemes in brief - straight piece rate, differential piece rate, Task and Time Bonus, Merit rating		
7.4	Organisation wide incentive plans - Profit sharing, Employee stock options (ESOP)		
7.5	Fringe benefits - objectives and forms		
Chapter 8	Grievances and Discipline	03	06
8.1	Grievance Handling - causes of grievances, GHS		
8.2	Grievance handling system		
8.3	Discipline aims and objectives, Causes of indiscipline		
8.4	Women Grievance committee - importance, role and functions		
Chapter 9	Industrial Relations - Labour and Management Relations	03	06
9.1	Trade union - concept, objectives and functions		
9.2	Collective Bargaining		
9.3	Workers Participation in Management in hospitality industry		
9.4	Labour turn over - causes and measures for reducing labour turnover and retention strategies implemented by the hospitality industry		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Fundamentals of Human Resource Management- content, competences and application	Gary Desslerand Biju Varkkey	Pearson Education
2	Personeel Management	C.B Mamoria	Himalaya Publishing
3	Human Resource management and human relations	Dr. V.P Michael	Himalaya Publishing
4	Human Resource Management Atextbook for the hospitality industry	Sudhir Andrews	Tata Mc Graw hill
5	Human Resource Management in Hospitality	Malay Biswas	Oxford university pres
6	Human Resource Management	Ved Prakash	

SUBJECT CODE: AEC 106				
SUBJECT: TOTAL QUALITY MANAGEMENT				
Teaching Scheme/Week	Examination Scheme			
Theory Hours	IA Marks	EA Marks	Total Marks	Credits
03	40	60	100	03

Rationale To enable the student to understand the importance of total quality management

		Hours	Marks
Chapter 1	Introduction to Quality	06	06
1.1	Definition		
1.2	Importance of Quality		
1.3	Evolution of Quality		
1.4	Determinants of Quality		
1.5	Quality Cycle		
Chapter 2	Contribution to total quality management	06	06
2.1	Philip B. Crosby		
2.2	W.Edwards Demings		
Chapter 3	Managing Quality	06	08
3.1	Quality Cycle		
3.2	Cost of Quality		
3.3	Traditional V/S Modern Management		
Chapter 4	Benchmarking	06	08
4.1	Concept of Benchmarking		
4.2	Bench marking process		
4.3	Advantages and limitations of benchmarking process		
Chapter 5	Focusing on Customers	06	08
5.1	Customer driven quality		
5.2	Requirement of internal and external customers		
5.3	Model of CRM- IDIC		
Chapter 6	Problem Solving Tools	06	08
6.1	PDCA		
6.2	Pareto analysis		
6.3	Quality circles		
6.4	Ishikawa/fish bone diagram		
Chapter 7	Quality Certification and audit	06	08
7.1	ISO-9000		
7.2	EMS-14001		

7.3	Food Safety Management-22000		
Chapter 8	TQM in Services	06	08
8.1	Dimension of Services		
8.2	PZB Model		
8.3	Rater Model		

REFERENCE BOOKS:

Sr. No.	Name of the Book	Author	Publisher
1	The essence of Total Quality Management	John Blake	Practice Hall of India Pvt. Ltd. New Delhi
2	Word of Kaizen – A Total Quality Culture of Survival	Shyam Talawadekar	Published by Quality Management System, Thane
3	Quality is Free – and Quality is still Free	Philip Crosby	McGraw Companies
4	The Eight Core Values of Japanese Businessmen	Yasutaka Sai	McGraw Companies
5	Total Quality Management text and cases	K. Shridhara. B	Himalya Publishing House.
6	Total Quality Management	Shailendra Nigam	Excel Books

Semester VIII

SUBJECT CODE: DSC					
SUBJECT: INDUSTRIAL EXPOSURE & REPORT-II					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
54	--	120	80	200	21

In the Eight semester the student shall undertake industrial training for a period of 11 weeks, reputed hotel, and restaurant or hospitality organization.

The institute shall assist in the placement of students for training in various hotels. The student can make self arrangement to train in any hotel of his choice. The student will have to bear the necessary expenses involved for the same.

At the end of the industrial training the student shall submit Training Report along with the logbook maintained on a daily basis during the period of training and the performance appraisal from each department.

The training report is to be prepared by the student in two copies and to be submitted to the Training & Placement Officer within the stipulated time for assessment.

The report will be assessed by the internal examiner and only on the basis of a certificate of the examiner concerned that the training has been satisfactorily completed would the student be allowed to appear for the external assessment conducted by a panel of examiners comprising of one external examiner (the external would include preferably one from the hotel industry of the level of Head of the Department and above) and one internal examiner. The Continuous Assessment marks will be awarded based on the performance appraisals filled by the hotel managers.

The student is required to practice the discipline & norms laid down by the institute and also follow the rules and regulations of the hotel in which he/she is undergoing training.

Any adverse remark from the hotel will call for stringent action.



BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

PUNE, 411030 (INDIA)

(Established under section 3 of the UGC Act, 1956

Vide notification No.F.9-15/95-U.3 of the Government of India)

'A'Grade University Status by Ministry of HRD, Govt.Of India

Re-Accredited by NAAC with 'A' Grade

**THREE YEARS PROGRAMME IN
BACHELOR IN SCIENCE
(HOSPITALITY & HOTEL ADMINISTRATION)**

CHOICE BASED CREDIT SYSTEM

SYLLABUS

**To be implemented from the Academic Year
2018 - 2019**

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE
BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY) PUNE

(Established u/s 3 of the UGC Act, 1956 Vide Notification No. F.9-15/95-U.3 of the Govt. Of India)

Faculty of Management
Syllabus for Bachelor in Science (Hospitality & Hotel Administration)
B.Sc (H&HA)

Bharati Vidyapeeth, the parent body of Bharati Vidyapeeth University was established on 10th May 1964, by Dr. Patangrao Kadam with the objective of bringing about intellectual awakening and all side development of the people of our country through dynamic education.

Bharati Vidyapeeth is now a leading educational institution in the country, which has created a history by establishing, within a short span of 52 years or so, 180 educational institutions imparting education from the preprimary stage to post graduate stage. Our college and institutions of higher education impart education in different disciplines including Medicine, Dentistry, Ayurved, Homeopathy, Nursing, Arts, Science, Commerce, Engineering, Pharmacy, Management, Social Sciences, Law, Environmental Science, Hotel Management and Catering Technology, Architecture, Physical Education, Journalism, Photography, Computer Science and Information Technology, Biotechnology & Agriculture.

These educational institutions which have achieved acclaimed academic excellence also cater to the educational needs of thousands of students coming from various states and abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student caring teachers. These educational institutions are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Sangli, Karad, Panchgani, Jawahar and New Delhi. This spectacular success achieved by Bharati Vidyapeeth is mainly a creation of unusual foresight, exceptionally dynamic leadership and able guidance of the founder of the Vidyapeeth, Dr. Patangrao Kadam. It has been our constant endeavor to impart high quality education and training to our students and so, no wonder that our institutions have been nationally known for their academic excellence. In recognition of the academic merit achieved by these institutions and their potential for development which they have, the Department of Human Resource Development, Government of India and the University Grants Commission of India have accorded the status of a deemed to be university to Bharati Vidyapeeth with its twenty nine constituent units.

Besides these 180 educational institutions, Bharati Vidyapeeth has also been running a Co-operative Bank, Co-operative Consumer Stores, Co-operative Poultry, Co-operative Sugar Factory, Charitable Hospitals and Medical Research Centre and the like.

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE

Bharati Vidyapeeth, the parent organization of this University is one of the largest educational organizations in the country. It has 171 educational units under its umbrella including 67 Colleges and institutes of conventional and professional disciplines.

The Department of Human Resource Development, Government of India on the recommendations of the University Grants Commission accorded the status of "Deemed to be University" initially to a cluster of 12 units of Bharati Vidyapeeth.

Subsequently, 17 additional colleges/institutes were brought within the ambit of Bharati Vidyapeeth Deemed University vide various notifications of the Government of India.

Bharati Vidyapeeth Deemed University commenced its functioning on 26th April, 1996.

Constituent Units of Bharati Vidyapeeth Deemed University

1. BVDU Medical College, Pune.
2. BVDU Dental College & Hospital, Pune
3. BVDU College of Ayurved, Pune
4. BVDU Homoeopathic Medical College, Pune
5. BVDU College of Nursing, Pune
6. BVDU Yashwantrao Mohite College of Arts, Science & Commerce, Pune.
7. BVDU New Law College, Pune
8. BVDU Social Sciences Centre (M.S.W.), Pune
9. BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune.
10. BVDU Centre for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
11. BVDU College of Physical Education, Pune.
12. BVDU Institute of Environment Education & Research, Pune
13. BVDU Institute of Management & Entrepreneurship Development, Pune

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE

14. BVDU Poona College of Pharmacy, Pune
15. BVDU College of Engineering, Pune
16. BVDU Interactive Research School in Health Affairs (IRSHA), Pune
17. BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
18. BVDU College of Architecture, Pune
19. BVDU Abhijit Kadam Institute of Management & Social Sciences, Solapur
20. BVDU Institute of Management, Kolhapur
21. BVDU Institute of Management & Rural Development administration, Sangli
22. BVDU Institute of Management & Research, New Delhi
23. BVDU Institute of Hotel Management & Catering Technology, Pune
24. BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
25. BVDU Medical College & Hospital, Sangli
26. BVDU Dental College & Hospital, Mumbai
27. BVDU Dental College & Hospital, Sangli
28. BVDU College of Nursing, Sangli
29. BVDU College of Nursing, Navi Mumbai

Approval

This University has come into being as per the provisions in the Act of the University Grants Commission (Section 3 of the UGCA ct of 1956) and by the notification of Government of India. It has the same legal status as that of the other statutory Universities in India.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
INSTITUTE OF HOTEL MANAGEMENT AND CATERING TECHNOLOGY
Pune

A Great Choice:

BVDUIHMCT is an institute dedicated to providing quality professional hospitality education. We teach our students the knowledge & specific skills necessary to live successful and to grow into positions of influence & leadership in their chosen profession.

BVIHMCT has been engaged in preparing students to make successful careers for the last 27 years, along the way, we have developed our own way of doing things. Things that our students like, and things that the employer's like & appreciate too.

Our Vision: Our vision is "To make education affordable and accessible to masses".

Our Mission: As a part of Bharati Vidyapeeth, we contribute in our own way to the vision of our founder, Dr. Patangrao Kadam—"Social transformation through dynamic education", by nurturing the spirit of professional education as a source and a system to enhance equality of life in society.

Our Goal: To ensure professional approach to teaching within an excellent environment for students to gain an international awareness of the industry through effective communication techniques.

Our Objectives:

- To offer students the opportunity to develop their practical, management, and communication abilities.
- To provide each individual student with the training know how for a successful career in the highly competitive industry.
- To develop the personality of a student as required by the hospitality industry.
- To make students worthy citizens of the nation.

Increasingly selective hotels target BVDUIHMCT students not only for their achievements but also for their attitude which is vital in today's competitive world.

Realising the increasing importance of Hotel Management and Tourism as a profession and industry and also the need to make arrangements for Hotel Management and Tourism

Education Dr.Patangrao Kadam, the founder of Bharati Vidyapeeth with his unusual futuristic vision established the Institute of Hotel Management & Catering Technology in the year 1992.

Over the years, the institution has established itself as an ideal centre of Hotel Management education.

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

Faculty of Management Studies

Bachelor in Science (Hospitality & Hotel Administration)

Revised Course Structure to be implemented from 2018-2019

I. Title:

- a) **Name of the Programme:** Bachelor in Science (Hospitality & Hotel Administration)
- b) **Nature and Duration of Programme:** Full Time under Graduate Programme of 03 Years
(Approved by UGC)

II. Introduction:

Bachelor in Science (Hospitality & Hotel Administration) is a Full Time Three year programme offered by Bharati Vidyapeeth Deemed University and conducted at Bharati Vidyapeeth Deemed University-Institute of Hotel Management & Catering Technology, Pune.

The institute has experienced faculty members, excellent infrastructure, well stocked library and Computer Lab with LAN/Internet facility and other facilities to provide a conducive environment for learning and development.

III. Rationale for Syllabus Revision

The curriculum of the Three Years Bachelor in Science (Hospitality & Hotel Administration) is devised to incorporate changes in the hospitality and tourism industry and to keep abreast with the current trends in the hospitality industry.

In view of the dynamic nature of the hospitality industry and the evolving expectations of the stakeholders such as the students, parents and the society, need was felt for the revision of the syllabus and to introduce a Choice Based Credit system.

Over the period of two years the faculty members of the institute, adjunct faculty members and industry experts have been involved in the framing of the structure and course content.

The revised syllabus is designed to equip the students with the essential knowledge, skills and attitudinal orientation vital for successful careers in the hospitality industry.

Attempt has been made to incorporate the current trends such as Environmental studies, Safety and security, Application of Computers in Hotels, Skill

enhancement for Media and Journalism in Hospitality. Other relevant courses such as Retail Management, Event Management, Entrepreneurship Development, Hotel Economics, First aid have also been incorporated. The Curriculum provides students with an opportunity to select an area of specialization among the Discipline Specific electives.

IV. Objectives and Frame work of the curriculum of B.Sc (H&HA) programme

1. The basic objectives of the B.Sc(H&HA) programme is to provide to the hospitality industry a steady stream of competent young men and women with the necessary knowledge, skills, values and attitudes to occupy key operational positions.
2. The course structure of the B.Sc (H&HA) programme is designed keeping in view with the objectives stated above. Consequently certain essential features of such model programmes structure would be:
 - a) To impart to the student latest and relevant theoretical and practical knowledge for deloping their competencies to work in the field of hospitality services.
 - b) To provide opportunities to the students within and outside the institute for for developing necessary operational skills necessary for the hospitality industry.
 - c) To develop the right kind of values and attitudes to function effectively in the hospitality industry.
3. The following considerations have been taken into account:
 - a) The knowledge inputs and oppourtunities for skill development have been offered in an evenly distributed and logically sequenced manner.
 - b) The design is simple and logical.
4. The relative importance of skill development and attitudional oreination in management education suggest that the instituons offering B.Sc (H&HA) programmes should have some freedom on course development in choosong methods of instuuctions and internal assesment ina broad frame worl of ojectives and cirriculum structure.
5. A weight age of 40 precent is given to Internal Assessment, consisting of tasks like classroom exercises, tests, seminars, presentations.quizzes, group tasks, self study assignments, class room discusiion etc.
6. The External Assessment (University Examination) has a weightage of 60 percent.

This full time Three Year programme in B.Sc (H&HA) has 6 semesters. Each semester has a total of 20 academic weeks of which 16 weeks's comprise instructional weeks.

V. Eligibility for Admission

Admission to the B.Sc (H&HA)programme is open to any candidate having passed the H.S.C.(Class XII) examination or its equivalent in academic streams of Science, Arts, Commerce or vocation from any recognized board.

Candidates who have taken admission to Four Years BHMCT and would like to change over to B.Sc(H&HA) after first year of BHMCT can do so subject to availability of seats and provided the candidate has passed all the subjects in First Year of BHMCT.

Candidates who have appeared for class XII Re-examination may also apply for admission. Admission of such candidates will remain provisional until submission of the H.S.C (Class XII) Mark list and passing Certificate in original.

Subject to the above conditions, the final admission is based solely on:

- i) Merit in the Entrance Examination conducted by Bharat iVidyapeeth Deemed University
- ii) Submission of College Leaving/Transfer/ Migration Certificate and Anti Ragging Affidavit.

VI. Structure of the Programme

1. B.Sc (H & HA) is a three years programme divided into six semesters.
2. A student of B.Sc (H & HA) programme must take 150 credits to full fill the total number of credits required for the completion of the academic programme
3. The curriculum requires the students to spend at least 32 hours per semester for non credit course options such as Community Service, Sports Activities, Cultural Activities, General Interest Activities (during Semester I and Semester III B.Sc(H&HA) in order to encourage participation in extra curricular activities which is aimed at developing an all rounded personality of the students.

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4. After imparting general understanding of the hotel operations during the first three semesters, the students are provided with an opportunity to select areas of specialization in the fourth semester from amongst the Discipline Specific Elective courses in the fourth semester and in detail in the subsequent semesters.
 5. Students have to choose and study at least any two courses from among the list of Ability Enhancing Elective Courses and at least any two courses from among the list of Skill Enhancing Elective Courses of their choice during the second and third year of their choice during the Second & Third Year of B.Sc (H&HA). Ability Enhancing Elective course and Skill Enhancing Elective course carries 04 credits each.
 6. The programme includes on the job learning in the form of Industrial Exposure for a period of 18 weeks in a classified hotel of 3 star category and above during the fourth semester with 31 credits.
 7. The medium of instruction and examination will be English.
 8. A student would be required to complete the course within 08 academic years from the date of admission.
 9. Outline of the Structure of B.Sc (H&HA) programme is given in Appendix I and Detailed Syllabus is given in Annexure II.

VII. Attendance

The students are required to have at least 75% attendance in each course. The students who fail to comply with the above requirement shall not be allowed to appear for the University examinations. Such students shall have to seek readmission in the same class of the succeeding year.

VIII. Choice Based Credit System

In the credit system. Each In the Credit system, each course is defined in terms of expected learning outcomes. The study load (The average number of clock hours spend per student is needed to achieve the Expected learning outcomes) determines the assigned credit value for each course. The total assigned credits of all courses are the assigned credit for the programme and this total constitutes the minimum credits required to be earned to complete the programme and obtain the degree from the university.

The minimum credits to complete Three Years B.Sc (H&HA) programme shall be 150 credits.

The courses in B.Sc (H&HA) programmes are of various kinds and include:

DSC Discipline Specific Compulsory Course

DSE Discipline Specific Elective Course

AEC Ability Enhancing Compulsory Course AEE Ability Enhancing Elective Course

SEC Skill Enhancing Compulsory Course

SEE Skill Enhancing Elective Course

LEC Language Enhancing Compulsory Course

LEE Language Enhancing Elective Course

NC Non Credit Course

In terms of a semester of 15/16 weeks, Every One hour session per week of theory / lecture = One Credit per semester. Every Two hours Session per week of practice = One Credit per semester.

Discipline Specific courses are about 70% of the minimum credits that constitute the programme.

Assessment

1. The final total assessment of the candidates shall be made in terms of an Internal Assessment (IA) and External Assessment (EA) with the exception of Ability Enhancing Elective courses and Skill Enhancing Elective Courses which will be made in terms of continuous Assessment only. The internal assessment will be conducted by the institute and external assessment will be conducted by the university. The external assessment will be based on the entire Syllabus. Internal Assessment (IA), Continuous Assessment (CA) and External Assessment (EA) will constitute as separate heads of passing and they will be shown separately in the transcripts.
2. For each course, the ratio of internal assessment in relation to the external assessment shall be 40:60.

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3. Internal assessment (IA) will be calculated as follows: 50% based on Attendance, class participation, performance, journal work, classroom exercises, presentations, quizzes, group tasks, self-study assignments, classroom discussion etc, and 50% based on the performance in minimum two class tests during these mester.
 4. External Assessment (EA) will be based on the examinations conducted by the University at the end of each semester.
 5. Ability Enhancing Elective courses and Skill Enhancing Elective Courses will have only Continuous Assessment (CA) based on the performance in minimum two class tests and submission of minimum 04 assignments during the semester.
 6. Industrial Exposure will have Continuous Assessment and External Assessment.

Continuous Assessment will be based on the Performance Appraisal filled by the departmental heads of the various Operational Departments of the Hotel in which the student undergoes Industrial Exposure. The Training Report has to be prepared and submitted to the Principal within the stipulated time for assessment. The training report will be assessed by a panel of examiners appointed by the University, comprising of one internal examiner and one external examiner (preferably HOD of a classified hotel of 3 Star category and above or a Senior faculty from any recognized Institute of Hotel Management).

7. Non Credit courses will be assessed as 'Satisfactory' or 'Unsatisfactory' Performance based on completion of assigned activities/tasks and submission of the report thereof.
8. Students have to complete the Compulsory Core Module in Environmental Studies and will be assessed as 'Pass or 'Fail' based on their performance in the examination conducted by the University.
9. Re-assessment of Internal Marks: In case of those students who have secured less than 5 grade points in internal assessment the institute shall administer additional internal assessment test, the result of which shall be conveyed to the University as revised internal marks. In case the result of the internal test as above results in lower marks than the original figure of

marks shall prevail, in short the rule is that the higher of the two figures of the marks, shall be taken into consideration.

10. The Grades obtained in Internal Assessment/Continuous Assessment will be communicated to the University at the end of each semester. These marks will be considered for the declaration of the results.

Standard of passing

For all courses, both internal assessment and External assessment constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the students must obtain a minimum grade point of 5(40%marks) at External Assessment and also a minimum of grade point of 5(40%marks) for Internal Assessment.

In order to pass in courses which are assessed on the basis of continuous assessment the student must secure at least Pass Grade equivalent to 5 grade points.

A student who fails at External Assessment (EA) of a course has to reappear only for External assessment and clear the head of passing, Similarly a student who fails in internal Assessment/Continuous Assessment of a course has to appear only for Internal Assessment /Continuous Assessment as a backlog student and clear the head of passing to secure the Grade Point Average (GPA) required for passing. The performance of Internal assessment and continuous assessment will be combined to obtain Grade Point Average for the course the weights for performance at External Assessment and Internal Assessment shall be 60 % and 40 % respectively. Students can avail the verification/revaluation facility as per the prevailing policy, guidelines and norms of the University.

Grading System

10 point Grading System for grading in each head of passing shall be adopted as suggested By the Bharati Vidyapeeth University.

The grading system shall be as shown in the Table 1 below

Range of Marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} < 80$	9	A+
$60 \leq \text{Marks} < 70$	8	A
$55 \leq \text{Marks} < 60$	7	B+

$50 \leq \text{Marks} < 55$	6	B
$40 \leq \text{Marks} < 50$	5	C
Marks < 40	0	D

The performance at Internal Assessment /Continuous Assessment will be combined to abating the Grade Point Average (GPA) and EA will be combined to obtain the Grade Point Average (GPA) for the course. The Weights for performance at External Assessment and Continuous Assessment shall be 60 % and 40% respectively.

The GP for a course shall be calculated by first finding the totalmarks for the course. The corresponding GP Average as per the table below shall be the GPA for the course.

The Formula to calculate the GradePoint (GP) -

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which Grade point will be computed. In order to determine the GP, set $x = \text{Max}/10$ (since we have adopted 10 Points system) The GP is calculated by the formul as shown in the Table2. After computing the grade point, the grade can be found from Table1.

Table2: Formula to calculate Grade Point in individual evaluations.

Range of Marks atthee valuation	Formula for the Grade Point
$8x \leq M \leq 10x$	10
$5.5x \leq M < 8x$	Truncate (M/x) +2
$4x \leq M < 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators namely Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of the learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of a learner when he or she completes the programme is the final result of the learner.

The SGPA is calculated by the formula

$$\text{SGPA} = \frac{\sum C_k \times \text{GP}_k}{\sum C_k}$$

Where C_k is the credit value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all courses that the learner has

undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent.

Formula to compute equivalent percentage marks for specified CGPA.

$$\begin{aligned} & 10 \times \text{CGPA} - 10, \text{ if } 5.00 \leq \text{CGPA} \leq 6.00 \\ & 05 \times \text{CGPA} + 10, \text{ if } 6.00 \leq \text{CGPA} \leq 8.00 \\ \% \text{Marks}(\text{CGPA}) = & 10 \times \text{CGPA} - 20, \text{ if } 8.00 \leq \text{CGPA} \leq 9.00 \\ & 20 \times \text{CGPA} - 110, \text{ if } 9.00 \leq \text{CGPA} \leq 9.50 \\ & 40 \times \text{CGPA} - 300, \text{ if } 9.50 \leq \text{CGPA} \leq 10.00 \end{aligned}$$

ATKT Rules:

A student is allowed to keep term for semester III if he/she has a backlog of not more than eight courses (Theory as well as Practical) in Semester I and Semester II together

A student shall be allowed to keep term for semester V, if he/she has a backlog of not more (Theory as well as Practical) in Semester III and IV together and should pass all the subjects of Semester I and Semester II.

Award of Honours

A student who has completed the minimum credit specified for the programmes shall be declared to have passed in the programme.

The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed.

The criteria for the award of honours are given in the table below.

Question Paper Pattern for External Assessment conducted by the University

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$

CGPA below ≤ 5.00	F	Fail	Marks below 40
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The pattern of Question Paper for External Assessment (60Marks) of Theory subjects conducted by the University will be as follows:

1. The Question Paper will be divided into 02 Sections, Section I and Section II.
2. Each Section will consist of 03 Questions and all questions will be compulsory.
3. Question 1 of each Section shall be Objective in nature (Multiple Choice Question, Fill in the Blanks, Match the Pairs, True or False etc.) and carry a total of 06 marks only.
4. Question 2 and Question 3 will be of 12 marks each with internal choice. A question may be subdivided into sub-question a, b, c ... and the allocation of marks will depend on the weight age given to the topic.
5. Questions shall be set to assess the basic knowledge acquired, comprehension and application of knowledge in a given situation.
6. The Chairman of Board of Paper Setters for each course shall ensure that the questions cover the entire syllabus as per the weight age of marks indicated in the syllabus.
7. The duration of written examination shall be 2 ½ hours.

PROGRAMME STRUCTURE FOR B.Sc. (H&HA)
B.Sc. (H&HA) (6 semesters with subjects)
Bachelor of Science (Hospitality and Hotel Administration)-Three Years under
Choice Based Credit System

DSC: DISCIPLINE SPECIFIC COMPULSORY COURSE

LEC: LANGUAGE ENHANCING COMPULSORY COURSE

NC: NON CREDIT COURSE

LEE: LANGUAGE ENHANCING ELECTIVE COURSE

AEC: ABILITY ENHANCING COMPULSORY COURSE

SEC: SKILL ENHANCING COMPULSORY COURSE

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HORS / WEEK	CREDITS/ WEEK
				IA	EA	CA	Total		
I	DSC 101	BASIC INDIAN FOOD PRODUCTION (THEORY)	COMPULSORY	40	60	--	100	03	03
	DSC 101 A	BASICINDIANFOODPRODUCTION(PRACTICAL)	COMPULSORY	40	60	--	100	04	02
	DSC 102	BASIC FOOD & BEVERAGE SERVICE I (THEORY)	COMPULSORY	40	60	--	100	03	03
	DSC 102 A	BASICFOOD&BEVERAGESERVICEI(PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC 103	BASIC HOUSEKEEPING OPERATIONS (THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC 103 A	BASIC HOUSEKEEPING OPERATIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC 104	BASIC FRONT OFFICE OPERATIONS (THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC 104 A	BASIC FRONT OFFICE OPERATIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	AEC 101	FOOD COMMODITIES	COMPULSORY	20	30	--	50	02	02
	LEE 101 LEE 102	BUSINESS COMMUNICATION*(THEORY)	ANYONE	40	60	--	100	02	02
LEE 101A LEE 102A	BUSINESSCOMMUNICATION (PRACTICAL) BASICFRENCH(PRACTICAL)	ANYONE*	20	30	--	50	04**	02	
				400	600	--	1000	28	21

*EXEMPTION OF BUSINESS COMMUNICATION ONLY IF THE CANDIDATE HAS SECURED A MINIMUM OF 60% & ABOVE IN THE QUALIFYING EXAMINATION.

**INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUT SIDE CLASS.

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS/ WEEK	CREDITS/ WEEK
				IA	EA	CA	TOTAL		
II	DSC201	BASICCONTINENTALFOOD PRODUCTION (THEORY)	COMPULSORY	40	60	--	100	03	03
	DSC201 A	BASICCONTINENTALFOOD PRODUCTION(PRACTICAL)	COMPULSORY	40	60	--	100	04	02
	DSC202	BASICFOOD&BEVERAGES SERVICEII(THEORY)	COMPULSORY	40	60	--	100	03	03
	DSC202 A	BASICFOOD&BEVERAGES SERVICEII(PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC203	MANAGING HOUSEKEEPING OPERATIONS(THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC203 A	MANAGING HOUSEKEEPING OPERATIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC204	MANAGING FRONT OFFICE OPERATIONS(THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC204 A	MANAGING FRONT OFFICE OPERATIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	SEC101	PERSONALITY SKILLS FOR HOSPITALITY INDUSTRY (THEORY)	COMPULSORY	40	60	--	100	03	03
	SEC101 A	PERSONALITY SKILLS FORHOSPITALITY INDUSTRY (PRACTICAL)	COMPULSORY	20	30	--	50	04*	02
				380	570		950	27	20

*INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE CLASS

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS / WEEK	CREDITS / WEEK
				IA	EA	CA	Total		
III	DSC301 (I)	INDUSTRY EXPOSURE & REPORT-I	COMPULSORY	--	120	80	200	54	35
	AEE 101-107	SELECT FROM LIST	ANY ONE	--	--	50*	50	04	04
					--	120	130	250	58

THE STUDENT IS REQUIRED TO UNDERTAKE 22 WEEKS OF INDUSTRIAL EXPOSURE WITH A CLASSIFIED HOTEL (3 STAR AND ABOVE) IN THE FOLLOWING OPERATIONAL DEPARTMENTS:

- FOOD PRODUCTION OPERATIONS
- FOOD & BEVERAGE OPERATIONS
- HOUSEKEEPING /ACCOMODATION OPERATIONS
- FRONT OFFICE OPERATIONS

*ABILITY ENHANCING ELECTIVE COURSES WILL HAVE CONTINUOS ASSESSMENT BASED ON PERFORMANCE IN THE TWO CLASS TESTS AND SUBMISSION OF MINIMUM FOUR ASSIGNMENTS

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS/WEEK	CREDITS/WEEK
				IA	EA	CA	Total		
IV	DSC 401	LARDER & BASIC BAKING (THEORY)	COMPULSORY	40	60	--	100	04	04
	DSC 401A	LARDER & BASIC BAKING (PRACTICAL)	COMPULSORY	40	60	--	100	08	04
	DSC 402	ALCOHOLIC BEVERAGES I (THEORY)	COMPULSORY	40	60	--	100	03	03
	DSC 402A	ALCOHOLIC BEVERAGES (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC 403	ALLIED HOUSEKEEPING FUNCTIONS (THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC 403A	ALLIED HOUSEKEEPING FUNCTIONS (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	DSC 404	FRONT OFFICE ACCOUNTING (THEORY)	COMPULSORY	40	60	--	100	02	02
	DSC 404 A	FRONT OFFICE ACCOUNTING (PRACTICAL)	COMPULSORY	40	60	--	100	02	01
	LEC101	HOTEL FRENCH (THEORY)	COMPULSORY	40	60	--	100	03	03
	LEC101A	HOTEL FRENCH (PRACTICAL)	COMPULSORY	20	30	--	50	04*	02
	SEE101-106	SELECT FROM LIST	ANY ONE	--	--	50**	50	04	04
	NC101A NC102A NC103A NC104A	COMMUNITY SERVICE SPORTS ACTIVITIES CULTURAL ACTIVITIES	ANYONE***	--	--	--	--	02	00
				380	570	50	1000	36	27

*INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE CLASS

**SKILL ENHANCING ELECTIVE COURSES WILL HAVE CONTINUOUS ASSESSMENT
BASED ON PERFORMANCE IN THE TWO CLASS TESTS AND SUBMISSION OF
MINIMUM FOUR ASSIGNMENTS

*** STUDENTS ARE REQUIRED TO TAKE ANY ONE OF THE NON CREDIT COURSES
WHICH WILL BE ASSESSED AS "SATISFACTORY" OR "UNSATISFACTORY"
PERFORMANCE BASED ON COMPLETION OF ASSIGNED ACTIVITIES /TASKS AND
SUBMISSION OF REPORT THERE OF.

SEM	SUBJECT CODE	SUBJECTNAME	CHOICE	MARKS				HOURS/ WEEK	CREDITS/ WEEK
				IA	EA	CA	TOTAL		
V	DSE101	QUANTITY INDIAN & REGIONAL FOOD PRODUCTION (THEORY)	ANY ONE	40	60	--	100	04	04
	DSE102	ALCOHOLIC BEVERAGES II (THEORY)							
	DSE103	ACCOMMODATION OPERATIONS (THEORY)							
	DSE101A	QUANTITY INDIAN & REGIONAL FOOD PRODUCTION (PRACTICAL)	ANY ONE	40	60	--	100	08	04
	DSE102A	ALCOHOLIC BEVERAGES II (PRACTICAL)						08*	04
	DSE103A	ACCOMMODATION OPERATIONS (PRACTICAL)						08*	04
	SEC 102	ACCOUNTING SKILLS FOR HOTELS (THEORY)	COMPULSORY	40	60	--	100	03	03
	SEC 103	TOURISM OPERATIONS (THEORY)	COMPULSORY	40	60	--	100	03	03
AEC 102	HOSPITALITY LAW (THEORY)	COMPULSORY	40	60	--	100	03	03	
AEE 101-107	SELECT FROM LIST	ANY ONE	--	--	50**	50	04	04	
				200	300	50	550	25	21

*INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE CLASS

STUDENTS OPTING FOR DSE 102A MAY UNDERTAKE MINIMUM 08 ODC OR PARTTIMEJOB/ WEEKEND JOB WITH REPUTED HOTELS/ RESTAURANTS FOR MINIMUM 64 HOURS IN THE SEMESTER.

STUDENTS OPTING FOR DSE 103A MAY ENGAGE THEMSELVES IN PRACTICAL TRAINING/ PART TIME JOB WITH REPUTED HOTELS FOR MINIMUM 64 HOURS IN THE SEMESTER

** ABILITY ENHANCING ELECTIVE COURSES WILL HAVE CONTINUOUS ASSESSMENT BASED ON PERFORMANCE IN THE TWO CLASS TESTS AND SUBMISSION OF MINIMUM FOUR ASSIGNMENTS.

SEM	SUBJECT CODE	SUBJECT NAME	CHOICE	MARKS				HOURS / WEEK	CREDITS / WEEK
				IA	EA	CA	Total		
VI	DSE 201 DSE 202 DSE 203	SELECT FROM LIST (THEORY)	ANY ONE	40	60	--	100	04	04
	DSE 201 A DSE 202 A DSE 203 A	SELECT FROM LIST (PRACTICAL)	ANY ONE	40	60	--	100	08 08* 08*	04 04 04
	SEC 104	APPLICATIONS OF COMPUTER IN HOTELS (THEORY)	COMPULSORY	20	30	--	50	02	02
	SEC 104 A	APPLICATIONS OF COMPUTER IN HOTELS (PRACTICAL)	COMPULSORY	40	60	--	100	04	02
	AEC 103	HOSPITALITY MARKETING (THEORY)	COMPULSORY	40	60	--	100	03	03
	AEC 104	HUMAN RESOURCE MANAGEMENT (THEORY)	COMPULSORY	40	60	--	100	03	03
	SEE 101 - 107	SELECT FROM LIST (THEORY)	ANY ONE OR TWO**	--	--	50 * *	50	04	04
				220	330	50	600	28	22

*INCLUDES CLASS HOURS AS WELL AS HOURS SPENT IN PRACTICE OUTSIDE CLASS

STUDENTS OPTING FOR DSE 203 A-DSE 204 A MAY UNDERTAKE MINIMUM 08 ODC OR PART TIME / WEEKEND JOB WITH REPUTED HOTELS / RESTAURANTS FOR MINIMUM 64 HOURS IN THE SEMESTER.

STUDENTS OPTING FOR DSE 205 A-DSE 206 A MAY ENGAGE THEMSELVES IN PRACTICAL TRAINING/ PART TIME JOB WITH REPUTED HOTELS FOR MINIMUM 64 HOURS IN THE SEMESTER.

**SKILL ENHANCING ELECTIVE COURSES WILL HAVE CONTINUOUS ASSESSMENT BASED ON PERFORMANCE IN THE TWO CLASS TESTS AND SUBMISSION OF MINIMUM FOUR ASSIGNMENTS

LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSE(THEORY)

- DSE201 ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT(THEORY)
- DSE202 FOOD & BEVERAGE OPERATIONS & MANAGEMENT(THEORY)
- DSE203 ACCOMMODATION MANAGEMENT (THEORY)

LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSE(PRACTICAL)

- DSE201 ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT
(PRACTICAL)
- DSE202 FOOD & BEVERAGE OPERATIONS & MANAGEMENT(PRACTICAL)
- DSE203 ACCOMMODATION MANAGEMENT (PRACTICAL)

LIST OF ABILITY ENHANCING ELECTIVE COURSES

- AEE101 CATERING SCIENCE
- AEE102 DIETITICS & NUTRITION
- AEE103 FOOD & BEVERAGE CONTROLS
- AEE104 PRINCIPLES OF MANAGEMENT
- AEE105 ORGANISATION BEHAVIOR
- AEE106 HOTEL ECONOMICS
- AEE107 FINANCIAL MANAGEMENT

LIST OF SKILL ENHANCING ELECTIVE COURSES

- SEE101 FIRST AID
- SEE102 HOTELMAINTENANCE
- SEE103 RETAILMANAGEMENT
- SEE104 EVENTMANAGEMENT
- SEE105 ENTREPRENEURSHIP DEVELOPMENT
- SEE106 FACILITYPLANNING
- SEE107 SKILL ENHANCEMENT FOR MEDIA & JOURNALISM IN HOSPITALITY
(PRACTICAL)

SEMESTER- I

SUBJECT CODE: DSC 101					
SUBJECT : BASIC INDIAN FOOD PRODUCTION (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	-	100	03

Rationale :

This subject intends to develop knowledge and basic culinary skills, which will help students to develop a comprehensive insight into culinary history, ingredients and their uses, methods of cooking, basic cooking equipment and tools.

		Hours	Marks
Chapter 1	Introduction to art of cookery	06	08
1.1	Culinary History		
1.2	Origins of classical and modern cuisine		
1.3	Classical kitchen brigade for a five star hotel		
1.4	Duties and responsibilities of Executive Chef and various chefs		
1.5	Organization of modern kitchen		
1.6	Standards of professionalism		
1.7	Kitchen Uniforms		
1.8	Inter departmental co-ordination		
Chapter 2	Mise-en-place	04	08
2.1	Importance		
2.2	Weighing and measuring ingredients-weight and volume consideration		
2.3	Preparation of ingredients		
2.4	Methods of mixing food		
Chapter 3	Equivalents of ingredients	04	04
3.1	Equivalents of various ingredients used in the kitchen-cereals, pulses, vegetables, fruits, nuts, fish, meat.		
Chapter 4	Methods of Cooking	14	16
4.1	Aims and Objectives of cooking food		
4.2	Effects of heat on food- proteins, carbohydrates, vitamins, fats, minerals, fruit and vegetable fiber, flavor components		
4.3	Types of pigments in vegetables, fruits and animal products		

4.4	Effects of heat, acid, alkali, oxidation and metal on pigments		
4.5	Precautions for enhancing and retention of colour.		
4.6	Methods of heat transfer- conduction, convection, radiation.		
4.7	Cooking methods- Moist & Dry (Salient features of various cooking methods, temperature precaution) Steaming, braising, stewing, poaching, boiling, baking, roasting, grilling, frying, broiling, microwave and solar.		
Chapter 5	Tools & Equipments	04	06
5.1	Introduction to various types of Knives, Hand tools and Small equipments, Measuring devices, Pots, Pans and Containers		
5.2	Use and maintenance of Equipment- Cooking range, Mixer, OTG, Refrigerator.		
5.3	Properties, Advantages and Disadvantage of various materials used in tools and equipment		
Chapter 6	Sanitation and Safety	08	08
6.1	Personnel Hygiene		
6.2	Food Storage		
6.3	Hygiene & safe practices in food handling and preparation		
6.4	Cleaning and Sanitizing Equipments		
6.5	Rodent and insect control		
6.6	Safety practices at work place, preventing cuts & burns, falls & injuries		
6.7	Fire prevention.		
6.8	HACCP system.		
Chapter 7	Standard Recipe	04	06
7.1	Definition		
7.2	Uses & Limitations		
7.3	Structure		
Chapter 8	Culinary Terms	04	04

Raita	Payassam	Do pyaza
Murabba	Korma	Bharwaan
Phirnee	Kofta	Bhurta
Chenna	Khoya	Pakora
Rabarhi	Kachumber	Kadhi
Khichri	Kachori	Baghar
Achar	Boti	Bhujjia
Halwa	Bonda	Foogath
Bhunnana	Bhunao	Vindaloo
Boondi	Kheema	Burfi
Pachadi	Dhansak	Chikki
Kulfi	Pulao	Falooda

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Professional Cooking	Wayne Gisselen	John Weily & Sons , N.Y
2	Modern cookery for Teaching and Trade	Thangam E. Philip	Orient Longman Ltd.Mumbai
3	Theory of cookery	Krishna Arora	Frank Bros & Co. Ltd. New Delhi
4	Theory of Catering	Kinton Ceserani	ELBS
5	Practical cookery	Kinton Ceserani	ELBS
6	The book of ingredients	Jane Grigson	Pengiuin Books ,England
7	Basic Cookery	Richard Maetland & Derek Welsby	Heinemann Professional
8	Food Commodities	Bernard Davis	Heinemann Professional
9	Food Commodities For Cookery	Lingard & Sizer	Butterworth & Heinemann

SUBJECT CODE:DSC101A					
SUBJECT: BASIC INDIAN FOOD PRODUCTION (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-----	100	02

Minimum 12 practicals of Indian menus to be conducted and should include basic rice/ Indian bread meat, vegetable and sweet dishes.

It is recommended that demonstrations be conducted in the initial stages to familiarise the students with the following:

1. Introduction of various tools and their usage.
 2. Familiarization and identification of commonly used ingredients—weights and volume conversion, yield testing.
 3. Basic hygiene practices to be observed in the kitchen.
 4. Safety practices in the kitchen.
 5. Food storage.
 6. Use of knife and cutting techniques, cuts of vegetables.
 7. Pre-preparations, mixing methods.
 8. Basic Cooking methods.
- Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSC102					
SUBJECT: BASIC FOOD & BEVERAGE SERVICE-I (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	-----	100	03

Rationale:

To impart comprehensive knowledge and develop technical skills in basic aspects of Food & Beverage operations in the hotel industry.

		Hours	Marks
Chapter 1	The Food & Beverage Industry	06	08
1.1	Introduction to Food & Beverage Industry		
1.2	Classification of Catering Establishments		
1.3	Introduction to Food & Beverage Operations		
Chapter 2	Food & Beverage Service Areas in the Hotel	08	10
2.1	Restaurant , Coffee Shop, Room Service, Bars, Banquets, Snack Bars, Executives lounges,		
2.2	Business Centre & Night Clubs Auxiliary Areas		
Chapter 3	Food & Beverage Service Equipments	06	10
3.1	Types & Usage of Equipments , Furniture, Chinaware, Silverware, Glassware, Linen and Disposables		
3.2	Special Equipments,Care and maintenance of Equipments		
Chapter 4	Food & Beverage Service Personnel	08	12
4.1	Food & Beverage Service Organizations		
4.2	Job Description & Job Specification of Food & Beverage Staff		
4.3	Attitudes & attributes of Food & Beverage service personnel, competencies		
4.4	Basic etiquettes for service staff, Interdepartmental relationship		
Chapter 5	Food & Beverage Service Methods	12	12
5.1	Table Service- Silver / English, Butler / French,		

	Russian, American		
5.2	Self Service , Buffet & Cafeteria		
5.3	Specialized Service- Gueridon , Tray, Trolley, Lounge, Room		
5.4	Single Point Service – Take away, Vending Machine,		
5.5	Food Courts, Bars& Automats		
5.6	Mise-en-place & Mise-en-scene		
Chapter 6	In Room Dining-IRD	08	08
6.1	Introduction		
6.2	Equipments Required for IRD–Trays& Trolleys		
6.3	In Room Dining Procedures-Misen place activities		
6.4	Order Taking for IRD and Execution of IRD order		
6.5	Collecting the order and Carryingit to the Room		
6.6	Other Services		

Glossary of Terms

Popular Catering	Industrial Catering	ODC
Fast Food	Welfare Catering	Bistro
Take away	Transport Catering	Brasserie
Gastrodome	Carvery	Self Service
Gastropubs	Echelon	Assisted Service
Table Service	Drive thru	Maitre d’hotel
Silver Service	Kiosks	Chef de rang
English Service	Food Court	Demi Chef de rang
Russian Service	Drive-in	Station
American Service	Insitu Service	Commis de rang
Gueridon Service	Single Point Service	Debarasseur
Sommelier	Chef d’etage	Chef de sale
Bus Boy	Hot Plate	Barista
Aboyeur	Off-board	Still Room
Deferred Wash	Tray Jack	EPOS
Mise-en-place	Mise-en-scene	Polivit
Crumb down	Dummy Waiter	Carte du jour
Waiters Friend	EPNS	Tisane
Café Complet	Café Simple	Cover
Still Set	Still room	Perrier
Evian		

Assignments:

- A minimum of **2 assignments** based on the following topics to be given to individual student and the marks to be considered in internal marks.
- Identify various outlets providing different types of service in the city.
 - Identify different brands of various F & B service outlets in the city.
 - Various F & B equipments with sizes, capacity, picture –in form of Power Point Presentation.
 - Making various creative napkin folds.

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Food & Beverage Service	Denis Lillycrap Cousins	Book Power
2	Modern Restaurant Service	John Fuller	Hutchinson
3	Food & Beverage Service	Sudhir Andrews	Tata McGraw Hill

SUBJECTCODE:DSC102A					
SUBJECT: BASIC FOOD & BEVERAGE SERVICE– I (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	---	100	01

Sr.No.	Topic
1	Restaurant Etiquettes
2	Restaurant Hygiene Practices
3	Mise en place & Mise en scene
4	Identification of Equipments
5	Laying & relaying of tablecloths
6	Napkin Folds
7	Service of Water ,Carrying a salver/ tray
8	Room Service Order taking Procedure, Tray Set-ups
9	Handling service gear
10	Carrying plates, glasses & other Equipments
11	Setting of table d'hôte&A'la carte cover
12	Changing of Ashtray
13	Planning & Writing Indian Menus
14	Laying cover for Indian menu
15	Service of Indian Food & Accompaniments. Clearance following the same
16	Laying the cover for a three course continental menu (Starter, Main Courses, Sweets)

SUBJECT CODE: DSC 103					
SUBJECT : BASIC HOUSEKEEPING OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	---	100	02

Rationale: The subject aims to establish the importance of Housekeeping and its role in the hospitality Industry. It prepares the student to acquire basic knowledge and skills necessary for different tasks and aspects of housekeeping

		Hours	Marks
Chapter 1	Introduction to Hotel House Keeping	04	08
1.1	Importance of Housekeeping.		
1.2	Functions of Housekeeping.		
1.3	Areas of House Keeping responsibility		
1.4	Types of Guest Rooms ,		
1.5	Standard Guest Room amenities & facilities for regular and VIP rooms		
Chapter 2	Layout of House Keeping Department	04	06
2.1	Section of the housekeeping department		
2.2	Layout of Housekeeping Department		
2.3	Functions of each section		
2.4	Maids Service room - Location, Function		
Chapter 3	Organization of House Keeping Department	04	08
3.1	Hierarchy of Large, medium and small hotel's Housekeeping department.		
3.2	Attributes of Housekeeping staff.		
3.3	Job Description and Job Specification of House Keeping Personnel		
Chapter 4	Cleaning Equipment used in Housekeeping Operations	04	06
4.1	Classification, Use, care & maintenance.		
Chapter 5	Cleaning Agents	04	06
5.1	Classification , Use, care and Storage, Distribution & Control		

Chapter 6	Co-ordination of Rooms division with other Departments	02	06
6.1	Departments like Front Office, Engineering, F & B, Kitchen, Security, Purchase, HRD, Accounts		
Chapter 7	Cleaning Routine of Housekeeping Department	04	06
7.1	General principles of cleaning.		
7.2	Work routine for Housekeeping Department floor supervisors and chamber maids.		
7.3	Rules of the floor.		
Chapter 8	Cleaning Routine of Guest Rooms	04	08
8.1	Daily cleaning of occupied, departure, vacant, under repair, VIP.		
8.2	Evening service & second service procedures.		
8.3	Weekly cleaning / periodic cleaning. Spring Cleaning tasks to be carried out.		
Chapter 9	Cleaning Routine of Public Areas	02	06
9.1	Areas to be maintained		
9.2	Daily, weekly cleaning procedures for various Public areas such as Lobby/ Lounge, Restaurants, Bar, Banquet Halls, Swimming Pool, Elevators, and staircase and Corridors		

Glossary of Terms

Amenity	Back to back	Deep cleaning
Back of the house	Double lock	Faucet
Departure room	DND	Floor pantry
Front of the house	GRA	Inventory
Hardscape	Landscape	Preventive Maintaence
Job description	Job specification	Occupancy report
OOO	Organization chart	Room status discrepancy
Rooms division manager	Room status report	Twin room
WC	Maid's service room	Cabana
Hollywood room	Lanai	Suite
Interconnecting room	Efficiency room	Pent house
Duplex	Hospitality suite	Murphy bed
U/R	Z -bed	Duvet
King bed	Queen bed	Aerosols
Bidet	Abrasives	Hand caddy
Blade dispenser	Coverlet	Chamois
Buffing	Burnishing	Shams
Crib		Dust ruffle
Disinfectants	Dustette	Jewelers' rouge
Dutch wife		Dust sheet
Shoe mitt	Drugget	Tent card
Squeegee	Vanity unit	Deodorizers
Lint	Johnny mop	Swab
Wringer mop	Upholstery	Feather brush
Scrim	Glass cloth	Linen chute
Block cleaning	Foot fold	Re-sheeting
Mitring	Orthodox cleaning	Spring cleaning
Second service	Turndown service	Jacuzzis
Team cleaning	Damp dusting	Jacuzzis
Powder room	Sauna	

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management-	Sudhir Andrews	Tata McGraw Hill
2	Hotel Housekeeping & Management	G Raghubalan Smritee Raghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	E L B S
4	Accomodation Management	Rosemary Hurst	Heinemann publishing

SUBJECT CODE: DSC 103A					
SUBJECT : BASIC HOUSEKEEPING OPERATIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	---	100	01

1. Introduction to the Housekeeping department.

- Identifying various sections of the Housekeeping department
- Introduction to the various types of Guest rooms and Public areas in the Hospitality Training centre
- Introduction to Guest room supplies and their placement.

2. Introduction to Cleaning Equipment's and cleaning agents.

- Identification of manual and mechanical cleaning equipment.
- Different parts of equipment.
- Function of cleaning equipments.
- Care and maintenance.
- Introduction to Cleaning Agents as per their classification and function.

3. Cleaning and Polishing of Laminated surfaces.

- Cleaning and polishing of wooden surfaces.
- Cleaning and polishing of plastic and acrylic surfaces.
- Cleaning and polishing of oil painted surfaces.

4. Polishing of Brass Articles.

- Cleaning and polishing of Brass Ornamental and utility articles.

5. Polishing of Silver articles

- Cleaning and polishing of Silver articles.
- Cleaning of oil painted surfaces.

6. Cleaning of Glass surfaces

- Cleaning and polishing of window panes.
- Cleaning and polishing of glass counters.
- Cleaning of ventilators.

7. Polishing of Wooden surfaces

- Cleaning and polishing of wooden surfaces Sand papering and French polishing. Wax polishing, Mansion polishing
- Cleaning of wooden and metal frames of furniture.

8. Cleaning of different floor finishes

- Cleaning and scrubbing of Kota, Ceramic, Wooden, Stone and Marble floor finishes.

9. Cleaning of different wall finishes

- Cleaning and scrubbing of Kota, Ceramic, Wooden, Stone and Marble wall finishes.

10. Bed making

- Different styles of making a bed- Day bed, Evening bed.
- Cleaning of Guest room- Morning service and Evening service.

11. Daily Cleaning of Guest rooms - Departure, Occupied and Vacant rooms.

12. Weekly Cleaning of Guest rooms.

- Super Cleaning and scrubbing of various surfaces in a guest room.

13. Daily, Weekly cleaning of Public Areas (Corridors, Restaurant, Administrative Offices, Staircases and Elevators, Exterior areas)

SUBJECT CODE: DSC104					
SUBJECT : BASIC FRONT OFFICE OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	---	100	02

Rationale: The subject aims to establish the importance of Front office and its role in the hospitality Industry. It prepares the student to acquire basic knowledge and skills necessary to identify the required standards.

		Hours	Marks
Chapter 1	Introduction To Hospitality Industry	06	10
1.1	Evolution to Hotel Industry		
1.2	Classification of Hotels (Based on various categories like size, location, clientele, length of stay, facilities, ownership)		
Chapter 2	Front office Organisation	06	10
2.1	Introduction to Front office Dept.		
2.2	Layout of Front office Dept., Equipment's used in Front office department.		
2.3	Essential Attributes and Qualities of Front Office staff		
2.4	Organizational Chart of Hotels (Large, Medium, Small)		
2.5	Duties and Responsibilities of Front office staff		
Chapter 3	Room Rates & Tariff	06	12
3.1	Types of Guests.		
3.2	Types of room		
3.3	Room Tariff (factors affecting room Tariff, Establishing the end of the day)		
3.4	Types of Rates (Rack, FIT, Crew, Group, Corporate)		
3.5	Meal Plans		
3.6	Basis of charging Tariff		

Chapter 4	Bell Desk & Concierge	04	10
4.1	Procedure for Guest Arrival & Departure		
4.2	Procedure for Left luggage & Scanty Baggage		
4.3	Paging & Luggage Handling		
4.4	Other Duties of Bell staff		
4.5	Valet service		
Chapter 5	Guest Cycle and Room Reservations	08	12
5.1	Guest Cycle		
5.2	Modes and Sources of reservation		
5.3	Importance of reservation		
5.4	Procedure for taking reservation		
5.5	Records used in reservation		
5.6	Types of reservation		
5.7	Computerized reservation system		
5.8	Overbooking		
Chapter 6	Interdepartmental communication	02	06
6.1	Coordination of Front office department with other departments (Housekeeping, Food and Beverage department, Sales and Marketing department Engineering and Maintenance department Security, Accounts, Human Resource)		

Glossary of Terms

Resort	Motel	Transit hotel
Convention hotel	Timeshare hotel	Casino hotel
Boutique hotel	Heritage hotel	Budget hotel
American Plan	Modified American Plan	Continental Plan
Bermuda Plan	Go plan	Walk in
Check in	Checkout	Walkout
No show	Overstay	Under stay
Crib rate	Corporate rate	CVGR
Rack rate	Day rate	GDS
CRS	Amendment	Guaranteed booking
Confirmed reservation	GIT	SB
Concierge	Waitlist	PBX
Paging	Retention charge	Sleep out
NB	Left luggage	Studio
PABX	EPABX	Valet
Skipper	Quad room	

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel Front Office Operations & Management	Sudhir Andrews.	Tata McGraw Hill
2	Check-in Check -out	Jerome Vallen	WM.C Brown IOWA
3	Principles of Hotel Front Office Operations	Sue Baker, P. Bradley, J. Huyton	Continuum
4	Hotel Front Office	Bruce Graham Stanley	Thornes
5	Managing Front Office operations	Michael Kasavanna Richard Brooks Charles Steadmon	AH&LA,
6	Front Office Procedures & Management	Peter Abott. & Sue Lewry	Butterworth & Heinemann
7	Front Office operations	Colin Dix, Chris Baird	Pearson
8	Front Office Operations and Administration	Dennis foster	Glencoe.

SUBJECT CODE: DSC 104 A					
SUBJECT : BASIC FRONT OFFICE OPERATIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	-----	100	01

1. Telephone Etiquettes and mannerisms
Role play of situations pertaining to Telephone handling.
2. Handling guest mail
Role play of situations pertaining to handling guest mails (in-house, expected and checked out guests)
3. Handling guest messages
Role play of situations pertaining to handling guest message (Telephonic, In Person)
4. Situations on basis of charging Room tariff
5. Handling Arrival and Departure procedure at bell desk
6. Handling Scanty baggage and Left luggage procedure at bell desk
7. Handling Guest enquires and providing information
8. Procedure for receiving reservations
Procedure for determining room availability using conventional charts
9. Procedure for receiving reservations
Procedure for determining room availability using software
10. Procedure for receiving reservations
Procedure for Amendments & Cancellation
11. Handling guest who are blacklisted

ASSIGNMENTS

1. Country, Capital, Currencies & Airlines
2. India – States and Capitals
3. 10 Tourist destination of Maharashtra
4. 10 Tourist destination of India
5. Metro cities information (Location, Shopping, Facilities, Restaurants, Places of interest, Historical Monuments)
6. Information on National and International chain of Hotels
Presentation on assignments with the use of audio visual aids.

SUBJECT CODE: AEC 101					
SUBJECT : FOOD COMMODITIES (THEORY)					
Teaching Scheme/Week			Examination Scheme		
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	20	30	----	50	02

Rationale This subject intends to develop help students to develop an understanding into ingredients used in the kitchen, their types, uses, and storage.

		Hours	Marks
Chapter 1	Vegetables and Fruits	04	04
1.1	Classification and Uses		
1.2	Purchasing and Storage		
Chapter 2	Cereals and Pulses	04	04
2.1	Wheat – Composition and Structure, Flour Milling and Types of Flours		
2.2	Rice – Types of Rice and Rice Products		
2.3	Introduction to maize, barley and oats		
2.4	Pulses – Types, method of sprouting and cooking		
Chapter 3	Fats and Oils	03	03
3.1	Sources and Properties		
3.2	Manufacture and Uses		
3.3	Rendering of fats		
3.4	Rancidity in fats and oils		
Chapter 4	Sugar	03	03
4.1	Sources		
4.2	Types		
4.3	Functions		
4.4	Storage		
Chapter 5	Raising Agents	02	02
5.1	Definition		
5.2	Principle		
5.3	Classification		
Chapter 6	Herbs, Spices and Condiments	03	02
6.1	Functions and Storage		
6.2	Difference between Herbs and Spices		
6.3	Condiments		
Chapter 7	Colours and Flavours, Gels and Gelling Agents, Preserves	03	02
7.1	Colours – Forms, Instructions for use		

7.2	Flavours – Types		
7.3	Examples of commonly used colours, flavours and essences		
7.4	Classification, Types and Uses of Edible gums		
7.5	Preserves - Types		

Chapter 8	Milk	03	03
8.1	Composition		
8.2	Types		
8.3	Uses and Storage		
Chapter 9	Cheese	04	03
9.1	Classification		
9.2	Manufacturing of Cheddar Cheese		
9.3	Uses, Purchasing and Storage of Cheese		
Chapter10	Butter, Cream and Yoghurt	03	04
10.1	Butter – Manufacturing, Types and Uses		
10.2	Cream – Types and Uses		
10.3	Yoghurt – Types and Uses		

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Food Commodities	Bernard Davis	Heinemann Professional
2	Food Commodities For Cookery	Lingard & Sizer	Butterworth & Heinemann
3	The Book of Ingredients	Jane Grigson	Pengiu Books ,England

SUBJECT CODE:LEE101					
SUBJECT:BUSINESS COMMUNICATION					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	-----	100	0

		Hours	Marks
Chapter1	The Communication Process	06	15
1.1	Definition and importance of communication.		
1.2	Elements of communication/process of communication		
1.3	Formal and informal communication-		
1.4	Types of communication– Flow of communication (vertical, horizontal, lateral),		
1.5	Barriers to effective communication		
1.6	How to overcome communication barriers		
Chapter2	Oral communication	04	10
2.1	Advantages and disadvantages		
2.2	Articulation and delivery		
2.3	Making speeches and presentations		
2.4	Telephone etiquettes		
2.5	Standard phrases used in hotels and restaurants.		
Chapter3	Written communication	14	35
3.1	Advantages & disadvantages		
3.2	Letter of enquiry, Letter of complaint, Letter of apology, Letter of order, Letter of application Accompanied by bio-data, Letter of resignation, Letter of collection & sales		
3.3	Writing a logbook		
3.4	Paragraph structure		
3.5	Report writing (incidents, visits)		
3.6	Memos, notices, circulars		
3.7	Notes Making		

REFERENCE BOOKS

- 1 Technical Communication, an & Sharma, Oxford University Press Principle sand Practice Meenakshi Raman, Sangeeta Sharma, Oxford University Press
- 2 Technical communication, Urmila Rai & S.M Rai, Himalaya Publication
- 3 Essentials of Technical Communication, Sunil Gokhale Himalaya Publication
- 4 English Grammar & Composition, Wren & Martin, Orient Longman

SUBJECT CODE:LEE 101A					
SUBJECT:BUSINESS COMMUNICATION (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	----	50	02

Sr.No	Topic
1	Self introduction.
2	Extempore onvarious topics
3	Presentations onvarious topics
4	Group Discussion.
5	Telephone etiquettes and hand ling telephones.
6	Practice of Standard phrases used in hotels and restaurants
7	Preparation for interviews.
8	Importance of Body language informal situations
9	Conduct of Meeting/briefing
10	Preparing Reports-Visit/incident
11	Presentation of Reports.
12	Formal Speeches
13	Reading
14	Vocabulary development
15	Debate
16	Book reading and Discussion

SUBJECT CODE:LEE102					
SUBJECT: BASIC FRENCH(THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	---	100	02

Rationale

To introduce basic knowledge of French language to the students of Hotel management

Chapter1	INTRODUCTION	Hours	Mark
1.1	Alphabet		
1.2	Accents		
1.3	Articles:Definite, Indefinite, partitive and contracted articles		
1.4	Subject Pronouns		
1.5	Basic greetings		
1.6	Vocabulary related to classroom		
1.7	Cardinal Numbers (0-100) & Ordinal Numbers		
1.8	Time, days of a week, months		
1.9	Vocabulary related to seasons, weather		
Chapter2	Conjugation– PresentTense	08	08
2.1	Conjugation of verbs être and avoir		
2.2	Conjugation of first regular group ‘-er’(Ex.Parleretc)		
2.3	Conjugation of second regular group‘-ir’(Ex.finir)		
2.4	Conjugation of third regular group‘-re’(ex.attendre)		
2.5	Conjugation of third regular group‘oir’(ex.Vouloir)		
Chapter3	Grammar	06	12
3.1	Adjectives : Qualifying, Demonstrative, Possesive		
3.2	Preposition		
3.3	Plural		
3.4	Masculine and Feminine		

3.5	Negations		
3.6	Pronouns:Subject, object, en, y, reflexive		
Chapter4	Personal Life	03	10
4.1	Self Introduction		
4.2	Vocabulary relatedtofamily		
4.3	Hobbies,daily routine		
Chapter5	At work	01	08
4.1	Professions		
4.2	Vocabulary related to professions		
Chapter6	Translation	04	10
5.1	English to French		
5.2	French to English		

REFERENCE BOOKS

- 1 Basic French for Hotel Industry, Vaishali Mankikar Continental, Prakashan, Pune
- 2 Basic French course for the Hotel Industry, Catherine Lobo, Sonali Jadhav Tanay Enterprises, Pune

SUBJECT CODE:LEE102A					
SUBJECT: BASIC FRENCH (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	-	50	02

Rational:To enable students to acquire correct pronunciation of French terminology and practice basics spoken French skills.

S.No. Topic

- 1 Alphabets
- 2 Basic greetings
- 3 Numbers
- 4 Days of the week, Date, Months
- 5 Vocabulary related to Classroom
- 6 Question & Answers related to classroom
- 7 Time– Clock, Questions and Answers related to time
- 8 Seasons and weather
- 9 Question & Answers related to seasons and weather
- 10 Vocabulary related Professions
- 11 Questions & Answers related to professions
- 12 Vocabulary related to family
- 13 Questions & Answers related to family
- 14 Vocabulary related to hobbies and daily routine
- 15 Questions & Answers related to hobbies and daily routine
- 16 Self Introduction

SEMESTER- II

SUBJECT CODE: DSC 201					
SUBJECT : BASIC CONTINENTAL FOOD PRODUCTION (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	-	100	03

Rationale:

This subject intends to develop knowledge of stocks, soups, sauces, egg and fish cookery, salads and potato preparations and its application in continental cooking.

		Hours	Marks
Chapter 1	Stocks , Essences and Glazes	06	06
1.1	Definition of stock		
1.2	Ingredients used in stock making		
1.3	Care and rules of stock making		
1.4	Recipes of one litre of various stocks. (White stock, Brown stock, Fish stock and Vegetable stock)		
1.5	Storage of Stocks.		
1.6	Essences, Glazes & Convenience bases.		
Chapter 2	Soups	06	08
2.1	Classification of Soup with 5 examples each (Consommé, Cream, Puree, Broths, Chowder, Veloute, Bisque, National Soup)		
2.2	Consommé- Definition, Ingredients, Clarification, Recipe for one litre and five variations.		
2.3	Garnishes and Accompaniments for Soups & Consommés.		
Chapter 3	Sauces	08	10
3.1	Definition of Sauces. Structure & Functions of Sauces.		
3.2	Thickening agents – Roux: preparation and types, Beurre Manie, White Wash, Cornstarch, Arrowroot,		

3.3	Waxymaize, Instant Starches, Liaison.		
3.4	Classification of sauces.		
3.5	Recipes of Mother sauces – 1 litre&five derivatives of each sauce.		
3.6	Butter sauces – types Dessert sauces – types. Miscellaneous sauces.		
Chapter 4	Textures	03	04
4.1	Definition and Characteristics		
4.2	Types – Desirable and Undesirable		
Chapter 5	Eggs	06	08
5.1	Composition, Structure & Selection		
5.2	Uses in cookery		
5.3	General cooking principles - Effect of heat, acid, salt & sugar		
5.4	Cooking eggs – boiling, poaching, frying , shirred eggs, scrambled eggs, omelets, soufflés		
5.5	Types and Storage		
Chapter 6	Fish	06	08
6.1	Classification of fish with examples & characteristics.		
6.2	Selection of fish & shellfish		
6.3	Cuts of fish.		
6.4	Cooking of fish.		
6.5	Handling & Storage of fish		
6.6	Local equivalentents of fish varieties.		
Chapter 7	Salads	04	06
7.1	Definition of salad, Classification and structure of salad		
7.2	Rules for salad making		
7.3	Salad dressings – Definition, Ingredients used for salad dressing, Types of salad dressings		
7.4	Different types of Salad – Caesar Waldorf Nicoise Russian Cole slaw Tossed Florida German Japonaise Mimosa Raphael Andalouse Eve		
Chapter 8	Potatoes and other starches	03	06
8.1	Various styles of potato preparations: Parsley Potato, Potato Lyonnaise, Potato Marquise, Potato Duchesse, French Fries, Fried Potato, Dauphinois Potato, Potato Croquettes, Potato Lorette, Anna Potato, Macairepotato, Potato Brioche, Chester		

8.2	Potato, Hashed Brown, Jacket Baked		
8.3	Cooking Rice. - Boiling & steaming, Reheating. Pasta – Varieties and Cooking of Pasta.		
Chapter 9	Culinary Terms	06	04
9.1	Bain Marie Appetizer Baste Blend Blanched Bouquet garni Caramel Bouillon Garniture Consommé Dough Estouffade Court Bouillon Cutlet Garnish Beurre Manie Fumet Glaze Concasse Liason Mire Poix Hors d'œuvre Julienne Knead Mis – en- Place Marinade Matignon Paysanne Paner Parboil Poach Puree Sabayon Ragout Potage Roux Simmer Royale Stew Infusion Au gratin Sear Bisque Macedione Zest Fricasse Pare Souffle Barbeque Croutons Printaniere Beurre Noir Espagnole Brunoise Maitre – d- hotel butter		

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Professional Cooking	Wayne Gisselen	John Weily& Sons , N.Y
2	Modern cookery for Teaching and Trade	Thangam E. Philip	Orient Longman Ltd.Mumbai
3	Theory of cookery	Krishna Arora	Frank Bros & Co. Ltd. New Delhi
4	Theory of Catering	KintonCeserani	ELBS
5	Practical cookery	KintonCeserani	ELBS
6	The book of ingredients	Jane Grigson	Pengiuon Books ,England
7	Basic Cookery	Richard Maetland& Derek Welsby	Heinemann Professional

8	Food Commodities	Bernard Davis	Heinemann Professional
9	Food Commodities For Cookery	Lingard & Sizer	Butterworth & Heinemann

SUBJECT CODE: DSC 201A

SUBJECT : BASIC CONTINENTAL FOOD PRODUCTION (PRACTICAL)

Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	02

Minimum 12 practicals of Continental menus to be conducted and should include the following : basic soups, sauces, egg preparations, fish preparations, stews, vegetables, potatoes, salads, basic custard, puddings and mousses.

- Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSC 202					
SUBJECT: BASIC FOOD & BEVERAGE SERVICE II (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	---	100	03

Rationale:

This subject aims to provide fundamental knowledge of Food & Beverage Menus with purpose to apply knowledge & skills required to provide immense services to the guest.

		Hours	Marks
Chapter 1	The Service Sequence	10	12
1.1	Taking Bookings		
1.2	Preparation for service		
1.3	Methods of Order Taking		
1.4	Types of KOT, BOT		
1.5	Service of Food & Beverage		
1.6	Clearing Following Services		
1.7	Billing Methods, dealing with discrepancies		
1.8	Feedback system		
Chapter 2	Types of Meals	10	14
2.1	Breakfast- Types & Service methods		
2.2	Brunch		
2.3	Lunch		
2.4	Afternoon Teas, High Tea		
2.5	Dinner		
2.6	Supper		
Chapter 3	Menu Knowledge	12	14
3.1	Introduction		
3.2	Menu Types – Table d’ hote& A ’la carte ´ menu		
3.3	Menu Planning, Considerations & Constraints		
3.4	Menu Terms		
3.5	French Classical Menu		
3.6	Classical Foods, Accompaniments , cover & service		

Chapter 4	Control Methods	06	08
4.1	Necessity & Functions of Control System		
4.2	Objectives of Control System		
4.3	Flow chart of F & B system		
4.4	Purpose of Revenue control system		
Chapter 5	Non Alcoholic Beverages	10	12
5.1	Classification		
5.2	Hot Beverages-Types, Production, Service		
5.3	Cold Beverages-Types, Production, Service		

Glossary of Terms

Gueridon Service	Single Point Service	Debarrasseur
Trancheur	Chef d'etage	Chef de sale
Sommelier	Mixologist	Barista
Bus Boy	Hot Plate	Still Room
Aboyeur	Off-board	EPOS
Deferred Wash	Tray Jack	Plat du jour
Mise-en-place	Mise-en-scene	Carte du jour
Crumb down	Dumb Waiter	Tisane
Waiters Friend	EPNS	Cover
BOT	KOT	Accompaniment

Assignments:

Minimum of **2 assignments** based on the following topics to be given to individual student and the marks to be considered in internal marks.

1. Collect Menus of Fine Dining Restaurants, QSR, 5 Star Hotel, Coffee Shop
2. Prepare a chart of food and accompaniments for French and Indian menu.
3. Prepare one menu each of Fixed, Cyclic for Cafeteria.

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Food & Beverage Service	Denis Lillicrap, Cousins	Book Power
2	Modern Restaurant Service	John Fuller	Hutchinson
3	Food & Beverage Service- Training Manual	Sudhir Andrews	Tata McGraw Hill
4	The Restaurant (from Concept to operation)	John Walker Donald Lundberg	John Wiley & Sons

SUBJECT CODE:DSC 202A					
SUBJECT: BASIC FOOD & BEVERAGE SERVICE– II (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	-----	100	01

Sr. No	Topic
1	Miseen place & miseen scene
2	Taking an Order for meal and writing KOT
3	Sequence of Service (Clearing , Crumbing & service of coffee and presenting the bill)
4	Restaurant Reservation System
5	Breakfast Menu Planning, Cover Layup & Service : Continental, American Breakfast
6	Service of non alcoholic beverages
7	Breakfast Menu Planning, Cover Layup & Service : Full English Breakfast
8	Menu Planning, Cover Layup & Service: Full Afternoon Tea & High Tea
9	Menu Planning, Cover Layup & Service: Brunch & Supper
10	Menu Planning, Cover Layup & Service:17 Course French Classical menu
11	Menu Planning, Cover Layup & Service: Hor-d'oeuvres, Potage, Oeuf, Farineaux
12	Menu Planning, Cover Layup & Service: Poisson, Entree ´ , Sorbet, Releve ´ , Roti, Legume, Salade
13	Menu Planning, Cover Layup & Service: Buffetfroid, Entremets, Savoureux, Fromage, Dessert
14	Menu Planning, Cover Layup & Service:5-7 Course French Classical Menu
15	Menu Planning, Cover Layup & Service:3- 4 Course French Classical menu
16	Menu Planning, Cover Layup & Service: Indian Lunch & Dinner Menu

SUBJECT CODE: DSC 203					
SUBJECT : MANAGING HOUSEKEEPING OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	---	100	02

Rationale: The subject aims to establish the importance of House keeping and their role in the Hospitality Industry. It also prepares the student to acquire basic knowledge and skills necessary for different tasks and aspects of housekeeping.

		Hours	Marks
Chapter 1	Housekeeping Supervision	04	08
1.1	Importance of supervision		
1.2	Checklist for inspection		
1.3	Dirty Dozen		
Chapter 2	Control Desk	06	12
2.1	Importance and functions of Control Desk		
2.2	Records maintained		
2.3	Key Control- Computerized keys, Manual keys,		
2.4	Key Control Procedures		
2.5	Lost & Found Procedures- Procedure for Guest articles Procedure for lost Hotel Property, Records maintained		
Chapter 3	Linen, Uniform Room& sewing room	08	14
3.1	Layout of Linen Room		
3.2	Classification of Linen		
3.3	Sizes of Linen		
3.4	Calculation of Linen requirement		
3.5	Discard management		
3.6	Issue & exchange of uniforms		
3.7	Activities & Equipments in sewing room		

Chapter 4	Textiles	06	12
4.1	Classification of fibers with examples		
4.2	Characteristics and uses of fabrics used in Hotel Industry		
Chapter 5	Laundry Management	08	14
5.1	In - house laundry v/s Contract Laundry- Merits & Demerits		
5.2	Layout, Equipment's & Agents		
5.3	Laundry procedure : Guest, House		
5.4	Stains and Stain removal		
5.5	Dry-cleaning - Agents and procedures		

Glossary of Terms

Dirty dozen	Tarnish	Guestroom inspection
Inspection checklist	Log book	Vanity unit
Vestibule	White ragging	Gate pass
Scheduled maintenance	Antichlor	Calender
Contingency plan	Cutting down	Damask
Laundromats	Linen	Discard/ Condemned
Light linen	Linen Par	OPL
Seersucker	Selvedge	Sizing
Soft furnishing	Stock taking	Suds
Tensile strength	Togs	Thread count
Drill	Dungarees	Gaberdine
Toque	Darning	Seams
Shirring	Thimbles	Drycleaning
Weft	Warp	Selvedge
Thread count	Flax	Flannelette
Mercerization	Saniforization	Napery
Napping	Pile weave	Seersucker
Yarn	Spining	Sericulture

Felt	Weighting	Antichlors
Hydro extractor	Tumble dryer	Bleach
Suzie	Flat bed press	Absorbents

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management	Sudhir Andrews	Tata Mc Graw Hill
2	Hotel Housekeeping & Management	G Raghubalan, SmriteeRaghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	E L B S
4	Accommodation Management	Rosemary Hurst	Heinemann publishing
5	Accommodation Management	Rosemary Hurst	Heinemann publishing

SUBJECT CODE: DSC 203 A					
SUBJECT : MANAGING HOUSEKEEPING OPERATIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	-----	100	01

1. Using a Room and public area inspection checklist

- Cleaning of a Guest room and public area.
- Checking of the Guest room and public area using a check list.

2. Various forms, formats maintained at control desk

3. Linen room inventory

- Physical inventory of linen

4. Monogramming

- Monogramming of linen and uniforms using chain stitch and satin stitch
- Setting up and cleaning of linen and uniform room
- Setting up and cleaning of floor pantry

5. Mending

- Mending of torn linen and repair of uniforms- Button and hook stitching.

6. Identification and construction of weaves

- Plain weave
- Basket weave
- Figured weave
- Pile weave

7. Identification and construction of weaves

- Satin weave
- Twill weave
- Sateen weave

8. Stain Removal

- Identification, classification and stain removal procedures for- Animal, vegetable, mineral, metalloid.

9. Stain Removal

- Identification, classification and stain removal procedures for acidic, alkaline, pigments and miscellaneous stains.

10. Laundering Procedure

- Prewashing, washing, rinsing
- Starching
- Blueing

11. Laundering Procedure

- Washing, Ironing of cotton, silk and synthetic fabrics.
- Cleaning of laundry and laundry equipments.

ASSIGNMENTS

1. Fabrics used in Hotel Industry (Samples to be collected)

Presentation on assignments with the use of audio visual aids.

SUBJECT CODE: DSC 204					
SUBJECT :MANAGING FRONT OFFICE OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	----	100	02

Rationale: The subject aims to establish the importance of Front office and their role in the Hospitality Industry. It also prepares the student to acquire basic knowledge and skills necessary for different tasks and aspects related to arrival and Departure.

		Hours	Marks
Chapter 1	Pre- arrival Procedure	02	08
1.1	Pre Arrival activities- Preparing an arrival list.		
1.2	Pre Arrival Procedure for FIT/FFIT, VIP.		
1.3	Pre Arrival Procedure for group arrival (Special arrangements, meal coupons etc.)		
Chapter 2	Arrival procedures for various categories	08	12
2.1	Types of Registration & its importance		
2.2	Procedure for Arrival for FIT / FFIT/ Walk-in.		
2.3	Procedure for Arrival for VIP		
2.4	Procedure for Arrival for Group		
2.5	Dealing with overbooking situations and walking a guest		
Chapter 3	Procedures at Front Desk	06	10
3.1	Room change Procedure		
3.2	Safe deposit lockers		
3.3	Handling Guest Complaints		
3.4	Dealing with Emergencies,Medical,Theft, Fire, Bomb threat, Robbery, Terrorist attacks		
Chapter 4	Guest Departure	06	10
4.1	Summary of Front office Duties at checkout		
4.2	Tasks performed at Bell Desk, Cashier & Reception.		
4.3	Late checkout & Late charge		
4.4	Express checkout		
4.5	Departure Notification		

4.6	Soliciting guest comments		
4.7	Creating a good lasting Impression		
4.8	Onward & Future Reservations		
4.9	Updating Front Office Records		
Chapter 5	Methods of Payment	08	12
5.1	Handling Cash, Credit Cards		
5.2	Handling Foreign Currency, TravellersCheques , Bills to company, Travel Agent		
5.3	Foreign Currency Regulations pertaining to payment of bills.		
Chapter 6	Guest Relations	02	08
6.1	Hospitality Desk - Its Functions & role.		
6.2	Standard Operating Procedures at Hospitality Desk		

Glossary of Terms

Float	FIT	FEEC
Overbooking	Voucher	Allowances
C Form	VPO	Cut off time
Guest folio	House limit	Floor limit
Late charge	Late checkout charge	Petty cash
Posting	Transient guest	Cancellation bulletin
Sold out	House guest	Blacklist
Double occupancy	Departure	Crew
House count	No show	GRC
Room rack	Sleep out	Stay over
Under stay	Walk in	Walking a guest
Cut off time	Check out	Retention charge

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Hotel Front Office Operations & Management	Sudhir Andrews.	Tata Mc Graw Hill
2	Check-in Check –out	Jerome Vallen	WM.C Brown IOWA
3	Principles of Hotel Front Office Operations	Sue Baker, P. Bradley J. Huyton	Continuum
4	Hotel Front Office	Bruce Graham Stanley	Thornes
5	Managing Front Office operations	Michael Kasavanna Richard Brooks Charles Steadmon	AH & LA,
6	Front Office Procedures & Management	Peter Abott.& Sue Lewry	Butterworth & Heinemann
7	Front Office operations	Colin Dix, Chris Baird	Pearson
8	Front Office Operations and administration	Dennis foster	Glencoe

SUBJECT CODE: DSC 204 A

SUBJECT : MANAGING FRONT OFFICE OPERATIONS (PRACTICAL)

Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	---	100	01

- 1. Procedure for check-in walk in guests.**
Role play of situations pertaining to arrival and receiving of walk-in guests.
- 2. Procedure for check-in of reserved guests.**
Role play of situations pertaining to arrival and receiving of guests with confirmed reservations.
- 3. Procedure for check-in of foreigners.**
Role play of situations pertaining to arrival and receiving of foreign guests.
- 4. Procedure for Group Check-in**
Role play of situations pertaining to Pre-arrival, arrival and receiving of groups.
- 5. Procedure for VIP Check-in**
Role play of situations pertaining to Pre-arrival, arrival and receiving of VIP guests.
- 6. Handling overbooked situations and walking a guest**
Role play of situations pertaining to overbooking and walking a guest.
- 7. Procedure for room change**
Role play of situations pertaining to guests request for a room change.
- 8. Procedure for checking out a guest**
Role play of situations pertaining to checking out of a guest.
- 9. Procedure for accepting various forms of settlements**
Role play of situations pertaining to settlement by Cash.
Role play of situations pertaining to settlement by credit card.

10. Procedure for accepting various forms of settlements

Role play of situations pertaining to settlement by BTC.

Role play of situations pertaining to settlement by Travel agent.

Role play of situations pertaining to settlement by Travellers' cheque.

11. Procedure for accepting various forms of settlements

Role play of situations pertaining to settlement by foreign currency

12. The Hospitality desk

Role play of situations pertaining to complaint handling at hospitality desk.

13. Standard operating Procedure at front desk

Role play of situations pertaining to SOP's to be followed during reservation, occupancy and checkout.

ASSIGNMENTS

1. Metro cities information (Location, Shopping, Facilities, Restaurants, Places of interest, Historical Monuments)
2. Information on National and International chain of Hotels
3. Collection of brochures and tariff card of different types of Hotel.

Presentation on assignments with the use of audio visual aids.

SUBJECT CODE:SEC101					
SUBJECT : PERSONALITY SKILLS FOR HOPITALITY INDUSTRY (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CAMarks	Total Marks	Credits
03	40	60	–	100	03

Rationale: The subject is designed to make students understand the concept and components of personality, thereby to apply the acquired knowledge towards achieving excellence in their respective academic careers.

		Hours	Marks
Chapter 1	Introduction to personality development	02	02
Chapter 2	Communication Skills	06	08
2.1	Modes of communication		
2.2	Verbal and Non-verbal communication		
2.3	Professional presentations(Types, Use of A/V aids)		
Chapter 3	Impression Management	06	06
3.1	Importance of Physical appearance and grooming (presentable and attractive appearance, dressing, make up, poise and posture)		
3.2	Importance of Physical Fitness		
3.3	Body Language-Kinesics ,Haptics ,Vocalics ,Proxemics Chronemics		
Chapter 4	Personality profile and Self development	06	12
4.1	Elements of persnality		
4.2	Determinants of persnality		
4.3	Personal goal setting and action plan		
4.4	Areas of self developement		
4.5	Self Analysis (Self esteem, Motivation, Attitude)		
4.6	SWOT Analysis- Concept		
Chapter 5	Time Management	04	04
5.1	Time Planning		
5.2	Time Quadrant model		
5.3	Time Wasters and Robbers		

Chapter 6	Emotions	04	06
6.1	What are emotions		
6.2	Emotions and personality		
6.3	Emotional Stability		
6.4	Emotional Maturity		
6.5	Emotional Intelligence		
Chapter 7	Ethics	04	06
7.1	Introduction to Ethics and values		
7.2	Code of ethics		
7.3	Ethics and positive Human relationship		
7.4	Function of values		
7.5	Sets of value for harmonious life		
Chapter 8	Skill development for personality enrichment	08	08
8.1	Identifying general and specific skills		
8.2	Human Skills		
8.3	Cognitive skills		
8.4	Technical skills		
8.5	Listening Skills		
8.6	Practical skills		
Chapter 9	Stress Management	04	04
9.1	Introduction		
9.2	Management strategies		
9.3	Stress managers		
9.4	Stress control		
Chapter 10	Frustration	04	04
10.1	Introduction		
10.2	Causes of frustration		
10.3	Effects of frustration		
10.4	Solutions for avoiding frustration		

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Development of Generic Skills-I	K Sudesh	Nandu printers and publications
2	Development of Generic Skills-II	K Sudesh	Nandu printers and publications
3	Development of Generic Skills	M K MALKE	Central techno Publication
4	Basic Managerial skills for all Human learning	E H Mcgrath	Prentice Hall, India

SUBJECT CODE: SEC 101 A					
SUBJECT : PERSONALITY SKILLS FOR HOSPITALITY INDUSTRY (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	-----	50	02

1. Development of proficiency in English

- Practice on spoken communication skills and testing voice and accent, voice clarity, voice modulation and intonation.

2. Personal Introduction

- Developing an Understanding of Social Etiquettes.

3. Business manners and etiquettes

- To understand presenting oneself with finesse.

4. Debate

- To understand subject knowledge, oral and leadership skills.

5. Group Discussion

- To understand subject knowledge, oral and leadership skills.

6. Extempore

- To understand subject knowledge, oral and leadership skills.

7. Body Language

- Study of different pictorial expression of nonverbal communications and its analysis.

8. SWOT Analysis

- Self evaluation.
- Self discipline
- Recognition of one's own limits and deficiencies.
- Self Awareness.

9. Presentation skills

- To understand Preparing and delivery of presentation.

10. Time Management techniques

- To understand Time Quadrant model and its use.

11. Stress management techniques

- To identify factors that cause stress through questionnaire/games.

12. Listening skills

- To improve note making and listening skills.

13. Organizing a seminar

14. Guest lectures of hospitality professionals.

15. Field visits

- Field visits to various sectors of the hospitality industry as a learning experience for students.

16. Report writing on guest lectures and field visits

Assignment

1. Make a SWOT Analysis to identify your strength, weaknesses, opportunity and threats
2. Identify your areas of self development and plan a strategy to improve.
3. Identify qualities, traits of a eminent admired personality
4. Prepare a tree of life to understand personality determinants
5. Identify your values and prepare a code of ethics for yourself
6. Presentation on your role model in hospitality industr

SEMESTER– III

Industrial Training

SUBJECT CODE:DSC 301-(I)					
SUBJECT:INDUSTRIAL EXPOSURE & REPORT					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
54	--	120	80	200	37

In the fifth semester the student shall undertake industrial training for a period of 22 weeks, reputed hotel, and restaurant or hospitality organization.

The institute shall assist in the placement of students for training in various hotels. The student can make self arrangement to train in any hotel of his choice. The student will have to bear the necessary expenses involved for the same.

At the end of the industrial training the student shall submit a training Report along with the logbook maintained on a daily basis during the period of training and the performance appraisal from each department.

The training report is to be prepared by the student in two copies and to be submitted to the Training & Placement Officer within the stipulated time for assessment.

The report will be assessed by the internal examiner and only on the basis of a certificate of the examiner concerned that the training has been satisfactorily completed would the student be allowed to appear for the external assessment conducted by a panel of examiners comprising of one external examiner (the external would include preferably one from the hotel industry of the level of Head of the Department and above) and one internal examiner. The Continuous Assessment marks will be awarded based on the performance appraisals filled by the hotel managers.

The student is required to practice the disciplines & norms laid down by the institute and also follow the rules and regulations of the hotel in which he/she is undergoing training.

Any adverse remark from the hotel will call for stringent action.

SUBJECT CODE: AEE 101					
SUBJECT: CATERING SCIENCE					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To develop awareness of the importance of hygiene, sanitation and food safety in hotel industry.

		Hours	Marks
Chapter1	Importance of Hygiene in the Catering Industry.	04	02
1.1	Introduction, Definitions: Hygiene & Sanitation		
1.2	Significance of hygiene & Sanitation in the food industry		
Chapter2	Food Microbiology.	08	06
2.1	Classification & Morphology of Microorganisms- Bacteria, Virus,		
2.2	Fungi, Algae, protozoa.		
2.3	Growth of Bacteria and its relevance to the food industry. Factors affecting microbial Growth. Moisture, Ph, Temperature, Oxygen, Time, Osmotic Pressure		
2.4	How food act as substrate for micro organisms.		
2.5	Concept of food contamination, Sterility, Cross Contamination, Contamination from plants & fruits, animals, sewage, soil, water, air.		
2.6	Food spoilage, causes, chemical changes caused by microorganisms		
Chapter3	Food borne illnesses	08	04
3.1	Microbial action-Food Poisoning (Microorganisms involved, mode of transmission, control of food Borne illness) Food infection (Bacterial, Viral, Protozoal) (Micro organisms involved, mode of transmission,		

	control of food born eillness)		
3.2	Toxicmetals and chemicals		
3.3	Naturally occurring toxicants in food.		
3.4	Investigation of food– borne disease outbreak		
Chapter4	Beneficial effects of micro organisms	06	04
4.1	Role of micro organisms in the manufacture of fermented foods, Dairyproducts, Vegetable preparations, Bakery products & Alcoholic beverages.		
Chapter5	Hygienic food Handling	06	06
5.1	Importance of following sanitary procedures.		
5.2	Concept of danger zone		
5.3	Sanitaryprocedures whilePreparation,Cooking, Mixing rawand cooked preparation, Holding: Hotholding, cooling, leftover		
5.4	Common Faults in food preparation		
Chapter6	Environmental Sanitation. Hygiene in food production and service areas.	08	04
6.1	Types of wastes in catering establishments the irdisposal methods. Food Contamination and spoilage due to kitchen pests and Pest control.		
Chapter 7	Hazard Analysis and critical control points, Importance, definition & usage of HACCP.	06	06
Chapter 8	Sanitation Regulation & standards	06	06
8.1	Food adulteration. Simple tests to detect food adult erantsin milk, sugar, turmeric, chilli powder, tea, coffee semolina, Ghee, butter margarine,oil		
8.2	Control of food quality– IndianStan.		
Chapter 9	Food Preservation.	06	06
9.1	Food Preservation by canning, drying, fermentation, Pickl ingandcuring, chemical preservatives & by irradiation.		
Chapter 10	Food Science	06	06

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- 10.1 pH-Definition and its relevance in industry.
 - 10.2 Browning reactions (desirable & undesirable, enzymatic and non enzymatic reactions of food)
 - 10.3 Concept of gelatinization, inversion and crystallization in starch.
 - 10.4 Definitions and relevance of Boiling point, Boiling under pressure, Melting Point, Smoking point, Flash Point, Surface Tension.

REFERENCE BOOKS

- 1 Food Hygiene and sanitation, Ms.S. Roday, Tata Mc Graw Hill
- 2 The technology of food preservation, Norman Desrosier, CBS Publishers
- 3 Food microbiology, William Frazier & Dennis Westhoff Tata McGraw Hill
- 4 Food science & experimental foods, Dr. M.Swaminathan Bappco Publishers
- 5 Prevention of food adulteration act, 1954, Seth & Capoors, ILBS Publishers

SUBJECT CODE:AEE 102					
SUBJECT: DIETITICS & NUTRITION					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	–	–	50	50	04

Rationale

To develop basic awareness of important nutrients and knowledge of nutritional requirements for human beings & plan a balanced diet & understand the changes that occurs in the chemical components of food during preparation.

		Hours	Marks
Chapter1	Introduction to nutrition	06	04
1.1	Definitions: Food, Diet, nutrients, nutrition, Malnutrition, over and under nutrition/Energy, energy requirements.		
1.2	Basal metabolic rate, Factors affecting basal metabolic rate.		
1.3	Concept of digestion, absorption, metabolism.		
1.4	Objectives of cooking.		
Chapter 2	Carbohydrates	04	04
2.1	Definition, Composition, Classification		
2.2	Foodsources, Functions		
2.3	RDA (Adolescents and Adults)		
2.4	Importance of fiber in the Diet		
2.5	Symptoms of Deficiency and Excess of Carbohydrates In diet		
2.6	Effect of heat on Carbohydrates		
Chapter 3	Proteins	06	04
3.1	Definition, Composition, Classification		
3.2	Food sources		

3.3	Essential and Non-essential Aminoacids		
3.4	RDA (Children and Adults)		
3.5	Effect of heat on Proteins		
Chapter4	Lipids	06	04
4.1	Definition, Composition, Classification		
4.2	Food Sources		
4.3	RDA (Adolescents and Adults)		
4.4	Symptoms of deficiency and excess of fats		
4.5	Effect of heat on fats		
Chapter 5	Vitamins	06	06
5.1	Definition, Classification of Vitamins in to Fat Soluble And Water Soluble		
5.2	Functions, Sources, RDA, Symptoms of Deficiency and excess		
Chapter6	Mineral	06	04
6.1	Classification, General Functions of Minerals- Calcium, Iron, Iodine, Sodium and Chlorine		
6.2	FoodSources,Symptoms of DeficiencyandExcess		
6.3	RD Ain Adole scents and Adults		
Chapter7	Water	04	04
7.1	Sources, Functions of Water in human body, Sources Of Water		
7.2	Deficiency and Excess		
Chapter8	Classification of Raw Materials into food groups	08	04
8.1	The irnutritive values-cereals, pulses, nuts& Oil seeds milk & milk Products, eggs,flesh foods, Vegetables & fruits, fats & oils.		

Chapter 9	Formulation of balanced & Therapeutic Diet	10	06
9.1	Five food groups system diet therapeutic diet		
9.2	Exchange list system		
9.3	Planning of a diet for normal adults (male & female)		
9.4	Concepts of Therapeutic diets, Foods to be avoided and recommended in Diabetes Mellitus, Cardiovascular disorders,		
9.5	Gastro intestinal disorders, Kidney disorders and Liver disorders, Fevers and Infections		
9.6	New trend sin Nutrition (importance of avoiding junk food, gluten free diet, transfatty acids, convenience food)		
Chapter 10	Food Additives	04	04
11.1	Definition, types and functions andvarious uses in food industry		

REFERENCEBOOKS

- 1 Nutrition and Dietetics, Ms. Shubhangini Joshi, Tata Mc-Graw Hill
- 2 Hand Book of food and Nutrition, Dr. M.S. Swaminathan, Bappco
- 3 Diet and Nutrition, BN Tiwari, Pearl Books
- 4 Food Science, B.Srilakshmi, New Age International Publication

SUBJECTCODE:AEE103					
SUBJECT:FOOD & BEVERAGE CONTROLS					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	–	–	50	50	04

Rationale

To impart to students various cost, control and inventory concepts in a food and beverage operation.

		Hours	Marks
Chapter1	Introduction to Food & Beverage management	8	6
1.1	Sectors of Food & Beverage Industry		
1.2	Cost and market orientation		
1.3	Food & Beverage Management functions		
1.4	Responsibilities of food and beverage management		
1.5	Constraintst of o odand beverage management		
Chapter2	An overview of Food and Beverage control	6	04
2.1	Food and beverage control defined		
2.2	Objectives of food and beverage control		
2.3	Problems of food and beverage control		
2.4	The fundamentals of control		
Chapter3	Cost, Profit and Sales concepts	10	6
3.1	The elements of cost		
3.2	Basic cos tconcepts - Fixed and variable costs, Direct And indirect costs,Control lable and uncontrollable costs, Estimated, budgeted and Standard costs Outlay And opportunity costs		
3.3	Kinds of profit		
3.4	Break evenan alysis		
Chapter4	Budgeting for Food and Beverage Operations	10	6
4.1	Budgets defined		
4.2	Objectives of budgetary control		
4.3	Types of budgets		

4.4	Basic stages in the preparation of budgets		
4.5	Obstacles to control		
Chapter 5	Purchasing	6	6
5.1	The main duties of the purchasing manager		
5.2	The purchasing procedure for food and beverage		
5.3	The selection of a supplier		
5.4	Methods of purchasing food and beverage		
5.5	Purchase specifications for food and beverage		
Chapter 6	Receiving, Storing and Issuing	8	8
6.1	Objectives of receiving food		
6.2	Themeattag		
6.3	Stock taking of food		
6.4	Receiving of beverages		
6.5	Storing and issuing of beverages		
6.6	Cellar records		
6.7	Issuing beverages		
6.8	Stock taking of beverages		
Chapter 7	Control checklist	6	6
7.1	Food control checklist		
7.2	Beverage control checklist, bar procedures, beverage control procedures		
7.3	Prevention of fraud in the bar		
Chapter 8	Management information System	10	8
8.1	Various Reports		
8.2	Calculation of Actual Cost		
8.3	Daily Food Cost		
8.4	Monthly Food Cost		
8.5	Statistical Revenue Reports		
8.6	Cumulative and Non-Cumulative		

REFERENCE BOOKS

- 1 Food and Beverage management, Bernard Davis, Sally Stone, Butter worth Heineman Ltd
- 2 Food and beverage control, Richard Kotas Bernard Davis, International, Textbook, Glasgow
- 3 Cost accounting- Methods and Problems, BK Bhar, Academic Publishing

SUBJECT CODE: AEE104					
SUBJECT: PRINCIPLES OF MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	–	–	50	50	04

Rationale

To make the student understand the concepts of management and the irpractical application in the hospitality industry.

		Hours	Marks
Chapter1	Introduction to management	06	04
1.1	Management and Organization defined		
1.2	Elements of an organisation		
1.3	Levels of management		
1.4	External and internal factors that affect management		
Chapter2	The Evolution of Managementtheory	08	08
2.1	Brief history of management thought		
2.2	Taylor’s Scientific Management Theory		
2.3	Fayol’s Classical Organization Theory		
Chapter3	Planningand DecisionMaking	08	08
3.1	Planning defined		
3.2	Importance of plans and goals		
3.3	Hierarchy of plans/Types of plans (Objectives, Strategies, Policies, Procedures, Methods, Rules, Programmes, Budgets		
3.4	Steps in planning		
3.5	The rational model of decision making		
Chapter4	Organising& Staffing	12	08
4.1	Organising defined and importance		
4.2	Formal and informal organization		
4.3	Span of management		
4.4	Departmentation		
4.5	Centralisation & Decentralisation		
4.6	Delegation of Authority		

Chapter5	Leadership	10	06
5.1	Leadership styles- Autocratic, Democratic, Laissez faire		
5.2	Blake & Mouton's Managerial Contingency Theory) Characteristics of a good leader		
5.3			
Chapter6	Motivation	08	08
6.1	Motivation defined		
6.2	Nature and importance		
6.3	Theories of motivation		
	i) Maslow's Hierarchy of Needs		
	ii) McGregor's Theory X &Theory Y		
6.4	Morale		
6.5	Benefits of high morale/motivation		
Chapter7	Co ordination	06	04
7.1	Co-ordination defined		
7.2	Need for Coordination		
7.3	Problems in achieving effective coordination		
7.4	Approaches to achieving effective coordination		
Chapter8	Controlling	06	04
8.1	Control defined		
8.2	Need for control		
8.3	Steps in the control process		

REFERENCE BOOKS

- 1 Management, Stoner and Freeman, Prentice Hall of India
- 2 Essentials of Management, Koontz,O' Donnell, Mac Graw Publishing Co.
- 3 The best of Peter Drucker Management, Peter Drucker Mac Graw Publishing Co.
- 4 Management Process, R. Davar, Universal Books

SUBJECT CODE:AEE105					
SUBJECT:ORGANIZATIONAL BEHAVIOUR					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	–	–	50	50	04

Rationale

The subject aims to introduce students to the various elements and dynamics of organizational behavior.

Chapter	Topic	Hours	Marks
Chapter1	Introduction to organizational behavior	05	04
1.1	Organizational behaviour defined.		
1.2	Relevance and scope.		
Chapter2	Foundation of individual behaviour	08	06
2.1	Environmental factors		
2.2	Personal factors		
2.3	Organizational factors		
2.4	Psychological factors		
2.5	Personality, perception, attitudes and learning		
Chapter3	Motivation	06	06
3.1	Nature of Motivation		
3.2	Theories of motivation-Maslow, Herzberg, Equity And Expectancy		
Chapter4	Foundation of Group Behaviour	06	06
4.1	Group Dynamics		
4.2	Group Formation		
4.3	Group Task		
4.4	Group Decision making		

Chapter 5	Leadership	05	04
5.1	Nature of leadership		
5.2	Theories of leadership-Traittheory, Behavioural and Fielder’s contingency theory		
Chapter 6	Communication	05	04
6.1	Inter personal communication		
6.2	Barriers and ways of overcoming barriers		
6.3	Organizational communication		
6.4	Informal communication		
Chapter 7	Conflicts	03	04
7.1	Causes of conflicts		
7.2	Ways of overcoming conflicts		
Chapter 8	Organization	05	04
8.1	Organizational structures		
8.2	Behavioural implications of different structures		
Chapter 9		08	06
9.1	Organizational Change		
9.2	Factors responsible for change		
9.3	Resistance to change		
9.4	Implementation of the change process		
	Ways of overcoming theresistance		
Chapter10	Organizational Culture	05	06
10.1	Definition and importance of organizational culture		
10.2	Creation and sustenance of organizational culture		

REFERENCEBOOKS

- 1 Essentials of Organizational Behaviour, Stephen. P. Robbins Prentice Hall of Indi
- 2 Organisational Behaviour, Fred Luthans, McGraw Hill
- 3 Organisational Behaviour, Ashwathappa. K,Himalaya Publishing House
- 4 Organisational Behaviour, B.P.Singh, DhanpatRai & sons
- 5 Organisation Behaviour, Umashankaran, Tata McGraw Hill

SUBJECT CODE: AEE106					
SUBJECT: HOTEL ECONOMICS					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	-	-	50	50	04

Rationale

This subject helps the students to develop an understanding of the concept and theories of application of management techniques in the field of economics. More over they should be able to understand the Manager's role in the decision making process from economic view point.

		Hours	Marks
Chapter1	Nature & Significance of Managerial Economics	04	08
1.1	Meaning, Features & Significance		
1.2	Functions of Managerial Economist		
Chapter2	Basic Terms used in Economics	08	08
2.1	Micro & Macro Economics		
2.2	Problem of Scarcity – Lionel Robbins Definition of Economics		
2.3	Economic Tasks– Production & Distribution		
2.4	Economic Entities– Household & Firm		
2.5	Distinction between Plant, Firm & Industry		
Chapter3	Demand Analysis	12	08
3.1	Meaning, Types & Determinants of Demand		
3.2	Meaning & Determinants of Individual & Market Demand		
3.3	Demand Function & Demand Schedule		
3.4	The Law of Demand		
Chapter4	Theory of Consumer Demand	10	06
4.1	Utility- Meaning & Types		
4.2	The Law of Diminishing Marginal Utility		
4.3	The Law of Equi-Marginal Utility		

Chapter5	Elasticity of Demand	10	06
5.1	Concepts, Kinds & Types		
5.2	Measurement of Price Elasticity Demand		
Chapter6	Production Analysis	08	06
6.1	Concepts & Attributes		
6.2	The Law of Variable Proportions		
6.3	The Law of Returns to Scale		
Chapter7	Supply Analysis	06	04
7.1	Meaning & Determinants of Supply		
7.2	The Law of Supply		
7.3	Elasticity of Supply-meaning, measurement & factors Affecting elasticity of Supply		
Chapter8	Types of Market	06	04
8.1	Meaning & Classification of Market Structure		
8.2	Types of Market Structures Formed by the Nature of Competition		

REFERENCE BOOKS

- 1 Business Economics, V. G. Mankar, Himalaya Publishing House,
- 2 Modern Micro Economics, Ahuja H. L, S. Chand Publishing
- 3 Business Economics (Micro), Dr. (Ms). Girija Shamkar, Nirali Prakashan

SUBJECT CODE:AEE107					
SUBJECT:FINANCIAL MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	–	–	50	50	04

Rationale

This subject helps the students to develop an understanding of the concepts and theories of Financial Management in the Hospitality industry. This will also help the student in analyzing the financial statements and capital budgeting.

		Hours	Marks
Chapter 1	Financial Management	04	04
1.1	Definition, Scope and objectives-Branches of accounting-		
1.2	Historical, cost, Financial control, Financial Management and Revenue.		
Chapter 2	Ratio Analysis	12	08
2.1	Meaning, Importance and limitations		
2.2	Practical problems on computation of Liquidity Ratios- Current and Quick Ratio. Activity /Turnover Ratios-Stock Turnover Ratio, Debtors Turnover Ratio, Creditors Turnover Ratio, Long-term Solvency Ratios-Proprietary Ratio, Debt Equity Ratio.		
2.3	Profitability Ratios-Gross Profit, Net Profit, Operating ratio, Return on Capital employed, Return on Proprietor's Fund Ratio. Practical problems on preparation of Balance sheet from given Ratios.		
Chapter 3	Funds Flow and Cash Flow Statement	12	10
3.1	Nature, Importance and Uses		
3.2	Differences between Funds Flow and Cash Flow Statement		
3.3	Practical problems on preparation of Funds Flow considering following adjustment only: Depreciation On fixed Assets, Dividend- Interim and Final and Taxation		

Chapter 4	Working Capital Management	08	06
4.1	Definition and Meaning		
4.2	Factors affecting working capital		
4.3	Working capital cycle		
4.4	Practical problems on determination of working capital		
Chapter 5	Capital Budgeting	10	06
5.1	Meaning and Importance		
5.2	Practical problems on capital budgeting : payback period, Accounting Rate of return, Netpresent Value		
Chapter6	Budgets,Budgeting and Budgetary Control	08	08
6.1	Definition and Characteristics of Budgets		
6.2	Meaning and Advantages of Budgetary control		
6.3	Practical problems on Cash Budget, Flexible Budget		
Chapter7	Introduction to Pricing and Value added Tax.	10	08
7.1	Importance of Pricing.		
7.2	Methods of Pricing- Costplus, Rate of Return, Absorption Contribution and Backward.		
7.3	History, Meaning and Advantages of Value added tax In Hotel and Catering establishment		

The students may be assigned exercises related to Hotel Accounting to get hands on experience.They may beg ivenassignments to collect various Formats use din the Hotel Industry and to present samein the class.

REFERENCE BOOKS

- 1 Financial Management, M.Y.Khan & P.K.Jain,Tata McGraw Hill
- 2 Financial Management, Prof. Dr. S.V. Patankar, Everest Publishing House
- 3 Financial Management, Prof. N. M.Vechalekar, Nirali Publication
- 4 Financial Management, Satish M Inamdar, Everest Publishing House
- 5 Introduction To Management Accounting, L.N.Chopdeand D.H.Choudhary, Sheth Publishers Pvt.Ltd
- 6 Financial and Cost Control Techniques, Dr. Jagmohan Negi, Gaurav Manohar Metropolitan Book Co. Pvt. Ltd. New Delhi.

SEMESTER– IV

SUBJECT CODE:DSC401					
SUBJECT:LARDER AND BASIC BAKING (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	---	100	04

Rationale

This subject in tends to develop knowledge and skills required for Garde Manger work and preparation off rozen desserts. It will also enhance understanding of the basic principles of baking, ingredients used in bakery and their role. It attempts to develop an understanding of meat cookery.

		Hours	Marks
Chapter 1	Le GardeManger	04	06
1.1	Definition		
1.2	Functions of larder department		
1.3	Break down of larder department		
1.4	Responsibilities of Chef Garde Manger		
1.5	Larder control		
1.6	Liasion with kitchen & pastry department		
1.7	Layout of larder in a hotel		
1.8	Equipments & tools use dinlarder		
Chapter 2	Horsd'oeuvres	03	04
2.1	Types of horsd'oeuvres: Hotand Cold- Canapés, Cocktails, Relishes.		
2.2	Miscellaneoushorsd'oeuvres- Antipasto, Bruschetta, Tapas, Amusebouche		
Chapter 3	Meat Cookery and Poultry	10	10
3.1	Composition & structure		
3.2	Quality of Meat		
3.3	Factors affecting flavour & tenderness		
3.4	Cooking of meats		
3.5	Selection, Cuts, approximate weights & method of cooking of the following– Lamb, Pork, Beef, Veal.		
3.6	Poultry- Selection, Cuts, Uses.		

Chapter 4	Curing And Smoking	02	02
4.1	Ingredients used for curing foods		
4.2	Curing methods		
4.3	Smoking		
Chapter 5	Charcuterie	05	06
5.1	Bacon– cuts & uses		
5.2	Ham– types & uses		
5.3	Differentiation – Ham, Bacon & Gammon		
5.4	Forcemeats – Types		
5.5	Sausages– Composition, Classification & Types		
Chapter 6	Pate,Terrines and other cold foods	05	06
6.1	Duties and responsibilities of Chef-de - froid		
6.2	Aspic– Definition, Function & Types		
6.3	Chaufroid – definition, types		
6.4	Using aspic & chaud froid sauce		
6.5	Pates & Terrines– Definition, Preparation, Difference		
6.6	Galantine & Ballotine- Definition, Preparation, Difference		
6.7	Mousse & Mouselline- Definition, Preparation, Difference		
6.8	Assembly of cold buffet		
6.9	Smorgasbord		
Chapter 7	Creams,Custards,Puddingsand FrozenDesserts	04	06
7.1	Basic custard		
7.2	Pastrycream – Definition, Preparation & Variations		
7.3	Pudding– Types		
7.4	Bavarians, Chiffons, Mousses & Souffles		
7.5	Frozen dessert – Classification, Popular ice - cream desserts		
7.6	Dessert sauces		
Chapter 8	Culinary Terms	04	06
Anglaise	Assaisonner	Ateraux	Aspic
Abattis	Ballotine	Barder	Bavarois
Beignet	Bouchee	Blondir	Chantilly
Charlotte	Chiffonade	Coulis	Crecy
Dariole	Duxelle	Panada	Farcir
FoieGras	Jardiniere	Jambonnette	Juslie
Meringue	Navarin	Papillote	Parfait
Praline	Provencale	Quenelle	Quiche
Ratatouille	Timbale	Dartois	Crudite
Forcemeat	Rollmops	Frizzling	Baba

Kedegree	Raspings	Nori	Fleuron
Crepinettes	Tournedos	Zakuski	Matellote
Civet	Duglere	Rissotto	Hummus
Macerate	Taboullleh	Gnocchi	Sippets
Tripe	Muesli	Neige	Pastillage
Dashi	Bombe	Compote	Tapenade
Lardons	Panache	Piquante	Baron
Sauerkraut	Salsa	Daube	Shaslik
Blanquette	Sundae	Crepes	Zabaglion
Qubus	Moussaka	Paella	Falafel
Baveuse	Waffles	Blackpudding	Truffles

Chapter 9 Ingredients Used in Bakery **05 04**

- 9.1 Flour– Functions.
- 9.2 Sugars – Functions
- 9.3 Fats - Types, Functions
- 9.4 Milk & milk products - Functions, guidelines for usage
- 9.5 Eggs - Functions, guidelines for usage
- 9.6 Leavening agents - Functions, guidelines for usage
- 9.7 Fruits and nuts - Types, Functions.
- 9.8 Salt- Functions, guidelines for usage
- 9.9 Spices & Flavouring - Types, Functions
- 9.10 Chocolate & Cocoa- Types, Functions, guidelines for usage

Chapter 10 Basic Baking **06 10**

- 10.1 Steps in Bread making
- 10.2 Methods of making cookies – Rolled, Dropped, Molded, Bagged, Ice Box, Stencil, Sheet, Bar
- 10.3 Cake Mixing Methods – Sugar Batter, Flour Batter, Boiling, Sugar Water, All in One
- 10.4 Faults in Bread, Cakes, Cookies.

REFERENC EBOOKS

- 1 Professional Cooking, Wayne Gisselen, John Wiley & Sons, N.Y
- 2 Professional Baking, Wayne Gisselen, John Wiley & Sons, N.Y
- 3 Modern Cookery for Teaching & Trade (Volume I&II), Thangam E.Philip, Orient Longman Ltd.Mumbai.
- 4 The Larder Chef, Leto. M. J & Bode. K. H, Heinemann Professional
- 5 Larousse Gastronomique, Paul Hamlym,Cookery Encyclopedia
- 6 Practical Cookery, Kinton Ceserani, ELBS
- 7 Professional Chefs- Art of Garde Manger, Frederic. H & John Nicolas, John Wiley & Sons, N.Y
- 8 Kitchen Planning & Mgmt, John Fuller & David Kirk, Heinemann Butterworth
- 9 Classical Food Preparation & Presentation,W.K.H. Bode, Batsford
- 10 BasicBaking,S.C.Dubey,TheSocietyofIndianBakers
- 11 Understanding Baking, Joseph Amendola & Donald Lundberg, John Wiley & Sons, N.Y

SUBJECTCODE:DSC 401A					
SUBJECT:LARDER AND BASICBAKING(PRACTICAL)					
TeachingScheme/Week	ExaminationScheme				
Practical Hours	IAMarks	EAMarks	CAMarks	Total Marks	Credits
08	40	60	-----	100	04

- Minimum 08 practicals of Advanced Continental menus to be conducted. Menus may be designed so as to cover classical appetizers, soups, main course, accompaniments, salads and desserts.
- Minimum 04 Bakery practicals to be conducted to include varieties of bread, cookies and also introduce them to basic cake making.
- Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day today basis.

SUBJECTCODE:DSC 402				
SUBJECT:ALCOHOLICBEVERAGES – I(THEORY)				
TeachingScheme/Week	Examination Scheme			
Theory Hours	IAMarks	EAMarks	TotalMarks	Credits
03	40	60	100	03

Rationale:

To impart comprehensive knowledge about various fermented & distilled alcoholic beverages such as wines, aperitifs, spirits, liqueurs & bitters.

		Hours	Marks
Chapter 1	Aperitifs	02	04
1.1	Definition		
1.2	Types- Wine Based, Spirit Based		
Chapter 2	Introduction to Fermented Alcoholic Beverages	10	12
2.1	Wine- Classification , Brands		
2.2	Beer – Classification, Brands		
2.3	Sake – Classification , Brand		
Chapter 3	Introduction to Distilled Alcoholic Beverages	14	16
3.1	Brandy – Classification, Brands		
3.2	Rum – Classification, Brands		
3.3	Vodka – Classification, Brands		
3.4	Gin – Classification, Brands		
3.5	Whisky – Classification, Brands		
3.6	Tequila – Classification, Brands		
Chapter 4	Introduction to Cocktails	08	10
4.1	Methods of Making Cocktails		
4.2	Golden Rules		
4.3	Classification of Cocktails		
4.4	Examples of Cocktails		
Chapter 5	Other Alcoholic Beverage	03	04
5.1	Arrack, Aquavit, Schnapps, Fruit Brandies, Pastis,		
5.2	Kirsch, Feni, Calvados, Korn, Doppelkorn, Cordials		
Chapter 6	Introduction to Liqueur	06	08
6.1	Introduction, Manufacturing		
6.2	Types		
6.3	Brands		

Chapter 7	Introduction to Bitter	03	04
7.1	Introduction, Manufacturing		
7.2	Types		
7.3	Brands		
Chapter 8	Introduction to Tobacco	02	02
8.1	Introduction		
8.2	Types, Brands of Cigar, Cigarettes.		

Glossary of Terms

Distillation	Aqua-vitae	Eau-de-vie
Congeners	Pot still	Fore-shots
Blending	Coffey still	Maturing
Cognac	Armagnac	Bonne chauffe
Ageing	Angels share	Brouillis
Grande Fine Champagne	Fine Champagne	Fine Maison
VSOP	Napoleon Brandy	Old liqueur cognac
Hors d'age	Marc	Grappa
Grain Whiskey	Ouzo	Peats reek
Single malt	Blended whisky	Malt whisky
Dunder	Vatted malt	Rye whisky
Schnapps	White rum	Bagasse
Wine	Aromatized wine	Dark rum
Blue wine	Blush wine	Agave
Champagne	Sparkling wine	Vinc
Asti spumante	Vins mousseux	Fortified wine
Vinho coto		

Assignment: Minimum of two assignments to be submitted by students by the end of these semester.

1. Wines from New world countries (USA, Australia, Africa and New Zealand)
2. Price list of wines from two outlets.
3. Indian wines brand names and prices
4. Price list of Beer from two outlets
5. Prepare a wine & other alcoholic beverages list.
6. List & give recipe of 10 cocktails of different base : Vodka, Rum, Tequila, Brandy, Whisky

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Food & Beverage Service	Denis Lillicrap, Cousins	Book Power
2	Modern Restaurant Service	John Fuller	Hutchinson
3	Food & Beverage Service- Training Manual	Sudhir Andrews	Tata McGraw Hill
4	The Restaurant (from Concept to operation)	John Walker Donald Lundberg	John Wiley & Sons
5	The Beverage Book	Dunkan& Cousins	Hodder & Stoughton
6	Professional Guide to Alcoholic Beverages	Lipinski	Van Nostrand Reinhold
7	Oxford Companion to Wines	Jancis Robinson	Oxford University Press

SUBJECTCODE:DSC-402A					
SUBJECT:ALCOHOLIC BEVERAGES – I (PRACTICAL)					
TeachingScheme/Week	ExaminationScheme				
PracticalHours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	-----	100	01

Sr.No	Topic
1	Types of Glassware used in Beverage Service
2	Service of Aperitifs
3	Service of Wines
4	Setting up cover for menu with wines
5	Service of Beer – Service Temperature, Equipment, Procedure, Brands
6	Service of Brandy
7	Service of Rum
8	Service of Vodka
9	Service of Tequila
10	Service of Gin
11	Service of Whisky
12	Service of Liqueur at the bar and at the table
13	Compiling a Wine & other drink list
14	Service of Cocktails at the bar and at the table
15	Types of bitter and service of bitter& other alcoholic beverages
16	Service of Cigar & Cigarettes

SUBJECT CODE: DSC 403					
SUBJECT : ALLIED HOUSEKEEPING FUNCTIONS(THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA	EA	CA	Total	Credits
	Marks	Marks	Marks	Marks	
02	40	60	---	100	02

Rationale:

The subject aims to establish the importance of Housekeeping Operations & its role in the Hospitality Industry. It also prepares the student to acquire knowledge of the operational aspects in housekeeping.

		Hours	Marks
Chapter1	Horticulture & Flower Arrangement	06	12
1.1	Concept and Importance		
1.2	Principles, Types and Shapes of flower arrangements		
1.3	Types of indoor and outdoor plants used in hotels		
1.4	Tools, Equipment's and Accessories used in horticulture and flower arrangement		
1.5	Conditioning of Plant Materials		
Chapter 2	Pest Control	04	08
2.1	Types of Pests		
2.2	Preventive and Control measures		
Chapter 3	Contract Cleaning	04	10
3.1	Definition, Concept		
3.2	Jobs given on contract by Housekeeping		
3.3	Advantage & Disadvantages		
3.4	Pricing a contract		
Chapter 4	Safety & Security Processes	06	10
4.1	Safety of Guests & Guests Property		
4.2	Safety of Hotel Property & employees		
4.3	Prevention of accidents		
Chapter 5	Purchasing Systems.	06	10
5.1	Types of purchasing.		
5.2	Purchase procedure for housekeeping supplies, linen,		

5.3	cleaning agents and cleaning equipments Records of storage		
Chapter 6	Housekeeping stores.	06	10
6.1	Store requisition		
6.2	Issuing & controls of materials.		
6.3	Inventory Control & Stock taking.		

Glossary of Terms

Conditioning	Fillers	Foliage
Kenzan	Ikebana	Hogarth curve
Mechanics	Moribana	Nagiere
Oasis	Bonsai	Hardscape
Perennials	Horticulture	Landscape
Trellis	Patio	Deck
Turf	Pest	Fumigation
Dry rot	Rodent	Pesticutor
Wet rot	Silver fish	OSH Standards
Recycled inventory items	NonRecycled inventory items	Store indent
Purchase order	Lead time	Stores requisition
Grand master key	Emergency key	Floor master key
Pass key	Contract	Stocktaking
Charge Back	Contract Specification	Outsourcing

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management-	Sudhir Andrews	Tata McGraw Hill
2	Hotel Housekeeping & Management	G RaghubalanSmriteeRaghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	E L B S
4	Accomodation Management	Rosemary Hurst	Heinemann publishing
5	Accomodation Management	Rosemary Hurst	Heinemann publishing

SUBJECT CODE: DSC 403 A					
SUBJECT : ALLIED HOUSEKEEPING FUNCTIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	-----	100	01

1. Using a Room and Public area inspection checklist

- Cleaning of a Guest room and Public area.
- Checking of the Guest room and Public area using a check list.

2. Flower Arrangements

- Demonstration of various styles and shapes of flower arrangements.

3. Flower Arrangements

- Preparation of various styles and shapes of flower arrangements.

4. Introduction to Horticultural aspects.

- Visit to Green house for identification of indoor plants used in hotels.
- Identification of outdoor plants used in hotels.
- Identification and use of foliage in flower arrangements.

5. Special decorations for functions in hotel

- Preparations for events organized in hotels- Floral rangolis, Garlands, Tinsel and miscellaneous decorations.

6. Inventory and stocktaking of room and cleaning supplies

- Requisition procedure.
- Calculating par stock.
- Stock taking or physical inventory of room and cleaning supplies.
- Documentation of supplies inventory.
- Cleaning of housekeeping stores.

7. Using housekeeping software for Material Management

8. Various methods of pricing a contract

9. Pest control demonstration.

10. Standard operating Procedure at Housekeeping

- Handling of keys

-
-
- Safety of Guests & Guest Property
 - Safety of Hotel Property & employees

11. Standard operating Procedure at housekeeping

- To eliminate workplace hazards

ASSIGNMENTS

1. Indoor and outdoor plants used in hotels.

Presentation on assignments with the use of audio visual aids.

SUBJECT CODE: DSC 404					
SUBJECT : FRONT OFFICE ACCOUNTING (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA	EA	CA	Total	Credits
	Marks	Marks	Marks	Marks	
02	40	60	-----	100	02

Rationale:

The subject aims to establish the importance of Front office Operations & its role in the Hospitality Industry. It also prepares the student to acquire knowledge of the operational aspects in front office. It also prepares the student to acquire basic skills and knowledge necessary to calculate occupancy statistics in the front office department.

		Hours	Marks
Chapter 1	Front Office Accounting	06	10
1.1	Importance of the front office accounting system		
1.2	Types of accounts		
1.3	Vouchers		
1.4	Folios		
1.5	Ledger		
1.6	The front office accounting cycle		
1.7	Use of computers in front office accounting		
Chapter 2	Credit Control practices at front desk	06	10
2.1	Objectives of credit control		
2.2	Hotel credit control policy		
2.3	Credit control measures at check-in		
2.4	Credit control measures during occupancy		
2.5	Credit control measures at check out and after guest departure		
Chapter 3	Calculation of various Statistical data using formula	06	10
3.1	ARR, Room Occupancy %, Double Occupancy %, Bed Occupancy %, Foreign occupancy %, Local Occupancy % House Count, House Position, etc.		
3.2	Reports - DRR, Revenue Report, Daily Occupancy Report.		

Chapter4	Night Auditor	04	10
4.1	Concept of Night Audit & Role of Night Auditor		
4.2	Night Auditor's Report		
Chapter 5	Establishing Room Rates	06	10
5.1	Rule of Thumb		
5.2	Hubbart's formula		
5.3	Market Condition Approach		
Chapter 6	Forecasting Room Availability	04	10
6.1	Benefits of forecasting		
6.2	Data Required for forecasting		
6.3	Records Required for forecasting		
6.4	Room Availability forecast.		
6.5	Types of forecast & their sample format		

Glossary of Term

ARR	Rev Par	Yield
ARG	DRR	Re -capitulation sheet
Transcript	High Balance	High Debt
House count	City Ledger	House limit
Management Account	Overstay	Noshow
Stayover	Understay	Cash Paid out
Forecasting	Hubbart's Formula	Rule of Thumb
Market Condition approach		

REFERENCE BOOKS

Sr.No.	Name of the Book	Author	Publisher
1	Hotel Front Office Operations & Management	Sudhir Andrews.	Tata McGraw Hill
2	Check-in Check –out	Jerome Vallen	WM.C Brown IOWA
3	Principles of Hotel Front Office Operations	Sue Baker, P. Bradley, J. Huyton	Continuum
4	Hotel Front Office	Bruce Graham Stanley	Thornes
5	Managing Front Office operations	Michael Kasavanna Richard Brooks Charles Steadmon	AH&LA
6	Front Office Procedures & Management	Peter Abott. & Sue Lewry	Butterworth & Heinemann
7	Front Office operations	Colin Dix, Chris Baird	Pearson
8	Front Office Operations and administration	Dennis foster	Glencoe
9	Hotel Accounting & Financial Control	OziD'Cunha	Dickey Enterprises

SUBJECT CODE: DSC 404A					
SUBJECT : FRONT OFFICE ACCOUNTING (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA	EA	CA	Total	Credits
	Marks	Marks	Marks	Marks	
02	40	60	-----	100	01

- 1. Use of computers in front office accounting**
Practice on use of front office software for accounting at front desk.
- 2. Using and making various vouchers used at front desk**
Role play of situations pertaining to using and making vouchers like Allowance voucher, VPO, Cash voucher and miscellaneous vouchers.
- 3. Credit control practices at front desk**
Role play of situations pertaining to credit control practices during reservations.
Role play of situations pertaining to credit control practices during arrival.
- 4. Credit control practices at front desk**
Role play of situations pertaining to credit control practices during occupancy.
Role play of situations pertaining to credit control practices during checkout.
- 5. Preparing a Night Auditor's Report.**
- 6. Calculations of various statistical data using Formulae**
ARR, Rev Par, Room Occupancy %, Double Occupancy %, Bed Occupancy %, foreign occupancy %, Local Occupancy %
- 7. Calculations of various statistical data using Formulae**
Bed Occupancy %, Foreign occupancy %, Local Occupancy %
Graphical presentation.
- 8. Preparing Weekly & Monthly forecasts.**
- 9. Using Hubbart's formula for calculating room rate**
- 10. Using front office software for MIS reports**
Budgetary reports, Occupancy reports, Income and expenditure reports, forecasting reports etc.

11. Situations handling with guest problems

Role play of situations pertaining to guest problems and emergency situations like bomb, terrorist attack, fire, death, theft and natural disasters.

ASSIGNMENTS

1. Calculation of various statistical data using formula and graphical representation.
2. Hubbart's Formula for calculating Room rate.

SUBJECT CODE:LEC101					
SUBJECT:HOTEL FRENCH(THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
0	40	60	-	100	03

Rationale

To introduce basic knowledge of French language to the students of Hotel management

	Hours	Marks
Chapter 1 Introduction	05	12
1.1 Alphabet		
1.2 Accents		
1.3 Articles: Definite, Indefinite, partitive and contracted articles		
1.4 Subject Pronouns		
1.5 Basic greetings		
1.6 Vocabulary related to classroom		
1.7 Cardinal Numbers (0-100) & Ordinal Numbers		
1.8 Time, days of a week, months		
1.9 Vocabulary related to seasons, weather		
Chapter 2 Conjugation-Present Tense(verb relevant to hotel only)	05	08
2.1 Conjugation of verbs être and avoir		
2.2 Conjugation of first regular group '-er'(Ex.Parler etc)		
2.3 Conjugation of second regular group '-ir'(Ex.firir)		
2.4 Conjugation of third regular group '-re'(ex.attendre)		
2.5 Conjugation of third regular group '-oir'(ex.Vouloir)		
Chapter 3 Food & Beverage Service	06	12
3.1 Equivalents		
3.2 Restaurant Brigade		
3.3 French Classical menu (17 course)		
With classic examples of each course, & meanings in brief		
3.4 Wines		
<ul style="list-style-type: none"> • Wine of France • Wine Terminology • Reading a wine label • Wine regions 		
3.5 French Cheese		

Chapter 4	Kitchen	10	12
4.1	Equivalents		
	<ul style="list-style-type: none"> • Kitchen Tools • Dairy Products • Vegetables • Fruits • Herbs and spices • Meat, fish, Poultry • Cereals • Seasoning 		
4.2	Weights and Measurements		
4.3	The Kitchen Brigade		
4.4	French Culinary Terms and the meaning in English		
4.5	Recipe of any five basic food preparations (Cream of Tomato, Egg Omelette, Salad, Cake, Grilled Chicken)		
4.6	Translation of recipe from French to English		
Chapter5	House keeping	01	04
5.1	Vocabulary related Guest room and hotel Floor		
Chapter6	Front Office	01	04
6.1	Vocabulary related to Front Office operations		
Chapter7	Standard Phrases use dina hotel	04	08
7.1	Translation from English to French		
7.2	Translation from French to English		

REFERENCE BOOKS

- 1 Basic French for Hotel Industry, Vaishali Mankikar, Continental Prakashan, Pune
- 2 Basic French course for the Hotel Industry, Catherine Lobo, Sonali Jadhav, Tanay Enterprises, Pune

SUBJECT CODE:LEC 101A					
SUBJECT:HOTEL FRENCH (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	20	30	-	50	02

Rationale

To enable students to acquire correct pronunciation of French hotel terminology, to use standard phrase in French related to hotel operations and also practice spoken French skills.

S.No. Topic

- 1 Alphabets
- 2 Basic greetings, Days of the week, Date, Months– Question and Answers
- 3 Time– Clock, Questions and Answers related to time
- 4 Kitchen Equivalentents
- 5 Kitchen Equivalentents
- 6 Kitchen Equivalentents
- 7 To plan and read a menu in French and briefly describe the dishesin English
- 8 To read, translate and say the recipe for basic dishes covered in theory class
- 9 To read, translate and say the recipe for basic dishes covered in theory class-Practice
- 10 Question and Answers related to Kitchen
- 11 Reading of a wine label
- 12 Dialogues related to F & B Service
- 13 Question and Answers related to F & B Service
- 14 Standard phrases use din House keeping and Front Office
- 15 Questions & Answers, Dialogues related to House keeping
- 16 Question &Answers, Dialogues related to Front Office

SEMESTER - V

SUBJECT CODE:DSE 101					
SUBJECT:QUANTITY & INDIAN REGIONAL FOOD PRODUCTION (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-----	100	04

Rationale

This subject intends to develop knowledge & skills required for catering with emphasis on operational techniques practiced in quantity food production which will help students to produce quality products in a large quantity. It also provides a detailed understanding of meat cookery.

		Hours	Marks
Chapter 1	Quantity Food Equipments	03	06
1.1	Selection criteria		
1.2	Classification, Use, Care & Maintenance of following equipments. Cooking Equipments - range, oven, salamander, grill, griddle, rotisserie, deep fryer, tilting pan, steam jacket kettle, tandoor, steam cooker. Processing equipments - Mixer, food cutter, slicer, food processor, food grinder, potato peeler. Holding & storage equipments - Steam table, bain marie, overhead infrared lamp, refrigerator, walk in cooler, deep freezer		
Chapter 2	Introduction to Catering Industry	06	06
2.1	Institutional catering - Hospital, School, College		
2.2	Industrial catering		
2.3	Transport catering - Air, Sea, Railway Outdoor catering		
2.4	Outdoor catering		
Chapter 3	Kitchen Layout	03	06
3.1	Factors to be considered when planning a kitchen		
3.2	General layout of quantity kitchen of Institutional, Industrial, Flight catering, Five star deluxe hotels.		
Chapter 4	Menu Planning	04	06
4.1	Types of menu		
4.2	Principles of menu planning		

4.3	Planning of menus for various catering establishments.		
Chapter 5	Food and Nutrition	02	04
5.1	Importance of Balance diet Preparing		
5.2	Points to be considered while healthful meals.		
Chapter 6	Indian Spices and Masalas		04 06
6.1	Role of Indian spices and ingredients in Indian Cooking.		
6.2	Role of masalas in Indian cuisine.		
6.3	Different masalas used in Indian cooking - Wet and Dry.		
6.4	Composition of different masalas - garam masala, sambar masala , rasam powder, chat Goda masala		
6.5	Proprietary masala blends		
6.6	Basic Indian Gravies - Makhani, Kadhai Brown, White, Green		
Chapter 7	Regional Cooking Style	22	20
7.1	Cooking from different states with reference to - - Geographical location - Historical background - Seasonal availability of raw material - Special equipments and fuels. Staple diet & popular food preparations. For the following cuisines / states.		
	1. Maharashtrian	7. Tamilnadu	
	2. Gujarati	8. Kashmiri	
	3. Karnataka	9. Lucknowi	
	4. Bengali	10. Kerala	
	5. Punjab	11. Hyderabadi	
	6. Bengali	12. Goan	

Chapter 8 Culinary Terms**04 06**

Kahwah	Wazwan	Ver
Sandesh	Toddy	Loochi
Sorpotel	Shukto	Imarti
Kari	Shikora	Gile hikmat
Gustaba	Seekh kebab	Galavat
Kalan	Saunth	Gajjac
Malpua	Rista	Wark
Roganjosh	Raan	Tandoor
Ittr	Pongal	Gujjiya
Zarda	Panch phoran	Bisi bela huliyaana
Shikampuri kebab	Naan	Kabachini
Dosa	Mussallum	Salan
Yakhini	Moin	Baffad
Bhatura	Biryani	Falooda
Dhungar	Kalia	Loab
		Kalia
		Dhungar

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Professional Cooking	Wayne Gisselen	John Wiley & Sons, N.Y
2	Modern cookery for teaching & trade. Volume I	Thangam E. Philip	Orient Longman Ltd. Mumbai
3	Food commodities	Bernard Davis	William Heinmen Ltd. London
4	Prasad Cooking with Indian Masters	J. Indersingh & Pradeep Das Gupta	Allied publishers Ltd. New Delhi
5	Introduction to Catering Management	John Fuller	John Wiley & Sons, N.Y
6	Theory of Catering	Kinton ceserani	ELBS
7	Food & Beverage Management	Bernard Davis, Shally Stone	William Heinmen Ltd. London
8	Theory of cookery	Krishna Arora	Frank Bros & Co. Ltd.

			New Delhi
9	Practical cookery	Kinton Ceserani	ELBS
10	Menu Planning	John Kivela	Hospitality Press
11	Hyderabadi Cuisine	Pratibha Karam	Harper Collins
12	Dastarkhwan-e-A-wadh	Sangeeta Bhatnagar & R.K Saxena	Harper Collins
13	Wazwaan	Rocky Mohan	Roli & Janssen
14	Punjabi Cuisine	Premjit Gill	Harper Business
15	A Taste of India	Madhur Jaffrey	Mac Millan Publishing
16	Tandoor	Ranjit Rai	Overlook Press
17	The Bengal Book	Das Gupta	UBSPD
18	Maharastrian Cuisine	Kaumudi Marathe	Zaika

SUBJECT CODE:DSE 101 A					
SUBJECT: Quantity & Indian Regional FOOD Production (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	-----	100	04

Minimum 20 menus to be conducted.

Menus should comprise of 06 Indian menus for Industrial and Institutional purpose and 02 snack menus in quantity kitchen and 12 Indian Regional menus.

Students are required to maintain a journal to record the various practicals attended and the teacher first record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSE 102					
SUBJECT: ALCOHOLIC BEVERAGES II (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-----	100	0

Rationale

To impart comprehensive knowledge of various spirits, liqueurs and cocktails.

		Hours	Marks
Chapter 1	Spirits	08	06
1.1	Introduction to Spirits		
1.2	Fermentation and Distillation Process		
1.3	Pot Still and Patent still.		
1.4	Various methods of Measuring Alcoholic Strength		
Chapter 2	Whisky	10	08
2.1	Ingredients used in making of Whisky.		
2.2	Manufacturing process of Whisky.		
2.3	Types of Whisky-Scotch and Irish Whisky		
2.4	Americal and Canadian Whisky		
2.5	International and IMFL Brand		
Chapter 3	Brandy	08	08
3.1	Ingredients used in making of Brandy		
3.2	Manufacturing process of Brandy		
3.3	Types of Brandy - Cognac and Armagnac		
3.4	Labeling Terminology		
3.5	Fruit and other Brandies.		
3.6	International and IMFL Brands.		

Chapter 4	Rum	06	06
4.1	Ingredients used in making of Rum		
4.2	Manufacturing process of Rum		
4.3	Tyype of Rum-White, dark and golden		
4.4	International and IMFL Brands		
Chapter 5	Gin	06	06
5.1	Ingredients used in making of Gin.		
5.2	Manufacturing process of Gin		
5.3	Types of Gin.		
5.4	International and IMFL Brands		
Chapter 6	Vodka	04	04
6.1	Ingredients used in making of Vodka		
6.2	Manufacturing process of Vodka.		
6.3	Types of Vodka		
6.4	International and IMFL Brands.		
Chapter 7	Tequila	06	04
7.1	Ingredients used in making of Tequila.		
7.2	Manufacturing process of Tequila		
7.3	Types of tequila		
7.4	Brands of Tequila		
Chapter 8	Other Alcoholic Beverages	04	06
8.1	Aquavit		
8.2	Schnapps		
8.3	Pastis		
8.4	Feni		
8.5	Arrack		
Chapter 9	Liqueurs.	06	06

9.1	Definition and types of liqueurs		
9.2	Production methods		
9.3	Service of Liqueurs.		
Chapter 10	Cocktails	06	06
10.1	Introduction and history of cocktails		
10.2	Methods of making cocktails and rules for making cocktails		
10.3	Equipments glassware, and garnishes used in making of cocktails, Cocktail recipe		

Glossary of Terms

Hors d'age	Marc	Grappa
Pisco	Ouzo	Peats Reek
Grain whisky	Blended whisky	Malt whisky
Single malt	Vatted malt	Rye whisky
Corn whisky	Bourbon	Jack Daniels
London dry gin	Plymouth	Steinhaeger
Old tom gin	Dutch gin	Bagasse
Dunder	White rum	Dark rum
Silver Tequila	Gold Tequila	Agave
Schnapps	Aquavit	Arrack
Tiquira	Absinthe	Pastis
Pernod	Ricard	Apertitifs
Angostura bitters	Cordials	Aromatized wines
Ale	Lager	Stout
Porter	Boquet	Burgundy
Aguardante	Grappa	Quetsch
Himadors		

Field Visit

Students should be taken for visit to Winery and report must be submitted individually.

Work Shop -A cocktail and mocktail workshop to be conducted and the report must be submitted individually.

Minimum of 02 assignments to be submitted by students by the end of these semester based on following topics.

- 1 Types of mocktail with recipes, glassware, method and presentation
- 2 Collecting themed bar menu cards (Minimum 5)
- 3 Price list of Spirits from 5 outlets

REFERENCE BOOKS

- 1 Food and Beverage Service, Dennis Lillicrap, John Cousins Power Book
- 2 Modern Restaurant Service, John Fuller, Hutchinson
- 3 Food and Beverage Service, Sudhir Andrews, Tata Mc Graw Hill Edition
- 4 The Beverage Book, Durkan & Cousins, Hodder Arnold, H & S Toughton
- 5 Professional Guide to Alcoholic Beverages, Lipinski Van Nostrand Reinhold
- 6 Oxford Companion to wines, Jancis Robinson, Oxford University Press
- 7 The Restaurant (From Concept to Operations), Donald lundberg John Willey
- 8 The ultimate Encyclopedia of Wines, Beer, Spirits and liqueues, Stuart Walton, brain Glover hermes house

SUBJECT CODE:DSE 102 A					
SUBJECT: ALCOHOLIC BEVERAGES II (PRACTICAL)					
Teaching Scheme/Week		Examination Scheme			
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	---	100	02

Sr. No.	Topic
1.	Preparing a Beverage list
2.	Preparing an Beverage order ticket
3.	Service of Whisky
4.	Service of Brandy
5.	Service of Rum
6.	Service of Gin
7.	Service of Vodka
8.	Service of Tequila
9.	Service of other alcoholic beverages
10.	Service of Liqueurs
11.	Types of Cocktails
12.	Methods of making cocktails-Buildup, Stirred
13.	Methods of making cocktails-Layered, Floating
14.	Menu planning and Service of food and alcoholic beverages
15.	Preparing of Beverage List for a Specialty bar
16.	Maintenance of statutory books

SUBJECT CODE:DSE 103**SUBJECT: ACCOMMODATION OPERATIONS (THEORY)**

Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Rationale

The subjects aims to introduce students to the elements of interior designing of guest rooms and public areas with respect to colour, lighting, window treatment, floor and wall finishes. It helps the student to understand sales techniques and role of sales and marketing department.

	Inventory	Hours	Marks
Chapter 1	Parstock Calculation and InVENTORY	04	04
1.1	Linen		
1.2	Uniform		
1.3	Guest Supplies and consumables		
1.4	Cleaning supplies and consumables		
1.5	Stocktaking and inventory		
Chapter 2	Standard contents of a guest room	06	06
2.1	Guest room furniture		
2.2	Standard furniture and room sizes		
2.3	Furniture arrangement in guest rooms		
2.4	Guest room fixtures and fitting		
2.5	Beds, mattresses and bedding		
2.6	Soft furnishings		
2.7	Accessories		
Chapter 3	Interior Designing	06	06

3.1	Importance & Definition		
3.2	Principles of Design		
3.3	Elements of Design- Line/Form/colour /texture		
Chapter 4	Refurbishing & Redecoration	04	04
4.1	Definition		
4.2	Factors		
4.3	Snagging list		
Chapter 5	Interior Decoration	20	20
5.1	Colour : Colour Wheel, Colour schemes (used in hotel areas), Psychological effects of colour		
5.2	Lighting : Type / classification / importance, Lighting for guest rooms & public areas		
	Window and Window Treatment : Different types of Windows, Curtains & Draperies, Valance, swags, Blinds		
	Floor finishes & wall coverings:		
	Classification /Types		
	Characteristics & use		
	Selection criteria		
	Cleaning procedures- Agents used / polishing/		
	Burnishing, Floor seals		
	Carpets - Types, selection, care & maintenance		
	Types & functions of wall coverings		
Chapter 6	Hospitality	04	04
6.1	Importance of Hospitality		
6.2	Managing the delivery of Hospitality		
6.3	Developing a service management programme		
Chapter 7	Hotel Technology	06	06
7.1	Technology in guest room-cost & benefits		

7.2	Locking system		
7.3	Energy management and climate control system		
7.4	Network fire alarm system		
7.5	Communication systems		
7.6	Other technology-In room entertainment system, control panels		
Chapter 8	Sales Techniques	04	04
8.1	Co-ordination between front office & sales and marketing department in a hotel.		
8.2	MICE business		
8.3	Handling of group and corporate sales		
	Setting the price		
	Objective/ Determining Demand/ Estimating Costs/ Analysis of competitors cost, Prices and offers/ Pricing method and final price / Adoption of pricing strategy promotional pricing / Discriminative pricing		
Chapter 9	Managing Guest services	06	06
9.1	Total quality management in Inn keeping		
9.2	The real components of Total quality management		
9.3	Measuring guest services		
9.4	Customer relationship management		
9.5	Complaint handling		

Glossary of Terms

Dado	Atrium	Valence
Cornice	Cascade	Swag
Pelmet	Terrazzo	Granolithic
Tessellated tiles	Anaglypta	Lincrusta
Anglepoise	CFL	LED

Parquet	Pile	Wilton
PVC	Chenille Axminster	Axminster
Shoji screen	Supaglypta	Tint
Tufted carpet	Broad loom carpet	Persian carpet
Pile bonded carpet	Bay window	Bow window
Plantation window	Dalhousie	Attic window
Louvers	Venetian blinds	Sky lights
Refurbishing	Renovation	Underlay
Soffit lighting	Diffused lighting	Incandescent lighting
Tertiary colours	Bolsters	Shams
Triad	Accents	Up selling
Upgrading	MICE	USP
Hospitality	Moment of truth	Point of sale
TQM	CRM	AIOD
ATM	EDP	HOBIC
HITIS	LEED	Moment of truth
Opaque	WATS	PIP
Quality assurance	Quality circle	VoIP
ELS	RFID	CAS
OTA	Biometric lock	

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management -	Sudhir Andrews	Tata Mc Graw Hill
2	Hotel Housekeeping & Management	G Raghubalan	Oxford University
		Smritee Raghubalan	Press
3	Hotel, Hostel & Hospital	Branson & Lennox	ELBS

	Housekeeping		
4	Accommodation Management	Rosemary Hurst	Heinemann
5	Hotel Front Office Operations & Management	Sudhir Andrews	Tata Mc Graw Hill
6	Check-in check out	Jerome Vallen	WMC Brown IOWA
7	Principles of Hotel Front Office Operations	Sue Baker, P. Bradley J. Huyton	Continuum
8	Hotel Front Office	Bruce Graham Stanley	Thornes
9	Managing Front Office operations	Michael Kasavanna Richard Brooks Charles Steadmon	AH & LA
10	Front Office Procedures & Management	Peter Abott. & Sue Lewry	Butterworth & Heinemann
11	Front Office operations	Colin Dix, Chris Baird	Pearson
12	Front Office Operations and administration	Dennis foster	Glencoe.
13	Hotel Accounting & Financial Control	OxiD'Cunha	Dickey Enterprises

SUBJECT CODE:DSE 103 A					
SUBJECT: ACCOMMODATION OPERATION (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	---	100	02

1. Drawing of colour wheel, identification of different types of colours.
2. Identification of different types of colour schemes.
3. Planning and designing colour schemes for - Different types of rooms and suite rooms.
4. Planning and designing colour schemes for the public areas of a hotel.
5. Preparation of a Snagging list.
6. Designing of various floor coverings for guest rooms and public areas.
7. Designing of various wall coverings for guest rooms and public areas.
8. Designing of various curtains and draperies for guest rooms and public areas.
9. Designing a lighting plan for guest rooms and public areas.
10. Role play of situations pertaining to USP in selling rooms, Upgrading of guests.
11. Role play of situations pertaining to up selling, suggestive selling.
12. Role play of situations pertaining to Business techniques for CVGR and Groups.
13. Comparison of hotel Advertisements - Business hotel, Heritage hotel, Resort.
14. Comparative study of MICE destinations, Convention hotels.
15. Role play of situations pertaining to repeat clientele.
16. Role play of situations pertaining to offering alternatives to guests.

Assignments :

1. Field visits related to above topics.
2. Assignment on floor finishes (samples to be collected)
3. Assignment on wall coverings (samples to be collected)
4. Assignment on soft furnishings. (samples to be collected)

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5. Assignment on different types of windows and window treatments.
 6. Assignment on lighting systems in guest rooms and public areas.
 7. Collection of brochures and tariff cards of different types of hotels.
 8. Designing a brochure for - A Business hotel, Heritage hotel, Resort.

Presentation on above topics with use of audio visual aids.

SUBJECT CODE:SEC 102					
SUBJECT: ACCOUNTING SKILLS FOR HOTELS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

The course aims to help students to acquire the basic knowledge of Accounting as practiced in Hotels for the day-to-day operations of the organization. It would also prepare them to comprehend and utilize this knowledge in day-to-day operations undertaken in the various department in hotels.

Chapter 1	Introduction to Accounting	Hours	Marks
1.1	Terms and terminologies used in Accounting	04	04
1.2	Definition, Objectives and Importance of Accounting and Hotel Accounting		
Chapter 2	Double Entry System of Book - Keeping	04	04
2.1	Nature, Advantages and Principles		
2.2	Classification of Accounts		
2.3	Golden rules of Debit and Credit		
2.4	Accounting Concepts and Convention		
Chapter 3	Journal and special function books	04	06
3.1	Practical problems on Journalizing-simple entries		
	Practical problems on special function books		
Chapter 4	Trial Balance	04	06
4.1	Definition, need and types of Trial Balance		
4.2	Practical problems on preparation of Trial balance		
Chapter 5	Final accounts of Small Hotels and Restaurants	10	10

5.1	Need for preparation of Trading account, Profit and Loss account and Balance Sheet		
5.2	Practical problems on Trading account, Profit and Loss account and Balance Sheet with following adjustments only : Closing stock, Depreciation of fixed assets and Staff meals		
Chapter 6	Allowances, Discount and Visitors Paid Out	04	06
6.1	Meaning and Types		
6.2	Formats of Allowance and VPO Vouchers		
6.3	Difference between Allowance & Discount		
6.4	Difference between Discount & VPO		
Chapter 7	Visitors Tabular Ledger	04	06
7.1	Format and Use of Visitors Tabular Ledger		
7.2	Practical Problems on Visitors Tabular Ledger		
Chapter 8	Guest Weekly Bill	06	08
8.1	Format and Use of Guest Weekly Bill		
8.2	Practical Problems on Guest Weekly Bill		
8.3	Difference between VTL and GWB		
Chapter 9	Uniform System of Accounting	08	10
9.1	Introduction to Uniform System of Accounting (Practical problems on Cost of Food and Beverage sales)		
9.2	Practical problems on preparation of Income Statement as per Uniform System of Account.		

REFERENCE BOOKS

1. Managerial Accounting in the Hospitality Industry-Vol-II, Peter. J. Harris and Peter A Hazzard, Fourth Edition, Stanley Thornes Publishers Ltd. Gloucestershire.
2. Hotel Accounting & Financial Control, OziD' Cunha, Gleson Fist-, 2002- Dickey Enterprises, Kandivali (w) Mumbai
3. Accounting in the Hotel & Catering Industry, Richard Kotas - Fourth edition International Textbook Company Co. Ltd.
4. Hotel Management, Dr. Jagmohan Negi, First Edition 2005 Himalaya, Publishing House, Mumbai - 400004

SUBJECT CODE: SEC 103					
SUBJECT: TOURISM OPERATIONS (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	-	100	03

Rationale

To inculcate a sense of importance and establish a link between the tourism industry and the hotel industry and to highlight tourism industry as an alternative career path.

		Hours	Marks
Chapter 1	The Tourism Phenomenon	04	03
1.1	Definition - Tourism, Tour; Tourist; Visitor; Excursionist; Domestic; International; Inbound; Outbound; Destination.		
1.2	Growth of Tourism / Evolution / History of Tourism.		
1.3	Present status of tourism in India.		
Chapter 2	Constituents of Tourism Industry	04	05
2.1	Primary Constituents		
2.2	Secondary Constituents		
2.3	The 5 A's of Tourism - Attractions, Accessibility, Accommodation, Amenities, Activities.		
2.4	Career Opportunities for tourism professionals.		
Chapter 3	Infrastructure of Tourism	04	06
3.1	Role of Transport in Tourism		
3.2	Modes of Transport: Road, Rail, Air, Sea.		
3.3	Types of Accommodation- Main Alternate & Supplementary accommodation.		

Chapter 4	Types of Tourism	04	06
4.1	Types of Tourism -		
4.2	Various motivators, Holiday, Social, Cultural, MICE, Religious, VFR (Visiting Friends and Relatives), Sports, Political, Health, Senior Citizen, Sustainable Tourism		
4.3	Alternative Tourism : Eco Tourism, Agro Rural Tourism		
Chapter 5	The Impact of Tourism	04	06
5.1	Economic Impact - Employment generation, Foreign Exchange earnings.		
Chapter 10	Itinerary Planning	04	06
10.1	Definition		
10.2	Steps to plan a Tour		
10.3	Route map		
10.4	Transport booking - reservation		
10.5	Accommodation - reservation		
10.6	Food facilities		
10.7	Local guide / escort		
10.8	Climate / seasonality		
10.9	Shopping & cultural show		
10.10	Costing		
Chapter 11	Technology in the Travel Industry	02	04
11.1	Relationship between Information Technology and Tourism Industry. Current Technology used.		
11.2	G.D.S (Global distribution system)		
11.3	Use of Internet in tourism.		

REFERENCE BOOKS

- 1 Introduction to Travel & Tourism, Michael M. Cottman, Van Nostrand Reinhold
- 2 Travel Agency & Tour Operation, Jagmohan Negi, Kanishka Publishers & Distributors
- 3 Concepts & Principles International Tourism, A.K. Bhatia, Sterling Publishers PVT. LTD.
- 4 Fundamentals & Practices A Textbook of Indian Tourism, B. K. Goswami G. Raveendran, HarAnand Publications Pvt.
- 5 Dynamics of Modern Tourism, Ratnadeep Singh, Kanishka Publishers & Distributors
- 6 Tourism Development, Principles, Fletcher & Cooper, ELBS and Practices

Assignments

1. Preparation of Itinerary - 2 days, 15 days, 21 days etc. for well-known tourist destinations in India and abroad.
2. Preparation of passport and visa-Documents and procedural requirements
3. Field visit to a Travel Agency, Airport etc.

SUBJECT CODE:AEC 102				
SUBJECT: HOSPITALITY LAW (THEORY)				
Teaching Scheme/Week	Examination Scheme			
Theory Hours	IA Marks	EA Marks	Total Marks	Credits
03	40	60	100	03

Rationale

The subject aims to provide information regarding the various laws pertaining to the hotel and catering industry.

		Hours	Marks
Chapter 1	The Indian Contract Act 1872	06	06
1.1	Definition and essentials of a contract.		
1.2	Valid, void and voidable contracts		
1.3	Free consent and consideration		
1.4	Performance and discharge of contracts		
1.5	Breach of contract and remedies for breach of contract.		
Chapter 2	The Sales of Goods Act 1932	04	04
2.1	Meaning of contract of sale.		
2.2	Difference between sale and agreement to sale.		
2.3	Rights and duties of seller and buyer.		
2.4	Unpaid seller.		
Chapter 3	The Partnership Act 1932	04	04
3.1	Nature of partners.		
3.2	Rights and duties of partners.		
Chapter 4	The Companies Act 1956	04	06
4.1	Essential features of company.		
4.2	Legal aspects of corporate social responsibility.		

Chapter 5	The Bombay Shop and Establishment Act	04	06
5.1	General Provisions applicable to the Hotel industry		
5.2	Daily and weekly working hours, over time, Annual leave with wages,		
Chapter 6	The Industrial Dispute Act 1948	04	06
6.1	Definition of Industry.		
6.2	Industrial disputes		
6.3	Settlement of industrial disputes		
6.4	Strike, lay-off, lock out, retrenchment and closure.		
Chapter 7	The Payment of Wages Act 1936.	04	06
7.1	Responsibility of payment of wages.		
7.2	Rules for payment of wages.		
7.3	Permissible deductions.		
Chapter 8	Food Legislation.	06	06
8.1	The prevention of food Adulteration Act 1954		
8.2	Role of Food inspector and public analyst.		
8.3	Colouring, packing and labeling,		
8.4	Prohibition and regulation of sales		
8.5	Preservatives.		
8.6	Anti-oxidants, emulsifying, stabilizing and anti-caking agents.		
Chapter 9	The Food Safety and Standards Act 2006	04	06
9.1	Food Safety and Standards Authority of India		
9.2	General Principles of Food Safety		
9.3	General Provisions as to Articles of Food		
9.4	Provisions Relating to Import		
9.5	Special responsibilities related to food safety		

9.6	Offences and penalties		
Chapter 10	The Consumer Protection Act.	04	04
10.1	Rights of a consumer		
10.2	Redressal of consumer disputes		
Chapter 11	Licenses and Permits	04	06
11.1	Licenses and permits required for hotel and catering establishments		
11.2	Procedure for applying and renewal of licenses and Permits.		
11.3	Provisions for suspension and cancellation of licenses		
11.4	By laws for operating Permit Rooms and Bar		

REFERENCES

- 1 Mercantile Law, B.D Joshi, Narendra Publication
- 2 Elements of Mercantile Law, N.D. Kapoor, Tata Mac Graw Hill
- 3 Principles of Business Law, Ashwathappa. K, Himalaya Publication
- 4 Business Law, M.C. Kuchal, Viaks Publication
- 5 Various Bare Acts

LIST OF ABILITY ENHANCING ELECTIVE COURSES

AEE 101	CATERING SCIENCE
AEE 102	DIETITICS & NUTRITION
AEE 103	FOOD & BEVERAGE CONTROLS
AEE 104	PRINCIPLES OF MANAGEMENT
AEE 105	ORGANISATION BEHAVIOR
AEE 106	HOTEL ECONOMICS
AEE 107	FINANCIAL MANAGEMENT

SUBJECT CODE: AEE 101					
SUBJECT: CATERING SCIENCE (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	---	---	50	50	04

Rationale

To develop awareness of the importance of hygiene, sanitation and food safety in hotel industry.

		Hours	Marks
Chapter 1	Importance of Hygiene in the Catering Industry.	02	02
1.1	Introduction, Definitions : Hygiene & Sanitation		
1.2	Significance of hygiene & Sanitation in the food industry		
Chapter 2	Food Microbiology	10	06
2.1	Classification & Morphology of Microorganisms Bacteria, Virus,		
2.2	Fungi, Algae, protozoa.		
2.3	Growth of Bacteria and its relevance to the food industry. Factors affecting microbial Growth, Moisture, Ph, Temperature, Oxygen, Time, Osmotic Pressure		
2.4	How food act as a substrate for microorganisms.		
2.5	Concept of food contamination, Sterility, Cross Contamination, Contamination from plants & fruits, animals, sewage, soil, water, air.		
2.6	Food spoilage, causes, chemical changes caused by microorganisms		
Chapter 3	Food borne illnesses	10	04
3.1	Microbialaction-Food Poisoning (Microorganisms involved, mode of transmission, control of food Borneillness) Food infection (Bacterial, Viral Protozoal) (Microorganisms involved, mode of transmission,		

	control of food borne illness)		
3.2	Toxic metals and chemicals		
3.3	Naturally occurring toxicants in food.		
3.4	Investigation of food - borne disease outbreak		
Chapter 4	Beneficial effects of microorganisms	08	06
4.1	Role of microorganisms in the manufacture of fermented foods, Dairy products, Vegetable preparations, Bakery Products & Alcoholic beverages.		
Chapter 5	Hygienic food Handling	08	06
5.1	Importance of following sanitary procedures.		
5.2	Concept of danger zone		
5.3	Sanitary procedures while Preparation, Cooking, Mixing raw and cooked preparation, Holding: Hot holding, cooling, leftover		
5.4	Common Faults in food preparation		
Chapter 6	Environmental Sanitation. Hygiene in food production and service areas.	08	08
6.1	Types of wastes in catering establishments their disposal methods. Food Contamination and spoilage due to kitchen pests and Pest control.		
Chapter 7	Hazard Analysis and critical control points, Importance, definition & usage of HACCP.	06	06
Chapter 8	Sanitation Regulation & standards	06	06
8.1	Food adulteration. Simple tests to detect food adulterants in milk, sugar, turmeric, chilli powder, tea, coffee, semolina, Ghee, butter margarine, oil		
8.2	Control of food quality - Indian Stan.		
Chapter 9	Food Preservation.	06	08
9.1	Food Preservation by canning, drying, fermentation, Pickling and curing, chemical preservatives & by irradiation.		

REFERENCE BOOKS

- 1 Food Hygiene and sanitation, Ms. S. Roday, Tata McGraw Hill
- 2 The technology of food preservation, Narman Desrosier, CBS Publishers
- 3 Food microbiology, William Frazier & Dennis Westhoff Tata McGraw Hill
- 4 Food science & experimental foods, Dr. M. Swaminathan Bapco Publishers
- 5 Prevention of food adulteration act, 1954, Seth & Capoor, ILBS Publishers

SUBJECT CODE: AEE 102					
SUBJECT: DIETITICS & NUTRITION (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	---	--	50	50	04

Rationale

To develop basic awareness of important nutrients and knowledge of nutritional requirements for human beings & plan a balanced diet & understand the changes that occurs in the chemical components of food during preparation.

		Hours	Marks
Chapter 1	Introduction to nutrition	04	04
1.1	Definitions : Food, Diet, nutrients, nutrition, Malnutrition over and under nutrition/Energy energy requirements.		
1.2	Basal metabolic rate, Factors affecting basa Imetabolic rate.		
1.3	Concept of digestion, absorption, metabolism.		
1.4	Objectives of cooking.		
Chapter 2	Carbohydrates	04	04
2.1	Definition, Composition, Classification		
2.2	Food sources, Functions		
2.3	RDA (Adolescents and Adults)		
2.4	Importance of fiber in the Diet		
2.5	Symptoms of Deficiency and Excess of Carbohydrates in diet		
2.6	Effect of heat on Carbohydrates		
Chapter 3	Proteins		
3.1	Definition, Composition, Classification		
3.2	Food sources		

3.3	Essential and Non-essential Amino acids		
3.4	RDA (Children and Adults)		
3.5	Effect of heat on Proteins		
Chapter 4	Lipids	06	04
4.1	Definition, Composition, Classification		
4.2	Food Sources		
4.3	RDA (Adolescents and Adults)		
4.4	Symptoms of deficiency and excess of fats		
4.5	Effect of heat on fats		
Chapter 5	Vitamins	06	06
5.1	Definition, Classification of Vitamins into Fat Soluble And Water Soluble		
5.2	Functions, Sources, RDA, Symptoms of Deficiency and excess		
Chapter 6	Mineral	06	04
6.1	Classification, General Functions of Minerals, Calcium, Iron Iodine, Sodium and Chlorine		
6.2	Food Sources, Symptoms of Deficiency and Excess		
6.3	RDA in Adolescents and Adults		
Chapter 7	Water	02	04
7.1	Sources, Functions of Water in human body, Sources of Water		
7.2	Deficiency and Excess		
Chapter 8	Classification of Raw Materials into food groups	06	04
8.1	Their nutritive values-cereals, pulses, nuts & Oil seeds milk & Products, eggs, flesh foods, Vegetables & fruits, fats & oils.		
Chapter 9	Formulation of balanced & Therapeutic Diet	10	06
9.1	Five food groups system diet therapeutic diet Exchange list system		
9.2	Exchange list system		
9.3	Planning of a diet for normal adults (male & female)		

9.4	Concepts of Therapeutic diets, Foods to be avoided and recommended in Diabetes Mellitus, Cardiovascular disorders,		
9.5	Gastro intestinal disorders, Kidney disorders and Liver disorders, Fevers and Infections		
9.6	New trends in Nutrition (importance of avoiding junk food, gluten free diet, trans fatty acids, convenience food)		
Chapter 10	Food Science	10	06
10.1	pH-Definition and its relevance in industry		
10.2	Browning reactions (desirable & undesirable, enzymatic And non enzymic reactions in food)		
10.3	Concept of gelatinization, inversion and cystallization in starch.		
10.4	Definitions and relevance of Boiling point, Boiling under pressure, Melting Point Smoling point, Flash Point, Surface Tension		
Chapter 11	Food Additives	04	04
11.1	Definition, types and functions and various uses in food industry		

REFERENCE BOOKS

- 1 Nutrition and Dietetics, Ms. Shubhangini Joshi, Tata Mc-Graw Hill
- 2 Hand Book of food and Nutrition, Dr. M.S. Swaminathan, Bappco
- 3 Diet and Nutrition, BN Tiwari, Pearl Books
- 4 Food Science, B. Srilakshmi, New Age International Publication

SUBJECT CODE: AEE 103					
SUBJECT: FOOD & BEVERAGE CONTROLS					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	-	--	50	50	04

Rationale : To impart to students various cost, control and inventory concepts in a food and beverage operation.

		Hours	Marks
Chapter 1	Introduction to Food & Beverage management	8	6
1.1	Sectors of Food & Beverage Industry		
1.2	Cost and market orientation		
1.3	Food & Beverage Management functions		
1.4	Responsibilities of food and beverage management		
1.5	Constraintst of o odand beverage management		
Chapter 2	An overview of Food and Beverage control	6	04
2.1	Food and beverage control defined		
2.2	Objectives of food and beverage control		
2.3	Problems of food and beverage control		
2.4	The fundamentals of control		
Chapter 3	Cost, Profit and Sales concepts	10	06
3.1	The elements of cost		
3.2	Basic cost concepts - Fixed and variable costs, Direct costs, Estimated, budgetd and Standard costs Outlay		
3.3	Kinds of profit		
3.4	Break evenan alysis		

Chapter 4	Budgeting for Food and Beverage Operations	10	6
4.1	Budgets defined		
4.2	Objectives of budgetary control		
4.3	Types of budgets		
4.4	Basic stages in the preparation of budgets		
4.5	Obstacles to control		
Chapter 5	Purchasing	6	6
5.1	The main duties of the purchasing manager		
5.2	The purchasing procedure for food and beverage		
5.3	The selection of a supplier		
5.4	Methods of purchasing food and beverage		
5.5	Purchase specifications for food and beverage		
Chapter 6	Receiving, Storing and Issuing	8	8
6.1	Objectives of receiving food		
6.2	Themeattag		
6.3	Stock taking of food		
6.4	Receiving of beverages		
6.5	Storing and issuing of beverages		
6.6	Cellar records		
6.7	Issuing beverages		
6.8	Stock taking of beverages		
Chapter 7	Control checklist	6	6
7.1	Food control checklist		
7.2	Beverage control checklist, bar procedures, beverage control procedures		
7.3	Prevention of fraud in the bar		

Chapter 8	Management information System	10	8
8.1	Various Reports		
8.2	Calculation of Actual Cost		
8.3	Daily Food Cost		
8.4	Monthly Food Cost		
8.5	Statistical Revenue Reports		
8.6	Cumulative and Non-Cumulative		

REFERENCE BOOKS

- 1 Food and Beverage management, Bernard Davis, Sally Stone, Butter worth heinemanltd
- 2 Food and beverag control, Richard Kotas Bernard Davis, International, Textbook,
Glasagow
- 3 Cost accounting- Methods and Problems, Bk Bhar, Academic Publishing

SUBJECT CODE:AEE 104					
SUBJECT: PRINCIPLES OF MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	-	--	50	50	04

Rationale

To make the student understand the concepts of management and their practical application in the hospitality industry.

		Hours	Marks
Chapter 1	Introduction to Management	06	04
1.1	Management and Organization defined		
1.2	Why organizations and managers are needed		
1.3	Types of managers		
1.4	External and internal factors that affect management.		
Chapter 2	The Evolution of Management theory	08	08
2.1	Brief history of management thought		
2.2	Taylor's Scientifica Management Thory		
2.3	Fayol's Classical Organization Theory		
Chapter 3	Planning and Decision Making	08	08
3.1	Planning defined		
3.2	Importance of plans and goals		
3.3	Hierarchy of plans/Types of plans (Objectives, Strategies, Policies, Procedures, Methods, Rules,		
3.4	Steps in planning		
3.5	The rational mode of decision making		

Chapter 4	Organising & Staffing	12	08
4.1	Organising define and importance		
4.2	Formal and informal organization		
4.3	Span of management		
4.4	Departmentation		
4.5	Centralisation & Decentralisation		
4.6	Delegation of Authority		
Chapter 5	Leadership	10	06
5.1	Leadership styles		
5.2	Leadership theory (Blake & Mouton's Managerial Grid, Trait Theory, Contingency Theory) Characteristics		
5.3	of a good leader		
Chapter 6	Motivation	08	08
6.1	Motivation define		
6.2	Nature and importance		
6.3	Theories of motivation		
	i) Maslow's Hierarchy of Needs		
	ii) Mc Gregor's Theory X & Theory		
6.4	Y Morale		
6.5	Benefits of high morale/motivation		
Chapter 7	Co- ordination	06	04
7.1	Co-ordination defined		
7.2	Need for Co ordination		
7.3	Problems in achieving effective coordination		
7.4	Approaches to achieving effective coordination		

Chapter 8 Controlling

06 04

- 8.1 Control defined
- 8.2 Need for control
- 8.3 Steps in the control process

REFERENCE BOOKS

- 1 Management, Stonerand Freeman, Prentice Hall of India
- 2 Essentials of Management, Koonts, O' Donnell, Mac Graw Publishing Co.
- 3 The best of peter Druckeron Management, Peter Drucker Mac Graw Publising Co.
- 4 Management Process, R.Davar, Universal Books

SUBJECT CODE:AEE 105					
SUBJECT: ORGANIZATIONAL BEHAVIOUR					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	---	--	50	50	04

Rationale

The Subject aims to introduce students to the various elements and dynamics of organizational behavior.

		Hours	Marks
Chapter 1	Introduction to organizational behavior	04	04
1.1	Organizational behaviour defined		
1.2	Relevance and Scope.		
Chapter 2	Foundation of individual behaviour	06	06
2.1	Environmental factors		
2.2	Personal factors		
2.3	Organizational factors		
2.4	Psychological factors		
2.5	Personality, perception, attitudes and learning		
Chapter 3	Motivation	06	06
3.1	Nature of Motivation		
3.2	Theories of motivation-Maslow, Herzberg, Equity And Expectancy		
Chapter 4	Foundation of Group Behaviour	06	06
4.1	Group Dynamics		
4.2	Group Formation		
4.3	Group Task		
4.4	Group Decision making		

Chapter 5	Leadership	04	04
5.1	Nature of leadership		
5.2	Theories of leadership - Traittheory, Behavioural and Fielder's contingency theory		
Chapter 6	Communication	04	04
6.1	Inter personal communication		
6.2	Barriers and ways of ovrcoming barrirs		
6.3	Organizational communication		
6.4	Informal communication		
Chapter 7	Conflicts	03	04
7.1	Causes of conflicts		
7.2	Ways of overcoming conflicts		
Chapter 8	Organization	05	04
8.1	Organizational structures		
8.2	Behavioural implications of diffrent structures		
Chaper 9		05	06
9.1	Organizational Change		
9.2	Factors responsible for change		
9.3	Resistance to change		
9.4	Implementation of the change process		
	Ways of overcoming the resistance		
Chapter 10	Organizational Culture	05	06
10.1	Definition and importance of organizational culture		
10.2	Creation and sustenance of organizational culture		

REFERENCE BOOKS

- 1 Essentials of Organizational Behaviour, Stephen. P. Robbins Prentice Hall of Indi
- 2 Organizational Behaviour, Fred Luthans, Mc Graw Hill
- 3 Organisational Behaviour, Ashwathappa. k, Himalaya Publishing House
- 4 Organisational Behaviour, B.P. Singh, Dhnapat Rai & sons
- 5 Organisation Behaviour, Umashankaran, Tata Mc Graw Hill

SUBJECT CODE: AEE 106					
SUBJECT: HOTEL ECONOMICS					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	-	-	50	50	04

Rationale

This subject helps the students to develop an understanding of the concepts and theories of application of management techniques in the field of economics. Moreover they should be able to understand the Manager's role in the decision making process from economic view point.

		Hours	Marks
Chapter 1	Nature & Significance of Managerial Economics	04	08
1.1	Meaning, Features & Significance		
1.2	Functions of Managerial Economist		
Chapter 2	Basic Terms used in Economics	08	08
2.1	Micro & Macro Economics		
2.2	Problem of Scarcity - Lionel Robbins Definition of Economics		
2.3	Economic Tasks-Production & Distribution		
2.4	Economic Entities - Household & Firm		
2.5	Distinction between Plant, Firm & Industry		
Chapter 3	Demand Analysis	12	08
3.1	Meaning Types & Determinants of Demand		
3.2	Meaning & Determinants of Individual & Market Demand		
3.3	Demand Function & Demand Schedule		
3.4	The Law of Demand		
Chapter 4	Theory of Consumer Demand	10	06
4.1	Utility - Meaning & Types		
4.2	The Law of Diminishing Marginal Utility		
4.3	The Law of Equi-Marginal Utility		

Chapter 5	Elasticity of Demand	10	06
5.1	Concepts, Kinds & Types		
5.2	Measurement of Price Elasticity Demand		
Chapter 6	Production Analysis	08	06
6.1	Concepts & Attributes		
6.2	The Law of Variable Proportions		
6.3	The Law of Returns to Scale		
Chapter 7	Supply Analysis	06	04
7.1	Meaning & Determinants of Supply		
7.2	The Law of Supply		
7.3	Elasticity of Supply meaning, measurement & factors Affecting elasticity of Supply		
Chapter 8	Types of Market	06	04
8.1	Meaning & Classification of Market Structure		
8.2	Types of Market Structures Formed by the Nature of Competition		

REFERENCE BOOKS

- 1 Business Economics, V.G. Mankar, Himalaya Publishing House,
- 2 Modern Micro Economics, Ahuja H.L.S. Chand Publishing
- 3 Business Economics (Micro), Dr. (Ms). Girija Shamkar, Nirali Prakashan

SUBJECT CODE: AEE 107					
SUBJECT: FINANCIAL MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

This subject helps the students to develop an understanding of the concepts and theories of Financial Management in the Hospitality industry. This will also help the student in analyzing the financial statements and capital budgeting.

		Hours	Marks
Chapter 1	Financial Management	04	04
1.1	Definition, Scope and objectives Branches of accounting.		
1.2	Historical, Cost, Financial control , Financial Management and Revenue.		
Chapter 2	Ratio Analysis	12	08
2.1	Meaning, Importance and limitations		
2.2	Practical problems on computation of Liquidity Ratios. Turnover Ratio, Debtors Turnover Ratio, Creditors Turnover Ratio, Long-term Solvency Ratios-Proprietary Ratio, Debt Equity Ratio.		
2.3	Profitability Ratios - Gross Profit, Net Profit, Operating ratio, Practical problems on preparation of Balance sheet from given Ratios.		
Chapter 3	Funds Flow and Cash Flow Statement	12	10
3.1	Nature, Importance and Uses		
3.2	Differences between Funds Flow and Cash Flow Statement Practical problems on preparation of Funds Flow considering following adjustment only : Depreciation		

	Onfixed Assets, Dividend- Interim and Finaland Taxation		
Chapter 4	Working Capital Management	08	06
4.1	Definition and Meaning		
4.2	Factors affecting working capital		
4.3	Working capital cycle		
4.4	Practical problems on determination of working capital		
Chapter 5	Capital Budgeting	10	06
5.1	Meaning and Importance		
5.2	Practical problems on capital budgeting : payback period, Accounting Rate of return, Netpresent Value		
Chapter 6	Budgets, Budgeting and Budgetary Control	08	08
6.1	Definition and Characteristics of Budgets		
6.2	Meaning and Advantages of Budgetary control		
6.3	Practical problems on Cash Budget, Flexible Budget		
Chapter 7	Introduction to Pricing and Value added Tax.	10	08
7.1	Importance of Pricing.		
7.2	Methods of Pricing - Costplus, Rate of Return, History, Meaning and Advantages of Value added tax		
7.3	History, Meaning and Advantages of Value added tax In Hotel and Catering establishment		

The students may be assigned exercises related to Hotel Accounting to get hands on experience. They may be given assignments to collect various Formats use in the Hotel Industry and to present same in the class.

REFERENCE BOOKS

- 1 Financial Management, M.Y. Khan & P.K. Jain, Tata Mc Graw Hill
- 2 Financial Management, Prof. Dr. S.V. Patankar, Everest Publishing House
- 3 Financial Management, Prof. N.M. Vechalekar, Nirali Publication
- 4 Financial Management, Satish M Inamdar, Everest Publishing House

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-
- 5 Introduction To Management Accounting, L.N. Chopdeand D.H. Choudhary, Sheth Publishers Pvt. Ltd
 - 6 Financial and Cost Control Techniques, Dr. Jagmohan Negi, Gaurav Manohar Metropolitan Book Co. Pvt. Ltd. New Delhi.

Sem VI

SUBJECT CODE:DSE 201					
SUBJECT: ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
0	40	60	-	100	04

Rationale

The subject intends to provide indepth insight into international cuisine and develop advanced understanding of technical as well as managerial skills for culinary professional.

		Hours	Marks
Chapte 1	Production Management	02	04
1.1	Introduction to production management		
1.2	Kitchen organization		
1.3	Allocation of work, Job Description, Duty Roaster		
1.4	Production planning & scheduling		
1.5	Production Quality & Quantity Control		
1.6	Forecasting and Budgeting		
Chapter 2	Nouvelle cuisine	02	04
2.1	Evolution of Nouvelle cuisine		
2.2	Principles of Nouvelle cuisine		
Chapter 3	Food presentation & Garnishes	02	04
3.1	Importance of food presentation		
3.2	Skills and techniques in food presentation		
3.3	Importance of garnishes		
3.4	Ten classical garnishes		
Chapter 4	International Cuisine	20	20
4.1	Influence of Geographical location, Historical background on		

staple food and cuisines of following countries.

1. Tex-Mex 2. France 3. Italy 4 China

5. Spain 6. Germany 7. Great Britain 8. Japan

9. Mediterranean region 10. South East Asia

Chapter 5	Meringues	02	02
5.1	Making of meringues		
5.2	Factors affecting stability		
5.3	Cooking of meringues		
5.4	Types & uses of meringues,		
Chapter 6	Sugar	02	04
6.1	Tools required for sugar work		
6.2	Types of Sugar as decorative work-spun sugar, pulled sugar, poured sugar, blown sugar		
Chapter 7	Chocolate	02	04
7.1	Manufacture		
7.2	Couverture		
7.3	Tempering		
7.4	Moulding		
7.5	Chocolate decorations		
Chapter 8	Icing & Topping	04	04
8.1	Icing : Types- Flat, Royal, Butter Cream		
8.2	Marzipan, Nougatine, pastillage, Ganache		
8.3	Cooking of meringues		
8.4	Types & uses of meringues.		
Chapter 9	Recipe Balancing	02	04
9.1	Importance of recipe balancing		
9.2	Principles of recipe balancing in cake making & bakery		

Chapter 10	Pastries	05	06
10.1	Types-Shortcrust, Flakey, Puff, Danish, Choux, Filo		
10.2	Faults & their causes.		
Chapter 11	New Concepts in Culinary	05	04
11.1	Molecular Gastronomy : Concept.		
11.2	Organic foods		
11.3	Vegan cuisine		

REFERENCE BOOKS

- 1 Professional Cooking, Wayne Gisselen, John Wiley & Sons, N.Y
- 2 Theory of Cookery, Krishna Arora, Frank Bros & Co. Ltd, Delhi
- 3 Theory of Catering, Kinton ceserani, Book Power
- 4 Practical Cookery, Kinton Ceserani, ELBS
- 5 Basic Cookery, Richard Maetland & Derek Welsby, Heinemann
- 6 Culinaria Volume I & II Konemann, CBS Publication
- 7 Professional Baking, Wayne Gisslen, John Wiley & Sons, N.Y.
- 8 International Cuisine & Food Oroduction Management, Parvinder S. Bali, Oxford Publication.
- 9 Professional Baking, Wayne Gisslen, John Wiley & Sons, N.Y
- 10 Understanding Baking, Joseph Amendola & Donald Lundberg John Wiley & Sons, N.Y
- 11 Larousse Gastronomique, Paul Hamlym, Cookery Encyclopedia
- 12 Basic baking, S.C. Dubey, The Society of Indian Bakers
- 13 Classical Food Preparation & Presentation, W.K.H. Bode, Batsford
- 14 Professional Pastry Chef, Bo Friberg John Wiley & Sons, N.Y.

SUBJECT CODE:DSE 201 (A)				
SUBJECT: ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT (PRACTICAL)				
Teaching Scheme/Week	Examination Scheme			
Practical Hours	IA Marks	EA Marks	Total Marks	Credits
08	40	60	100	04

Minimum 24 International menus to be conducted.

The menus should cover the following regions of the world :

1. Tex-Mex
2. France
3. Italy
4. China
5. Spain
6. Germany
7. Great Britain
8. Japan
9. Mediterraneanregion
10. South East Asia

Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

SUBJECT CODE:DSE 202					
SUBJECT: FOOD & BEVERAGE OPERATIONS & MANAGEMENT (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	4	60	-	100	04

Rationale

To impart comprehensive knowledge about bar operation and management skills.

		Hours	Marks
Chapter 1	Introduction to Bar & Bar Beverages	12	12
1.1	Alcoholic Beverages		
1.2	Non Alcoholic Beverages,		
1.3	Aerated Beverages, Bar Syrups, Squashes and Cordials		
	Premixed Drinks Mineral, Spring water, flavoured and packaged waters.		
1.4	Aperitifs, Liqueurs and digestifs		
1.5	Types of Bars		
1.6	Role of Various personnel's in the bar.		
1.7	Bar Equipment's and their uses (Large and Small equipment's)		
Chapter 2	Planning of Bar	08	06
2.1	Layout of a bar		
2.2	Factors to be considered while planning a bar		
2.3	Safety and hygiene consideration		
2.4	Seating Arrangements of various bars.		
Chapter 3	Bar Controls & Statutory Requirements	08	06
3.1	Purchasing, Receiving and storing of Beverages		

3.2	Inventory/Stock Control methods.		
3.3	Calculation of Beverage cost., Daily, Weekly Bar Reports.		
3.4	Sales Summary and Sales Analysis, Sales Mix.		
Chapter 4	Mixology	10	10
4.1	Introduction to the science of Mixology.		
4.2	Cocktail making		
4.3	Glassware and garnishes.		
4.4	Making of Traditional and Innovative cocktails.		
4.5	Flair bartending		
Chapter 5	Function and Event Catering	08	10
5.1	Definition of function catering and types of functions		
5.2	Organizational structure of Banquet department, duties and		
5.3	Responsibilities of various personnel's		
5.4	Function catering administrative procedures		
5.5	Preparation of function prospectus.		
5.6	Menu planning for various types of functions		
5.7	Seating arrangement for various functions, Table plan and		
5.8	space considerations. Off premises / out-door catering.		
Chapter 6	Gueridon Service	08	06
6.1	Origin and Definition.		
6.2	Types of trolleys.		
6.3	Special equipments used in Gueridon service care and		
6.4	Maintenance.		
6.5	Service Procedure.		
6.6	Service of classical dishes.		
Chapter 7	Buffets	04	04
7.1	Definition		

7.2	Types of Buffets		
7.3	Equipments and set up of buffets.		
Chapter 8	Menu Engineering	03	03
8.1	Concept and application.		
8.2	SWOT analysis of various food and beverage outlets.		
Chapter 9	Customer Relationship	03	03
9.1	Handling Customer Complaints.		
9.2	Customer SAtisfaction		

Glossary of Terms

Fortified wines	Cobblers	Collins
Blended drinks	Coolers	Crustas
Cups	Daisies	Egg nogs
Fixes	Flips	Frappes
High ball	Juleps	Pick-me-up
Pousee-cafe	Smashes	Sours
Swizzles	Toddies	Amer-picon
Campari	Bar die	Hawthorne strainer
Boston shaker	Cassis	Cerise
Citronelle	Framboise	Gomme
Grenadine	Orgeat	Squashes
Bar-blade	Speed pourers	Bar optics
Front bar	Back bar	Kirsch
Generic liqueurs	Proprietary liqueurs	Pousee cafe
Jigger	Asian Buffet	Gala Reception
Dispense Bar	Smorgasbord	Easter Buffet
Brunch Buffet	Candelabra	Casserole Stations
Fork Buffet	Suzette Pans	Beverage Urns

Chafing Dish	Portion scale	Props
Floral Accessories	Skirting	Waffle Irons
Rechaud Stores	Trancheur	Carousal
Gueridon	Underbars	Over bar
Portable bar	Cobra Gun	IRD
Centralized Rook Service	De-Centralized Romm Service	RSOT
California Menu	Cyclic Menu	EMT
PMT	Evlevenses	
SWOT		

REFERENCE BOOKS

- 1 Food and Beverage Service, Dennis Lillicrap, John cousins, Power Book
- 2 Modern Restaurant Service, John Fuller, Hutchinson
- 3 Food and Beverage Service, Sudhir Andrews, Tata Mc Graw Hill Edition
- 4 The Beverage Book, Durkan & Cousins, Hodder Arnold, H & S Toughton
- 5 Professional Guide to Alcoholic Beverages, Lipinski, Van Nostrand Reinhold
- 6 Oxford Companion to wines, Jancis Robinson, Oxford University Press
- 7 The Restaurant (From Concept to Operations), Donald Lundberg, John Willey
- 8 The ultimate Encyclopedia of Wines, Beer, Spirits and liqueurs. Stuart Walton, Brain Glover, Hermes House.
- 9 Food and Beverage Management, Bernard Davis, Sally Stone Butterworth Heineman Ltd

SUBJECT CODE:DSE 202A**SUBJECT: FOOD & BEVERAGE OPERATIONS & MANAGEMENT (PRACTICAL)**

Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	-----	100	02

Sr. No.	Topic
1	Preparation of Various types of Beverage lists
2	Service of Various Spirits & Cocktails
3	Planning and layout of various types of bars
4	Maintenance of statutory Records
5	Preparing of Daily/Weekly Bar Reports
6	Flair Bartending Principles : Types of Flair Bartending
7	Molecular Mixology
8	Innovative Cocktails & Mocktails
9	Filling up of Banquet function prospectus
10	Banquet seating arrangements, formal banquet service
11	Mise-en-place for service from Gueridon trolley and service of dishes
12	Setting up of buffets and service procedures
13	Planning of Off premises catering functions
14	Menu Engineering Analysis of Menu.
15	SWOT Analysis of fine dining establishment, QSR
16	Planning and service of food festivals and other promotional events

SUBJECT CODE:DSE 203					
SUBJECT: ACCOMMODATION MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
0	40	60	-	100	04

Rationale :

The subject aims to establish the importance of management in Accommodation Operations.

This course aims to establish the importance of Front Office within the hospitality industry. It also prepares the student to acquire management skills and knowledge in the Department.

	Topic	Hours	Marks
Chapter 1	Pioneers of the hotel industry	04	02
1.1	Founders of the Hotel Industry		
1.2	Developments in hotel industry		
1.3	Indian chain hotels-History & growth		
Chapter 2	Social skills required for Rooms Division staff	06	06
2.1	Introduction and Importance of social skills		
2.2	Behaviorial skills-self presentation, body language Cross culture-Styles of welcoming, need for foreign language, global language		
Chapter 3	Budgeting in Rooms Division	06	08
3.1	Definition, concept & importance		
3.2	Type of budgets - capital & operating		
3.3	Budgeting for front office operations- Forecasting Revenue, Estimating Expenses, Refining Budget Plans		
Chapter 4	Revenue Management	06	06
4.1	Concept		

4.2	Measuring & maximizing Yield		
4.3	Elements of Revenue Management		
4.4	Using Revenue Management- concept of ARR and REV PAR		
4.5	Calculation of Yield statistics and yield management		
Chapter 5	Evaluating Front Office Operations	06	06
5.1	Daily Operations Report		
5.2	Occupancy Ratios		
5.3	Rooms Revenue Analysis		
5.4	Hotel Income Statement		
5.5	Rooms Division Income Statement		
5.6	Rooms Division Budget Reports		
5.7	Operating Ratios		
5.8	Ratio Standards		
Chapter 6	Introduction to Management Information System	06	06
6.1	MIS-Introduction, Definition, Concept Understanding information system, MIS for key decisions		
6.2	Property management system - Various modules related to Reservations, Registration, Cashiering, Telephones, Guest history		
Chapter 7	Managing Human Resource in Rooms Division Department	06	06
7.1	Determining manpower requirements.		
7.2	Recruitment		
7.3	Training		
7.4	Staff Scheduling		
7.5	Staff Motivation		
7.6	Performance Appraisal		

7.7	Effective use of SOP's in front office departments.		
Chapter 8	New property operations	06	06
8.1	Starting up Rooms Division Operations		
8.2	Systems and procedures		
8.3	Staffing consideration		
8.4	Count down		
Chapter 9	Housekeeping in Allied sectors	08	08
9.1	Need & Importance		
9.2	Institutional Housekeeping-Hostels, guest houses & residential		
9.3	Homes		
9.4	Housekeeping in Hospitals		
9.5	Housekeeping in Retail sectors		
	Housekeeping in Art Gallery, Museum		
	Housekeeping in Aircrafts, Airports		
	Corporate Housekeeping.		
Chapter 10	Customer Relationship Management in Rooms Division	06	06
10.1	Definition & concept		
10.2	Importance of loyalty programme		
10.3	Benefits of loyalty Programme		
10.4	Types of loyalty programme		

Glossary of Terms

Capital budget	Operating budget	Pre opening budget
Flexible bedget	Fixed budget	Master budget
Variable expenses	Semi variable expenses	Yield Management
GOPPAR	Performance Appraisal	Induction

Orientation	Cross training	Multi skilling
Time and motion study	Soft opening	Countdown
Zero base budgeting	Contingency plan	Graveyard shift
Job description	Job specification	Job analysis
Job assignment	Job breakdown	Productivity standard
Job assignment	Work study	Pre opening budget
Zero base budgeting	Job analysis	Facility management
Buddy system	Productivity standard	Countdown
Social Skills	Staffing guide	Graveyard shift
Behavioral skillas		

REFERENCE BOOKS

Sr. No.	Name of the Book	Author	Publisher
1	Hotel House Keeping Operations & Management-	Sudhir Andrews	Tata Mc Graw Hill
2	Hotel Housekeeping & Management	G Raghubalan, Smritee Raghubalan	Oxford University Press
3	Hotel, Hostel & Hospital Housekeeping	Branson & Lennox	ELBS
4	Accomodation Management	Rosemary Hurst	Heinemann publishing
5	Hotel Front Office Operations & Management	Sudhir Andrews.	ELBS
6	Check-in Check-out	Jerome Vallen	Heinemann publishing
7	Principles of Hotel Front Office Operations	Sue Baker, P. Bradly, J. Huyton	Tata Mc Graw Hill
8	Hotel Front Office	Bruce Graham Stanley	WM.C Brown IOWA
9	Managing Front Office operations	Michael Kasavanna	Continuum

		Richard Brooks Charles Steadmon	Thornes
10	Front Office Procedures & Management	Peter Abott. & Sue Lewry	AH & LA Butterworth & Heinemann
11	Front Office operations	Colin Dix, Chris Baird	Pearson
12	Front Office Operations And administration	Dennis foster	Glencoe.
13	Hotel Accounting & Financial Control	OziD'Cunha	Dickey Enterprises

SUBJECT CODE:DSE 203 A

SUBJECT: ACCOMMODATION MANAGEMENT (PRACTICAL)

Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	-----	100	04

1. Preparing of various budgets in Rooms Division department.
2. Calculation of stocks and expenses for Rooms Division department.
3. Preparation of Rooms division income statement.
4. Preparation of reports for consumption of guest consumables.
5. Calculations of various statistical data using Formulae : ARR, Room Occupancy %, Double Occupancy %, Bed Occupancy %, Foreign occupancy %, Local Occupancy %
6. Calculation of Yield statistics and yield management.
7. Calculation of staffing requirements and staff scheduling for the Rooms Division department in different types of hotels.
8. Preparation of duty roster for Rooms Division department in different types of hotels.
9. Preparation of orientation and training programme for new recruits in Rooms Division department.
10. Preparation of format for performance appraisal and various rating systems.
11. Preparation of Time and motion study for Rooms Division jobs.
12. Practice with computer & PMS handling related to Rooms Division
13. Practice of mock interviews of Rooms Division job positions.
14. Preparation of a checklist for Rooms Division tasks in the countdown of a new property launch.
15. Planning Start up systems and procedures in the Rooms Division department of a new start up property.
16. Planning for a housekeeping operation in Retail and Corporate sectors, Hostels, Guest houses and Hospitals.

Assignment

1. Preparation of job descriptions for housekeeping personnel
2. Preparation of orientation and induction training programme for housekeeping staff
3. Preparation of performance appraisal report
4. Preparation of SWOT analysis for Rooms Division Department
5. Preparation of SOP's for front office department. Preparation of SOP's for Protocols of VVIP, VIP's and CIP's & traditional welcome amenities (Ministers, Dignitaries, Govt. Officials, Foreign delegates and others)
6. Preparation of SOP's for different tasks in Housekeeping department.

SUBJECT CODE:SEC 104**SUBJECT: APPLICATION OF COMPUTERS IN HOTELS (THEORY)**

Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	20	30	---	50	02

Rationale

The subject aims to give a basic knowledge of computers and its operations and enables the student to operate the computer with enough practice to get confidence.

		Hours	Marks
Chapter 1	Computer Fundamentals	03	03
1.1	Features of Computer System		
1.2	Block Diagram		
1.3	Hardware Input & Output Devices, CPU, RAM, ROM		
1.4	Software - System, Applications/W		
1.5	Networks - LAN, MAN, WAN, Topologies		
1.6	Viruses- Types, Precautions		
1.7	Types of Software- System & Application software's		
Chapter 2	Windows	03	03
2.1	Features		
2.2	Terminologies - Desktop, Windows, Wallpaper, Icons, File, Folder, etc. Windows Explorer - (Assignment with files, folders)		
2.3	Accessories - Paint, Notepad, Calculator,		
Chapter 3	MS Word	03	02
3.1	File Commands, Print, Page Setup		
3.2	Editing - Cut, Copy, Paste, Find, Replace, etc.		

3.3	Formatting Commands - Fonts, Bullets, Borders, Columns, Tabs, Indents.		
3.4	Tables, Auto Text, Auto Correct		
3.5	Mail Merge, Hyperlinks		
Chapter 4	MS Excel	03	03
4.1	Features, Auto Fill, Custom Listsetc		
4.2	Cell Reference - Relative & Absolute (s)		
4.3	Formulae, Functions (Math/Stats, Text, Date, IF)		
4.4	Charts-Types, Parts of the Chart		
4.5	Databases (Create, Sort, Auto Filter, Sub Total)		
Chapter 5	MS Powerpoint	04	03
5.1	Slide Layout, Slidetransition		
5.2	Clip Art, Organizational Chart, Graphs, Tables.		
5.3	Custom Animations, Slide Timings.		
Chapter 6	Internet / Email	04	04
6.1	History, Pre-requisites for Internet, Role of Modem		
6.2	Services - Emailing, Chatting, Surfing, Blog		
6.3	Search Engines, Browsers, Dial Up, Domains		
6.4	Broadband, Concepts of Webupload, download		
6.5	Threats - Spyware, Adware, SPAM		
Chapter 7	E-Commerce And ERP Concepts	03	03
7.1	Concepts of B-to-B, B-to-C		
7.2	ERP Concept		
7.3	SAP Concepts		
Chapter 8	Hospitality Software	03	03
8.1	Shawman Hospitality Software- Point of Sale (VPOS - 9)		

8.2	Introduction		
8.3	Restaurant order taking		
8.4	Add on command prompt		
8.5	Cheque making -single, split etc.		
8.6	Bill settlement		
8.7	Availing Discounts		
Chapter 9	Hospitality software	03	03
9.1	Shawman Hospitality Software-Property Management System		
9.2	Introduction		
9.3	Room Reservations		
9.4	Group Booking		
9.5	Payment Settlement		
9.6	Adding Discounts		
9.7	Payroll Management System		
Chapter 10	Hospitality Software	03	03
10.1	Shawman Hospitality Software- Human Resource Management System		
10.2	Sales & Catering Management System		
10.3	Wire data System		
10.4	Customer feedback system		
10.5	Introduction		
10.6	Payroll		
10.7	Customer Feedback		
10.8	Communication within the property & Outside the property		
10.9	Other Hospitality Software's Fidelio, Opera, Oracle, Micros		

REFERENCE BOOKS

- 1 Mastering MS-OFFICE, Lonnie E. Moseley & David M. Boodey, BPB Publication
- 2 Computer Fundamentals, P.K. Sinha, BPB Publication
- 3 Computer Fundamentals, Anita Goel, BPB Publication

SUBJECT CODE: SEC 104 - A

SUBJECT: APPLICATION OF COMPUTERS IN HOTELS (PRACTICAL)

Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	---	100	02

Practical 1 COMPUTER FUNDAMENTALS

Input Devices, Output devices,
LAN, WAN, MAN

Practical 2 WINDOWS

Change wallpaper, set screen saver, Create folders and files using Notepad.
Cut, copy and paste files to floppy/ pen drives.
Create images using Paint
Check free disk space and speed of processor.
Change date and time.

Practical 3, 4, 5, 6 WORD

Type recipe of any dish, with its image, with ingredients inatable.
Create KOT, Student's Resumes with students photograph. (WORD)
Letter Writing
KOT Making
Company Letter head making
File, Edit, View, Insert, Format, Tools, Table Commands Page Setup, Print File, Edit, View, Insert, Format, Tools, Table Commands Page Setup, Print Options, Setting Page Margins Clip Arts, Inserting Pictures/Charts/Files Correcting Text, Cut, Paste, Undo, Redo, Deleting Blank lines, Inserting A Page, Typing Over Text, Replacing Text, Moving And Copying Text. menu Method, Key Board Method, Tool Bar Method, Drag & Drop Method, Checking Text, The Spell Checker, Auto Correct Check Up, The Grammar Checker, Formatting A Text, Changing Type Style, Character Highlighting, Alignment of Text, Left, Right

Center, Justifying Text-Types & Tab Setting, Setting Tab Using Ruler, Indenting Paragraphs, Increasing And Decreasing Indents, Using Ruler To set Indents, Spacing Paragraph Line Spacing, Spacing Between Paragraphs. Page Views, Normal Views, Page Layout View, Outline View, Print Preview, "Full Screen View, Master Document View, Magnification, Page Formatting, Setting Margins, Paper Size, Printing in Landscape Or Portrait Orientation, Page Numbering, Adjoining Page Numbering, Deleting Page Numbering, Header & Footer, Creating And Editing Inserting And Deleting Pages in A Document, Saving The Text, Saving The File To Disk, Closing A file, Opening A Non-Work document Printing Text.

Practical 7, 8, 9

EXCEL

List of employees, with salary,

KOT,

Report Card with Pass/Fail Result, Bills with details of Hotel Rooms, Charts, Data base of Employees with filters

Processing With MS Excel, Starting Excel, Starting New Work Book, Entering And Editing Data, Formatting Work Sheet, Sorting The DATA, The Worksheet Selecting Cells And Ranges, Selecting With Mouse, Data Entry, Entering Numbers, Text, DATE & Time Entries, Entering Series, Filing A Text Series With Auto Fill, Filing A Number Series, Editing DATA, Clearance And Replacing Contents of A Cell, Deleting The Contents of A Range of Cell, Re-arranging Work sheet data, Copying Auto Correct, Spell Checking, File dose, Formatting Data, Font Selection, Aligning DATA, Format Style, Formatting Work Book, Arranging, Hiding, Unhiding, Inserting Columns And Rows, Adjusting Width, Copying And Moving, Inserting And Deleting Sheets From Work Book, Mathematical Operator, Exponentiation And Percentage Operators, Logical Or Comparison Operator, Exponentiation And Percentage Operators, Logical Or Comparison Operators, Using Mouse To Create A Formula. Inserting A Chart, Chart Types, Modifying Chart Adding Drawing To the Chart, Printing In Excel, Print Parameters, Default And Changing Default Settings, Sorting, Printing Etc.

Practical 10, 11

POWER POINT

To Present the above information as a presentation as an assignment.

Use different layout, organization chart, design templates, in the presentation.

Opening And Saving Presentations The Easy Way -Using Auto Content Wizard-Working With Blank Presentation -Using The Templates -Using

The Slide Master Working with Color Schemes- Working with slides, Making A New Slide Move, Copy or Duplicate Slides Delete A Slide Copy A Slide From One Presentation To Another Go To Specific Slide-Change The Lay Out of A Slide Zoom In or Out of Slide Working With Text In Power Point Cutting, Copying and Pasting-Formatting Text, Change Font & Size, Shadowing, Embossing-Alignment The Text-Left, Center, Right And Justify-Power Of Graphics In Power Point Working With Clipart Picture- Using Microsoft Excel-Chart-Using Organization Charts-Power Point Drawings Ways To Draw- Adding Lines Connecting Lines Borders And Adding Curves - Creating Word Tables Making Great Looking Presentations (Putting On A Show)- Arranging, Creating Animated Slides - Manually Advancing Slides-Adding And Removing Transitions - Running A Presentation Continuously Printing The Presentation Elements.

Practical 12

INTERNET

To search and downloading formation from the internet as a topica and submit (Hard/Softcopy)

Create email id, send mail to faculty as an assignment.

Practical 13, 14

Shawman - Point of Sale

Shawman Hospitality Software - Point of Sale (VPOS9)

Introduction

Restaurant ordertaking

Add on command prompt

Cheque making - single, split etc.

Availing Discounts

Bill Printing, Re-printing, Bill settlement

Practical 15

Property Management System

Taking Rooms Booking

Adding Discounts

Billing

Practical 16

Payroll System

Calculating Paryroll

Appraisal System

SUBJECT CODE:AEC 103					
SUBJECT: HOSPITALITY MARKETING (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	--	100	03

Rationale

This subject intends to promote and understanding of core concepts of marketting, current marketing environment, challenges in marketing of services and the marketing strategies to be adopted.

		Hours	Marks
		04	04
Chapter 1	Introduction to Marketting		
1.1	Defining Marketing		
1.2	Core concepts of Marketing		
1.3	Orientations towards Marketing. Production concept, Product concept, Selling concept, Marketing concept, Sociatal Marketing concept		
1.4	Difference between Selling and Marketing		
1.5	Marketing Mix		
Chapter 2	Introduction to Services Marketing	06	08
2.1	Introduction to Services Marketing		
2.2	Goods Vs. Service		
2.3	Characteristics of Services		
2.4	Problems in marketing of services and its solution		
2.5	Scope of Service		
Chapter 3	Customer Value and Satisfaction	04	04
3.1	Defining Customer Value and Satisfaction		

3.2	Delivering Customer Value and Satisfaction		
3.3	Attracting and Retaining customers		
3.4	Concept of Customer Profitability		
Chapter 4	Understanding the Marketing Environment	02	04
4.1	Demographic environment		
4.2	Economic environment		
4.3	Technological environment		
4.4	Political environment		
4.5	Social Cultural environment		
4.6	Business environment		
Chapter 5	Analyzing Consumer Markets and Buying Behavior	04	04
5.1	Consumer Behavior Model		
5.2	Factors influencing buyer behavior : Cultural, Social Personal, Psychological		
5.3	Buying decision process		
Chapter 6	Market Segmentation, Targeting and Positioning	04	04
6.1	Concept of market segmentation,		
6.2	Basis for segmentation : Geographic, Demographic, behavioral, Psychographic		
6.3	Concept of Market Targeting & of Market Positioning		
Chapter 7	Product Strategies	06	08
7.1	Levels of Product		
7.2	New Product Development		
7.3	Product Life cycle concept		
7.4	Product Differentiation		
7.5	Concept of Branding		

Chapter 8	Pricing Strategies	06	08
8.1	Price and its importance		
8.2	Internal and external factors affecting pricing decisions		
8.3	Pricing strategies adopted by hotel for : Room Tariff, F & B items, Functions & Packages.		
Chapter 9	Physical Distribution Strategies	06	08
9.1	Importance of distribution		
9.2	Channel Level		
9.3	Channels of distribution in the hospitality industry (Travel agents, Tour operators, Internet, Consortia, Hotel Representative, CRS etc.)		
9.4	Franchising		
9.5	Alliances		
9.6	Location of Services		
Chapter 10	Promotion Strategies	06	08
10.1	Definition and Characteristics of Promotional tools used in the hotel industry.		
10.2	Advertising		
10.3	Sales Promotion		
10.4	Publicity & Public Relations		
10.5	Personal Selling		
10.6	Direct Marketing.		

REFERENCE BOOKS

- 1 Marketing for Hospitality and Tourism, Philip Kotler, Pearson Education.
- 2 hotel Marketing, S M Jha, Himalaya Publishing
- 3 Hospitality Marketing, Neil Warne, Hospitality Press, Melbourne
- 4 Hospitality Marketing Management, Robert Reid, John Wiley & Sons, N.Y

SUBJECT CODE: AEC 104					
SUBJECT: HUMAN RESOURCE MANAGEMENT (THEORY)					
Teaching Scheme/Week		Examination Scheme			
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
03	40	60	-	100	03

Rationale :

The student will be able to understand the role and importance of Human Resource Management in the modern hospitality environment.

		Hours	Marks
Chapter 1	Introduction to Human Resource Management.	04	06
1.1	Human Resource Management defined.		
1.2	Human Resource Management and Personnel Management.		
1.3	Role, Nature and Characteristics of Human Resource Management		
1.4	Functions of Human Resource Management		
1.5	Challenges for Human Resource Management		
Chapter 2	Human Resource Planning	10	10
2.1	Man power planning-concept need and technique.		
2.2	Process of manpower planning.		
2.3	Job analysis, job description, job specification.		
2.4	Recruitment/Sources of recruitment.		
2.5	Selection, orientation and induction process		
Chapter 3	Human Resource Development	06	06
3.1	Definition and elements of Human Resource Development.		
3.2	Training - need and importance.		
3.3	Assessment of training needs.		
3.4	Difference between training and development		

Chapter 4	Performance Management and Appraisal	08	08
4.1	Performance Management - Need and importance.		
4.2	Performance Appraisal - Purpose method sanderrours.		
4.3	Career Management promotion and transfers.		
4.4	Career development and its benefits.		
4.5	Need for career counseling		
Chapter 5	Performance and Job Evaluation	08	04
5.1	Performance evaluation and its objectives		
5.2	Job Evaluation-concept and objectives, methods of job evaluation		
5.3	Limitations of Job Evaluation.		
5.4	Competency matrix-concept, benefits and implementation In the hospitality industry.		
Chapter 6	Compensation Administration	10	08
6.1	Objectives of compensation administration.		
6.2	Types of compensation-direct and indirect.		
6.3	Factors influencing compensation administration- External and internal factors, concept of Cost to Company (CTC)		
6.4	Steps in formulation of compensation packages.		
6.5	Current trend in compensation - competency and Skill based pay, Broad banding.		
Chapter 7	Incentives and Benefits	08	06
7.1	Objectives of wage incentives.		
7.2	Wage incentives planning process.		
7.3	Types of incentive schemes in brief-straight piece rate, differential piecerate, task and time bonus, meritrating.		
7.4	Organisation wide incentive plans-profit sharing, Employee stock options (ESOP)		
7.5	Fringe benefits -objectives and forms		
Chapter 8	Grievances and Discipline	03	06
8.1	Grievance Handling -causes of grievances.		

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- 8.2 Grievance handling system.
 - 8.3 Discipline aims and objectives.
 - 8.4 Causes of indiscipline.
 - 8.5 Women Grievance committee-importance, Role and functions.

Chapter 9 Industrial Relations - Labour and Management Relations 03 06

- 9.1 Trade union-concept, objectives and functions.
- 9.2 Collective Bargaining.
- 9.3 Workers participation in management in hospitality industry.
- 9.4 Labour turn over-causes and measures for reducing labour turnover, retention
- 9.5 Strategies implemented by the hospitality industry.

REFERENCE BOOKS.

- 1 Fundamentals of Human Resource Management- content, competences and application, Gary Dessler and Biju Varkkey, Pearson.
- 2 Personnel Management, C.B Mamoria, Himalaya Publishing.
- 3 Human Resource management and human relations., Dr. V.P, Michael Himalaya Publishing
- 4 Human Resource Management in Hospitality, Malay Biswas, Oxford university press
- 5 Human Resource Management A textbook for the hospitality industry, Sudhir Andrews Tata Mc Graw hill
- 6 Human Resource Management, Ved Prakash

SUBJECT CODE:SEE101					
SUBJECT: FIRST AID					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To develop awareness of the importance of hygiene, sanitation and food safety in hotel industry.

		Hours	Marks
Chapter 1	Introduction to First Aid	10	10
1.1	First Aid		
1.2	First aid priorities		
1.3	How to prepare yourself during an emergency		
1.4	Looking after yourself: Personal safety and protection from infections		
Chapter 2	Accidents and Injuries	12	10
2.1	Dealing with a casualty		
2.2	Requesting help		
2.3	Use of medication		
2.4	Assessing a casualty: Methods of assessment Head to toe examination Monitoring vital sign		
Chapter 3	Managing an incident	14	10
3.1	Removing clothing and headgear		
3.2	First aid material: Dressings, Bandages, slings.		
3.3	Action at an emergency		
3.4	Traffic incidents		

3.5	Fires		
3.6	Electrical incidents		
3.7	Water incidents		
Chapter 4	Emergency first aid for	14	10
4.1	Wounds and bleeding		
4.2	Shock		
4.3	Head injury		
4.4	Spinal injury		
4.5	Broken bones		
4.6	Burns and Scalds		
4.7	Poisoning		
4.8	Bites and Stings		
Chapter 5	Life saving procedures	14	10
5.1	Resuscitation		
5.2	Choking		
5.3	Hanging and Strangulation		
5.4	Drowning		
5.5	Inhalation of fumes		
5.6	Asthma		

REFERENCE BOOKS

- 1 First aid manual, Written and endorsed by St John Ambulance, St Andrew's First Aid and the British Red Cross, DK
- 2 First aid Manual, St. John Ambulance (Author), Dorling Kindersley Publishers Ltd;
7th Revised edition edition (1 May 1997)

SUBJECT CODE:SEE 102					
SUBJECT: HOTEL MAINTENANCE					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

The subject will provide information regarding the basic services and different types of engineering and maintenance systems in hotel industry. This subject will help students understand various aspects and importance of the Engineering department in a hotel. At the end of the course students will be thorough with various machines and their working, fuels, electricity, safety and security, water distribution systems and energy conservation in hotel.

		Hours	Marks
Chapter 1	Maintenance & Replacement Policy	07	05
1.1	Definition of Maintenance		
1.2	Importance of Maintenance department in the hotel Industry		
1.3	Organization chart of Maintenance department in 3/4/5 star hotels		
1.4	Duties & responsibilities of Chief Engineer of a hotel		
1.5	Types on maintenance and their advantages and disadvantages <ul style="list-style-type: none"> • Breakdown/Corrective • Preventive • Predictive. 		
1.6	Contract Maintenance <ul style="list-style-type: none"> • Need of contract maintenance • Types: Lumpsum, Unit price/Unit Rate, cost plus upper limit Contract 		
1.7	Maintenance chart for <ul style="list-style-type: none"> • Swimming Pool: Daily basis and Quarterly basis • Kitchen: Daily basis and Quarterly basis 		
1.8	Replacement of Equipments: <ul style="list-style-type: none"> • Reasons for replacement • Economic placement of equipments 		
Chapter 2	Refrigeration	08	08
2.1	Definitions: Heat, Temperature, Sensible heat, Latent Heat, Relative Humidity, Zero Law of Thermodynamics, First Law of Thermodynamics,		

2.2	Methods of Heat Transfer:		
	• Conduction		
	• Convection		
	• Radiation		
2.3	Refrigeration		
	• Principle of refrigeration		
	• Unit of Refrigeration		
	• Refrigerants: Properties and Types		
	• Block diagram and working of Vapour Compression Refrigeration System		
	• Block diagram and working of Vapour Absorption Refrigeration System		
2.4	Domestic Refrigerator:		
	• Block Diagram and working		
	• Maintenance		
	• Defrosting: Need, Methods		
2.5	Walk in Freezer/Cold Storage		
	• Block diagram		
	• Working		
Chapter 3	Air Conditioning	06	06
3.1	Types of AC		
	• Unitary AC: Window A C and S plit AC		
	• Block Diagram and Working		
3.2	Factors affecting Load on AC		
3.3	Factors affecting AC Comfort		
Chapter4	Fuels	04	04
4.1	Types of Fuels		
4.2	Comparison of various Fuels: Solid, Liquid And Gaseous		
4.3	Fuels used in the hotel industry		
Chapter5	Electricity	07	06
5.1	Types of Electricity supply: Single and Three Phase		
5.2	Types of Fuse: Re-wireable, Cartridge, MCB.		
5.3	Importance and method of Earthing		
5.4	Calculation of Electricity Bill		

Chapter 6	Water Systems	08	07
6.1	Sources of water.		
6.2	Adverse effects of hard water		
6.3	Methods of purification & water softening: Ion Exchange, limesoda.		
6.4	Water Distribution System: Up Feed and Down Feed		
6.5	Traps, Water Closets and Flushing Systems: Types, diagrams, functions.		
6.6	Various plumbing fixtures		
Chapter 7	Energy & Its Conservation	06	04
7.1	Various energy sources: Conventional & Non Conventional (Examples, Advantages and Disadvantages)		
7.2	Need for energy conservation		
7.3	Simple Methods of energy conservation in Kitchen & Guest room.		
7.4	Use of Solar Energy in a hotel		
Chapter 8	Fire & Its Prevention	06	04
8.1	Fire Triangle		
8.2	Fire types: A, B,C,D, E,F		
8.3	Theory of Extinguishment: Starvation, Cooling, Smothering		
8.4	Various types of fire extinguishers		
8.5	Smoke Detectors and Fire Alarm system		
Chapter 9	Safety and Security in Hotel	06	03
9.1	Causes of Accidents		
9.2	Prevention /Control of Accidents		
9.3	Safety Issues in Hotel: <ul style="list-style-type: none"> • Guest Key Control • Kitchen Safety • Slip & fall 		
Chapter 10	Pollution & Control	06	03
10.1	Air Pollution: Causes and Effects		
10.2	Water Pollution: Causes and Effects		
10.3	Noise Pollution: Causes and Effects		
10.4	Waste Management		

Note

Field Visits–Field visit to be arranged for students to engineering department of a five star hotel. Working of AC Plants and other aspects and systems of maintenance department to be shown to students. Are part of the same must be submitted by students individually.

Assignments

1. Write Short Note one co-friendly Refrigerant.
2. Explain Centralized Air Conditioning in Detail with block diagram
3. Explain the working of Air filter, Humidifier and Dehumidifier in AC
4. Enlist and Explain water purification methods
5. Explain various Lighting systems used in Hotel
6. Write procedure to be followed in case of Fire Alarm in Hotel
7. Make a chart for various fire extinguishers with colour code and the type of fire it extinguishes.
8. Write notes on: Waste Disposal Methods– Incineration and Land Fill

REFERENCES

1. Hotel Engineering, Sujit Ghosal, Oxford University Press
2. Hotel Engineering, R.K.Chhatwal,
3. Hotel Maintenance, Arora
4. Hospitality Facilities Management & Design, David m Stipnauk, EIAHMA

SUBJECT CODE:SEE103					
SUBJECT: RETAIL MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

This subject helps the students to develop an understanding of the concepts and application of retail management techniques.

		Hours	Marks
Chapter 1	Retailing	04	04
1.1	Concept, Importance, Functions		
1.2	Retail as a career.		
Chapter 2	Retailformats	08	06
2.1	Store & NonStore		
2.2	Retailing		
2.3	Franchising		
2.4	Unconventional channels		
2.5	Retail expansion-need for foreign direct investment in Indian retail.		
Chapter3	Indian Vs. Global Scenario in Retail	08	06
3.1	Evolution of retail in India		
3.2	Traditional business models in Indian retail		
3.3	Drivers of retail change in India		
3.4	Key sectors in Indian Retail		
3.5	International retailing- factors contributing to it's growth		
Chapter 4	The Retail Consumer	06	06
4.1	Need for understanding consumer buying behavior		
4.2	Customer decision making process		
4.3	Factors influencing the retail shopper		
Chapter 5	Retail Strategy	06	06
5.1	Importance of strategy from a retail perspective.		
5.2	The strategic planning process		

Chapter 6	Retail Location	06	06
6.1	Factors affecting location decision		
6.2	Site Selection		
6.3	Store Design		
Chapter 7	Basics of Retail Merchandising	08	06
7.1	Concept, Importance, Functions		
7.2	Function and methods of buying for different types of organizations Introduction to Private label Brands-concept and need.		
Chapter 8	Retail Pricing	06	06
8.1	Factors affecting retail pricing decisions		
8.2	Pricing Strategies		
Chapter 9	Retail Store Operations	08	06
9.1	Concept		
9.2	Functional are as of retail operations		
9.3	Floor space management		
9.4	Managing store inventories and display		
Chapter 10	The legal and Ethical aspects of the retail business	06	04
10.1	Acts pertaining to the retail sector		
10.2	Taxation and its impact on retailing		

REFERENCE BOOKS

- 1 Retail Management, GibsonG Vedamani, and Jaico Publishing house
- 2 Retail Management, Chetan Bajaj, and Oxford University press
- 3 Retail Management Text & Cases, Sapna Pradhan, Tata Mc Graw Hill
- 4 Retail Management Text & Cases, UC Mathur, K. International Publishing house

SUBJECT CODE:SEE104					
SUBJECT: EVENT MANAGEMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

This subject helps the students to develop an understanding of the concepts and theories of application of management techniques inorganising of events.

		Hours	Marks
Chapter 1	Event Management	08	08
1.1	Introduction - Event Management		
1.2	Size of Event		
1.3	Types of Events - Cultural, festivals, religious, business etc.		
1.4	Case study of some events		
Chapter 2	Planning an Event	08	08
2.1	Principles and steps in Planning		
2.2	Consultation with client: Setting objectives, confirmation of date, list of guests, theme finalization, Event agenda		
Chapter 3	Conceptand Design	10	5
3.1	Developing the concept		
3.2	Analyzing the concept		
3.3	Designing the event		
3.4	Logistics of the concept		
3.5	Feasibility		
Chapter 4	Legal Compliance	06	05
4.1	Relevant legislations		
Chapter 5	Activities in Event Management	12	10
5.1	Pre event activities		
5.2	During event activities		

5.3	Post event activities		
5.4	Managing an event– Planning, Staging, Staging, Organizing, Leadership and Co-ordination, Controlling, Evaluation, Protocol		
5.5	Financial Considerations		
5.6	Marketing and Promotion		
Chapter 6	Planning Venues	08	05
6.1	Finding a venue, requirement of space		
6.2	Creating request for proposal		
6.3	Site inspection and confirmation		
6.4	Pre event meeting		
Chapter 7	Marketing of the Event	08	05
7.1	Tools used for marketing: advertising, publicity, Sponsorship and media.		
Chapter 8	Dealing with the Vendors	04	04
8.1	Types of vendors, choosing vendors		
8.2	Vendor contracts		

REFERENCE BOOKS

- 1 Event planning: the ultimate guide to successful meetings, corporate events, fundrai singgal as, conferences, conventions, incentives, Allen, Judy, Mississauga, Ont.
:John Wiley & Sons Canada, c2009
- 2 The event manager’s bible: how to plan and deliver an event, Conway, Des,
Oxford, 2006
- 3 Tony Rogers Conferences and Conventions: a global industry, Tony Rogers, Elsevier, 2003
- 4 Marketing Destinations and Venues for Conferences, Conventions and Business
Events, Tony Rogers & Rob, Davids on Pearson, 1998

SUBJECT CODE:SEE105					
SUBJECT: ENTREPRENEURSHIP DEVELOPMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale:

The subject aims to provide information regarding the various aspects pertaining to becoming a successful entrepreneur in the Hotel & Catering Industry.

	Hours	Marks
Chapter 1 Introduction of Entrepreneurship	10	08
1.1 Who is an entrepreneur?		
1.2 Definition of an Entrepreneur, Entrepreneurship and Intrapreneur Concept, Classification, Characteristics and skills of an Entrepreneur		
1.3 Qualities of an Entrepreneur		
1.4 “ Women Entrepreneurship “		
Chapter 2 Introduction to Entrepreneurship	10	08
2.1 Entrepreneurship as a Career		
2.2 Role of an Entrepreneur and Economic development		
2.3 Various Entrepreneurs in India and abroad		
2.4 Identifying the Opportunity (SWOT Analysis)		
Chapter 3 Market Assessment	10	08
3.1 Source of Funding to Business		
Sources of Finance-		
<ul style="list-style-type: none"> • Internal & External Funds • Personal Funds 		

	<ul style="list-style-type: none"> • Family and friends • Commercial Banks • Procedure to get loan from Various banks for Business 		
Chapter 4	Tools and Techniques of Ideation	12	10
4.1	Business plan – Steps involved from concept to commissioning		
4.2	Project report – 1. Meaning and importance		
	2. Components of project report.		
4.3	Project Appraisal -1. Meaning and definition		
	2. Technical, Economic feasibility		
	3. Cost- benefit analysis		
4.4	Risktaking		
Chapter 5	Modern Trends in Entrepreneurship	10	08
5.1	E-Commerce		
5.2	Concept and process		
5.3	Global Entrepreneur		
Chapter 6	Legal acts prevailing in India	12	08
6.1	Various acts applicable in business		
6.2	GST – Introduction		

REFERENCE BOOKS:

Sr.No.	Name of the Book	Author	Publisher
1	Entrepreneurship Theory & Practice	J.S.Saini B.S.Rathore	Wheeler Publisher
2	Entrepreneurship Development	E.Gorden k.Natrajan	Himalaya Publishing
3	Entrepreneurship Development	J.B.Patel D.G.Allampally	Tata McGraw Hill
4	A Manual On How to Prepare a Project Reports	J.B.Patel S.S.Modi	EDI STUDY MATERIAL, Gujarat,India
5	Entrepreneurship	Rajiv Roy	Oxford Higher Education
6	Principals of Entrepreneurship	Prof.Satish C.Ailawadi Mrs.Romy Banerjee	Everest Publishing House
7	Entrepreneurship	Robert D Michael P.Peters Dean A Shepherd	Tata McGraw Hill Education Private Limited,NewDelhi,Sixth Edition

SUBJECT CODE : SEE 106					
SUBJECT:FACILITY PLANNING (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale

To introduce students to the fundamentals of planning and design related to hotel operation areas.

		Hours	Marks
Chapter 1	Introduction to Planning and Designing	08	10
1.1	Principles of planning and designing		
1.2	Trends in catering		
1.3	Time and motion study		
Chapter 2	Building and Exterior Facilities	08	10
2.1	Roof, exterior walls, windows and doors		
2.2	Structural frame & foundation.		
2.3	Elevators.		
2.4	Storm water drainage systems, utilities.		
2.5	Landscaping and grounds		
Chapter 3	Parking Areas	08	10
3.1	Parking lots		
3.2	Structural features		
3.3	Lay out considerations		
3.4	Maintenance		
3.5	Parking garages		
3.6	Accessibility requirements for parking areas		
3.7	Valet parking.		
Chapter 4	Lodging Planning and design	16	10
4.1	Development process		
4.2	Feasibility studies		
4.3	Space allocation programme		
4.4	Operational criteria		
4.5	Budget		
4.6	Preliminary schedule		

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- 4.7 Site design
 - 4.8 Hotel design
 - 4.9 Guestrooms and suites
 - 4.10 Lobby
 - 4.11 Food and beverage outlets
 - 4.12 Function areas
 - 4.13 Recreational facilities
 - 4.14 Back of the house areas

Chapter 5 Food Service Planning and Design 08 10

- 5.1 Concept development
- 5.2 Feasibility
- 5.3 Regulations
- 5.4 Planning layout
- 5.5 Receiving areas
- 5.6 Storage areas
- 5.7 Kitchen
- 5.8 Office space
- 5.9 Sample blue print

REFERENCE BOOKS

1. Hospitality Facilities management, David M. Stipanuk, Educational Institute, and Design, Harold Roffmann, AHMA
2. How things work–The Universal Encyclopedia of Machines. Volume 1&2
3. The Management of Maintenance, Frank D. Borselink & John Willey & Engeneering system’s in the Hospitality Industry, Alan T. Status., Sons Inc. NY
4. Air Conditioning Engieering, W.P.Jones, English Language Book, Society Edword Arnold
5. Building Construction, Sushil Kumar, Standard Publishers, Distributors, Delhi
6. The Complete Guide to DIY and Mike Lawrence, Orbis Publishing Ltd. UK, Maintenance Home

Assignments

Assignments based on all the above topics to bedone.

SUBJECT CODE:SEE107					
SUBJECT:SKILL ENHANCEMENT FOR MEDIA & JOURNALISM IN HOSPITALITY					
Teaching Scheme/Week	Examination Scheme				
PracticalHours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	--	--	50	50	04

Rationale

The subject in to develop creative writing skills among hospitality students

The students are expected to utilize the allotted hours in the following activities:

- Book reading and discussion (Atleast2)
- Exploring journals/literature in the digital /electronic media(Atleast4)
- Writing a travelogue (Atleast2)
- Writing are view of a book or are staurant(Atleast4)
- Creating promotional material such as posters, pamphlets etc.forth evarious curricular as well as extra curricular events of the institute.(Atleast4)

DSC 302 / 302 A

CO1 - Understand classification of Alcoholic beverages

CO2 - Differentiate between non-alcoholic beverages.

CO3 - Understand manufacturing process of liqueurs and bitters

CO4 - Identify types of glassware

CO5 - Acquire skills for service of Beer, Wine, Spirits, Liqueurs, Bitters, Cocktails and Cigars

CO6 - Implement the knowledge in wine and food pairing

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development

SUBJECT CODE: DSC302					
SUBJECT: INTRODUCTION TO BEVERAGE SERVICE (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Rationale

To impart comprehensive knowledge about various fermented & distilled alcoholic beverages such as wines, aperitifs, spirits, liqueurs & bitters.

		Hours	Marks
Chapter 1	Non Alcoholic Beverages	10	20
1.1	Classification		
1.2	Hot Beverages- Types, Production and		
1.3	Service Cold Beverages- Types, Production and Service		
Chapter 2	Aperitifs	04	04
2.1	Definition		
2.2	Types- Wine Based, Spirit Based		

2.3	ServiceofAperitifs		
2.4	Brands		
Chapter3	IntroductiontoFermentedAlcoholicBeverages	06	08
3.1	Wine-Classification,Brands		
3.2	Beer-Classification,Brands		
3.4	Sake-Classification,Brands		
Chapter 4	IntroductiontoDistilledAlcoholicBeverages	10	12
4.1	Brandy-Classification,Brands		
4.2	Rum-Classification,Brands		
4.3	Vodka-Classification,Brands		
4.4	Gin-Classification,Brands		
4.5	Whisky-Classification,Brands		
4.6	Tequila-Classification, Brands		
Chapter 5	IntroductiontoCocktails	06	06
5.1	Methods of Making		
5.2	CocktailsGoldenRules		
5.3	ClassificationofCocktails		
5.4	ExamplesofCocktails		

Chapter6	IntroductiontoOtherBeverages	06	06
6.1	Arrack,Aquavit,Schnapps,FruitBrandies,Pastis,Kirsch		
6.2	Feni,Calvados,Korn,Doppelkorn,Cordials		
Chapter7	IntroductiontoLiqueur	03	05
7.1	Introduction,Manufacturing		
7.2	Types		
7.3	Brands		
Chapter8	IntroductiontoBitter	03	04
8.1	Introduction,Manufacturing		
8.2	Types		
8.3	Brands		
Chapter9	Tobacco	03	05
9.1	IntroductiontoTobacco		
9.2	TypesofTobacco		
9.3	ManufacturingofTobacco		
9.4	CigarandCigarettes		
9.5	Brands		
9.6	Service		

GlossaryofTerms

Perrier	AngosturaBitters	
	AmerPiconUnderberg	
	FernetBranca	Campari
Pernod	Aperitif	Unicorn
Pastis	Bitters	Malt
Grist	Kilning	Draftbeer
Wort	Hops	
		Wei
		ssbier
		/Weizen
		bier
Mash	Lager	Cider
Mash-Tun	Ale	Perry
Brewing	Stouts	Sake
Micro-brewery	Porter	
	CalvadosHops	Bottle-
conditionedbeer	Esters	

SUBJECTCODE:DSC302					
SUBJECT:INTRODUCTIONTOBEVERAGESERVICE(PRACTICAL)					
TeachingScheme/Week		ExaminationScheme			
TheoryHours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
04	40	60	-	100	04

Sr.no	Topic
1	TypesofGlasswareusedin beverageService
2	ServiceofNonAlcoholicBeverages (Hot&Cold)
3	ServiceofAperitifs
4	Serviceof WinesSettingupcoverformenu withwines
5	ServiceofBeer–ServiceTemperature,Equipment,Procedure,Brands
6	ServiceofBrandy
7	ServiceofRum
8	ServiceofVodka
9	ServiceofTequila
10	ServiceofGin
11	Serviceof Whisky
12	ServiceofLiqueur
13	CompilingaWine&otherdrink list
14	ServiceofCocktails
15	Typesofbitter andserviceofbitter &otheralcoholicbeverages
16	ServiceofCigar&Cigar

Assignment

Minimumoftwoassignments tobesubmittedby studentsbythe endofthesemester.1)Wines from New world countries (USA, Australia, Africa and New Zealand)2)Pricelist of wines fromtwo outlets.

3)Indianwinesbrandnamesandprices

4)PricelistofBeerfromtwooutlets

5)Prepareawine& other alcoholicbeverageslist.

List& giverecipe of10 cocktails ofdifferent base: Vodka,Rum, Tequila,Brandy,Whisky

DSC 303 / 303 A

CO1 - Understand the concepts

& principles of making different types of flower arrangements used in hotels.

CO2 - Determine various pests and understand the eradication and prevention techniques.

CO3 - Learn the concept, advantages and disadvantages of contract services in housekeeping department.

CO4 - Learn various types of safety and security measures used in hotel industry.

CO5 - Analyse purchase, storage and issue of housekeeping supplies, linen, cleaning agents and cleaning equipment.

CO6 - Know the use and importance of inspection checklist.

CO7 - Understand the importance of pest control and horticulture in the hotels.

CO8 - Know the technique of making different types of flower arrangements used in hotels.

CO9 - Understand the standard procedure of taking inventories of stock.

CO10 - Understand the use of Material Management System with the help of software.

CO11 -

Understand the importance and use of Store requisition and other records used in housekeeping store.

CO12 - Know the importance of Key Control and safety procedures.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Skill Development
CO9	Skill Development
CO10	Skill Development
CO11	Skill Development
CO12	Skill Development

SUBJECT CODE: DSC303 A

SUBJECT: ALLIED HOUSEKEEPING FUNCTIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60		100	01

Rationale

The Subject aims to establish the importance of housekeeping operations and its role in the hospitality industry. It also prepares the student to acquire knowledge of the operational aspects in housekeeping.

		Hours	Marks
Chapter 1	Hospitality and Flower Arrangement	06	12
1.1	Concept and importance		
1.2	Principles, Types and Shapes of flower arrangement		
1.3	Types of Indoor and Outdoor plants used in hotels		
1.4	Tools, equipments and accessories used in horticulture and flower arrangements		
1.5	Conditioning of plant material		
Chapter 2	Pest Control	04	08
2.1	Types of Pest		
2.2	Preventive and control measures		
Chapter 3	Contract Cleaning	04	08
3.1	Definition, concept		
3.2	Jobs given on contract by Housekeeping		
3.3	Advantages and disadvantages		
3.4	Pricing of Contracts		
Chapter 4	Safety and Security Processes	06	10
4.1	Safety of guest and guest property		
4.2	Safety of hotel property and employees		
4.3	Prevention of accidents		
Chapter 5	Purchasing Systems	06	10
5.1	Types of purchasing		
5.2	Purchase procedure for housekeeping supplies, linen, cleaning agents and cleaning equipments		
Chapter 6	Housekeeping Stores	06	10
6.1	Store requisition		
6.2	Issuing and control of materials		
6.3	Inventory Control and Stocktaking		

Glossary of Terms

Conditioning	Fillers	Foliage
Kenzan	Ikebana	Hogarth curve
Mechanics	Moribana	Nagiere
Oasis	Bonsai	Hardscape
Perennials	Horticulture	Landscape
Trellis	Patio	Deck
Turf	Pest	Fumigation
Dryrot	Rodent	Pesticutor
Wetrot	Silverfish	Osh Standards
Recycled	Non Recycled	Store
indent inventory items	inventory items	Lead
time Purchase order	Stores requisition	Pass key
Grandmaster key	Emergency key	Floor master
key Contract	Stocktaking	Outsourcing
Charge Back	Contract Specification	

SUBJECT CODE: DSC303 A					
SUBJECT: ALLIED HOUSEKEEPING FUNCTIONS (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60		100	01

- Using a Room and public area inspection checklist
 - Cleaning of a Guestroom and public area.
 - Checking of the Guestroom and public area using a checklist.
- Flower Arrangements
 - Demonstration of various styles and shapes of flower arrangements.
- Flower Arrangements
 - Preparation of various styles and shapes of flower arrangements.
- Introduction to Horticultural aspects.
 - Visit to greenhouse for identification of indoor plants used in hot

els.

- Identification of outdoor plants used in hotels.
 - Identification and use of foliage in flower arrangements.
5. Special decorations for functions in hotel
- Preparations for events organized in hotels—floral rangolis, garlands, tinsel and miscellaneous decorations.
6. Inventory and stock taking of room and cleaning supplies
- Requisition procedure
 - Calculating par stock
 - Stock taking or physical inventory of room and cleaning supplies.
 - Documentation of supplies inventory.
 - Cleaning of housekeeping stores.
7. Using housekeeping software for material management
8. Various methods of pricing contract
9. Pest control demonstration.
10. Standard operating Procedure at housekeeping
- Handing of keys
 - Safety of Guests & Guests Property

-
- Safety of Hotel Property & employees
- 11. Standard operating Procedure at housekeeping**
- To eliminate workplace hazards

ASSIGNMENTS

1. Indoor and outdoor plants used in hotels.
2. Presentation on assignments with the use of Audio Visual aids

DSC 304 / 304 A

CO1 - Learn Importance of the front office accounting system, Types of accounts, Vouchers, Folios & Ledger.

CO2 - Enhance the knowledge of cash and credit handling through front office cashiering.

CO3 - Understand the process of a Night Audit.

CO4 - Learn various types of room rates and methods used to establish room rate.

CO5 - Understand the importance of forecasting and various types of forecasting used in front office department.

CO6 - Understand the Calculations of various statistical data using Formulae in front office.

CO7 - Know how to use software for accounting and preparing MIS at front desk.

CO8 - Understand the importance and use of various vouchers at front desk.

CO9 - Learn various techniques used for credit control at various stages of guest stay.

CO10 - Gain knowledge about calculation of statistics of hotel performance and understand the procedure of Night Auditing.

CO11 - Learn to prepare forecast of occupancy.

CO12 - Know how to calculate room rate with the help of Hubbart's formula.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Skill Development
CO9	Skill Development
CO10	Skill Development
CO11	Skill Development
CO12	Skill Development

SUBJECT CODE: DSC304	
SUBJECT: FRONT OFFICE ACCOUNTING (THEORY)	
Teaching Scheme/Week	Examination Scheme

TheoryHours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
02	40	60		100	0

Rationale

It prepares the student to acquire knowledge of the operational aspects in front office. It also prepares the student to acquire basic skills and knowledge necessary related to front office accounting.

		Hours	Marks
Chapter1	FrontOffice Accounting	06	10
1.1	Importanceofthefrontofficeaccounting system		
1.2	Typesofaccounts		
1.3	Vouchers		
1.4	Folios		
1.5	Ledger		
1.6	Thefront officeaccounting cycle		
1.7	Useof computersin frontofficeaccounting		
Chapter2	CreditControlpracticesatfrontdesk	06	10
2.1	Objectiveofcreditcontrol		
2.2	Hotelcreditcontrolpolicy		
2.3	Creditcontrolmeasuresatcheck-in		
2.4	Creditcontrolmeasures duringoccupancy		
2.5	Creditcontrolmeasuresatcheckout andafter guestdeparture		
Chapter3	Calculation of various Statistical data usingformula	06	10
3.1	ARR,Room Occupancy%, DoubleOccupancy%,BedOccupancy%,Foreignoccupancy%,Local		
3.2	Occupancy %House Count, House Position,etc.		

3.3	Reports – DRR, Revenue Report, DailyOccupancyReport		
Chapter4	NightAuditor	04	10
4.1	Conceptof NightAudit & RoleofNight Auditor		
4.2	NightAuditorsReport		
Chapter5	EstablishingRoomRates	06	10
5.1	Rule of		
5.2	ThumbHubbart'sf		
5.3	ormula		
	MarketconditionApproach		
Chapter6	ForecastingRoomAvailability	04	10
6.1	Benefitsofforecasting		
6.2	DataRequiredforforecasting		
6.3	RecordsRequiredforforecasting		
6.4	RoomAvailabilityforecast.		
6.5	Typesofforecast&theirsampleformat		

GlossaryofTerms

ARR	RevPar	Yield
ARG	DRR	Re-capitulationsheet
Transcript	HighBalance	High
DebtHousecount	CityLedger	House
limitOverstay	Noshow	Understay
Stayover	CashPaidout	Rule of
ThumbHubbart'sFormulaForecasting		
Management		
AccountMarketConditionap		
proach		

SUBJECTCODE:DSC304 A					
SUBJECT:FRONTOFFICEACCOUNTING(PRACTICAL)					
Teaching	ExaminationScheme				
TheoryHours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
02	40	60		100	01

1. Use of computers in front office accounting
Practice on use of front office software for accounting at front desk.
2. Using and making various vouchers used at front desk
Role play of situations pertaining to using and making vouchers like Allowance voucher, VPO, Cash voucher and miscellaneous vouchers.
3. Credit control practices at front desk
Role play of situations pertaining to credit control practices during reservations.
Role play of situations pertaining to credit control practices during arrival.
4. Credit control practices at front desk
Role play of situations pertaining to credit control practices during occupancy. Role play of situations pertaining to credit control practices during checkout.
5. Preparing a Night Auditors Report.
6. Calculations of various statistical data using Formulae ARR, RevPar, Room Occupancy%, Double Occupancy%, Bed Occupancy%, foreign occupancy%, Local Occupancy%
7. Calculations of various statistical data using Formulae Bed Occupancy%, Foreign occupancy%, Local Occupancy%, Graphical presentation.
8. Preparing Weekly & Monthly forecasts.
9. Using Hubbart's formula for calculating room rate
10. Using front office software for MIS reports
Budgetary reports, Occupancy reports, Income and expenditure reports, forecasting reports etc.

11. Situations dealing with guest problems

Roleplay of situations pertaining to guest problems and emergency situations like bomb, terrorist attack, fire, death and natural disasters.

ASSIGNMENTS

1. Calculation of various statistical data using formula and graphical representation.

Hubbart's Formula for calculating Room rate.

DSC 401

CO1 - gain practical understanding of the daily operations of the host organization (hospitality)

CO2 - understand the interdepartmental functions of the organization.

CO3 - acquire knowledge, hands-on experience and improve skills for effective performance in the area of specialisation.

CO4 - know the desirable profile for the industry and help students prepare for it.

CO5 - make informed career choices.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development

SUBJECT CODE: DSC					
SUBJECT: INDUSTRIAL EXPOSURE & REPORT-II					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
54	--	120	80	200	21

In the Eight semester the students shall undertake industrial training for a period of 11 weeks, reputed hotel, and restaurant or hospitality organization.

The institute shall assist in the placement of students for training in various hotels. The student can make self arrangement to train in any hotel of his choice. The student will have to bear the necessary expenses involved for the same.

At the end of the industrial training the student shall submit Training Report along with the logbook maintained on a daily basis during the period of training and the performance appraisal from each department.

The training report is to be prepared by the student in two copies and to be submitted to the Training & Placement Officer within the stipulated time for assessment.

The report will be assessed by the internal examiner and only on the basis of a certificate of the examiner concerned that the training has been satisfactorily completed would the student be allowed to appear for the external assessment.

conducted by a panel of examiners comprising of one external examiner (the external would include preferably one from the hotel industry of the level of Head of the Department and above) and one internal examiner. The Continuous Assessment marks will be awarded based on the performance appraisals filled by the hotel managers.

The student is required to practice the discipline & norms laid down by the institute and also follow the rules and regulations of the hotel in which he/she is undergoing training. Any adverse remark from the hotel will call for stringent action.

DSC 401

CO1 - gain practical understanding of the daily operations of the host organization (hospitality)

CO2 - understand the interdepartmental functions of the organization.

CO3 - acquire knowledge, hands-on experience and improve skills for effective performance in the area of specialisation.

CO4 - know the desirable profile for the industry and help students prepare for it.

CO5 - make informed career choices.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development

SUBJECT CODE: DSC401-(I)					
SUBJECT: INDUSTRIAL EXPOSURE & REPORT					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
54	--	120	80	200	37

In the Fourth semester the student shall undertake industrial training for a period of 22 weeks, reputed hotel, and restaurant or hospitality organization.

The institute shall assist in the placement of students for training in various hotels. The student can make self-arrangement to train in any hotel of his choice. The student will have to bear the necessary expenses involved for the same.

At the end of the industrial training the student shall submit Training Report along with the logbook maintained on a daily basis during the period of training and the performance appraisal from each department.

The training report is to be prepared by the student in two copies and to be submitted to the Training & Placement Officer within the stipulated time for assessment.

The report will be assessed by the internal examiner and only on the basis of a certificate of the examiner concerned that the training has been satisfactorily completed would the student be allowed to appear for the external assessment conducted by a panel of examiners comprising of one external examiner (the external would include preferably one from the hotel industry of the level of Head of the Department and above) and one internal examiner. The Continuous Assessment marks will be awarded based on the performance appraisals filled by the hotel managers.

The student is required to practice the discipline & norms laid down by the institute and also follow the rules and regulations of the hotel in which he/she is undergoing training. Any adverse remark from the hotel will call for stringent action.

DSE 101 / 101 A

- CO1 - Gain understanding of the functions, layout, equipments and measures of larder control.
 CO2 - Enhance understanding of Hors d'oeuvres & sandwiches.
 CO3 - Acquire knowledge of Charcutière and the process of curing and smoking.
 CO4 - Visualize and understand the cuts of meats and appropriate cooking methods of the same.
 CO5 - Learn about Custards, Puddings and frozen desserts.
 CO6 - Learn preparation of Hors d'oeuvres.
 CO7 - Learn preparation of Sandwiches.
 CO8 - Learn to prepare different puddings and custards.
 CO9 - Learn to set up a Cold buffet.
 CO10 - Learn to cook various meats along with appropriate methods.
 CO11 - Learn through demos of various cold cut preparations.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Skill Development
CO9	Skill Development
CO10	Skill Development
CO11	Skill Development

SUBJECT CODE: DSE101					
SUBJECT: LARDER (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Rationale

This subject intends to develop knowledge and skills required for Garde Manger work and preparation of frozen desserts.

		Hours	Marks
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Chapter 1	LeGarde Manger	04	06
1.1	Definition		
1.2	Functionsoflarderdepartment		
1.3	Breakdownoflarderdepartment		
1.4	ResponsibilitiesofChefGradeManger		
1.5	LarderControl		
1.6	LiasonwithKitchenand Pastrydepartment		
1.7	Layoutof larder inahotel		
1.8	Equipmentsandtoolsusedinlarder department		
Chapter 2	Horsd'oeuvres	03	04
2.1	Typesofhorsd'oeuvres: HotandCold-Canapes, Cocktailsrelishes		
2.2	Miscellaneoushorsd'oeuvres-Antipasto, Bruschetta, Tapas, Amusebouche		
Chapter 3	MeatCookeryandPoultry	10	10
3.1	Composition&Structure		
3.2	QualityofMeat		
3.3	Factorsaffectingflavorandtenderness		
3.4	Cookingofmeat		
3.5	Selection,Cuts,approximateweightsandmethodsof cookingofthe following-Lamb, Pork,Beefand Veal		
3.6	Poultry-Selection,Cutsanduses		

Chapter4	CuringandSmoking	02	02
4.1	IngredientsusedforcuringfoodsC		
4.2	uring methods		
4.3	Smoking		
Chapter 5	Charcuterie	05	06
5.1	Bacon – Cuts &		
5.2	usesHam–		
5.3	Types&uses		
5.4	Differentiation–		
5.5	Ham,Bacon&GammonForcemeats – Types Sausages –Composition,Classification&types		
Chapter6	Pate,Terrines andothercold foods	05	06
6.1	DutiesandresponsibilitiesofChefduFroid		
6.2	Aspic– Definition,function andtypes		
6.3	Chaufroid-definations,types		
6.4	Usingaspicjellyandchaufroidsauce		
6.5	PateandTerrines-defination,preparationand difference		
6.6	GallantineandBallotine- definition,preprationand difference		
6.7	MousseandMousseline- definition,preprationand difference		
6.8	Assemblyofcoldbuffet		
6.9	Smorgasbord		
Chapter7	Creams,Custard,PuddingsandFrozenDesserts	04	06
7.1	BasicCustard		
7.2	Pastrycream-definition,preprationandvariations		
7.3	Puddingtypes		
7.4	Bavarians,Chiffons,MoussesandSouffles		
7.5	Frozendesserts-classifaication,popularice-cream desserts		
7.6	Dessertsauces		
Chaper8	CulinaryTerms	04	06

	Anglaise Abattis Beignet Charlotte Dariole Foe Gras Meringue Praline Rataouille Force me Kedgerie Crepinets Civet Ma cerate Muesli Bombe Lar dons Sauer karat Blanquette Qubus Baveuse	Assaisonner Ballotine Bouchee Chiffonade Duxelle Jar diniere Navarin Provencale Timbale Rollmops Raspings Tournedos Tournedos Gnocchi Nage eige Compote Panache Sals Sunda e Moussaka Waffles	Ateraux Barder Blondir Coulis Panada Nori Papillote Quenelle Darois Frizzling bonnettes Fleurons Zakuski Sippets illage Tapenade Piquante Daube Crepes Paella Blackpudding	Aspic Bavarois Chantilly Crecy Farcir Jus-lie Parfait Quiche Crudite Baba Jam Zaku Matelote Taboulleh Tripe Past Dashi Zabaglione Baron Shaslik Falafel Truffles		
Chaper9	MeatCookeryand Poultry			12	12	
9.1	Composition&structure					
9.2	Qualityofmeat					
9.3	Factorsaffectingflavorandtenderness					
9.4	Cookingofmeat					
9.5	Selection,cuts,approximateweightandmethodsof cookingofthefollowing: Lamb,Pork,Beef,Veal					
9.6	Poultry-Selection,cutsanduses					

SUBJECTCODE:DSE101A

SUBJECT:LARDER(PRACTICAL)					
TeachingScheme/Week	Examination Scheme				
TrainingHours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
04	40	60	-	100	04

Minimum 20 practicals of Advanced Continental menus to be conducted.

Menus may be designed so as to cover classical appetizers, soups, sandwiches, main course, accompaniments, salads and desserts relevant to the theory covered in classroom sessions.

Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

DSE 102 / 102 A

CO1 - The classification of alcoholic beverages

CO2 - Acquire knowledge of manufacturing process of wine & beer

CO3 - Learn about the production process of Cigar & Cigarettes

CO4 - Learn the classification of Bitter and its service.

CO5 - Identify glassware, & equipments required for beverage service

CO6 - Serve wines, liqueurs, Aperitifs, bitters & Beers

CO7 - Enhance knowledge on Menu planning with Food & Beverage Harmony

CO8 - Learn the role of Sommelier & taking wine orders.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Skill Development

SUBJECT CODE: DSE102					
SUBJECT: ALCOHOLIC BEVERAGES-I (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Training Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	-	100	04

Rationale:

The students will gain comprehensive knowledge about various types of wines, aperitif and beers.

		Hours	Marks
Chapter 1	Alcoholic Beverages	16	16
1.1	Introduction to alcoholic beverages		
1.2	Manufacturing process - Fermentation, Distillation and Brewing		

1.3	Classification of alcoholic beverages- Wines, Spirits and Brewed beverages		
1.4	Aperitifs- Wine based and spirit based		
1.5	Liqueurs- digestifs and after meal drinks		
Chapter 2	Fermented Alcoholic Beverages	16	16
2.1	Wines		
2.2	Viticulture and its methods, wine diseases		
2.3	Vinification- Still, Sparkling, Natural, Fortified and Aromatized wines.		
2.4	Wines of France, Italy, Spain, Africa, Australia, USA and India		
2.5	Food and wine Harmony		
2.6	Wine Glasses and equipments		
2.7	Storage and service of wine		
2.8	BOT and Beverage Control		
Chapter 3	Brewed Beverages- Beer	16	16
3.1	Manufacturing process of beer		
3.2	Types of Beer- Bottled, Canned and Draught		
3.3	Famous Brands- International and Indian		
3.4	Other Fermented and Brewed beverages- Cider, Perry		
3.5	Sake		
3.6	Glassware and equipments		
3.7	Service of Beer		
Chapter 4	Tobacco	08	06
4.1	Cigar and Cigarettes		
4.2	Types of Cigar and production of cigars		
4.3	Cigar- strength and sizes		
4.4	Brand names, Storage and service		
Chapter 5	Bitters	08	06
5.1	Introduction- Types and Classification of bitters.		
5.2	Manufacturing of bitters.		
5.3	Brands, use and service of bitters.		

Glossary of Terms

Distillation

Congeners

Blending

Cognac

Aqua- vitae

Pot Still

Coffee Still

Armagnac

Foreshots

Maturing

Bonne chauffe

Brouillis

Ageing	AngelsShare	FineMaison
GrandeFineChampagne	FineChampagne	Old Liqueur
CognacVSOP	NapoleanBrandy	Grappa
Horsd'age	Marc	Peatsreek
GrainWhiskey	Ouzo	Malt
WhiskeySingleMalt	BlendedWhisky	RyeWhisky
Dunder	VattedMalt	Bagasse
Schnapps	WhiteRum	DarkRum
Wine	AromatisedWine	Agave
BlueWine	Blush Wine	Vine
Champagne	SparklingWine	FortifiedWine
Asti Spumante	Vinsmousseux	JackDaniels
Vinhocoto	PiscoLondon	DryOldTomGin

SUBJECTCODE:DSE102A					
SUBJECT:ALCOHOLICBEVERAGES-I(PRACTICAL)					
TeachingScheme/Week	Examination Scheme				
TrainingHours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
04	40	60	-	100	04

Srno	Topic
1	Identificationof Glassware, Winebottlesandequipment'srequiredfororservice
2	ServiceofAperitifs
3	ServiceofLiquors
4	Readingwinelabel
5	Serviceofwinered,white(temperature, equipment,procedureandbrands)
6	Serviceofwineoldoldredwine(decantingofwine),(temperature, equipment,procedureand brands)
7	Serviceofwinerose, Fortified(temperature,equipment,procedureandbrands)
8	Service of champagne(classification, temperature, equipment, procedure andbrands)
9	Foodandwineharmonytraditionalandmodernapproachtowineandfoodmatching
10	PlanningofFrenchclassical menuwithwines
11	Serviceofcigarsand cigarettes

12	Draught/Draftbeardandserviceofdraftbeer
13	Serviceofbeerbottle,canned
14	Bitterstypesofbittersandusesofbitters
15	PreparingtheBeverage Menucard
16	Preparingthebeverage menu card roleofSommelierintakingwine orderspreparingB.O.T

Eau- de – vieBourbonGoldTequilaAbsintheRicard

DSE 103 / 103 A

CO1 - Understand the elements of Interior designing, Refurbishing and Restoration.

CO2 - Learn calculation of Par stock & Inventory.

CO3 - Know the standard contents of a guest room in a hotel.

CO4 - Learn Sales techniques and role of Sales in Marketing Departments.

CO5 - Understand the importance of Hospitality and maintaining quality in delivery of services.

CO6 - Know the use of latest technology in hotels.

CO7 -

Know the different colour schemes used in interior decoration of guest rooms and public areas in hotel.

CO8 - Understand the use of snag list.

CO9 - Gain knowledge about various aspects of Interior Decoration.

CO10 - Know the selling techniques like USP, up-selling and suggestive selling used at front desk.

CO11 - Understand the importance of advertisement and repeat business.

CO12 - Know the facilities offered to MICE clients.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Skill Development
CO9	Skill Development
CO10	Skill Development
CO11	Skill Development
CO12	Skill Development

SUBJECT CODE: DSE103					
SUBJECT: ACCOMMODATION OPERATIONS (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

The subject aims to introduce students to the elements of interior design of guest rooms and public areas with respect to colour, lighting, window treatment, floor and wall finishes. It helps the student to understand sales techniques and role of sales and marketing department.

		Hours	Marks
Chapter1	ParstockCalculationandInventory	04	04
1.1	Linen		
1.2	Uniform		
1.3	GuestSuppliesandconsumables		
1.4	Cleaningsuppliesandconsumables		
1.5	Stocktakingandinventory		
Chapter2	Standard contentsofaguestroom	06	06
2.1	Guestroomfurniture		
2.2	Standardfurnitureandroomsizes		
2.3	Furniturearrangementinguestrooms		
2.4	Guestroomfixturesandfitting		
2.5	Beds,mattressesandbedding		
2.6	Softfurnishings		
2.7	Accessories		
Chapter3	InteriorDesigning	06	06
3.1	Importance&Definition		
3.2	PrinciplesofDesign		
3.3	ElementsofDesign-Line/Form/colour/texture		
Chapter4	Refurbishing&Redecoration	04	04
4.1	Definition		
4.2	Factors		
4.3	Snagginglist		

Chapter5	InteriorDecoration	20	20
5.1	Colour: ColourWheel,Colourschemes(usedin hotelareas),Psychologicaleffectsofcolour		
5.2	Lighting: Type/classification/importance, Lightingforguestrooms&public areas		
5.3	Windowand WindowTreatment: Different typesofWindows,Curtains&Draperies,VAlance, swags,Blinds		
5.4	Floorfinishes& wallcoverings: Classification/Types Characteristics&use Selectioncriteria Cleaningprocedures-Agentsused/polishing/ Burnishing,Floorseals Carpets-Types,selection,care& maintenance Types&functionsofwallcoverings		
Chapter6	Hospitality	04	04
6.1	ImportanceofHospitality		
6.2	Managingthedelivery ofHospitality		
6.3	Developingaservicemanagementprogramme		
Chapter7	HotelTechnology	06	06
7.1	Technologyinguestroom-cost&benefits		
7.2	Lockingsystem		
7.3	Energymanagementandclimatecontrolsystem		
7.4	Networkfirealarmsystem		
7.5	Communicationsystems		
7.6	Othertechnology-Inroomentertainmentsystem, controlpanels		
Chapter8	SalesTechniques	04	04
8.1	Varioussalestoolsandsalestechniques- Upselling &suggestiveselling,offeringalternatives		
8.2	RoleofFront officestaff to maximizeoccupancy		
8.3	Businessrelatedmarketingtechniques-CVGR, Tour,MICEbusiness,handlingofgroupand corporatesales		
Chapter9	ManagingGuestservices	06	06
9.1	Totalqualitymanagement inhotel		
9.2	TherealcomponentsofTotalQualityManagement		
9.3	Measuringguestservices		
9.4	Customerrelationshipmanagement		

Glossary of Terms

Dado	Atrium	Valence
Cornice	Cascade	Swag
Pelmet	Terrazzo	Granolithic
Tessellated tiles	Anaglypta	Lincrusta
Anglepoise	CFL	LED
Parquet	Pile	Wilton
PVC	Chenille Axminster	Axminster
Shoji screen	Supaglypta	Tint
Tufted carpet	Broadloom carpet	Persian carpet
Pile bonded carpet	Bay window	Bow window
Plantation window	Dalhousie	Attic window
Louvers	Venetian blinds	Skylights
Refurbishing	Renovation	Underlay
Soffit lighting	Diffused lighting	Incandescent lighting
Tertiary colours	Bolsters	Shams
Triad	Accents	Upselling
Upgrading	MICE	USP
Hospitality	Moment of truth	Point of sale
TQM	CRM	AIOD
ATM	EDP	HOBIC
HITIS	LEED	Moment of truth
Opaque	WATS	PIP
Quality assurance	Quality circle	VoIP
ELS	RFID	CAS
OTA	Biometric lock	

SUBJECT CODE: DSE103A					
SUBJECT: ACCOMMODATION OPERATION (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	--	100	02

1. Drawing of colour wheel, identification of different types of colours.
2. Identification of different types of colour schemes.
3. Planning and designing colour schemes for - Different types of rooms and suite rooms.
4. Planning and designing colour schemes for the public areas of a hotel.
5. Preparation of a Snagging list.
6. Designing of various floor coverings for guest rooms and public areas.
7. Designing of various wall coverings for guest rooms and public areas.
8. Designing of various curtains and draperies for guest rooms and public areas.
9. Designing a lighting plan for guest rooms and public areas.
10. Role play of situations pertaining to USP in selling rooms, Upgrading of guests.
11. Role play of situations pertaining to upselling, suggestive selling.
12. Role play of situations pertaining to Business techniques for CVGR and Groups.
13. Comparison of hotel Advertisements - Business hotel, Heritage hotel, Resort.
14. Comparative study of MICE destinations, Convention hotels.
15. Role play of situations pertaining to repeat clientele.
16. Role play of situations pertaining to offering alternatives to guests.

Assignments

1. Field visits related to above topics.
2. Assignment on floor finishes (sample to be collected)
3. Assignment on wall coverings (sample to be collected)
4. Assignment on soft furnishings. (sample to be collected)
5. Assignment on different types of windows and window treatments.
6. Assignment on lighting systems in guest rooms and public areas.
7. Collection of brochures and tariff cards of different types of hotels.
8. Designing a brochure for - A Business hotel, Heritage hotel, Resort.
9. Designing a model for guest room, restroom and public areas.

Presentation on above topics with use of audiovisual aids.

DSE 201 / 201 A

CO1 - Understand the religious food ethos followed in India.

CO2 - Understand the principles of ayurveda in food.

CO3 - Understand the role of spices & masalas used in Indian cooking.

CO4 - Learn the various regional cooking styles of India with reference to geographical locations, historical influence, availability of ingredients and staple diet.

CO5 -

Acquire specialised skills and techniques required for preparation of various regional Indian cuisines.

CO6 - Learn to prepare popular regional Indian dishes.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development

SUBJECT CODE: DSE201

SUBJECT: REGIONAL CUISINES OF INDIA (THEORY)

Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale:- This subject will give the students an insight into the Indian food ethos, Indian spices, masalas, as well as promote and understanding of regional Indian cuisine

		Hours	Marks
Chapter 1	Indian Food Ethos	04	06
1.1	Indian food ethos- Jainism, Buddhism, Hinduism, Sikhism, Muslim, Jewish, Christianity		
Chapter 2	Indian Spices and Ingredients	04	04
2.1	Role of Indian spices and ingredients in Indian cooking		
Chapter 3	Food and Ayurveda	04	06
3.1	Introduction to Ayurveda		
3.2	Body Constitution Types of Prakriti		

3.3	Tridosa –Vata,Pitta,Kapha Lifestyle related eating habits – Healthy, eating habits Satvik,Rajas,Tamas diet Incompatible foods Fast Food		
Chapter 4	Basic Masalas	02	06
4.1	Role of masala in Indian cuisine.		
4.2	Different masalas used in Indian cooking – wet and dry.		
4.3	Composition of different masalas – garam masala – garam masala, sambar masala, rasam powder, chat masala, dhansak masala, goda masala, malawa masala, kashmiri masala.		
4.4	Proprietary masala blends		
Chapter 5	Regional Cooking Style	24	26
5.1	Cooking from different states with reference to		
5.2	• Geographical location		
5.3	• Historical background		
5.4	• Seasonal availability of raw material		
5.5	• Special equipment and fuels		
	• Staple diet & popular food preparations.		
	For the following cuisines/ states		

	1) Goan 2) Maharashtra 3) Gujrati/ Parsi 4) Karnataka 5) Bengali 6) Punjabi 7) Andhra/Hyderabad	8) Rajasthani 9) Tamilnadu 10) Kashmiri 11) Lucknowi 12) Kerala 13) Sindhi			
Chapter6	CulinaryTerms		04	06	
	Kahwah Sandesh Loochi Sorpotel Panchphoran AppamBrista Raita Tikka Kari Khansamah Murabba Rista Chenna Kabachini Kalan Tandoor Malpua Roganjosh Vindaloo Zarda Bhurta Rabarhi Pakora Shikampurikebab Khichri Dosa Baghar Yakhni Achar	Wazwan Toddy Shukto Payassam Shikora Ponga SeekhKebab Naan SaunthGustaba Petha Dopyazaa RaamMussallum Bharwaan Imarti KachoriKheema Bhatura Ittr Burfi Moilee Kulfi Korma Kofta Khoya Kalia Kachumber	Ver Dhansak Wark Halwa Gujiya Moin doz Kadhi Pulao Salan		

	Bhujjia	Gil-e-hikmat	Zamin		
	Loab				
	Galavat				
	Chikki	Dhungar			

	Mutanjan Bhunao Boondi Biryani Bonda	Pachadi Falooda FoogathBaffad Gajjac Boti Bisibelehuliyana	Dum Mungodi	
Chapter7	IndianThemeLunches			06
7.1	Concept of themelunches			
7.2	Factors to be considered when organizing themelunches			

SUBJECT CODE: DSE201A				
SUBJECT: REGIONAL CUISINES OF INDIA (PRACTICAL)				
Teaching Scheme/Week	Examination Scheme			
Practical Hours	IA Marks	EA Marks	Total Marks	Credits
08	40	60	100	04

Minimum 20 Practicals including, Indian regional menus to be conducted. The practicals should comprise dishes from the following states / cuisine:

- | | |
|---------------------|---------------|
| 1) Goan | 8) Rajasthani |
| 2) Maharashtrian | 9) Tamilnadu |
| 3) Gujarati/ Parsi | 10) Kashmiri |
| 4) Karnataka | 11) Lucknowi |
| 5) Bengali | 12) Kerala |
| 6) Punjabi | 13) Sindhi |
| 7) Andhra/Hyderabad | |

Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

DSE 202 / 202 A

CO1 - Classify types and brands of spirits

CO2 - Learn production methods of liqueurs and bitters

CO3 - Understand methods of making cocktails

CO4 - Identify types of glassware used in a bar

CO5 - Acquire the skills for service of spirits and cocktails

CO6 - Develop the ability to compile a beverage list

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development

SUBJECT CODE: DSE202					
SUBJECT: ALCOHOLIC BEVERAGES II (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

To impart comprehensive knowledge of various spirits, liqueurs and cocktails.

		Hours	Marks
Chapter 1	Spirits	08	06
1.1	Introduction to Spirits		
1.2	Fermentation and Distillation Process		
1.3	Pot Still and Patent still.		
1.4	Various methods of Measuring Alcoholic Strength		
Chapter 2	Whisky	10	08
2.1	Ingredients used in making of Whisky.		
2.2	Manufacturing process of Whisky.		
2.3	Types of Whisky - Scotch and Irish Whisky		
2.4	American and Canadian Whisky		
2.5	International and MFL Brand		
Chapter 3	Brandy	08	08
3.1	Ingredients used in making of Brandy		
3.2	Manufacturing process of Brandy		
3.3	Types of Brandy - Cognac and Armagnac		

3.4	Labeling Terminology		
3.5	Fruit and other Brandies.		
3.6	International and IMFL Brands.		
Chapter 4	Rum	06	06
4.1	Ingredients used in making of Rum		
4.2	Manufacturing process of Rum		
4.3	Type of Rum-White, dark and golden		
4.4	International and IMFL Brands		
Chapter 5	Gin	06	06
5.1	Ingredients used in making of Gin.		
5.2	Manufacturing process of Gin		
5.3	Types of Gin.		
5.4	International and IMFL Brands		
Chapter 6	Vodka	04	04
6.1	Ingredients used in making of Vodka		
6.2	Manufacturing process of Vodka.		
6.3	Types of Vodka		
6.4	International and IMFL Brands.		
Chapter 7	Tequila	06	04
7.1	Ingredients used in making of Tequila.		
7.2	Manufacturing process of Tequila		
7.3	Types of tequila		
7.4	Brands of Tequila		
Chapter 8	Other Alcoholic Beverages	04	06
8.1	Aquavit		
8.2	Schnapps		
8.3	Pastis		
8.4	Feni		
8.5	Arrack		
Chapter 9	Liqueurs	06	06
9.1	Definition and types of liqueurs		
9.2	Production methods		
9.3	Service of Liqueurs		
Chapter 10	Cocktails	06	06
10.1	Introduction and history of cocktails		
10.2	Methods of making cocktails and rules for making cocktails		
10.3	Equipments glassware, and garnishes used in making of cocktails, Cocktail recipe		

Glossary of Terms

Horsd'age

Pisco

Grain whisky

Single malt

Marc

Ouzo

Blended whisky

Vatted malt

Grappa

Peats Reek

Malt whisky

Ryewhisky

Cornwhisky	Bourbon	JackDaniels
Londondry gin	Plymouth	Steinhaeger
Oldtom gin	Dutchgin	Bagasse
Dunder	Whiterum	Darkrum
SilverTequila	GoldTequila	Agave
Schnapps	Aquavit	Arrack
Tiquira	Absinthe	Pastis
Pernod	Ricard	Apertitifs
Angosturabitters	Cordials	Aromatizedwines
Ale	Lager	Stout
Porter	Boquet	Burgundy
Aguardante	Grappa	Quetsch

SUBJECTCODE:DSE202A					
SUBJECT:ALCOHOLICBEVERAGESII(PRACTICAL)					
TeachingScheme/Week	Examination Scheme				
PracticalHours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
08	40	60	--	100	04

1. PreparingaBeveragelist
2. PreparinganBeverageorderticket
3. Serviceof Whisky
4. ServiceofBrandy
5. ServiceofRum
6. ServiceofGin
7. ServiceofVodka
8. ServiceofTequila
9. Serviceofotheralcoholicbeverages
10. ServiceofLiqueurs
11. TypesofCocktails
12. Methodsofmakingcocktails-Buildup,Stirred
13. Methodsofmaking cocktails-Layered,Floating
14. MenuplanningandServiceoffoodandalcoholic beverages
15. PreparingofBeverageListforaSpecialty bar
16. Maintenanceofstatutory books

Field Visit

~~Students should be taken for visit to Winery and report must be submitted individually. Work Shop -A cocktail and mocktail workshop to be conducted and the report must be submitted individually.~~

Minimum of 02 assignments to be submitted by students by the end of the semester based on following topics.

1Types of mocktail with recipes, glassware, method and
presentation2Collecting themed barmenu cards(Minimum 5)
3Pricelist ofSpirits from5 outlets

DSE 203 / 203 A

- CO1 - Know various Trends in housekeeping.
CO2 - Understand the concept of ergonomics and Green Housekeeping.
CO3 - Understand the scope of facility management.
CO4 - Gain knowledge about Green practices like conservation of energy, water etc.
CO5 - Learn about the recent trends in Material Management in housekeeping.
CO6 - Know the techniques of energy conservation in hotels.
CO7 - Calculate the energy consumption in various areas of hotel.
CO8 - Understand the systems used for safety and security in hotel.
CO9 -
Understand the calculation of staff requirement, scheduling and maintaining performance records of the employees in the housekeeping department.
CO10 - Be able to check the feasibility of outsourcing in housekeeping department.
CO11 - Know the latest trends in uniforms.
CO12 - Gain knowledge about reports generated in MIS in housekeeping department.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Skill Development
CO9	Skill Development
CO10	Skill Development
CO11	Skill Development
CO12	Skill Development

SUBJECT CODE: DSE203					
SUBJECT: TRENDS IN HOUSEKEEPING (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	16	60	100	04

Rationale: The subject intends to familiarize the students with the current trends in housekeeping

		Hours	Marks
Chapter1	Chaningtrends in Housekeeping	06	06
1.1	Introduction		
1.2	Latest trends in Housekeeping with respect to Ergonomics Green housekeeping- Ecotel Facility management Technology		
Chapter2	Ergonomics	08	08
2.1	Importance of Ergonomics in housekeeping		
2.2	Time and motion study in housekeeping routine		
2.3	Ergonomics design of furniture and fixtures		
2.4	Ergonomics design of equipments		
2.5	Ergonomics in housekeeping process		
Chapter3	Introduction to Greenhousekeeping	08	06
3.1	Introduction to greenhousekeeping		
3.2	Ecotels		
3.3	Ecotel certification – 5 globes		
3.4	Role of housekeeping in environmental control		
3.5	Case study		
Chapter4	Energy Conservation	08	06
4.1	Importance of Energy Conservation		
4.2	Energy Monitoring and Performance		
4.3	Guidelines for energy conservation		
4.4	Use of energy conserving products Educating and Sensitizing housekeeping staff regarding Importance of energy conservation		
Chapter5	Water Conservation	08	06
5.1	Importance of Water Conservation		
5.2	General guidelines for water conservation		
5.3	Rainwater Harvesting		
5.4	Educating and Sensitizing housekeeping staff and guest		
Chapter6	Waste Management	06	06
6.1	Importance of Waste Management		
6.2	3-R principle: Reduce, Reuse, Recycle		
6.3	Types of waste in hotels		
6.4	Waste disposal and control		
6.5	Sewage treatment plant in hotels		
6.6	Vermicomposting		
Chapter7	Recent trends in Material planning for House Keeping	08	08
7.1	Bedding – Mattress, bed sheets, pillow menus Bedspreads, comforted and dustruffle		

7.2	BathLinen		
7.3	Tablelinen		
7.4	Uniforms		
Chapter8	Facilitymanagement	06	06
8.1	IntroductiontoFacilityManagement		
8.2	ScopeofFacilityManagement		
8.3	Outsourcing		
8.4	Housekeepingservicesin FacilityManagement		
8.5	Maintenancein FacilityManagement		
8.6	SecurityinFacilityManagement		
Chapter9	RoleofTechnology inHousekeeping	06	08
9.1	PropertyManagementSystem-PMS		
9.2	Familiarize withsoftwareusedinhousekeeping-		
9.3	Opera, Fidelio MIS-Definition,Conceptandvariousreports generated		

GlossaryofTerms

Atrium	Feasibilitystudy	HVAC
Shotgunarrangement	Towerconfiguration	Facilitiesplanning
Evafloors	Ergonomics	Skylitbathrooms
Jacuzzi	Luxmeter	Outsourcing
Pillowmenu	Productivitystandards	Slumber
Whirlpool	Workstudy	AACBlocks
Biodegradables	CFCs	CFLs
Ecotels	Flyash	Greenbuilding
Greywater	Highalbedopaint	HPMV's
HPSVs	MDF	Mulches
R-value	Trellises	Vermicompost
Dupionsilk	Bastfibre	Damask
Towyarn	Jacquard	Percalé
Sericulture	FBAs	Fillingyarn
Ergonomics	Tebilization	Anthropometry
Biogas	Powerzone	Organicwastes

SUBJECTCODE:DSE 203A					
SUBJECT:TRENDSINHOUSEKEEPING (PRACTICAL)					
TeachingScheme/Week		Examination Scheme			
PracticalHours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
08	40	60	--	100	04

1. PreparationofTime andmotionstudy andpracticeinHousekeepingroutines.

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2. Preparation of sample format of ergonomic risk factor analysis for housekeeping staff.
 3. Preparation of guidelines for energy conservation in housekeeping department.
 4. Preparation of lighting system design for guest rooms and public areas.
 5. Preparation of safety and security systems for guest rooms and public areas.
 6. Calculation of energy cost in public areas for energy management.
 7. Calculation of energy cost in public areas for energy management.
 8. Preparation of checklist for eco-friendly housekeeping in hotels.
 9. Practice with computer & PMS handling related to Housekeeping.
 10. Preparation of Housekeeping staff requirement and staff scheduling using housekeeping software.
 11. Preparation of daily housekeeping schedules using housekeeping software.
 12. Preparation of housekeeping history and staff performance reports using housekeeping software.
 13. Planning of a Facility management project for various sectors.
 14. Preparation of a feasibility study for outsourcing housekeeping jobs.
 15. Designing of hotel staff uniforms.
 16. Various reports generated for MIS in housekeeping.

Assignments :

1. Methods of pest control and chemicals used in hotels.
2. Project report on biogas and sewage treatment plants for waste disposal.
3. Project report on Vermicomposting.
4. Project report on Rainwater harvesting.
5. Project report on Ecotel.

Visits:

1. Visit to an Ecotel.
2. Visit to a biogas and sewage treatment plant.
3. Visit to a Vermicomposting plant.
4. Visit to a Rainwater harvesting system.

Visit to a facility management agency.

DSE 301 / 301 A

CO1 - Learn various International Cuisine-

CO2 - Geographical location, Historical background and influence on food, staple diet and ingredients.

CO3 - Learn Advanced bakery skills- Meringues, Chocolate decorations, Sugar work, Icings and toppings, Pastries & Recipe balancing.

CO4 - Learn New concepts in culinary- Vegan, Molecular Gastronomy & Organic foods.

CO5 - Acquire professional skills and techniques required for various International cuisines.

CO6 - Detect and correct various faults in bakery and confectionery products.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Employability
CO6	Employability

SUBJECT CODE: DSE301					
SUBJECT: ADVANCED FOOD PRODUCTION & KITCHEN MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

The subject intends to provide in-depth insight into international cuisine and develop an advanced understanding of technical as well as managerial skills for culinary professionals.

		Hours	Marks
Chapter 1	Production Management	02	04
1.1	Introduction to production management		
1.2	Kitchen organization		
1.3	Allocation of work, Job Description, Duty Roster		
1.4	Production Planning & Scheduling		
1.5	Production Quality & Quantity Control		
1.6	Forecasting and Budgeting		
Chapter 2	Nouvelle Cuisine	02	04
2.1	Evolution of Nouvelle cuisine		
2.2	Principles of Nouvelle cuisine		
Chapter 3	Food Presentations & Garnishes	02	04

3.1	Importance of food presentation		
3.2	Skills and techniques in food presentation		
3.3	Importance of garnishes		
3.4	Classical garnishes		
Chapter 4	International Cookery	20	20
4.1	Influence of historical background, geographical location on the staple food and cuisines of the following countries/ regions: France Japan Italy China Germany TexMex Spain Mediterranean Great Britain South East Asia		
Chapter 5	Meringues	02	02
5.1	Making of meringues		
5.2	Factors affecting stability of meringues Cooking of meringues Types and uses of meringue		
Chapter 6	Sugar	02	04
6.1	Tools required for sugar work		
6.2	Types of sugar as decorative work: Spun Sugar, Pulled Sugar, Poured sugar and Blown Sugar		
Chapter 7	Chocolate	02	04
7.1	Manufacture		
7.2	Couverture T		
7.3	Tempering M		
7.4	Molding		
7.5	Chocolate Decorations		
Chapter 8	Icings & Toppings	04	04
8.1	Types of icings – Flat, Buttercream, Royal, Marzipan, Nougatine, Pastillage, Ganache		
Chapter 9	Recipe Balancing	02	04
9.1	Importance		
9.2	Principles of recipe balancing in cake making and bakery		
Chapter 10	Pastries	05	06
10.1	Types: Short Crust, Flaky, Puff, Danish, Choux and Filo		
10.2	Faults and their causes		
Chapter 11	New Concepts in Culinary	05	04
11.1	Understanding basics of Molecular Gastronomy		
11.2	Organic foods		

11.3 Vegancuisine		
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SUBJECTCODE:DSE301 (A)				
SUBJECT:ADVANCEDFOODPRODUCTION&KITCHENMANAGEMENT(PRACTICAL)				
TeachingScheme/Week	Examination Scheme			
PracticalHours	IAMarks	EAMarks	TotalMarks	Credits
08	40	60	100	04

Minimum 24 International menus to be conducted.

The menus should cover the following regions of the world:

1. Tex-Mex
2. France
3. Italy
4. China
5. Spain
6. Germany
7. Great Britain
8. Japan
9. Mediterranean region
10. South East Asia

Students are required to maintain a journal to record the various practicals attended and the teacher must record the performance evaluation of the same on a day to day basis.

DSE 302 / 302 A

CO1 - Understand the different layout of Bar and their considerations

CO2 - Learn the Bar control procedures & concerned statutory requirements

CO3 - Acquire knowledge about Science of Mixology

CO4 - Learn the function catering procedure and types of buffets

CO5 - Enhance the knowledge about types of trolleys, service procedure & classical dishes made in Gueridon Service.

CO6 - Understand modern concepts of Menu Engineering & Customer relationship

CO7 - To enhance the skills required for the service of spirits & cocktails

CO8 - To strengthen the managerial skills with hands on experience of Hospitality software

CO9 - Students will be able to prepare innovative cocktails & mocktails

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Employability
CO9	Employability

SUBJECT CODE: DSE302					
SUBJECT: FOOD & BEVERAGE OPERATIONS & MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

To impart comprehensive knowledge about bar operation and management skills.

		Hours	Marks
Chapter 1	Introduction to Bar & Bar Beverages	12	12
1.1	Alcoholic Beverages		
1.2	Non Alcoholic Beverages		
1.3	Aerated Beverages, Bar Syrups, Squashes and Cordials		
1.4	Premixed Drinks Mineral, Spring water, Flavoured and Packaged waters.		

1.5	Aperitifs, Liqueurs and digestifs		
1.6	Types of Bars		
1.7	Role of Various bar personnel in the bar. Bar equipment's and their uses (Large and Small equipment's)		
Chapter 2	Planning of Bar	08	06
2.1	Layout of a bar		
2.2	Factors to be considered while planning a bar		
2.3	Safety and hygiene consideration		
2.4	Seating arrangements of various bars.		
Chapter 3	Bar Controls & Statutory Requirements	08	06
3.1	Purchasing, Receiving and storing of beverages		
3.2	Inventory/Stock Control methods.		
3.3	Calculation of Beverage cost Daily, Weekly Bar Reports.		
3.4	Sales Summary and Sales Analysis, Sales Mix.		
Chapter 4	Mixology	10	10
4.1	Introduction to the science of Mixology.		
4.2	Cocktail making		
4.3	Glassware and garnishes.		
4.4	Making of Traditional and Innovative cocktails.		
4.5	Flair bartending		
Chapter 5	Function and Event Catering	08	10
5.1	Definition of function catering and types of functions		
5.2	Organizational structure of Banquet department, duties and responsibilities of banquet		
5.3	Function catering administrative procedures		
5.4	Preparation of function prospectus.		
5.5	Menu planning for various types of functions		
5.6	Seating arrangement for various functions, Table plan and space considerations.		
5.7	Off premises/out-door catering		
Chapter 6	Gueridon Service	08	06
6.1	Origin and definition.		
6.2	Types of trolleys.		
6.3	Special equipments used in gueridon service care and maintenance.		
6.4	Service Procedure.		
6.5	Service of classical dishes		
Chapter 7	Buffets	04	04
7.1	Definition		
7.2	Types of Buffets		
7.3	Equipments and setup of buffets.		
Chapter 8	Menu Engineering	03	03
8.1	Concept and application.		

8.2	SWOT analysis of various food and beverage outlets.		
Chapter 9	Customer Relationship	03	03
9.1	Handling Customer Complaints.		
9.2	Customer Satisfaction		

Glossary of Terms

Fortified wines	Cobblers	Collins
Blended drinks	Coolers	Crustas
Cups	Daisies	Egg nogs
Fixes	Flips	Frappes
Highball	Juleps	Pick-me-up
Pousee-cafe	Smashes	Sours
Swizzles	Toddies	Amer-picon
Campari	Bardie	Hawthornestrainer
Bostonshaker	Cassis	Cerise
Citronelle	Framboise	Gomme
Grenadine	Orgeat	Squashes
Bar-blade	Speedpourers	Baroptics
Frontbar	Backbar	Kirsch
Genericliqueurs	Proprietaryliqueurs	Pouseecafe
Jigger	AsianBuffet	GalaReception
DispenseBar	Smorgasbord	EasterBuffet
BrunchBuffet	Candelabra	CasseroleStations
ForkBuffet	SuzettePans	BeverageUrns
ChafingDish	Portionscale	Props
FloralAccessories	Skirting	WaffleIrons
RechaudStores	Trancheur	Carousal
Gueridon	Underbars	Overbar
Portablebar	CobraGun	IRD
CentralizedRoomService	RSOT	De-CentralizedRoomService
CaliforniaMenu	CyclicMenu	EMT
PMT	Evlevenses	
SWOT		

SUBJECT CODE: DSE302A					
SUBJECT: FOOD & BEVERAGE OPERATIONS & MANAGEMENT (PRACTICAL)					
Teaching Scheme/Week		Examination Scheme			
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits

08	40	60	--	100	04
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- 1 Preparation of various types of Beverage lists
- 2 Service of various Spirits & Cocktails
- 3 Planning and layout of various types of bars
- 4 Maintenance of statutory records
- 5 Preparing of Daily/Weekly Bar Reports
- 6 Flair Bartending Principles: Types of Flair Bartending
- 7 Molecular Mixology
- 8 Innovative Cocktails & Mocktails
- 9 Filling up of Banquet Function Prospectus
- 10 Banquet seating arrangements, formal banquet service
- 11 Mise-en-place for service from gueridon trolley and service of dishes
- 12 Setting up of buffets and service procedures
- 13 Planning of Off-premises catering functions
- 14 Menu Engineering
- 15 SWOT Analysis of fine dining establishment, QSR
- 16 Planning and service of food festivals and other promotional events

DSE 303 / 303 A

- CO1 - Learn about Indian Chain Hotels & their growth.
CO2 - Understand the concept of Budgeting, MIS and Revenue Management.
CO3 - Know the aspect of Human Resource Management in rooms division.
CO4 - Learn about preparations done before opening of a new property.
CO5 - Understand the role of Housekeeping in allied sectors.
CO6 - Understand the concept and importance of Customer Relationship.
CO7 - Be able to prepare budgets and calculate income and expenditure for rooms division.
CO8 - Know how to maintain reports of guest consumable with the help of software.
CO9 - Learn to calculate various statistical data of performance of rooms division.
CO10 - Understand various aspects of human resource like manpower
CO11 - planning, scheduling, orientation and training, maintaining performance appraisal etc.
CO12 - Know the importance and use of Time & Motion Study in housekeeping.
CO13 - Be able to prepare a list of jobs to be done in a new property.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Employability
CO5	Skill Development
CO6	Employability
CO7	Employability
CO8	Employability
CO9	Employability
CO10	Employability
CO11	Employability
CO12	Employability
CO13	Employability

SUBJECT CODE: DSE303					
SUBJECT: ACCOMMODATION MANAGEMENT (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	40	60	--	100	04

Rationale

This subject aims to establish the importance of management in Accommodation Operations. The course aims to establish the importance of Front Office within the hospitality industry. It also prepares the student to acquire management skills and knowledge in the Department.

		Hours	Marks
Chapter1	Pioneersofthehotelindustry	04	02
1.1	Foundersof thehotel industry		
1.2	Developmentsinhotelindustry		
1.3	Indianhotelchains-History&growth		
Chapter2	SocialskillsrequiredforRoomsDivision staff	06	06
2.1	Introductionand Importanceofsocialskills		
2.2	Behaviorialskills- selfpresentation,bodylanguage		
2.3	Crossculture-Stylesofwelcoming,needfor foreignlanguage,global language		
Chapter3	BudgetinginRoomsDivision	06	08
3.1	Definition,concept&importance		
3.2	Typeofbudgets - capital&operating		
3.3	Budgetingforfrontofficeoperations-Forecasting Revenue,EstimatingExpenses,RefiningBudget Plans		
Chapter4	RevenueManagement	06	06
4.1	Concept		
4.2	Measuring&maximizingYield		
4.3	Elementsof RevenueManagement		
4.4	Using Revenue Management- concept of ARR andREVPAR		
4.5	CalculationofYieldStatisticsandYield Management		
Chapter5	EvaluatingFrontOfficeOperations	06	06
5.1	DailyOperationsReport		
5.2	OccupancyRatios		
5.3	RoomsRevenueAnalysis		
5.4	HotelIncomeStatement		
5.5	RoomsDivisionIncome Statement		
5.6	RoomsDivision BudgetReports		
5.7	OperatingRatios		
5.8	RatioStandards		
Chapter6	IntroductiontoManagementInformation System	06	06
6.1	MIS-Introduction, Definition,		
6.2	Concept,understandinginformationsystem,MIS forkeydecisions Property Management System - Various modulesrelated to Reservations, Registration, Cashiering,Telephones,Guest history		

Chapter7	ManagingHumanResourceinRoomsDivision Department	06	06
7.1	Determiningmanpowerrequirements.		
7.2	Recruitment		
7.3	Training		
7.4	StaffScheduling		
7.5	StaffMotivation		
7.6	PerformanceAppraisal		
7.7	Effectiveuseof SOP'sinfront officedepartments		
Chapter8	Newpropertyoperations	06	06
8.1	StartingupRoomsDivisionOperations		
8.2	Systemsandprocedures		
8.3	Staffingconsideration		
8.4	Count down		
Chapter9	HousekeepinginAlliedsectors	08	08
9.1	Need& Importance		
9.2	InstitutionalHousekeeping-Hostels,guesthouses &residentialhomes		
9.3	HousekeepinginHospitals		
9.4	HousekeepinginRetailsectors		
9.5	HousekeepinginArtGallery,Museum		
9.6	HousekeepinginAircrafts,Airports		
9.7	CorporateHousekeeping		
Chapter10	CustomerRelationshipManagementinRooms Division	06	06
10.1	Definition&concept		
10.2	Importanceofloyaltyprogramme		
10.3	BenefitsofloyaltyProgramme		
10.4	Typesofloyaltyprogramme		

GlossaryofTerms

Capitalbudget

Flexiblebedget

Variableexpenses

~~GOPPAR~~

Orientation

Timeand motionstudy

Zerobasebudgeting

Jobdescription

Operatingbudget

Fixedbudget

Semivariableexpenses

~~PerformanceAppraisal~~

Crosstraining

Softopening

Contingencyplan

Jobspecification

Preopening budget

Masterbudget

YieldManagement

~~Induction~~

Multiskilling

Countdown

Graveyardshift

Jobanalysis

Jobassignment
Jobassignment
Zerobasebudgeting
Buddysystem
SocialSkills
Behavioralskills

Jobbreakdown
Workstudy
Jobanalysis
Productivitystandard
Staffingguide

Productivitystandard
Preopening budget
Facilitymanagement
Countdown
Graveyardshift

SUBJECT CODE: DSE303 A					
SUBJECT: ACCOMMODATION MANAGEMENT (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
08	40	60	--	100	04

1.	Preparing of various budgets in Rooms Division department.
2.	Calculation of stocks and expenses for Rooms Division department.
3.	Preparation of Rooms division income statement.
4.	Preparation of reports for consumption of guest consumables.
5.	Calculations of various statistical data using Formulae: ARR, Room Occupancy Double Occupancy%, Bed Occupancy%, foreign occupancy%, Local Occupancy %
6.	Calculation of Yield Statistics and Yield Management.
7.	Calculation of staffing requirements and staff scheduling for the Rooms Division department in different types of hotels.
8.	Preparation of duty roster for Rooms Division department in different types of hotels.
9.	Preparation of orientation and training programme for new recruits in Rooms Division department.
10.	Preparation of format for performance appraisal and various ratings systems.
11.	Preparation of Time and motion study for Rooms Division jobs.
12.	Practice with computer & PMS handling related to Rooms Division
13.	Practice of mock interviews of Rooms Division job positions.
14.	Preparation of a checklist for Rooms Division tasks in the countdown of a new property launch.
15.	Planning Startup systems and procedures in the Rooms Division department of a new startup property.
16.	Planning for housekeeping operations in Retail and Corporate sectors, Hostels, Guest houses and Hospitals.

Assignment

1. Preparation of job descriptions for housekeeping personnel
2. Preparation of orientation and induction training programme for housekeeping staff
3. Preparation of performance appraisal report
4. Preparation of SWOT analysis for Rooms Division Department
5. Preparation of SOP's for front office department. Preparation of SOP's for Protocol of

VVIP, VIP's and CIP's & traditional welcome amenities (Ministers,
Dignitaries, Govt. Officials, Foreign delegates and others)
Preparation of SOP's for different tasks in Rooms Division.

LEC 101/ 101 A

CO1 - Understand the basic knowledge of French language like Alphabet, conjugations of verb, Grammar and basic conversation skills in personal as well as professional life.

CO2 - Learn translations from French to English and English to French.

CO3 - Develop basic French speaking and reading skills- Days of the week, seasons, weather, professional terms, family, time, hobbies and daily routine.

CO4 - Acquire correct pronunciation of French terminology.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development

SUBJECT CODE: LEC101					
SUBJECT: BASIC FRENCH (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	02

Rationale

To introduce basic knowledge of French language to the students of Hotel management

		Hours	Marks
Chapter 1	INTRODUCTION	10	12
1.1	Alphabet		
1.2	Accents		
1.3	Articles: Definite, Indefinite,		
1.4	Partitive and contracted articles		
1.5	Subject Pronouns		
1.6	Basic greetings		
1.7	Vocabulary related to classroom		
1.8	Cardinal Numbers (0-100) & Ordinal Numbers		
1.9	Time, days of a week, months		
	Vocabulary related to seasons, weather		
Chapter 2	Conjugation – Present Tense	08	08

2.1	Conjugation of verbs être and avoir		
2.2	Conjugation of first regular group '-er' (Ex. Parler etc)		
2.3	Conjugation of second regular group '-ir' (Ex. finir)		
2.4	Conjugation of third regular group '-re' (ex. attendre)		
2.5	Conjugation of third regular group '-oir' (ex. Vouloir)		
Chapter 3	Grammar	06	12
3.1	Adjectives: Qualifying, Demonstrative, Possessive		
3.2	Preposition		
3.3	Plural		
3.4	Masculine and Feminine		
3.5	Negations		
3.6	Pronouns: Subject, object, en, y, reflexive		

Chapter4	PersonalLife	03	10
4.1	SelfIntroduction		
4.2	Vocabulary relatedtofamily		
4.3	Hobbies,dailyroutine		
Chapter5	Atwork	01	08
5.1	Professions		
5.2	Vocabulary relatedtoprofessions		
Chapter6	Translation	04	10
6.1	EnglishtoFrench		
6.2	FrenchtoEnglish		

SUBJECTCODE:LEC101A					
SUBJECT:BASICFRENCH(PRACTICAL)					
TeachingScheme/Week	Examination Scheme				
PracticalHours	IAMarks	EAMarks	CAMarks	TotalMarks	Credits
04*	20	30	--	50	02

1. Alphabets
2. Basicgreetings
3. Numbers
4. Daysoftheweek, Date, Months
5. Vocabulary relatedtoClassroom
6. Question&Answersrelatedtoclassroom
7. Time–Clock,Questionsand Answers relatedtotime
8. Seasonsandweather
9. Question&Answersrelatedto seasonsandweather
10. VocabularyrelatedProfessions
11. Questions&Answersrelatedtoprofessions
12. Vocabulary relatedtofamily
13. Questions&Answersrelatedtofamily
14. Vocabulary relatedtohobbiesanddailyroutine
15. Questions&Answersrelatedtohobbiesanddailyroutine

SelfIntroduction

LEE 101 / 101 A

CO1 - Learn the importance of communication.

CO2 - Identify types of communication and its Barriers.

CO3 - Know the importance of Body language while communicating.

CO4 - Demonstrate proficiency in reading skills.

CO5 - Understand the importance of formal Communication.

CO6 - Discuss different types of reports and their purposes.

CO7 - Identify key principles of effective speaking.

CO8 - Discuss the usefulness of visual aids and identify useful presentation tools.

CO9 - Create a presentation using power point.

CO10 - Discuss the key elements of successful interview.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Skill Development
CO9	Skill Development
CO10	Skill Development

SUBJECT CODE: LEE101					
SUBJECT : BUSINESS COMMUNICATION (THEORY)					
Teaching Scheme/Week	Examination Scheme				
Theory hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
02	40	60	--	100	02

Rationale

To introduce students to the communication and presentation skills needed by hospitality professional

		Hours	Marks
Chapter 1	The Communication Process	06	15
1.1	Definition and importance of communication.		

1.2	Elements of communication/process of communication		
1.3	Formal and informal communication-		
1.4	Types of communication– Flow of communication (vertical, horizontal, lateral),		
1.5	Barriers to effective communication		
1.6	How to overcome communication barriers		
Chapter 2	Oral communication	04	10
2.1	Advantages and disadvantages		
2.2	Articulation and delivery		
2.3	Making speeches and presentations		
2.4	Telephone etiquettes		
2.5	Standard phrases used in hotels and restaurants.		
Chapter 3	Written communication	14	35
3.1	Advantages & disadvantages		
3.2	Letter of enquiry, Letter of complaint, Letter of apology, Letter of order, Letter of application Accompanied by bio-data, Letter of resignation, Letter of collection & sales		
3.3	Writing a logbook		
3.4	Paragraph structure		
3.5	Report writing (incidents, visits)		
3.6	Memos, notices, circulars		
3.7	Notes Making		

SUBJECTCODE:LEE 101A					
SUBJECT:BUSINESS COMMUNICATION(PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	--	50	02

1. Self introduction.
2. Extempore on various topics
3. Presentations on various topics
4. Group Discussion.
5. Telephone etiquettes and handling telephones.
6. Practice of Standard phrases used in hotels and restaurants
7. Preparation for interviews.
8. Importance of Bodylanguage informal situations
9. Conduct of Meeting/briefing
10. Preparing Reports-Visit/incident
11. Presentation of Reports.
12. Formal Speeches
13. Reading
14. Vocabulary development
15. Debate

Book reading and Discussion

SEC 101 / 101 A

CO1 - Understand the components of personality and importance of verbal communication , non-verbal communication, body language and SWOTanalysis.

CO2 - Learn how to deal with stress and frustration.

CO3 - Understand the importance of Technical skills, Organisational skills and Human skills for a successful career.

CO4 - Learn the concept of time management and its techniques.

CO5 - Enhance the presentation skills and listening skills.

CO6 - Understand the importance of grooming, and proficiency in communication.

CO7 - Learn essential business manners and etiquettes.

CO8 - Be confident in expressing their views through Debate, Group Discussion and Extempore.

CO9 - Be able to do self-analysis with SWOT analysis.

CO10 - Develop listening skills, presentation skills, time management and organisation skills.

CO11 - Gain more knowledge through field visits and guest lectures.

Mapping of Course Outcome	
CO1	Skill Development
CO2	Skill Development
CO3	Skill Development
CO4	Skill Development
CO5	Skill Development
CO6	Skill Development
CO7	Skill Development
CO8	Skill Development
CO9	Skill Development
CO10	Skill Development
CO11	Skill Development

SUBJECT CODE:SEC 101					
SUBJECT : PERSONALITY SKILLS FOR HOPITALITY INDUSTRY					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CAMarks	Total Marks	Credits
03	40	60	--	100	03

Rationale

The subject is designed to make students understand the concept and components of personality, thereby to apply the acquired knowledge towards achieving excellence in their respective academic careers.

		Hours	Marks
Chapter 1	Introduction to Personality Development	02	02
Chapter 2	Communication Skills	06	08
2.1	Modes of communication		
2.2	Verbal and Non-verbal communication		
2.3	Professional presentations (Types, Use of A/V aids)		
Chapter 3	Impression Management	06	06
3.1	Importance of Physical Appearance and Grooming (presentable and attractive appearance, dressing, make up, poise and posture)		
3.2	Importance of Physical Fitness		
3.3	Body Language-Kinesics, Haptics, Vocalics, Proxemics and Chronemics		
Chapter 4	Personality profile and Self development	06	12
4.1	Elements of Personality		
4.2	Determinants of Personality		
4.3	Personal goal setting and action plan		
4.4	Areas of self development		
4.5	Self Analysis (Self esteem, Motivation, Attitude)		
4.6	SWOT Analysis- Concept		
Chapter 5	Time Management	04	04
5.1	Time Planning		
5.2	Time Quadrant model		
5.3	Time Wasters and Robbers		

Chapter 6	Emotions	04	06
6.1	What are emotions?		
6.2	Emotions and Personality		
6.3	Emotional Stability		
6.4	Emotional Maturity		
6.5	Emotional Intelligence		
Chapter 7	Ethics	04	06
7.1	Introduction to Ethics and Values		
7.2	Code of ethics		
7.3	Ethics and positive human relationship		
7.4	Function of values		
7.5	Set of values for harmonious life		
Chapter 8	Skill development for personality enrichment	08	08
8.1	Identifying general and specific skills		
8.2	Human Skills		
8.3	Cognitive Skills		
8.4	Technical Skills		
8.5	Listening Skills		
8.6	Practical Skills		
Chapter 9	Stress Management	04	04
9.1	Introduction		
9.2	Management Strategies		
9.3	Stress Managers		
9.4	Stress Control		
Chapter10	Frustration	04	04
10.1	Introduction		
10.2	Causes of frustration		
10.3	Effects of frustration		
10.4	Solutions for avoiding frustration		

SUBJECT CODE: SEC 101 A					
SUBJECT : PERSONALITY SKILLS FOR HOSPITALITY INDUSTRY (PRACTICAL)					
Teaching Scheme/Week	Examination Scheme				
Practical hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04*	20	30	--	50	02

1. Development of proficiency in English

Practice on spoken communication skills and testing voice and accent, voice clarity, voice modulation and intonation.

2. Personal Introduction

Developing an Understanding of Social Etiquettes.

3. Business manners and etiquettes

To understand presenting oneself with finesse.

4. Debate

To understand subject knowledge, oral and leadership skills.

5. Group Discussion

To understand subject knowledge, oral and leadership skills.

6. Extempore

To understand subject knowledge, oral and leadership skills.

7. Body Language

Study of different pictorial expression of nonverbal communications and its analysis.

8. SWOT Analysis

- Self evaluation.
- Self discipline
- Recognition of one's own limits and deficiencies.
- Self Awareness.

9. Presentation skills

To understand Preparing and delivery of presentation.

10. Time Management techniques

To understand Time Quadrant model and its use.

11. Stress management techniques

To identify factors that causes stress through questionnaire/games.

12. Listening skills

To improve note making and listening skills.

13. Organizing a seminar**14. Guest lectures of hospitality professionals.****15. Field visits**

Field visits to various sectors of the hospitality industry as a learning experience for students.

16. Report writing on guest lectures and field**visits Assignment**

1. Make a SWOT Analysis to identify your strength, weaknesses, opportunity and threats
2. Identify your areas of self development and plan a strategy to improve.
3. Identify qualities, traits of a eminent admired personality
4. Prepare a tree of life to understand personality determinants
5. Identify your values and prepare a code of ethics for yourself
6. Presentation on your role model in hospitality industry

SEE 105

CO1 - To develop the spirit of Entrepreneurship

CO2 - To understand the attributes required to become a successful entrepreneur

CO3 - To understand the techniques of idea generation.

CO4 - Learn about Modern trends in Entrepreneurship.

CO5 - To enable the student to prepare a project report

CO6 - To understand Market Feasibility studies

Mapping of Course Outcome	
CO1	Entrepreneurship Development
CO2	Entrepreneurship Development
CO3	Entrepreneurship Development
CO4	Entrepreneurship Development
CO5	Entrepreneurship Development
CO6	Entrepreneurship Development

SUBJECT CODE: SEE105					
SUBJECT: ENTREPRENEURSHIP DEVELOPMENT					
Teaching Scheme/Week	Examination Scheme				
Theory Hours	IA Marks	EA Marks	CA Marks	Total Marks	Credits
04	--	--	50	50	04

Rationale:

The subject aims to provide information regarding the various aspects pertaining to becoming a successful entrepreneur in the Hotel & Catering Industry.

		Hours	Marks
Chapter 1	Introduction to Entrepreneurship	10	08
1.1	Who is entrepreneurship?		
1.2	Definition of an Entrepreneur, Entrepreneurship and Intrapreneur Concept, Classification, Characteristics and skills of an Entrepreneur		
1.3	Skills of an Entrepreneur		
1.4	Qualities of an Entrepreneur		
1.5	Women Entrepreneurship		
Chapter 2	Introduction to Entrepreneurship	10	08
2.1	Entrepreneurship as a Career		
2.2	Role of an Entrepreneur and Economic development		
2.3	Various Entrepreneurs in India and Abroad		

2.4	Identifying the Opportunity (SWOT Analysis)		
Chapter 3	Market Assessment	10	08
3.1	Sources of Funding for a Business: Internal and External Funds, Personal Funds, Family and friends		
3.2	, Commercial banks and Financial institutions Procedure to get loan from various banks for business		
Chapter 4	Tools and Techniques of Ideation	12	10
4.1	Business plan - steps involved from concept to commissioning		
4.2	Project Report: Meaning and importance, components of a project report		
4.3	Project Appraisal: Meaning and definition,		
4.4	Technical, Economic feasibility and Cost-Benefit analysis Risk taking		
Chapter 5	Modern Trends in Entrepreneurship	10	08
5.1	E-		
5.2	Commerce Concepts		
5.3	and Process Global Entrepreneurship		
Chapter 6	Legal Acts prevailing in India	12	08
6.1	Various Acts applicable to business enterprises		
6.2	GST - Introduction		

**THE SEMESTER-WISE DETAILS OF COURSES/CREDITS ARE GIVEN BELOW:
LL.B. (3 Year Degree Programme)**

I	LL.B First Semester Examination	Credits
1.	Constitutional Law – I	4
2.	Law of Contract	4
3.	Law of Crimes	4
4.	Legal Language	4
5.	Law of Torts Including Motor Vehicle Accident and Consumer Protection Act	4
6.	Optional – I	4
	A. Business Law Group – Banking Law including Negotiable Instrument Act	
	B. Constitutional Law Group – Media and Law	
		Total = 24 Credits
II	LL.B Second Semester Examination	Credits
1.	Constitutional Law – II	4
2.	Special Contract	4
3.	ICT and Legal Research (Soft Skills)	4
4.	Practical Paper – I (Professional Ethics, Accountancy for Lawyers and Bar Bench Relations)	6
5.	Jurisprudence	4
6.	Optional – II	4
	A Business Law Group – Insurance Law	
	B. Constitutional Law Group – Health Law	
		Total =26 Credits
III	LL.B. Third Semester Examination	Credits
1.	Family Law – I (Marriage,Divorce and Matrimonial Disputes)	4
2.	Civil Procedure Code	4
3.	Interpretation of Statute	4
4.	Practical Paper – II (Drafting Pleading & Conveyancing)	6
5.	Company Law	4
6.	Optional – III	4
	A Business Law Group – Merger and Acquisition	
	B. Constitutional Law Group – Right to Information	
		Total =26 Credits
IV	LL.B. Fourth Semester Examination	Credits
1.	Family Law – II (Matrimonial Property, Guardianship And Adoption)	4
2.	Public International Law	4
3.	Criminal Procedure Code, Juvenile Justice Act & Probation of Offenders Act	4
4.	Law of Evidence	4
5.	Cyber Law	4
6.	Optional –IV	4
	A. Business Law Group – Competition Law and practice	
	B. Constitutional Law Group – Gender Justice and Feminist Jurisprudence	
		Total =24 Credits

V	LL.B. Fifth Semester Examination	Credits
1.	Intellectual Property Law	4
2.	Property Law Including Transfer of Property Act and Easement Act	4
3.	Administrative Law	4
4.	Practical Paper – III (Moot Court Pre-trial Preparations and Participation in Trial Proceedings)	6
5.	Court Management	4
6.	Optional – V	4
	A. Business Law Group – Direct Tax	
	B. Constitutional Law Group – Law on Education	

Total =26 Credits

VI	LL.B. Sixth Semester Examination	Credits
1.	Labour Law	4
2.	Environmental Law	4
3.	Law of Trusts, Equity and Fiduciary Relationship	4
4.	Practical Paper-IV (Arbitration, Conciliation and Alternative Dispute Resolution Systems)	6
5.	Law on Infrastructure Development	4
6.	Optional – VI	4
	A Business Law Group – Indirect Tax	
	B. Constitutional Law Group – Human Rights Law & Practice	

Total =26 Credits

Total Credit requirement for LL.B 3 Years Programme = 152 Credits

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COURSE DESIGN OF LL.B 3 YEARS PROGRAMME

The Scope of the Subjects shall be as indicated in the prescribed syllabus.

Semester	Foundational/ Compulsory Courses	Practical papers	Electives/ Optional	Total number of Papers	Total Marks Allotted	Total Credits
I	5	-	1	6	600	24
II	4	1	1	6	600	26
III	4	1	1	6	600	26
IV	5	-	1	6	600	24
V	4	1	1	6	600	26
VI	4	1	1	6	600	26
Total Number of Compulsory / Foundational Courses = 26		Total Number of Practical Papers = 04	Total Number of Electives = 06	Total Number of papers = 36	Total Marks = 3600	Total number of Credits for LL.B 3 Years Programme = 152



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**GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM
(Rules & Regulations)**

1	Class/ Home Assignments & Research Paper	- 10 Marks
2	Unit Tests / Moot Courts/ Legal Aid	- 20 Marks
3	Tutorials Based On Case Studies & Legislative Analysis	- 05 Marks
4	Attendance	- 05 Marks

Total = 40 Marks

**GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM
(Rules & Regulations)**

1. CLASS/ HOME ASSIGNMENTS & RESEARCH PAPER :-

Long Term Paper	- 05 Marks
2 research papers	- 05 Marks (2.5 Marks Each)

Total = 10 Marks

EXPLANATION:-

In the Class/Home Assignments, the students are required to prepare a compulsory **Long Term Paper**. Besides this, the students shall also submit a minimum of **two compulsory Research papers** on any of the themes relating to the subject. The Submissions must be **free from plagiarism** and must meet international standards of modes of citation (except at places where only Indian Citation applies).

2. UNIT TESTS:-

Unit test I	- 10 Marks
Unit test II	- 10 Marks

Total = 20 Marks

EXPLANATION:-

There shall be a minimum of two compulsory Unit written tests to be appeared by the students which shall consist of 10 Marks for each paper. The Topics for each paper shall be notified by the concerned subject teacher well in advance. Similarly, a student can participate in the moot court/ legal aid and related activities.

3. TUTORIALS BASED ON CASE STUDIES & LEGISLATIVE ANALYSIS:-

Tutorial 1 (Case Study-I)	- 02 Marks
Tutorial 2 (Case Study-II)	- 02 Marks
Tutorial 3 (Legislative Analysis)	- 01 Marks

Total = 05 Marks

EXPLANATION:-

There shall be a minimum number of 3 Tutorials out of which 2 tutorials shall be based on the recent case studies while 1 tutorial shall be based on analysis of recent or landmark legislation relating to the subject to be appeared by the students in the Class.

4. ATTENDANCE:-

Attendance = 05 Marks

EXPLANATION:-

As per the norms of Bar Council of India, it shall be compulsory for all students to have a minimum of 75% of attendance per semester.

SPECIAL CLAUSE:-

The students who participate at the following activities with the prior permission of the Principal may be exempted from the above rules as a Special case:

- a) *A Student Who participated at Various national and International Moot Court Competitions in India or abroad; or*
- b) *A Student Who participated in Mock Trials, Debate, Essay or any other kind of competitions*
- c) *A Student who participated in any Model United Nations, Model Parliamentary Debate Competitions in India or abroad; or*
- d) *A Student Who actively volunteered in the College organized or any national NSS activity or any other extra-curricular activities; or*
- e) *A Student Who participated in assisting NLC's Free Legal Aid Clinic or other legal aid services, Legal Awareness camps etc. ; or*
- f) *A Student who participated in any cultural or sports activities held at national or international level; or*
- g) *A Student who is suffering from prolonged illness duly certified by the Registered medical practitioner*

Provided, the students who participated in the abovementioned activities, have sought prior permission, in writing, of the Principal, Law College to represent the institute at national and international level. The exemption granted under this rule shall solely be subject to the discretion of the Principal, Law College and no Student can claim the exemption as a matter of his/her right.

SYSTEM OF EXAMINATION:

Each paper shall be of out of which 40 Marks shall be for Internal Assessment (IA) and 60 Marks shall be for University Examination (UE). Internal Assessment (IA) and University Examination (UE) shall be conducted by the University for each Paper.

THE CREDIT SYSTEM:

The credits specified for LL.B. 3 year programme describe the weightages of various courses of the programme. The number of credits along with grade points that the student has satisfactorily completed measures the performance of the student. Satisfactory progress of a student is subject to his/ her maintaining a minimum Cumulative Grade Point Average (CGPA), as well as minimum grades in different courses of the programme. A certain number of credits must be earned by the student to qualify for the degree. Description of credit distribution for core Courses, elective Courses, and language course has already been shown. There shall be a 10-Point Absolute Grading System for grading in each head of passing. The system shall have seven, the highest being 10. The performance indicators **O, A+, A, B+, B, and F** shall respectively mean:

O	Outstanding
A+	Excellent
A	Very Good
B+	Good
B	Satisfactory
F	Fail

THE GRADING SYSTEM UNDER CBCS

Point Scale for Grading

Marks Range of marks (Out of 100)	Grade Point	Grade
80 ≤ Marks ≤ 100	10	O
70 ≤ Marks ≤ 80	9	A+
60 ≤ Marks ≤ 70	8	A
55 ≤ Marks ≤ 60	7	B+
50 ≤ Marks ≤ 55	6	B
Marks below < 50	0	F

EVALUATION AND COMPUTATION OF THE GRADE POINT AVERAGES:

Cumulative performance indicators such as GPA, SGPA or CGPA shall be calculated as described and illustrated below.

- A) The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the Course/ Paper.
- B) The Weights for performance at UE and IA shall respectively be **60% and 40%**.
- C) The Grade Point Average (GPA) for a Course/ Paper shall be calculated by first finding the total marks out of 100 for the Course/ Paper.
- D) Two kinds of performance indicators, namely, the Semester Grade point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the Courses/ Paper in a particular Semester, while CGPA measures the cumulative performance in all courses/ papers since his/her enrollment. The CGPA of a learner when he/she completes the programme is the Final Result of the learner.

STANDARDS OF PASSING:

- A) In order to pass in a Semester, a Student must obtain a minimum grade point of 6.00 (50%) both at the UE and IA.
- B) A Student who passes in a Course/ Paper is said to have completed the Credits assigned to the Course/ Paper.
- C) A Student who completed the minimum Credits required for a programme will be declared to have completed the programme.
- D) **Minimum passing grade** shall be Grade 'B' for each course/ Paper.

RULES OF PROMOTION FOR LL.B 3 YEARS PROGRAMME:

The candidate, who has taken admission in LL.B 3 years Course, subject to the clearance of eligibility and after securing required credits as prescribed by the university, shall be automatically promoted to next year. However, a Student who has not put up sufficient credits shall not be promoted to next year. In order to take admission in the final year, the Candidate has to pass in all the papers of 1st year with minimum 6.00 Grade points at both University Examination and Internal Examination.

AWARD OF HONOURS:

A Student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The Final result will be in terms of letter grade only and is based on the CGPA of all Courses studied and passed. The Criteria for the award of honours is given below.

The Criteria for the award of Degree are given as follows:

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 < CGPA < 10.00	O	Outstanding	80 <Marks <100
9.00 < CGPA < 9.49	A+	Excellent	70 <Marks <80
8.00 < CGPA < 8.99	A	Very Good	60 <Marks <70
7.00 < CGPA < 7.99	B+	Good	55 <Marks <60
6.00 < CGPA < 6.99	B	Satisfactory	50 <Marks <55
CGPA Below 6.00	F	Fail	Marks below 50



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B.A. LL.B. (5 Year Degree Programme-10 Semester Programme)

I. B.A LL.B First Semester	Credits
1. General English – I	5
2. Political Science – I	5
3. Sociology – I (General Principles)	5
4. Economics – I (General Principles)	5
5. Law of Torts including Motor Vehicle Accident and Consumer Protection Act	5
Total Credits= 25	
II. B.A LL.B Second Semester	Credits
1. General English – II	5
2. Political Science – II	5
3. Sociology – II (Sociology of India)	5
4. Economics – II (Indian Economics)	5
5. Law of Contract	5
6. International Human Rights	5
Total Credits= 30	
III. B.A Law Third Semester	Credits
1. General English – III (Including Legal Writing)	5
2. Political Science – III (Concepts & Ideology)	5
3. Sociology & Law – III	5
4. ICT & Legal Research (Soft Skills)	5
5. Constitutional Law – I	5
Total Credits= 25	
IV. B.A LL.B Fourth Semester	Credits
1. English – IV (Legal Language)	5
2. Political Science – IV (International Relations)	5
3. Economics and Law III	5
4. Family Law – I (Marriage, Divorce and Matrimonial Disputes)	5
5. Constitutional Law – II	5
6. Private International Law	5
Total Credits= 30	
V. B.A LL.B Fifth Semester	Credits
1. Political Science – V (Politics & Foreign Policy in India)	5
2. Law of Crimes	5
3. Jurisprudence	5
4. Family Law – II (Matrimonial Property, Guardianship & Adoption)	5
5. Optional – I	5
A. Business Law Group – Banking law including Negotiable Instrument Act	
B. Constitutional Law Group – Media and Law	
Total Credits= 25	

VI. B.A LL.B Sixth Semester	Credits
1. Political Science – VI (Public Administration)	5
2. Cyber Law	5
3. Special Contract	5
4. Practical Paper – I (Professional Ethics, Accountancy for Lawyers and Bar Bench Relations)	6
5. International Dispute Resolution Bodies	5
6. Optional – II	5
A Business Law Group – Insurance Law	
B. Constitutional Law Group – Health Law	
Total Credits=	31

VII. B.A LL.B Seventh Semester	Credits
1. Civil Procedure Code & Limitation Act	5
2. Interpretation of Statutes	5
3. Company Law	5
4. Property Law Including Transfer of Property Act and Easement Act	5
5. Optional – III	5
A Business Law Group – Merger and Acquisition	
B. Constitutional Law Group – Right to Information	
Total Credits=	25

VIII. B.A LL.B Eighth Semester	Credits
1. Labour Laws	5
2. Law of Evidence	5
3. Criminal Procedure Code, Juvenile Justice Act & Probation of Offenders Act	5
4. Practical Paper-II (Drafting, Pleading & Conveyancing)	6
5. Maritime Law	5
6. Optional –IV	5
A. Business Law Group – Competition Law & Practice	
B. Constitutional Law Group – Gender Justice and Feminist Jurisprudence	
Total Credits=	31

IX. B.A LL.B Ninth Semester	Credits
1. Administrative Law	5
2. Environmental Law	5
3. Law on Infrastructure Development	5
4. Practical Paper-III (Moot Court, Pre-trial Preparations and Participation in trial proceedings)	6
5. Optional – V	5
A. Business Law Group – Direct Tax	
B. Constitutional Law Group – Law on Education	
<hr/> Total Credits = 26	

X. B.A LL.B Tenth Semester	Credits
1. Public International Law	5
2. Intellectual Property Laws	5
3. Court Management	5
4. Practical Paper-IV (Arbitration, Conciliation and Alternative Dispute Resolution Systems)	7
5. International Environmental Law	5
6. Optional – VI	5
A Business Law Group – Indirect Tax	
B. Constitutional Law Group – Human Rights Law & Practice	
<hr/> Total Credits=32	

Total Requirement of Credits for B.A. LL.B 5 years Programme= 280 Credits



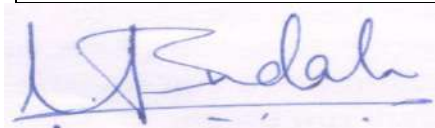
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COURSE DESIGN OF B.A. LL.B 5 YEAR PROGRAMME

The Scope of the Subjects shall be as indicated in the prescribed syllabus.

Semester	Foundational/ Compulsory Courses	Practical Papers	Electives/ Optionals	Total number of Papers	Total Marks Allotted	Total Credits
I	5	-	-	5	500	25
II	6	-	-	6	600	30
III	5	-	-	5	500	25
IV	6	-	-	6	600	30
V	4	-	1	5	500	25
VI	4	1	1	6	600	31
VII	4	-	1	5	500	25
VIII	4	1	1	6	600	31
IX	3	1	1	5	500	26
X	4	1	1	6	600	32
Total Number of Compulsory / Foundational Courses =45		Total Practical papers = 04	Total Number of Electives = 06	Total Number of papers = 55	Total Marks = 5500	Total number of Credits for BA. LL.B 5 Years Programme = 280



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GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

(Rules & Regulations)

- **Class/ Home Assignments & Research Paper** - 10 Marks
- **Unit Tests / Moot Courts/ Legal Aid** - 20 Marks
- **Tutorials Based On Case Studies & Legislative Analysis** - 05 Marks
- **Attendance** - 05 Marks

Total = 40 Marks

GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

(Rules & Regulations)

1. CLASS/ HOME ASSIGNMENTS & RESEARCH PAPER :-

- Long Term Paper - 05 Marks
- 2 research papers - 05 Marks (2.5 Marks Each)

Total = 10 Marks

EXPLANATION:-

In the Class/Home Assignments, the students are required to prepare a compulsory **Long Term Paper**. Besides this, the students shall also submit a minimum of **two compulsory Research papers** on any of the themes relating to the subject. The Submissions must be **free from plagiarism** and must meet international standards of modes of citation (except at places where only Indian Citation applies).

2. UNIT TESTS:-

- Unit test I - 10 Marks
- Unit test II - 10 Marks

Total = 20 Marks

EXPLANATION:-

There shall be a minimum of two compulsory Unit written tests to be appeared by the students which shall consist of 10 Marks for each paper. The Topics for each paper shall be notified by the concerned subject teacher well in advance. Similarly, a student can participate in the moot court/ legal aid and related activities.

3. TUTORIALS BASED ON CASE STUDIES & LEGISLATIVE ANALYSIS:-

Tutorial 1 (Case Study-I)	- 02 Marks
Tutorial 2 (Case Study-II)	- 02 Marks
Tutorial 3 (Legislative Analysis)	- 01 Marks

Total = 05 Marks

EXPLANATION:-

There shall be a minimum number of 3 Tutorials out of which 2 tutorials shall be based on the recent case studies while 1 tutorial shall be based on analysis of recent or landmark legislation relating to the subject to be appeared by the students in the Class.

4. ATTENDANCE:-

Attendance = 05 Marks

EXPLANATION:-

As per the norms of Bar Council of India, it shall be compulsory for all students to have a minimum of 75% of attendance per semester.

SPECIAL CLAUSE

The students who participate at the following activities with the prior permission of the Principal may be exempted from the above rules as a Special case:

- a) *A Student Who participated at Various national and International Moot Court Competitions in India or abroad; or*
- b) *A Student Who participated in Mock Trials, Debate, Essay or any other kind of competitions*
- c) *A Student who participated in any Model United Nations, Model Parliamentary Debate Competitions in India or abroad; or*
- d) *A Student Who actively volunteered in the College organized or any national NSS activity or any other extra-curricular activities; or*
- e) *A Student Who participated in assisting NLC's Free Legal Aid Clinic or other legal aid services, Legal Awareness camps etc. ; or*
- f) *A Student who participated in any cultural or sports activities held at national or international level; or*
- g) *A Student who is suffering from prolonged illness duly certified by the Registered medical practitioner*

Provided, the students who participated in the abovementioned activities, have sought prior permission, in writing, of the Principal, Law College to represent the institute at national and international level. The exemption granted under this rule shall solely be subject to the discretion of the Principal, Law College and no Student can claim the exemption as a matter of his/her right.

SYSTEM OF EXAMINATION

Each paper shall be of 100 Marks out of which 40 Marks shall be for Internal Assessment (IA) and 60 Marks shall be for University Examination (UE). Internal Assessment (IA) and University Examination (UE) shall be conducted by the University for each paper.

THE CREDIT SYSTEM:

The credits specified for B.A. LL.B. 5 years programme describe the weight ages of various courses of the programme. The number of credits along with grade points that the student has satisfactorily completed measures the performance of the student. Satisfactory progress of a student is subject to his/ her maintaining a minimum Cumulative Grade Point Average (CGPA), as well as minimum grades in different courses of the programme. A certain number of credits must be earned by the student to qualify for the degree. Description of credit distribution for core Courses, elective Courses, and language course has already been shown.

There shall be a 10-Point Absolute Grading System for grading in each head of passing. The system shall have seven, the highest being 10.

The performance indicators **O, A+, A, B+, B, and F** shall respectively mean:

O	Outstanding
A+	Excellent
A	Very Good
B+	Good
B	Satisfactory
F	Fail

THE GRADING SYSTEM UNDER CBCS

Point Scale for Grading

Marks Range of marks (Out of 100)	Grade Point	Grade
80 ≤ Marks ≤ 100	10	O
70 ≤ Marks ≤ 80	9	A+
60 ≤ Marks ≤ 70	8	A
55 ≤ Marks ≤ 60	7	B+
50 ≤ Marks ≤ 55	6	B
Marks below < 50	0	F

EVALUATION AND COMPUTATION OF THE GRADE POINT AVERAGES:

Cumulative performance indicators such as GPA, SGPA or CGPA shall be calculated as described and illustrated below.

- A) The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the Course/ Paper.
- B) The Weights for performance at UE and IA shall respectively be **60% and 40%**.
- C) The Grade Point Average (GPA) for a Course/ Paper shall be calculated by first finding the total marks out of 100 for the Course/ Paper.
- D) Two kinds of performance indicators, namely, the Semester Grade point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the Courses/ Paper in a particular Semester, while CGPA measures the cumulative performance in all courses/ papers since his/her enrollment. The CGPA of a learner when he/she completes the programme is the Final Result of the learner.

STANDARDS OF PASSING

- A) In order to pass in a Semester, a Student must obtain a minimum grade point of 6.00 (50%) both at the UE and IA.
- B) A Student who passes in a Course/ Paper is said to have completed the Credits assigned to the Course/ Paper.
- C) A Student who completed the minimum Credits required for a programme will be declared to have completed the programme.
- D) **Minimum passing grade** shall be Grade 'B' for each course/ Paper.

RULES OF PROMOTION FOR B.A LL.B 5 YEARS PROGRAMME

In a 5 year LL.B programme, a Student who is admitted in 1st year, subject to the clearance of eligibility and after securing required credits for that year, shall automatically be promoted to next year. However, a Candidate who has not put minimum credits shall not be promoted to next year of the programme. In order to get promotion in 3rd year, the Candidate has to pass in all the papers of 1st year with minimum 6.00 grade points in each paper at both University Examination and Internal Examination. Similarly, in order to get promotion to 4th Year, a Candidate has to pass in all the papers of 1st year and 2nd year. In order to get promotion in last year, a Candidate has to pass in all the papers of 1st year, 2nd year and 3rd year of the programme.

SINGLE DEGREE:

As per the UGC rules, a Candidate admitted in **B.A. LL.B 5 Years Programme** is entitled for Single Degree only (**B.A. LL.B**) that too after the successful completion of 5 years programme. They shall not be entitled for Dual Degree as the duration of the Programme is only five years.

AWARD OF HONOURS:

A Student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The Final result will be in terms of letter grade only and is based on the CGPA of all Courses studied and passed. The Criteria for the award of honours is given below.

The Criteria for the award of Degree are given as follows:

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 < CGPA < 10.00	O	Outstanding	80 <Marks <100
9.00 < CGPA < 9.49	A+	Excellent	70 <Marks <80
8.00 < CGPA < 8.99	A	Very Good	60 <Marks <70
7.00 < CGPA < 7.99	B+	Good	55 <Marks <60
6.00 < CGPA < 6.99	B	Satisfactory	50 <Marks <55
CGPA Below 6.00	F	Fail	Marks below 50



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BB.A. LL.B (5 Year Degree Programme-10 Semester Programme)

I. BB.A LL.B First Semester	Credits
1. General English – I	5
2. Fundamentals of Management	5
3. Sociology – I (General Principles)	5
4. Economics – I (General Principles)	5
5. Law of Torts including Motor Vehicle Accident and Consumer Protection Act	5
Total Credits = 25	
II. BB.A LL.B Second Semester	Credits
1. General English – II	5
2. Human Resource Management	5
3. Sociology – II (Sociology of India)	5
4. Economics – II (Indian Economics)	5
5. Law of Contract	5
6. Business Organization	5
Total Credits =30	
III. BB.A LL.B Third Semester	Credits
1. General English – III (Including Legal Writing)	5
2. Business Ethics	5
3. Sociology & Law – III	5
4. ICT & Legal Research (Soft Skills)	5
5. Constitutional Law – I	5
Total Credits = 25	
IV. BB.A LL.B Fourth Semester	Credits
1. General English – IV (Legal Language)	5
2. Business Communication	5
3. Economics and Law III	5
4. Family Law – I (Marriage, Divorce And Matrimonial Disputes)	5
5. Constitutional Law – II	5
6. Financial & Management Accounting	5
Total Credits =30	
V. BB.A LL.B Fifth Semester	Credits
1. Business Environment	5
2. Law of Crimes	5
3. Jurisprudence	5
4. Family Law – II (Matrimonial Property, Guardianship & Adoption)	5
5. Optional – I	5
A. Business Law Group – Banking law including Negotiable Instrument Act	
B. Constitutional Law Group – Media and Law	

Total Credits = 25

VI. BB.A LL.B Sixth Semester	Credits
1. Marketing Management	5
2. Cyber Law	5
3. Special Contract	5
4. Practical Paper – I (Professional Ethics, Accountancy for Lawyers and Bar Bench Relations)	6
5. Financial Management	5
6. Optional – II	5
A Business Law Group – Insurance Law	
B. Constitutional Law Group – Health Law	

Total Credits =31

VII. BB.A LL.B Seventh Semester	Credits
1. Civil Procedure Code & Limitation Act	5
2. Interpretation of Statutes	5
3. Company Law	5
4. Property Law Including Transfer of Property Act and Easement Act	5
5. Optional – III	5
A Business Law Group – Merger and Acquisition	
B. Constitutional Law Group – Right to Information	

Total Credits =25

VIII. BB.A LL.B Eighth Semester	Credits
1. Labour Laws	5
2. Law of Evidence	5
3. Criminal Procedure Code, Juvenile Justice Act & Probation of Offenders Act	5
4. Practical Paper-II (Drafting, Pleading & Conveyancing)	6
5. International Business	5
6. Optional –IV	5
A. Business Law Group – Competition Law & Practice	
B. Constitutional Law Group – Gender Justice and Feminist Jurisprudence	

Total Credits =31

IX. BB.A LL.B Ninth Semester	Credits
1. Administrative Law	5
2. Environmental Law	5
3. Law on Infrastructure Development	5
4. Practical Paper-III (Moot Court. Pre-trial Preparations and Participation in trial proceedings)	6
5. Optional – V	5
A. Business Law Group – Direct Tax	
B. Constitutional Law Group – Law on Education	
<hr/> Total Credits =26	

X. BB.A LL.B Tenth Semester	Credits
1. Public International Law	5
2. Intellectual Property Laws	5
3. Court Management	5
4. Practical Paper-IV (Arbitration, Conciliation and Alternative Dispute Resolution Systems)	7
5. Important Documentation in Business	5
6. Optional – VI	5
A Business Law Group – Indirect Tax	
B. Constitutional Law Group – Human Rights Law & Practice	
<hr/> Total Credits =32	

Total Credits for BB.A LL.B 5 Years Programme = 280



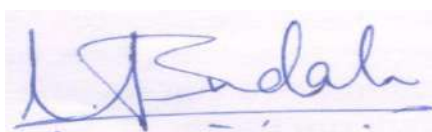
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COURSE DESIGN OF BB.A. LL.B 5 YEAR PROGRAMME

The Scope of the Subjects shall be as indicated in the prescribed syllabus.

Semester	Foundational/ Compulsory Courses	Practical Papers	Electives/ Optional	total number of Papers	total Marks Allotted	total Credits
I	5	-	-	5	500	25
II	6	-	-	6	600	30
III	5	-	-	5	500	25
IV	6	-	-	6	600	30
V	4	-	1	5	500	25
VI	4	1	1	6	600	31
VII	4	-	1	5	500	25
VIII	4	1	1	6	600	31
IX	3	1	1	5	500	26
X	4	1	1	6	600	32
Total Number of Compulsory /Foundational Courses =45		Total Practical papers = 04	Total Number of Electives = 06	Total Number of papers = 55	Total Marks = 5500	Total number of Credits for BBA. LL.B 5 Years Programme = 280



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GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

(Rules & Regulations)

- **Class/ Home Assignments & Research Paper** - 10 Marks
- **Unit Tests / Moot Courts/ Legal Aid** - 20 Marks
- **Tutorials Based On Case Studies & Legislative Analysis** - 05 Marks
- **Attendance** - 05 Marks

Total = 40 Marks

GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

(Rules & Regulations)

1. CLASS/ HOME ASSIGNMENTS & RESEARCH PAPER :-

- Long Term Paper - 05 Marks
- 2 research papers - 05 Marks (2.5 Marks Each)

Total = 10 Marks

EXPLANATION:-

In the Class/Home Assignments, the students are required to prepare a compulsory **Long Term Paper**. Besides this, the students shall also submit a minimum of **two compulsory Research papers** on any of the themes relating to the subject. The Submissions must be **free from plagiarism** and must meet international standards of modes of citation (except at places where only Indian Citation applies).

2. UNIT TESTS:-

- Unit test I - 10 Marks
- Unit test II - 10 Marks

Total = 20 Marks

EXPLANATION:-

There shall be a minimum of two compulsory Unit written tests to be appeared by the students which shall consist of 10 Marks for each paper. The topics for each paper shall be notified by the concerned subject teacher well in advance. Similarly, a student can participate in the moot court/ legal aid and related activities.

3. TUTORIALS BASED ON CASE STUDIES & LEGISLATIVE ANALYSIS:-

Tutorial 1 (Case Study-I)	- 02 Marks
Tutorial 2 (Case Study-II)	- 02 Marks
Tutorial 3 (Legislative Analysis)	- 01 Marks

Total = 05 Marks

EXPLANATION:-

There shall be a minimum number of 3 Tutorials out of which 2 tutorials shall be based on the recent case studies while 1 tutorial shall be based on analysis of recent or landmark legislation relating to the subject to be appeared by the students in the Class.

4. ATTENDANCE:-

Attendance = 05 Marks

EXPLANATION:-

As per the norms of Bar Council of India, it shall be compulsory for all students to have a minimum of 75% of attendance per semester.

SPECIAL CLAUSE

The students who participate at the following activities with the prior permission of the Principal may be exempted from the above rules as a Special case:

- a) *A Student Who participated at Various national and International Moot Court Competitions in India or abroad; or*
- b) *A Student Who participated in Mock Trials, Debate, Essay or any other kind of competitions*
- c) *A Student who participated in any Model United Nations, Model Parliamentary Debate Competitions in India or abroad; or*
- d) *A Student Who actively volunteered in the College organized or any national NSS activity or any other extra-curricular activities; or*
- e) *A Student Who participated in assisting NLC's Free Legal Aid Clinic or other legal aid services, Legal Awareness camps etc. ; or*
- f) *A Student who participated in any cultural or sports activities held at national or international level; or*
- g) *A Student who is suffering from prolonged illness duly certified by the Registered medical practitioner*

Provided, the students who participated in the abovementioned activities, have sought prior permission, in writing, of the Principal, Law College to represent the institute at national and international level. The exemption granted under this rule shall solely be subject to the discretion of the Principal, Law College and no Student can claim the exemption as a matter of his/her right.

SYSTEM OF EXAMINATION

Each paper shall be of out of which 40 Marks shall be for Internal Assessment (IA) and 60 Marks shall be for University Examination (UE). Internal Assessment (IA) and University Examination (UE) shall be conducted by the University for each paper.

THE CREDIT SYSTEM:

The credits specified for BB.A. LL.B. 5 years programme describe the weightages of various courses of the programme. The number of credits along with grade points that the student has satisfactorily completed measures the performance of the student. Satisfactory progress of a student is subject to his/ her maintaining a minimum Cumulative Grade Point Average (CGPA), as well as minimum grades in different courses of the programme. A certain number of credits must be earned by the student to qualify for the degree. Description of credit distribution for core Courses, elective Courses, and language course has already been shown.

There shall be a 10-Point Absolute Grading System for grading in each head of passing. The system shall have seven, the highest being 10.

The performance indicators **O, A+, A, B+, B, and F** shall respectively mean:

O	Outstanding
A+	Excellent
A	Very Good
B+	Good
B	Satisfactory
F	Fail

THE GRADING SYSTEM UNDER CBCS

Point Scale for Grading

Marks Range of marks (Out of 100)	Grade Point	Grade
80 ≤ Marks ≤ 100	10	O
70 ≤ Marks ≤ 80	9	A+
60 ≤ Marks ≤ 70	8	A
55 ≤ Marks ≤ 60	7	B+
50 ≤ Marks ≤ 55	6	B
Marks below < 50	0	F

EVALUATION AND COMPUTATION OF THE GRADE POINT AVERAGES:

Cumulative performance indicators such as GPA, SGPA or CGPA shall be calculated as described and illustrated below.

- A) The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the Course/ Paper.
- B) The Weights for performance at UE and IA shall respectively be **60% and 40%**.
- C) The Grade Point Average (GPA) for a Course/ Paper shall be calculated by first finding the total marks out of 100 for the Course/ Paper.
- D) Two kinds of performance indicators, namely, the Semester Grade point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the Courses/ Paper in a particular Semester, while CGPA measures the cumulative performance in all courses/ papers since his/her enrollment. The CGPA of a learner when he/she completes the programme is the Final Result of the learner.

STANDARDS OF PASSING

- A) In order to pass in a Semester, a Student must obtain a minimum grade point of 6.00 (50%) both at the UE and IA.
- B) A Student who passes in a Course/ Paper is said to have completed the Credits assigned to the Course/ Paper.
- C) A Student who completed the minimum Credits required for a programme will be declared to have completed the programme.
- D) **Minimum passing grade** shall be Grade 'B' for each course/ Paper.

RULES OF PROMOTION FOR BB.A LL.B 5 YEARS PROGRAMME

In a 5 year LL.B programme, a Student who is admitted in 1st year, subject to the clearance of eligibility and after securing required credits for that year, shall automatically be promoted to next year. However, a Candidate who has not put minimum credits shall not be promoted to next year of the programme. In order to get promotion in 3rd year, the Candidate has to pass in all the papers of 1st year with minimum 6.00 grade points in each paper at both University Examination and Internal Examination. Similarly, in order to get promotion to 4th Year, a Candidate has to pass in all the papers of 1st year and 2nd year. In order to get promotion in last year, a Candidate has to pass in all the papers of 1st year, 2nd year and 3rd year of the programme.

SINGLE DEGREE:

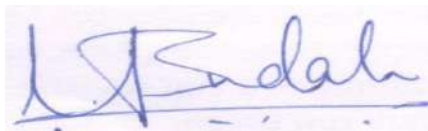
As per the UGC rules, a Candidate admitted in **BB.A. LL.B 5 Years Programme** is entitled for Single Degree only (**BB.A. LL.B**) that too after the successful completion of 5 years programme. They shall not be entitled for Dual Degree as the duration of the Programme is only five years.

AWARD OF HONOURS:

A Student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The Final result will be in terms of letter grade only and is based on the CGPA of all Courses studied and passed. The Criteria for the award of honours is given below.

The Criteria for the award of Degree are given as follows:

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 < CGPA < 10.00	O	Outstanding	80 < Marks < 100
9.00 < CGPA < 9.49	A+	Excellent	70 < Marks < 80
8.00 < CGPA < 8.99	A	Very Good	60 < Marks < 70
7.00 < CGPA < 7.99	B+	Good	55 < Marks < 60
6.00 < CGPA < 6.99	B	Satisfactory	50 < Marks < 55
CGPA Below 6.00	F	Fail	Marks below 50



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**COURSE DESIGN OF LL.M (TWO YEAR PROGRAM)
(SEMESTER PATTERN)**

Semester	Core Course	Elective Course	Practical Paper	Open Course	General Course	Total No. of Papers	Total Marks	Total Credits
First Semester	02	02	01	NIL	NIL	05	500	30
Second Semester	02	02	01	NIL	NIL	05	500	30
Third Semester	NIL	02	01	02	01	06	600	30
Fourth Semester	Dissertation	NIL	NIL	NIL	NIL	01	200	30
Total						17	1800	120

1. Scheme of Examination: The examinations for two year LL.M. Program will be held in each Semester. The medium of instruction and the examination shall be in English. Every paper shall carry 100 marks out of which 60 marks are for written examination i.e. University Examination (UE) & 40 marks for Internal Assessment (IA). There shall be no written examination (i.e UE) for Practical Paper and Dissertation.

▪ **Internal Assessment (IA) will be as follows:**

- Unit Tests - 15 marks
- Home assignment - 10 marks
- Tutorial/Class Presentation - 10 marks
- Attendance - 5 marks

▪ **Practical Paper**

- The student has to appear for a Practical Paper in First, Second and Third Semester each respectively.
- The practical paper shall carry 100 marks each which shall be evaluated on the basis of the performance of the students under following headings:
 - Research Project (Doctrinal/Non-doctrinal)
 - Research publication
 - Clinical work
 - Law teaching

▪ **Dissertation**

- Dissertation shall carry 200 marks which shall be evaluated as follows:
 - Written work submission – 100 Marks
 - Research Publication – 50 Marks
(in Peer reviewed journal having ISSN No.)
 - Presentation and Viva voce – 50 marks

The student shall also have to submit two progress reports signed by their research guide highlighting the work carried out by the student during his research.

2. **Credit System:** Choice based credit system designed as per the University rules has been implemented for this program. The two year LL.M. program will have **120 credits**. Each credit is of 15 hours.
3. **Grading System:** The University has adopted a **10-point absolute grading system** for grading in each head of passing. The grading system shall be as shown in Table-1 below.

The Grading System under CBCS

Range of Marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} < 80$	9	A+
$60 \leq \text{Marks} < 70$	8	A
$55 \leq \text{Marks} < 60$	7	B+
$50 \leq \text{Marks} < 55$	6	B
Marks < 50	0	D

The performance indicators O, A+, A, B+, B, and D shall respectively mean Outstanding, Excellent, Very Good, Good, Average, and Poor. It may be noted that entries in Table are meant for converting marks in individual courses to grade points. The respective grade points can also be computed from the following formulas given in Table-2.

The Formula to calculate the Grade Points (GP):

Suppose that '**Max**' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, set $x = \text{Max}/10$ (since we have adapted 10-point system). Then GP is calculated by the formulas shown in Table-2. After computing the grade point the grade can be found from Table-1.

Table-2: Formula to Calculate Grade Point in Individual Evaluations

Range of Marks at the evaluation	Formula for the Grade Point
$8x < M < 10x$	10
$5.5x < M < 8x$	$\text{Truncate}(M / x) + 2$
$4x < M < 5.5x$	$\text{Truncate}(M/x) + 1$

4. Computation of Grade Point Averages: Cumulative performance indicators such as GPA, SGPA, or CGPA shall be calculated as described and illustrated below.

- I. The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. **The weights for performance at UE and IA shall respectively be 60% and 40%.**
- II. The grade point average (GPA) for a course shall be calculated by first finding the total marks **out of 100 for the course. The corresponding GP (as per the table in (2) above) shall be the GPA for the course.**
- III. Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of a learner when he/she completes the programme is the final result of the learner.

- IV. The SGPA is calculated by the formula
$$SGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$$
, where C_k is the credit-value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

- V. The CGPA is calculated by the formula
$$CGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$$
, where C_k is the credit-value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**

- VI. The CGPA, calculated after the minimum credits specified for the programme are 'earned', will be the final result.

5. Standards of Passing

- For all courses, both UE and IE constitute separate heads-of-passing (HoP).
- In order to pass in such courses and to 'earn' the assigned credits the learner must obtain a minimum grade point of **6.0 (50% marks) at UE** and also a minimum grade point of **6.0 (50% marks) at IA**;
- The GPA for a course will be calculated only if the learner passes at the UE.
- A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP.

- Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the HoP.

6. Rules of Promotion: - The admission of students to the Two Year LL.M Program shall be on the yearly basis. A student admitted to the First Year of the course who complies with norms of the credit system and internal assessment with minimum 75% of attendance in the first year shall be automatically promoted to the Second year.

7. Award of Honours:

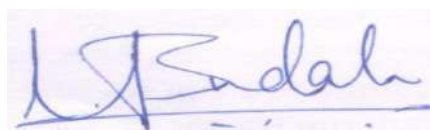
1. A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given in Table 4.

Table 4: Criteria for the Award of Honours at the End of the Programme

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 < CGPA < 10.00$	O	Outstanding	$80 < Marks \leq 100$
$9.00 < CGPA < 9.49$	A+	Excellent	$70 < Marks < 80$
$8.00 \leq CGPA \leq 8.99$	A	Very Good	$60 \leq Marks < 70$
$7.00 < CGPA < 7.99$	B+	Good	$55 < Marks < 60$
$6.00 < CGPA < 6.99$	B	Satisfactory	$50 < Marks < 55$
CGPA below 6.00	F	Fail	<i>Marks Below 50</i>

2. Formula to compute equivalent percentage marks for specified CGPA:

$$\%Marks(CGPA) = \begin{cases} 10 \times CGPA - 10, & \text{if } 5.00 \leq CGPA \leq 6.00 \\ 5 \times CGPA + 20, & \text{if } 6.00 \leq CGPA \leq 8.00 \\ 10 \times CGPA - 20, & \text{if } 8.00 \leq CGPA \leq 9.00 \\ 20 \times CGPA - 110, & \text{if } 9.00 \leq CGPA \leq 9.50 \\ 40 \times CGPA - 300, & \text{if } 9.50 \leq CGPA \leq 10.00 \end{cases}$$



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COURSE STRUCTURE FOR LL.M (TWO YEAR PROGRAM) (SEMESTER PATTERN)

➤ Core courses

- Law and social transformation in India (5 credits)
- Indian constitutional law: The new challenges (5 credits)
- Judicial process (5 credits)
- Legal education and research methodology (5 credits)

➤ Elective Courses

▪ Business law

- Law of industrial and Intellectual property (5 credits)
- Legal regulation of economic enterprises (5 credits)
- Law of export import regulation (5 credits)
- Banking laws (5 credits)
- Insurance laws (5 credits)
- Corporate finance (5 credits)

▪ Human rights law

- Concept and development of human rights (5 credits)
- Human rights and international order (5 credits)
- Protection and enforcement of human rights in India (5 credits)
- Human rights of disadvantaged groups (5 credits)
- International humanitarian law and refugee law (5 credits)
- Science technology and human rights (5 credits)
- Dissertation (30 credits)

▪ Intellectual Property Law

- General Regime of Intellectual Property Rights (5 credits)
- Law Relating to Patents (5 credits)
- Law Relating to Trademarks (5 credits)
- Law Relating to Copyright (5 credits)
- Biotechnology and IPR (5 credits)
- Law of geographical indication and traditional knowledge (5 credits)

▪ Environment Law

- Environment and Development: Law and Policy (5 credits)
- Environment and international legal order (5 credits)
- Environment protection in India (5 credits)
- Environment protection and disaster management (5 credits)
- Climate change and legal order (5 credits)
- Biological diversity and legal order (5 credits)

➤ **Practical Paper**

- Practical Paper I (10 Credits)
- Practical Paper II (10 Credits)
- Practical Paper III (10 Credits)

➤ **Interdisciplinary Courses**

- Educational Technology and E-learning (3 credits)
- Computer Application and Legal research (3 credits)

➤ **Value Added Course**

- Soft skills and Personality Development (4 credits)



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Bharati Vidyapeeth Deemed University

COLLEGE OF PHYSICAL EDUCATION

Dhankawadi, Pune-411 043 (Maharashtra), INDIA

DIPLOMA IN YOGA EDUCATION

(PG D.Y.Ed. - 1 Year)

GENERAL OBJECTIVES

- 1) To train the candidates in the esoteric aspects of Yoga that deals with the problems of integration of personality.
- 2) To prepare the students to undertake teaching work in yoga.
- 3) To inculcate rational thinking and scientific temper among the students of yoga.
- 4) To use managerial and organizational skills for becoming a yoga teacher.
- 5) To help them understand varied responsibilities of a yoga teacher.
- 6) To acquaint the student with school/ college Health Programme.
- 7) To acquaint the students with the basic concept of management of yoga education in the school.
- 8) To understand the evaluation procedure in Physical Education.
- 9) To develop competencies and skills in yoga needed for becoming a healthy individual.
- 10) To enrich proper knowledge of yoga among the students to resolve emerging issues such as health & fitness, wellness etc.
- 11) To develop a special aptitude towards spiritual phenomenon through yoga.

Programme outcome

1. At the end of the course the students will be able to understand traditional Indian Yoga systems; the philosophy of the Yoga systems and the new thought in Yoga movement in the country.
2. The students will be able to understand the principles of Hatha Yoga and the texts in this field.
3. The programme will develop basic understanding of the human anatomy, the human physiology and a deeper understanding of the human systems
4. The students will be introduced to the essential elements of a yogic life style, the concept of health and disease and their remedies through yoga practice. They will also learn the overview of the five sheath human existence.
5. The students will be introduced to regular and rigorous practice (sadhana) of yoga practices that would make them disciplined and knowledgeable Yoga teachers

REGULATIONS

1. **Duration of the Course:**

This is a co-education course. The duration of the course of study is for 1 year. The total Teaching days shall not be less than 200 days excluding examination.

2. **Eligibility for Admission:**

Candidate must be a graduate from any discipline.

3. **Selection Procedure for Admission:**

Admission to the eligible candidates will be given as per the selection procedure laid down by the College from time to time.

4. **Rules of examination**

- He/ she have completed all the practical and other work according to the syllabus up to the satisfaction of the principal. He/ she should have obtained such a certificate from the principal of the college. Unless and until the student obtains such a certificate, he will not be allowed to appear for university examination.
- Student who fails in any one or more internal practical works in the term end examination will be permitted to complete in the subsequent year of examination
- Student who fails in any one or more papers in the final examination will be permitted to rewrite the remained paper or papers in the subsequent year of examination
- **Medium of Instruction:** Medium of Instruction will be Marathi or Hindi or English or in combination. The candidate appearing for examination will have the option of answering all the examination subjects either in Marathi or in Hindi or in English.
- The college will complete the internal assessment of the heads mentioned in the syllabus. The internal assessment will be in the form of marks.
- For the rationalization of internal marks, the **College shall appoint moderation committee** (keeping the Principal of the college or his nominee as Chairman). The Committee will take the review of the internal marks given by the college faculties and advice the college if necessary. The college should take the appropriate action as per the advice of the committee.

Norms for passing PG D.Y.Ed. Examination :

To pass the examination the candidate must obtain at least 35% marks in each theory and 40% in practical separately and the aggregate must be 45%.

- i) Pass Class: 45% & above and below 50%

- ii) II Class: 50% & above and below 60%.
 iii) I Class: 60% & above and below 70%.
 iv) I Class with distinction: 70% & above

Note:

- 1) The candidate who has obtained minimum 35% or more marks in any head of passing but failed in the examination shall be eligible to claim exemption in such head/heads. Candidates claiming exemption will not be eligible for first class with Distinction, first class, and second class and merit list.
- 2) The candidate has completed their terms but has not completed internal work are eligible do so in next one academic year only.

SCHEME OF EXAMINATION

PART-A (THEORY)

Subject Code	Theory Subjects	Final Paper (Marks)	Sessional (Marks)	Total (Marks)	Minimum Aggregate Passing Marks	Credits
DYEd/Th-1	Foundation of Patanjala Yoga Sutra (3 periods per week)	75	25	100	35	6
DYEd/Th-2	Foundation of Hath yoga (3 periods per week)	75	25	100	35	6
DYEd/Th-3	Yoga, Cultural Synthesis & Value Education (3 periods per week)	75	25	100	35	6
DYEd/Th-4	Anatomic-physiological aspects in Yoga Education (3 periods per week)	75	25	100	35	6
DYEd/Th-5	Psychology of Yoga Education (3 periods per week)	75	25	100	35	6
DYEd/Th-6	Teaching Methods in Yoga Education (3 periods per week)	75	25	100	35	6
	TOTAL	450	150	600	-	36

PART-B (PRACTICAL SKILL)

Activity Code	Activities	Max. Marks	Min. Pass Marks	Credits
DYEd/Pr-1	Asanas (3 periods per week)	100	40	6
DYEd/Pr-2	Pranayamas (2 periods per week)	100	40	4
DYEd/Pr-3	Kriyas (2 periods per week)	100	40	4
DYEd/Pr-4	Bandhas & Mudras (2 periods per week)	100	40	4
DYEd/Pr-5	Antaranga Yoga (2 periods per week)	100	20	4
DYEd/Pr-6	Practice teaching (1 period per week) 1) peer group lesson-ten 2) external lesson- two	100	20	2
	TOTAL	600	-	24

Total Credit (A+B) = 60

GENERAL OBJECTIVES

- 1) To train the candidates in the esoteric aspects of Yoga that deals with the problems of integration of personality.
- 2) To prepare the students to undertake teaching work in yoga.
- 3) To inculcate rational thinking and scientific temper among the students of yoga.
- 4) To use managerial and organizational skills for becoming a yoga teacher.
- 5) To help them understand varied responsibilities of a yoga teacher.
- 6) To acquaint the student with school/ college Health Programme.
- 7) To acquaint the students with the basic concept of management of yoga education in the school.
- 8) To understand the evaluation procedure in Physical Education.
- 9) To develop competencies and skills in yoga needed for becoming a healthy individual.
- 10) To enrich proper knowledge of yoga among the students to resolve emerging issues such as health & fitness, wellness etc.
- 11) To develop a special aptitude towards spiritual phenomenon through yoga.

REGULATIONS

1. Duration of the Course:

This is a co-education course. The duration of the course of study is for 1 year. The total Teaching days shall not be less than 200 days excluding examination.

2. Eligibility for Admission:

Candidate must be a graduate from any discipline.

3. Selection Procedure for Admission:

Admission to the eligible candidates will be given as per the selection procedure laid down by the College from time to time

4. Medium of instruction :- Medium of instruction will be **Marathi** or **Hindi** or **English** in combination. The candidate appearing for examination will have the option of answering all the examination subjects either in Marathi or in Hindi or in English

5. Rules of examination

- A candidate (He/She) must have completed all the practical and other work according to the syllabus up to the satisfaction of the principal. He/she should have obtained such a certificate from the principal of the college. Unless and until the student obtains such a certificate, he will not be allowed to appear for university examination.
- The College will complete the internal assessment of the heads mentioned in the syllabus internal assessment will be in the form of marks.
- For the rationalization of internal marks, the college shall appoint moderation committee (keeping the principal of the college or his nominee as chairman). The Committee will take the review of the internal marks given by the college and advise the college if necessary. The college should take the appropriate action as per the advice of the committee.
- 80% of marks will be assessed through external evaluation and 20% shall be by the internal evaluation.
- A candidate must record attendance at the periods in college for the whole year as prescribed in the university norms (min.80%) to be able to appear for university examination.
- Candidate should complete all the practical and internal assessment work up to the satisfaction of the principal / Head of the unit.
- To pass the examination the candidate should score minimum 40% marks separately in internal as well as external examination for each theory and practical paper

SYLLABUS FOR P.G. DIPLOMA IN YOGA EDUCATION (P.G.D.Y.Ed.)

PAPER I- Foundation of Patanjala Yoga Sutra (P.Y.S.)

Marks 100

Unit-I.

1. P.Y.S.: Introduction to P.Y.S., its author and its concept about Yoga and chapters.
2. P.Y.S.: According to *Samkhya* Philosophy,
3. Yoga traditions: P.Y.S. and other Traditions (*Gita, Hatha, Mantra, Laya*)
4. Brief survey of P.Y.S. and its Traditional and Modern commentaries and other related works on P.Y.S.
5. Concept of Citta, its structure & functions and need to channelize it

Unit-II.

1. *Abhyasa & Vairagya.*
2. Factors that accelerate *Patanjala Yoga Sadhana, Bhavapratyaya Yogis & Upayapratyaya Yogis,*
3. Concept of *Isvara* and *Isvarapranidhana/ Pranava Japa*
4. Concept of *Cittaviksepa/ antaraya, Eka tattva – Abhyasa .*
5. Concept and methods to achieve *Cittaprasadana,*

Unit-III.

1. *Kriyayoga:* Meaning, concept , importance and Its educational value.

2. *Klesas*: Concept & their remedy.
3. Concept of *Caturvyuha*: *heya*, *heyahetu*, *hana* and *hanopaya*.
4. *Rtambhara prajna*,
5. Concept of Saptabhumi Prajna

Unit-IV.

1. *Yamas* and *Niyamas*: Concept and practice.
2. Concept and practice of *Asanas*, *Pranayama*, *Pratyahara* according to Patanjali and their practice in the light of other scripture.
3. Concept of *Dharana*, *Dhyana* and *Samadhi*, their differences and salient features
4. *Samprajnata* and *Anya*, *Samapattis*, *Sabija Samadhi* and *Nirbija Samadhi* and difference between Samapatti and Samadhi
5. Concept of *Samyama* in PYS.

REFERENCE BOOKS

A) Traditional Commentaries:

1. Shri *Patanjala Yoga Darshanam* published by Kaivalyadhama, Lonavla 410 403.
2. “*Patanjala-Rahasyam*” of Raghavananda Saraswati : In THE SAMGA YOGADARSANA : The Kashi Sanskrit Series No.110, The Chowkhamba Sanskrit Series Office, Banaras (India),1935.
3. “*Patanjala-Yogasutra-Bhasya-Vivarsanam*” of Sankaro Bhagavadpada, edited by poiagam by poiagam Sir Rama Sastri and S.R. Krishnamurti Sastri (The Madras Government oriental Series No.94),the Govt. Oriental Manuscripts Library, Madras (India)1952.
4. “*Rajamartanda*”of Bhojaraja :In *YOGASUTRAM OF MAHARSHI PATANJALA*. The Chowkhamba Sanskrit Sansthan, Varanasi, (India),1982 (Second Edition).
5. “*Sutrarha-bodhini*” of Narayana Tirtha : In YOGADARSANAM Edited by Pandita Ratna Gopal Bhatta (The Chowkamba Sanskrit Series Nos.154 and 159) The Chowkamba Sanskrit Book Depot, Banaras (India)1911.
6. “ *Tattvavaisaradi*” (Ta. Vai.) of Vacaspati Misra : In THE SAMGA YOGADARSANA “ The Kashi Sanskrit Series No.110,The Chowkhamba Sanskrit Series No.110, The Chowkhamba Sanskrit Series Office, Banaras (India), 1935.
7. “*Vyasabhasya*” of Vyasa : In *PATANJALA YOGASUTANI* edited by Kasinath Sastri Agashe (Anandashrama Sanskrit Series No.47) Anandashrama press,poona (India)1932.
8. “*Yoga Karika*” of Hariharananda Aranya : In *THE SAMGA YOGADARSANA* Gosvami Damodara Sastri : The Kashi Sanskrit Series No.110, The Chowkhamba Sanskrit Series No.110, The Chowkhamba Sanskrit Series No.110, The Chowkhamba Sanskrit Series Office, Banaras (India), 1935.

9. YOGASARASAMGRAHA OF *Vijnanabhiksu* : edited by *Dr. Pavan Kumari*, Eastern Book Linkars, Delhi, 1935.

B. Modern Commentaries:

a) English-

1. *Patanjala Yoga Sutra*, Dr.P.V.Karambelkar,Kaivalyadhama,Lonavala.
2. The Science of Yoga,I.K.Taimini, The Theosophical Publication House, Madras.
3. The Science of Yoga, Aprabuddha, Shri Aprabuddha Vichar Sadhana, Nagpur.
4. “*Yoga-Vattik*” (YV) of *Vijnanabhiksu* (Volume I To IV),edited by T.S Rukmani : Munshiram Manoharlal Publishers Pvt.Ltd., New Delhi 110 055, 1983.
5. Introduction to *yoga sutra*, Ram Shankar Bhattacharya, Bharatiya Vidya prakashan, Varanasi 1.
6. Yoga Sutra of Patanjali, Ballantyne & Shastri, Akay Book Corporation, Delhi 35
7. Four Chapters on Freedom, Swami Satyananda Saraswti, Bihar School Of Yoga, Munger, Bihar.

B) Hindi:

- 1) *Patanjala Yoga Darshanam*, Acharya Udayavir shastri, Chairman, Virajananda Vaidik (Shodh) Samsthan, Gajiyabad, U.P.
- 2) *Patanjala Yoga Darshanam*, Vol.1 to 4, Dr.Vimla Karnataka , Kashi Hindu Vishvavidyalaya, Varanasi and Ratana publications, aranasi.
- 3) *Patanjala Yoga Darshanam*, Acharya Rajvir Shastri, Arsha Sahitya prachar Trust, New Delhi 110 007
- 4) Maharshi Patanjalikrit Yoga Darsana, Harikrishna Goyanka, Gita press, Gorakhpur.
- 5) *Patanjala Yogapradipika*, Shri Swami Omananda Tirth, Gita Press,Gorakh
- 6) Patanjalyogadarshanam, Shrimat swami Hariharananda aradhya, Motilala Banarashidas New Delhi 10007.
- 7) *Vyasa bhasya Samvalitam*,Patanjalyogadarshanam, Dr. Sureshchandra Shrivastava ,Chaukhamba Surbharati Prakashan ,Varanasi 220001.

PAPER II. Foundations of Hatha Yoga

Marks 100

Unit – I

- 1) Concept of Yoga in the light of its definitions, Schools of Yoga- *Bhavana* Yoga-*Jnana*, *Karma* and *Bhakti*; *Prana Samyama* Yoga- *Mantra*, *Hatha* , *Laya* and *Raja*;
- 2) Introduction to important *Hathayogic* Texts with special reference to *Hathapradipika* (HP) and *Gheranda Samhita* (Gh S), Special features of these two texts,
- 3) Ideal place and ideal hut according to *HP* and *Gh S*.
- 4) *Sadhaka* and *Badhaka* Factors according to *HP*,
- 5) Concept of *Mitahara* in *HP* and *Gh S*.

Unit – II

- 1) Antiquity and definitions of *Asana*,
- 2) All 15 *asanas* from *HP* and 32 *Asanas* from *Gh S*.
- 3) Evolution of *Pranayama*, Components of *Pranayama*, *Yukta* and *Ayukta* *Pranayama*,
- 4) Concept of *Kanda* and *Nadi* in *Hathayoga*, *Nadishodhana* *Pranayama* in *HP* and *Gh S*.
- 5) *Yoga Therapy* in 5th Chapter of *HP* of *Kaivalyadhama*.

Unit – III

- 1) Importance of *Cleansing* processes in *Yogic* curriculum, comparison between *Pancha karma* and *Shat karma*,
- 2) *Cleansing* processes in *HP* and *Gh S*.
- 3) Eight *kumbhakas* in *HP* and *Gh S*, Special study of *Suryabhedana*, *Ujjayi*, *Bhramari*, *Bhastrika* and *Kevala/ Kevali* in *HP* and *Gh S*
- 4) *Sahita kumbhaka* in *Gh S*,

5) *Sitkari and Plavini Kumbhaka* in *HP*

Unit -IV

1. Importance and purpose of *Mudras* in *Hathayoga*, Concept of *Kundalini* and its arousal,
2. *Mudras* in *HP* and *Gh S*, Special study of *Khecari* and *Shaktichalana*,
3. Five *Dharanas*, in *Hatha yoga*
4. Concept of *Pratyahara* and *Dhyana* in *Hathayoga* with special reference to *Gh S*, Concept and technique of *Samadhi* in *Gh S*,
5. Concept of *Laya* and *nada*, Technique and stages of *Nadanusandhana*.

REFERENCE BOOKS

1. *Goraksha Shatakam* of *Gorakshanath* (Pub by kaivalyadhama, Lonavla)
2. *Shiv samhita* (Pub. By Kaivalyadhama ,Lonavla)
3. *Vasishtha samhita* (Pub. By Kaivalyadhama ,Lonavla)
4. *Yoga Yajnavalkya yajnavalkya smriti*
5. *Asana* by Swami Kuvalayananda (Pub by kaivalyadhama, Lonavla)
6. *Pranayama* by Swami Kuvalayananda (Pub by kaivalyadhama, Lonavla)

PAPER III. Yoga, Cultural Synthesis & Value Education: Marks 100

UNIT – I

Yoga and Culture

1. Concept and meaning of *Yoga* and its forms.
2. Definition of Culture and Civilization,
3. Salient Characteristics of Indian and Western Culture.
4. *Yoga* as basis of Culture and Humanitarianism

UNIT – II

Yoga and Philosophy (Darshana)& Philosophy of Yoga in Darshana,

1. Brief Introduction to *Yoga* in *Veda* and *Upanishads*, *Shrimad Bhagawad Gita* with special reference to – *Jnana Yoga*, *Karma Yoga* and *Bhakti Yoga* – their inter- relationship and synthesis.
2. Salient features of Indian Philosophy and Western Philosophy
3. Six systems of Indian Philosophy with special reference to concepts of Soul, Bondage and Liberation. Relation of *Yoga* to these systems.
4. Brief Introduction to the contribution of Modern Indian personalities like Swami Vivekananda, Gandhiji, Shri Aurobindo, Swami Shivanandaji and Swami Kuvalayanandaji towards World Peace and Harmony with special reference to *Yoga*.

UNIT III

Yoga, Religion and Mysticism

1. Meaning and significance of Religion; Yoga and Religion; Yoga and Jainism
2. Yoga and Buddhism
3. Yoga and Islam,
4. Yoga and Christianity
5. Yoga and Mysticism, Yoga and Suficism.

UNIT IV

Yoga and Value Education

Values – meaning, significance, classification; Indian Understanding of Values.

1. Basis of Value Development –
 - a) Socio-cultural,
 - b) Psychological.
2. Concept of Value Education – Meaning, aims and objectives, Rationale of Value Education, Contents of Value Education and Role of Teachers.

Methods of Value Education:- a) Yoga as a method of Value Education.
b) Implication & application of Value Education in one's own life style.
Short –term project to prepare & follow & submit to in- charge for evaluation . (Committed Project)

Reference Books –

- 1) Mysticism and Philosophy – Stace, W.T. Mac Milan and Co., London, 1961.
- 2) Mysticism in World's Religions – Geoffrey Parinder, Oxford University Press, New York, Shendon Press, 1976.
- 3) Education in value a Source book Pub: national council of education research and training Nov 1992, Secretary, NCERT ,Sri Aurobindo Marg New Delhi 10016 Price Rs.54
- 4) Hindu Cultural An Introduction, Pub – Central Chinmaya Mission trust, Mumbai

- 5) Indian Philosophy Datta & Chatterjee Hindi and English, Pub.:University of Calcutta, Calcutta Year 1984, 8th Reprint
- 6) World's Religions, Pub.: Sri Swami Shivananda, Ananda Kutir, Rishikesh, Himalayas, The Sivananda Publication League, Rishkesh. Year 1947
- 7) Bharatiya Darshana: parasnath Dwivedi- Hindi Pub.: Shriram Mehra & com., Agra 3 Year 1980
- 8) *Bharatiya Sanskriti*, - Dr. Rajkishor Singh Hindi, Pub.: Vinod Pustak Mandir, Agra, Year 1995-96
- 9) *Dharma Avem Sanskriti* V.K.Bhatiya, -Hindi, Pub.: Sahitya Bhavan, Agra, Year 1978

PAPER IV. Anatomico-Physiological aspects in Yoga Education (Marks100)

UNIT I –

1) Knowledge about the Living Body :

1. Concept of Living body and stages of life – modern view.
2. Concept of Anatomy & Physiology and its importance in Yogic field.
3. Modern History of Scientific concept about yogic practices.
4. Structural organization of body.
5. Basic physiological concepts.
6. Concept of harmony in related with health (all systems , organs cells)

2) Nervous System :

1. Anatomy of Brain , spinal cord , nerves.
2. Voluntary & Autonomus work of nervous system.
3. Concept of the development of brain and nerve cell.
4. Role of neurotransmitters.

3) Digestive system –

- 1) Structure and functions of all part of alimentary track and glands
- 2) Process of digestion; factors influencing the digestion.
- 3) Concept of diet through modern, Ayurvedic and yogic views.
- 4) Indigestion and its complications; How does yoga help to reverse the complication due to indigestion.

UNIT II –

1) Respiratory system

- Structure and functions of all parts of respiratory track.
- Mechanism of ventilation, diffusion and cellular respiration, breath regulation.
- Lung capacity and factors influencing it.
- Yogic practices for healthy respiratory system

2) Circulatory system –

- Structure and functions of the heart , blood vessels & blood cells.
- Concept of blood pressure and effect of yoga practices on it.

3) Endocrine system –

- Structure and functions of all endocrine glands.
- Neuro endocrine balance and yoga
- Yogic practices, how they influences work of glands.

4) Reproductive and Excretory System:

- Structure and Functions & effect of Yoga practices on it.

UNIT III –

1) Musculoskeletal System

Muscles –properties, function, types of muscles

Types of contraction & stretching

Bones – function and types of bones

Yoga and health of muscles and bones in different stage of life.

2) Asana

Definition

View of traditional text, scientific view,

Types.

Anatomy, physiology, therapeutic importance & limitation of various asanas described in traditional texts.

Asana- How to use as a therapy.

3) Pranayama

Definition, psycho-physiological effect.

Various types according to traditional texts and their importance.

Therapeutic importance and research about Pranayama.

UNIT- IV

1) Kriya

Cleansing concept in *Hatha & Patanjali*

Neti – Effect, importance and limitation

Vastra and *Nauli* - Effect, importance and limitation

Kapalabhati - Effect, importance and limitation

Trataka - Effect, importance and limitation.

Shankha Prakshalana & other processes.

2) **Meditation**

Scientific view

Types and variation. As a means & Goal/End.

Types and variations

3) **Yoga Therapy**

Concept of Yoga Therapy 1- Life style modification.2- practice.

Klesha and *antarayas* & how to overcome it. *Chittaprasadhana*.

Yogic management of 1- psychosomatic disorders.

2. Metabolic disorders

3. Immunity related diseases.

UNIT V –

1. Concept of Body, Mind and beyond mind.
2. Conceptual understanding of body mind & beyond with reference to human body function.
3. Body as a micro & macrocosm with interrelation.
4. *Nadi chakra*, *Kosha* , Subtle body etc.

UNIT VI –

1. Structural & functional comparison of modern / ancient yoga , ayurveda, Homeopathy.
2. Experience based knowledge & information about human body- According to yogic text & with their technical terms without equation & comparison according to *Hatha Pradipika* & *PYS*.

Reference books

1. Structure and function of human body.....published by Kaivalyadhama
2. *Asana* by swami kuvalayananda , kaivalyadhama ,Lonavla
3. *Pranayama* by Swami kuvalayananda ,kaivalyadhama ,Lonavla
4. *Yogic Therapy* by swami Kuvalayananda, kaivalyadhama ,Lonavla
5. *Anatomy & Physiology for Nurses*, Evelyn Pearce,16th Edn.1992
6. *Anatomy & physiology for Nurses*, Evelyn Pearce, (Hindi version) by Manju & Mahesh
7. *Yogic therapy* by Swami Shivananda Saraswati ,1957
8. *simple Yoga and Therapy* by Yogeshwar,1986
9. *Management of common diseases* compiled by swami Karmananda Saraswati ,Bihar School of Yoga, 1983.
10. *Principles of anatomy and Physiology* ,Tortora and Anagnostakos (1984), Harper & Row Publisher ,New Delhi.
11. *Swadhyay* and *Yoga therapy* Dr. D.R.Vaze, Lonavla : Kaivalyadhama.

PAPER V. Psychology of Yoga Education

Marks 100

UNIT –I

1. Similarities and dissimilarities between the sciences of yoga and modern psychology.
2. Advantages and limitations in understanding yoga through psychological means and methods.
3. Definitions of Health, Mental Health, Mental Hygiene and Total health in the context of the concept of swasthya.
4. Who is 'Swastha' ? what is "Swa" as per P.Y.S.

UNIT –II

1. **Normality** in yoga and modern Psychology in the context of different theories and models available in psychology. Emphasis should be laid on "Normality " in yoga.
2. Psychosomatic abnormalities / disorders: Freudian approach to these disorders causes of these disorders according to Patanjala Yoga Sutra.
3. Personality Development and yoga: Modern theories of personality, Indian approach to personality and personality integration.

UNIT –III

1. Personal and interpersonal adjustment through yogic methods with special reference to Niyamas & Yamas.
2. Attitude change through yogic & psychological methods
3. Tackling ill effects of conflict / Frustration through yogic methods.

4. How far, “Yoga-Psychology” is developed ? How far a synthesis of psychology and yoga is possible for personality development.

UNIT –IV

- 1. Concept of stress:** Modern psychological and yogic perspectives.
- 2. Methods of Citta Prasadanaam for**
 - (a) Stress management
 - (b) Application of Patanjali Yoga Sutra for a total Health.
- 3. Prayer:** a cross –cultural approach to mento-spiritual development , psychology of prayer ,benefits of prayer to the yoga Sadhaka , as well as, to the common man.

REFERENCE BOOKS :

1. Bhoga R.S. (2010)Yoga and mental Health Lonavla, kaivlyadhama
2. Bhogal R.S.(2006) Yoga and modern psychology, Lonavla, Kaivalyadhama
3. Mathur, S.S.(1985) *Samanya Manovigyan* (Hindi) Agra :Vinod Pustak Mandir
4. Morgan, C.T. & king R.A.(1978) Introduction to Psychology ,New Delhi :Tata McGraw- hill Publishing company limited
5. Pandit,R.V.(1971)*Samanya Manasa Shastra* (Marathi). Nagpur: Payal Prakasan
6. Sharma,Ram Nath,(1960) Indian psychology; Meerut: Kedar Nath Ram Nath.

PAPER VI. Teaching Methods in Yoga Education

100 Marks

- Besides the above mentioned theory, subjects and practicals, students will also be taught the art of teaching Yoga. Since Yoga is a specialized field, the method of its teaching is also unique. Kalvalyadhama has evolved special methods of teaching yoga hence the subject. This has been further divided into Theroy and Practical Teaching.

Unit 1

Introduction: need of practice teaching and its use in yogic practice.

Yoga and Yogic practices.

Unit 2

- 2.1. Meaning and Scope of Teaching Methods.
- 2.2. Sources of Teaching Methods.
- 2.3. Presentation techniques: its meaning and relevance in yoga education .

Unit 3

- 3.1. Teaching aids: its meaning and need up to the modern time power point.
- 3.2. Class management: its meaning and need.

Unit 4

- 4.1. Lesson plan: meaning and need.

- 4.2. Preparation of lesson plan in yogic practice.
- 4.3. Time allotment in different lesson plans & its importance.
- 4.4. Lesson presentation.

Practical Teaching

Each student will be assigned to prepare and teach five lessons on different aspects of Yoga. Out of Which the 5th Lesson is to be presented by each student on any one topic relating common disease.

Reference book

1. Gharote, M.L. and Ganguly, S.K. (1988) Teaching Methods of Yogic Practice, Kaivalyadhama, Lonavla,
2. Doanld G. Butter (1975) Teaching Yoga, Geoffery Chapman Publisher,
3. *Yogasana* Teacher's Guide (1983) National council of Educational Research and Training,
4. K.K. Bhatia and J.N. Arora, Methodology of Teaching, Prakash brothers Ludhiana 1985
5. Sachitra Shaleya Yogaabhyasakrama, (Marathi), director Sports and Youth welfare Pune 1976
6. Tiwari O.P. (1984) asana Why and How? Kaivalyadhama, Lonavla.

PRACTICAL TRAINING :

Marks 100

Shavasana	Vatayanasana
Shrishasana	Garudasana
Crocodile Practices (Four variations)	Shirh-padangusthasana
Pavanmuktasana	Vajrasana
Naukasana	Padmasana
Viparitakarani	Siddhasana
Sarvangasana	Swastikasana
Matsyasana	Shavasana
Halasana	Makarasana
Karnapidasana	Brahmamudra
Bhujangasana	B. PRANAYAMA
Shalabhasana	1. Anuloma-viloma
Sarpasana	2. Ujjayi
Dhanurasana	3. Shitali
Vakrasana	4. Sitkari
Ardha-Matsyendrasana	5. Bhastrika
Paschimatanasana	6. Bhramari
Supta Vajrasana	7. Suryabhedana
Yoga Mudra	8. Chandrabhedana
Simhasana	9. Murccha (Theory only)
Gomukhasana	10. Plavini (Theory only)
Matsyendrasana	C. BANDHAS AND MUDRAS
Mayurasana	1. Jalandhara Bandha
Kukkutasana	2. Uddiyana Bandha
Uttana Kurmasana	3. Jicha Bandha
Ushtrasana	

<p>Gorakshasana Padma - Bakasana Baddha -padmasana Akarmadhanurasana Ugrasana Parvatasana Janushriasana Tolangulasana Muktasana Virasana Guptasana Sankatasana Uttanamandukasana Vrishabhasana Padangusthasana Garbhasana Bhadrasana Kapotasana Ekpadaskandhasna Chakrasana (Sideward) Chakrasana (Backward) Virkshasana Tadasana Pada - hastasana Utkatasana Natarajasana</p>	<p>4.Mula Bandha</p> <p>D.KRIYAS</p> <ol style="list-style-type: none"> 1.Jala Neti 2.Sutra Neti 3.Dhauti (Vamana,Danda,Vastra) 4.Nauli 5.Kapalabhati 6.Aganisara 7.Trataka 8.Shankhprakashalana <p>E.RECITATIONS</p> <ol style="list-style-type: none"> 1.Pranava Japa 2.Svasti Mantra 3.Rudropasana 4.Savitru Upasana 5.Mahapurushavidya 6.Om Stavana 7. 15th Chapter of shrimad Bagwat Gita <p>F.OTHER PRACTICES</p> <ol style="list-style-type: none"> 1.Meditation Techniques 2.Suryanamaskar 3.Sukshma Vyayama 4.Kriya Yoga Session-consisting of Pranayama,Mantra,Yoga,Sutra etc.
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Calculation of Credit:

For theory	For practical
1 day = 2 hrs. For 200 days, total (200x2) = 400 hrs. 36 credits = 400 hrs. 1 credit = 11 hrs.	1 day = 1 hrs (1 hr in morning + 1 hr in evening) For 200 days, total (200x2) = 400 hrs. 24 credits = 400 hrs. 1 credit = 16 hrs.
Minimum eligibility for exam: Minimum 4 Credits in each paper = 11 hrs x 4=44 hrs. Thus, 44 hrs. to be spent for each paper	Minimum eligibility for exam: Minimum 2 Credits in each event = 16 hrs. x 2= 32 hrs. Thus, 32 hrs. to be spent for each event

A student must acquire 4 credits in each theory paper and 2 credits in practical event. Thus, the year-wise credit to be acquired is as follows:

Year	Minimum CREDIT		Minimum TOTAL Credit needed
	Theory paper	Practical	
1 st year	Minimum 4 credits x 6 papers =24 credits	Minimum 2 credits x 6 events =12 credits	36 Credits (Out of 60)

Theory Lectures : 600 Credits : 24

Practical : 600 Credits : 12

BHARATI VIDYAPEETH DEEMED UNIVERSITY

**(Established u/s 3 of UGC Act 1956, vide notification no. F9. 15.U.3 of
Govt. of India)**

COLLEGE OF PHYSICAL EDUCATION

Dhankawadi, Pune-411 043 (Maharashtra), Tel.020-24373741

REACCREDITED 'A' GRADE BY NAAC



**Bachelor of Physical Education & Sports
(B.P.E.S)-3Years**

(6 Semester Programme)

**CURRICULUM FRAMEWORK
2015-2018**

**GUIDELINES OF REGULATIONS AND SYLLABUS STRUCTURE FOR
[B.P.E.S -3 years] (Six SEMESTERS)
CHOICE BASED CREDIT SYSTEM (CBCS)**

Preamble: Bachelor of Physical Education and Sports i.e. B.P.E.S (Six Semesters Choice Based Credit System) for 3 year duration This is a professional programme meant for preparing basics to become teachers of physical education.

B.P.E.S programme shall be designed to integrate the study of physical activity in childhood, social context of Physical Education, historical development, subject knowledge of psychology, pedagogy, aim of Physical Education, communication language & skills etc. The B.P.E.S programme comprises of compulsory and optional theory papers as well as physical activity (practical courses).

Programme Outcome

1. Students will know and apply discipline specific scientific and theoretical concepts critical to development of physically educated person.
2. Students will plan, design and implement learning experiences that facilitate and enhance the growth of learners of diverse needs from varying backgrounds.
3. Students will use effective communication and pedagogical skills and strategies to enhance student engagement & learning.
4. Students will utilize assessments and reflection to foster student learning and to inform instructional decisions.
5. Students will inherit qualities essential to become effective professionals.
6. Students will understand the disciplinary content knowledge, application of content knowledge to teaching physical education.
7. Students will evaluate self and seek opportunities to grow professionally and humanistically.
8. Students will use appropriate technology to enhance teaching and learning and enhance personal and professional productivity.
9. Students will foster relationship with colleagues, parents, community and associated agencies to support student's growth & wellbeing.

Duration, Intake, Eligibility and Admission Procedure:

The Duration, Intake, Eligibility and Admission Procedure are as per the University norms and standards.

Duration: B.P.E.S programme shall be of duration of three academic years,

that is, Six semesters. However, the students shall be permitted to complete the B.P.E.S programme requirements within a maximum of Five years from the date of admission to the programme. However, if a student fails to complete the degree in 5 years he should take fresh admission.

Intake:-

50 seats are approved by University for B.P.E.S course.

*No differently-abled candidate is eligible for the admission in B.P.E.S Course.

Eligibility

Candidate should have passed the higher secondary (10+2 standard) or equivalent examination with 40% marks. Relaxation of 5% marks will be given to the candidates belonging to S.C. & S.T. and other notified categories as per Government Rules or for extraordinary sportsman.

Age:-

For General category candidates, the upper age limit is 25 years as on 1st July of the academic year. Age relaxation for SC, ST and OBC candidate will be given according to the rules and regulation of Bharati Vidyapeeth University and GOI

Admission procedure:-

Admission shall be made on merit on the basis of marks obtained in the entrance examination consisting of 100 marks based on the following.

a- Physical fitness test	50 marks
b- Written test	30 marks
c- Interview	10 marks
d- Sports achievement	10 marks

The total entrance test will be conducted in two days and could be extended, if needed and it will be conducted at Bharati Vidyapeeth Deemed University College of Physical Education

There shall be Physical Fitness Test (modified AAHPER/CNADIAN/OR ANYOTHER fitness test) of 50 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education

- (A)** Theory Paper comprising of 30 multiple-choice questions of 30 minutes duration carrying 30 marks. Questions shall be based on Aptitude Test, Current Affairs and General Knowledge about sports.

(B) Interview comprising of 10 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education

(C) Sports Participation **Weightage** :- Candidate shall be given maximum 10 marks *weight age* on the basis of their sports participation in any one of the following level:

Participation	Marks
<input type="checkbox"/> International:	10
<input type="checkbox"/> Senior National championship/ National Games:	
1st Place :	10
2nd Place :	08
3rd Place :	07
Participation:	05
<input type="checkbox"/> All India Inter-Zonal Inter University Competitions:	
1st Place :	08
2nd Place :	07
3rd Place :	06
Participation:	05
<input type="checkbox"/> Zonal Inter University Competitions/ Junior National Competitions:	
1st Place :	07
2nd Place :	06
3rd Place :	05
Participation:	04
<input type="checkbox"/> Senior State Championship/Rural national games/Woman Festival:	
1st Place :	05
2nd Place :	04

3rd Place :	03
Participation:	02

Note:-

*The marks will be given in only those games/sports, which are in the competition list of Association of Indian Universities (**AIU**) and/or School Games Federation of India (**SGFI**).

*The obtained position must be during last five academic sessions.

*The school state championship and inter collegiate championship participation shall be considered for eligibility criteria only; the candidate shall not get any marks for sports **weightage**.

Medical examination:-

Qualified candidates will have to submit medical certificate by CMO and blood group certificate to the concern office.

1. Rules of examination**(i) Eligibility for appearing at B. A. (Physical Education) examination:**

Students should have kept at least 80% attendance in each year for theory and practical.

He/ she must complete all the practical and other work according to the syllabus up to the satisfaction of the Principal. He/ she must obtain such a certificate from the Principal of the college. Unless and until the student obtains such a certificate, he will not be allowed to appear for university examination.

(ii) Annual Examination:**Theory**

An annual examination will be held at the end of each year which shall be called "Annual Examination". This is a 6 semester course in semester-wise distribution of theory marks for each annual examination will be as follows:

1 st Semester:	400
2 nd Semester:	400
3 rd Semester:	400
4 th Semester:	400
5 th Semester:	400
6 st Semester:	400

Practical:

There shall be practical examination to be conducted at the end of the completion of teaching every year. Year-wise distribution of practical marks for each annual examination will be as follows:

1 st Semester:	500
2 nd Semester:	500
3 rd Semester:	500
4 th Semester:	500
5 th Semester:	500
6 st Semester:	500

- N.B.-** (i) University Exam, internal assessment and practical will be done by a Panel of two examiners (One Internal And One External)appointed by University
- (ii) For the rationalization of internal marks, the **College shall appoint moderation committee** (keeping the Principal of the college or his nominee as Chairman). The Committee will take the review of the internal marks given by the college faculties and advice the college, if necessary. The college should take the appropriate action as per the advice of the committee and submit the internal marks to the University.

3. Standard of Passing

A candidate should obtain minimum 40% of marks in each theory paper and also he/she should get 40% marks to pass the subject including theory and **sessional**. Similarly, to pass the examination, the candidate should also obtain minimum 40% marks in practical examination.

4. A.T.K.T.

A candidate may be allowed to take admission in succeeding year of the course irrespective of number of papers/ practical events in which he/she fails. It is mandatory that the whole course shall be completed within a period of 5 years from the date of admission.

SCHEME OF EXAMINATION FOR B.P.E.S

(6SEMESTERS)

(2015-2018)

Semester wise Distribution of Marks & Credits

		Sem-I	Sem-II	Sem-III	Sem-IV	Sem-V	Sem-VI	Total
Part-A: Theory Courses	Marks	400	400	400	400	400	400	2400
	Credits	16	16	16	16	16	16	96
Part-B: Activity Courses (Games/Sports)	Marks	400	400	300	300	400	400	2200
	Credits	8	8	6	6	8	8	44
Part- C: Game/ Sport Specialization	Marks	100	100	100	100	100	100	600
	Credits	2	2	2	2	2	2	12
Part D -: Teaching Ability and Internship	Marks	--	--	100	100	--	--	200
	Credits	--	--	2	2	--	--	4
Grand Total	Marks	900	900	900	900	900	900	5400
	Credits	26	26	26	26	26	26	156

NOTES:

- Each Theory Course shall have 4 Units and 3 hrs. Duration final examination except Sports Specialization which will have 3 units in each semester and 2-hour duration semester-end examination.
- The pattern of Semester-end question papers shall be:

2.1. For papers having Max. Marks- 60: [12+12+12+12+(4x3)=60 marks]

1. For University examination each question paper shall consist of 9 questions (4 long answer questions from each unit and 1 combined question of 4 short notes from all 4 units).
2. The candidate will attempt any one question from each unit. The 5th question will be compulsory consisting 4 short notes of 3 marks each.
3. For Internal Assessment of Theory Courses one Mid Semester Test of 30 marks for each course will be conducted by the college. For the mid semester test each question paper (of 30 marks) shall consist of 5 questions (4 long answer questions from first two unit and 1 combined question of 2 short notes from both units). The candidate will attempt any one question from each unit (2 questions of 12 marks each from first 4 questions). The 5th question will be compulsory consisting 2 short notes of 3 marks each. In addition, the teacher concerned shall conduct one open book examination consisting of 10 marks and submit the marks to the college exam department.
4. For Semester-end Examination in Activity Courses, the breaks-up of 100 Marks shall be as follows:

- Skill proficiency/playing ability	:	80
- Diary / Record book	:	20
5. For Specialization Sports Practice and Sports Training, the break-up of 100 Marks shall be as follows:

- Skill proficiency/playing ability	:	50
- Written Test	:	50
6. For Lesson Plan, student needs to complete perform 10 ground lesson in 3rd and 4th Semester at college itself.

- Lesson Plan	:	100 marks
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CURRICULUM FRAMEWORK FOR
B.P.E.S
(6 SEMESTERS (2015-2018))

B.P.E.S I-Semester (July 2015 to November 2015)

PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lectures	Credits
B.P.E.S /I/A/HC/01	Fundamental of Physical Education	60	40	100	64	4
B.P.E.S /I/A/HC/02	Anatomy	60	40	100	64	4
B.P.E.S /I/A/HC/03	English	60	40	100	64	4
B.P.E.S /I/A/SC/01 B.P.E.S /I/A/SC/02	<u>Select anyone of the following:</u> *Historical development of Sports Movements *First Aid	60	40	100	64	4
	Total	240	160	400	256	16

NOTE: **HC**- Hard Core/Compulsory Course; **SC**- Soft Core/Elective Course.

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Classes	Credits
B.P.E.S /I/B/HC/01	Conditioning	100	48	2
B.P.E.S /I/B/HC/02	Track and Field (Running events)	100	48	2
B.P.E.S /I/B/SC/01-04	<u>Select anyone Activity/Game/Sport from each</u>	100X2	48X2	2X2

	Group** (B1 and B2 – the offer shall depends as per the choice of students).			
	Total	400	--	08

****Groups of Activity/Game/Sport:**

Activity Group-B1		Activity Group-B2	
Activity Code	Activity	Activity Code	Activity
B.P.E.S /I /B/SC/01	Basketball	BPEd/I/B/SC/03	Table Tennis
B.P.E.S /I /B/SC/02	Volleyball	BPEd/I/B/SC/04	Tennis

PART-C: GAME/SPORT SPECIALIZATION:

Activity Code	Name of Area	University Exam	Clas s	Credits
B.P.E.S /I/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport- seasonal only)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

NOTE: SCC- Soft Core Compulsory.

B.P.E.S**II-Semester (December 2015 to April 2016)****PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.P.E.S /II/A/HC/01	Physiology of Exercise	60	40	100	64	4
B.P.E.S /II/A/HC/02	Information Technology	60	40	100	64	4
B.P.E.S /II/A/HC/03	Psychology of Sports	60	40	100	64	4
B.P.E.S /II/A/SC/01	<u>Select anyone of the following:</u> *Fitness and Wellness	60	40	100	64	4
B.P.E.S /II/A/SC/02	*Adapted Physical Education					
	Total	240	160	400	256	16

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
B.P.E.S /II/B/HC/01	Track & Field-I (Field	100	48	2

	Events)			
B.P.E.S /II/B/HC/03	Light Apparatus	100	48	2
B.P.E.S /II/B/SC/01-04	Select anyone Activity/Game/Sport from Group-B3* and B4* (the offer shall depends as per the choice of students).	100X2	48X2	2X2
	Total	400	192	08

***Group of Activity/Game/Sport:**

Activity Group-B3		Activity Group-B4	
Activity Code	Activity Code	Activity Code	Activity
B.P.E.S /II/B/SC/01	Handball	B.P.E.S /II/B/SC/03	Kho- Kho
B.P.E.S /II/B/SC/02	Cricket	B.P.E.S /II/B/SC/04	Weight Lifting

PART-C: GAME/SPORT SPECIALIZATION:(Continued from Semester-I)

Activity Code	Name of Area	University Exam	Classes	Credits
B.P.E.S /II/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

B.P.E.S
III-Semester (July 2016 to November 2016)

PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.P.E.S /III/A/HC/01	Kinesiology	60	40	100	64	4
B.P.E.S /III/A/HC/02	Methods of Teaching in Physical Education	60	40	100	64	4
B.P.E.S /III/A/HC/03	Health Education	60	40	100	64	4
B.P.E.S /III/A/SC/01 B.P.E.S /III/A/SC/02	Select anyone of the following: *Sports Entrepreneur *Professional Preparation in Physical Education	60	40	100	64	4
	Total	240	160	400	256	16

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
B.P.E.S /III/B/HC/01	Conditioning	100	48	2
B.P.E.S /III/B/HC/02	Judo	100	48	2
B.P.E.S /III/B/HC/03	Select anyone Activity/Game/Sport from Group-B5& B6 (the offer shall depends as per the choice of students).	100	48	2
	Total	300	144	06

***Group of Activity/Game/Sport:**

Activity Group-B5		Activity Group-B6	
Activity Code	Activity Code	Activity Code	Activity
B.P.E.S /III/B/SC/01	Yoga	B.P.E.S /III/B/SC/02	Aerobics
B.P.E.S /III/B/SC/03	Boxing	B.P.E.S /II/B/SC/04	Taekwondo

PART-C: GAME/SPORT SPECIALIZATION:(continue from Semester - I &II)

Activity Code	Name of Area	University Exam	Classes	Credits
B.P.E.S /III/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

PART-D: TEACHING ABILITY AND INTERNSHIP (ACTIVITY TEACHING):

Activity Code	Name of Area	University Exam	Class	Credits
B.P.E.S /III/C/HC/01	Teaching Practice	100	48	2

B.P.E.S IV-Semester (December 2016 to April 2017)**PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lectures	Credits
B.P.E.S /IV/A/HC/01	Event Management	60	40	100	64	4
B.P.E.S /IV/A/HC/02	Sports Sociology	60	40	100	64	4
B.P.E.S /IV/A/HC/03	Environment Science	60	40	100	64	4
B.P.E.S / IV /A/SC/01 B.P.E.S / IV /A/SC/02	Select anyone of the following: <ul style="list-style-type: none"> • Fitness Instructor • Sports Industry 	60	40	100	64	4
	Total	240	160	400	256	16

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Classes	Credits
B.P.E.S /IV/B/HC/02	Weight Training	100	48	2
B.P.E.S /IV/B/HC/03	Gymnastics	100	48	2
B.P.E.S /IV/B/HC/03	Camping/ Hiking /Tracking	100	48	2
	Total	300	144	6

PART-C: GAME/SPORT SPECIALIZATION:(Different from Semester – I-II&III)

Activity Code	Name of Area	University Exam	Classes	Credits
B.P.E.S /IV/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

PART-D: TEACHING ABILITY AND INTERNSHIP (ACTIVITY TEACHING):

Activity Code	Name of Area	University Exam	Class	Credits
B.P.E.S / IV /C/HC/01	Teaching Practice	100	48	2

B.P.E.S V-Semester (July 2017 to November 2017)

PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.P.E.S /V/A/HC/01	Correctives in Physical Education	60	40	100	64	4
B.P.E.S /V/A/HC/02	Test measurement and Evaluation	60	40	100	64	4
B.P.E.S /V/A/HC/03	Yoga Education	60	40	100	64	4
B.P.E.S /V/A/SC/01 B.P.E.S/V/A/SC/02	Select anyone of the following: <ul style="list-style-type: none"> • Gym Management • Sports Journalism 	60	40	100	64	4
	Total	240	160	400	256	16

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
B.P.E.S /V/B/HC/01	Kabaddi	100	48	2
B.P.E.S /V/B/HC/02	Mallakhamb	100	48	2

B.P.E.S /V/B/HC/03	Wrestling	100	48	2
B.P.E.S /V/B/HC/04	Badminton	100	48	2
	Total	400	192	8

PART-C: SPECIALIZATION:(Continue from Semester –IVsemester)

Activity Code	Name of Area	University Exam	Class	Credits
B.P.E.S /V/D/SCC/01	<u>SPECIALIZATION</u>	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

B.P.E.S VI-Semester (December 2017 to April 2018)

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.P.E.S /VI/A/HC/01	Basic of Sports Training	60	40	100	64	
B.P.E.S /VI/A/HC/02	Stress Management	60	40	100	64	4
B.P.E.S /VI/A/HC/03	Education Technology	60	40	100	64	4
B.P.E.S /VI/A/SC/01 B.P.E.S /VI/A/SC/02	<u>Select anyone of the following:</u> <ul style="list-style-type: none"> ● Recreation in Physical Education ● Art Of Daily Scheduling 	60	40	100	64	4

	Total	240	160	400	256	16
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PART-A: THEORY COURSES:**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

Activity Code	Name of Activity	University Exam	Class	Credits
B.P.E.S /VI/B/HC/01	Softball	100	48	2
B.P.E.S /VI/B/HC/02	Hockey	100	48	2
B.P.E.S /VI/B/HC/03	Football	100	48	2
B.P.E.S /VI/B/HC/03	Swimming	100	48	2
	Total	400	192	8

PART-C: SPECIALIZATION :(continue from Semester –IV& V)

Activity Code	Name of Area	University Exam	Class	Credits
B.P.E.S /VI/D/SCC/01	<u>SPECIALIZATION</u>	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

(Choice Based Credit System)**Standard of Passing:**

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0(40% of marks) at UE and also a minimum grade point of 5.0(40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50 % in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table:

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} \leq 80$	A+	9
$60 \leq \text{Marks} \leq 70$	A	8
$55 \leq \text{Marks} \leq 60$	B+	7
$50 \leq \text{Marks} \leq 55$	B	6
$40 \leq \text{Marks} \leq 50$	C	5
$\text{Marks} \leq 40$	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

Formula to calculate Grade Points (GP)

Suppose that Max is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP. Sex x -Max/10 (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (Marks/x)+2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (Marks/x)+1

Two kinds of performance indicators, namely, the semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester. While the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the B.P.E.S programme is the final result of the learner.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA)	10x CGPA -10	If $5.00 \leq \text{CGPA} \leq 6.00$
	5x CGPA +20	If $6.00 \leq \text{CGPA} \leq 8.00$
	10x CGPA -20	If $8.00 \leq \text{CGPA} \leq 9.00$
	20x CGPA -110	If $9.00 \leq \text{CGPA} \leq 9.50$
	40x CGPA -300	If $9.50 \leq \text{CGPA} \leq 10.00$

Award of Honours:

A student who has completed the minimum credits specified for the B.P.E.S programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honors are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

Educational Tour/Camp: In addition to the above rules the student must fulfill the following requirements to acquire the degree which is mandatory. Educational Tour or Leadership Camp organized by the College of Physical Education of at least 07 days. The students shall contribute separately for these activities.

B.P.E.S

(Physical Education and Sports)

6 semester Credit system

Syllabus

Semester I

B.P.E.S /I/A/HC/01: **Fundamental of Physical Education**

Unit I: Introduction

- a. Meaning, Definition, Scope and Functions of Physical Education
- b. Different Interpretations of Physical Education
- c. Concept of Movement Education
- d. Physical Education an Integral Part of Education
- e. Life time Physical Education for Fitness

Unit II: Philosophical Foundations

- a. Meaning of Philosophy, Philosophical basis of Physical Education, Different Schools of Philosophy
- b. History of Physical Education
- c. Objectives of Preprimary, Primary and Secondary School Physical Education Programmes
- d. Concept of Physical Fitness
- e. Cultural aspect of sports and worthy use of Leisure time through Physical Education activities
- f. F) National and International understanding through Sports

Unit III: Contribution of Thinkers & Competitions.

- | | |
|-----------------------|---------------------|
| a. Swami Kuvalayanand | b. Baren'Dcaubertin |
| c. Shri. Aurobindo | d. Olympic Games |
| e. Asian Games | |

Unit IV: Recreations.

- a. Meaning, Definition, Scope & Functions of Recreations
- b. Recreation in Rural, Urban & Industrial Area
- c. Age-Wise Planning & leadership in recreation

Book Recommended

- i Principles of Education – R. M. Marathe, MoghePrakashan, Kolhapur
- ii Teacher and Education in Emerging Indian Society – NCERT, New Delhi.
- iii Human Values Education – S. P Rahela
- iv Foundation of Physical Education – Bucher Charles, WCB/McGraw Hill, 1999
- v The Principles of Physical Education – Willam J. E. W. B. Sounders Com. Philadelphia, 1964.

B.P.E.S /I/A/HC/02: Anatomy**UNIT-I Introduction**

- a. Introduction of Basic concepts of Anatomy
- b. Structure and functions of cell.
- c Tissues and their classification.
- d Basic introduction of body systems.

UNIT-II Skeleto Muscular Systems

- a. Classification of Skeletal system.
- b. Types and structure of bones.
- c. Different types of joints.
- d. Classification of Muscle
- e. . Types of Muscles

Unit III Respiratory and Digestive System

- a) Meaning and types of Respiration, Organs of Respiratory System.
- b) Functions of Respiratory System, Vital capacity and its measurement. Mechanism of Respiration.
- c) Meaning, importance and organs of Digestive System.
- d) Functions, processes, mechanism of Digestive System.

UNIT-IV

- a. Circulatory System and Nervous System
- b. Meaning of the Circulatory System.
- c. Heart, its structure, functions.
- d. Cardiac Cycle. Meaning, functions compositions of Blood,
- e. Maintenance of Blood supply

Books Recommended

1. Evelyn Pearce: Anatomy and Physiology for nurses. Culcutta, Oxford University press, 1992
2. Sedey Rod R.- Anatomy and Physiology
3. Stephens & Tate P. St. lous, Mosby, 1992
4. Tortora G. J. : Introduction to Human Body, Ed. 4th California, Addison, Wesley, 1996

B.P.E.S /I/A/HC/03: ENGLISH**UNIT-I : Vocabulary**

- 1.1 Synonyms
- 1.2 Antonyms
- 1.3 Common abbreviations in use
- 1.4 One word substitution
- 1.5 Words Commonly Misspel
- 1.6 Idiomatic Comparisons or Similes
- 1.7 Word Formation by Prefix and Suffix

UNIT-II : Common Errors & Transformations

- 2.1 Common errors in sentences especially regarding number, gender, Pronouns, prepositions, articles, degrees etc.
- 2.2 Punctuation
- 2.3 Kinds of sentences - Assertive, Interrogative, Exclamatory, Imperative, Optative
- 2.4 Transformation of sentences
- 2.5 Tenses

UNIT-III : Correspondence

- 3.1 Personal Letters
- 3.2 Applications for leave, scholarship etc.
- 3.3 Invitations- Formal and Informal with reply
- 3.4 Notice Writing

UNIT-IV :- Descriptive Writing

- 4.1 Paragraph writing (50 words)
- 4.2 Essay writing (250 words)
- 4.3 Comprehension of unseen passage
- 4.4 Summary Writing

REFERENCES

- ❖ High School English Grammar – Wren & Martin
- ❖ How to write & speak better English –John Elisson Kahn, D. Phil.
- ❖ Business Correspondence and Report Writing – R.C. Sharma, Krishna Mohan
- ❖ Macmillan the Student’s companion – Wilfred D. Best.
- ❖ A remedial English grammar for foreign students – F.T. wood
- ❖ English Vocabulary in use – Michael McCarthy, Felicily O’Dell.
- ❖ Advanced English Grammar – Martin Haurings.
- ❖ G.O.E. Lydall, A practical Guide to précis Writing & indexing, London: Macdonald & Evans Ltd. (1955)

B.P.E.S/I/A/SC/01: Historical Development of Sports Movements (Elective Subject)

UNIT -Introduction

- A. Physical Education in Ancient Civilization with reference to
i) India ii) Greece iii) Rome iv) Egypt.
- B. Development of Physical Education & sports during 20th Century with special reference to i) U.S.A. ii) Sweden iii) Germany iv) Olympics v) Asian Games.

UNIT - II Sports Bodies of India

- Physical Training for teacher working in school & college
- Movement of Akhadash & Vyayam Shalas.
- Central Advisory Board of Physical Education
- Sports authority of India (Sai)
- Awards National & state level.
- All India council of sports
- SNIPES, NSNIS, LNIPE.
- Nehru Yuwak Kendra

UNIT - III A Study of the development of Physical Education sports & Games in Maharashtra with reference to

- a) Pune International marathon
b) The present Organization set up in state.
c) Important schemes and activities including indigenous activities.
d) Role of Voluntary Physical Education & sports Bodies in state...

UNIT - IV Youth welfare & Youth Services:-

- a) Concept of youth welfare & Youth work.
b) Youth organization in India
c) Programmers under youth development
d) Youth services such as secreting & guiding N.C.C. N.S.S., Civil defense & scout & Guide movement.

Reference

1. Manual of Physical Education of India - D.G. Wakharkar
2. A World History of Physical Education - Van Ten Micher
3. History of Physical Education C.W. Hyensmith
4. A Brief History of Physical Education -Emmel A Rice & John L Hutchinson
5. Physical Education in ancient India - Dr. S.H. Deshpande.

B.P.E.S /I/A/SC/01: First Aid**UNIT -I**

- a) Meaning and definition of first aids and its importance in sports
- b) Types of first aids and its objectives
- c) First aids box and its management
- d) Role and qualification of first aider

Unit-II

- a) Common sports injuries in different parts of body
- b) First aids for sports injuries
- c) Common causes of sports injuries and its prevention
- d) RICE & Bandage

UNIT - III

- a) Definition of safety education and its significant
- b) Aims and objectives of safety education
- c) Identify causes of accidents & List types and sources of accidents
- d) Safety measures at
 - Home
 - Road
 - School
 - Community

UNIT – IV

- a) Describe and demonstrate the management of the following:-
 - Stings and Snake bites
 - Fracture
 - Nose bleeding
 - Electric shocks and other shocks
- b) Fevers:-
 - Definition of fever
 - signs of fever
 - first Aid for fever
 - Management of fever.
- c) Fainting- Definition and causes of fainting, first aid for fainting
- d) Drowning/Near-drowning:- Definition of drowning, definition of near-drowning
- e) first aid for drowning/near drowning.

Reference :

- Guyton, A.C. (1996). Textbook of Medical Physiology, 9th edition. Philadelphia: W.B. Saunders.

- Hunter, M. dictionary for physical educators. In H. M. Borrow & R. McGee, (Eds.), A Practical approach to measurement in Physical Education (pp. 573-74). Philadelphia: Lea & Febiger.

Semester II

B.P.E.S /II/A/HC/01: **Physiology of Exercise**

UNIT-I Introduction

- a. Definition and importance of physiology and Exercise physiology
- b. Essential properties of living being.
- c. Effect of exercise on various system of the body.
 - a) Circulatory system
 - b) Respiratory system
 - c) Muscular system

UNIT-II

1. Cardiac functions and Blood

- a. Cardiac cycle and its function in human body.
- b. Control of cardiac function.
- c. Blood pressure and it's regulation in human body.

2. Kidney

- a) Role of kidney in human body
- b) Function of kidney

3. Physiology terminology

a) Second wing	b) Second wing
c) Second wing	d) oxygen debt
e) VO_2 max	f) Vital capacity
g) Athletic heart	

Unit III

1. Nervous system

- a) Definition of Nervous system, role of nerve fibers
- b) Parts of Brain & spinal cord its functions,
- c) Central nervous system and peripheral nervous system**

2. Endocrine system

a) Pituitary gland	b) Thyroid
c) Parathyroid	d) Adrenal
e) Sex organ	

3. Environment effect on the body

- a) High altitude
- b) Hot condition
- c) Cold condition

UNIT-IV

- a) Physical fitness and its components.
- b) Training, conditioning, and warm-up.
- c) Types of muscle contraction.
- d) Lactic acid and its influence on sports performance.
- e) First aids and sports injuries

Books Recommended

- Evelyn Pearce: Anatomy and Physiology for nurses. Culcutta, Oxford University press, 1992
- Sedey Rod R.- Anatomy and Physiology
- Stephens & Tate P. St. lous, Mosby, 1992
- Tortora G. J. : Introduction to Human Body, Ed. 4th California, Addison, Wesley, 1996
- MariefEsclaine N. Human Anatomy and Physiology Ed. 3rd California, The Benjanin Cumming Co. 1991
- Fox Edward – Sports Physiology W B Soundrs Co. 1994

B.P.E.S /II/A/HC/02: **Information Technology**

Unit I: Introduction of Computer

1. History, application, characteristics, types of computer (Analog, Digital, Hybrid) and generations of Computer.
2. Physical structure of computer.
3. Role of computer in various fields
4. Need of computer in Physical Education.

Unit-II Component of Computer System: An Introduction of Hardware and Soft ware

1. Components of computer system
2. CPU (CU, ALU and Main memory)
3. Input devices (Keyboard, Mouse and Track Ball, Touchpad, Joysticks, Touch Sensitive Screens, Data Scanning Device, Bar Code Readers, Optical Mark Reader (OMR) and Magnetic Ink Character Reader (MICR)
4. Output Devices (Monitor, Printer, LCD)
5. Hardcopy Devices (Printers and Plotter)
6. UPS and types of UPS
7. Operating System Programme Languages translator.
8. Application program/package

UNIT-III: USE OF COMPUTERS IN SCHOOLS

1. Functional knowledge of operating computers–on/off, word processing, use of power point, excel
2. Computer as a learning tool
3. Effective browsing of the internet for discerning and selecting relevant information
4. Survey of educational sites based in India
5. Downloading relevant material
6. Cross collating knowledge from varied sources
7. Competencies in developing original software

UNIT IV: VISUALISING TECHNOLOGY-SUPPORTED LEARNING SITUATIONS

1. Preparation of learning schemes
2. Interactive use of audio-visual programme
3. Developing PPT slide show for classroom use
4. Use of available software or CDs with LCD projection for subject learning interactions
5. Generating subject-related demonstrations using computer software

B.P.E.S /II/A/HC/03: **Psychology of Sports**

UNIT- I Introduction to Sport Psychology

1. Meaning and scope, Importance, relationship with other sport sciences,
2. Development of sport psychology in India.
3. Scope of Sports Psychology

UNIT-II Concept and meaning of motor learning

1. Stages of learning transfer of training, assessment of learning and factors affecting of motor learning.
2. Growth & Development: Concept of growth & development,
3. Play and its Theories.

UNIT III Personality in Sport:

1. Concept and definition of Personality
2. Modern perspective, (trait, humanistic, social cognitive and biological),
3. Dynamics of personality in sport Anxiety in Sports

UNIT-IV Psychological Preparation and Competition:

1. Motivation and Techniques of Motivation
2. Phenomenon of competitive
3. Psychological preparation for competition (arousal regulation, imagery, self-confidence, goal setting, concentration.)
4. Short term psychological preparation (upcoming competition) Mind to muscle and muscle to mind relaxation techniques.

Reference

1. Kamlesh, M.L. (2006). Educational Sport Psychology. New Delhi: Friend's publication
2. Cox Richard. (1998) Sports Psychology (W.C.B.)
3. Gill, Diance L. Psychological Dynamics of Sports (Illinois: Human Kinetics Publishers, 1986)
4. Silva, J.M. and Weinberg.(1984). Physiological Foundation of Sports. IL: Kinetics Publishers,
5. Suinn, Richard M. (1982) Psychology in Sports: Methods and Applications. New Delhi: Sujeet Publication.
6. Martens, Rainer. (1987). Coaches Guide to Sports Psychology. IL: Human Kinetics;
7. Roberts Glyn C. and et al. (1986). Learning Experiences in Sports Psychology. IL: Human Kinetics.
8. Alegaonkar, P.M. (1997). Sports Psychology Pune: Pune VidyarthiGriha.

B.P.E.S /II/A/SC/01: **Fitness and Wellness (Elective Subject)**

FITNESS & WELLNESS

Unit-I

- Definition of fitness & wellness, Components of fitness & wellness,
- Benefits of exercise & health, Fitness & wellness strategy,
- Fitness potential for popular sports, Fitness & wellness activities,
- Role of parents & community for the maintenance of fitness & wellness

Unit-II –

- Selection of machines for various parameters of health & wellness,
- Fitness center, Safety in gymnasium & sports field,
- Clothing & accessories, Carriers in fitness & wellness

Unit-III –

- Test, measurements & evaluation of fitness components, Cardiovascular endurance, Muscular strength, Muscular endurance, flexibility, body composition, agility, balance, co-ordination, speed, power, reaction time

Unit-IV –

- Assessment prior to fitness & wellness prescription,
- Principles of training, Training methods
- Diet prescription, Exercise prescription, Prescription for life style changes, Weight management
- Prevention of diseases through fitness & wellness, Diabetes & exercise, Cardiovascular diseases and exercise, Ageing and exercise, Addiction management- sustains abuse controls
- Stress management, Spiritual management

Reference

- Dougherty NJ et al (2002), Sport, Physical Activity and the Law. Sagamore Pub. Champaign. IL.
- Driskell JA and Wolinsky I (2002). Nutritional Assessment of Athletes. CRC Press. Boca Raton. Fla.
- Greenberg JS Diutriman GB and Oakes BM (2004). Physical Fitness and Wellness: Changing the way you look, feel and perform. Human Kinetics. Champaign. IL.
- Hoeger WW & Hoeger S (2007). Fitness & Wellness. Thomson Wadsworth.
- Maughan RJ Burke LM and Coyle EF (2004). Food, Nutrition and Sports Performance II: The International Olympic Committee Consensus on Sports Nutrition. Routledge. New York.
- Siedentop D (2004). Introduction to physical education, Fitness and sports. McGraw Hill. Boston

B.P.E.S /II/A/SC/02: **Adapted Physical Education (Elective Subject)**

Unit 1: An Introduction to Adapted Physical Education

- a) Meaning, Need and Importance of Adapted Physical Education and Sports
- b) Purpose, Aims and Objectives of Adapted Physical Education and Sports
- c) Program organization of Adapted Physical Education and Sports
- d) Adapted Sports- Para Olympics

Unit 2: Development of Individual Education Program (IEP)

- a) The student with a disability
- b) Components and Development of IEP.
- c) Principles of Adapted Physical Education and Sports
- d) Role of Physical Education teacher
- e) Teaching style, method & approach in teaching Adapted Physical Education

Unit 3: Developmental Considerations of an Individual

- 3.1 Motor development
- 3.2 Perceptual Motor development
- 3.3 Early childhood and Adapted Physical Education

Unit 4: Individual with unique need and activities

- 4.1 Behavioral and Special learning disability
- 4.2 Visual Impaired and Deafness
- 4.3 Health Impaired students and Physical Education
- 4.4 HRPF and its development for Individual with unique need
- 4.5 Role of games and sports in Adapted Physical Education

Reference

1. Beverly, N. (1986). Moving and Learning. Times Mirror/Mosby College Publishing.
2. Cratty, B.J. Adapted Physical Education in the Mainstream. (4th Edition) Love Publishing Company.
3. Houner, L.D. Integrated Physical Education- A guide for the elementary classroom teacher.
4. Winnick, J. P. (2005). Adapted Physical Education and Sports. Human Kinetics (4th Edition).
5. Pangrazi, R.P. and Dauer, V. P. Dynamics Physical

Semester III

B.P.E.S /III/A/HC/01 :Kinesiology

Unit-I : Introduction To Kinesiology

1. Meaning, aim & objectives, importance of kinesiology for physical education and sports
2. Fundamental concepts: Centre of gravity, line of gravity, axis and planes of motion, fundamental starting positions,
3. terminology of fundamental movements, and classification of muscles

UNIT-II :Location& Action

1. Types of Joints
2. Location & Action of Muscles at Various Joints:- a) Upper extremity – shoulder girdle, shoulder joints, elbow joint b) Neck, trunk (Lumbothoracic region)
3. Lower extremity – Hip joint, knee joint, ankle joint
4. Muscular analysis of fundamental movements:- Walking, running, jumping, throwing, catching, pulling, pushing, striking, hanging

UNIT-III Laws of Motion

1. Define mass, weight, force, pressure work, power energy, impulse, moments, impact, friction,
2. Newton's laws of motion
3. Angular kinetics: moment of inertias, conservation of moments, transfer of moments, levers, equilibrium

UNIT-IV Motion

1. Meaning, aims, objectives and importance, types of motion, linear motion & angular motion
2. Linear kinematics: Speed, velocity acceleration uniform accelerated motion and projectile motion
3. Angular kinematics: Angular speed, angular velocity, angular acceleration and relationship between linear and angular motion

Reference

- Bartlett, R. (2007). Introduction to Sports Biomechanics. Routledge Publishers, USA.
- Blazeovich, A. (2007). Sports Biomechanics. A& C Black Publishers, USA.
- Breer&Zarnicks (1979). Efficiency of human movement. WIB Saunders Co. USA.
- Hamill, J. and Knutzen, K.M. (2003). Biomechanical Basis of Human Movement. Lippincott Williams and Wilkins, USA.
- Hay (1993). The biomechanics of sports techniques prentice hall inC New Jersey

B.P.E.S/III/A/HC/02: **METHODS OF TEACHING IN PHYSICAL EDUCATION**

UNIT I : Introduction of Teaching

1. Meaning of teaching, coaching, officiating and as a career in Physical Education & Sports
2. Meaning and need for methods,
3. Factors effecting teaching method.

UNIT II Teaching methods

1. Teaching methods and its Types- command, demonstration, imitation, discussion, part- whole, whole- part-whole, explanation and recitation
2. Techniques of presentation: personal and technical preparation.

UNIT III Class management

1. Class management: techniques, formations, command (types and techniques)
2. factors effecting class management
3. Lesson Plan: Need, construction, Introduction development, skill/recreation

UNIT IV

1. Qualification and qualities of a coach,
2. Personnel in physical education/sports.
3. Teaching Aids: Need and Importance, Types of teaching aids.
4. Fundamental skills of athletics, aquatics, badminton, basketball, cricket, football, hockey, handball, kabaddi, KhoKho, volleyball and Judo, Yoga Assanas,

References

- Capel, S. et al Editors (2006). A Practical Guide to Teaching Physical Education. Routledge Publishers, USA.
- Graham, G.M. (2009). Children Moving : A Reflective Approach to Teaching Physical Education. 8th Ed. McGraw Hill, USA
- Gupta R. (2010). SharirikShiksha Mein ShikhshanPradhyogiki. Friends Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (1999).Lesson Plan in Physical Education &Sports.R.D.P. Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (2004).SharirikShiksha Mein Path Yojna.SahyogPrakashan. New Delhi
- Kamlesh ML (2005). Methods in Physical Education.Friends. Delhi.

B.P.E.S /III/A/HC/03: **Health Education**

Unit-I Health

1. Health-meaning, dimensions of health and their interrelationships,
2. Importance of health for individual, family, community and nation;
3. Factors influencing health,
4. Spectrum of health

Unit II Health Education

1. Health Education- meaning, scope
2. Aims and objectives of Health Education
3. Principles, methods and media used in health education
4. Hygiene- personal hygiene, food hygiene, environmental hygiene-meaning, need and importance; associated practices related to maintenance and promotion of health

Unit-II Foods and Nutrition-

1. Misconceptions about food, essential body nutrients- functions, food sources, balanced diet, diet prescription
2. Communicable and Non-communicable diseases- meaning, distinction between communicable and non-communicable diseases.
3. Communicable diseases- their mode of spread and prevention of diarrhea diseases, typhoid, malaria, STD Respiratory disease ; non-communicable diseases- causes and prevention of diabetes, CVD, cancers, renal diseases and respiratory diseases.

Unit-III Contemporary health problems of college youth-

1. Alcohol, drugs, use of tobacco (chewing, sniffing, smoking)- their harmful effects substance abuse management
2. National health programmes- components of existing national health programmes

Unit IV Health Agencies:

- 1 Introduction to Organizational and Administrative set-up of Health System in India
 - National level
 - State Level
 - District Leve
2. Steps of Planning of Health Education Programme
3. Internationals health agencies- WHO, UNICEF, Red Cross- their constitution and role in promoting health

Reference

- Anspaugh DJ Ezell G and Goodman KN (2006).
- Teaching Today's Health. Mosby Publishers. Chicago. USA

- Balayan D (2007). Swasthya Shiksha Evam Prathmik Chikitsa. Khel Sahitya. Delhi.

B.P.E.S /III/A/SC/01: **Sports Entrepreneur (Elective)**

Unit I: Introduction to Sports Entrepreneurship

1. Concept of entrepreneurship, innovation & knowledge management in sport
2. Business Planning Process - The business plan as an entrepreneurial tool
3. Elements of Business Plan, Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition, Business Model Canvas and Drafting Business Proposal for Funding Agency.

Unit II : Introduction to Finance in Sports

1. The Four Domains of Sports Marketing, Marketing Through Sports
2. Finance, Organization & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition,
3. Business Model Canvas and Drafting Business Proposal for Funding Agency.

Unit II. Management of Physical Education and sports

1. Meaning, Need and scope of management of Physical Education
2. Principles of Sports Management
3. Construction, marking and maintenance of play grounds, track & field, gymnasium, swimming pool and athletic track

Unit IV: Organization of co-curricular activities and Physical Education programmes.

1. Physical Education Budget : Need, Importance, procedure and principles of budget making,
2. Physical Education and sports programmes for - Primary, secondary and higher secondary School for sports awareness – demonstration, play days, sports rallies, sports exhibitions
3. Organization of National days (15th August & 26th January)., Organization of mass competition, sports day, hiking, trekking, Scout and Guide Camp and picnics
4. Ceremonies of competition – Opening, closing and victory

References:

- Sports Marketing By Melissa Jane Johnson Morgan Jane

- Small Business, Entrepreneurship and Enterprise Development. Harlow: Pearson Education.

B.P.E.S/III/A/SC/02: Professional Preparation in Physical Education (Elective)

Unit I- Foundation OF Professional Preparation

- 1 Meaning of Professional
- 2 Components of Professional Preparation.
- 3 Contribution of physical education in attaining ideals of Indian democracy.
- 4 Forces and factors affecting educational policies and Programme.

UNIT-II Historical Perspective

1. Historical review of Professional Preparation in India.
2. Professional courses being offered in professional preparation colleges in India.
3. Professional Preparation in Physical Education in USA, USSR and UK.
4. Beginning of Professional Preparation in the world.

UNIT-III Under-Graduate preparation of professional personnel.

- 1 Purposes, Admission Requirements of Undergraduate preparation.
- 2 Theory, Teaching practice and practical.
- 3 Professional competencies to be developed.
- 4 Post-Graduate Preparation.
- 5 Methods of instruction.
- 6 Professional relations.

UNIT-IV Teacher and Teaching

- 1 Teaching as a career.
- 2 Basic Qualities of a successful teacher.
- 3 Preparation of the specialized physical education teacher.
- 4 Types of teaching jobs.
- 5 Types of non-teaching jobs.

Reference

1. A Professional Career in Physical Education. (Englewood Cliffs, N.J. Prentice Hall, Inc. 1963.)
2. Jensen, R. Clayne, Administrative Management of Physical Education and Athletic Programmes. (Philadelphia Lea and Febiger, 1983.)
3. Snyder and Scott. Professional Preparation in Health, Physical Education and Recreation. (Connecticut, Greenwood press, Westport, 1971).
4. Bucher, C.A Foundations of Physical Education (Saint Louis) : The C.V. Mosby Company, 1975), Ed. 7.

5. Aahper publication: Professional Preparation in Dance, Physical Education, Recreation, Education, Safety Education, and School health Education, Washington, Aahper pub. 1974 Borozne Joseph & Pechar Stanley

Semester IV

B.P.E.S /IV/A/HC/01: **EVENT MANAGEMENT**

Unit-1

Meaning of Events, classification of events, Event Management, Designing an Event- 5C"s (Conceptualization, Costing, Canvassing, Customization, Carrying out).

Key Elements of Events- (Event Infrastructure, Organizers, Clients, Target Audience, Media, and Venue).

Unit-II

Managing Sports Events- Planning, Organizing, Coordinating and Controlling Pre events,

During the Events & Post Events issues. Sponsors, Sports Management Companies, Spectators, Sports personalities, Media etc. Sports Management Companies- Introduction, Role, Scope of Work, Service rendered to the clients, Ways of Functioning- Team work, Departments etc.

Unit-III

Sources of funds available for sports: Broadcasting:- What is broadcasting, The basics of sports broadcasting rights, Media providers:-Who are the media providers, How do they fund sports

Sponsorship:-Meaning of sponsorship, Sports and sponsorship, Major sponsors in sports

Team sponsors and individual sponsors, Endorsement, Sports and celebrity endorsement

Unit-IV

Sports and advertisements Advertisement Suggested Readings

Advertisement and brand choice Aiming the right target, Top sports ad companies

Firms and their advertisement choices, Effects of advertisement, gate money

Budgetary Control in sports

Role of Mass Media in Event Promotion.- Introduction to different Sports Media (Television channels, Sports Magazines etc.) Popular Sports Channels Operating in India- ESPN STAR SPORTS, ZEE SPORTS, TEN SPORTS, DD SPORTS, and NEO SPORTS etc. Spectators control, Importance of Spectators for Sports & Games. Human resource management.

Reference

- Chakraborty S (1998). Sports Management. Sports Publications. Delhi.
- Kamlesh ML (2000). Management Concept in Physical Education and Sport. Metropolitan Book Co. Pvt. Ltd. New Delhi.
- Kilkenny, S. (2007). The Complete Guide to Successful Event Planning. Atlantic Publishing Co., USA.
- Roy SS (1995). Sports Management. Friends Publications. Delhi.

B.P.E.S /IV/A/HC/02 : **Sports Sociology**

1. Introduction to Social Science

- 1.1 Introduction & Meaning of Social Sciences.
- 1.2 Scope of Sociology and its relation with other subjects of Social Sciences.
- 1.3 Defining Society, Community, Association, Institutions, Customs;
- 1.4 Man as a Social animal;
- 1.4 Effect of various social forces on personality development;
- 1.5 Origin and growth of society & Culture.

2. Social Structure, Organization and Institutions :

- 2.1 Socialization, social codes and social control, groups (primary and secondary, crowds and public, family, kinship and marriage;
- 2.2 Social stratification, social class and caste, social mobility;
- 2.3 Economical and political institutes for society;
- 2.4 Cultural and religious institutions;
- 2.5 Concept, factors and process of socio-cultural changes.

3. Main Features of Indian Society and Rural Scene:

- 3.1 Demographic profile, social elements;
- 3.2 Religions pluralism – Hindu, Muslim, Christian and Tribal;
- 3.3 Linguistic Pluralism;
- 3.4 Indian policy – secularism, democracy, social justice;
- 3.5 Indian Rural Scene:
 - 3.5.1 Indian village, rural family, rural education;
 - 3.5.2 Indian village community, rural stratification;
 - 3.5.3 Community development projects and Panchayati-Raj;
 - 3.5.4 Trends in Rural change.

4. Sport and Society:

- 4.1 Meaning and definition of sport sociology;
- 4.2 Sport as a social occurrence;
- 4.3 Socialization through games and sports;
- 4.4 Relationship between family and sport participation;
- 4.5 Relationship between politics and sports;
- 4.6 Social Stratification and sports;
- 4.7 Sports as a social phenomenon.

Reference

- ❖ Iyec, Mac. R.M. and Page Charles H. Society (London : McMillan & C., 1974).
- ❖ Ogburn, William F. and Nimkoff, Meyer F., Hand Book of Sociology (New Delhi : Eurasia Publishing House Ltd., 1972).
- ❖ Loy, Lohn W. Dr. and Kenyon, Gerald S. Sports Culture and Society (Philadelphia : The MacMillan Co. 1969).

B.P.E.S / IV / A/ HC/03: Environment Science

1. **Introduction:**
 - 1.1 Multi – Disciplinary nature of environmental studies.
 - 1.2 Definition, Scope and Importance of environmental studies.
 - 1.3 Concept of environmental education.
 - 1.4 Historical Background of environmental education.
2. **Natural Resources and related environmental issues:**
 - 2.1 Forest Resources:
 - 2.1.1 Use and over exploitation, deforestation
 - 2.1.2 Timber extraction, mining, dams and their effects on forests and tribal people.
 - 2.2 Water Resources
 - 2.3 Flood Resources:
 - 2.3.1 World food problems
 - 2.3.2 Changes caused by agriculture and overgrazing
 - 2.3.3 Effects of modern agriculture
 - 2.3.4 Fertilizer-pesticide problems.
 - 2.4 Energy Resources:
 - 2.4.1 Growing energy needs
 - 2.4.2 Renewable and non-renewable energy sources
 - 2.4.3 Use of alternate energy sources.
 - 2.5 Land Resources:
 - 2.5.1 Land as a resource
 - 2.5.2 Land degradation
 - 2.5.3 Man induced Land Slides
 - 2.5.4 Soil erosion and desertification
 - 2.6 Role of an individual in conservation of Natural Resources.
- 3.1 **Ecosystem:**
 - 3.1.1 Concept, structure and function of an Ecosystem
 - 3.1.2 Producers, consumers and decomposers.
 - 3.1.3 Energy flow in the ecosystem
 - 3.1.4 Food chains, food Webs and ecological pyramids.

4.1 Environmental Pollution:

4.1.1 Definition, effects and control measure of:

- 4.1.1.1 Air Pollution
- 4.1.1.2 Water Pollution
- 4.1.1.3 Soil Pollution
- 4.1.1.4 Marine Pollution
- 4.1.1.5 Noise Pollution
- 4.1.1.6 Thermal Pollution
- 4.1.1.7 Nuclear Hazards

4.1.2 Solid Waste Management: causes, effects and control measures of urban and industrial wastes.

4.1.3 Role Disaster Management: Floods, earthquake, cyclone and Land slides.

REFERENCES

- ❖ Agrawal, K.C. Environmental Biology (Bikaner: Nidhi Publishers Ltd.) 2001.
- ❖ Cunningham, W.P., and others. Environmental Encyclopedia (Mumbai: Jaico Publishers Home) 2001.
- ❖ Hawkins, R.E. Encyclopedia of Indian Natural History (Bombay : Natural History Society)
- ❖ Heywood, V.H. and Watson V.M; Global biodiversity Assessment (U.K: Cambridge University Press), 1995.
- ❖ Jadhav, H. and Bhosale, V.M. Environmental Protection and Laws (Delhi:Himalaya Pub. House), 1995.
- ❖ Mc Kinney, M.L. and school, R.M Environmental Science system and solution (web enhanced Ed.) 1996.
- ❖ Miller T.G. Jr. Environmental Science (Wadsworth Publishing Co.)
- ❖ Odum, E.P. Fundamentals of Ecology (U.S.A: W.B Saunders Co.) 1971.
- ❖ Rao, M.N. &Datta, A.K. Waste Water Treatment (Oxford & IBH Publication Co. Pvt. Ltd.)1987
- ❖ Townsend C.and others, Essentials of Ecology (Black well Science).

B.P.E.S /IV/A/SC/01: **FITNESS INSTRUCTOR**

Unit-I Introduction to health and fitness

Health goals, fitness goals, performance goals, components of physical fitness and performance, behaviours that support fitness and performance, taking control of personal health and fitness, factors to consider prior to physical activity, exercise requirement for prevention of premature health problems, how to promote physical activity promotion of physical activity adherence

Unit-II Foundation to health fitness instructions:

Energy cost of physical activity, measurement of energy expenditure, significance of cardiovascular fitness, risks of testing cardio respiratory fitness, components of health related and fitness related fitness

Unit-III Healthy body composition

Measurement of body fat calculating target body weight, LBM and Body fat,

Muscular strength and endurance:- health fitness requirements, assessment of strength and muscular endurance

Flexibility: Importance of flexibility in health and fitness, factors affecting range of movement (ROM) spine and hip joint, flexibility and low back function

Unit-IV Exercise prescription: foundation of prescribing exercise, general guidelines for cardio-respiratory fitness programmes, determining intensity, general exercise testing, exercise programme selection, exercise prescription for body weight management

Muscular strength and endurance training: fundamental principles, types of strength training, muscular training modes, intensity and frequency. Overreaching and overtraining

Flexibility training: exercise considerations for improving flexibility, prophylactic exercise for improving low back function

Reference

- Anspaugh, D.J. and G. Exell (2004) Teaching To-day's Health, Pearson Benjamin Cummings. San Francisco. California.USA.
- Bishop JG (2005).Fitness through Aerobics Person- Benjamin Cummings. San Francisco. California.USA.
- Donatelle RJ (2006).Access to Health. Pearson Benjamin Cummings. San Francisco. California.USA.
- Hoeger WW and Hoeger S (2007).Fitness and Wellness.Thomson-Wadsworth, Belmont. California. USA.

B.P.E.S /IV/A/SC/02: Sports Industry**SPORTS INDUSTRY****Unit-I**

Introduction, history in relation to „sports goods industry“ in India, Industrial relations in India, Peculiar characteristic, i.e. Hand Made Goods, Involving skilled workers-piece rated wages, Policy- five year plans for production, export strategy and potential

Unit-II

Sports Industry in Europe-USA, Canada and ASIA & other parts of the world, Major sports-World wide-Europe, ASIA & India including some local games, development of sports

Unit-III

Future need for mechanization to improve quality, Evaluation of management thought, planning-nature, objective, promises, strategies & tactical plan

Unit-IV

Organizations-Principles, structure, management, levels, quality control, Personnel management- recruitment selection, training, performance

Unit-V

Direction/controlling- production control, material control, quality control, sales distribution-government departments, whole sellers & retailers

Reference

- Field S. (2008). Managing Your Career in the Sports Industry. Checkmark Books. Belmont. California. U.S.A.
- Kaing NH and Sakai K (2001). New Patterns of Industrial Globalisation. OECD Publishers. U.S.A.
- Kraft JP (2009). Leisure Economy 1960-1985; Students in sports Industry & Society. Johns Hopkins University Press. U.S.A.
- Likert R (1961). New Patterns of Management. McGraw Hill. New York. U.S.A.

Semester V

B.P.E.S /V/A/HC/01: **Correctives in Physical Education**

Unit-I

1. Definition of Remedial, physiotherapy and corrective exercises.
2. Concept of posture, its meaning and characteristics of correct and incorrect posture.
3. Causes of incorrect posture
4. Necessity and importance of correct posture.
5. Principles of correct posture.
6. Tests for correct posture.

Unit-II

1. Classification of posture : a. Good Type b. Bantom Type c. Fatigue Type
2. Postural deformities and their causes : a. Kyphosis b. Lordosis c. Scoliosis d. Bow legs e. Knock knee f. Flat foot
3. Preventive and remedial measures for postural defects :
 - a. Psychological and habitual consideration in preventing and correcting postural defects.
 - b. Corrective exercises for various postural defects.
 - c. Physiotherapist treatment in correcting postural defects.

Unit-III

1. Massage: **a.** Meaning, definition and a brief history of massage.
b. Massage as means of relaxation and points to be considered while giving massage. **c.** General effects of massage.
2. Classification of the manipulation and movements in the massage :
3. Effleurage and stroking i. Petrissage ii. Percussion / Tapotement
iii. Vibration and shaking.
4. Effects of manipulation and movements on the different systems of human body.

Unit-IV

- Classification of positions : a. Fundamental positions b. Derived positions c. Modified positions
- Classification of exercises along with their practical instructions : a. Free mobility exercises b. Assisted exercise c. Resisted exercises

Reference Books:

1. Smith Lara K. and Others, "Srunnstrem's Clinical Kinesiology", Jaypee Brothers P.B. No- 7193 New Delhi 1998.
2. J.L. Rathoore, "Corrective Physical Education", Philadelphia W.B. Saunders Co. 1968.
3. P.G. Rasch and R.K. Burke, "Kinesiology and Applied Anatomy", Lee and Febriger, Philadelphia 1978.
4. Singh Ajmer et.al, "Essentials of Physical Education", Kalyani Publishers, Ludhiana, Second revised addition 2008.

B.P.E.S /V/A/HC/02 : **Test measurement and Evaluation**

UNIT-I

- Introduction to test, measurement and evaluation and their importance in the field of physical education
- Test constructions:- a) general consideration b) physical fitness/ efficiency test

UNIT – II

- Meaning and importance of statistics in the field of physical education, “population” and “sample” “random sampling”
- Meaning of data, kinds of data- continuous and discrete Frequency distribution, construction of frequency tables, mean, median and mode.

UNIT –III

- Measures of variability range, quartile, deviation, standard Deviation, co-efficient of variation
- Normal probability curve and meaning, uses its principles, Diagrammatic represent action

UNIT-IV

- Physical fitness testing: components of physical fitness
- Strength test: - Kraus Weber strength test, Muscular Endurance test: Cardiopulmonary test:
- Endurance Test, Harvard step test.
- Anthropometric Measurements:- Weight, height, sitting height, chest circumference, thigh circumference, calf circumference, skin fold biceps, triceps, sub scapular and supra iliac.
- Measurement of skills, games and sports-Johnson badminton test, Brady volleyball test, McDonald soccer test, Cornish Handball test, Hockey skill test- SAI hockey Test

Reference

- Acsm’s (2001) Guidelines for Exercise Testing and Prescription by American College of Sports Medicine Human kinetics USA.
- BalyanSunita (2006). Sharirk Shiksha main Parikshanevnmnmaapan. Khel Sahitya. Delhi.
- Barrow &Mc Gee s Practical Measurement and Assessment.
- Barrow H.M. and McGee R. (1979).A Practical Approach to Measurement in Physical Education.Lea&Febiger, Philadelphia. U.S.A.

B.P.E.S /V/A/HC/03: **Yoga Education**

UNIT- I

Origin of yoga, definition and scope of yoga, limitations and misconceptions, importance of yoga in physical education and other fields

UNIT- II

Historical development of yoga in India.

Types of Yoga:- Hatha yoga, laya yoga, mantra yoga, bhakti yoga, karma yoga, jnana yoga, raj yoga

UNIT- III

Patanjali yoga sutras- yama, niyama, asana, pranayama

Pratyahar- Benefits & utilities of these. Astanga yoga- Definition, objectives, dharna, dhyana, Samadhi & their psychological impact.

Shatkarm/cleansing process/ yogic methods and personal hygiene.

UNIT- IV

Asanas: Types, importance of asanas in special reference to Physical Education & Sports.

Differentiate between asanas and exercise.

Pranayama and importance of pranayama in special reference to Physiological effects

Bandhas, mudras and their physiological effects.

UNIT- V

Disease wise treatment through yoga therapy- Asthma, high & low B.P, diabetes, obesity, heart disease, insomania, arthritis, backache, female disease and importance of vegetarianism in yogic diet

SUGGESTED READINGS

- Day P. (1986). Yoga Illustrated Dictionary. Jaico Pub. House. New Delhi.
- Debnath M (2007). Basic Core Fitness Through Yoga And Naturopathy. Sports Publication. New Delhi.
- Kumar ER (1988). Heal Yourself With Yoga: Specific Disease. Taraporevala. Bombay.
- Shanti KY (1987).The Science of Yogic Breuthiay (Pranayana). D.B. Bombay.
- Sharma JP and Ganesh S (2007). Yog Kala Ek Prichya. Friends. New Delhi
- Sharma JP (2007).Manavjeevanevamyoga.Friends Pub. New Delhi.
- Sharma Jai Prakash AndSehgalMadhu (2006).Yog-Shiksha.Friends. Delhi.
- Singh MK And Jain P (2008). Yoga aurmanoranjan.KhelSahitya Kendra. New Delhi.

B.P.E.S /V/A/SC/01: **GYM MANAGEMENT**

UNIT-I

Concept of nutrition and health, balanced diet, dietary aids and gimmicks, Energy and activity, calculating calorie intake and expenditure

Obesity, anorexia and related health problems – measurements and management, Weight management programmes

UNIT-II

Understanding of various forms of aerobics- floor aerobics, step – aerobics, weight, Aerobics and aqua aerobics, Training effects of aerobic fitness on various physiological systems namely skeletal Muscular, circulatory and respiratory

Improvement of aerobic fitness, Aerobic fitness programme

UNIT-III

Location and Establishment of gym (Publicity, policy, reception, information, Registration, offer of programmes), Procurement, placement & maintenance of gym, Equipments , Marketing, clientage, Enrolments, record keeping, social activities, Public Relations, Individualized/group grooming programme, basic concepts of financial management

Gym-instructor – qualification, qualities, pay-roll, Performance – evaluation, grooming and presentation, Introduction to different exercise equipment, Gym management – Costing, Balance sheet, Promotional plans

UNIT-IV

Measurement of Weight and Height, Calculating BMI (Body Mass Index), Measurement of Fitness Components Flexibility (Sit and Reach Test, Hip Bend and Toe Touch), Strength (Sit-Ups, Leg-Raise for Minimal Strength), Cardiovascular Endurance (One-mile run, Physical Efficiency test, Harvard step test),

Self- evaluation –Personal Health and Well-being

UNIT-V

Exercise schedules – Aerobics, Fitness and Weight Management

Reference

- Carol K A. and Mary M. Y (2009).“Methods of Group Exercise Instruction” McGraw Hill. New York. U.S.A.
- Sheela K (2009).Fitness, Aerobics & Gym Operations.KhelSahitya Kendra. New Delhi.
- Taylor, D. and Nichols, D.S. (2010). The Brand Gym : A Practical Workout. Wiley Publishers, USA.
- Time Life Books..(2004).Gym Workout. London Times Life Books
- Wayne L Westcott (2007).“Strength Training”. Thomas R. Bachle. Benjamin Cummings. U.S.A.

B.P.E.S V/A/SC/02 :SPORTS JOURNALISM

UNIT-I

Meaning, scope and changing trends of journalism in sports

Historical development & role of print and electronic media in sports promotion

UNIT-II

Language – vocabulary, spellings, figure of speech , dialect, grammar, punctuation

Fundamentals of a sports story/ news

UNIT-III

Organizational set-up of a news paper- printing, process sequences of operations in the printing of a news paper/journals.

Introduction of various sports organization and agencies- Olympic Games, Asian games, commonwealth games, awards and trophies.

UNIT-IV

Theory and principles of advertising in sports

Public relations in sports, press release, conferences

Research tools for developing a sports story

Process of news paper publishing and management

Reference

- AamidorA (2003).Real Sports Reporting.Indiana University Press. Valparaiso. Indiana. U.S.A.
- Ahuja, B.N (1988).Theory and Practice of Journalism.Surjeet. Delhi.
- Andrews P (2005). Sports Journalism: A Practical Introduction. Sage Publications Ltd. Delhi.
- Boyle R (2006). Sports Journalism: Context and Issues. Sage Publications Ltd.
- Kamath, MV (1980).Professional Journalism.K.S.K. New Delhi..
- Steen (2007). Sports Journalism: A Multimedia Primer (Paperback). Routledge. London
- Wilstein S (2001).Associated Press Sports Writing Handbook. McGraw-Hill.

Semester VI

B.P.E.S /VI/A/HC/01: **Basic of Sports Training**

UNIT I: Introduction

- Meaning and Definitions of Sports Training.
- Meaning of terms: Coaching, Teaching, Conditioning and Training.
- Aim and Tasks of Sports Training.
- Characteristics of Sports Training.
- Principles of Sports Training.
- Systematization of Sports Training.
 - Beginner
 - Intermediate.
 - High Performance.

UNIT-II: Training Load

- Definition and Types of Training Load.
- Features/Factors of Training Load
- Principles of Intensity and Volume of Stimulus.
- Over Load.
- Meaning and types of over load.
- Causes of over load.
- Symptoms of over load.
- Tackling of over load.
- Judgment of Training Load.

UNIT-III :- Strength

- Concept and types of Strength.
- Factors determining Strength.
- Methods of strength training.
- Management of strength training programme.

Endurance

- Concept and types of endurance.
- Factors determining endurance.
- Methods of endurance training.

Speed

- Concept and Classification of Speed.
- Factors determining speed.
- Methods of developing speed abilities.
- Reaction speed
- Speed of movement.
- Acceleration speed
- Sprinting speed.

- Speed endurance.

UNIT-IV : Technical Training

- Definition of Technique and Skill.
- Importance of Technique.
- Process of Skill Learning.
- Methods of Technique Training.

Tactical Training

- Concept of Tactics and Strategy.
- Methods of Tactical Training.

Planning

- Concept of Training Plan.
- Principles of Planning.
- Types of Training Plan.

Periodization

- Meaning and Importance of Periodization.
- Periods of Training Year.
- Aim and Contents of Periods.
- Types of Periodization.

REFERENCES

- ❖ Dick W. Frank, Sports Training Principles 4th ed. (London: A&C Black Ltd.), 2002.
- ❖ Harre, D. Principles of Sports Training (Berlin: Sport Veulag), 1982.
- ❖ Matveyev, L.P. Fundamentals of Sports Training (Moscow :Progress Publishers) 1977.
- ❖ Singh, Hardayal. Science of Sports Training (New Delhi: DVS Publications), 1991.
- ❖ Uppal, A.K. Principles of Sports Training (Delhi: Friends Publication) 2001.
- ❖ Tudor B. Bompa&Mihal C. Carera, Periodiation Training for Sports, Human Kinetics,2005 (IInd Edition)
- ❖ YograjThani, Sports Training, Sports Publication-2003
- ❖ K. Chandra Shekar, Sports Training, KhelSahitya Kendra -2004

B.P.E.S /VI/A/HC/01: **STRESS MANAGEMENT**

Unit-I

Definition of stress and anger, Causes of stress and anger, two main emotions of stress-fear and anger, Daily life stressors, Process of stress and anger- Psycho Physiology of stress

Unit-II

Adaptation to stress-Reframing of habitual stress resistance, Occupational stress, Peer stress (Students stress), Family stress, Stress & elderly

Unit-III

Stress & drug abuse

Stress related diseases- i) Sleep disorder, ii) Eating disorder, iii) Sexual and emotional disorder, iv) Other stress related diseases, v) Stress & Spirituality

Unit-IV

Self awareness and stress management, Muscular tension reduction, Emotional tension reduction, Stress free living, Stress free examination, Stress management through physical activity, Stress management through recreation

Unit-V

Anger management- Redford William's 12 steps of anger management

Stress management- behavior modification, time management, coping strategy

Relaxation technique- i) Diaphragmatic breathing, ii) Meditation, iii) Progressive muscle relaxation, iv) Yoga, v) Mental imagery, vi) Music therapy, vii) Massage therapy

SUGGESTED READINGS

- Adrain F & Herrick E. and Sharp P (1998). Anger Management. Routledge Publishing. Florence. Kentucky. U.S.A.
- Allen E (2008). Stress Management for Dummies. For Dummies Publishers. U.S.A.
- Davis M. et al (2008). The Relaxation and Stress Reduction workbook. Harbinger Publications, USA.
- Greenberg J.S. (2008). Comprehensive stress management. McGraw Hill, USA
- Hipp E. (2008). Fighting Invisible Tigers : Stress Management for Teens. Free Spirit Publishing, USA.
- Mac W. (2007). Anger and Stress Management. God's Way. Calvary Press, USA.
- Petee F (2006). Anger Management. Pentagon. Press. New York. U.S.A.
- Swate Y B (2009). Anger Management. Sage Publication. New Delhi.

B.P.E.S /VI/A/HC/01: EDUCATIONAL TECHNOLOGY**UNIT-I : Introduction to Educational Technology**

- 1.1 Definition
- 1.2 Educative Process
- 1.3 The Teacher of Yesterday & Today
- 1.4 An outline of Teaching method used then and now
- 1.5 Use of sensory organ in the process of learning and remembering
- 1.6 Communication:
 - 1.6.1 Types of Communication
 - 1.6.2 Communication Cycle
 - 1.6.3 Communication in the Class room

UNIT-II Teaching Aids:

- 2.1 Importance of Teaching Aids
- 2.2 Criteria for selecting Teaching Aids
- 2.3 Difference between Teaching Method and Teaching Aid
- 2.4 Broad classification of Teaching Aids
 - 2.4.1 Audio Aids
 - 2.4.2 Visual Aids
 - 2.4.3 Audio-Visual Aids
 - 2.4.4 Effectiveness of Edger Dale's cone classification
- 2.5 Advantage and suggestions for effective use of selected teaching Aids.
 - 2.5.1 Verbal
 - 2.5.2 Chock Board
 - 2.5.3 Charts
 - 2.5.4 Models
 - 2.5.5 Slide Projector
 - 2.5.6 Over Head Projector
 - 2.5.7 Motion Picture
 - 2.5.8 Self Experiment and Projects.

UNIT-III New Teaching Techniques and Innovations – I:

- 3.1 Art of questioning and answering
 - 3.1.1 Purpose of Questioning
 - 3.1.2 Classification of Questioning
 - 3.1.3 Techniques of asking questions
- 3.2 Programmed Learning
 - 3.2.1 Concept of Programmed learning
 - 3.2.2 Fundamental Principles of Programmed learning

3.2.3 Steps involved in preparation of Programme

3.3 Team Teaching

3.3.1 Meaning

3.3.2 Guiding principles of Team Teaching

3.3.3 Advantage of Team Teaching.

UNIT-IV **New Teaching Techniques and INNOVATIONS – II :**

4.1 Micro Teaching

4.1.1 Concept and Features of Micro Teaching

4.1.2 Micro Teaching Verses Traditional Teaching

4.1.3 Steps in Micro Teaching

4.1.4 Principles of Micro Teaching

4.1.5 Micro Teaching Skills

4.1.6 Limitation of Micro Teaching

4.2 Simulation Teaching

4.2.1 Meaning of Simulation

4.2.2 Types of activities in simulation

4.2.3 Steps in Simulation

4.2.4 Advantages of Simulation

4.2.5 Limitations of Simulation

REFERENCES

- ❖ K. Sampath, A. Pannirselvam and S. Santhanam. Introduction to Educational Technology (New Delhi: Sterling Publishers Pvt. Ltd.) : 1981.
- ❖ Bhatia and Bhatia. The Principles and Methods of Teaching (New Delhi :Doaba House), 1959.
- ❖ Walia, J.S. Principles and Methods of Education (Paul Publishers, Jullandhar), 1999.
- ❖ Kochar, S.K. Methods and Techniques of Teaching (New Delhi, Jullandhar, Sterling Publishers Pvt. Ltd.), 1982
- ❖ Kozman, Cassidy and kJackson. Methods in Physical Education (W.B. Saunders Company, Philadelphia and London), 1952.
- ❖ Singh, Ajmer and other. Modern Text Book of Physical Education, Health and Sports, (KalyaniPublishers,Ludhiana)2000.
- ❖ AmitaBhardwaj, New Media of Educational Planning".Sarup of Sons, New Delhi-2003
- ❖ Prof. Ramesh Chandra, DitelAneja,"Corporate Global Environment", Usha Books, Delhi 2004.
- ❖ MohitChakravarty,"Education in the 4 Century" KalpanPublication' Delhi2005.
- ❖ V.C. Pandey, Educational Technology" Usha Books Delhi -2005.
- ❖ Sarita, Monika Tomar,"Delhi, 2004
- ❖ JagannathMohanty, "Educational Technology" Deep & Deep Publication. Pvt. Ltd. New Delhi.2003

- ❖ Prof. RameshChandra, Technology in the preparation of Teachers,” Usha Books, Delhi 2004

B.P.E.S /VI/A/SC/01: **Recreation in Physical Education**

UNIT-I Introduction to Recreation

- 1.1 Meaning, Definitions and characteristics of Recreation
- 1.2 Importance of Recreation
- 1.3 Misconceptions about Recreation
- 1.4 Scope of Recreation

UNIT-II Influence of Recreation in Social Institutions.

- 2.1 Family
- 2.2 Educational institutions
- 2.3 Community/ Cultural
- 2.4 Religious organizations

UNIT-III Planning for Recreation

- 3.1 Planning criteria and objectives of Recreation facilities
- 3.2 Different types of indoor and outdoor Recreation for Urban and Rural population
- 3.3 Operation and maintenance of different Recreation area and facilities
- 3.4 Sources of funding of Recreational activities

UNIT-IV Programmes in Recreation

- 4.1 Criteria and principles of selecting a programme
- 4.2 Classification of Recreational activities:
 - 4.2.1 Indoor and outdoor activities
 - 4.2.2 Water activities
 - 4.2.3 Cultural activities
 - 4.2.4 Literary activities
 - 4.2.5 Nature and outing
 - 4.2.6 Social events
 - 4.2.7 Adventure activities
- 4.3 Hobbies – Introduction to hobbies and types of hobbies.
- 4.4 Agencies providing Recreation.
- Camping and leadership**
- 4.5 Aim, objectives and importance of Camping.
- 4.6 Organization and types of Camp.
 - Selection and layout of camp site.
 - Camping leadership.
- 4.7 Types and functions of Recreation leaders.
- 4.8 Qualification, Qualities and training & Recreation leaders.

REFERENCES

- ❖ Bright Charles K. and Herold C. Meyer. “Recreational test and readings”. Eaglewood cliff, New Jersey Prentice Hall, Inc. 1953.
- ❖ Ness wed, M.H. and New Meyer E.S. Leisure and Recreation, New York : Ronald Press.
- ❖ VannierMaryhalen, “Methods and Material in Recreation leadership: Philadelphia.” W.B. Sounders company, 1959.

B.P.E.S /VI/A/SC/02: **ART OF DAILY SCHEDULING**

Unit-I

Introduction:- Meaning and definition of Daily Schedule, art, science, management of time, shortage of time for daily activities

Types of daily activities: requirement of daily activities for various domains of personality, essential categories of daily activities, correct decision making to include all types of daily activities with in fixed 24 hours

Unit-II

Art of living, art of scheduling, art and science of principles of time management, acronym and daily prayers, methods of recalling and rechecking daily activities

Attitudes and art of daily schedules: right knowledge of daily activities, developing correct attitude by learning the art of behaviour change, transdental theory of behaviour changes, relation between attitude and behaviour change

Unit-III

Understanding the concept of perfection of nature, relation between nature known as superpower or god in religious terms, predisposing, enabling and reinforcing factors for strengthening the art of daily schedules

Cognition and daily schedules: necessity of right attitude and right information of essential components of daily schedules. Enlisting activities needed daily, relation between qualitative and quantitative balances

Unit-IV

Alternative daily schedule patterns: effect of culture, race, gender and age on daily schedules, fundamentals of art of daily schedules, listing alternative daily schedules for different categories of human being based on culture, race. Gender, age, and geographical locations

Factors helping adherence to daily schedule: self responsibility, knowledge to body requirements, important body systems requiring daily attention

Analysis of lifestyles: role of active lifestyle and wellness activities, factors helping to promote daily schedules

Barriers to daily schedules – peer pressures, careless environment of , firm no to harmful barriers like smoking, drugs, alcohol and irresponsible sex urge

Wellness and daily schedules: art of inclusion of all wellness parameters to daily schedules, namely meditation, foods, right physical activities, right hygienic habits, right environmental care, right injury preventing behaviours, right decision towards sex, entertainment recreation, rest, sleep

Reference

- Anspaugh DJ and Ezell G. (2003) Teaching To-day's Health. Allyn & Bacon Publishing. San Francisco. California. USA.
- Covey, F. (2008). Cornerstone Daily Format. Ring Bound. Franklin Covey Publishers, USA.
- Donatelle RJ (2006). Access to Health. Pearson Benjamin Cummings. San Francisco. California. USA.
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- Gates, T.L. (2008). Daily Planning 50 Worksheets. Power Systems Inc., USA.
- Graham G (2001). Teaching Children Physical Education: Becoming a Master Teacher. Human Kinetics. Champaign. Illinois. USA.
- Hales D (2005). An Invitation to Health. Thomson Wadsworth Publishers. USA.
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- Moss, S., Schwartz, L. and Wertz, M. (2007). Where's my Stuff? The Ultimate Organizer. Orange Avenue Publishing, USA.
- Robbins G Power D and Burgess S (2002). A Wellness of Way. McGraw Hill Company. Inc. New York. USA.
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BHARATI VIDYAPEETH DEEMED UNIVERSITY
(Established u/s 3 of UGC Act 1956, vide notification no. F9. 15.U.3 of Govt. of India)

COLLEGE OF PHYSICAL EDUCATION

Dhankawadi, Pune-411 043 (Maharashtra), Tel.020-24373741

REACCREDITED 'A' GRADE BY NAAC



Bachelor of Physical Education

(B.P.Ed.)

(4 Semester Programme)

CURRICULUM FRAMEWORK

**GUIDELINES OF REGULATIONS AND SYLLABUS STRUCTURE FOR
B. P. ED. (FOUR SEMESTERS)
CHOICE BASED CREDIT SYSTEM (CBCS)**

Preamble: Bachelor of Physical Education (B. P. Ed.) two years (Four Semesters Choice Based Credit System) B.P.Ed programme is a professional B.P.Ed programme meant for preparing teachers of physical education in classes VI to X and for conducting physical education and sports activities in classes XI and XII.

B. P. Ed. B.P.Ed programme shall be designed to integrate the study of childhood, social context of Physical Education, subject knowledge, pedagogical knowledge, aim of Physical Education and communication skills. The B.P.Ed programme comprises of compulsory and optional theory as well as practical courses and compulsory school internship.

Course Outcome

1. Bachelor of Physical Education (B. P. Ed.) two years (Four Semesters Choice Based Credit System) programme is a professional programme meant for preparing teachers of Physical Education in classes VI to X and for conducting Physical Education and sports activities in classes XI and XII.
2. The course prepares the leaders in Physical Education who act as Mentors and Motivators for School children in inculcating healthy and hygienic habits.
3. To prepare the leaders who can work in Health and Fitness Industry as Fitness and Wellness experts.
4. To prepare Sports Experts in various capacities like Trainers, Physiotherapists, Rehabilitation Experts, Sports Counsellors, Game Officials, Scorers, Referees etc.
5. To prepares Experts who can work with various Sports Federations/Organisations/Leagues/Media Houses.

Intake, Eligibility and Admission Procedure:

The Intake, Eligibility and Admission Procedure are as per the NCTE norms and standards.

Eligibility

(a) Bachelor's degree in any discipline with 50% marks and having at least participation in the Inter-College/Inter-Zonal/District/School competition in sports and games as recognized by the AIU/IOA/SGFI/Govt. of India. (Sports participation in last 05 years.)

Or

(b) Bachelor's degree in physical education with 45%marks.

Or

(c) Bachelor's degree in any discipline with 45%marks and studied physical education as compulsory/elective subject.

Or

(d) Bachelor's degree with 45%marks and having participated in national/Inter University/State competitions or secured 1st, 2nd or 3rd position in Inter College/Inter-Zonal/District/School competition in sports and games as recognized by the AIU/IOA/SGFI/Govt. of India. (Sports participation in last 05 years.)

Or

(e) Bachelor's degree with participation in International competition or secured 1st, 2nd or 3rd position in National/Inter-University competition in sports and games as recognized by the AIU/IOA/SGFI/Govt. of India. (Sports participation in last 05 years.)

Or

(f) Graduation with 45%marks and at least three years of teaching experience (for deputed in-service candidates i.e. trained physical education teachers/coaches).

The relaxation in the percentage of marks in the qualifying examination and in the reservation of seats for SC/ST/OBC and other categories shall be as per the rules of the Central Government/State Government, whichever is applicable.

Age:-

For General category candidates the upper age limit is 32 years as on 1st July of the academic year. Age relaxation for SC, ST and OBC candidate will be given according to the rules and regulation of Bharati Vidyapeeth University and GOI

Number of seats:-

50 (Fifty) seats are approved by NCTE Bhopal for B.P.Ed. course.

Note:-

*Married girl is eligible for admission to B.P.Ed. programme. But, it is also compulsory for her to sign an undertaking that she will discontinue the B.P.Ed programme at once for at least one academic year, if she gets pregnant during the course of study. She can join back afresh from the beginning of the semester keeping the guidelines pertaining to the maximum duration of the course in mind.

*No differently-abled candidate is eligible for the admission in B.P.Ed. Course.

Admission procedure:-

Admission shall be made on merit on the basis of marks obtained in the entrance examination consisting of 100 marks based on the following.

a- Physical fitness test	50 marks
b- Written test	30 marks
c- Interview	10 marks
d- Sports achievement	10 marks

The total entrance test will be conducted in two days and could be extended, if needed and it will be conducted at Bharati Vidyapeeth Deemed University College of Physical Education

There shall be Physical Fitness Test (modified AAHPER/CNADIAN/OR ANYOTHER fitness test) of 50 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education

- (A) Theory Paper comprising of 30 multiple-choice questions of 30 minutes duration carrying 30 marks. Questions shall be based on Aptitude Test, Current Affairs and General Knowledge about sports.
- (B) Interview comprising of 10 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education
- (C) Sports Participation Weightage :- Candidate shall be given maximum 10 marks weightage on the basis of their sports participation in any one of the following level:

Participation	Marks
➤ International:	10
➤ Senior National championship/ National Games:	
1st Place :	10
2nd Place :	08
3rd Place :	07
Participation:	05
➤ All India Inter-Zonal Inter University Competitions:	
1st Place :	08
2nd Place :	07
3rd Place :	06
Participation:	05
➤ Zonal Inter University Competitions/Junior National Competitions:	
1st Place :	07
2nd Place :	06
3rd Place :	05
Participation:	04
➤ Senior State Championship/Rural national games/Woman Festival:	
1st Place :	05
2nd Place :	04
3rd Place :	03
Participation:	02

Note:-

*The marks will be given in only those games/sports, which are in the competition list of Association of Indian Universities (**AIU**) and/or School Games Federation of India (**SGFI**).

*The obtained position must be during last five academic sessions.

*The school state championship and inter collegiate championship participation shall be considered for eligibility criteria only; the candidate shall not get any marks for sports weightage.

Medical examination:-

Qualified candidates will have to submit medical certificate by CMO and blood group certificate to the concern office.

Course fee

The course fee Rs 80,000/- shall be deposited in Four installments ie.

Semester	Installment	Month	Amount
1 st	1 st	July- At the time of admission	Rs.20,000
2 nd	2 nd	December	Rs 20,000
3 rd	3 rd	June	Rs.20,000
4 th	4 th	December	Rs.20,000

The mode of **DD/Banker's cheque** in favor of the **The Pricipal ,Bharati Vidyapeeth (Deemed to be) University, College of Physical Education, or candidate can deposit cash in Bharati Bank in prescribed bank account of the college through Challan obtaining from College office .**

Duration: The B.P.Ed programme shall be of duration of two academic years, that is, four semesters. However, the students shall be permitted to complete the B.P.Ed programme requirements within a maximum of three years from the date of admission to the programme.

The student, who discontinue the B.P.Ed programme after one year or more semesters due to extraordinary circumstances, are allowed to continue and complete the B.P.Ed programme with due approval from the principal .

SCHEME OF EXAMINATION FOR B.P.ED. (4 SEMESTERS)
(2015-2017)

Semester wise Distribution of Marks & Credits

		Sem-I	Sem-II	Sem-III	Sem-IV	Total
Part-A: Theory Courses	Marks	400	400	400	200	1500
	Credits	16	16	16	8	60
Part-B: Activity Courses (Games/Sports)	Marks	400	300	300	400	1300
	Credits	8	6	6	8	26
Part- C: Game/ Sport Specialization	Marks	100	100	100	100	400
	Credits	2	2	2	2	8
Part D -: Teaching Ability and Internship	Marks	--	100	100	300	400
	Credits	--	2	2	6	8
Grand Total	Marks	900	900	900	900	3600
	Credits	26	26	26	24	102

NOTES:

- Each Theory Course shall have 4 Units and 3 hrs. duration final examination except Sports Specialization which will have 3 units in each semester and 2-hour duration semester-end examination.
- The pattern of Semester-end question papers shall be:
 - 2.1. For papers having Max. Marks- 60 : [12+12+12+12+(4x3)=60 marks]**
For University examination each question paper shall consist of 9 questions (8 long answer questions from each unit and 1 combined question of 4 short notes from all 4 units). The candidate will attempt any one question from each unit (4 questions of 12 marks each from first 8 questions). The 9th question will be compulsory consisting 4 short notes of 3 marks each.
- For Internal Assessment of Theory Courses one Mid Semester Test of 30 marks for each course will be conducted by the college. For the mid semester test each question paper (of 30 marks) shall consist of 5 questions (4 long answer questions from first two unit and 1 combined question of 2 short notes from both units). The candidate will attempt any one question from each unit (2 questions of 12 marks each from first 4 questions). The 5th question will be compulsory consisting 2 short notes of 3 marks each. In addition, the teacher concerned shall conduct one open book examination consisting of 10 marks and submit the marks to the college exam department.

4. For Semester-end Examination in Activity Courses, the breaks-up of 100 Marks shall be as follows:

-	Skill proficiency/playing ability	:	80
-	Diary / Record book	:	20

5. For Specialization Sports Practice and Sports Training, the break-up of 100 Marks shall be as follows:

-	Skill proficiency/playing ability	:	60
-	Written Test	:	40

6. For internship, student needs to complete 150 hrs. as a physical education teacher in schools and also needs to prepare day to day lesson plan. Every day lesson plan will be evaluated and signed by School Administrator/Principal. Student needs to submit a report on his or her internship with the lesson plan duly signed by School Administrator/Principal. School Administrator/Principal will also be asked to give marks to the student according to his performance after the internship gets over. The break-up of 300 Marks shall be as follows

-	School Administrator Report	:	100 marks
-	Lesson Plan	:	100 marks
-	Viva-Voce	:	100 marks

CURRICULUM FRAMEWORK FOR B.P.ED.

(4 SEMESTERS 2015-2017)

B.P.Ed. I-Semester (July 2015 to November 2016)

PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
BPEd/I/A/HC/01	Introduction & History of Physical Education	60	40	100	64	4
BPEd/I/A/HC/02	Anatomy, Physiology and Exercise Physiology	60	40	100	64	4
BPEd/I/A/HC/03	Computer Application & Communicative Skills in Physical Education	60	40	100	64	4
BPEd/I/A/SC/01 BPEd/I/A/SC/02	Select anyone of the following: *Development of Sports Movements *First Aid & Safety Education	60	40	100	64	4
Total		240	160	400	256	16

NOTE:HC- Hard Core/Compulsory Course; **SC-** Soft Core/Elective Course.

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
BPEd/I/B/HC/01	Conditioning	100	48	2
BPEd/I/B/HC/02	Track and Field (Running events)	100	48	2
BPEd/I/B/SC/01-04	Select anyone Activity/ Game/Sport from each Group* (B1 and B2 – the offer shall depend on administrative feasibility).	100X2	48X2	2X2
Total		400	--	08

****Groups of Activity/Game/Sport:** (Should be other than Sport Specialization).

Activity Group-B1		Activity Group-B2	
Activity Code	Activity	Activity Code	Activity
BPEd/I/B/SC/01	Basketball	BPEd/I/B/SC/03	Table Tennis
BPEd/I/B/SC/02	Volleyball	BPEd/I/B/SC/04	Tennis

PART-C: GAME/SPORT SPECIALIZATION: A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/I/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport - sessional only)	100	48	2

NOTE: SCC- Soft Core Compulsory.

B.P.Ed. II-Semester (December 2015 to April 2016)

PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
BPEd/II/A/HC/01	Educational & Sports Psychology	60	40	100	64	4
BPEd/II/A/HC/02	Methodology of Teaching in Physical Education	60	40	100	64	4
BPEd/II/A/HC/03	Sports Training	60	40	100	64	4
BPEd/II/A/SC/01	Select anyone of the following: *Fitness, Wellness and Sports Nutrition	60	40	100	64	4
BPEd/II/A/SC/02	*Adapted Physical Education					
	Total	240	160	400	256	16

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
BPEd/II/B/HC/01	Track & Field-I (Field Events)	100	48	2
BPEd/II/B/HC/03	Light Apparatus	100	48	2
BPEd/II/B/SC/01-04	Select anyone Activity/ Game/ Sport from Group-B3* (The offer shall depend on administrative feasibility).	100	48	2
	Total	300	144	06

*Group of Activity/Game/Sport: (Should be other than Sport Specialization).

Activity Group-B3			
Activity Code	Activity	Activity Code	Activity
BPEd/II/B/SC/01	Handball	BPEd/II/B/SC/03	Kho- Kho
BPEd/II/B/SC/02	Cricket	BPEd/II/B/SC/04	Weight Lifting

PART-C: GAME/SPORT SPECIALIZATION: (Continued from Semester-I)

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/II/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

PART-D: TEACHING ABILITY AND INTERNSHIP-I (ACTIVITY TEACHING):

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/II/C/HC/01	Teaching Lessons (students shall conduct minimum 5 teaching lessons at the Institute itself in different activities like Marching, Calisthenics and Rhythmic Activities).	100	48	2

B.P.Ed. III-Semester (July 2016 to November 2016)

PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
BPEd/III/A/HC/01	Measurement & Evaluation in Physical Education	60	40	100	64	4
BPEd/III/A/HC/02	Kinesiology & Biomechanics	60	40	100	64	4
BPEd/III/A/HC/03	Yoga and Health Education	60	40	100	64	4
BPEd/III/A/SC/01	Select anyone of the following: *Sports Entrepreneur, Marketing & Sports Management	60	40	100	64	4
BPEd/III/A/SC/02	*Professional Preparation in Physical Education					
	Total	240	160	400	256	16

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
BPEd/III/B/HC/01	Conditioning	100	48	2
BPEd/III/B/HC/02	Judo	100	48	2
BPEd/III/B/HC/03	Select anyone Activity/ Game/ Sport from Group-B4* (The offer shall depend on administrative feasibility).	100	48	2
	Total	300	94	6

*Group of Activity/Game/Sport: (Should be other than Sport Specialization).

Activity Group-B4			
Activity Code	Activity	Activity Code	Activity
BPEd/III/B/SC/01	Yoga	BPEd/II/B/SC/03	Aerobics

PART-C: GAME/SPORT SPECIALIZATION: (Different from Semester - I & II)

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/III/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

PART-D: TEACHING ABILITY AND INTERNSHIP-II (ACTIVITY TEACHING):

(Continued from Semester - II)

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/III/C/HC/01	Teaching Practice	100	60	2

B.P.Ed. IV-Semester (December 2016 to April 2017)

PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
BPEd/IV/A/HC/02	Sports Medicine, Physiotherapy and Rehabilitation	60	40	100	64	4
BPEd/IV/A/HC/03	Research and Statistics in Physical Education	60	40	100	64	4
	Total	120	80	200	128	8

PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
BPEd/IV/B/HC/01	Kabaddi	100	48	2
BPEd/IV/B/HC/02	Weight Training	100	48	2
BPEd/IV/B/HC/03	Gymnastics	100	48	2
BPEd/IV/B/HC/03	Camping, Hiking and Tracking	100	48	2
	Total	400	192	8

PART-C: GAME/SPORT SPECIALIZATION: (Continued from Semester - III)

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/III/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

PART-D: TEACHING ABILITY AND INTERNSHIP (ACTIVITY TEACHING):

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/III/C/HC/01	Internship	300	150	6

(Choice Based Credit System)

Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0(40% of marks) at UE and also a minimum grade point of 5.0(40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50 % in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table:

Range of Marks (Out of 100)	Grade	Grade Point
80 ≤ Marks ≤ 100	O	10
70 ≤ Marks ≤ 80	A+	9
60 ≤ Marks ≤ 70	A	8
55 ≤ Marks ≤ 60	B+	7
50 ≤ Marks ≤ 55	B	6
40 ≤ Marks ≤ 50	C	5
Marks ≤ 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

Formula to calculate Grade Points (GP)

Suppose that Max is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP. Sex x -Max/10 (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (Marks/x)+2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (Marks/x)+1

particular semester. While the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the B.P.Ed programme is the final result of the learner.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA)	10x CGPA - 10	If $5.00 \leq \text{CGPA} \leq 6.00$
	5x CGPA + 20	If $6.00 \leq \text{CGPA} \leq 8.00$
	10x CGPA - 20	If $8.00 \leq \text{CGPA} \leq 9.00$
	20x CGPA - 110	If $9.00 \leq \text{CGPA} \leq 9.50$
	40x CGPA - 300	If $9.50 \leq \text{CGPA} \leq 10.00$

Award of Honours:

A student who has completed the minimum credits specified for the B.P.Ed programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

Educational Tour/Camp: In addition to the above rules the student must fulfill the following requirements to acquire the degree which is mandatory. Educational Tour or Leadership Camp organized by the College of Physical Education of at least 07 days. The students shall contribute separately for these activities.

B.P.Ed

Semester I

BPEd/I/A/HC/01: Introduction & History of Physical Education

Subject Outcome:-

1. Students will understand the concept of Philosophy and philosophy of physical education to acquaint student with the different Philosophies along with their implications in Physical education.
2. Students will understand the concept of Sociology and to acquaint student the implications of Physical education and sports in society.
3. Students will understand the concept of Education and Physical Education
4. Students will get acquainted with historical perspective as influence on physical education, Abroad and in India.
5. Students will get acquainted with different Issues, challenges and opportunities in Physical education & sports

Unit – 1: Introduction

Meaning, Definition and Scope of Physical Education
 Aims and Objective of Physical Education
 Importance of Physical Education in present era.
 Misconceptions about Physical Education.
 Relationship of Physical Education with General Education.
 Physical Education as an Art and Science.

Unit- II – Historical Development of Physical Education in India

Indus Valley Civilization Period. (3250 BC – 2500 BC)
 Vedic Period (2500 BC – 600 BC)
 Early Hindu Period (600 BC–320 AD) & Later Hindu Period (320AD-1000AD)
 Medieval Period (1000 AD – 1757 AD) British Period (Before 1947)
 Physical Education in India (After 1947)
 Contribution of Akhadas and Vyayamshalas
 Y.M.C.A. and its contributions.

Unit- III- Foundation of Physical Education

Philosophical foundation:
 Idealism, Pragmatism, Naturalism, Realism, Humanism,
 Existentialism and Indian Philosophy and Culture.
 Fitness and wellness movement in the contemporary perspectives
 Sports for all and its role in the maintenance and promotion of fitness.

Unit-IV- Principles of Physical Education

Biological, Growth and development, Age and gender characteristics, Body Types
 Anthropometric differences , Psychological, Learning types, learning curve Laws and principles of learning, Attitude, interest, cognition, emotions and sentiments. Sociological, Society and culture, Social acceptance and recognition, Leadership
 Social integration and cohesiveness

References:

- Bucher, C. A. (n.d.) *Foundation of Physical Education*. St. Louis: The C.V. Mosby Co.
- Deshpande, S. H. (2014). *Physical Education in Ancient India*. Amravati: Degree college of Physical Education.(Maharashtra)
- Mohan, V. M. (1969). *Principles of Physical Education*. Delhi: Metropolitan Book Dep.
- Nixon, E. E. & Cozen, F.W. (1969). *An introduction to Physical Education*. Philadelphia: W.B. Saunders Co.
- Obertuffer, Delbert(1970) *Physical Education*. New York: Harper & Brothers Publisher.

BPEd/I/A/HC/02: Anatomy, Physiology and Exercise Physiology

Subject Outcome:-

1. Students will understand the basic structure and function of the human body
2. Students will understand the effect of exercise on the different systems
3. Students will understand the normal movements of the body
4. Students will understand how body gets fuel for its working.

Unit – 1 Introduction

Brief introduction of Anatomy and Physiology
 Need and importance of anatomy and physiology
 Organization of Living organism
 Essential Properties of living cell

Unit – II Skeletal System, Digestive System and Respiratory system

Skeletal System

General structure of the bone, various kinds of bones, functions of the bones.
 Joints, their structure, and their movements

Digestive System

Organs and its function in digestive system
 Process of digestion in human body

Respiratory system

Organs and its function in respiratory system
 Types of respiration

Unit – III Cardiovascular System and Nervous system

Cardiovascular System

Heart, its location, structure and function.
 Mechanism of blood circulation.
 Blood pressure, cardiac output, cardiac cycle, heart rate, pulse rate and athletes heart.

Nervous system

Organs of nervous system
 Function of brain
 Function of spinal cords
 Types of nervous system

Unit – IV- Effect of Exercise on Various Systems

Cardio – respiratory system
 Skeletal system
 Muscular System
 Digestive and Excretory system
 Nervous system

References:

- D. (1979). A Christine, M. D., (1999). *Physiology of Sports and Exercise*. USA: Human Kinetics.
- Conley, M. (2000). *Bioenergetics of Exercise Training*. In T.R. Baechle, & R.W. Earle, (Eds.), *Essentials of Strength Training and Conditioning* (pp. 73-90). Champaign, IL: Human Kinetics.
- Gupta, A. P. (2010). *Anatomy and Physiology*. Agra: Sumit Prakashan.
- Gupta, M. and Gupta, M. C. (1980). *Body and Anatomical Science*. Delhi: Swaran Printing Press.
- Guyton, A.C. (1996). *Textbook of Medical Physiology*, 9th edition. Philadelphia: W.B. Saunders.

BPEd/I/A/HC/03: Computer Application & Communicative Skills in Physical Education

Learning Outcome

1. Understand concept of information and communication technology in physical education field
2. Analyse sporting data of various types via astute use of statistical packages.
3. Practice mathematics, statistics, information technology in sport technology related problems.
4. Offer Hands on Knowledge in information and communication Technology .

Unit I: Introduction of Computer

1. History, application, characteristics, types of computer (Analog, Digital, Hybrid) and generations of Computer.
2. Physical structure of computer.
3. Role of computer in various fields
4. Need of computer in Physical Education.

Unit-II Component of Computer System: An Introduction of Hardware and Software

1. Components of computer system
2. CPU (CU, ALU and Main memory)
3. Input devices (Keyboard, Mouse and Track Ball, Touchpad, Joysticks, Touch Sensitive Screens, Data Scanning Device, Bar Code Readers, Optical Mark Reader (OMR) and Magnetic Ink Character Reader (MICR)
4. Output Devices (Monitor, Printer, LCD)
5. Hardcopy Devices (Printers and Plotter)
6. UPS and types of UPS
7. Operating System Programme Languages translator.
8. Application program/package

UNIT III Effective Communication

A) The Seven C's of the Effective Communication

B) Communication: Its interpretation

- i)** Basics **ii).** Nonverbal Communication **iii).** Barriers to Communication

UNIT IV Business Communication and Writing

A) Business Communication at Work Place

- i)** Letter Components and Layouts **ii).** Planning a letter **iii).** Process of Letter writing **iv).** Email Communication **v).** Memo and Memo Reports **vi).** Employment Communication **vii).** Notice Agenda and Minutes of Meeting **vii).** Brochures

B) Report Writing

i). Effective Writing ii). Types of Business Reports iii). Structure of Reports iv). Gathering Information v). Organization of the Material vi). Writing Abstracts and Summaries vii) Writing Definitions viii). Visual Aids ix). User Instruction Manual

Reference

- Koneru Aruna, Professional Communication McGraw Hill Pub. 1998, New Delhi
- Murphy Herta, Herbert W Hilderbrandt, Jane P Thomas Effective Business Communication, 1997, McGraw Hill
- Petit Lesikkar, Business Communication, 1994, McGraw Hill
- Willey, Communication Skills Handbook, Summers Willey Pub. India
- Rai and Rai, Business Communication, 1999, Himalaya Publishing House, Mumbai.

BPEd/I/A/SC/01: Development of Sports Movements (Elective)**Subject Outcome:-**

1. Students will understand the concept of Philosophy and philosophy of physical education to acquaint student with the different Philosophies along with their implications in Physical education.
2. Students will understand the concept of Sociology and to acquaint student the implications of Physical education and sports in society.
3. Students will understand the concept of Education and Physical Education
4. Students will get acquainted with historical perspective as influence on physical education, Abroad and in India.
5. Students will get acquainted with different Issues, challenges and opportunities in Physical education & sports

UNIT - I A) Physical Education in Ancient Civilization with reference to

- I) India ii) Greece iii) Rome IV) Egypt.
- B) Development of Physical Education & sports during 20 Th Century with special reference to 1) U.S.A. ii) Sweden iii) Germany iv) Olympics v) Asian Games.

UNIT - II Physical Education in India during 20th century

- a) Physical Training for teacher working in school & college.
- b) Movement of Akhadas & Vyayam Shalas.
- c) Central Advisory Board of Physical Education.
- d) All India council of sports.
- e) SNIPES, NSNIS, LNIPE.
- f) Sports authority of India (sai)
- g) Nehru yuwak Kendra.
- h) Awards National & state level.

UNIT - III A Study of the development of Physical Education sports & Games in Maharashtra with reference to

- a) The present Organization set up in state.
- b) Important schemes and activities including indigenous activities.
- c) Role of Voluntary Physical Education & sports Bodies in state...

UNIT - IV Youth welfare & Youth Services:-

- a) Concept of youth welfare & Youth work.
- b) Youth organization in India
- c) Programmers under youth development
- d) Youth services such as secreting & guiding N.C.C. N.S.S., Civil defense & scout & Guide movement.

Reference

- 1) Manual of Physical Education of India - D.G. Wakharkar
- 2) A World History of Physical Education - Van Ten Micher
- 3) History of Physical Education C.W. Hyensmith
- 4) A Brief History of Physical Education - Emmel A Rice & John L Hutchinson
- 5) Physical Education in ancient India - Dr. S.H. Deshpande.

BPEd/I/A/SC/02: First Aid & Safety Education (Elective)**Subject Outcome:-**

1. Students will understand classification of sports injuries and its first aid and immediate management.
2. Students will know the basics of therapeutic modalities and its physiological effects.
3. Students will know the process of rehabilitation
4. Students will understand good and bad posture, postural deformities, its causes and management.
5. Students will understand nutrition and diet plan pre, during and post competition.
6. Students will know the general first aid.

UNIT - I

- a) Meaning and definition of first aids and its importance in sports
- b) Types of first aids and its objectives
- c) First aids box and its management
- d) Role and qualification of first aider

Unit-II

- a) Common sports injuries in different parts of body
- b) First aids for sports injuries
- c) Common causes of sports injuries and its prevention
- d) RICE & Bandage

UNIT - III

- a) Definition of safety education and its significant
- b) Aims and objectives of safety education
- c) Identify causes of accidents & List types and sources of accidents
- d) Safety measures at
 - Home
 - Road
 - School
 - Community

UNIT - IV

- a) Describe and demonstrate the management of the following:-
 - Stings and Snake bites
 - Fracture
 - Nose bleeding
 - Electric shocks and other shocks
- b) Fevers:-
 - Definition of fever
 - signs of fever
 - first Aid for fever
 - Management of fever.
- c) Fainting- Definition and causes of fainting, first aid for fainting
- d) Drowning/Near-drowning:- Definition of drowning, definition of near-drowning
- e) first aid for drowning/near drowning.

Reference :

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- Hunter, M. dictionary for physical educators. In H. M. Borrow & R. McGee, (Eds.), A Practical approach to measurement in Physical Education (pp. 573-74). Philadelphia: Lea & Febiger.

B.P.Ed

Semester II

BPEd/II/A/HC/01: Educational & Sports Psychology**Subject Outcome:-**

1. Students will know about psychology and sports Psychology.
2. Students will understand Human behavior and learning patterns of individuals.
3. Students will know learning process and different theories based on learning
4. Students will acquire theoretical perspectives and develop understanding of stages of human development with special reference to Motor Development for Skill Learning in Sport and PE.
5. Students will be aware about different attributes affecting learning and development process.
6. Students will understand range of cognitive capacities in learners.
7. Students will understand the Cognitive and higher mental processes involved in learning in sports and Physical Education.
8. Students will understand the differences of personality among various types of sports and its importance for character building.

UNIT-I : Introduction of Sports Psychology

- 1.1 Meaning, Scope of Sports Psychology
- 1.2 Importance of Sports Psychology for Physical Education teacher and Coach
- 1.3 Human behavior, Urge and instincts.

UNIT-II: Cognitions Process and higher mental Processes in Physical Activities

- 2.1 Learning: Definitions, Meaning and Types (Primary, Associate & Concomitant)
- 2.2 Laws of Learning and Transfer of Training
- 2.3 Meaning of Sensation & Perception, Thinking and Attention. 2.4 Fatigue.

UNIT-III : Growth and Development and Personality

- 3.1 Meaning and Concept of Motor Development
- 3.2 Motor Development during Childhood, Adolescence
- 3.3 Concept of personality and Personality traits of sportsmen.
- 3.4 Adjustment and maladjustment and causes of maladjustment.

UNIT-IV : Individual Differences

- 4.1 Meaning of Individual differences.
- 4.2 Heredity and Personality and their role in individual differences.
- 4.3 Interaction of Heredity and Environment.
- 4.4 Various Status of an Individual
- 4.5 Other Causes of individual differences.

Reference

1. Kamlesh, M.L. (2006). Educational Sport Psychology. New Delhi: Friend's publication
2. Cox Richard. (1998) Sports Psychology (W.C.B.)
3. Gill, Diance L. Psychological Dynamics of Sports (Illinois: Human Kinetics Publishers,1986)
4. Silva, J.M. and Weinberg. (1984). Physiological Foundation of Sports. IL: Kinetics Publishers,
5. Suinn, Richard M. (1982) Psychology in Sports: Methods and Applications. New Delhi: Sujeet Publication.
6. Martens, Rainer. (1987). Coaches Guide to Sports Psychology. IL: Human Kinetics;
7. Roberts Glyn C. and et al. (1986). Learning Experiences in Sports Psychology. IL: Human Kinetics.
8. Alegaonkar, P.M. (1997). Sports Psychology Pune: Pune Vidyarthi Griha.

BPEd/II/A/HC/02: Methodology of Teaching in Education & Physical Education

Subject Outcome:-

1. To understand the place of Physical Education in school curriculum.
2. To acquaint the learner with different methods of teaching physical activities.
3. To acquaint the students with planning, objectives of different types of lessons.
4. To acquaint the learner with organizing and conducting various types of tournaments and athletic meet.
5. To acquaint the learner with the constructions and marking of track and field events

Unit -I Introduction

- I) Aims and Objectives of Physical Education.
- ii) Place of Physical Education in Curriculum.
- iii) Principles of Learning Process.
- iv) Principles of Teaching Process.

Unit -II Methods and importance of Teaching

Orientation, Demonstration, Imitation, Command, Exploration, Set Drill, Progressive Part, Observation, Verbal Explanation, Whole- Part- Whole, Formal informal.

Unit III Procedure of Teaching Presentation Technique -

- I) Personal Preparation
- ii) Technical Preparation.
- iii) Steps and characteristics of Presentation.
- iv) Principle of classes Management.
- v) Factors affecting class management.

Unit IV - Lesson Planning -

- i) Micro Teaching - importance and skills.
- ii) Types of lesson - General & Specific
- iii) Planning and importance of lesson.
- iv) Teaching Aids- Importance Types and uses.

References

- Capel, S. et al Editors (2006). A Practical Guide to Teaching Physical Education. Routledge Publishers, USA.

- Graham, G.M. (2009). Children Moving : A Reflective Approach to Teaching Physical Education. 8th Ed. McGraw Hill, USA
- Gupta R. (2010). SharirikShiksha Mein ShikhshanPradhyogiki. Friends Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (1999).Lesson Plan in Physical Education &Sports.R.D.P. Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (2004).SharirikShiksha Mein Path Yojna.SahyogPrakashan. New Delhi
- Kamlesh ML (2005). Methods in Physical Education.Friends. Delhi.

BPEd/II/ A/HC/03: Sports Training**Subject Outcome:-**

1. To understand the basic concept and principles of officiating and coaching of different games and sports.
2. To enable the students to understand the rules, regulations and officiating of different games and sports.
3. To acquaint the students with the duties and responsibilities of an officials and coaches.
4. To acquaint the students with dimensions and actual markings of different play fields, courts and arenas.
5. To understand the concept, principles and forms of sports training

UNIT – I Sports Training & Training Load

- 1.1 Sports Training, Definition, Meaning, Aim & Tasks.
- 1.2 Coaching, Meaning, Aim and Objectives.
- 1.3 Principles of Sports Training.
- 1.4 Load, Intensity, Density, Duration and Frequency.
- 1.5 Over Load, Fatigue causes, symptoms and remedial measures.

UNIT – II Development of Motor Components:

- 2.1 Strength: Definition, Importance & Classification, Methods of Development.
- 2.2 Endurance: Definition, Importance & Classification, Methods of Development.
- 2.3 Speed: Definition, Importance & Classification, and Methods of Development.
- 2.4 Flexibility: Definition, Importance & Classification, Methods of Development.
- 2.5 Coordinative Abilities: Definition, Importance & Classification, Methods of Development.

UNIT – III Technical & Tactical Preparation:

- 3.1 Technique: Meaning & Definition and Importance, Stage of technical Development, correction of faults.
- 3.2 Methods of Technique Training.
- 3.3 Strategy & Tactics: Meaning, Importance.
- 3.4 Methods of Tactical Training.
- 3.5 Principles of Attack & Defence.

UNIT – IV Planning and Periodisation:

- 4.1 Meaning and Importance.

4.2 Types of Plan: Short term, Medium term and long-term training Programme.

4.3 Periodisation: Meaning & Importance.

4.4 Types of Periodisation.

References:

1. Bunn, Johan D: The Art of Officiating Sports.
2. Lawther, J.D.: Psychology of Coaching.
3. Bunn, J, N.: Scientific Principles of Coaching.
4. Kamlesh, M.I. : Methods in Physical Education.
5. Singh, H.: Scientific Principles of Sports Training.

BPEd/II/A/SC/01 : Fitness, Wellness and Sports Nutrition (Elective Subject)

Subject Outcome:-

1. Students will understand the concept of physical activity, exercise, fitness, and wellness and will be able to recognize the long term benefits of maintaining a high level of wellness for living in today's world.
2. Students will know the dimensions of wellness and strategies to improve them
3. Students will know the physiological benefits of exercise, physical activity, physical fitness and wellness
4. Students will understand the concept of overweight, obesity & their management.

Unit I Physical Fitness

- a. Definition, meaning and concept of Physical fitness, Physical Activity and Exercise
- a. Components of HRPF, SRPF and Physical fitness
- b. Definition and concept of wellness and holistic health
- c. Factors affecting Physical Fitness and wellness

Unit II Doping and Nutrition

- a. Prevention and first-aid for common sports injuries
- b. Nutrition-components, balance diet and diet for athlete
- c. Meaning and definition of doping, ergogenic aids

Unit III Development of Fitness

- a. Benefits of physical fitness and exercise and principles of physical fitness
- b. Calculation of fitness index level 1-4
- c. Waist-hip ratio larger heart rate, BMI and types and principles of exercise (FITT)
- d. Methods of training – Continues, Interval, Circuit, Fartlek and Plyometric

Unit IV Wellness and Weight Management

- a. Concept, meaning and Components of wellness
- b. Manipulation of energy balance to Induce weight loss and weight gain
- c. Methods of Weight Management
- d. Concept, types and causes of obesity and its management

REFERENCES :

- 1 Alexandria, V. (1989). *Fitness for Life*. Virginia : Time Life book.

- 2 Anne, R. (1995). **Health & Social Care**. UK : Thomas Nelson & Sons Ltd.
- 3 Bates M. (2008). **Health Fitness Management** (2nd Ed.) USA : Human Kinetics.
- 4 Bean, Anita. (1999). **Food For Fitness**. London : A & C Black
- 5 Beashel P., & Taylor, J. (1996). **Advanced Studies in Physical Education and Sports**. UK : Thomas Nelson & Son Ltd.
- 6 Bouchard, C. M. & Robert, P.L. (1997). **Genetics of Fitness and Physical Performance**. USA : Human Kinetics.

BPed/II/A/SC/02 : Adapted Physical Education

Subject Outcome:-

1. To equip the students to understand the basic of skills acquisitions of sports performance.
2. To make them understand the basic of skills and selected sports movement pattern
3. To enable them to understand the link between motor skills, ability, learning and performance
4. To familiarize the students with various theories improving and affecting the sports skills performance

Unit 1: Introduction to Adapted Physical Education

- 1.1 Meaning, Need and Importance of Adapted Physical Education and Sports
- 1.2 Purpose, Aims and Objectives of Adapted Physical Education and Sports
- 1.3 Program organization of Adapted Physical Education and Sports
- 1.4 Adapted Sports- Para Olympics

Unit 2: Development of Individual Education Program (IEP)

- 2.1 The student with a disability
- 2.2 Components and Development of IEP.
- 2.3 Principles of Adapted Physical Education and Sports
- 2.4 Role of Physical Education teacher
- 2.5 Teaching style, method and approach in teaching Adapted Physical Education

Unit 3: Developmental Considerations of an Individual

- 3.1 Motor development
- 3.2 Perceptual Motor development
- 3.3 Early childhood and Adapted Physical Education

Unit 4: Individual with unique need and activities

- 4.1 Behavioral and Special learning disability
- 4.2 Visual Impaired and Deafness
- 4.3 Health Impaired students and Physical Education
- 4.4 HRPF and its development for Individual with unique need
- 4.5 Role of games and sports in Adapted Physical Education

Reference

1. Beverly, N. (1986). Moving and Learning. Times Mirror/Mosby College Publishing.
2. Cratty, B.J. Adapted Physical Education in the Mainstream. (4th Edition) Love Publishing Company.

3. Houner, L.D. Integrated Physical Education- A guide for the elementary classroom teacher.
4. Winnick, J. P. (2005). Adapted Physical Education and Sports. Human Kinetics (4th Edition).
5. Pangrazi, R.P. and Dauer, V. P. Dynamics Physical Education for Elementary School Children. (11th Edition). Allyn and Bacon Publishing.

B.P.Ed

Semester III

BPEd/III/A/HC/01: Measurement & Evaluation in Physical Education

Subject Outcome:-

1. Students will understand the concept of Test, Measurement, Evaluation and Assessment Procedure in Physical Education and give examples of each
2. Students will differentiate formative and summative evaluation, Process and Product evaluation
3. Students will identify the purposes of measurement and Evaluation
4. Students will describe the features of Technical and administrative feasibility that should be considered when selecting test
5. Students will locate and select physical fitness and sports skill tests
6. Students will properly administer psychomotor tests.

Unit- I Introduction to Test & Measurement & Evaluation

Meaning of Test & Measurement & Evaluation in Physical Education

Need & Importance of Test & Measurement & Evaluation in Physical Education

Principles of Evaluation

Unit- II Criteria; Classification and Administration of test

Criteria of tests, scientific authenticity (reliability, objectivity, validity)

Type and classification of Test, Administration of test

Unit- III Physical Fitness Tests

AAHPER youth fitness test

National physical Fitness Test

Indiana Motor Fitness Test

JCR test

U.S Army Physical Fitness Test

Unit- IV Sports Skill Tests

Badminton Skill test

Basketball Skill test

Soccer Skill test

Volleyball Skill test

Hockey Skill test

REFERENCES:

1. Andrew and Jackson : Instructors manual, measurement, evaluation in Physical Education, Allanta Dullas, Geneva, 1981.
2. Banmgartner and Jackson : Measurement for Evaluation in Physical Education, Instructor's Manual, Houghton Mifflin Col. Boston, 1975.

3. Barrow and Rosemary Mc. Gee : Practical Approach to Measurement in Physical Education, Lea and Febiger, Philadelphia,1979.
4. Bosco J.S. and F.G. William : Measurement and Evaluation Fitness and Sports, Prentice Hall, New Jersey, Inc. 1983.
5. Clarke, Harison and Clark H. David : Application of Measurements in Physical Education, Prentice Hall, Englewood Cliff, New Jersey, 1987.
6. Eckert H.M. : Practical Measurement of Physical Performance, Lea and Febiger, Philadephic,1974.
7. Garretl, H. E. and Woodward : Statistics in Psychology and Education, Greenwood Press, Westport,1966.

BPEd/III/A/HC/02 : Kinesiology & Biomechanics

Subject Outcome:-

1. To understand the nature and scope of Biomechanics in Physical Education & Sports.
2. To understand the importance of movement analysis, kinesiological analysis and biomechanical Analysis.
3. To understand the knowledge regarding antagonistic and agonistic muscles in the movements.
4. To gain knowledge of the application of mechanical principles to fundamental skills and sports techniques.
5. To understand basic mathematical problems related to motion, force and levers.

Unit – I Introduction to Kinesiology and Sports Biomechanics

Meaning and Definition of Kinesiology and Sports Biomechanics
 Importance of Kinesiology and Sports Biomechanics to Physical Education Teacher, Athletes and Sports Coaches.
 Terminology of Fundamental Movements
 Fundamental concepts of following terms – Axes and Planes, Centre of Gravity, Equilibrium, Line of Gravity

Unit – II Fundamental Concept of Anatomy and Physiology

Classification of Joints and Muscles
 Types of Muscle Contractions
 Posture – Meaning, Types and Importance of good posture.
 Fundamental concepts of following terms- Angle of Pull, All or None Law, Reciprocal

Unit – III Mechanical Concepts

Force - Meaning, definition, types and its application to sports activities
 Lever - Meaning, definition, types and its application to human body.
 Newton's Laws of Motion – Meaning, definition & its application to sports activities.
 Projectile – Factors influencing projectile trajectory.

Unit – IV Kinematics and Kinetics of Human Movement

Linear Kinematics – Distance and Displacement, speed and velocity, Acceleration
 Angular kinematics – Angular Distance and Displacement, Angular Speed and velocity, Angular Acceleration.
 Linear Kinetics – Inertia, Mass, Momentum, Friction.
 Angular Kinetics – Moment of inertia, Couple, Stability.

Reference:

- Bunn, J. W. (1972). *Scientific principles of coaching*. Englewood Cliffs, N.J.: Prentice Hall Inc.
- Hay, J. G. & Reid, J. G. (1982). *The anatomical and mechanical basis of human motion*. Englewood Cliffs, N.J.: prentice Hall Inc.
- Hay, J. G. & Reid, J. G. (1988). *Anatomy, mechanics and human motion*. Englewood Cliffs, N.J.: prentice Hall Inc.
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- Simonian, C. (1911). *Fundamentals of sport biomechanics*. Englewood Cliffs, N.J.: Prentice Hall Inc.
- Deshpande, S.H. (1995) *Manav Kriya Vigyan (Hindi)*, H.V.P. Mandal, Amravati.

BPEd/III/A/HC/03 : Yoga and Health Education

Subject Outcome:-

1. To understand the concept and nature of yoga along with its historical background.
2. To gain knowledge regarding the application of yoga to Physical Education and Sports.
3. To understand the anatomy and Physiology of Asanas and Pranayamas.
4. To acquire the skills needed to understand and to overcome environmental problems.
5. To gain knowledge regarding the effect of yogic practices on health aspects.

Unit – I Introduction of Yoga

Meaning and Definition of Yoga

Aims and Objectives of Yoga

Yoga in Early Upanisads

The Yoga Sutra: General Consideration

Need and Importance of Yoga in Physical Education and Sports

Unit - II: Foundation of Yoga

Yoga in the Bhagavadgita - Karma Yoga, Raj Yoga, Jnana Yoga and Bhakti Yoga

The Astanga Yoga: Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana and Samadhi

Effect of Asanas and Pranayama on various systems of the body

Unit – III Health Education

Concept, Dimensions, Spectrum and Determinants of Health

Definition of Health, Health Education, Health Instruction, Health Supervision

Aim, objective and Principles of Health Education

Health Service and guidance instruction in personal hygiene

Unit – IV Health Problems in India

Communicable and Non Communicable Diseases

Obesity, Malnutrition, Adulteration in food, Environmental sanitation,

Explosive Population,

Personal and Environmental Hygiene for schools

Objective of school health service, Role of health education in schools

Health Services – Care of skin, Nails, Eye health service, Nutritional service, Health appraisal, Health record, Healthful school environment, first- aid and emergency care etc.

References:

- Brown, F. Y.(2000). *How to use yoga*. Delhi: Sports Publication.
- Gharote, M. L. & Ganguly, H. (1988). *Teaching methods for yogic practices*. Lonawala: Kaivalyadham.
 - Shankar, G.(1998). *Holistic approach of yoga*. New Delhi: Aditya Publishers.
 - Shekar, K. C. (2003). *Yoga for health*. Delhi: Khel Sahitya Kendra.
 - Agrawal, K.C. (2001). *Environmental Biology*. Bikaner: Nidhi publishers Ltd.
 - Frank, H. &Walter, H., (1976). *Turners school health education*. Saint Louis: The C.V. Mosby Company.
 - Nemir, A. (n.d.). *The school health education*. New York: Harber and Brothers.
 - Odum, E.P. (1971). *Fundamental of Ecology*. U.S.A.: W.B. Saunders Co.

**BPEd/III/A/SC/01: Sports Entrepreneur, Marketing & Sports Management
(Elective)**

Subject Outcome:-

1. Identify the skills and knowledge base needed to foster entrepreneurial activity for individuals based on the experiences of successful sports entrepreneurs as well as assess and discuss the challenges they have faced.
2. Critically discuss ways in which entrepreneurial-minded individuals can thrive in large sports organizations despite the tendency of such organizations to resist innovation and to favor the status quo or only seek marginal gains.
3. Demonstrate an understanding of, and identify, new opportunities and translate them into viable business solutions or opportunities

Unit I: Introduction to Sports Entrepreneurship

Concept of entrepreneurship, innovation and knowledge management in sports.
Business Planning Process - The business plan as an entrepreneurial tool
Elements of Business Plan, Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition, Business Model Canvas and Drafting Business Proposal for Funding Agency.

Unit II : Introduction to Sports Marketing

The Four Domains of Sports Marketing, Marketing Through Sports ,
Marketing concepts – traditional and modern; Selling vs. marketing; Marketing mix; Marketing environment.

Sponsorship: Introduction , Sponsorship: Developing and Selling the Proposal

Unit II. Management of Physical Education and sports

Meaning, Need and scope of management of Physical Education

Principles of Sports Management

Construction, marking and maintenance of play grounds, track & field, gymnasium, swimming pool and athletic track

Unit IV: Organization of co-curricular activities and Physical Education programmes.

Physical Education Budget : Need, Importance, procedure and principles of budget making,

Physical Education and sports programmes for - Primary, secondary and higher secondary School for sports awareness – demonstration, play days, sports rallies, sports exhibitions

Organization of National days (15th August & 26th January)., Organization of mass competition, sports day, hiking, trekking, Scout and Guide Camp and picnics

Ceremonies of competition – Opening, closing and victory

References:

- Sports Marketing By Melissa Jane Johnson Morgan Jane
- Small Business, Entrepreneurship and Enterprise Development. Harlow: Pearson Education.
- Broyles, F. J. & Robert, H. D. (1979). *Administration of sports, Athletic programme: A Managerial Approach*. New York: Prentice hall Inc.
- Business-Model-Generation-Visionaries-Challengers
- Bucher, C. A. (1983). *Administration of Physical Education and Athletic programme*. St. Louis: The C.V. Mosby Co.
- Earl, F. Z, & Gary, W. B. (1963). *Management competency development in sports and physical education*. Philadelphia: W. Lea and Febiger.
- Kozman, H.C. Cassidy, R. & Jackson, C. (1960). *Methods in Physical Education*. London: W.B. Saunders Co.
- Pandey, L.K. (1977). *Methods in Physical Education*. Delhi: Metropolitan Book Depot

BPEd/III/A/SC/02: Professional Preparation in Physical Education (Elective)

Subject Outcome:-

1. Students will develop understanding of the profession of Physical Education.
2. Students will be able to deal with issues experienced by Physical Education teachers.
3. Students will recognize that learning to teach is a lifelong process.
4. Students will develop a comprehensive view of Physical Education from a global perspective.
5. Students will understand the domains & hidden dimensions of Physical Education.
6. Students will Demonstrate basic knowledge & awareness about inclusion, differently-abled students & describe steps to inclusion.

UNIT I: Foundation of Professional Preparation

- 1.1 Meaning of Professional
- 1.2 Components of Professional Preparation.
- 1.3 Contribution of physical education in attaining ideals of Indian democracy.
- 1.4 Forces and factors affecting educational policies and Programme.

UNIT-II Historical Perspective

- 2.1 Historical review of Professional Preparation in India.
- 2.2 Professional courses being offered in professional preparation colleges in India.
- 2.3 Professional Preparation in Physical Education in USA, USSR and UK.
- 2.4 Beginning of Professional Preparation in the world.

UNIT-III Under-Graduate preparation of professional personnel.

- 3.1 Purposes, Admission Requirements of Undergraduate preparation.
- 3.2 Theory, Teaching practice and practical.
- 3.3 Professional competencies to be developed.
- 3.4. Post-Graduate Preparation.
- 3.5 Purposes & Admission requirements.
- 3.6 Methods of instruction.
- 3.7 Professional relations.

UNIT-IV Teacher and Teaching

- 4.1 Teaching as a career.
- 4.2 Basic Qualities of a successful teacher.
- 4.3 Preparation of the specialized physical education teacher.
- 4.4 Types of teaching jobs.
- 4.5 Types of non-teaching jobs.

Reference

- 1) A Professional Career in Physical Education. (Englewood Cliffs, N.J. Prentice Hall, Inc. 1963.)

- 2) Jensen, R. Clayne, Administrative Management of Physical Education and Athletic Programmes. (Philadelphia Lea and Febiger, 1983.)
- 3) Snyder and Scott. Professional Preparation in Health, Physical Education and Recreation. (Connecticut, Greenwood press, Westport, 1971).
- 4) Bucher, C.A Foundations of Physical Education (Saint Louis) : The C.V. Mosby Company, 1975), Ed. 7.
- 5) Aahper publication: Professional Preparation in Dance, Physical Education Recreation Education Safety Education and School health Education, Washington, Aahper pub.1974
- 6) Borozne Joseph & Pechar Stanley: Administration & Supervision for Safety in sports, Washington,Aaphper pub. 1977.
- 7) Aahper pub: Profession preparation in Safety Education and School health Education, Washington Aahper Pub.1974.

B.P.Ed

Semester IV

BPEd/IV/ A/HCS/01: Sports Medicine, Physiotherapy and Rehabilitation

Subject Outcome:-

1. Students will understand classification of sports injuries and its first aid and immediate management.
2. Students will know the basics of therapeutic modalities and its physiological effects.
3. Students will know the process of rehabilitation
4. Students will understand good and bad posture, postural deformities, its causes and management.
5. Students will understand nutrition and diet plan pre, during and post competition.

Unit – I Sports Medicine

- Meaning and concept of sports medicine
- Aim and objective of sports medicine
- Role of Sports trainers and physician in team

Unit-II Common Sports injuries

- Types of sports injuries and their causes
- Common regional injuries and their management – shoulder, elbow, wrist, knee and ankle
- Low back problem cause, symptom and its management in sports
- First aid – meaning and its concepts
- Athletic bandage and massage – Its classification, indications & contra-indications, general principles of massage

Unit – III Athletic Care and Rehabilitation

- Meaning of Physiotherapy and Rehabilitation
- Diagnosis of injuries – signs and symptoms of injuries
- Different forms of Hydrotherapy and Thermotherapy – hot and cold packs, whirlpool, contrast bath, infrared, short wave diathermy and ultrasound

Unit – IV Drugs and Doping

- Meaning of drugs and doping
- Wada and Nada
- Types of doping and its advantage and disadvantage
- Types of dope test

References:

- D. (1979). A Christine, M. D., (1999). *Physiology of Sports and Exercise*. USA: Human Kinetics.

- Conley, M. (2000). *Bioenergetics of Exercise Training*. In T.R. Baechle, & R.W. Earle, (Eds.), *Essentials of Strength Training and Conditioning* (pp. 73-90). Champaign, IL: Human Kinetics.
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- Gupta, M. and Gupta, M. C. (1980). *Body and Anatomical Science*. Delhi: Swaran Printing Press.
- Guyton, A.C. (1996). *Textbook of Medical Physiology*, 9th edition. Philadelphia: W.B. Saunders.
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- Karpovich, P. V. (n.d.). *Physiology of Muscular Activity*. London: W.B. Saunders Co.

BPEd/IV/A/HC/02: Research and Statistics in Physical Education

Learning outcomes

1. Identify the research problem in the field of physical Education and sports
2. Know to Summarize the various research literature
3. Understand and apply the basics of statistics in research
4. Organize the samples and sampling techniques which is relevant to the study.

Unit-I Introduction to Research

Definition of Research

Need and importance of Research in Physical Education and Sports.

Scope of Research in Physical Education & Sports.

Classification of Research

Research Problem, Meaning of the term, Location and criteria of Selection of Problem, Formulation of a Research Problem, Limitations and Delimitations.

Unit-II Survey of Related Literature

Need for surveying related literature.

Literature Sources, Library Reading

Research Proposal, Meaning and Significance of Research Proposal.

Preparation of Research proposal / project.

Research Report: A group project is to be undertaken by a small batch of students under the supervision of a teacher, wherein it is expected to survey school facilities of physical education, health assessment, programme evaluation, fitness status of the students, staff and other stakeholders etc. and submit the report to the institution.

Unit-III Basics of Statistical Analysis

Statistics: Meaning, Definition, Nature and Importance

Class Intervals: Raw Score, Continuous and Discrete Series, Class Distribution, Construction of Tables, Graphical Presentation of Class Distribution: Histogram, Frequency Polygon, Frequency Curve. Cumulative Frequency Polygon, Ogive, Pie Diagram

Unit- IV Statistical Models in Physical Education and Sports

Measures of Central Tendency: Mean, Median and Mode-Meaning, Definition, Importance, Advantages, Disadvantages and Calculation from Group and Ungrouped data

Measures of Variability: Meaning, importance, computing from group and ungroup data

Percentiles and Quartiles: Meaning, importance, computing from group and ungroup data

References:

- Best, J.W. (1963). *Research in education*. U.S.A.: Prentice Hall.
- Bompa, T. O. & Haff, G. G. (2009). *Periodization: theory and methodology of training, 5th ed.* Champaign, IL: Human Kinetics.

- Brown, L. E., & Ferrigno, V. A. (2005). *Training for speed, agility and quickness*, 2nd ed. Champaign, IL: Human Kinetics.
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- Thomas, J.R., & Nelson J.K. (2005). *Research method in physical activity*. U.S.A: Champaign, IL: Human Kinetics Books.
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BHARATI VIDYAPEETH DEEMED UNIVERSITY

(Established u/s 3 of UGC Act 1956, vide notification no. F9. 15.U.3 of Govt. of India)

COLLEGE OF PHYSICAL EDUCATION

Dhankawadi, Pune-411 043 (Maharashtra), Tel.020-24373741

REACCREDITED 'A' GRADE BY NAAC



Master of Philosophy (M. Phil.) In Physical Education

**CURRICULUM FRAMEWORK
(2009-2010)**

BHARATI VIDYAPEETH UNIVERSITY

Relevant Rules for Degree of Master of Philosophy (M. Phil.) In Physical Education

1. Status :

The M. Phil. Degree shall have the status of an intermediate Degree between the first Post-Graduate degree and Doctorate Degree. It will have both research and course components and will give the student adequate background for advanced research.

2. Learning Outcome

- i.** The course would equip students of Gujarat with necessary qualification for lecturer in a college/ secondary teacher or principal / higher secondary teacher or principal.
- ii.** Use online resources, libraries, databases etc.
- iii.** Create/prepare research papers for Sports and Physical Education
- iv.** Present and publish research papers in field of Sports and Physical Education.
- v.** Research scholar comes out with his/her original research or translation under the guidance of respected faculties in the second term. 9 Documentation skills.
- vi.** Knowledge of Sports Medicine, Sports Psychology, Sports Sociology and Sports Management.
- vii.** Organize and participate in seminar, workshop, symposia, conference etc.
- viii.** Participate in group discussions.

3. Eligibility and Admission :

An applicant seeking admission to the M. Phil. Course must have obtained a Master's Degree in Physical Education from this or any other recognized University.

Admission to the M.Phil. course shall be made on the basis of :

- 1) Satisfactory performance at the Masters Degree examination in Physical Education; and
- 2) The performance at a test conducted by the College / University concerned.

4. Duration of the M.Phil. course :

The M.Phil. Course can be done either on a full-time or on Vacational basis depending upon the availability of the programme in the College.

(a) Full-time course:

- 1.** The duration of the full-time M.Phil. course shall be 12 months.
- 2.** A full-time M.Phil. Student shall attend lectures, tutorials, practicals and seminars and must complete to the satisfaction of the institute.
- 3.** Although the duration of a full-time M.Phil. Course shall be for 1 yr., which can be maximally extended up to 2½ yrs from the date of admission to complete dissertation and after which the admission shall stand cancelled. In such a case, the student has to take fresh admission.

(b) Vacational course :

- i.** The vacational M.Phil. course shall extend over a period of 24 months (2 years). Such a Vacational M.Phil. student shall have to attend a minimum period of 4 months for his studies at the College / M.Phil. Centre. Like a regular student, a vacational student also may be permitted to complete his dissertation within the period of 2½ years from the date of admission. The facility of vacational M.Phil. course shall be restricted to teachers of any institutions.
- ii.** A student of vacational M.Phil. Course must attend lectures, tutorials, practicals and seminars for at least two months in a year to the satisfaction of the institution.
- iii.** The criteria for granting admission to the Vacational M.Phil. programme will be as follows :
 - a.** First preference will be given to the lecturers who are working in Universities and Colleges as per the merit of previous examination.
 - b.** Second preference will be lecturers of Junior College or School teachers.
- iv.** The duration of a vacational M.Phil. Course shall be for 2 yrs., However it can be extended up to 2½ yrs with the prior permission of the University authorities.

4. Content: - This course shall be divided into two parts-

Part A - Theory Paper (3 papers i.e., 2 compulsory & 1 optional).

Part B - Research Project (Dissertation, Seminar & Viva-Voce).

5. Evaluation :

- i. The evaluation of the performance of the student will be a continuous process and performance will be evaluated by the concern guide.
- ii. The dissertation will be evaluated by the guide of the candidate and an external referee appointed by the University authorities on recommendation of the principal.
- iii. Seminar and Viva-voce will be based on the dissertation. The evaluation of the final seminar and the viva-voce test will be done by a **committee** consisting of the following :
 - a. One expert (who is a senior research guide for Ph.D. of this or any other university) to be nominated by the Head/Professor-in-charge of the Institute;
 - b. The dissertation supervisor;
 - c. The Head of the Institute, who will act as Chairman of this Committee.
- iv. The following grade will be awarded to a student on the basis of marks obtain by him in the final exam as follows:

Percentage of Total Marks	Grade
50% & above but less than 55 %	“C” Grade
55% & above but less than 60 %	“B” Grade
60% & above but less than 65 %	“B”+ Grade
65% & above but less than 70 %	“A” Grade
Above 70%	“O” Grade / Outstanding

- v. In case a student fails in dissertation by not getting required marks for passing. The same dissertation may be sent to second examiner for evaluation. Even after second time evaluation, if the student fail he/she may be asked to resubmit the dissertation

with the suggestions and modification given by the examiners. He can resubmit and appear for final examination.

- vi.** All interested persons can attend the seminar and the viva-voce examination which will constitute the defense of the dissertation and they shall have the right to ask questions and participate in discussion on the dissertation. The chairman of M.Phil. Evaluation committee shall exercise his/ her discretion to allow or not to allow a question. However, the members of the audience at the defense shall have no right to express their opinion on the suitability or otherwise of the dissertation for the award of the M. Phil. Degree.

M. Phil. Structure

(Regular Course:- 1 yr. / Vacational Course:- 2 yrs.)

Intake: - 30 Students for each course

Structure of M. Phil.:- This course shall be divided into two parts

Part A - Theory Paper

Part B - Research Project

Examination:

Part A: Structure of Theory Paper

Sr. No.	Paper Name	Optional / Compulsory	Theory / Practical	Marks	Min. Marks	Min.% of Passing
01	Research Processes in Physical Education	Compulsory	Theory	100 Marks	40 Marks	50%
02	Advanced Statistics & Computer Application to Physical Education	Compulsory	Theory	100 Marks	40 Marks	
03	Yoga and Sports Achievement	Optional	Theory	100 Marks	40 Marks	
	Training method and applied Mechanics	Optional	Theory	100 Marks	40 Marks	
	Measurement & Evaluation in Physical Education	Optional	Theory	100 Marks	40 Marks	
	Sports Medicine	Optional	Theory	100 Marks	40 Marks	
	Exercise Physiology	Optional	Theory	100 Marks	40 Marks	
	Sports Psychology	Optional	Theory	100 Marks	40 Marks	
				300 Marks	120 Marks	

Part B: Structure of Research Project

1. Dissertation / Thesis:-

Dissertation / Thesis shall be evaluated by both internal and external examiners for 100 Marks (i.e., Internal 50 Marks and External 50 Marks).

2. Seminar Presentation:-

Seminar Presentation shall be an open defense system, and will be evaluated by a three-member Committee which will consist of the Head of the Institute as Chairman of the committee, internal examiner and any one subject expert (Preferably a Ph.D. guide)

3. Viva Voce:-

Viva-voce shall be evaluated by a three-member Committee which will consist the Head of the Institute as Chairman of the committee, internal examiner and any one subject expert (Preferably a Ph.D. guide).

Structure of Research Project:-

Sr. No	Research Project	Internal	External	Full Marks	Min. Marks of Passing	Minimum % of Passing
01	Dissertation/Thesis	50 Marks	50 Marks	100 Marks	40 Marks	50%
02	Seminar Presentation	50 Marks	50 Marks	100 Marks	40 Marks	
03	Viva - Voce	50 Marks	50 Marks	100 Marks	40 Marks	
		150 Marks	150 Marks			
	Total			300 Marks	120 Marks	150 marks

STRUCTURE OF OVERALL MINIMUM PASSING MARKS:

Sr. No.	Name of Part	Total Marks	Minimum Passing Marks
01	Part "A"	300	150
02	Part "B"	300	150
Total		600	300

STANDARD OF PASSING:

- A student has to obtain minimum 40% Marks in each THEORY PAPER of Part-A and 50% marks in aggregate in Part-A total, also students has to obtain 40% marks in each a) Dissertation b) seminar & c) Viva-voce and 50% marks in aggregate in Part B
- If a student fails to get less than 50% marks in overall aggregate in theory, he / she may apply again in *one or more theory subject* to obtain 50% marks in Part-A.
- If any student fails to get 50% marks in Part-B (Dissertation / Seminar Presentation / Viva Voce), he / she has to reappear either in Seminar or Viva Voce or both to get 50% marks for passing in part-B.

AWARDS OF GRADE:

The following grade will be awarded to a student on the basis of marks obtain by him in the final exam as follows:

Percentage of Total Marks	Grade
50% & above but less than 55 %	“C” Grade
55% & above but less than 60 %	“B” Grade
60% & above but less than 65 %	“B”+ Grade
65% & above but less than 70 %	“A” Grade
Above 70%	“O” Grade / Outstanding

System of Dissertation / Thesis Submission:

The M. Phil. Course must be completed within 2½ years from the time of admission; otherwise the admission is treated as cancelled. In such a case, the student has to take fresh admission.

Students can submit their dissertation any time during the session. The dissertation will be sent to an expert for evaluation and Viva-voce will be conducted accordingly. After receiving the marks, the university will declare the final result.

**PATTERN OF QUESTION PAPER:
M. Phil. Question Paper Structure**

Subject: -

Day: -

Time:-

Date: -

Marks:- 100

N. B. 1. Attempt any 04 questions from Q. No. 01 to 06

2. Q. No. 07 is **COMPULSARY**

01.(20)

02.(20)

03.(20)

04.(20)

05.(20)

06.(20)

07. Write to Short Note (Any Four) (20)

a)

b)

c)

d)

e)

f)

Time Table of M. Phil. Examination

Paper No.	Subject	Full Marks	Day & Date	
			Regular Course	Vacational Course
Paper I (Compulsory)	Research Process in Physical Education	100	Monday 21 st June 2010	Monday 18 th June 2012
Paper II (Compulsory)	Advanced Statistics and Computer Application to Physical Education	100	Tuesday 22 nd June 2010	Tuesday 19 th June 2012
Paper III (Optional)	Yoga & Sports Achievement	100	Wednesday 23 rd June 2010	Wednesday 20 ^h June 2012
	Thesis/Dissertation (Submission)	100	Monday 03 rd May 2010	Monday 03 rd May 2012
	Final Seminar (Research Thesis)	100	7 th June 2010 To	4 th June 2012 To
	Viva-Voce (Research Thesis)	100	10 th June 2010	9 th June 2012
		600 Marks		

Syllabus For Master Of Philosophy (M. Phil.)

Compulsory paper – I: - Research Processes in physical education

Learning outcomes

1. Identify the research problem in the field of physical Education and sports
2. Know to Summarize the various research literature
3. Understand and apply the basics of statistics in research
4. Organize the samples and sampling techniques which is relevant to the study.
5. Apply the systematic methods in writing research thesis

Unit I: - Introduction

Meaning nature and scope of research importance of research in general and With special reference to physical education and sports Characteristics of research and research worker.

Unit II:-

Basic, Applied and action research-their relationship and difference.

Importance and methodology of research.

Unit III:-

Place of research in university, Historical perspective, relation to graduate study,

Organization & financing of research, problem of university sponsored research.

Unit IV:- The Problem

Located the problem – selection of problem

Developing problem statement

Meaning and significance of Hypothesis

Type of hypothesis

Unit V:- Non-Laboratory Research Techniques

Historical Research

Meaning and significance of Hypothesis

Examining validate of historical data

Principal of historical criticism

Pitfalls in historical Research

Unit VI:- Philosophical studies.

Meaning and significance.

Methodology of philosophical research.

Critical thinking continuum.

Unit VII : - Descriptive studies – Board survey

Questionnaire, Opinion ire and interview techniques.

Case studies and profiles.

Unit VIII:- Laboratory Research

Experimental designs.

Unit XI:- Experimental Methods

Control of Experiment Factors.

Principals of Experimental Enquiry (Mill's Canons)

Establishing a research Laboratory

Unit X:- Research Report

Deference between abstract, Research proposal & research reports.

Format of research reports

Table and Figures.

Footnote and Bibliography

Reference Books:

1. John w. Best Research Education (Fourth Ed.) New Delhi, prentice Hall of India.
2. M.L. Kamallesh- Methodology of research in physical education. New Delhi, 1994
3. R.H. Whitney, Techniques of research.
4. Good, Bar, Gatesw, Research in education.

5. Clark, David H. Clar. Harison H.: Research process in physical education.
6. Veit, Richard, Research – The students Guide. New York Macmillan publishing company, 1980.
7. Sadhu A.N., Sing Amarjit; Research Methodology In Social Sciences (Fourth Edition) Bombay Himalaya Publishing House-1998

Compulsory paper– II:- Advanced Statistics And Computer Application to physical Education

Learning Outcome

1. To equip the students to understand the basic of skills acquisitions of sports performance.
2. To make them understand the basic of skills and selected sports movement pattern
3. To enable them to understand the link between motor skills, ability, learning and performance
4. To familiarize the students with various theories improving and affecting the sports skills performance

Unit I :- Introduction to statistics

Meaning – importance and need of statistics parametric and non parametric statistic.

Unit II:- Measure of central tendency – specific characteristics and use of central tendency

Unit III: Percentiles and quartiles –

Meaning and importance – computation of percentiles and deciles.

Unit IV:- Measure of variability-

Quartile deviation, mean deviation and standard deviation – Specific Characteristic and uses.

Unit V: Normal probability curve – principles and properties of normal curve

Unit VI: Analysis of variance :

Need for analysis of variance – standard deviations of combined

Samples – one way analysis of variance – two way analysis of Variance post Hoc Tests of significance

Unit VII: Analysis of co-variance:-

Need for co-variance. Application of analysis of co-variance, control of covariates.

Unit VIII : Partial and multiple correlations :

Meaning of partial correlation, First order part correlation – computation of partial standard deviation.

Meaning of multiple correlation computation of multiple correlation – Difference between multiple correlation.

Unit IX : Prediction and Wherry – Doolittle method:

Meaning of predication – Two Variables regression equations – Multiple regression equations.

Unit X:- Wherry Doolittle method of multiple correlation.

Unit XI Special Co relational and parametric methods:

Chi-Square

Rank – Difference method of correlation. Biserial Correlation

Phi-Coefficient, Contingency coefficient, Curvilinear, relationship

Unit XII : Computer programmers with basic knowledge.**Reference Books:**

1. Ferguson, George A. Statistical Analysis in psychology and education (Fifth edi.) Singapore, Mc Graw-hill international Book Co.,1985.
2. Walpole Ronald E. Introduction to statistics (Third Edi) Macmillan publish co. Inc, New York 1982
3. Mendenhal, off Understanding statistics (Second Edi) Belmont california, Wadsworth publishing company Inc., 1976
4. Garrett, Henry E. Wood Worth R.S.; Statistic in psychology and education, Bombay, Vakil & sons Ltd. INDIA, 1981
5. Advance statistic by Clark & Clarke.
6. Steele Robert, and Torrid James A. Principles and procedure of statistics, New York, Mc Graw-hill Book CoM.,1960.
7. Garret, Harry E. and Wood worth R.S. statistic in psychology and education, Bombay, Allied Pacific Private Ltd. 1981

Optional Paper – Training Method and Applied Mechanics

Part – ‘A’ Training Methods

Learning outcome

1. Understand training as performance based science
2. Explain different means and methods of various training
3. Prepare training schedule for various sports and games
4. Appraise types of periodization for performance development
5. Create various training facilities and plans for novice to advance performers
6. Students will describe the features of Technical and administrative feasibility that should be considered when selecting test
7. Students will locate and select physical fitness and sports skill tests
8. Students will properly administer psychomotor tests

Unit I :- Principals of training and Conditioning

Type of training weight training, circuit training, interval, times

Running wind sprint, jogging miles, fartlek training.

Other factors: diet, sleep-rest musical ione and readiness

Unit II :- Fitness

Basic of physical fitness, basic physical characteristic fitness & training,

Emotional fitness and psychological training.

Unit II :- Strength Development:

Maximum strength, elastic strength, strength endurance, absolute and relative strength, external resistance and the athletes ability to express force, static muscular activity, dynamic muscular activity, strength development training

Unit IV: Speed Development :

Speed in Sports, Speed Development Training For Speed Development the Speed Barrier Endurance and Speed Training.

Unit V : Endurance Development

Training Method- Duratin-Repetirion Competition and Testing Endurance Sports.

Unit VI: Mobility Development

Mobility Classification Factors influencing Mobility Role of Mobility,
Mobility Training: Mobility Unit Construction- Mobility Derivation.

Unit VII: Physiological Effort of Training:

Unit VIII: Training Schedules – Seasons and Levels-Concept of Trainer System
Role of Trainer in Programmed Implementation.

Unit XI: Testing Processes & Tools Strength Speed- Endurance Vital Capacity
Blood Pressure- Pulse rate. Apparatus Spirometer Spigometer
Meter-Lig Dynamo Meter-Intruder Pulse Apparatus.

Unit X: The Effect of Drugs, Alcohol and Smoking on Performance.

Unit XI: Effect of climatic changes and High Altitude on Human Performance.

Part-B Applied Mechanics

Unit I: Nature and Scope of Applied Mechanics in Physical Education
Movement Mechanics in the Body

Unit II: a) Concepts of Application of Mechanics in Sports Static and Dynamic
Balance (Equilibrium).

Force-Movement of Force Centripetal and Centrifugal.

Force of Gravity, Spin and Friction, Impact -Levers, Newton's

Laws of Motion Velocity and Action-Reaction types of Motion -Rotary
and Linear Motion-Angular Kinetics, Linear Kinetics, Kinematics
Linear, Kinematics Center of Gravity Falling Bodies. Path of
Projection-Work Power and Energy.

B) Guiding Principles Derived From the Application of Above
Mechanical Concepts.

Unit III : Hydrodynamics constructions:

Concepts & Application of Mechanics in Sports in the Aquatic Media
Flotation. Buoyant Force-Specific Gravity Center of Buoyancy-Rotative
Motion Fluid Resistance-Gyro Scoping Action-Guiding Principles

Derived From the Application of the Above Mechanical Concepts in the Aqua Media.

Unit IV: Aero Dynamic Constructs :

Principal of Cinematographic Analysis-Application of Cinematographic & Video Analysis Motor Ideograms Avoidance of Errors of Measurements.

Unit IV: Analysis dynamic constructions:

Principal of cinematographic analysis – application of cinematographic & video analysis motor ideograms avoidance of errors of measurement

Reference Books:

1. Johnson C.R.Fisher, A.G.Scientific Basis of Athletic Conditioning. Philadelphia ,Lea Febiger1972.
2. Singh,H Sport Training General Theory and Method N.I.S., Patiala, 1984.
3. Singh, Hardayal,Science of Sports Trainig,New D.A.V Publications.
4. Fronce Wand Field,Dorothy Marking and John M.Cooper Track and Field fundamental for Girls & Women, London C.V.Mosby Company 70.
5. L. Matevan ,Sports Training U.S.S.R Publication, New Delhi.
6. Frank N. Dich. Sports Training Principles, London M Lepus Book Co.
7. Amol, Robert & Gaines, Charles Sport Talent New Zealand, Penguin Books.
8. Bunn, John W. Scientific Principal of Coaching Eagle wood Cliffs N.J. Prentice Hall.
9. Harre, Dierich Principles of Sports Training Berlin Sportverlag.

Optional Paper – Measurement And Evaluation In Physical Education

Learning outcome

1. Students will understand the concept of Test, Measurement, Evaluation and Assessment Procedure in Physical Education and give examples of each
2. Students will differentiate formative and summative evaluation, Process and Product evaluation
3. Students will identify the purposes of measurement and Evaluation
4. Students will describe the features of Technical and administrative feasibility that should be considered when selecting test
5. Students will locate and select physical fitness and sports skill tests
6. Students will properly administer psychomotor tests

Unit I: Meaning of the term Measurement and evaluation. Basic Principles & functions of measurements and evaluation – Brief history of Measurement in Physical Education –Place of measurement and evaluation in Phy.Edu.

Unit II: Critical of test selection – Scientific Authenticity, Reliability, Validity, Objectivity, Norms– Administrative feasibility & educational application

Unit III: Tests Classification – Standard test – Objective and Subjective tests. Construction of Tests: Knowledge tests (Written Tests) & Skill tests (Evaluation of knowledge test steps in constructions of knowledge & skill tests.)

Unit IV: Maturity, Nutrition Body Size and form _ Nutrition – Evaluating Nutrition, Nutritional test evaluation body Dimensions – Somato types – Posture, Values Test of Antero Posterior Posture, Lateral Deviation and Spine foot measurement.

Unit V: Determination of Center of Gravity of the human body – Graphic method, and Analytical rate, Respiratory Volume, Tidal Volume – Vital Capacity Audition & visual Reaction time, body fat, Grip Strength. Leg Strength & Flexibility.

Unit VI: Strength test – Kraus Weber Muscular Tests – Rogers Physical Fitness, Index Suggested Changes in the PFI test. Physiological fitness – Mc curdy Larson test of Organic efficiency cremation blood – piosis tests, Harvard step test, Kuper's 12 minutes continuous Run / Walk test.

Unit VII: Testing instrument– Expire Graph, Peak Flow meter chromatograph, Duckle method and Analytical method.

Unit VIII: Motor fitness – Oregon motor fitness test, California physical performance tests, revised AAHPER Youth fitness tests, Motor fitness tests of the armed forces. The JCR test, New York State Physical Fitness test, Purdue University Motor fitness test, Shafer Girl’s motor fitness test, Evaluation of motor Fitness test, sit-ups and chins. Inter relationship and self-scoring.

Unit IX: General motor Abilities – the concept of general motor Ability equating by specific activities, equating by general abilities, strength index – strength abilities of girls. MC Cloy’s General motor ability & Capacity test, Motor educability – LOWA Brace test. Explosive muscular vertical jump & standing broad jump.

Unit X: Measurement of social efficiency – MC Dolly’s behavior rating scale, Blascrchand’s scale, Cowell Social behavior trend index, social Acceptance Evaluation Socio metric Questionnaire. Measurement of general social Efficiency – Bell Adjustment Inventory, the Bereuter Personality Inventory. Cattails Sixteen personality Factor questionnaire & California psychological Inventory.

Unit XI: Measurement Programmes – Suggestions for administering tests. Test Personnel, time for testing – Economy of tables, Graphics exhibits Preparation of reports – Co-Operative measurement projects central New York State Projects, Oregon Pilot Physical fitness project.

Unit XII: Use of test in meeting the individual needs:

- a) Presentation, interpretation and use of test results.
- b) The teacher
- c) The student
- d) The parent
- e) The Administrator

Reference Book:

1. Clarke, Harrison, Application of measurement to physical Education, Englewood Cliffs, New Jersey: Prentice Hall’76

2. Mathews, Donald K. Measurement in physical Education Philadelphia, London W.B. Saunders co.'58.
3. Margaret H. Safrit, Evaluation in physical education Englewood cliffs, New Jersey: prentice Hall Inc. '81.
4. Barry L. Jonson and jack N. Nelson practical measurements for evaluation in physical education. Delhi: Surjeet Publication.

Optional Paper:- Sports Medicine

Learning Outcome

1. Perform and report on the exploratory analysis of data collected using sports technology
2. Analyze sporting data of various types via astute use of statistical packages.
3. Practice mathematics, statistics, information technology in sport technology related problems.
4. Support a conclusion based upon quantitative prediction, performance and analysis of a sporting team, code, or gaming environment

Unit I: - History of sports medicine – its definition aims and objective, nature and functional utility- preventive, curative and rehabilitative aspects.

Unit II:- Concept of physical fitness – specific fitness- definition and components of physical fitness.

Unit III:- Physiological, pathological and psychological problems of sportsmen before, during and after competition.

Unit IV:- Thermo-regulation and sports: Fluid balance, Climatic ant tomes and their possible effects on the physiological function – Heat Exhaustion, Heat camp, Heat stroke, Exposure, Mountain Sickness-High altitude & its effects on performance,

Unit V:- Nutrition and Hygiene : Athletic nutrition and malnutrition high calorie diets, Role of vitamins, Minerals, Salts Carballydrate protein, fat loading before tournament, Hygiene of sportsmen Athletes foot, ringworm etc. Importance and need of immunization

Unit VI:- Roll of Skills rule and regulation in the prevention of sports injuries and early rehabilitation.

Unit VII:- Regional and specific injuries in track and filels and ither major games and their management

Unit VIII:- Common injuries and their management

Unit IX:- Somato types, physique and performance.

Unit X:- Women in sorts: Special problem of female athlete.

Unit XI:- Aging and Sports

Unit XII :- Sports physiotherapy: History of massage, definition, Muscle relaxations an aid to massage factors to be considered in including relaxation – points to be considered in giving massage - classification, contra indication – effects & uses Hydrotherapy, sauna bath , Electrotherapy & exercise therapy – Sports therapy- Sports therapy.

Unit XIII: At tapping and supports – safety gadgets in sports and games.

Unit XIV: Drugs and doping: Ergogenic – Artificial aids, Anabolic substances its use and amuses in sports, its effects and dangers.

Unit XV: Evaluation in sports medicine – Biometrics – measurement analysis interpretation for evaluation & performance – selection – prediction.

Reference Books:

1. Peter G. Stroke A Guide to Sports Medicine Churchill Livingston. Edinburgh, London.79.
2. Armstrong and Trckter injuries and sports London stampel press.
3. Dolon J.P. Treatment an prevention of Athletic injuries.
4. Johnson W.R. science and medicine of Exercise and sports, New York, Harper and Smither Publisher.
5. Encyclopedia of sports science and medicine London: Edward Arnold publish.

OPTIONAL PAPER – EXERCISE PHYSIOLOGY

Learning outcomes

1. Understand the basic principles of physiology and Exercise Physiology
2. Apply the knowledge in the field of physical education and movement activity.
3. Analyze the practical knowledge during the practical situation.
4. Remember and recall the definition of physiology and co-relate the principles of physiology.
5. Appraise the effects during the training and practical sessions

Unit I: Introduction and function of muscles:

Classification of muscles, structure of muscles tissues, various theories of Muscular contraction, Hypertrophy of muscles in relation to physical activity.

Unit II: Neuromuscular Physiology:

Neuron, motor units neuron muscular junction, Bio-electric Potential, Kinesthesia tone moisture and equilibrium.

Unit III: Bio-Energies:

Fule for muscular work, energy for muscular contraction, Aerobic & Anaerobic systems. Inter relationship of aerobic and Anaerobic system with special reference to different activities Anaerobic – Threshold training.

Unit IV: Operational Dynamic:

Physiological changes due to Exercise and training: Effect of exercise on various systems, - oxygen debt, second wind, micro circulation. Effect of Exercise and training on carbohydrates, Fat and protein metabolism- control of variables in training.

Unit V: Sports Ergonomics:

Works capacity under different environmental conditions such as hot, humid, cold and high altitude.

Unit VI: Sports Nutrition:

Physiological consideration of diet in relation components, quantities and significance, sports and diet, diet before during and after competition Glycogen boosting – calorie calculator. Determination of energy cost of various sports activities.

Unit VII: Sex differences and sports.

Unit VIII: Effect of smoking, drinking, drugs and athletic performance, Dope Testing.

Unit IX: Aging and Exercise, Basic principles and guidelines for construction of cardio respiratory endurance exercise for the aged.

Unit X: Physical conditioning:

General principles of physical training, development of muscular strength and local endurance, development of Aerobic & Anaerobic endurance.

Unit XI: Functional tests E.M.G. Instrumentation.

Unit XII: Physiology for the physically handicapped

- a) Neuro Muscular condition
- b) Skelete – Muscular condition.
- c) Cardio – Muscular condition

Reference Books:

1. Astrance: P.P. and K.Rodhal Text Book of work physiology, New York, MCGraw book company.
2. Berger, A.R. applied Exercise physiology, Philadelphia lea and Febiger.
3. Clarke, David N. Exercise physiology, Eaglewood cliffs, New Jersey, Prentice
4. Curbain T.K. The physiological Effects of Exercise programmed on Adults, springfield: Charles C. Thomas Publisher.
5. Da Vriv H.A. Physiotoy of exercise far physical education and Athletic, Staples press, condon,1976.
6. Karpovioh, P.V. and Siuning W.R. Physiology, New Delhi: Surjeet Publications.
7. Shaver L.G. Essentials of exercise physiology of muscular Activity.
8. Noble Bruce J. Physiology of exercise and sports, saint Louis: Time / Mirror / Mosby college publishing.
9. Sundarajan G.S. Sports Medical Lecturers, Madars, Rasha Publications.
10. Welsh R. Peter and Roy J. shafer (Eds) Current Therpy in Sports Medicine, Toronto: B.C. Becker Inc.

Optional Paper :- SPORTS PSYCHOLOGY

Learning outcomes

1. Understand the basic principles of physiology and Exercise Physiology
2. Apply the knowledge in the field of physical education and movement activity.
3. Analyze the practical knowledge during the practical situation.
4. Remember and recall the definition of physiology and co-relate the principles of physiology.
5. Appraise the effects during the training and practical sessions

Unit I: The History and Development of Sports Psychology.

Unit II: Psychology and play
Traditional theories of play
Twentieth Century theories of Play

Unit III: Psychology of motor learning.

Measuring of the term, perceptual motor learning the retention of motor skills transfer of skill, measurement of learning, and learning curve, Attention and its role in learning motor skills.

Unit IV: Children in Sports:

Early Psychological experience, motivation of children in sport emotions of Children in sport, child and coach, children and competitive sports.

Unit V: Women in sport – issues and controversies.

Unit VI: Physical activity and the psychological development of the handicapped.

Unit VII: Personality of sportsmen and coach:

Nature of personality, the issue of heredity in personality, personality traits of sportsmen, assessment of personality traits of the coach and his personality.

Unit VIII: Motivation in Sport:

Theories in/ or/ motivation, achievement motivation, level of aspiration and achievement, methods and assessing aspiration level, motivation and participation in physical activity dropouts in sports.

Unit IX: Socio psychological dimension of sport:

Sport performance in groups, team cohesion, socio metry in sport, leadership sport, sport audience and their effect on performance.

Unit X: Psychology of competition:

Psychological characteristics of pre-during and post competition (Anxiety, fear, frustration) Mental training, Psychological preparation for competition – Autogenic training.

Unit XI: Psycho Dynamics in sports:**Unit XII:**The Evaluation of the superior Athlete:

- a) Typology of Athletics activities based upon their Psychological demands.
- b) Personality assessment.
- c) Assessing the Athlete through field tests.
- d) Motivate of superior athletes.
- e) Psychological preparation of the superior athlete.

Unit XIII: Aggression and performance:

- a) Theories of aggression
- b) Aggression in Athletic competition
- c) Sex difference in Aggression
- d) Instruction in Aggression

Unit XIV: Activation:

- a) Basic research findings
- b) Activation in sports, research findings
- c) Method of adjusting activation levels of Athletes.

Reference Books:

1. Vanke Miroave: Bryant Cratty J. 'Psychology and the Superior Athletic' The Mamillian Co. London.
2. Craty Bryant, 'Psychology in Contemporary Leadership' Englewood cliffs: prentice – Hall Inc. New Jersey.
3. Bruin Richard, 'Psychology in sports methods and application' Collarada state University, Fort Williams, Colorado, Surjeet Publications, Delhi.
4. Lee Wakyn Tackh, Judy Al Bliner, 'Psychology of coaching,Theory and application' Florida International University, Miami Florida Reprinted by Surjeet Publications, New Delhi.
5. Gratty Bryant, 'Movement Behavior and Motor Learning' Philadelphia: Lea and Febiger, 1989.
6. Gratly Bryant J. Career Potential in Physical Activity. Englewood Cliffs, New Jersey's Prentice Hall Inc.

7. Gratly Bryant **Psychology in contemporary sports**. Englewood Cliffs, New Jersey, Prentice Hall Inc.
8. Singer Robert N. **Motor Learning and human performance**. New York Mc Graw Hill Company, 1975.
9. J.N. Schultz and W. Luther '**Autogenic Therapy**' Grune and Stration New York.
10. Cox Richard H. 'Sport Psychology conepts and application' MC Graw Hill, New York.

Optional Paper: Yoga and Sports Achievement:

Subject Outcome:-

1. To understand the concept and nature of yoga along with its historical background.
2. To gain knowledge regarding the application of yoga to Physical Education and Sports.
3. To understand the anatomy and Physiology of Asanas and Pranayamas.
4. To acquire the skills needed to understand and to overcome environmental problems.
5. To gain knowledge regarding the effect of yogic practices on health aspects.

Unit I: Understanding of Yoga:

- Yoga – Definition of Yoga – steps, Asana: Definition of objectives, aims.
- Pranayama – Definition, Aims & Objectives, Mechanism of Pranayama.
- Kriyas, Bandhas, Mudras.
- Ardinal Principles of Yoga practives.

Unit II: Philosophical Foundation of Yoga

- Yogic Texts & Yoga Philosophy
- Patanjali Yoga.
- Yoga, Mysticism & Cultural Synthesis.

Unit III: Scientific Foundation of Yoga

- Various physiological systems in the body.
- Deep Breathing, Normal breathing – pranayama breathing
- Scientific explanation of Asana & Exercises.
- Physiological implications of different yogic practices.

Unit IV: Yoga Psychology & Mental Health

- Meaning & nature
- Characteristics of mental health in western Psychology and Yoga.
- Interpretation of Psychological disturbance in terms of Yoga.
- Mechanism of Patanjala Yoga in controlling psychosomatic disorders.

Unit V: Yoga, Health & Fitness

- Health related fitness
- Role of yoga in health & fitness
- Non-slip dominance in relation to health, fitness and performance
- Injuries in yoga & remedies

Unit VI: Yoga Diet

- Philosophy of Yoga diet.
- Process of Eating
- Balance diet & concept of Ahara (Svattik, Rajasik, Tamasik)
- Diet & Behavior

Unit VII: Yoga Practical's (as suggested by Swami Kuvalayanada)

- Short course of Yoga
- Easy course of Yoga
- Full course of yoga

Unit VIII: Yoga Practicals

- Methods of Teaching & Learning
- Yoga Lesson Planning
- Practice Teaching (One Lesson)

Reference Book:

1. Pal Satya, 'Yogasana and sadhana' Pustak Mandal, Delhi.
2. Nagendra H.R. 'Yoga and Cancer' Swami Vivekananda Yoga Prakashan, Bangalore.
3. Narendran Shamanthakamani. 'Yoga for Pregnancy' Swami Vivekananda Yoga Prakashan, Bangalore.
4. Nagarathana R. 'Yoga for Arthritis' Swami Vivekananda Yoga Prakashan, Bangalore.
5. Nagarathana R. 'Yoga for Anxiety and Depression' Swami Vivekananda Yoga Prakashan, Bangalore.
6. Srikanta S.S. 'Yoga for Diabetes' Swami Vivekananda Yoga Prakashana, Bangalore.
7. Nagarthana R. 'Yoga for Digestive Disorders' Swami Vivekananda Yoga Prakashan, Bangalore.
8. Nagarthana R. 'Yoga for Hypertension and heart diseases' Swami Vekananada Yoga Prakashan, Bangalore.
9. Nagrthana R. 'Yoga for Asthama' Swami Vivekananda Yoga Prakashan, Bangalore.

10. B.K.S. 'Light on Pranayama pranayama Dipika' Harper Collins, New Delhi.

BHARATI VIDYAPEETH DEEMED UNIVERSITY
(Established u/s 3 of UGC Act 1956, vide notification no. F9. 15.U.3 of Govt. of India)

COLLEGE OF PHYSICAL EDUCATION
Dhankawadi, Pune-411 043 (Maharashtra),
Tel.020-24373741

REACCREDITED 'A' GRADE BY NAAC



Master of Physical Education
(M.P.Ed)-2Years

(4 Semester Programme)

Curriculum Framework & Syllabus

CURRICULUM FRAMEWORK

**GUIDELINES OF REGULATIONS AND SYLLABUS STRUCTURE FOR M.P.
ED. TWO YEARS PROGRAMME (FOUR SEMESTERS)
CHOICE BASED CREDIT SYSTEM (CBCS)**

Preamble: The Master of Physical Education (M.P.Ed.) two years (Four Semesters, Choice Based Credit System) programme is a professional programme meant for preparing Physical Education Teachers for senior secondary (Class XI and XII) level as well as Assistant Professor/Directors/Sports Officers in Colleges/Universities and teacher educators in College of Physical Education.

The M.P.Ed. programme is designed to integrate the study of childhood, social context of Physical Education, subject knowledge, pedagogical knowledge, aim of Physical Education and communication skills. The programme comprise of compulsory and optional theory, Specialization and Teaching Practice

Programme Outcome

1. The Master of Physical Education (M.P. Ed.) two years (Four Semesters, Choice Based Credit System) programme is a professional programme meant for preparing Physical Education Teachers for senior secondary (Class XI and XII) level as well as Assistant Professor/Directors/Sports Officers in Colleges/Universities and teacher educators in College of Physical Education.
2. To prepare the leaders who can work in Health and Fitness Industry as Fitness and Wellness experts.
3. To prepare Sports Experts in various capacities like Trainers, Physiotherapists, Rehabilitation Experts, Sports Counsellors, Game Officials, Scorers, Referees etc.
4. To prepares Experts who can work with various Sports Federations/Organisations/Leagues/Media Houses.

Intake, Eligibility and Admission Procedure: The Intake, Eligibility and Admission Procedure are as per the NCTE norms and standards.

Eligibility

(a) Bachelor of physical education (B.P.Ed.) or equivalent with at least **50% marks.**

Or

(b) A candidate, who has passed any one of B.Ed (Phy.Edu), B.P.E. (4 yrs) or any other equivalent degree.

Number of seats: As approved by NCTE for M.P.Ed. Course.

Note:-

*Married girl is eligible for admission to M.P.Ed. programme. But, it is also compulsory for her to sign an undertaking that she will discontinue the programme at once for at least one academic year, if she gets pregnant during the course of study. She can join back afresh from the beginning of the semester keeping the guidelines pertaining to the maximum duration of the course in mind.

*No differently-abled candidate is eligible for the admission in M.P.Ed. programme.

Admission procedure: Admission shall be made on merit on the basis of marks obtained in the entrance examination consisting of 100 marks based on the following.

a- Written test	50 marks
b- Sports proficiency test	30 marks
c- Interview	10 marks
d- Sports achievement	10 marks

The total entrance test will be conducted in two days and could be extended, if needed and it will be conducted at College of Physical Education, Bharati Vidyapeeth University.

- (A) **Theory Paper** comprising of 50 multiple-choice questions of one and half hours duration carrying 50 marks. Questions shall be based on B.P.Ed. course.
- (B) There shall be **Physical Fitness** of 30 marks will be conducted by Internal Examiners of College of physical education.
- (C) **Interview** comprising of 10 marks will be conducted by Internal Examiners of College of Physical Education

(D) Weightage :- Candidate shall be given maximum 10 marks weightage on the basis of their sports participation in any one of the following level:

Participation	Marks
➤ International:	10
➤ Senior National championship/ National Games:	
1st Place :	10
2nd Place :	08
3rd Place :	07
Participation:	05
➤ All India Inter-Zonal Inter University Competitions:	
1st Place :	08
2nd Place :	07
3rd Place :	06
Participation:	05
➤ Zonal Inter University Competitions/Junior National Competitions:	
1st Place :	07
2nd Place :	06
3rd Place :	05
Participation:	04
➤ Senior State Championship/Rural national games/Women festival:	
1st Place :	05
2nd Place :	04
3rd Place :	03
Participation:	02

Note:-

*The marks will be given in only those games/sports, which are in the competition list of Association of Indian Universities (AIU) and/or School Games Federation of India (SGFI).

*The obtained position must be during last five academic sessions.

*The school state championship and inter collegiate championship participation shall be considered for eligibility criteria only; candidate shall not get any marks for sports weightage.

Medical examination: Qualified candidates will have to submit medical certificate by CMO and blood group certificate to the concern College

Course fee: It has been decided by the B.O.S. that the convener of the B.O.S. is authorized to submit the proposal of the M.P.Ed Fees Structure to the University Authorities with consultation with the Internal members of B.O.S.

Duration: The M.P.Ed programme shall be of duration of two academic years, that is, four semesters. However, the students shall be permitted to complete the programme requirements within a maximum of 4 years from the date of admission to the programme.

The student, who discontinue the programme after one year or more semesters due to extraordinary circumstances, are allowed to continue and complete the programme with due approval from the Principal.

The CBCS System: M.P.Ed Programmes shall run on Choice Based Credit System (CBCS). It is an instructional package developed to suit the needs of students, to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

Course: The term course usually referred to, as 'papers' is a component of a M.P.Ed programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise Lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of the

Courses of Programme: The M.P.Ed. Programme consists of a number of courses, the term 'Course' applied to indicate a logical part of subject matter of the programme and is invariably equivalent to the subject matter of a "paper" in the conventional sense. The following are the various categories of courses suggested for the M.P.Ed. Programme.

a) Theory:

Core Course

Elective Course

b) Practicum:

c) Specialization

d) Teaching Practices:

Programme Outcome

1. The Master of Physical Education (M.P. Ed.) two years (Four Semesters, Choice Based Credit System) programme is a professional programme meant for preparing Physical Education Teachers for senior secondary (Class XI and XII) level as well as Assistant

Professor/Directors/Sports Officers in Colleges/Universities and teacher educators in College of Physical Education.

2. To prepare the leaders who can work in Health and Fitness Industry as Fitness and Wellness experts.
3. To prepare Sports Experts in various capacities like Trainers, Physiotherapists, Rehabilitation Experts, Sports Counsellors, Game Officials, Scorers, Referees etc.
4. To prepares Experts who can work with various Sports Federations/Organizations/Leagues/Media Houses

Semesters: An academic year is divided into two semesters. Each semester will consist of 17-20 weeks of academic work equivalent to 100 actual teaching days. The odd semester may be scheduled from July to November/December and even semester from November / December to April/May.

Credits: The term 'Credit' refers to a unit by which the programme is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or one and half hours of practical work/field work per week. The term 'Credit' refers to the weight given to a course, usually in relation to the instructional hours assigned to it. The total minimum credits, required for completing a M.P.Ed. Programme is 90 credits and for each semester 20 credits. Total Number of hours required to earn 1 credit is 20-25 hrs in theory and 30 hrs in Practical.

Condonation: Student must have 75% of attendance in each course for appearing the examination. Students who have 74% to 65% of attendance shall apply for condonation in the prescribed form along with the Medical Certificate or proof of participation in intercollege or inter university competitions. Students who have 64% to 50% of attendance shall apply for condonation in prescribed form along with the Medical Certificate. Students who have below 50% of attendance are not eligible to appear for the examination.

Provision of Bonus Credits Maximum 06 Credits in each Semester

S. No.	Special Credits for Extra Co-curricular Activities	Credit
1.	Sports Achievement at State level Competition (Medal Winner)	1
	Sports Achievement National level Competition (Medal Winner)	2
	Sports participation International level Competition	4
2.	Inter Uni. Participation (Any one game)	2
3.	Inter College Participation (min. two game)	1
4.	National Cadet Corps / National Service Scheme	2
5.	Blood donation / Cleanliness drive / Community services	2
6.	Mountaineering - Basic Camp, Advance Camp / Adventure Activities	2
7.	Organization / Officiating - State / National level in any two game	2
8.	News Reposting / Article Writing / book writing / progress report writing	1
9.	Research Project by any funding agencies	4

Students can earn maximum **06 Bonus credits** in each semester by his/her participation in the above mentioned activities duly certified by the Head of the institution / Department. **This Bonus credit will be used only to compensate loss of credits in academic activities.**

Examinations:

- i. There shall be examinations at the end of each semester, for first semester in the month of November /December: for second semester in the month of April/May. A candidate who does not pass the examination in any course(s) shall be permitted to appear in such failed course(s) in the subsequent examinations to be held in November/December or April/May.
- ii. A candidate should get enrolled /registered for the first semester examination. If enrollment/registration is not possible owing to shortage of attendance beyond condonation limit / rules prescribed OR belated joining OR on medical grounds, such candidates are not permitted to proceed to the next semester. Such candidates shall redo the semester in the subsequent term of that semester as a regular student; however, a student of first semester shall be admitted in the second semester, if he/she has successfully kept the term in first semester.

Pattern of Question Papers:

A) For papers having Max. Marks- 60: [12+12+12+12+(4x3)=60 marks]

For University examination each question paper shall consist of 9 questions (2 long answer questions from each unit and 1 combined question of 4 short notes from all 4 units). The candidate will attempt any one question from each unit. The 5th question will be compulsory consisting 4 short notes of 3 marks each.

B) For Semester-end Examination in Activity Courses, the breaks-up of 100

Marks shall be as follows:

- Skill proficiency/playing ability : 60
- Diary / Record book : 40

C) For Specialization Sports Practice and Sports Training, the break-up of 100 Marks shall be as follows:

- P=(Practical) Skill proficiency : 60
- IA=(Internal Assessment)Written Test : 40

D) For Lesson Plan, student needs to complete perform lesson at college itself.-

Lesson Plan : 100 marks

- P=(Practical) Skill proficiency : 60
- IA=(Internal Assessment)Written Test : 40

Examiners: There will be one internal and one external examiner based on the Game specialization that is from **Athletics, badminton, basketball, cricket, football, handball, kabaddi, kho-kho, table-tennis, volleyball and yoga.**

Evaluation: The performance of a student in each course is evaluated through continuous internal assessment (CIA), one test of 20 marks and of one to two hours duration is to be conducted around 10-14 weeks of academic work from the start of each semester; evaluation is to be done in terms of percentage of marks with a provision for conversion to grade point. If, any student is not able to give the internal test due to Medical reason or participation in inter college or inter university competitions, the concerned course teacher must conduct the student examination within a month time (there is no provision for seeking improvement of internal assessment). The marks obtain in CIA is added with end semester examination and will be consolidated at the end of course. The components for continuous internal assessment are;

Internal Test	20 Marks
Seminar / Lab Practical / presentations	5 Marks
Open Book Test	5 Marks
Attendance	10 Marks
Total	40 Marks

Attendance shall be taken as a component of continuous assessment, although the students should have minimum 75% attendance in each course. In addition to continuous evaluation component, the end semester examination, which will be written type examination of at least 3 hours duration, would also form an integral component of the evaluation. The ratio of marks to be allotted to continuous internal assessment and to end semester examination is 30:70. The evaluation of practical work, wherever applicable, will also be based on continuous internal assessment and on an end-semester practical examination.

Attendance in Percentage	Marks
Above 95	10
95-90	8
89-85	6
84-80	4
79-75	2
Below 75	0

Minimum Passing Standard: The minimum passing standard for CIA (Continuous Internal Assessment) and External Examinations shall be 40%, i.e. 16 marks out of 40 marks and 24 marks out of 60 marks respectively for theory courses. The minimum passing for both CIA & external examination shall be 50%, i.e. 20 marks out of 40 and 30 marks out of 60 marks for the practical courses.

Grading: Once the marks of the CIA (Continues Internal Assessment) and SEA (Semester End Assessment) for each of the courses are available, both (CIA and SEA)

will be added. The marks thus obtained for each of the courses will then be graded as per details provided in **Letter Grades and Grade Points table** from the first semester onwards the average performance within any semester from the first semester is indicated by Semester Grade Point Average (**SGPA**). while continuous performance (including the performance of the previous semesters also) starting from the first semester is indicated by Cumulative Grade Point Average (**CGPA**). These two are calculated by the following formula:

(i) **SGPA(Si)** $S_i = \frac{\sum(C_i \times G_i)}{\sum C_i}$

where C_i is the number of credits of the i th course and G_i is the grade point scored by the student in the i th course.

(ii) The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e. $CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$

Where S_i is the SGPA of the i th semester and C_i is the total number of credits in that semester.

(iii) The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcript or certificate or marksheet.

Classification of Final Results: For the purpose of declaring a candidate to have qualified for the Degree of Master of Physical Education in the First class / Second class / Pass class or First class with Distinction, the marks and the corresponding CGPA earned by the candidate in Core Courses will be the criterion. It is further provided that the candidate should have scored the First / Second Class separately in both the grand total and end Semester (External) examinations.

Award of the M.P.Ed. Degree: A candidate shall be eligible for the award of the degree of the M.P.Ed. Only if he/she has earned the minimum required credit including Bonus Credits of the programme prescribed above.

A.T.K.T.: A candidate may be allowed to take admission in succeeding year of the course irrespective of number of papers/ practical events in which he/she fails. It is mandatory that the whole course shall be completed within a period of 4 years from the date of admission. Failing which candidate name will be removed from college.

(Choice Based Credit System)

Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0(40% of marks) at UE and also a minimum grade point of 5.0(40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50 % in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table:

Range of Marks (Out of 100)	Grade	Grade Point
80 ≤ Marks ≤ 100	O	10
70 ≤ Marks ≤ 80	A+	9
60 ≤ Marks ≤ 70	A	8
55 ≤ Marks ≤ 60	B+	7
50 ≤ Marks ≤ 55	B	6
40 ≤ Marks ≤ 50	C	5
Marks ≤ 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

Formula to calculate Grade Points (GP)

Suppose that Max is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP. Sex x -Max/10 (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (Marks/ x)+2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (Marks/ x)+1

Two kinds of performance indicators, namely, the semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester. While the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the B.P.E.S programme is the final result of the learner.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA)	10x CGPA -10	If $5.00 \leq \text{CGPA} \leq 6.00$
	5x CGPA +20	If $6.00 \leq \text{CGPA} \leq 8.00$
	10x CGPA -20	If $8.00 \leq \text{CGPA} \leq 9.00$
	20x CGPA -110	If $9.00 \leq \text{CGPA} \leq 9.50$
	40x CGPA -300	If $9.50 \leq \text{CGPA} \leq 10.00$

Award of Honors:

A student who has completed the minimum credits specified for the M.P.Ed programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honors are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

Note:

1. SGPA is calculated only if the candidate passes in all the courses i.e. get minimum C grade in all the courses.
2. CGPA is calculated only when the candidate passes in all the courses of all the previous and current semesters.
3. The cumulative grade point average will be calculated as the average of the SGPA of all the semesters continuously, as shown above.
4. For the award of the class, CGPA shall be calculated on the basis of:
 - Marks of each Semester End Assessment and
 - Marks of each Semester Continuous Internal Assessment for each course.
5. The final Class for M.P.Ed. Degree shall be awarded on the basis of last CGPA (grade) from all the one to four semester examinations.

Grievance Redressal Committee: The college/department shall form a Grievance Redressal Committee for each course in each college/department with the course teacher / Principal / Director and the HOD of the faculty as the members. This Committee shall solve all grievances of the students.

Revision of Syllabi: Syllabi of every course should be revised according to the NCTE.

- Revised Syllabi of each semester should be implemented in a sequential way.
- In courses, where units / topics related to governmental provisions, regulations or laws, that change to accommodate the latest developments, changes or corrections are to be made consequentially as recommended by the Academic Council.
- All formalities for revisions in the syllabi should be completed before the end of the semester for implementation of the revised syllabi in the next academic year.
- During every revision, up to twenty percent of the syllabi of each course should be changed so as to ensure the appearance of the students who have studied the old (unrevised) syllabi without any difficulties in the examinations of revised syllabi.
- In case, the syllabus of any course is carried forward without any revision, it shall also be counted as revised in the revised syllabi.

Miscellaneous:

1. The procedural details may be given by the university from time to time.
2. Any unforeseen problems/difficulties may be resolved by Vice Chancellor, whose decision in the matter shall be final.
3. The provision of any order, rules or regulation in force shall be inapplicable to

the extent of its inconsistency with these regulations.

Semester-I

Part- A Theoretical Course						
Course Code	Title of the papers	Total No of Class	Credits	Internal Assessment	University Exam	Total
Core Course						
SOE/PE/C-501	Research Method in Physical Education	64	4	40	60	100
SOE/PE/C-502	Physiology of Exercise & Sports	64	4	40	60	100
SOE/PE/C-503	Psychology of Sports	64	4	40	60	100
Elective course(Anyone)						
SOE/PE/E-501	Sports technology/	64	4	40	60	100
SOE/PE/E-502	Adapted Physical Education					
Part - B Practical Course						
SOE/PE/P -501	Conditioning	96	4	40	60	100
SOE/PE/P -502	Lab Practical (Sports Psychology, Biomechanics & Kinesiology, Test & Measurement)	96	4	40	60	100
Part - C Specialization						
SOE/PE/S -501	Games Specialization	96	4	40	60	100
Part - D Teaching Practices						
SOE/PE/T -501	Game Specialization Teaching Lesson theory Sports	96	4	40	60	100
	Total	40	32	320	480	800

Semester-II

Part- A Theoretical Course						
Course Code	Title of the papers	Total no of Class	Credits	Internal Assessment	University Exam	Total
Core Course						
SOE/PE/C -601	Statistics for Research in Physical Education	64	4	40	60	100
SOE/PE/C -602	Kinesiology & Biomechanics	64	4	40	60	100
SOE/PE/C-603	Science of Sports Training & Advanced Coaching	64	4	40	60	100
Elective course (Anyone)						
SOE/PE/E-601	Athletic care and Rehabilitation	64	4	40	60	100
SOE/PE/E -602	Sports Journalism & Mass Media					
Part - B Practical Course						
SOE/PE/P-601	Pilot Study	96	4	40	60	100
SOE/PE/P -602	Measurement & Evaluation	96	4	40	60	100
Part - C Specialization						
SOE/PE/S-601	Games Specialization	96	4	40	60	100
Part - D Teaching Practices						
SOE/PE/T -601	Game Specialization Practical Lesson Plan (5 Lesson)	96	4	40	60	100
	Total		32	320	480	800

Semester-III

Part- A Theoretical Course						
Course Code	Title of the papers	Total no of Class	Credits	Internal Assessment	University Exam	Total
Core Course						
SOE/PE/C-701	Professional preparation	64	4	40	60	100
SOE/PE/C -702	Management in PE & Sports	64	4	40	60	100
SOE/PE/C -703	Measurements and Evaluation in Physical Education	64	4	40	60	100
Elective Course (Anyone)						
SOE/PE/E-701	Information and communication technology in physical education	64	4	40	60	100
SOE/PE/E-702	Health Education and Sports Nutrition					
Part - B Practical Course						
SOE/PE/P -701	Conditioning	96	4	40	60	100
SOE/PE/P -703	Lab Practical (Sports Psychology, Biomechanics & Kinesiology, Test and Measurement)	96	4	40	60	100
Part - C Teaching Practices						
SOE/PE/T -701	Teaching Lesson theory	96	4	40	60	100

Semester-IV

Part- A Theoretical Course						
Course Code	Title of the papers	Total no of Class	Credits	Internal Assessment	University Exam	Total
Core Course						
SOE/PE/C-801	Sports Medicine	64	4	40	60	100
SOE/PE/C-802	Pedagogy of Physical Education	64	4	40	60	100
SOE/PE/C-803	Sports Entrepreneur	64	4	40	60	100
Elective Course (Anyone)						
SOE/PE/E-801	Dissertation	64	4	40	60	100
SOE/PE/E-802	Exercise Prescription & Fitness Management					

Note:-

- 1. Games specialization will be given in following Games and sports: Athletics, basketball, cricket, football, handball, hockey, kabaddi, kho-kho, table-tennis, volleyball and yoga. Student will select One Game specialization for I and II semester**
2. Teaching theory lesson plan will consist of 5 lessons from theory subject of Master degree which will be taken on college students itself.

SCHEME OF EXAMINATION FOR M.P.ED
(4 SEMESTERS)

Semester wise Distribution of Marks & Credits

		Sem-I	Sem-II	Sem-III	Sem-IV	Total
Part-A: Theory Courses	Marks	400	400	400	400	1600
	Credits	16	16	16	16	64
Part-B: Practical (Games/Sports)	Marks	200	200	200		600
	Credits	8	8	8		24
Part-C: Game/Sport Specialization	Marks	100	100			200
	Credits	4	4			8
Part D :- Teaching Ability	Marks	100	100	100		300
	Credits	4	4	4		12
Grand Total	Marks	800	800	700	400	2700
	Credits	32	32	28	16	108

Semester I

SOE/PE/C-501: Research Process In Physical Education

Learning outcomes

1. Identify the research problem in the field of physical Education and sports
2. Know to Summarize the various research literature
3. Understand and apply the basics of statistics in research
4. Organize the samples and sampling techniques which is relevant to the study.
5. Apply the systematic methods in writing research thesis

UNIT I - Introduction

Meaning and Definition of Research - Need, Nature and Scope of research in Physical Education. Classification of Research, Location of Research Problem, Criteria for selection of a problem, Qualities of a good researcher.

UNIT II - Methods of Research

Descriptive Methods of Research; Survey Study, Case study, Introduction of Historical Research, Steps in Historical Research, Sources of Historical Research: Primary Data and Secondary Data, Historical Criticism: Internal Criticism and External Criticism.

UNIT III - Experimental Research

Experimental Research - Meaning, Nature and Importance, Meaning of Variable, Types of Variables. Experimental Design - Single Group Design, Reverse Group Design, Repeated Measure Design, Static Group Comparison Design, Equated Group Design, Factorial Design.

UNIT IV - Sampling

Meaning and Definition of Sample and Population. Types of Sampling; Probability Methods; Systematic Sampling, Cluster sampling, Stratified Sampling. Area Sampling - Multistage Sampling. Non- Probability Methods; Convenience Sample, Judgement Sampling, Quota Sampling.

Research Proposal and Report

Cauterization of Thesis / Dissertation, Front Materials, Body of Thesis - Back materials. Method of Writing Research proposal, Thesis / Dissertation; Method of writing abstract and full paper for presenting in a conference and to publish in journals ,Mechanics of writing Research Report, Footnote and Bibliography writing.

Reference:

- Best J. W (1971) Research in Education, New Jersey; Prentice Hall, Inc
Clarke David. H & Clarke H, Harrison (1984) Research processes in Physical Education, New Jersey; Prentice Hall Inc.
Jerry R Thomas & Jack K Nelson (2000) Research Methods in Physical Activities; Illinois;

Human Kinetics;

Kamlesh, M. L. (1999) Research Methodology in Physical Education and Sports

Rothstein, A (1985) Research Design and Statistics for Physical Education, Englewood Cliffs: Prentice Hall, Inc

Subramanian, R, Thirumalai Kumar S & Arumugam C (2010) Research Methods in Health, Physical Education and Sports, New Delhi; Friends Publication

SOE/PE/C-502: PHYSIOLOGY OF EXERCISE AND SPORTS

Learning outcomes

1. Understand the basic principles of physiology and Exercise Physiology
2. Apply the knowledge in the field of physical education and movement activity.
3. Analyze the practical knowledge during the practical situation.
4. Remember and recall the definition of physiology and co-relate the principles of physiology.
5. Appraise the effects during the training and practical sessions

UNIT I – Skeletal Muscles and Exercise

Macro & Micro Structure of the Skeletal Muscle, Chemical Composition, Sliding Filament theory of Muscular Contraction. Types of Muscle fiber Muscle Tone, Chemistry of Muscular Contraction – Heat Production in the Muscle, Effect of exercises and training on the muscular system.

UNIT II – Cardiovascular System and Exercise

Heart Valves and Direction of the Blood Flow – Conduction System of the Heart – Blood Supply to the Heart – Cardiac Cycle – Stroke Volume – Cardiac Output – Heart Rate – Factors Affecting Heart Rate – Cardiac Hypertrophy – Effect of exercises and training on the Cardio vascular system.

UNIT III – Respiratory System and Exercise

Mechanics of Breathing – Respiratory Muscles, Minute Ventilation – Ventilation at Rest and During Exercise. Diffusion of Gases – Exchange of Gases in the Lungs –Exchange of Gases in the Tissues – Control of Ventilation – Ventilation and the Anaerobic Threshold. Oxygen Debt – Lung Volumes and Capacities – Effect of exercises and training on the respiratory system.

UNIT IV – Metabolism and Energy Transfer

Metabolism – ATP – PC- Anaerobic Metabolism – Aerobic Metabolism – Aerobic and Anaerobic Systems during Rest and Exercise. Short Duration High Intensity Exercises – High Intensity Exercise Lasting Several Minutes – Long Duration Exercises.

Climatic conditions and sports performance and ergogenic aids

Variation in Temperature and Humidity – Thermoregulation – Sports performance in hot climate, Cool Climate, high altitude. Influence of: Amphetamine, Anabolic steroids, Androstenedione, Beta Blocker, Choline, Creatine, Human growth hormone on sports performance. Narcotic, Stimulants: Amphetamines, Caffeine, Ephedrine, Sympathomimetic amines. Stimulants and sports performance.

Reference:

Amrit Kumar, R, Moses. (1995). Introduction to Exercise Physiology. Madras:

PoompugarPathipagam.

BeotraAlka, (2000) Drug Education Handbook on Drug Abuse in Sports: Sports Authority of India Delhi.

Clarke, D.H. (1975). Exercise Physiology. New Jersey: Prentice Hall Inc., Englewood Cliffs.

David, L Costill. (2004). Physiology of Sports and Exercise. Human Kinetics.

Fox, E.L., and Mathews, D.K. (1981). The Physiological Basis of Physical Education and Athletics. Philadelphia: Sanders College Publishing.

Guyton, A.C. (1976). Textbook of Medical Physiology. Philadelphia: W.B. Sanders co.

Richard, W. Bowers. (1989). Sports Physiology. WMC: Brown Publishers.

SOE/PE/C-503: SPORTS PSYCHOLOGY

Learning outcomes

1. Explain group mechanisms and group psychology in a sports context
2. Reflect upon motivational psychology as applied to sports activities
3. Formulate relevant constructs of exercise psychology
4. Demonstrate the ability to discuss sociological theories, concepts, and ideas in large and small groups and to express empirically as well as theoretically-based opinions.
5. To apply core sociological theories to specific social problems in order to analyse social problems

UNIT I - Introduction

Meaning, Definition, History, Need and Importance of Sports Psychology. Present Status of Sports Psychology in India. Motor Learning: Basic Considerations in Motor Learning- Motor Perception - Factors Affecting Perception - Perceptual Mechanism. Personality: Meaning, Definition, Structure - Measuring Personality Traits. Effects of Personality on Sports Performance.

UNIT II - Motivation

Meaning & Definition, Types of Motivation: Intrinsic, Extrinsic. Achievement Motivation: Meaning, Measuring of Achievement Motivation. Anxiety: Meaning and Definition, Nature, Causes, Method of Measuring Anxiety. Competitive Anxiety and Sports Performance. Stress: Meaning and Definition, Causes. Stress and Sports Performance. Aggression: Meaning and Definition, Method of Measurement. Aggression and Sports Performance. Self-Concept: Meaning and Definition, Method of Measurement.

UNIT III - Goal Setting

Meaning and Definition, Process of Goal Setting in Physical Education and Sports. Relaxation: Meaning and Definition, types and methods of psychological relaxation. Psychological Tests: Types of Psychological Test: Instrument based tests: Pass-along test - Tachistoscope - Reaction timer - Finger dexterity board - Depth perception box - Kinesthesiometer board. Questionnaire: Sports Achievement Motivation, Sports Competition Anxiety.

UNIT IV - Sports Sociology

Meaning and Definition - Sports and Socialization of Individual Sports as Social Institution. National Integration through Sports. Fans and Spectators: Meaning and definition, Advantages and disadvantages on Sports Performance. Leadership: Meaning, Definition, types. Leadership and Sports Performance.

Group Cohesion

Group: Definition and Meaning, Group Size, Groups on Composition, Group Cohesion,

Group Interaction, Group Dynamics. Current Problems in Sports and Future Directions - Sports Social Crisis Management - Women in Sports: Sports Women in our Society, Participation pattern among Women, Gender inequalities in Sports.

References:

Jain. (2002), Sports Sociology, Heal Sahety Kendre Publishers.

Jay Coakley. (2001) Sports in Society - Issues and Controversies in International Education, Mc-Craw Seventh Edn.

John D Lauther (2000) Psychology of Coaching. New Jersy: Prenticce Hall Inc.

John D. Lauther (1998) Sports Psychology. Englewood, Prentice Hall Inc.

Miroslaw Vauks& Bryant Cratty (1999).Psychology and the Superior Athlete. London: The Macmillan Co.

Richard, J. Crisp. (2000). Essential Social Psychology. Sage Publications.

SOE/PE/E-501: SPORTS TECHNOLOGY

Learning Objectives:

1. To enable students to learn the fundamental of sports technology.
2. To equip the students to learn the technology used in sports.
3. To understand the different types of playfield surfaces, sports equipment's and its advantages.
4. To familiarize the students with the latest technology involved in sports and games.

Unit I - Sports Technology

Meaning, definition, purpose, advantages and applications, General Principles and purpose of instrumentation in sports, Workflow of instrumentation and business aspects, Technological impacts on sports.

Unit II - Science of Sports Materials

Adhesives- Nano glue, nanomoulding technology, Nano turf. Foot wear production, Factors and application in sports, constraints. Foams- Polyurethane, Polystyrene, Styrofoam, closed-cell and open-cell foams, Neoprene, Foam. Smart Materials - Shape Memory Alloy (SMA), Thermo chromic film, High-density modeling foam.

Unit III - Surfaces of Playfields

Modern surfaces for playfields, construction and installation of sports surfaces. Types of materials - synthetic, wood, polyurethane Artificial turf. Modern technology in the construction of indoor and outdoor facilities. Technology in manufacture of modern play equipments. Use of computer and software in Match Analysis and Coaching.

Unit IV - Modern equipment

Playing Equipments: Balls: Types, Materials and Advantages, Bat/Stick/ Racquets: Types, Materials and Advantages. Clothing and shoes: Types, Materials and Advantages. Measuring equipments: Throwing and Jumping Events. Protective equipments: Types, Materials and Advantages. Sports equipment with nano technology, Advantages.

Training Gadgets

Basketball: Ball Feeder, Mechanism and Advantages. Cricket: Bowling Machine, Mechanism and Advantages, Tennis: Serving Machine, Mechanism and Advantages, Volleyball: Serving Machine Mechanism and Advantages. Lighting Facilities: Method of erecting Flood Light and measuring luminous. Video Coverage: Types, Size, Capacity, Place and Position of Camera in Live coverage of sporting events.

References:

- Charles J.A. Crane, F.A.A. and Furness, J.A.G. (1987) "Selection of Engineering Materials" UK: Butterworth Heiremann.
- Finn, R.A. and Trojan P.K. (1999) "Engineering Materials and their Applications" UK: Jaico

Publisher.

John Mongilo, (2001) "Nano Technology 101 "New York: Green wood publishing.

Walia, J.S. Principles and Methods of Education (Paul Publishers, Jullandhar), 1999.

Kochar, S.K. Methods and Techniques of Teaching (New Delhi, Jullandhar, Sterling Publishers Pvt. Ltd.), 1982

SOE/PE/E-502: ADAPTED PHYSICAL EDUCATION

Learning outcome

1. To equip the students to understand the basic of skills acquisitions of sports performance.
2. To make them understand the basic of skills and selected sports movement pattern
3. To enable them to understand the link between motor skills, ability, learning and performance
4. To familiarize the students with various theories improving and affecting the sports skills performance

Unit 1: An Introduction to Adapted Physical Education

- 1.1 Meaning, Need & Importance of Adapted Physical Education and Sports
- 1.2 Purpose, Aims and Objectives of Adapted Physical Education and Sports
- 1.3 Program organization of Adapted Physical Education and Sports
- 1.4 Adapted Sports- Para Olympics

Unit 2: Development of Individual Education Program (IEP)

- 2.1 The student with a disability
- 2.2 Components and Development of IEP.
- 2.3 Principles of Adapted Physical Education and Sports
- 2.4 Role of Physical Education teacher
- 2.5 Teaching style, method & approach in teaching Adapted Physical Education

Unit 3: Developmental Considerations of an Individual

- 3.1 Motor development
- 3.2 Perceptual Motor development
- 3.3 Early childhood and Adapted Physical Education

Unit 4: Individual with unique need and activities

- 4.1 Behavioral and Special learning disability
- 4.2 Visual Impaired and Deafness
- 4.3 Health Impaired students and Physical Education
- 4.4 HRPF and its development for Individual with unique need

4.5 Role of games and sports in Adapted Physical Education

Reference

1. Beverly, N. (1986). *Moving and Learning*. Times Mirror/Mosby College Publishing.
2. Cratty, B.J. *Adapted Physical Education in the Mainstream*. (4th Edition) Love Publishing Company.
3. Houser, L.D. *Integrated Physical Education- A guide for the elementary classroom teacher*.
4. Winnick, J. P. (2005). *Adapted Physical Education and Sports*. Human Kinetics (4th Edition).
5. Pangrazi, R.P. and Dauer, V. P. *Dynamics Physical*

Semester II

SOE/PE/C-601: STATISTICS FOR RESEARCH IN PHYSICAL EDUCATION

Learning Outcome

1. To equip the students to understand the basic of skills acquisitions of sports performance.
2. To make them understand the basic of skills and selected sports movement pattern
3. To enable them to understand the link between motor skills, ability, learning and performance
4. To familiarize the students with various theories improving and affecting the sports skills performance

UNIT I - Introduction

Meaning and Definition of Statistics. Function, need and importance of Statistics. Types of Statistics. Meaning of the terms, Population, Sample, Data, types of data. Variables; Discrete, Continuous. Parametric and non-parametric statistics.

UNIT II - Data Classification, Tabulation and Measures of Central Tendency

Meaning, uses and construction of frequency table. Meaning, Purpose, Calculation and advantages of Measures of central tendency - Mean, median and mode.

UNIT III - Measures of Dispersions and Scales

Meaning, Purpose, Calculation and advances of Range, Quartile, Deviation, Mean Deviation, Standard Deviation, Probable Error. Meaning, Purpose, Calculation and advantages of scoring scales; Sigma scale, Z Scale, Hull scale

UNIT IV - Probability Distributions and Graphs

Normal Curve, Meaning of probability- Principles of normal curve - Properties of normal curve. Divergence from normality - Skewness and Kurtosis. Graphical Representation in Statistics; Line diagram, Bar diagram, Histogram, Frequency Polygon, O give Curve.

Inferential and Comparative Statistics

Tests of significance; Independent "t" test, Dependent "t" test - chi - square test, level of confidence and interpretation of data. Meaning of correlation - co-efficient of correlation - calculation of co- efficient of correlation by the product moment method and rank difference method. Concept of ANOVA and ANCOVA.

References:

Best J. W (1971) Research in Education, New Jersey; Prentice Hall, Inc

Clark D.H. (1999) Research Problem in Physical Education 2nd edition, Eaglewood Cliffs, Prentice Hall, Inc.

Jerry R Thomas & Jack K Nelson (2000) Research Methods in Physical Activities; Illinois; Human Kinetics;

Kamlesh, M. L. (1999) Research Methodology in Physical Education and Sports, New Delhi

Rothstain A (1985) Research Design and Statistics for Physical Education, Englewood Cliffs: Prentice Hall, Inc

Sivaramakrishnan. S. (2006) Statistics for Physical Education, Delhi; Friends Publication

SOE/PE/C-602: KINSESIOLGY AND BIOMECHANICS

Learning Outcomes

1. Analyze and explain the mechanisms underlying biomechanical, physiological, and psychological changes that occur during after acute and chronic exercise.
2. Understand mechanical principles can be applied to the analysis of human movement to assess and improve performance and reduce risk of injury.
3. Know effectiveness of human movement using mechanical principles.

UNIT I - Introduction

Meaning, nature, role and scope of applied kinesiology and Sports Biomechanics. Meaning of Axis and Planes, Dynamics, Kinematics, Kinetics, Statics Centre of gravity -Line of gravity plane of the body and axis of motion, Vectors and Scalars.

UNIT II - Muscle Action

Origin, Insertion and action of muscles: Pectoralis major and minor, Deltoid, Biceps, Triceps (Anterior and Posterior), Trapezius, serratus, Sartorius, Rectus femoris, Abdominis, Quadriceps, Hamstring, Gastrocnemius.

UNIT III - Motion and Force

Meaning and definition of Motion. Types of Motion: Linear motion, angular motion, circular motion, uniform motion. Principles related to the law of Inertia, Law of acceleration, and law of counter force. Meaning and definition of force- Sources of force - Force components .Force applied at an angle - pressure -friction -Buoyancy, Spin - Centripetal force - Centrifugal force.

UNIT IV - Projectile and Lever

Freely falling bodies - Projectiles -Equation of projectiles stability Factors influencing equilibrium - Guiding principles for stability -static and dynamic stability. Meaning of work, power, energy, kinetic energy and potential energy. Leverage -classes of lever - practical application. Water resistance - Air resistance -Aerodynamics.

Movement Analysis: Analysis of Movement, Equipment's used for Analysis, Methods of analysis - Qualitative, Quantitative, Predictive,

References:

Deshpande S.H. (2002). Manav Kriya Vigyan - Kinesiology (Hindi Edition) Amravati :Hanuman Vyayam Prasarak Mandal.

Hoffman S.J. Introduction to Kinesiology (Human Kinesiology publication Inc. 2005

Thomas. (2001). Manual of structural Kinesiology, New York: McGraw Hill.

Uppal, A (2004), Kinesiology in Physical Education and Exercise Science, Delhi Friends publications.

Williams M (1982) Biomechanics of Human Motion, Philadelphia; Saunders Co.

SOE/PE/C-603: SCIENCE OF SPORTS TRAINING AND ADVANCED COACHING

Learning Outcomes

1. Understand training as performance based science
2. Explain different means and methods of various training
3. Prepare training schedule for various sports and games
4. Appraise types of periodization for performance development
5. Create various training facilities and plans for novice to advance performers

UNIT I

Introduction Sports training: Definition – Aim, Characteristics, Principles of Sports Training, Meaning of Coaching, Definition, Aim Characteristics, Principles of coaching, Over Load: Definition, Causes of Over Load, Symptoms of Overload, How to tackle over load, Judgement of Training load

UNIT II

Sports Training, various Sports Training Methods: Continuous Training Method, Interval Training Method, Repetition Method, Circuit Training Method, Fartlek Training Method, Weight Training Method, and Plyometric Training Method. Components of Physical Fitness, Development of Physical fitness. Endurance, Strength, speed, flexibility, Co-ordinative Abilities

UNIT III

Preparing for Competitions-Build-up competitions, Main Competition, Competition Frequency & Psychological Preparation, Training Plan: Macro Cycle, Meso-Cycle. Short Term Plan and Long Term Plans - Periodisation: Meaning, Single, Double and Multiple Periodisation, Preparatory Period, Competition Period and Transition Period.

UNIT IV

Preparing lesson Plan, significance of lesson plan, Types of lesson plan, principles of lesson plan, contents in lesson plan, time allotment

Definition of Doping – Side effects of drugs – Dietary supplements – IOC list of doping classes and methods. Blood Doping – The use of erythropoietin in blood boosting – Blood doping control – The testing programmes – Problems in drug detection – Blood testing in doping control – Problems with the supply of medicines Subject to IOC regulations : over-

the- counter drugs (OTC) – prescription only medicines (POMs) – Controlled drugs (CDs).
Reporting test results – Education

References:

Bunn, J.N. (1998) *Scientific Principles of Coaching*, New Jersey Engle Wood Cliffs, Prentice Hall Inc.

Cart, E. Klafs & Daniel, D. Arnheim (1999) *Modern Principles of Athletic Training* St. Louis C. V. Mosphy Company

Daniel, D. Arnheim (1991) *Principles of Athletic Training*, St. Luis, Mosby Year Book

David R. Mottram (1996) *Drugs in Sport*, School of Pharmacy, Liverpool: John Moore University

Hardayal Singh (1991) *Science of Sports Training*, New Delhi, DVS Publications

Jensen, C.R. & Fisher A.G. (2000) *Scientific Basic of Athletic Conditioning*, Philadelphia

SOE/PE/E-601: ATHLETIC CARE AND REHABILITATION

Learning outcomes

1. Understand the primary responsibilities the sports trainer has in preventing sports injuries and providing initial care for injured athletes.
2. Demonstrate the basics of sport first aid during and after game situation.
3. Recognize and appropriately treat common sports injuries and conditions from onset through rehabilitation.
4. Identify and apply knowledge of anatomy to the design and execution of research studies.

Unit I – Corrective Physical Education

Definition and objectives of corrective physical Education. Posture and body mechanics, Standards of Standing Posture. Value of good posture, Drawbacks and causes of bad posture. Posture test – Examination of the spine.

Unit II – Posture

Normal curve of the spine and its utility, Deviations in posture: Kyphosis, lordosis, flat back, Scoliosis, round shoulders, Knock Knee, Bow leg, Flat foot. Causes for deviations and treatment including exercises.

Unit III – Rehabilitation Exercises

Passive, Active, Assisted

Resisted exercise for Rehabilitation

Stretching, PNF techniques and principles.

Unit IV – Massage

Brief history of massage – Massage as an aid for relaxation – Points to be considered in giving massage – Physiological, Chemical, Psychological effects of massage – Indication / Contra indication of Massage – Classification of the manipulation used massage and their specific uses in the human body – Stroking manipulation: Effleurage – Pressure manipulation: Petrissage Kneading (Finger, Kneading, Circular) ironing Skin Rolling – Percussion manipulation: Tapotement, Hacking, Clapping, Beating, Pounding, Slapping, Cupping, Poking, Shaking Manipulation, Deep massage.

Sports Injuries Care, Treatment and Support

Principles pertaining to the prevention of Sports injuries – care and treatment of exposed and unexposed injuries in sports – Principles of apply cold and heat, infrared rays – Ultrasonic, Therapy – Short wave diathermy therapy. Principles and techniques of Strapping and

Bandages.

References:

Doherty. J. Meno. Wetb, Moder D (2000) Track & Field, Englewood Cliffs, Prentice Hal Inc.

Lace, M. V. (1951) Massage and Medical Gymnastics, London: J & A Churchill Ltd.

McOoyand Young (1954) Tests and Measurement, New York: Appleton Century.

SOE/PE/E-602: SPORTS JOURNALISM AND MASS MEDIA

Learning Outcome

1. Know how to seek accreditation to sporting events and to report on such events.
2. Demonstrate analytic skills in relation to reporting sporting events
3. Produce a number of assignments that demonstrate their own style and perception of events

UNIT I - Introduction

Meaning and Definition of Journalism, Ethics of Journalism – Canons of journalism- Sports Ethics and Sportsmanship – Reporting Sports Events. National and International Sports News Agencies.

UNIT II - Sports Bulletin

Concept of Sports Bulletin: Journalism and sports education – Structure of sports bulletin – Compiling a bulletin – Types of bulletin – Role of Journalism in the Field of Physical Education: Sports as an integral part of Physical Education – Sports organization and sports journalism – General news reporting and sports reporting.

UNIT III - Mass Media

Mass Media in Journalism: Radio and T.V. Commentary – Running commentary on the radio – Sports expert's comments. Role of Advertisement in Journalism. Sports Photography: Equipment- Editing – Publishing.

UNIT IV - Report Writing on Sports

Brief review of Olympic Games, Asian Games, Common Wealth Games World Cup, National Games and Indian Traditional Games. Preparing report of an Annual Sports Meet for Publication in Newspaper. Organization of Press Meet.

Sports organization and Sports Journalism – General news reporting and sports reporting. Methods of editing a Sports report. Evaluation of Reported News. Interview with and elite Player and Coach.

Reference:

Ahiya B.N. (1988) Theory and Practice of Journalism: Set to Indian context Ed3. Delhi :Surjeet Publications

Ahiya B.N. Chobra S.S.A. (1990) Concise Course in Reporting. New Delhi: Surjeet Publication

Bhatt S.C. (1993) Broadcast Journalism Basic Principles. New Delhi. Haranand Publication
Dhananjay Joshi (2010) Value Education in Global Perspective. New Delhi: Lotus Press.
MohitChakrabarti (2008): Value Education: Changing Perspective, New Delhi: Kanishka
Publication.

Semester III

SOE/PE/C-701: PROFESSIONAL PREPARATION

Learning outcome

- 1 Students will develop understanding of the profession of Physical Education.
2. Students will be able to deal with issues experienced by Physical Education teachers.
3. Students will recognize that learning to teach is a lifelong process.
4. Students will develop a comprehensive view of Physical Education from a global perspective.
5. Students will understand the domains & hidden dimensions of Physical Education.
6. Students will Demonstrate basic knowledge & awareness about inclusion, differently-abled students & describe steps to inclusion

Unit 1: The profession

- 1.1 Meaning, criteria & evaluation of profession
- 1.2 A professional & professionalism in Physical Education & sports
- 1.3 Physical Education as a profession
- 1.4 Legal regulation of profession

Unit 2: Professional Preparation

- 2.1 Historical perspectives
- 2.2 Policy perspectives
- 2.3 Theoretical perspectives
- 2.4 Nature & content of professional preparation programs

Unit 3: Professional Development

- 3.1 Meaning & process
- 3.2 Growth on the job- in service concept
- 3.3 Self appraisal & parameter influencing self appraisal
- 3.4 Guiding principles & professional relations
- 3.5 Qualifications & duties, responsibilities & job profiles of school Phy. Edu. teachers, directors of Physical Education in colleges & university

Unit 4: Curriculum

- 4.1 Meaning, importance & fundamental principles of curriculum planning
- 4.2 Writing the curriculum guide
- 4.3 Physical Education curriculum models
- 4.4 Implementing the Physical Education curriculum

Suggested Reading:

1. Kiran Sandhu (2004). Professional preparation and career development in Physical Education and sports. New Delhi: Friends publication.
2. Kiran Sandhu (2004). Trends and developments in Professional preparation in Physical Education and sports. New Delhi: Friends publication.

3. Barrow, H.M. (1983). *Man & movement* (3rd Ed.). Philadelphia: Lea & Febiger.
4. Buchor, C. A. & Wuest, D. A. (1987). *Foundations of Physical Education and sports*. St. Louis: Times mirror / Mosby college publication.
5. Kelly, L. E. & Melograno, V. J. (2004). *Developing the Physical Education curriculum*. Champaign: Human Kinetics.
6. Pangrazi, R.P. & Dauer, V. P. (1995). *Dynamic Physical Education for elementary school children* (11th Ed.). Boston: Allyn and Bacon.
7. Pangrazi, R.P. & Dauer, V.P. (1985). *Dynamic Physical Education curriculum & instruction for secondary school student*. Minnesota: Burgess publishing company.
8. Lombardo, B. & Wuest, D. (1994). *Curriculum & instruction the secondary school Physical Education experience*. St. Louis: Mosby
9. Kasat, G. & Karmarkar, A. K. (1996). *Professional preparation in Physical Education and sports*. Amravati: Kasat

SOE/PE/C-702: MANAGEMENT IN PHYSICAL EDUCATION AND SPORTS

1. Students will know the basic concept of management of Physical Education and Sports in the school.
2. Students will know the basic methods and technique and its principles to manage the programme of competitions, intramurals the basic level of competitions.
3. Students will know the duties and responsibilities of manager
4. Students will know the budget management, school programme of Phy. Edu. and sports.

UNIT I

Introduction, Definition of Sports Management, Need & Importance. Basic Principles and Procedures of Sports Management. Functions of Sports Management, Scope of Sports Management

UNIT II

Introduction, Organisation at school level, Organisation at University level, Organisation at National level, basic guiding Principles for organizing physical education and sports Programmes in the Institutions, Intramurals need and importance, Organisation and Administration of Intramural Activities, Extra murals- General Objectives, Policies for Organisation and management of Extra mural Programmes, Management of Personnel.

UNIT III

Introduction , Importance, types and need of Sports Equipments, Procurement of Equipment, Principles of Purchase Procedure, Quotations and tenders, Principles of Equipment Purchase, Important considerations in Selecting sports Equipment, Receiving, Stock Taking and Storing Equipment, Disposal of Equipment.

UNIT IV

Introduction, Planning the Facilities, administrative Principles for Planning a Facility, General Principles for Planning the Facilities, Types of Facilities, Principles for planning the Indoor facility, Outdoor facilities, facility requirements, Planning, Construction and Management of sports infrastructure, guidelines for layout of sports infrastructure, Surface, Fencing, Drainage, lighting, Beautification, Management, Gymnasium,

Swimming Pool, Management of Indoor facilities, Management in Care and Maintenance of the facility.

Reference:

Aggarwal, J.C (1990). Curriculum Reform in India - World overviews, Doaba World Education Series - 3 Delhi: Doaba House, Book seller and Publisher.

Carl, E, Willgoose. (1982. Curriculum in Physical Education, London: Prentice Hall.

Chakraborty&Samiran. (1998) .Sports Management. New Delhi: Sports Publication.

John, E, Nixon & Ann, E, Jewett. (1964). Physical Education Curriculum, New York: The Ronald Press Company.

McKernan, James (2007) Curriculum and Imagination: Process, Theory, Pedagogy and Action Research,. U.K. Routledge

SOE/PE/C-703: MEASUREMENT AND EVALUATION IN PHYSICAL EDUCATION

Learning outcome

1. Students will understand the concept of Test, Measurement, Evaluation and Assessment Procedure in Physical Education and give examples of each
2. Students will differentiate formative and summative evaluation, Process and Product evaluation
3. Students will identify the purposes of measurement and Evaluation
4. Students will describe the features of Technical and administrative feasibility that should be considered when selecting test
5. Students will locate and select physical fitness and sports skill tests
6. Students will properly administer psychomotor tests

Unit1: Basics of Measurement & Evaluation

- 1.1 Concept Test, measurement, evaluation & assessment & its importance
- 1.2 Classification of test in Physical Education
- 1.3 Different tools of evaluation in Physical Education
- 1.4 Trends in evaluation in Physical Education
- 1.5 Criteria of test selection

Unit2: Construction & Standardization of tools

- 2.1 Methods for testing Validity, Reliability & Objectivity
- 2.2 Construction of psychomotor test
- 2.3 Construction of Questionnaire and Opinionnaire
- 2.4 Administration of psychomotor test.
- 2.5 Concept, importance, construction & administrative concern of Rating scales

Unit3: Measuring fitness & sports skills

- 3.1 Measurement of HRPF, SRPF, GMA & Motor educability.
- 3.2 Measurement of skills of various sports & games: Soccer, Handball, Tennis, Basketball, volleyball.
- 3.3 Testing of psychological variable.
- 3.4 Fitness assessment Tests for SCoursecial Population & older adults

Unit4: Test batteries & norms for evaluation

- 4.1 Meaning & characteristics of Test batteries: AAHCOURSERD youth Fitness test, JCR, FITNESS GRAM & ACSM Fitness test
- 4.2 Factors affecting measurement in Physical Education.
- 4.3 Anthropometric measurement & somatoty Course.
- 4.4 Norm referenced tests & criterion referenced tests

Reference :

1. Miller, David. K. (2002). Measurement by the Physical Educator. New York: McGraw Hill companies.
2. John & Nelson (1998). Practical Measurements for Evaluation in Physical Education. Delhi: Surjit Publication.
3. Barrow, H.M.(1979).Practical Approach to Measurement in Physical Education. Ed.(3rd Ed.). Philadelphia: Lee & Febigeer,
4. Clarke, H. (1987). Application of Measurement in Health & Physical Education. Ed. (6th Ed.). New Jersey Prentic Hall,Inc 1987.
5. Kansal, D.K. (1996). Test & Measurement in Sports & Physical Education. New Delhi:.D.V.S.Publications
6. Acsm's (2001) Guidelines for Exercise Testing and Prescription by American College of Sports Medicine Human kinetics USA.
7. BalyanSunita (2006). SharirkShiksha main Parikshanevnmnaapan. Khel Sahitya. Delhi.
8. Barrow H.M. and McGee R. (1979). A Practical Approach to Measurement in Physical Education. Lea &Febiger, Philadelphia. U.S.A.

SOE/PE/E-701: INFORMATION AND COMMUNICATION TECHNOLOGY IN PHYSICAL EDUCATION

Learning outcome

1. Understand concept of information and communication technology in physical education field
2. Analyse sporting data of various types via astute use of statistical packages.
3. Practice mathematics, statistics, information technology in sport technology related problems.
4. Offer Hands on Knowledge in information and communication Technology

Unit I – Communication & Classroom Interaction

Concept, Elements, Process & Types of Communication, Communication Barriers & Facilitators of communication
Importance of ICT Need of ICT in Education
Scope of ICT: Teaching Learning Process, Publication Evaluation, Research and Administration, Challenges in Integrating ICT in Physical Education

Unit II – Fundamentals of Computers

Characteristics, Types & Applications of Computers Hardware of Computer: Input, Output & Storage Devices Software of Computer: Concept & Types
Computer Memory: Concept & Types Viruses & its Management
Concept, Types & Functions of Computer Networks Internet and its Applications Web Browsers & Search Engines Legal & Ethical Issues

Unit III – MS Office Applications

MS Word: Main Features & its Uses in Physical Education
MS Excel: Main Features & its Applications in Physical Education MS Access: Creating a Database, Creating a Table, Queries, Forms & Reports on Tables and its Uses in Physical Education
MS Power Point: Preparation of Slides with Multimedia Effects MS Publisher: Newsletter & Brochure

Unit IV – ICT Integration in Teaching Learning Process

Approaches to Integrating ICT in Teaching Learning Process
Project Based Learning (PBL)
Co-Operative Learning
Collaborative Learning
ICT and Constructivism: A Pedagogical Dimension
E-Learning & Web Based Learning
E-Learning

Web Based Learning
Visual Classroom

References:

Douglas E. Comer, The Internet Book, Purdue University, West Lafayette in 2005.

Heidi Steel Low price Edition, Microsoft Office Word 2003- 2004.

Pradeep K. Sinha&Priti; Sinha, Foundations computing BPB Publications -2006. Rebecca Bridges Altman Peach pit Press, Power point for window, 1999.

Sanjay Saxena, Vikas Publication House, Pvt. Ltd. Microsoft Office for ever one, Second Edition-2006.

SOE/PE/E-702: HEALTH EDUCATION AND SPORTS NURTITION

Learning Outcomes

1. Understand the basic principles of Anatomy, Physiology and Health Education
2. Apply the knowledge in the field of physical education and movement activity.
3. Analyze the practical knowledge during the practical situation. .
4. Remember and recall the definition of anatomy and physiology and co-relate the principles of physiology.
5. Appraise the effects of health condition during the training and practical sessions

Unit - I Health Education

Concept, Dimensions, Spectrum and Determinants of Health

Definition of Health, Health Education, Health Instruction, Health Supervision, Aim, objective and Principles of Health Education

Health Service and guidance instruction in personal hygiene

Unit - II Health Problems in India

Communicable and Non Communicable Diseases

Obesity, Malnutrition, Adulteration in food, Environmental sanitation, Explosive, Population,

Personal and Environmental Hygiene for schools

Objective of school health service, Role of health education in schools

Health Services - Care of skin, Nails, Eye health service, Nutritional service, Health appraisal, Health record, Healthful school environment, first- aid and emergency care etc.

Unit- III - Hygiene and Health

Meaning of Hygiene, Type of Hygiene, dental Hygiene, Effect of Alcohol on Health, Effect of Tobacco on Health, Life Style Management, Management of Hypertension, Management of Obesity, Management of Stress

Unit - IV- Introduction to Sports Nutrition

Meaning and Definition of Sports Nutrition, Role of nutrition in sports, Basic Nutrition guidelines, Nutrients: Ingestion to energy metabolism (Carbohydrate, Protein and Fat), Role of carbohydrates, Fat and protein during exercise.

Nutrition and Weight Management

Concept of BMI (Body mass index), Obesity and its hazard, Dieting versus exercise for weight control Maintaining a Healthy Lifestyle, Weight management program for sporty child, Role of diet and exercise in weight management, Design diet plan and exercise schedule for weight gain and loss.

References:

Bucher, Charles A. "Administration of Health and Physical Education Programme". Delbert, Oberteuffer, et. al." The School Health Education".
Ghosh, B.N. "Treaties of Hygiene and Public Health".
Hanlon, John J. "Principles of Public Health Administration" 2003.
Moss "Health Education" (National Education Association of U.T.A.)
Nemir A. "The School Health Education" (Harber and Brothers, New York). Nutrition Encyclopedia, edited by Delores C.S. James, The Gale Group, Inc.

Semester IV

SOE/PE/C-801: SPORTS MEDICINE

Learning Outcome

1. Perform and report on the exploratory analysis of data collected using sports technology
2. Analyze sporting data of various types via astute use of statistical packages.
3. Practice mathematics, statistics, information technology in sport technology related problems.
4. Support a conclusion based upon quantitative prediction, performance and analysis of a sporting team, code, or gaming environment

UNIT I - Introduction

Meaning, definition and importance of Sports Medicine, Definition and Principles of therapeutic exercises. Coordination exercise, Balance training exercise, Strengthening exercise, Mobilization exercise, Gait training, Gym ball exercise Injuries: acute, sub-acute, chronic. Advantages and Disadvantages of PRICE, PRINCE therapy, Aquatic therapy.

UNIT II - Basic Rehabilitation

Basic Rehabilitation: Strapping/Tapping: Definition, Principles Precautions Contraindications. Proprioceptive neuromuscular facilitation: Definition hold, relax, repeated contractions. Show reversal technique exercises. Isotonic, Isokinetic, isometric stretching. Definition. Types of stretching, Advantages, dangers of stretching, Manual muscle grading.

UNIT III - Spine Injuries and Exercise

Head, Neck and Spine injuries: Causes, Presentational of Spinal anomalies, Flexion, Compression, Hyperextension, Rotation injuries. Spinal range of motion. Free hand exercises, stretching and strengthening exercise for head neck, spine. Supporting and aiding techniques and equipment for Head, Neck and Spine injuries.

UNIT IV - Upper Extremity Injuries and Exercise

Upper Limb and Thorax Injuries: Shoulder: Sprain, Strain, Dislocation, and Strapping. Elbow: Sprain, Strain, Strapping. Wrist and Fingers: Sprain Strain, Strapping. Thorax, Rib fracture. Breathing exercises, Relaxation techniques, Free hand exercise, Stretching and strengthening exercise for shoulder, Elbow, Wrist and Hand. Supporting and aiding techniques and equipment for Upper Limb and Thorax Injuries.

Lower Extremity Injuries and Exercise

Lower Limb and Abdomen Injuries: Hip: Adductor strain, Dislocation, Strapping. Knee: Sprain, Strain, Strain, Strapping. Ankle: Sprain, Strain, Strapping. Abdomen: Abdominal wall, Contusion, Abdominal muscle strain. Free exercises - Stretching and strengthening exercise for Hip, knee, ankle and Foot. Supporting and aiding techniques and equipment for

Lower limb and Abdomen injures.

References:

- Christopher M. Norris. (1993). Sports Injures Diagnosis and Management for Physiotherapists. East Kilbride: Thomson Litho Ltd.
- James, A. Gould & George J. Davies.(1985). Physical Physical Therapy. Toronto: C.V. Mosby Company.
- Morris B. Million (1984) Sports Injuries and Athletic Problem. New Delhi: Surjeet Publication.
- Pande.(1998). Sports Medicine. New Delhi: Khel Shitya Kendra
- The Encyclopedia of Sports Medicine. (1998). The Olympic Book of Sports Medicine, Australia: Tittel Blackwell Scientific publications.

SOE/PE/C-802: PEDAGOGY OF PHYSICAL EDUCATION

Learning outcome

1. Students will use effective communication and pedagogical skills and strategies to enhance student engagement & learning.
2. Students will utilize assessments and reflection to foster student learning and to inform instructional decisions.
3. Students will inherit qualities essential to become effective professionals.
4. Students will understand the discipline

Unit 1: Systematic improvement in teaching skills

- 1.1 Science & Art of teaching – Teaching, Learning, & Pedagogy, appropriate practices-goals & feedback
- 1.2 Stages of skill development in teaching, sources of help, expert PE teacher
- 1.3 Effective teacher- how are they identified? Active teachers, contextual variations of active teaching
- 1.4 What teachers do in PE? What students do in PE? Effective PE teaching

Unit 2: Assessing and improving teaching

- 2.1 Assessment model, on-site assessment of teaching, steps in assessment process
- 2.2 Task system- ecology of PE, important concepts in ecological framework
- 2.3 Interpersonal skills in PE teaching – teacher-student interaction skills, effective communication skills
- 2.4 Legal, ethical & moral issues in teaching, promoting self growth in PE
- 2.5 Strategies for content development- factors affecting program level planning, differing visions of good in PE

Unit 3: Developing effective units of instructions

- 3.1 Determining entry & exit levels, end of unit objectives, practical factors related to unit planning, constructing unit plan, writing instructional objectives
- 3.2 Generic instructional strategies- guided practice, independent practice, monitoring student performance
- 3.3 Instructional format- active teaching, task teaching, teaching through questioning, peer teaching, cooperative learning
- 3.4 Self-instructional formats- contracts, PSI, providing effective instruction for mainstream students

Unit 4: Measuring teaching & its outcomes

- 4.1 Traditional methods for assessing teaching- intuitive judgment, eyeballing, anecdotal records, checklists, rating scale

4.2 Systematic observation records- event recording, duration recording, interval recording, group time sampling, self recording

4.3 Combining observation techniques, important decisions in developing observation strategies, building observation system

4.4 What to observe, training observers, calculating reliability of observation data, examples of observation system

Suggested Readings:

1. Siedentop, D. (1991). Developing teaching skills in Physical Education. Ca: Mayfield Publishing company

2. Mosston, M., Ashworth, S. (1994). Teaching Physical Education (4th Ed). NY: Macmillan College Publishing Company

3. Kelly, L.E., Nelograno, V.J. (2004). Developing the Physical Education curriculum. Champaign, IL: Human Kinetics

4. Hopple, C.J. (2005). Elementary Physical Education teaching & assessment- A practical guide. Champaign IL: Human Kinetic

SOE/PE/C-803: SPORTS ENTREPRENEUR

Learning outcomes

- Identify the skills and knowledge base needed to foster entrepreneurial activity for individuals based on the experiences of successful sports entrepreneurs as well as assess and discuss the challenges they have faced.
- Critically discuss ways in which entrepreneurial-minded individuals can thrive in large sports organizations despite the tendency of such organizations to resist innovation and to favor the status quo or only seek marginal gains.
- demonstrate an understanding of, and identify, new opportunities and translate them into viable business solutions or opportunities

Unit I: Introduction to Sports Entrepreneurship

1. Concept of entrepreneurship, innovation & knowledge management in sports
2. Business Planning Process - The business plan as an entrepreneurial tool
3. Elements of Business Plan, Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition, Business Model Canvas and Drafting Business Proposal for Funding Agency.

Unit II : Introduction to Finance in Sports

1. The Four Domains of Sports Marketing, Marketing Through Sports
2. Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling & milestones, Value proposition,
3. Business Model Canvas & Drafting Business Proposal for Funding Agency.

Unit II. Management of Physical Education and sports

1. Meaning, Need and scope of management of Physical Education
2. Principles of Sports Management
3. Construction, marking and maintenance of play grounds, track & field, gymnasium, swimming pool and athletic track

Unit IV: Organization of co-curricular activities & Physical Education programmes

1. Physical Education Budget : Need, Importance, procedure and principles of budget making,

2. Physical Education and sports programmes for - Primary, secondary and higher secondary School for sports awareness - demonstration, play days, sports rallies, sports exhibitions
3. Organization of National days (15th August & 26th January)., Organization of mass competition, sports day, hiking, trekking, Scout and Guide Camp and picnics
4. Ceremonies of competition - Opening, closing and victory

References:

- Sports Marketing By Melissa Jane Johnson Morgan Jane
- Small Business, Entrepreneurship and Enterprise Development. Harlow: Pearson Education.

SOE/PE/E-801: DISSERTATION

Learning Outcome

1. Students will have basic knowledge of Research in Physical Education, Fitness & Sports to Student
2. Students will know the fundamentals of research
3. Students will be able to select research problem & know the steps of developing it
4. Students will understand methodology & research procedure
5. Students will know different sampling techniques & data collection tools
6. Students will know basic statistics & statistical techniques
7. Students will apply & interpret descriptive statistics
8. Students will recognize appropriate inferential statistical tool as per research method
9. Students will understand data processing

SOE/PE/E-802: EXERCISE PRESCRIPTION & FITNESS MANAGEMENT

Learning objectives:

- 1. To make the students understand the concepts of fitness**
 - 2. To equip the students to learn the tests to measure each component of fitness**
 - 3. To acquire the skills of pre exercise screening**
 - 4. To learn the principles of training**
 - 5. To equip the students to prescribe the exercise to the clients**
 - 6. To understand the fitness norms and prepare fitness report of the clients**
- Learning objectives:**

Unit 1: Basic Principles of Physical Fitness

- 1.1. How much physical activity is enough? Benefits of physical activity
- 1.2. Health related components of physical fitness, skill related components of fitness
- 1.3. Principles of physical training: Specificity, progressive overload (FITT), Reversibility, individual difference
- 1.4. Designing your exercise program- guidelines for training, choosing activities for a balanced program

Unit 2: Developing fitness, improving quality of life

- 2.2. Benefits of aerobic exercises, monitoring heart rate
- 2.3. Developing aerobic exercise program- setting goals, applying FITT, building & maintaining aerobic fitness
- 2.4. Benefits of muscular strength & endurance, assessing muscular strength & endurance, creating a successful strength training program
- 2.5. Applying FITT principle, weight machines versus free weights, weight training safety
- 2.6. Determinants of flexibility, benefits & additional potential benefits of flexibility & stretching exercises, Flexibility improvement- FITT principle

Unit 3: Developing a personal fitness plan

- 3.1. Guidelines for personal fitness plan- set goals, select activity, set target, system of mini goals & rewards, lifestyle activity, monitoring, commitment
- 3.2. Putting plan into action, maintaining fitness program for life
- 3.3. Exercise guidelines for people with special concerns- arthritis, asthma, diabetes, heart disease, hypertension, obesity, and osteoporosis
- 3.4. Exercise guidelines for life stages- children & adolescents, pregnant women, older adults

Unit 4: Behavior change & fitness management

- 4.1. Psychosocial factors to consider, Behavioral change theories & exercise
- 4.2. Strategies to achieve fitness goals & maintaining fitness programs
- 4.3. Trends in weight loss, weight gain
- 4.4. Causes of obesity, implications of overweight & obesity
- 4.5. Underweight conditions & eating disorders

Suggested Readings:

1. Fahey, Insel, Roth (2004) Fit & well (6thEd.) Boston: McGraw Hill co. Greenberg
2. Dintiman, Oakes. (2004). Physical fitness & wellness (3rd Ed.). IL: Human Kinetics
3. Howley& Franks (1997). Health fitness instructor's Handbook (3rd Ed.)IL: Human kinetics
4. ACSM (1998) ACSM's resource manual for guidelines for exercise testing & Prescription (3rd Ed.) Lippincott, Williams & Wilkins
5. Destine& Moore (2003) ACSM's exercise management for person's with chronic diseases & disabilities (2nd Ed.) IL: Human Kinetics

Courses in Bioinformatics to enhance Entrepreneurship/ communication skill development

MBI 105: C Programming and Data Structure (C)	Total
Basic Course – Theory; 3 Credits	45L

UNIT I

1. Introduction and First Program	3
➤ Why Programming	
➤ Types of Programming	
➤ Introduction to C	
➤ C programming features	
➤ Benefits of C	
➤ Some Facts about C	
➤ Understanding First C Program	
2. Variables and Data Types	3
➤ Identifiers	
➤ Keywords	
➤ Data Types	
➤ Variables	
➤ Constants	
3. Console IO Operations	2
➤ printf function	
➤ scanf function	
➤ Unformatted Functions	
4. Operators and Expressions	2
➤ Expressions	
➤ Types of Operators	
➤ Type Casting	
5. Control Flow Statements	2
➤ Decision Making in C	
➤ If Statement	
➤ Switch Statement	
➤ Unconditional Branching	
➤ While Loop	
➤ Do...While Loop	
➤ For Loop	
➤ Break and continue statements	

UNIT II

6. Working with Functions	5
➤ What is a Function	
➤ Benefits of a Function	
➤ Function Terminology	
➤ Array of Structures	
➤ How does Function Works	
➤ Scope and Lifetime of Variables in function	

- Storage Classes of Variables
 - Call by value and call by reference
 - Recursion
7. Working with Arrays and Strings 5
- Understanding Arrays
 - Arrays Declaration and Initialization
 - Sample Programs
 - Multidimensional Arrays.
 - Arrays and Functions
 - String operation

UNIT III

8. Pointers 4
- Understanding Pointers
 - Declaring and Initializing Pointers
 - Function and Pointer Parameters
 - Pointer Arithmetic
 - Pointer and Arrays
 - Two Dimensional Arrays and Pointers
 - void Pointer
 - Dynamic allocation of memory
 - Difference between malloc and calloc
9. Structure and Unions 4
- Overview of Structures
 - Defining and Using a Structure
 - Structures within a Structure
 - typedef keyword
 - Passing Structures to Functions
 - Structure and Pointers
 - Unions
10. File Handling 4
- What is a Stream
 - Opening and Closing of Files
 - Writing and Reading in Text Format
 - Writing and Reading in Binary Format

UNIT IV

11. Introduction to Data Structures 2
- Data Structures- Data structure, Abstract Data Types (ADT), Concept of linear and Non-linear, static and dynamic data structures, and relationship among data, data structure
10. Linked Lists 3
- Concept, Comparison of sequential and linked organizations, Primitive operations, Realization of Linked Lists, Linked list operations, Head

pointer and header node, Types of linked list- Linear and circular linked lists, Doubly Linked List and operations, Circular Linked List, Singly circular linked list, Doubly circular linked list.

- 11. Stacks** **2**
Stacks- concept, Primitive operations, stack operations, Applications of Stack- Expression, Evaluation and Conversion, Need for prefix and postfix expressions, Postfix expression evaluation, Recursion- concept, Backtracking algorithmic strategy, use of stack in backtracking.
- 12. Queues** **2**
Concept, Realization of Queues Using Arrays , Circular Queue, Advantages of using circular queues, operations on queue
- 13. Sorting and Searching** **2**
Searching- Search Techniques, Sequential search, Binary search.
Sorting methods- Bubble sort, Insertion sort, Selection sort, Quick sort, Heap sort, Shell sort, Comparison of All Sorting Methods.

References:

1. C& Data structures - P. Padmanabham, B.S. Publications.
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education.
3. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.
4. Programming in C - Stephen G. Kochan, III Edition, Pearson Eductaion.
5. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.
6. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
7. DataStructures Using C - A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
8. Let us C – Yashwant Kanetkar

MBI 107: DBMS & MongoDB (C)	Total
Basic Course – Theory; 3 Credits	45L

UNIT I

1. DBMS	10
<ul style="list-style-type: none"> ➤ Database designing, data capturing ➤ Data Abstraction ➤ Data Models ➤ Instances & Schemes ➤ E-R Model - Entity and entity sets ➤ Relations and relationship sets ➤ E-R diagrams <p>Reducing E-R Diagrams to tables</p>	

UNIT II

2. Basic concepts in Indexing and hashing	15
<ul style="list-style-type: none"> ➤ Types of Indexing ➤ Data warehousing ➤ Data mining ➤ Oracle Architecture ➤ Basic concepts in Oracle: <ul style="list-style-type: none"> ○ Table space ○ Data files ○ Blocks ○ Extents ○ Segments ○ Oracle Background Processes ○ Control files ○ Oracle Memory Management ○ Rollback ○ Redo logs etc. ➤ Oracle Report generation, Grants, Roles, Privileges ➤ Introduction to SQL 	

UNIT III

3. MongoDB	10
<ul style="list-style-type: none"> ➤ Introduction of mongoDB ➤ Uses and Advantages ➤ RDBMS/SQL vs. MongoDB ➤ Structure of MongoDB ➤ Database, Collection – operation ➤ Data type 	

UNIT IV

4. ➤ CRVD commands 10
 ➤ Limit Records, Sorting Record
 ➤ Indexing, Aggregation
 ➤ Covered queries
 ➤ ObjectID
 ➤ Regular Expression

References:

1. Database System Concepts by Hanery Korth and Abraham Silberschatz, McGraw Hill publication.
2. An Introduction to Database Systems by C.J. Date, Addison-Wesley.
3. Database systems by Nilkamal Surve, Tech Max publications.
4. Data Mining: Concepts and Techniques by Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers.
5. Oracle PL/SQL Programming by Steven Feuerstein, Bill Pribyl, O'Reilly Media.
6. The Relational Database Dictionary by C.J. Date, O'Reilly Media
7. Fundamentals of Database Systems by Elmasri and Navathe, Pearson Education.
8. Database Design and Relational Theory by C.J. Date, O'Reilly Media.
9. Oracle Database 11g A Beginners Guide by Ian Abramson, Michael Abbey, Michael J. Corey and Michelle Malcher, McGraw Hill publication.
10. Developing Bioinformatics Computer Skills by Gibas, & Jambeck, O-Reilly.
11. Linux : The Complete Reference 6th Edition by Richard Petersen, Tata McGraw-Hill Education (2007)

MBI 108: PERL Programming	Total
Elective Course – Theory; 2 Credits	30L

UNIT I

1. Introduction to Perl	3
Perl Data types, Operators, Input/Output in Perl	
2. String Functions, Array Functions, Hash Functions	3
3. Control Statements and loops	4

UNIT II

4. Subroutine	3
Defining subroutine, Calling subroutine, Passing Arguments to a Subroutine	
Returning Value from a Subroutine	
5. Regular Expression, Pattern Matching, Referencing and Dereferencing	3
6. File handling	4
File I/O, Opening and Closing Files, Reading and Writing Files	

UNIT III

7. Object Oriented Programming in Perl	3
Objects, Methods, and Classes in Perl	
8. Packages in Perl	3
9. Perl and Web	4
CGI programming, Web browsing	

References:

1. Beginning Perl for Bioinformatics by James Tisdall, O-Reilly publication.
2. Perl: Complete Reference Perl by Martin C. Brown, McGraw-Hill publication.
3. Mastering Perl for Bioinformatics by James D. Tisdall, O-Reilly

Publication.

4. Teach Yourself Perl 5 in 21 days by David Till, Sams publishing.
5. Mastering Algorithms with Perl by Jon Orwant, Jarkko Hietaniemi and John Macdonald, O-Reilly Publication.
6. Professional Perl Programming by Peter Wainwrigth, Published by Wrox Press Ltd.
7. Beginning Web Development with Perl by Steve Suehring, Apress publication.

MBI 201: Statistical Analysis System (SAS) (C)	Total
Core Course – Theory; 2 Credits	30L

UNIT I

1. Introduction to SAS	1
➤ An overview of SAS foundation	
➤ Introduction to SAS programs submitting a SAS program	
➤ Working with SAS program syntax	
2. Accessing Data	1
➤ Examining SAS data sets	
➤ Accessing SAS libraries- Proc contents	
3. Reading and Creating SAS Data sets	2
➤ Introduction to SAS Data sets	
➤ Reading from existing SAS Data Sets	
➤ Reading Spreadsheet and Database Data	
➤ Reading Raw Data Files	
○ Reading standard delimited data	
○ Reading nonstandard delimited data	
○ Handling missing data	
○ Reading raw data files with formatted input	
○ Controlling when a record loads	
4. Formatting Data Values	1
➤ Using SAS formats	
➤ Creating user-defined formats	
5. Manipulating Data	2
➤ using SAS functions	
➤ conditional processing	
6. Combining SAS Data Sets	2
➤ Concatening	
➤ Merging - one-one, one-many, merging with non-matches	
7. Processing Data in groups	1

8. Processing Data Iteratively	2
➤ DO loop processing	
➤ conditional DO loop processing	
➤ SAS array processing	
➤ using SAS arrays	
9. Restruction / Rotating SAS Data Set	1
10. Creating Summary Reports	2
➤ Proc Print	
➤ Proc Freq	
➤ Proc Report	
➤ Proc Tabulate	
➤ Report Enhancement	

UNIT II

11. SAS Macros Language	1
➤ Purpose of Macro Facility	
➤ Program Flow	
12. Macro Variables introduction to macro variables	2
➤ Automatic macro variables	
➤ Macro variable references	
➤ User-defined macro variables	
➤ Delimiting macro variable references	
13. Macro Definitions defining and calling a macro	2
➤ Macro parameters	
➤ DATA Step and SQL Interfaces creating macro variables in the DATA step	
14. DATA Step and SQL Interfaces creating macro variables in the	2

	DATA step	
	➤ Indirect references to macro variables	
	➤ Creating macro variables in SQL	
15.	Macro Programs conditional processing	2
	➤ Parameter validation	
	➤ Iterative processing	
	➤ Global and local symbol tables	
16.	SAS SQL – Language	1
	➤ Introduction to SAS- SQL	
	➤ Basic Queries	
	➤ Overview of the SQL procedure	
	➤ Specifying columns	
	➤ Specifying rows	
17.	Types of Joins	1
18.	Introduction to Subqueries	2
19.	Set Operators	2

References:

1. Berger, J. O. (1985), Statistical Decision Theory and Bayesian Analysis, 2nd Edition, New York: Springer-Verlag.
2. Cameron, A. C. and Trivedi, P. K. (1998), Regression Analysis of Count Data, Cambridge: Cambridge University Press.
3. Gallant, A. R. (1987), Nonlinear Statistical Models, New York: John Wiley & Sons.
4. Gelman, A., Carlin, J. B., Stern, H. S., and Rubin, D. B. (2004) , Bayesian Data Analysis, 2nd Edition, London: Chapman & Hall.
5. Powers, D. A. and Xie, Y. (2000), Statistical Methods for Categorical Data Analysis, San Diego: Academic Press.
6. Schervish, M. J. (1995), Theory of Statistics, New York: Springer-Verlag.

MBI 202: R and Data Analytics (C)	Total
Core Course – Theory; 3 Credits	45 L

UNIT I

1. An Introduction to R and Basic Programming	5
➤ Overview	
➤ Environment set up (Note: Only for Lab Demonstration)	
➤ Data Types	
➤ Variables	
➤ Operator	
➤ Decision making	
2. R Core Programming	5
➤ Loops	
➤ Functions	
➤ Strings	
➤ Vector	
➤ List	
➤ Matrix	

UNIT II

3. R Core Programming	5
➤ Arrays	
➤ Factors	
➤ Data Frames	
➤ Packages	
➤ Data Shaping	
➤ Library	
4. R Charts and Graphs	5
➤ R-Pie Chart	

- R – Bar Chart
- R- Box Plots
- R - Histogram
- R- Line Graph
- R- Scatter Plots

UNIT III

- | | | |
|----|--|---|
| 5. | R Data Interfaces 1 | 5 |
| | <ul style="list-style-type: none"> ➤ R-CSV ➤ R-Excel ➤ R-Binary files ➤ R-XML files | |
| 6. | R Data Interfaces 1 | 5 |
| | <ul style="list-style-type: none"> ➤ R-JSON files ➤ R-Web Data ➤ R-Database ➤ R- NoSQL | |

UNIT IV

- | | | |
|----|--|---|
| 7. | Analytics with R Statistics | 6 |
| | <ul style="list-style-type: none"> ➤ Mean, Median, Mode ➤ Normal Distribution ➤ Multiple regression ➤ Supervised Model ➤ Unsupervised Model | |
| 8. | Algorithm | 9 |
| | <ul style="list-style-type: none"> ➤ Logistic regression ➤ Linear Regression ➤ Decision tree ➤ Random Forest | |

- SVM model

References:

1. Data Analysis with R: A comprehensive guide to manipulating, analyzing, and visualizing data in R, Tony Fischetti, 2nd Edition Paperback – Import, 28 Mar 2018
2. Python Machine Learning, Uxi (Hayden) Liu By Example Paperback,– Import, 31 May 2017
3. Data Analytics for Beginners: Basic Guide to Master Data Analytics Paperback – November 3, 2016, by Paul Kinley
4. Data Analytics Made Accessible: 2019 edition Kindle Edition by Anil Maheshwari
5. Learn R in a Day, 2013, Kindle Edition, by Steven Murray
6. Beginning R: The Statistical Programming Language, 2013 by Mark Gardener, Paperback
7. Statistical Programming in R, 5 June 2017 by K.G. Srinivasa and G.M. Siddesh Paperback

MBI 203: JAVA and BioJAVA Programming (C)	Total
Core Course – Theory; 3 Credits	45L

UNIT I

1. An Introduction to Java	2
A Short History of Java	
➤ Features or buzzwords of Java	
➤ Comparison of Java and C++	
➤ Java Environment	
➤ Simple java program	
➤ Java Tools – jdb, javap, javadoc	
➤ Java IDE – Eclipse/NetBeans (Note: Only for Lab Demonstration)	
2. An Overview of Java	4
➤ Types of Comments	
➤ Data Types	
➤ Final Variable	
➤ Declaring 1D, 2D array	
➤ Accepting input using Command line argument	
➤ Accepting input from console (Using Buffered Reader class)	
3. Objects and Classes	6
➤ Defining Your Own Classes	
➤ Access Specifiers (public, protected, private, default)	
➤ Array of Objects	
➤ Constructor, Overloading Constructors and use of 'this' Keyword	
➤ Static block, static Fields and methods	
➤ Predefined class – Object class methods (equals(), toString(), hashCode(), getClass())	
➤ Creating, Accessing and using Packages	
➤ Creating jar file and manifest file	

- Wrapper Classes
- Garbage Collection (finalize() Method)

UNIT II

- 4. Inheritance and Interface** **7**
- Inheritance Basics (extends Keyword) and Types of Inheritance
 - Superclass, Subclass and use of Super Keyword
 - Method Overriding and runtime polymorphism
 - Use of final keyword related to method and class
 - Use of abstract class and abstract methods
 - Defining and Implementing Interfaces
 - Runtime polymorphism using interface
 - Object Cloning
- 5. Exception Handling** **4**
- Dealing Errors
- Exception class, Checked and Unchecked exception
 - Catching exception and exception handling
 - Creating user defined exception
 - Assertions

UNIT III

- 6. Strings, Streams and Files** **5**
- String class and StringBuffer Class
 - Formatting string data using format() method
 - Using the File class
 - Stream classes
 - Byte Stream classes
 - Character Stream Classes
 - Creation of files

- Reading/Writing characters and bytes
- Handling primitive data types
- Random Access files

7. Collection 6

Introduction to the Collection framework

- List – ArrayList, LinkedList and Vector, Stack, Queue
- Set - HashSet, TreeSet, and LinkedHashSet
- Map – HashMap, LinkedHashMap, Hashtable and TreeMap
- Interfaces such as Comparator, Iterator, ListIterator, Enumeration

UNIT IV

8. Database Programming 6

- The design of jdbc, jdbc configuration
- Types of drivers
- Create and Execute sql statements, query execution
- The Result Set Object

9. Multithreading 3

- What are threads?
- Life cycle of thread
- Running and starting thread using Thread class
- Thread priorities
- Running multiple threads
- The Runnable interface
- Synchronization and interthread communication

10. Networking 2

Networking basics – Protocol, Addressing, DNS, URL, Socket, Port

- The java.net package – InetAddress, URL, URLConnection class
- SocketServer and Socket class
- Creating a Socket to a remote host on a port (creating TCP

client and server)

- Simple Socket Program Example

References:

1. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J.,
Delhi, Complete reference Java by Herbert Schildt(5th edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer ,Forth edition , By E. Balagurusamy
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann,
Gary Cornell,
Prentice Hall, Sun Microsystems Press
5. Core Java Volume-II-Advanced Features, Eighth Edition, Cay S.
Horstmann, Gary
Cornell, Prentice Hall, Sun Microsystems Press
6. Cornell, Prentice Hall, Sun Microsystems Press

MBI 208: Structural Biology & Molecular Modeling	Total
Core Course –Theory; 3 Credits	45L

UNIT I

- | | |
|--|---|
| 1. Secondary and tertiary structures of macromolecules: protein, DNA and RNA | 3 |
| 2. Secondary structure prediction using Chou Fasman, GOR methods; analysis of results and measuring the accuracy of predictions using Q3, Segment overlap, Mathew's correlation coefficient. | 2 |
| 3. Fundamentals of the methods for 3D structure prediction (sequence similarity/identity of target proteins of known structure, fundamental principles of protein folding etc.) | 5 |

UNIT II

- | | |
|--|---|
| 4. Homology Modeling, fold recognition, and ab-initio structure prediction methods - protocols/algorithms. | 5 |
| 5. 3-D structure comparison and concepts: FSSP, CE, VAST and DALI, Fold Classes. | 6 |
| 6. Databases of structure-based classification: CATH and SCOP. | 2 |

UNIT III

- | | |
|---|---|
| 7. General features- bond stretching, angle bending, improper torsions, cross terms, non-bonded interactions, point charges, calculation of atomic charges, polarization, Van Der Waals interactions, hydrogen bond interactions, Water models. | 3 |
| 8. Types of force field - all atoms force field, united atom force field, etc. | 4 |
| 9. Molecular Energy minimization methods: steepest descent, conjugate gradient– derivatives, First order steepest decent and conjugate gradients. | 3 |
| 10. Second order derivatives Newton-Raphson, Minima, maxima saddle points and convergence criteria.-non derivatives minimization methods, the simplex. | 3 |

UNIT IV

11. Molecular Dynamics Simulation: Newtonian dynamics, Periodic boundary conditions and minimum image convention, Potential truncation and shifted-force potentials, Neighbor list, Force calculations. 3
12. Classical Monte Carlo: Random numbers, Evaluating integrals using random numbers, Importance sampling, Metropolis algorithm. 3
13. Analysis of simulated trajectories: Radial distribution functions, Self diffusion coefficient, Time correlation functions. 3

References:

1. Molecular Modeling Principles and Applications (2nd Ed.) by Andrew R. Leach, 2001, Prentice Hall, USA.
2. Principles of Protein Structure by G. E. Schulz, 2009, Springer
3. Textbook of Structural Biology by Anders Liljas, Lars Liljas, Jure Piskur and Göran Lindblom, World Scientific Publishic Co. Pvt. Ltd.
4. Structural Bioinformatics, Edited by Jenny Gu, Philip E. Bourne, Wiley Blackwell
5. Computational Structural Biology: Methods and Applications by orsten Schwede, Torsten Schwede, Manuel C. Peitsch, 2008, World Scientific Publishing Company.
6. Molecular Modeling Of Nucleic Acids, Leontis N.B. and SantaLucia J. Jr. (eds), 1998, American Chemical Society.
7. Molecular Modeling of Proteins by Andreas Kukol, 2008, Humana Press.
8. Molecular Modeling and Simulation: An Interdisciplinary Guide by Schlick T., 2012, Springer.
9. Biological Modeling and Simulation: A Survey of Practical Models, Algorithms, and Numerical Methods (Computational Molecular Biology) by Russell Schwartz, The MIT Press, Cambridge, Massachusetts, London, England

MBI 302: Chemoinformatics and Drug Designing	Total
Advance Course – Theory; 3 Credits	45L

UNIT I

1. Introduction to Cheminformatics	12
<ul style="list-style-type: none"> ➤ Introduction to cheminformatics: aims, scope, role of cheminformatics in pharmaceutical/chemical research. ➤ Chemical Structure representation file format: 1D, 2D and 3D structures, molecular file formats (SMILES, PDB, SDF, MOL). ➤ Molecular Descriptors: 1D, 2D, 3D, topological (Molecular connectivity, electrotopological and refractotopological) and shape indices descriptors. ➤ Introduction to graph theory, vertex partitioning algorithms, Molecular Similarity and Molecular Diversity Analysis. 	

UNIT II

2. Introduction to Molecular Properties	11
<ul style="list-style-type: none"> ➤ Similarity metrics: Tanimoto Coefficient, Euclidean distance and Tversky Index. ➤ Chemical Databases: Design, storage and retrieval methods, molecular database screening, Lipinski rule, Drug/Lead like molecules, chemical structure based search techniques ➤ Introduction to molecular properties: Hydrophobicity, molecular refractivity, electronic charges (Huckel charge, Wang-ford charge), principal moment of inertia. ➤ Pharmacokinetics study: <i>In-silico</i> ADMET Studies 	

UNIT III

3. Drug discovery and QSAR	11
<ul style="list-style-type: none"> ➤ Drug discovery process, role of Bioinformatics in drug design. ➤ Target identification and validation, lead optimization and validation. ➤ Structure-based drug design and ligand based drug design. 	

- Concept of *de novo* design for lead identification.
- Structure Activity Relationship: QSARs and QSPRs, QSAR Methodology, Training data, test data and external validation data, applicability domain in QSAR
- 3D QSAR techniques: CoMFA and CoMSIA.

UNIT IV

4. Pharmacophore Modeling 11

- Pharmacophore features, Pharmacophore model, Receptor-based and ligand-based pharmacophore modeling.
- Virtual screening based on pharmacophore model.
- Receptor site, molecular docking study, flexible docking, rigid docking, molecular interactions.
- Scoring functions, correlation between ligand-based and receptor-based studies.

References:

1. Chemoinformatics -A Textbook by Johann Gasteiger and Thomas Engel, Wiley-VCH 2003.
2. Handbook of Chemoinformatics by Johann Gasteiger, Wiley-VCH 2003.
3. An Introduction to Chemoinformatics by Andrew R. Leach, Valerie J. Gillet, Springer 2007.
4. Burger's Medicinal Chemistry edited by Donald J. Abraham, Volume – I.
5. Computer-Aided Molecular Design: Theory and Applications by Jean-Pierre Doucet, J. P. Doucet, Jacques Weber, Elsevier Science & Technology Books.
6. Receptor-based Drug Design edited by Paul Leff, Marcel Dekker Inc., New York.
7. Advanced Drug Design and Development: A Medicinal Chemistry Approach by P. N. Kourounakis, 1994, Taylor & Francis.
8. Biopharmaceutical Drug Design and Development by Susanna Wu-Pong, Yon Rojanasakul, 2008, Humana Press.
9. Combinatorial Library Design and Evaluation: Principles, Software, Tools, and Applications in Drug Discovery by Arup Ghose, Vellerkad Viswanadhan, 2001.
10. Computer-Aided Drug Design and Delivery Systems by Ahindra Nag, Baishakhi De, 2010, McGraw-Hill Professional.

MBI 303: Machine Learning Techniques	Total
Advance Course – Theory; 3 Credits	45L

UNIT I

1. Introduction to Machine Learning (ML)	2
<ul style="list-style-type: none"> ➤ .Introduction to Artificial Intelligence & Machine Learning. ➤ Elements of ML. ➤ Life Cycle of ML. ➤ Applications of Machine Learning. 	
2. Introduction to Data Mining	3
<ul style="list-style-type: none"> ➤ Data Science and Visualization ➤ Important Python Libraries ➤ pandas ➤ numpy ➤ scikit-learn ➤ matplotlib ➤ seaborn. 	
3. Biological Data and its Application in Machine Learning	1
4. Genetic Algorithm	1
<ul style="list-style-type: none"> ➤ What is genetic algorithm? ➤ Types of genetic algorithm ➤ Introduction to feature selection 	
5. Introduction to Linear Regression	3
<ul style="list-style-type: none"> ➤ loss functions ➤ over fitting ➤ gradient descent 	

UNIT II

6.	Classification Algorithm	6
	➤ Logistic Regression,	
	➤ Support Vector Machine	
	➤ Naïve Bayes Classifier.	
7.	Non Parametric Learning:	4
	➤ K- Nearest Neighbors	
	➤ Decision Trees	
	➤ Random Forest Classifier	
8.	Introduction to Cross-Validation, Hyper parameter tuning and ensemble Models	2

UNIT III

7.	Introduction & Types of Unsupervised Learning	1
8.	Association Rule Mining : (Market Basket Analysis)	2
9.	Clustering :	3
	➤ K-means Clustering	
	➤ Hierarchical Clustering	
10.	➤ Principal Component Analysis (PCA)	3
	➤ Singular Value Decomposition (SVD)	
	➤ SOM(self-organizing maps)	

UNIT IV

8.	Neural Computation	2
	➤ Introduction to Neural computation	
	➤ Neural network model	
9.	Evolutionary computation	4
	➤ Introduction to evolutionary Processes	

- Genetic Operators
 - Evolutionary Optimization Algorithms
- 10. Fuzzy Computation 3**
- Introduction
 - Fuzzy sets & systems
 - Ant colony Optimization (ACO)
- 11. Introduction to Human Language Technology & Machine Learning 3**
- Stochastic Grammar & linguistics, Language models
 - Statistical language Model,
 - Markov model
 - Hidden Markov Model
- 12. Optimization Techniques 2**
- Conjugate Gradient,
 - Newton Raphson,
 - Steepest descent,
 - Simulated annealing

References:

1. Data Mining: Concepts and Techniques by Han and Kamber, Morgan Kaufmann.
2. Machine Learning by Tom Mitchell, McGraw Hill.
3. Data Mining: Practical Machine Learning Tools and Techniques by Witten and Frank, Elsevier.
4. Biological Sequence Analysis: probabilistic models of proteins and nucleic acids by Durbin, R., Eddy, S., Krogh, A. & Mitchison, G. Cambridge Univ. Press, 1998.
5. Optimization Theory and Application by Rao, S.S., 1984.
6. Discrete optimization by Parker, R. G. & Rardin, R. L., 1988.
7. Stochastic simulation by Repley, Brian D, Wiley series, 1987.
8. Methods of microarray data analysis III by Johnson, K.F. & Lin, S.M. Boston.

MBI 305: Python Programming	Total
Advance Course – Theory; 2 Credits	30L

UNIT I

1. Introduction and Overview of Python 4

- Installation and understanding Python Environment
- Introduction to Python variables
- basic Operators, keywords, python blocks

2. Data types and Program Flow Structures 6

- Numeric data types: int, float, complex, string data type and string operations,
- Control Structure: if, else and elif , nested control structures
- Python Loop : for loops in python using ranges, string, list and dictionaries, while loops in python, Controlling loop using pass, continue, break and else

3. String , Lists, Tuples & Dictionaries 5

- String: String operators, String manipulation using in built methods
- Lists: list operations, slicing, list methods, - list comprehension.
- Tuples: definition, assignment, tuple operations.
- Dictionaries: definition, operations and methods

UNIT II

4. Functions , Modules & Packages 4

- Function: Definition, Function calling, lambda function
- Modules: Introduction to inbuilt Modules, User defined Modules

- Package: Understanding in built package, building own package, importing package

5. File Handling & Exceptional Handling 6

- File Handling: Opening a file, Read and Write operations, File and Directory related methods
- Exceptional Handling: try-except-else, Assert, try-finally, Raise, Exception Names & descriptions, User defined exceptions.

6. Python Database Interaction 5

- Python Database interaction, Insertion and retrieval information in database.
- Reading and storing information on database.

References:

1. Python: The Complete Reference Paperback – 20 Mar 2018, Martin C. Brown
2. Python Programming: A modular approach by Pearson Paperback – 26 Sep 2017, by Taneja Sheetal , Kumar Naveen
3. Python Machine Learning By Example Paperback – Import, 31 May 2017
4. by Yuxi (Hayden) Liu
5. Artificial Intelligence with Python Paperback – Import, 27 Jan 2017, by Prateek Joshi
6. Python Deep Learning Paperback – Import, 28 Apr 2017, by Valentino Zocca , Gianmario Spacagna , Daniel Slater, Peter Roelants

MBI 307: Cancer Genomics	Total
Elective Course – Theory; 2 Credits	30L

UNIT I

- | | | |
|-----------|--|----------|
| 1. | <ul style="list-style-type: none"> ➤ HUMAN TUMORS -- epidemiology, classification, conventional treatment ➤ Clonal selection in human tumors. Metastasis as a product of cell evolution. ➤ Tumor initiation. Chemical, Viral and other cancerogenic routes | 7 |
| 2. | <ul style="list-style-type: none"> ➤ Tumor suppressor genes and oncogenes. ➤ Mutational process in tumors. Instability of tumor genome ➤ A review of the cancer gene cloning strategies in pre-genomic and post-genomic eras ➤ Genomic analysis of familial cancers ➤ Review of cancer and genomics | 8 |

UNIT II

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|-----------|--|-----------|
| 3. | <ul style="list-style-type: none"> ➤ Signaling pathways damaged or short-circuited in human tumors: RB genes network, cyclines, CDKs, CDKIs ➤ Signaling pathways damaged or short-circuited in human tumors: Receptors and RTKs, SMADs, RAS-cascade, PTEN, NF1 etc ➤ Extracellular matrix signaling, hypoxia, angiogenesis-related pathways and VHL ➤ Differentiation-related pathways in leukemia and lymphomas ➤ Cancer checkpoints ➤ P53 as guardian of genome ➤ Programmed cell death. ➤ Cancer- associated polymorphisms, Epigenetics ➤ Breakthrough Research and Therapeutics | 15 |
|-----------|--|-----------|

References:

1. Stewart, B. W. K. P., and Christopher P. Wild. "World cancer report 2014." (2014).
2. Neidle, Stephen, ed. Cancer drug design and discovery. Elsevier, 2011.
3. Dellaire, Graham, Jason N. Berman, and Robert J. Arceci, eds. *Cancer genomics: from bench to personalized medicine*. Academic Press, 2013.
4. *Cancer Genomics and Proteomics: Methods and Protocols (Methods in Molecular Biology)* by Paul B. Fisher , Humana Press; 2007 edition
5. *Cancer Genomics, Molecular Classification, Prognosis and Response Prediction*, Pfeffer, Ulrich, Springer 2013
6. *The Biology of Cancer*, Robert Weinberg, WW Norton & Co, 2014

MBI 308: Artificial Intelligence	Total
Elective Course – Theory; 2 Credits	30L

UNIT I

1. Intelligent Agents:	4
➤ PEAS Representation for an Agent,	
➤ Agent Environments, Concept of Rational Agent, Structure of Intelligent agents, Types of Agents	
2. Problem Solving:	4
➤ Solving problems by searching, - DFS, BFS, A* searches, Performance Evaluation.	
➤ Use of graphs in bioinformatics	
3. Knowledge and Reasoning:	4
➤ A knowledge Based Agent,	
➤ Introduction To Logic,	
➤ First Order Logic: Syntax and Semantics,	
➤ Inference in First Order Logic, Unification, Forward and backward chaining, Resolution	
4. Planning:	3
➤ Planning problem,	
➤ Planning with State Space Search	
➤ Partial Order Planning	
➤ Hierarchical Planning	
➤ Conditional Planning	

UNIT II

5. Genetic Algorithms:	2
➤ Single-objective genetic algorithms,	
➤ Multi-objective genetic algorithms,	

- GA – bioinformatics applications genetic programming
- 6. Learning: 3**
- Introduction to neural networks
 - Perceptrons
 - Multilayer feed forward network
 - Application of ANN
 - Reinforcement learning: Passive & Active Reinforcement learning
- 7. Introduction to Robotics: 2**
- Robot Classification, Robot Specification.
- 8. Direct and Inverse Kinematics: 4**
- Coordinate Frames, Rotations, Homogeneous Coordinates,
 - Arm Equation of four axis SCARA Robot,
 - TCV
 - Direct Kinematics of Four Axis SCARA Robot
 - Inverse Kinematics of Four Axis SCARA Robot
- 9. Application: 4**
- DNA sequencing, hybridization
 - RNA folding prediction using GA
 - Genomics and proteomics
 - MAGE (MicroArray *and* Gene Expression)
 - Advances in tele surgery and surgical robotics
 -

References:

1. Stuart Russell and Peter Norvig Artificial Intelligence A Modern Approach Edition, Pearson Publication.
2. Robert J. Schilling, Fundamentals of Robotics Analysis and Control, PHI Publication.
3. Intelligent Bioinformatics: The Application of Artificial Intelligence

Techniques to Bioinformatics Problems Edward Keedwell, Ajit Narayanan, John Wiley & Sons Ltd,

4. A Beginner's Guide to Microarrays: Eric M. Blalock, Springer
5. Artificial Intelligence and Bioinformatics group(AIBIG), Afnizanfaizal Abdullah Springer
6. Surgical Robotics Systems Applications and Visions : Rosen, Jacob; Hannaford, Blake; Satava, Richard M. (Eds.) Springer
7. Robotic Surgery: Farid Gharagozloo, Farzad Najam, McGraw-Hill Professional Publishing
8. Robin R Murphy Introduction to AI Robotics ISBN-81-203-2458-7 PHI Publication.

MBI 306: Introduction to Clinical Trials and Pharmacovigilance	Total
Elective Course – Theory; 2 Credits	30L

UNIT I

1. Clinical Research:	3
Introduction to clinical Pharmacology, basic components and scope. The concept of safety: measuring risk, safety in practice, risk–benefit balance, lack of benefit causation: causality assessment in individual cases, assessing causality from clinical trial data, using the Bradford hill criteria to assess causality.	
2. Introduction to basic terms: tolerance, addiction, idiosyncrasy, allergy, hypersensitivity, antagonism, synergism, potentiation, tachyphylaxis, adverse drug reactions and its monitoring.	2
3. Clinical evaluation of new drugs, organizations, types of clinical research	2
4. Phases of clinical research: pre-clinical studies, human volunteer studies (Phase I), clinical trials (Phase II and III studies), post-marketing surveillance (Phase IV studies), prescription-event monitoring and registries.	2
5. Introduction to clinical trials:	2
History, terminologies, type of clinical trials, role of clinical trials in new drug developments.	
6. Regulatory affairs in clinical trials: IND, NDA, ANDA-parts and contents, safety monitoring boards, FDA in various countries including India.	2
7. Clinical trial designs: Designs used in clinical trials, inclusion and exclusion criteria, randomization blinding and controls.	2

UNIT II

- | | | |
|------------|--|----------|
| 8. | Concept of Pharmacovigilance
Standard terms and terminologies in Pharmacovigilance. | 2 |
| 9. | Adverse Drug Reactions: nature and mechanisms of ADRs, predisposing factors for ADRs. | 2 |
| 10. | The process of Pharmacovigilance: signal detection, evaluation and investigation and communication. | 2 |
| 11. | Regulatory aspects of Pharmacovigilance: legislation and guidelines, key elements of European legislation, regulatory Pharmacovigilance systems, obligations of pharmaceutical companies. | 2 |
| 12. | International collaboration: international regulatory collaboration, World Health Organization, Council for International Organizations of Medical Sciences. | 2 |
| 13. | Clinical aspects of adverse drug reactions: clinical burden of ADRs, important ADRs and minimizing risk, improving patient safety in clinical practice. | 2 |
| 14. | Ethical and societal considerations: ethical principles, informed consent, privacy and confidentiality, ethical issues for the pharmaceutical industry, conflicts of interest. | 2 |
| 15. | Reporting Database, managements and Risk assessment: PSUR (periodic safety update reports), risk assessments and managements, Regulatory guidelines and laws n PV. | 1 |

References:

1. An Introduction to Pharmacovigilance (2nd edition) by Patrick Waller, Mira Harrison-Woolrych, Wiley-Blackwell, 2017
2. Pharmacovigilance- An Industry Perspective by By Deepa Arora, Pharmapublisher, 2012.
3. Pharmacovigilance: A Practical Approach edited by Thao Doan, Fabio Lievano, Mondira Bhattacharya, Linda Scarazzini, Cheryl Renz, Elsevier, 2018.



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Courses in B.Sc. Biotechnology to enhance Entrepreneurship/ communication skill development

BBT 309: General Course III, Elective; Option I - <u>Communication Skills and Personality Development</u>		Total
General Course III; 2 Credits		30 L
1	Preparation of presentation –principles and presentation technique (what, how, for whom etc).	3 L
2	Nonverbal communication during presentation – how to manage stress, what to do with hands, legs ..., activating the audience with nonverbal communication	3 L
3	Verbal communication –argumentation, usable and unsuitable phrases	2 L
4	Communication skills – listening, empathic reaction, how to question, stealing the show, opening door question	3 L
5	Conflict situation solving, attack from the audience – communication skills as a work experience, vicious circle of attack and defence	2 L
6	Work with audience – ice-breaking, get them in the mood, work with emotions, visualization tools, nonstandard situations	3 L
7	Improvisation and unprepared presentations	2 L
8	Paradigm of human cooperation – why there could be problems to start the communication and what to do with it	3 L
9	Defense against manipulation, how to say NO, stress management	3 L
10	Image and etiquette	2 L
11	Basics of Personality (Definationetc), Theories of Personality Development	3 L
12	Analysing Strengths & weaknesses, Body Language & Preparation of Self Introduction	3 L

BBT 608: Open Course VI, Elective; Option II - Business management in Biotechnology **Total**
Open Course VI; 2 Credits **30L**

UNIT I

1	Nature and characteristics of Management, Scope and Functional areas of management.	1 L
2	Roles of Management, Levels of Management in Biotechnology	1 L
3	Evolution of management thought: early, contemporary and modern	1 L
4	Nature, purpose and importance of planning process	2 L
5	Types of plans and Decision making.	2 L
6	Importance of planning – steps in planning & planning premises.	2 L
7	Hierarchy of plans. Components of planning	2 L
8	Principles of organization, Types of organization. Departmentation Committees.	1 L
9	Nature and importance of staffing–Process of Recruitment and Selection.	3 L

UNIT II

10	Performance appraisals	2 L
11	Motivation and leadership	1 L
12	Business Communication – Meaning and importance	1 L
13	Sales Management Nature of product and market strategy	1 L
14	Packaging and advertising	2 L
15	After Sales Service	1 L
16	Pricing techniques	2 L
17	Financial functions and cost analysis in project planning and control	2 L
18	Structure of a Biotechnology Company	2 L
19	Start-up of Biotechnology Company	1 L

References

1. Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka, Sultan Chand & Sons.
2. Marketing Management, 14/E Philip Kotler Kevin Keller
3. Principles of Management – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill
Management Fundamentals – Concepts, Application, Skill Development –
RobertsLusier – Thomson

BBT 504: Food Biotechnology
Core Course; 3 Credits

Total
45L

UNIT I

- | | |
|---|------|
| 1 Introduction | 5 L |
| Importance of food and dairy Micro biology – Types of microorganisms in food – Source of contamination (primary sources) – Factors influencing microbial growth in foods (extrinsic and intrinsic) | |
| 2 Food fermentations: Cheese, bread, wine, fermented vegetables – methods and organisms used. Significance of fermented foods, Starter cultures for curd preparation and fermentation of idli batter, production of mushroom, single cell protein, assessment of microbiological quality of various foods. | 10 L |

Unit II

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|--|------|
| 3 Food spoilage and General principles of food preservation | 15 L |
| Preservation by Heat -Blanching, Pasteurization, Sterilization, Boiling and Canning. Refrigeration & Freezing of foods– Differences between -refrigeration and freezing, Preservation by Drying: Air convection dryers, Fluidized bed drier, roller drier, vacuum drier, spray drier, Freeze – Drying.Preservation by Concentration- Methods of concentration, Types of Evaporators. Preservation by Radiations - Types of Radiations, Effects of Radiations, Dose – Determining Factors, Status of Irradiated foods in India, Microwave, Ohmic heating. Preservation by Chemicals -GRAS, Food preservation by preservatives, Food Additives | |

Unit III

- | | |
|--|-----|
| 4 Introduction to Tetrapack technology | 1 L |
| 5 Genetically modified foods –
Organic foods, Types of organic foods, identifying organic foods, organic food & preservatives.
Genetic modification in Food industry – Background, history, controversies over risks, application, future applications. | 7 L |
| 6 Industrial awareness: Quality control and quality assurance in food industry, concept of current good manufacturing practices (Hazard Analysis and Critical Control Points) | 7 L |

References

1. Food Microbiology, Frazier & Westhoff, 4th edition, (2008) Tata

BBT 602: Bioprocess Technology and Quality Control **Total**
Core Course - Theory; 3 Credits **45L**

UNIT I

- | | | |
|---|---|-----|
| 1 | Isolation & preservation of industrially important micro-organisms | 5 L |
| 2 | Selection of the desired characteristics, Screening methods, different methods of culture preservation, improvement of industrial micro-organisms | 5 L |
| 3 | Media formulation: media ingredients, objectives and cost effectiveness | 5 L |

UNIT II

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|---|--|-----|
| 4 | Types of fermentation, design of typical bioreactor and its various parts | 5 L |
| 5 | Types of bioreactors: continuous stirred tank reactors (CSTR), packed bed reactors, fluidized bed reactors, air lift fermenter | 5 L |
| 6 | Online monitoring and computer control of fermentation process | 3 L |

UNIT III

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|---|---|-----|
| 7 | Downstream processing: General steps, recovery of products, extraction and purification | 08L |
| 8 | Quality control in pharmaceutical industry: Evolution of quality concepts: Quality, Quality control, Quality Assurance, GMP
Quality Assurance concepts & tools: Process approach, System approach, Statistical Quality control , Documentation
Input control: Contamination, Cross contamination, Raw Material/ Packaging material, Building, premises and Location, Utilities, Human resource,
Process control: Validation- Equipment/Instruments, process, Operators, Utilities, Materials,
IPQC and Final quality testing and release of product
Good Documentation Practices | 09L |

References

- 1) Principles of Fermentation Technology, Stanbury, P. F., Whitaker, A. and Hall, S. J., Butterworth-Heinemann, Burlington, MA, USA (2005)
- 2) Biotechnology – A textbook of industrial microbiology by WulfCrueger, AnnelieseCrueger ,Panima Publishing

BBT 508: Open Course V, Elective, Option I - Biotechnology for forensics **Total**
Open Course V; 2 Credits **30 L**

Unit I

1	Collection and storage of biological evidence	2L
2	Chemical and microscopic analysis of biological stains	3 L
3	Screening evidence for biological stains in forensic casework	3L
4	Species of origin and serology separation techniques	5L
5	ABO Grouping and secretor status	2 L

Unit II

6	Biological markers of forensic significance	3L
7	Introduction to blood spatter	3 L
8	Introduction to DNA analysis	6 L
9	Court room testimony	3 L

References

- 1) **Forensic Science: An Introduction to Scientific and Investigative Techniques, Third Edition**
Author: Stuart H. James, Jon J. Nordby Ph.D.
Publisher: CRC; 3 edition (February 20, 2009) CRC Press, Taylor & Francis Group LLC, Routledge , 6000 Broken Sound Pkwy, NW, Suite 300, Boca Raton FL 33487
United States of America
- 2) **Criminalistics: An Introduction to Scientific and Investigative Techniques,**
Author: Richard Saferstein
Publisher: Prentice Hall College Div;
10th Edition (1/13/2010)

BBT 408: Open Course IV, Elective; Option II – Biofertilizer Technology **Total**
Open Course IV; 2 Credits **30L**

UNIT I

1	Soil microorganisms, composition and types of soil.	3 L
2	Rhizospheremicroflora and its role in the rhizosphere	3 L
3	Role of microorganisms in composting and humus formation; Bioinoculants and their agricultural importance	3 L
4	Biochemistry of symbiotic and non- symbiotic nitrogen fixation	3 L
5	Phosphate solubilization and Potassium mobilization	3 L

UNIT II

6	Methods of application (liquid and carrier based)	3 L
7	Comparison of bioinoculants with chemical fertilizers	3 L
8	Methods of preparation – liquid and carrier based	3 L
9	Endomycorrhizae and Ectomycorrhizae – Non symbiotic microbes – Azotobacter – Associative Symbiosis - Azospirillum – Cyanobacteria (Nostoc. Gloeocapsa)	3 L
10	AzolaAnabena System. Microbial inoculants.	3 L

References:

1. Food Microbiology by Adams, M.R. and Moss, M.O.1995. The Royal Society of Chemistry, Cambridge.
2. Food Microbiology by Frazier, W.C. and Westhoff,D.C.1988. TATA McGraw Hill Publishing company ltd., New Delhi. 8
3. Modern Food Microbiology by Jay, J.M.1987. CBS Publishers and distributors, New Delhi.
6. Basic Food Microbiology by Banwart, G.J.1989. Chapman & Hall New York.
7. A Modern Introduction to Food Microbiology by Board, R.C.1983. Blackwell Scientific Publications, Oxford.
8. Dairy Microbiology by Robinson, R.K.1990. Elsevier Applied Science, London.
9. Food Poisoning and Food Hygiene, Hobbs, B.C. andRoberts, D.1993. Edward Arnold. London



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Courses in M.Sc. Biotechnology/ Medical Biotechnology to enhance Entrepreneurship/ communication skill development

MBT&Med BT 210: Option I (210.1) Bio-entrepreneurship Elective Course I – Theory; 2 Credits	Total 30L
UNIT I	
1 Sectors: Pharma, Biotech, Food, Agri-biotech, Research, Diagnostics, Analytic Labs	3
2 Developing flair for business in students	1
3 Short-term opportunities available for business	2
4 Import substitute product list	2
5 Regulatory Affairs: SSI, MSME, FICCI, MCC, IEC	3
6 Firm registration, GST registration, SME Loan, ISO 22000/14000 etc.,	3
7 Export counsel	1
UNIT II	
8 Finance: Banking, MoFPI, SIDBI, Foreign collaboration, Investors	3
9 Subsidies: BIRAC, SSI, MSME, MoFPI	2
10 Marketing: Promotion, Distribution, Rolling Cycle	2
11 Business Concept and Competitors' knowledge	1
12 Export benefits, procedures	2
13 Make In India	1
14 Knowledge about taxation, GST, custom duty, excise	3
15 Packaging suitability knowledge	1
References:	
1. Forbat, John, "Entrepreneurship" New Age International. 2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International 3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.	
2. Principles of Management – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill,	
3. Dynamics of Entrepreneurial Development & Management – Vasant Desai – Himalaya Publishing House 3. Entrepreneurship Development – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4). 4. Management Fundamentals – Concepts, Application, Skill Development – RobersLusier – Thomson – 5. Entrepreneurship Development – S.S.Khanka – S.Chand& Co. 6. Management – Stephen Robbins – Pearson Education/PHI – 17 th Edition, 2003.	

MBT&MedBT 210: Option II (210.2) – Intellectual property rights I (IPR-I) Total
Elective Course I – Theory; 2 Credits 30L

UNIT I

1 Introduction to Intellectual Property 15
General Introduction to IP & IPR; Introduction, History & role of International Conventions & Treaties- GATT, WTO, WIPO, TRIPS, Budapest Treaty, CBD, Nagoya Protocol; International framework for the protection of IP; IP as a factor in R&D; IPs of relevance to Biotechnology, Agriculture, Bioinformatics and Pharma sector

UNIT II

2 Types of IP Industries: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Plant variety and Protection of New GMOs 8

3 Concept of 'prior art' 7
Need of Prior Art for IP types, Classification search and its implications; Invention in context of "prior art"; Patent databases; Searching International Databases; Country-wise patent searches (USPTO, EPO, India etc.); Analysis and Report formation

References:

1. Intellectual property rights in agricultural biotechnology By Frederic H. Erbisch, Karim M. Maredia, Biotechnology in Agriculture Series No 28,
2. The role of intellectual property rights in biotechnology innovation By David Castle, Edward Elgar Publishing
3. <http://www.wipo.int/portal/index.html.en>
4. http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html
5. www.patentoffice.nic.in
6. www.iprlawindia.org/ - 31k - Cached - Similar page
7. <http://www.cbd.int/biosafety/background.shtml>

MBT&Med BT 310: Option I (310.1) – Biomedical Waste Management	Total
Elective Course II – Theory; 2 Credits	30 L

UNIT I

1	Introduction, definition, classification/ categories, composition and sources. Radioactive waste Health Impacts, direct and Indirect hazards Modern technology for handling biomedical waste Basic steps in waste management, segregation, collection and handling of waste On site pre-treatment of waste Mechanical treatment and chemical disinfections store and off-site transportation Common treatment facilities in-site and off-site Liquid waste treatment and different technologies, cost aspect	15
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UNIT II

2	Technologies available for treatment of biomedical waste Conventional treatment technologies a) Wet thermal technology b) Incineration - different models Treatment of general/non-infectious waste a) Composting, rotating jumbling system French composting b) Vermi-composting Disposal Technologies a) Sharp disposal pit b) Deep- burial pit c) Secured land Controls applied to waste management, Environmental safety, risks & public issues, Instrumentation and monitoring, Crematories, Risk management in hospitals -Environment issues in hospitals -Risk analysis Legislation and policies on health care waste management.	15
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References:

1. Principles of Hospital Management - S. A. Tabish
2. Hospital Management - S. L. Goel
3. Hospital Administration - Francis
4. Bio-Medical Waste Act & Rules Govt. of India
5. Current Issues In BMW Waste Handling-ISHA, Bangalore
6. Management and Handling Rules for: municipal solid waste, biomedical waste, hazardous waste and radioactive wastes, Government of India Publications.
7. Bio-Medical Waste Management- Sushma Sahai

MBT& Med BT 310: Option III (310.3) – Intellectual property rights II (IPR II) Elective Total
 Course II - Theory; 2 Credits 30 L

UNIT I

1 Basics of Patents 5

Indian Patent Act 1970; Patent Rules, 2003; Recent Amendments; Definitions, non-patentable subject matter, patentability criteria, anticipation, infringement, opposition, biopiracy; Precautions before patenting-disclosure/non-disclosure.

2 Types of patents 5

Provisional and Complete specification; Contents of specification

3 Introduction to Patent drafting 5

National, PCT and Convention patent applications; PCT and Implications; Role of a Country Patent Office; Procedure for filing requirements National and international Patent application, Forms, fees and timelines
 Cost and financial assistance for patenting, introduction to existing schemes

UNIT II

4 Relevant case studies (3-4 cases) related to patentability criteria, anticipation, infringement, opposition, bio-piracy 12

5 Career opportunities in the field of IPR. 3

References:

1. Erbisch, Karim M. Maredia, Intellectual property rights in agricultural biotechnology
 By Frederic H. Biotechnology in Agriculture Series No 28,
2. David Castle, The role of intellectual property rights in biotechnology innovation,
 Edward Elgar Publishing
3. <http://www.wipo.int/portal/index.html.en>
4. http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html
5. www.patentoffice.nic.in
6. www.iprlawindia.org/ - 31k - Cached - Similar page
7. <http://www.cbd.int/biosafety/background.shtm>

Med BT 302: Plant Biotechnology Total
 Core Course – Theory; 3 Credits 45L

UNIT I

- | | | |
|---|---|---|
| 1 | Biodiversity hotspots in India: Characterization of biodiversity through different biochemical and molecular methods (chemical printing of biodiversity), | 3 |
| 2 | Conservation strategies of biodiversity, threatened and extinct species | 2 |
| 3 | Bio-prospecting of biodiversity for product development | 2 |

UNIT II

- | | | |
|---|---|---|
| 4 | Plant tissue culture and micropropagation
Introduction, Different systems and stages in axillary shoot proliferation, organogenesis, somatic embryogenesis with examples.. | 4 |
| 5 | Cell culture technology and its application for the production of artificial seeds and secondary metabolites.. | 4 |
| 6 | Homozygous plant production through anther and pollen culture, Embryo rescue and embryo culture in rearing viable hybrid plants, Endosperm culture and production of triploids, Somaclonal and gametoclonal variations and their applications | 4 |
| 7 | Protoplast technology for the production of somatic hybrids and cybrids. Applications in crop improvement. | 3 |

UNIT III

- | | | |
|----|--|---|
| 8 | Transgenic Plants
Introduction, vertical versus horizontal gene transfer, vectors, reporter genes | 3 |
| 9 | Direct and indirect methods for gene transformation, plant cell and chloroplast transformation, | 3 |
| 10 | Introduction to markers, Marker – Assisted Crop Improvement, Genetic Markers and Linkage Maps | 3 |

Unit IV

- | | | |
|----|--|---|
| 10 | Applications of transgenic plants
Development of transgenes for the production of biofuels, single cell proteins, pigments, nutraceuticals, pharmaceuticals, biopesticides, pharmaceuticals, vaccines, plantibodies, value addition, bio-fortification. | 3 |
| 11 | Selection and characterization of transformants for biotic and abiotic stress tolerance, for increase in crop and timber productivity | 3 |
| 12 | Marker Technology in Crop Improvement | 3 |

References:

1. Altman A, Hasegawa PM (Ed) (2012) – Plant Biotechnology and agriculture. Prospects for the 21st century (Academic press).
2. Bhojwani S S. & Razdan M K (1996). - Plant Tissue Culture : Theory and Practice (Elsevier)
3. Slater A, Scott NW, Fowler MR (2008) – Plant Biotechnology: the genetic manipulation of plants (Oxford Press)
4. Plant Molecular Breeding, (2009), Newbury HJ, John Wiley and Sons., USA




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1.1.3 Average percentage of courses having focus on Employability/ Entrepreneurship/ skill development

25% courses offer Employability/ Entrepreneurship/ skill development

List of courses

AE-1	Corporate Social responsibility
AE-2	Environmental Issues and Disaster management
SE - 1	Social Work and Skill development
SE -2	Media and Development
HRM&LW-6	Business Communication and Presentation Skills
CC-12	Community Health and Health Care System.
URCD-10	Sustainable development


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MSW Regular (CBCS 2019-20 pattern)
AE-1: CORPORATE SOCIAL RESPONSIBILITY

Section – I

Unit – I: Introduction

- Concept, meaning and definitions of CSR
- Objectives and Scope of CSR
- Development of CSR
- Functions of CSR
- Scope for Social Work in CSR Activities

Unit – II: Fields of Corporate Social Responsibility

- Education
- Health and Sanitation
- Gender Empowerment
- Infrastructure development
- Rural Development
- Environment

Unit – III: Essentials of Corporate Social Responsibility

- Identifying Priorities of the Community
- Community Investment and Employee Volunteering
- Partnership and Stakeholder Dialogue
- Managing CSR Along with Supply Chains

Section – II

Unit – IV: Aspects of Corporate Social Responsibility

- Social Aspects
- Economical Aspects
- Environment Aspects
- Role of Social Worker in CSR activities

Unit – V: Corporate Social Responsibility Policy and Programmes

- Policies and Programmes of CSR
- CSR programmes for employees
- Networking with Stakeholders

Unit – VI: Corporate Social Responsibility Strategic Planning and Management

- Non-financial Risk Assessment and Management
- Aligning CSR Strategies with Financial Performance
- CSR Investment for Poverty Alleviation
- Long Term Development and Commitment

AE-2: ENVIRONMENTAL ISSUES AND DISASTER MANAGEMENT

Section – I

Unit – I: Introduction

- Concept and Definitions of Environment
- Physical, Social and Communal Environment
- Environment Education; need and objectives
- Global Environmental Issues

Unit – II: Approaches and Models of Environment Education

- Service approach and Action approach
- Sustainable development approach
- Interdisciplinary model and Multi – disciplinary model
- Social Deveopment model and Economic development model

Unit – III: Concepts in Disaster Management

- Disasters, Risks, Hazards, Vulnerability, Disaster Cycle
- Relief and Rehabilitation in Disaster, Logistic Management
- Disaster preparedness and disaster mitigation
- Initiatives in disaster management

Section – II

Unit – IV: Classification of Disasters

- Meaning of Natural and Human made disasters.
- Types of disasters: Famine and drought, Floods, Cyclone, Storms, Tsunami, Earthquakes, Riots, Industrial Accidents, Road-Air-Rail Accidents, Bomb-blast and explosions, War, Avalanches and landslides.

Unit – V: Disaster Responses and Mitigation:

- Prevention and preparedness – Disaster response at various stages of disasters: evacuation and rescue; emergency supplies; early warning systems and vulnerability reduction; disaster financing: provisions and procedures.
- Aid administration and management
- Technological options for disaster response and preparedness

Unit – VI: Relief and Rehabilitation

- Relief – Damage and needs assessment.
- Rehabilitation and Recovery - Planning for rehabilitation and recovery, displacement and resettlement.
- Community Participation and capacity building for facing disasters
- Disaster Management Act, 2005.

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SE-1-: SOCIAL WORK AND SKILL DEVELOPMENT

Section – I

Unit – I: Self Awareness and Development

- Self-concept and Factors affecting Self-concept
- Concept and meaning of Self-Development
- Significance of Self Development for Social Workers

Unit – II: Sensitivity

- Meaning of Sensitivity
- Gender Sensitivity
- Sensitivity regarding Special- Needs

Unit – III: Perception

- Understanding Perception
- Distortions in Perception
- Understanding Stereotypes

Section – II

Unit – IV: Communication

- Concept of Communication
- Communication Process
- Barriers in Communication
- Use of Audio-Visual Media

Unit – V: Skills for Social Work Methods

- Skills for working with Individuals
- Skills for working with Groups
- Simulation Games
- Role Play and Street Plays

Unit – VI: Career and Work

- Models of career choice and development: Holland and Super
- Work life balance: Work holism, family roles, recreation

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SE-2 : MEDIA AND DEVELOPMENT

Section – I

Unit – I: Understanding Media

- Concept and meaning of Media
- Scope of media in development
- Role of Media in a Democracy
-

Unit – II: Types of Media:

- Print Media
- Electronic media
- Folk and cultural media
- Challenges for media

Unit – III: Media and Development – I

- Role of Press in Social & Political Movements
- Freedom of Press
- Role of Press Council of India

Section – II

Unit – IV: Media and Development – II

- Representation of Different Groups- Stereotyping and Labelling in Media
- Content of Newspaper: News Stories, Features, Articles, Editorial, Advertorial, Advertisements & Public Relations

Unit –V: Media and Society

- Understanding the Role of Media in Development
- Writing on Development Issues
- Media as Public Service
- Media and Civil Society

Unit – VI: Advertising

- Role of Advertising in Marketing
- Types of Advertisements
- Ethics in Advertising

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HRM&LW – 6: BUSINESS COMMUNICATION AND PRESENTATION SKILLS

Section – I

Unit – I: Concept and Nature of Communication

- Process and Objectives of Communication.
- Barriers to Communication.
- Seven Cs of effective communication

Unit – II: Verbal and Non-Verbal Communication

- Meaning of Verbal and Non-Verbal Communication
- Essentials of effective communication,
- Professional dressing and body language.

Unit – III: Types of Speeches

- Managerial speeches
- Presentations and Extempore speech
- Speech of thanks,
- Theme speech.

Section – II

Unit – IV: Effective Presentations:

- Organising Presentation
- Principles of Effective Presentations,
- Qualities of skillful Presenter

Unit – V: Interview Skills:

- Mastering the art of giving interviews in:
 - Selection or placement interviews,
 - Appraisal interviews,
 - Exit interviews,
 - Web /video conferencing,
 - Skype Interview
 - Tele-meeting

Unit – VI: Report Writing:

- Report Planning and outline,
- Types of reports
- Logical Sequencing, Graphs and Charts,
- Executive Summary

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CC-12: COMMUNITY HEALTH AND HEALTH CARE SYSTEM

Section – I

Unit – I: Community Health

- Concept and definitions of Health, Standards of Health ,
- Individual and community health
- Factors Affecting Health
- Concept of Diseases, Classification of diseases ,Mode of Transmission of Diseases

Unit – II: Public Health and Health Care Services

- History of Public Health in India
- Public Health Programmes in India- Village , Block, District Levels
- Health Policy and Administration

Unit – III: Government Initiatives in Public Health

- National Urban Health Mission-Objectives, Structure, Services
- National Rural Health Mission- Objectives, Structure, Services
- Issues in Public Health services

Section – II

Unit – IV: Prevention and Control of Diseases

- Concept of Control and Prevention of diseases
- Prevention and Control of : Communicable Diseases, -
- Measles ii) Mumps iii) Polio iv) Chicken Pox v) Rubella vi) Tetanus vii) Whooping cough viii) Diphtheria
- Levels of Prevention : Primary level, Secondary level & Tertiary level

Unit – V: Malnutrition

- Concept and Definition of Malnutrition
- Social aspects of Nutrition
- Diseases and Conditions related to Malnutrition
- Vitamin deficiency, Anemia, Iodine deficiency

Unit –VI: Community Health Care and Social Work

- Health Education and Counseling
- Application of Social Work Methods in Health Care
- Role of Social Worker in Community Health Care Programme

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URCD 10 SUSTAINABLE DEVELOPMENT

Unit 1: Sustainable and Inclusive Development – Genesis and Definition

- Definition and concept of Human Development, Sustainable and Inclusive Development
- Approaches of Sustainable Development
- Genesis of Sustainable and Inclusive Development

Unit 2: Mechanisms for Sustainable and Inclusive Development

- Mechanisms in Indian context (government, non-government, CSR, International Development Agencies)
- Planning Process of SD : five year plan to NITI Aayog
- Current schemes and Programmes of S & I D
- Impact of Schemes and Programmes

Unit 3: Social Implications of Inclusive Development

- Inclusive Development and social Integration
- Inclusive Development and upliftment of weaker sections
- Inclusive Development and Women Empowerment

Section II

Unit 4: Sustainable development Goals and Indicators (I)

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

Unit 5: Sustainable development Goals and Indicators (II)

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth

GOAL 9: Industry, Innovation and Infrastructure

GOAL 10: Reduced Inequality

GOAL 11: Sustainable Cities and Communities

GOAL 12: Responsible Consumption and Production

Unit 5: Sustainable development Goals and Indicators (III)

GOAL 13: Climate Action

GOAL 14: Life Below Water

GOAL 15: Life on Land

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal



BHARATI VIDYAPEETH

[DEEMED TO BE UNIVERSITY]

‘A’ Grade University Status by Ministry of HRD, Govt. of India

Re-Accredited by NAAC with ‘A’ Grade

FACULTY OF MANAGEMENT STUDIES

BACHELOR OF BUSINESS ADMINISTRATION

Choice Based Credit System

(BBA - 2018) (CBCS)

SYLLABUS

Course Structure

Applicable with effect from 2018-19

Bharati Vidyapeeth
[Deemed to be University],
Pune
Faculty of Management Studies
Bachelor of Business Administration Programme (BBA)
Revised Course Structure
(To be effective from 2018-2019)

The BBA Programme.....

The Bachelor of Business Administration Programme (BBA) is a full time three year programme offered by Bharati Vidyapeeth Deemed University (BVDU), Pune and conducted at its management institutes in New Delhi, Pune, Navi Mumbai, Kolhapur, Sangli, Karad and Solapur. All the seven institutes have excellent faculty, Laboratories, Library, and other facilities to provide proper learning environment. The University is accredited by NAAC with an 'A' grade. The Bachelor of Business Administration (BBA) is designed to provide a strong practical understanding of the principles, theories, and tools necessary to succeed in businesses. The BBA programme focuses on imparting to students the ability to demonstrate leadership, understand human relationships, and problem-solving abilities essential for success in any business endeavour. While designing the BBA course, the above facts are considered and the requirements for higher studies and immediate employment are visualized. This effort is reflected in the Vision and Mission statements of the BBA programme. Of course, the statements also embody the spirit of the vision of Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed University which is to usher in “Social Transformation Through Dynamic Education.”

Vision

To prepare the students to cope with the rigor of Post Graduate Programmes in India and Abroad as well as to prepare them for managing Businesses globally and as Entrepreneurs who will also be sensitive to societal concerns.

Mission

To impart sound conceptual knowledge and skills in the field of Business Management studies that can be leveraged for enhancing career prospects and higher education in the said discipline.

Objectives

The Bachelor of Business Administration (BBA) degree programme has the following objectives...

- To provide students with an in-depth knowledge of Management and Business concepts
- To provide students with a firm foundation in both theoretical and practical concepts and applications to meet the various needs of business organisations at a global level
- To prepare students for the responsibilities and career opportunities with corporations and as entrepreneurs.

Duration :

The duration of the BBA degree programme shall be of three years divided into six Semesters. i.e. BBA Part – I (Sem-I & II), BBA Part – II (Sem-III & IV) and BBA Part – III (Sem V & VI). The medium of instruction and examination will be only English.

Eligibility Requirements

A candidate applying for BBA programme should have passed higher secondary or equivalent examination (10 + 2) of any recognized Board satisfying the following conditions:

1. Subject to the above conditions, every eligible candidate has to pass a common All India Entrance test (B-UMAT) conducted by Bharati Vidyapeeth Deemed University, Pune. The final admission is based solely on the merit at the B-UMAT test

Note : Elective will be offered only if a minimum of ten (10) students opt for the same in semester V.

Grading System for Programmes under Faculty of Management Studies:

1. **Grade Points:** The Faculty of Management Studies, Bharati Vidyapeeth University has suggested the use of a 10-point grading system for all programmes designed by its various Board of Studies. A grading system is a 10-point system if the maximum grade point is 10. The system is given in Table I below.

Table I: The 10-point Grading System Adapted for Programmes under FMS

Range of Percent Marks	[80, 100]	[70, 79]	[60, 69]	[55, 59]	[50, 54]	[40, 49]	[00, 39]
Grade Point	10.0	9.0	8.0	7.0	6.0	5.0	0.0
Grade	O	A+	A	B+	B	C	D

Formula to calculate GP is as under:

Set $x = \text{Max}/10$ where Max is the maximum marks assigned for the examination (i.e. 100)

Formula to calculate the individual evaluation

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (M/x) +1

2.Scheme of Examination: Courses having Internal Assessment (IA) and University Examinations (UE) shall be evaluated by the respective institutes and the University at the term end for **40(forty)** and **60(Sixty)** Marks respectively. The total marks of IA and UE shall be 100 Marks and it will be converted to grade points and grades.

CCA – Comprehensive Continuous Assessment - Courses having *only Comprehensive Continuous Assessment (CCA)* the respective institutes will evaluate the students in various ways such as *Class Test, Presentations, Field Assignments and MiniProjects* for a total of 100 marks during the term. Then the marks will be converted to grade points and grades.

Open Courses shall be evaluated for 50 marks only (fifty marks only).

3. Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If learner fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at UE.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA he has to reappear only at IA as backlog candidate and clear the Head of Passing. to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table

Range of Marks (%)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} \leq 80$	A+	9
$60 \leq \text{Marks} \leq 70$	A	8
$55 \leq \text{Marks} \leq 60$	B+	7
$50 \leq \text{Marks} \leq 55$	B	6
$40 \leq \text{Marks} \leq 50$	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

Formula to calculate Grade Points (GP)

Suppose that „Max“ is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set $x = \text{Max}/10$ (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all the courses since his/her enrollment. The CGPA of learner when he /she completes the programme is the final result of the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

where, C_k is the Credit value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the following formula

$$CGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

where, C_k is the Credit value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrollment and also during the semester for which CGPA is calculated.

The CGPA shall be calculated up to two decimal place accuracy.

The formula to compute equivalent percentage marks for specified CGPA:

% marks (CGPA)	$10 * \text{CGPA} - 10$	If $5.00 \leq \text{CGPA} \leq 6.00$
	$5 * \text{CGPA} + 20$	If $6.00 \leq \text{CGPA} \leq 8.00$
	$10 * \text{CGPA} - 20$	If $8.00 \leq \text{CGPA} \leq 9.00$
	$20 * \text{CGPA} - 110$	If $9.00 \leq \text{CGPA} \leq 9.50$
	$40 * \text{CGPA} - 300$	If $9.50 \leq \text{CGPA} \leq 10.00$

Award of Honours:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA below 5.0	F	Fail	Marks below 40

c) ATKT Rules:

1. A student is allowed to carry backlog of any number of subjects for Semester IV.
2. A student must pass Semester I and Semester II to appear for Semester V.

* * *

BBA Program Structure 2018-19.
(As per UGC guidelines – template for BBA – 136 credits)

BBA – Sem I and Sem II w.e.f 2018-19

Semester I				Semester II			
Code	Course Title	Credit	Examination Pattern	Code	Course Title	Credit	Examination Pattern
101	Business English - Communication.	4	UE & IA	201	Environmental Science	2	CCA
102	Business Organization & Systems	4	UE & IA	202	Principles of Management	4	UE & IA
103	Micro Economics	4	UE & IA	203	Macro Economics	4	UE & IA
104	Business Accounting.	4	UE & IA	204	Management Accounting	4	UE & IA
105	Foundations of Mathematics and Statistics	4	UE & IA	205	Business Statistics	4	UE & IA
106	Community Work-I	2	CCA	206	Community Work – II	2	CCA
	Career & Life Skills				Swachha Bharat Abhiyan		
	Waste management				Sectoral Analysis		
					Smart Cities		
	Total Credits →	22				20	

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

BBA Program Structure 2018-21.

(as per UGC guidelines – template for BBA – 136 credits)

BBA – Sem III and Sem IV w.e.f 2018-21

Semester III				Semester IV					
Code		Course Title	Credit	Examination Pattern	Code		Course Title	Credit	Examination Pattern
301	SEC	Computer Applications for Business(Theory - 3 & Lab -2)	4	CCA	401	SEC	Enhancing Personal & Professional Skills (Theory - 3 & Lab -2)	4	CCA
302	C	Organizational Behavior.	4	UE & IA	402	C	Human Resource Management	4	UE & IA
303	C	Principles of Marketing.	4	UE & IA	403	C	International Business	4	
304	C	Introduction to Financial Management	4	UE & IA	404	C	Business Research	4	UE & IA
305	C	Entrepreneurship Development	4	UE & IA	405	C	Business Laws.	4	UE & IA
306	GE	Community Work	3	CCA	406	GE	Community Work	3	CCA
		Start-up Management					Basics of Taxation		
		Agro Tourism					Yoga - I		
		Total Credits→	23					23	

Courses Types

- AECC/SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course (Lab / Practical / Demo etc)
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

BBA Program Structure 2018-21.

(as per UGC guidelines – template for BBA – 136 credits)

BBA – Sem V and Sem VI w.e.f 2018-21

Semester V				Semester VI					
Code		Course Title	Credit	Examination Pattern	Code		Course Title	Credit	Examination Pattern
501	SEC	Summer Internship Report & Viva	6	CCA	601	SEC	Industrial Exposure. (Mini Project)	5	CCA
502	C	Services Management	4	UE & IA	602	C	Introduction to Strategic Management	4	UE & IA
503	DSE	Elective Paper – I	4	UE & IA	603	DSE	Elective Paper – III.	4	UE & IA
504	DSE	Elective Paper – II	4	UE & IA	604	DSE	Elective Paper – IV	4	UE & IA
505	C	Introduction to Operations Research	4	UE & IA	605		Disaster Management	4	CCA
506	GE	Social Media Management	2	CCA	606	GE	Business Ethics	3	CCA
		Road Safety & Management					Basics of Hospitality Management		
		Event Management					Yoga - II		
		Total Credits→	24					24	

Courses Types

- AECC/SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course (Lab / Practical / Demo etc)
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

Specializations Offered:

Marketing Management	Human Resource Management
Financial Management	International Business Management
Entrepreneurship Development	Financial Markets

Note : ADD ON Courses :

Courses such as mentioned below may be introduced as ADD-ON courses separately. The Add on Courses are not compulsory for the students and may be introduced on demand on Payment basis, with prior approval of concerned authorities)

- a) Foreign Language
- b) Office Automation Tools
- c) Supply Chain Management
- d) Event Management

Course Code 101

BBA- Sem - I (CBCS 2018)

Business English - Communication

Credits : 4

UE + IA: 60:40

Course Type : AECC

Course Objectives:

- To acquaint students in managerial communication from every perspective that is globally demanding.
- To acquaint students with the required skills for effective communication in business organizations
- To enable students to develop confidence and expertise in composing effective communication skills essential in Business Situations

Learning Outcomes:

After studying this subject, the student should be able to:

- Understand how to converse in business situations
- Write effective e-mails, Letters
- Write formal and informal Reports

Unit 1: Concept and Nature of Communication

(12 hours)

Meaning and Introduction, Importance and Nature of Communication. Process and Objectives of Communication. Channels of Communication, Barriers to Communication, Overcoming barriers, Seven C' s of effective communication

Unit 2: Verbal Communication

(12 hours)

Verbal Communication (oral) – Meaning, Advantages, Disadvantages, Essentials of effective oral communication, Types. Speaking Skills – Meaning and importance – Guidelines for preparing a Speech – Strategies for good conversation

Exercises on Verbal communication.

Unit 3: Non – Verbal Communication**(12 hours)**

Meaning , Importance, Uses of non verbal communication, Body Language, Gestures, Postures, Para Language, non verbal aspects of written communication.

Unit 4: Listening, Reading Skills, Presentation Skills**(12 hours)**

Listening Skills – Meaning and importance – Types – Listening Barriers – Overcoming barriers to improve Listening skills. Exercises on Listening Skills, Reading Skills – Meaning and importance – Steps for better reading. Exercises to improve Reading Skills ,

Introduction and importance, Planning the Presentation. Presentation Structure. Organizing the Presentation. Qualities of a skillful Presenter. Use of Visual aids in Presentation.

Unit 5: Written Communication**(12 hours)**

Writing Skills – Meaning and importance of written communication in business, Business Letters : Tactful use of language – Structure of a Business letter - Business letter formats – Types of letters: Letters of inquiry and Reply, Letters placing orders and reply, Letter of Complaint, Claims and Adjustments, Sales letters, Job application letters.

Reference Books :

1. Urmila Rai and S. M Rai , Effective Communication (Himalaya Publishing House)
2. Shirley Taylor, Communication for Business, Pearson Education, New Delhi
3. Raymond Lesikar, Marie E Flatley, Basic Business Communication –(Tata McGraw – Hill)

Online Resources:

<http://www.notesdesk.com/notes/business-communications/business-communication-and-its-types/>

MOOCs:

<https://swayam.gov.in/>

<https://alison.com/>:

<https://eDx.com/>:

<https://www.edx.org/course/business-communications-ubcx-bus2x>

<https://Coursera.com/>:

<https://www.coursera.org/courses?languages=en&query=business%20communication>

Course Code 102

BBA- Sem - I (CBCS 2018)

Business Organization & Systems

Credits : 4

UE + IA: 60:40

Course Type : Core

Course Objectives:

- To acquaint students with fundamentals of business organization and management systems as a body of knowledge.
- To impart to the students an understanding of business concepts with a view to prepare them to face challenge of managing business in the new era.

Learning Outcomes:

On successful completion of this syllabi the students will

- Understand the basic concepts in commerce, trade and industry. He will be exposed to modern business world.
- Understand modern business practices, forms, procedures and functioning of various business organizations.

Unit 1: Introduction to Business

14 hrs.

Concept of business – meaning, definition, nature and scope, characteristics of business. Business as an economic activity. Objectives of business. Structure of business. Requisites for success in modern business. Meaning, scope and evolution of commerce & industry, Industrial Revolution, beginning and growth of Indian business, industrialisation in India. Globalization & challenges for Indian Business in the modern era.

Unit 2: Forms of Business Ownership

8 hrs

Introduction to various forms – factors affecting choices of an ideal form of ownership, features merits and demerits of sole proprietorship – joint Hindu family business – partnership – joint stock company – co-operative organisation, public enterprises.

Unit 3: Formation of a Company

10 hrs

Stages in formation and incorporation of a company (i.e. promotion – incorporation and registration – capital subscription – commencement of business. - documents of a company i.e. Memorandum of association – articles of association – prospectus.

Unit 4: Establishment of Business Enterprise**12 hrs**

Various factors to be considered while starting a new business enterprise i.e. Identification of business opportunity – market assessment – suppliers – technology – location – human resource – finance etc. Small and medium enterprises – meaning characteristics and objectives. Role of support organisation such as trade associations and chambers of commerce.

Unit 5: Organization of Trade**12 hrs**

Channels of distribution – meaning, functions and types. Internal trade – wholesale and retail

External trade – import and export. Role and importance of support services to business such as transport insurance etc. Business combinations – mergers and acquisitions. Franchising. Business process outsourcing. Multinationals – concept and role of MNCs. Stock Exchange and Produce Exchange: Definition and Meaning, Importance, Functions, Listing, Dealers.

Reference Books :

- 1) S.A. Sherlekar ,Modern Business Organization And Management – (Himalaya Publishing House)
- 2) Y.K. Bhushan ,Fundamental Of Business Organization & Management – (S Chand Publishers)
- 3) Basu, C. R.; *Business Organization And Management*, Tata Mcgraw Hill, Publishing House, New Delhi, 1998
- 4) B S Moshal, J P Mahajan, j s gujral, business organization and management –. Galgotia publishing co, new Delhi
- 5) Redmond James, Robert Trager , media organization and management –, Biztantra, New Delhi
- 6) Business Environment Text and Cases By F. Cherunilam (Himalaya Publication House)

Online Resources:

- 1) <https://www.leanmethods.com/>
- 2) <https://sol.du.ac.in/library/>
- 3) <https://www.wto.org/>

MOOCs:

- 1) Designing the Organization: From Strategy to Organizational Structure (Coursera)
- 2) Understanding Modern Business & Organisations (FutureLearn)
- 3) Managing the Organization: From Organizational Design to Execution (Coursera)

Course Code 103

BBA- Sem - I (CBCS 2018)

Micro Economics

Credits : 4

UE + IA: 60:40

Course Type : Core

Course Objectives:

- To expose students to basic micro economic concepts.
- To apply economic analysis in the formulation of business policies.

Learning Outcomes:

Students will be able to use economic reasoning to problems of business.

Unit 1: Introduction to Micro Economics 12 hrs.

Business economics –meaning nature and scope; Micro and macro; Basic economic problems; Market forces in solving problems; Circular flow of income and expenditure; Tools for analysis (Functional relationships, Schedules, Graphs, Equations)

Unit 2: Demand Analysis and Utility Concept

12hrs.

Concept of demand; Law of demand ; Factors affecting demand ;Exceptions to law of demand; Market demand ;Changes in demand ;Elasticity of demand (Price ,Income ,Cross)
Concept of Utility, Cardinal & Ordinal Utility, Law Of Diminishing Marginal Utility

Unit 3: Supply and Cost & Revenue concepts 12 hrs.

Concept of supply, Factors affecting supply, Law of supply, Exceptions of law of supply
Types of cost, Fixed and variable, Accounting and economic, Total cost, marginal cost, average cost, implicit & explicit cost, real and money cost, Short run and long run, Average revenue, total and marginal revenue. Opportunity cost, Money cost, , Law of returns to scale, Economies and diseconomies of scale, Law of Variable proportions

Unit 4: Market Analysis 12 hrs.

Features of markets, Pure, Perfect, Monopoly, Duopoly, Oligopoly, Monopolistic competition
Equilibrium of firm and industry under perfect competition, Price determination under monopoly, Price and output determination under monopolistic competition

Unit 5: Theories of Distribution 8 hrs.

Marginal productivity theory of distribution, Rent –modern theory of rent, Role of trade union and collective bargaining in wage determination, Interest –liquidity theory of interest
Profits- Dynamic, Innovation, Risk and uncertainty bearing theories of profits

Reference Books :

1. Microeconomics theory and Application-D N DWIVEDI-Vikas.
2. Seth –micro economics
3. Mithani –managerial economics
4. M .jhingan
5. Ahuja.microeconomic analysis

MOOCs:

<https://swayam.gov.in/> :Accounting for Managerial Decisions

<https://alison.com/>: Fundamentals of Financial Accounting

Course Code 104

BBA- Sem - I (CBCS 2018)

Business Accounting

Credits : 4

UE + IA: 60:40

Course Type : Core

Course Objectives:

- To impart to the learners the basic accounting knowledge
- To train in the accounting process from entering business transactions to Journal to preparation of Final Accounts.

Learning Outcomes:

After the completion of the course, the students will understand:

- Importance and utility of Financial Accounting
- Accounting process from entering the business transactions to journal to preparation of Final Accounts of a sole proprietor.

Unit 1: Introduction to Financial Accounting: **6 hrs.**

Definition and Scope of Financial Accounting, Objectives of Financial Accounting, Book Keeping v/s. Accounting, Basic Terms used in Accounting, Users of Financial Statements, Limitations of Financial Accounting

Unit 2: Accounting Principles and Accounting Standards: **6 hrs.**

Accounting Concepts, Accounting Conventions, Meaning of Accounting Standards, Significance of Accounting Standards.

Unit 3: Journal & Subsidiary Books: **14 hrs.**

Accounting Process, Types of Accounts, Rules of Accounts, Preparation of Journal, Simple and Combined Journals entries.

Subsidiary Books: Purchase Book, Sales Book, Purchase Return Book, Sales Return Book, Cash Book

Unit 4: Ledger Posting and Trial Balance: **12 hrs.**

Meaning and Utility of Ledger, Format of Ledger Account, Procedure of posting Journal entries to Ledger Accounts, Balancing of Ledger Account, Preparation of Trial Balance

Unit 5: Depreciation: **8 hrs.**

Meaning of Depreciation, Causes of Depreciation, Methods of charging depreciation: Written Down Value & Straight Line Method, Accounting treatment of Depreciation

Unit 6: Meaning and Preparation of Final Accounts: **14 hrs.**

Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary

business.

Reference Books :

1. Anil Chowdhry Fundamentals of Accounting & Financial Analysis (Pearson Education)
2. Jane Reimers Financial Accounting (Pearson Education)
3. Rajesh Agarwal & R Srinivasan, Accounting Made Easy (Tata McGraw –Hill)
4. Dr. S. N. Maheshwari, Financial Accounting For Management: (Vikas Publishing House)
5. Robert Anthony, David Hawkins , Business Accounting. (Tata McGraw –Hill)
6. Ashok Sehgal, Fundamentals of Financial Accounting, (Taxmann)
7. Dr. S. N. Maheshwari, Sharad K. Maheshwari, Financial Accounting for BBA

Online Resources:

www.moneycontrol.com

www.rbi.org.in

www.icai.org

MOOCs:

<https://swayam.gov.in/> :Accounting for Managerial Decisions

<https://alison.com/>: Fundamentals of Financial Accounting

Course Code 105

BBA- Sem - I (CBCS 2018)

Foundation of Mathematics & Statistics

Credits : 4

UE + IA: 60:40

Course Type : Core

Course Objectives:

- i) To develop knowledge of key theories, concepts in Mathematics.
- ii) To enhance ability to problem solving
- iii) To build ability to apply mathematical and statistical concept for business applications

Learning Outcomes:

- i) Students will be able to solve problems in Mathematics using appropriate concepts
- ii) Students will be able to effectively apply the statistical tools for business applications

Unit 1:

12hrs.

Profit and Loss, Discount, Commission, Brokerage, Rates and Taxes, Insurance, Partnership, Bill of Exchange, Stock and Shares, Payroll

Unit 2:

12 hrs.

Simple interest and Compound interest and Annuity:

Simple interest, Compound Interest,, Interest Compounded Continuously, Compound Amount at changing rate, Introduction of Annuity, Amount and Present Value of Immediate or Ordinary Annuity, Annuity Due,

Unit 3:

12hrs.

Matrices and Determinants & Simultaneous Linear equations:

Definition of a Matrix, Matrix operations, Determinants, Properties of determinants. Applications in Business Problem, Solution of Simultaneous equations Linear Equation in two unknowns. Permutations and Combinations

Unit 4:

12 hrs.

Introduction to Business Statistics

Definition, descriptive and inferential statistics in business, scope of statistics, Population and sample, data, types of data, sources of data, methods of data collection.

Unit 5:

12 hrs.

Data presentations and graphical displays

Frequency, cumulative frequency distribution, Frequency distributions, importance of Diagrammatic and Graphic Representation of data, frequency polygons and frequency curves, histograms, Ogive Curves.

Reference Books :

1. Schaum Series , Basic Business Mathematics
2. Padmalochan Hazarika , A class textbook of Business Mathematics.
3. M. G. Dhaygude , Commercial Arithmetic and Statistics .

4. Business Statistics, S.C. Gupta

5. Eugene Don, Joel Lerner, Basic Business Mathematics, Tata McGraw Hill Publication.

6. Dr. Padmalochan Hazarika, A textbook of Business Mathematics

Online Resources:

https://en.wikipedia.org/wiki/Business_mathematics

<https://www.universiteitleiden.nl/.../mathematics/mathematics-and-science-based-business> Mathematics

<https://www.tru.ca/distance/courses/math1091.html>

MOOCs:

www/Alison

www/SWAYAM

www/NPTEL

BACHELOR OF BUSINESS ADMINISTRATION

Generic Elective / Interdisciplinary

Course Code 106
BBA- Sem - I (CBCS 2018)

Community Work

Credits : 2

CCA : 50 marks

Course Type : Generic Elective / Interdisciplinary

Course Objectives:

This course aims to expose the students to social issues and help them Participate in community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc

- (I) To expose the students towards social reality and role of community development for social upliftment and well being
- (II) To involve students in community work through active involvement and participation

Learning Outcomes:

Students will be able to know the community needs and understand their role to contribute meaningfully towards community development

Unit 1:

5 hrs

History, meaning, Goals, values, functions, role and process of community work. Professional and voluntary community work. Attitudes, roles and skills of a community worker

Unit 2:

10 hrs

Social concerns in India: poverty, unemployment, population, problems faced by women – dowry, domestic violence, etc. Social problems - terrorism, corruption, caste conflict, drug abuse, AIDS, ETC.

UNIT 3:

15 hrs

Types of community work. Caring for needy, helping the poor, fundraising drives- organizing

COMMUNITY HOURS:

Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken

Course Code 106

BBA- Sem - I (CBCS 2018)

Career & Life Skills

Credits : 2

CCA : 50 marks

Course Type : **Generic Elective / Interdisciplinary**

Course Objectives:

- To help students make well-informed, thoughtful decisions regarding your future as adults.
- To develop behaviours and attitudes that help students contribute to the community in a positive manner.
- Give you skills and knowledge to contribute to the well-being and respect of the self and others

Learning Outcomes:

Students will be able to understand self potential and ways to enhance capabilities.

Unit 1: Introduction to Life Management

Life management-definition, scope and application, concept of emotions, self belief, setting realistic goals, understanding system

Unit 2: Developing Emotional Potential and Physical Potential

12 hrs

Improving thinking skills, improving study skills, planning education
Eating habits, healthy foods, staying healthy, changing habits-the self change model

Developing Your Intellectual Potent

12 hrs

Effective communication, effective listening, effective speaking ,getting along with others, functioning in groups, how to delegate.

Definition-stress, handling change and stress, managing time, managing money, formulation of career plan, bring it all together

Unit 3: Career and Life Choices

Managing personal, lifelong career development.

Resource Choices... Making responsible decisions in the use of finances and other resources that reflect personal values and goals as well as a commitment to self and others.

Personal Choices... Understand the emotional/psychological, intellectual, social, spiritual, and physical dimensions of health and how these dimensions of health work together to contribute to personal well-being.

Reference Books :

LifeChoices Series: - LifeChoices: Careers, Healthy & Well, Relationships, Venturing Out

Online Resources:

- [the life-changing magic of tidying up: the japanese art of decluttering and organizing](#) - marie kondo
- [how to organize \(just about\) everything: more than 500 step-by-step instructions for everything from organizing your closets to planning a wedding to creating a flawless filing system](#) – peter walsh
- Mindset: the new psychology of success -[carol s. Dweck](#)

Course Code 106
BBA- Sem - I (CBCS 2018)

Waste Management

Credits : 2

CCA : 50 marks

Course Type : **Generic Elective / Interdisciplinary**

Course Objectives:

- to expose students to the issue of waste and waste management tools and techniques applicable for waste disposal and management.

Learning Outcomes:

After completion of the course students

- will be able to understand solid waste sources, health and environmental issues related to solid waste management.
- will get knowledge about Sources, handling and control of Biomedical, Chemical, Nuclear and e-wastes.
- will be able to understand the issues regarding waste disposal and management and will become aware of Environment and health impacts due to solid waste mismanagement

Unit – I Solid Waste Management-

10 hrs

Introduction to waste Management

Introduction, Meaning, Solid waste including municipal, hospital and industrial solid waste; health and environmental issues related to solid waste management. Provisions in Indian Penal Code for Environmental protection.

Unit – II Biomedical, Chemical, Nuclear and e-wastes

10 hrs

Biomedical wastes – Types – Management and handling – control of biomedical wastes, Chemical wastes – Sources – Environmental effects – Need for control – Health and environmental effects. Nuclear waste – Management of nuclear wastes, e-waste- sources and management.

Unit – III

10 hrs

Waste reduction at source – Treatment and disposal techniques for solid wastes – composting, vermin-composting, autoclaving, microwaving, incineration, non- incineration, Thermal techniques, use of refuse derived fuels, land-filling. **Reduce Reuse and Recycling Techniques:** Need for the concept- Various Types - Handmade Paper production – Reuse of materials- Recycle of material

Books Recommended:

- 1) A. D. Bhide and B.B. Sundaresan, “Solid Waste Management – Collection, Processing and disposal” Mudrashilpa Offset Printers, Nagpur, 2001.
- 2) Biomedical waste (Management and Handling) Rules, 1998.
- 3) George Tchobanoglous, Hilary Theisen, Rolf Eliassen; Solid Wastes: Engineering Principles

and Management Issues; McGraw-Hill.

- 4) Manual on Municipal Solid Waste Management, New Delhi, Controller of Publications.
- 5) Freeman H.M. (1988) Standard Handbook of Hazardous Waste Treatment and Disposal, New York, McGraw-Hill.
- 6) Constitutional Law of India – J.N. Pandey 1997 (31st Edn.) Central Law Agency Allahabad.
- 7) Diganta Bhusan Das , Diganta Bhusan Das; Solid Waste Management: Principles and Practice
- 8) George Tchobanoglous et al, "Integrated Solid Waste Management" McGraw - Hill, 1993.
- 9) A Study of Waste Management Systems in Pune Municipality Corporation, Rajendra Jagtap, Ph.D Thesis, Bharati Vidyapeeth University, Pune

List of Software/Learning Websites:

- i. <http://www.moef.nic.in/legis/hsm/mswmhr.html>
- ii. en.wikipedia.org/wiki/waste_management
- iii. <http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf>
- iv. <http://www.ilo.org/oshenc/part-vii/environmental-pollution-control/item/514-solid-waste-management-and-recycling>
- v. www.houstontx.gov/solidwaste
- vi. www.epa.gov/tribalmsw/
- vii. www.unc.edu/courses/2009spring/.../SolidWasteIndiaReview2008.pdf
- viii. http://www.digitalbookindex.org/_search/search010environmenwasterefusea.asp (e-books)

BACHELOR OF BUSINESS ADMINISTRATION

SEMESTER 2

Course Code 201

BBA- Sem - II (CBCS 2018)

Environment Studies

Credits : 2

CCA : 50 marks

Course Type : Generic / Open Elective

Course Objectives:

- To sensitize the students on the environmental issues
- To educate the students about the threats to the environment and natural resources

Learning Outcomes:

Learners will be able to understand the different aspects of environments, the threats posed by human activities and the solutions for the same.

Unit 1: Nature and Scope

(8 Hrs)

The Multidisciplinary Nature of Environmental Studies Definition, scope and importance Need for public awareness.

Natural Resources Renewable and Non-renewable Resources: (a) Forest resources: (b) Water resources: (c) Mineral resources: (d) Food resources: (e) Energy resources: (f) Land resources:

Unit 2: Ecosystems

(6 Hrs)

Concept, Structure and function of an ecosystem. Energy flow in the ecosystem.

Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estauries)

Biodiversity and Its Conservation, Introduction, definition: genetic, species and ecosystem diversity. Threats to biodiversity: Endangered and endemic species of India. Conservation of biodiversity.

Unit 3 : Pollution

(6 Hrs)

Environmental Pollution (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards

Unit 4: Social Issues and the Environment

(4 Hrs)

Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Unit 5: Environment and human health**(6 Hrs)**

Population growth, Environment and human health. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health. Case Studies. Field Work -

Visit to a local area to document environmental assets—river/forest/grassland/hill/mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.

Reference Books :

1. Agarwal, K.C.2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd. , Ahmedabad — 380 013, India, Email: mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001. Environmental Encyclopedia, Jaico Publ. House. Mumbai, 1196p
6. Dc A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment(R)

Course Code 202

BBA- Sem -II (CBCS 2018)

Principles of Management

Credits : 4

UE + IA: 60:40

Course Type : Core

Course Objectives:

Students will be given the opportunity to learn

- Basic concepts of management and to enable them to gain appreciation for emerging ideas, techniques, procedures and practices in the field of management.
- The role of leadership and management within an organization; appreciate different leadership styles and which one is suitable to a particular managerial context.

Learning Outcomes:

- Integrate management principles into management practices.
- Assess managerial practices and choices relative to ethical principles and standards.
- Specify how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.
- Determine the most effective action to take in specific situations

Unit 1: Introduction of Management

12 hrs

Introduction to Management- Definitions & Characteristics of Management-Scope of Management--Functions of Management. Skills for a Manager. The Evolution of Management Thoughts- Scientific Management, General Principles of Management.

Unit 2: Planning

8 hrs

Overview of Planning: Introduction to Planning & it's Importance; Planning Process; Types of Planning, Decision making Process - Types and Techniques.

Unit 3: Organizing

10 hrs

Introduction & Definition- Concept of Organization-Principles of Organization-Creating an Organization Structure- Informal Organization- Departmentalization, line and staff relationship.

Unit 4: Leading

10 hrs

Defining leadership, ingredients of leadership, Trait approach to leadership, Behavioral approach to leadership, and different styles of leadership.

Unit 5: Controlling

10 hrs

Controlling- Basic Concept, Relationship between Planning & Controlling. The Basic Control Process, Requirement for Effective Control, Control Techniques, Use of IT for Controlling.

Reference Books :

1. Stephen P Robbins, David A Decanzo, Fundamentals of Management, Pearson Education.
2. Richard L Daft, The New Era of Management, Thomson.
3. Prasad L.M, Principals & Practices of Management, Sultan Chand & Sons.
4. Philip Sadler, Leadership, Kogan Page.

Online Resources:**Journals:**

1. HBR
2. Indian Management
3. Human Capital

MOOCs:

1. Strategic Management (Open2Study)
2. Introduction to Operations Management (Coursera)
3. Critical Perspectives on Management (Coursera)

Course Code 203

BBA- Sem -II (CBCS 2018)

Macro Economics

Credits : 4

UE + IA: 60:40

Course Type : Core

Course Objectives:

- To study the behavior and working of the economy as a whole.
- To study relationships among aggregates.
- To apply economic reasoning to problems of business and public policy.
- To enhance knowledge regarding current affairs of the economy as a whole.
- The course is designed to study the impact of monetary and fiscal policy on the aggregate behavior of individuals.

Learning Outcomes:

The learner will get acquainted with the principles of Macroeconomics, determination of and linkages between major economic variables ; level of output and prices, inflation, interest rates and exchange rates.

Unit 1: Basic Issues and features of Indian Economy

12 hrs

Macroeconomics- definition & nature, Scope , Importance, Limitations, Paradoxes, Macro economic variables. Concept and Measures of Development and Underdevelopment; Human Development; Composition of national income and occupational structure, Measurement of macroeconomic variables: National income accounting, Circular flow of income (four sector model), Methods to calculate national income, Stock and flow concept, Gross domestic product(GDP), Gross national product(GNP), Net domestic product(NDP), Net national product(NNP), Personal and Personal disposable income; Classical theory of income and employment:

Unit 2: Policy Regimes

12 hrs

- a) The evolution of planning and import substituting industrialization.
- b) Economic Reforms since 1991.
- c) Monetary and Fiscal policies with their implications on economy

Unit 3:

12 hrs

Theory of Income & Employment, Says law of market, Keynes theory of Income & Employment: simple Keynesian model, components of aggregate demand, equilibrium income, changes in equilibrium, multiplier(investment, Government expenditure, lump sum tax, foreign trade), effect of fiscal and monetary policy, Classical aggregate demand curve, Classical theory

of interest rate, effect of fiscal and monetary policy.

Unit 4: Money :

12 hrs

Functions of money, quantity theory of money, determination of money supply and demand, Quantity Theory of Money

Business cycle & Inflation & Deflation:

Business cycle-nature, Features/Characteristics- Prosperity/Boom – Recession, Depression, Revival/Recovery

Inflation: Meaning , demand and supply side factors, causes & control,

Deflation: Meaning , causes & control, Phillips curve, Stagflation, Inflationary gap

Unit 5: :

12 hrs.

Macro economic policy: Monetary policy, Fiscal policy

Economic scenario analysis, Out of inflation & deflation , which is worst and why?

- What is the current CRR & SLR ratio? Are this ratios appropriate for current condition of the country
- Which trade cycle is prevailing in India at present

Which monetary & fiscal policy do you suggest for current condition of India?

Reference Books :

1. AHUJA H L - MACRO ECONOMY
2. BUSINESS ECONOMICS (MACRO) BY GIRIJA SHANKAR & KIRAN JOTWANI
3. M L SETH – MACRO ECONOMICS
4. D N DWIVEDI – MACRO ECONOMY

Online Resources:

<http://www.wisegeek.com/what-is-macroeconomics.htm>

<https://www.thoughtco.com/microeconomics-versus-macroeconomics-1147004>

<https://www.investopedia.com/terms/m/macroeconomics.asp>

MOOCs:

<https://swayam.gov.in/> :

<https://alison.com/>:

Course Code 204

BBA- Sem - II (CBCS 2018)

Management Accounting

Credits : 4

UE + IA: 60:40

Course Type : Core

Course Objectives:

- To Impart the Knowledge of Basic cost concepts, element of cost & Preparation of Cost Sheet.
- To provide basic knowledge of important Methods & Techniques of costing.
- To have basic knowledge about concept of management and cost audit

Learning Outcomes:

At the end of the course students should be able to

1. Understand basic cost concepts, element of cost & Preparation of Cost Sheet.
2. Have practical applications of important Methods & Techniques of costing.
3. Understand the application of concept of management and cost audit.

Unit 1: Introduction

(8 Hours)

Definition, Nature and scope of Management Accounting, Limitations of Financial Accounting, Advantages and Limitations of Management Accounting, Difference between Financial and Management Accounting.

Unit 2: Introduction of Cost Accounting

(12 Hours)

Concept and need of Cost Accounting, Material, Labour and other Expenses, Classification of cost & Types of Costs, Preparation of Cost Sheet, Methods and techniques of Costing,

Unit 3: Budget and Budgetary Control

(12 Hours)

Meaning and objectives of Budget, Definition, Meaning and objectives of Budgetary control, Advantages and disadvantages of Budgetary Control, Types of Budget, Preparation of flexible budget and cash budget.

Unit 4: Marginal Costing & Standard Costing

(20 Hours)

Definition and Meaning of Marginal Cost and Marginal Costing, importance and Limitations of Marginal Costing, Contribution, P/V Ratio, Break Event Point, Margin of Safety, Definition and Meaning of Standard Costing, Advantages and Limitations of Standard Costing ,Variance Analysis – Material and labour Variances only

Unit 5: Management Audit

(8 Hours)

Concept and Process of Audit, Essentials of Audit, Cost Audit its Objectives and Advantages, Management Audit its Objective and Advantages, Contents of Management Audit Reports.

Reference Books :

1. I.M. Pandey, Management Accounting
2. S.P.Jain and Narong., Advanced cost Accounting
3. S.N.Maheshwari, Cost Accounting.
3. Prabhu Dev , Cost Accounting, Himalaya Publication
4. Paul S Kr , Management Accounting. New Central Book Agency, Calcutta
5. Rebert N Anthony., Management Accounting D B taraporewala Sons, Bombay.

Online Resources:

1. Companies Annual Reports
2. Money control
3. SEBI and RBI Official Websites
4. NSE and BSE Official Websites

MOOCs:

<https://swayam.gov.in/> :Accounting for Managerial Decisions
<https://alison.com/>: Fundamentals of Financial Accounting

Course Code 205
BBA- Sem - II (CBCS 2018)
Business Statistics

Credits : 4

UE + IA: 60:40

Course Type : Core

Course Objectives:

- i) To familiarize the students with the basic statistical tools and their application in business decision-making.
- ii) To develop the quantitative skills of the students so as to make them skilled at understanding data, comparing two or more data sets and predicting business data etc.
- iii) To make the learner familiar with the processes needed to develop, report, and analyze business data.

Learning Outcomes:

- i) Students will be able to solve problems in Statistics using appropriate concepts
- ii) Students will be able to effectively apply the statistical tools for business applications

Unit 1: Descriptive statistics – Measures of Central Tendency and Dispersion **12 Hrs**

Arithmetic mean, median, Mode, G.M. Quartiles deciles, percentiles
Absolute and relative measures of dispersion, Range, quartile deviation, mean deviation, standard deviation, variance.

Unit 2: Correlation Analysis **12Hrs**

Meaning of correlation, types of correlation, Methods of studying correlation, scatter diagram, Karl Pearson's coefficient, Rank Correlation

Unit 3: Regression Analysis **12Hrs**

Meaning and applications, Lines of regression, regression coefficients, Business applications
Distinction between Correlation and regression

Unit 4: Probability **12Hrs**

Basic Concepts in probability, definition of probability, random experiment, sample space, independent events, mutually exclusive events, conditional probability, Expected Value and Variance – $E(X)$ and $V(X)$, Bayes' Theorem

Unit 5: Association of Attributes **12Hrs**

Introduction, Meaning and importance, Yule's Coefficient of association and interpretation

Teaching Methodology

- Lectures, tutorial and Field Work.
- Field work on collection of data through surveys and presentation of data using EXCEL to be carried out by students under the guidance of faculty.

Reference Books :

1. Dr. P Hazarika, Business Statistics, S. Chand & Co.

2. Bharadwaj, Business Statistics.
3. S.C. Gupta., Fundamentals of statistics
4. J. V. Tatke , Business Statistics
5. David L Eldredge., Business Statistics. South Western Thomson. USA
6. Amir D Aczel , Business Statistics. (Tata McGraw –Hill)

Online Resources:

<https://www.edx.org/course/subject/data-analysis-statistics>

<https://www.class-central.com › Subjects › Mathematics>

Moocs:

<https://swayam.gov.in/> :

<https://alison.com/>

[Statistics for International Business \(Coursera\)](#)

[Inferential Statistics \(Coursera\)](#)

[Basic Statistics \(Coursera\)](#)

[Statistical Reasoning for Public Health 1: Estimation, Inference, & Interpretation \(Coursera\)](#)

[Statistics in Education for Mere Mortals \(Canvas.net\)](#)

<https://alison.com/courses/math?locale=en&page=1&type\>

**BACHELOR OF BUSINESS ADMINISTRATION
OPEN COURSES SEMESTER II**

Course Code 206

BBA- Sem - II (CBCS 2018)

Community Work – Swachh Bharat Abhiyan

Credits : 2

CCA : 50 marks

Course Type : Generic / Open Elective

Course Objectives:

- i) This course aims to expose the students to Swachh Bharat Abhiyan initiative of the government.

Learning Outcomes:

Students will be able to understand the details about the Swachh Bharat Abhiyan and its impact on society.

Unit 1:

5 hrs

History, meaning, Goals of Cleanliness initiatives

Unit 2:

10 hrs

Initiators of cleanliness drive in India. Sant Ghadage Baba, Mahatam Gandhi, Efforts taken towards the Swachh Bharat Abhiyan, Swachh Bharat Mission.

UNIT 3:

15 hrs

Impact of Cleanliness initiatives. Social Awareness, Case Studies

COMMUNITY HOURS:

Internship of 15 days (100 hours) to be undertaken

Submit a report on a particular type of community involvement undertaken

References:

www.swachhbharaturban.in/

swachhbharatmission.gov.in

Course Code 206
BBA- Sem - II (CBCS 2018)

Smart Cities

Credits : 2

CCA : 50 marks

Course Type : Generic / Open Elective

Course Objectives:

to give exposure to tools and techniques applicable for planning, controlling & monitoring of Smart Infrastructure and Cities. This subject would also enable to develop insight for managing project risks, uncertainties and complexities of smart cities project.

Learning Outcomes:

Students will get an understanding of road map for Planning Smart Cities and benchmarking their performance for Indian context

Unit 1:

6 hrs

Introduction to Smart Cities, •Introduction to "City Planning", Understanding Smart Cities

Unit 2 :

12 hrs

Dimensions of Smart Cities, Global Experience of Smart Cities, Smart Cities –Global Standards and Performance, Benchmarks, Practice Codes, India "100 Smart Cities" Policy and Mission

Unit 3 :

12 hrs

- Smart City Planning and Development
- Financing Smart Cities Development
- Governance of Smart Cities, Case Studies on Smart Cities

Reference :

smartcities.gov.in

<https://internetofthingsagenda.techtarget.com/definition/smart-city>

Course Code 206
BBA- Sem - II (CBCS 2018)

Sectoral Analysis

Credits : 2

CCA : 50 marks

Course Type : Generic / Open Elective

Course Objectives:

- To expose the students to the different sectors of the economy
- To enable the students to understand the importance and contribution of the sectors to business, economy and global environment
- To expose the students towards rural problems To awaken sense of responsibility amongst students towards senior citizens

Learning Outcomes:

Students will get exposure to the different sectors of the economy and their contribution to the national development.

Unit 1 :

Introduction to the sectors of the economy

8 hours

Units 2:

Detailed view of the IT, Manufacturing, Agriculture, Banking Insurance, Service Sector, Retail etc

12 hours

Unit 3:

Project work on detailed analysis of any one sector – national and global scenario

10 hours

Reference Books :

1. S.A. Sherlekar ,Modern Business Organization And Management – (Himalaya Publishing House)
2. Y.K. Bhushan ,Fundamental Of Business Organization & Management – (S Chand Publishers)
3. Basu, C. R.; *Business Organization And Management*, Tata Mcgraw Hill, Publishing House, New Delhi, 1998
4. Business World



BHARATI VIDYAPEETH

(DEEMED TO BE UNIVERSITY)

'A' Grade University Status by Ministry of HRD, Govt. of India

Re-Accredited by NAAC with 'A' Grade

FACULTY OF MANAGEMENT STUDIES

BACHELOR OF BUSINESS ADMINISTRATION

Choice Based Credit System

(BBA – 2018- 21) (CBCS)

SYLLABUS

Course Structure

Applicable with effect from 2018-19

Bharati Vidyapeeth
[Deemed to be University],
Pune
Faculty of Management Studies
Bachelor of Business Administration Programme (BBA)
Revised Course Structure
(To be effective from 2018-2021)

BBA Program Structure 2018-21.
(As per UGC guidelines – template for BBA – 136 credits)

BBA – Sem I and Sem II w.e.f 2018-19

Semester I					Semester II				
Code		Course Title	Credit	Examination Pattern	Code		Course Title	Credit	Examination Pattern
101	AECC	Business English - Communication.	4	UE & IA	201	AECC	Environmental Science	2	CCA
102	C	Business Organization & Systems	4	UE & IA	202	C	Principles of Management	4	UE & IA
103	C	Micro Economics	4	UE & IA	203	C	Macro Economics	4	UE & IA
104	C	Business Accounting.	4	UE & IA	204	C	Management Accounting	4	UE & IA
105	C	Foundations of Mathematics and Statistics	4	UE & IA	205	C	Business Statistics	4	UE & IA
106	GE	Community Work – I	2	CCA	206	GE	Community Work – II	2	CCA
		Career & Life Skills					Swachha Bharat Abhiyan		
		Waste management					Smart Cities		
		Total Credits →	22					20	

Courses Types

- AECC / SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course (Lab / Practical / Demo etc)
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

BBA Program Structure 2018-21.**(as per UGC guidelines – template for BBA – 136 credits)****BBA – Sem III and Sem IV w.e.f 2018-21**

Semester III				Semester IV					
Code		Course Title	Credits	Examination Pattern	Code		Course Title	Credits	Examination Pattern
301	SEC	Computer Applications for Business(Theory - 3 & Lab -2)	4	CCA	401	SEC	Enhancing Personal & Professional Skills (Theory - 3 & Lab -2)	4	CCA
302	C	Organizational Behavior.	4	UE & IA	402	C	Human Resource Management	4	UE & IA
303	C	Principles of Marketing.	4	UE & IA	403	C	International Business	4	
304	C	Introduction to Financial Management	4	UE & IA	404	C	Business Research	4	UE & IA
305	C	Entrepreneurship Development	4	UE & IA	405	C	Business Laws.	4	UE & IA
306	GE	Community Work	3	CCA	406	GE	Community Work	3	CCA
		Start-up Management					Basics of Taxation		
		Agro Tourism					Yoga - I		
		Total Credits→	23					23	

Courses Types

- AECC/SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course (Lab / Practical / Demo etc)
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

BBA Program Structure 2018-21.**(as per UGC guidelines – template for BBA – 136 credits)****BBA – Sem V and Sem VI w.e.f 2018-21**

Semester V				Semester VI					
Code		Course Title	Credit	Examination Pattern	Code		Course Title	Credit	Examination Pattern
501	SEC	Summer Internship Report & Viva	6	CCA	601	SEC	Industrial Exposure. (Mini Project)	5	CCA
502	C	Services Management	4	UE & IA	602	C	Introduction to Strategic Management	4	UE & IA
503	DSE	Elective Paper – I	4	UE & IA	603	DSE	Elective Paper – III.	4	UE & IA
504	DSE	Elective Paper – II	4	UE & IA	604	DSE	Elective Paper – IV	4	UE & IA
505	C	Introduction to Operations Research	4	UE & IA	605		Disaster Management	4	CCA
506	GE	Social Media Management	2	CCA	606	GE	Business Ethics	3	CCA
		Road Safety & Management					Basics of Hospitality Management		
		Event Management					Yoga - II		
		Total Credits→	24					24	

Courses Types

- AECC/SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course (Lab / Practical / Demo etc)
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary

- DSE - Discipline Specific Elective

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

BBA Programme Objectives:

1. To provide students with an in-depth knowledge of Management and Business concepts
2. To provide students with a firm foundation in both theoretical and practical concepts and applications to meet the various needs of business organizations at a global level
3. To prepare students for the responsibilities and career opportunities with corporations and as entrepreneurs.

BBA CBCS 2018 SEM III

301 : Computer Applications For Business

Course Code	301	Course Type	SEC
Credits	Four.	Examination Pattern	CCA

Course Objectives:	
to introduce IT in a simple language to all undergraduate students, regardless of their specialization. to introduce the students to the world of computers and software applications.	
Learning Outcomes:	
This course will provide learners with a solid foundation on which to build a strong knowledge of computer applications for business. students will learn how to use Microsoft Office applications and explore and examine the fundamentals of computer hardware and software.	
Unit I: Introduction to Computer Fundamentals	(6 hours)
Introduction to Computer, Computer System Hardware, Computer Memory, Input and Output Devices, Interaction between User and Computer, Introduction to Free and Open Source Software, Definition of Computer Virus, Types of Viruses, Use of Antivirus software	
Unit II Basics of Operating System	(10 hours)
Definition of Operating System, Objectives, types and functions of Operating Systems, Working with Windows Operating System: Introduction to The Desktop, Structure of Windows, Windows Explorer, File and Folder Operations, The Search, The Recycle Bin, Configuring the Screen, Adding or Removing New Programs using Control Panel, Applications in windows (Paint, Notepad, WordPad, Calculator)	
Unit III: Use of Computer in Business	(12 hours)
Data Processing, Files and Records, File Organization (Sequential,	

Direct/Random, Index) Computer Applications in Business – Need and Scope
 Computer Applications in various fields of Commerce: Personnel Administration, Accounting, Cost and Budgetary Management, Purchasing, Banking, Insurance and Stock-broking, e-governance Introduction to E-Commerce, Evolution of E-Commerce, Role of e-Commerce, e-Commerce Framework, e-Commerce Categories

Unit IV: Introduction to Business Communication Tools (20 hours)

MS-Word: Introduction, Starting MS-Word, MS-Word Screen and its Components, Elementary Working with MS-Word

MS-Powerpoint: Introduction, Starting MS-PowerPoint, Basics of PowerPoint, MS-PowerPoint Screen and Its Components, Elementary Working with MSPowerPoint

Unit V: Spreadsheet tool (12 hours)

MS-Excel: Introduction, Starting MS-Excel, Basics of Spreadsheet, MS-Excel Screen and Its Components, Elementary Working with MS-Excel.

Reference Books :

- 1) Computer Fundamentals By P.K. Sinha
- 2) HTML, Java Script, DHTML & PHP by Evan Bayross
- 3) Electronic Commerce A Managers Guide by Ravi Kalkota & Andrew Whinston
- 4) MS-Office in Nutshell by Sanjay Saxena

Online Resources:

<https://www.tutorialspoint.com>
[youtube.com](https://www.youtube.com)

MOOCs:

<https://swayam.gov.in/>
<https://alison.com/en>

BBA- Sem -III (CBCS 2018)
302: Organizational Behavior

Course Code	302	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40

Course Objectives:

- To expose the students to the fundamentals of Organizational Behaviour (OB) - such as working with people, nature of organizations, communication, leadership and motivation of people.
- To help students develop a conceptual understanding of OB theories
- to enable the students to put the ideas and skills of OB into practice

Learning Outcomes:

On completion of this course, students will be able

- to understand the dynamics of individual and organizational behavior and relationships.
- To understand the importance of organizational behavior in managerial functions.

Unit 1: (12 hours)
 Introduction to Organizational Behavior : Definition, Evolution of the Concept of OB, Contributions to OB by major behavioral science disciplines, Challenge and Opportunities for OB managers, Models of OB study

Unit 2: (12 hours)
 Foundations of Individual Behavior Attitudes and Job Satisfaction, Components of Attitude, Major Job Attitude, Job Satisfaction, Personality and Values, Personality Determinants, MBTI, Big – Five Model, Values, Formation, Types of Values, Perception, Factors influencing perception.

Unit 3: Motivation and Leadership (14 hours)
 Motivation and Leadership Concept of motivation, Definition, Theories of Motivation, Maslow’s need Theory, ERG Theory, Theory X and Theory Y, Two Factor Theory, McClelland’s Theory, Equity Theory, Vroom’s Expectancy Theory. Concept of Leadership, Theories of leadership, Traits of good Leader, Difference between Leader and Manager

Unit 4: Groups and Teams (10 hours)

Foundations of Group Behaviour, Formation of Group, Group - Classification, Properties, Roles, norms, status, size and cohesiveness, Group decision making, Understanding teams, creating effective teams, Conflict Process, Conflict management communication.

Unit 5 : (10 hours)
Culture, Definition, Culture's function, need and importance of Cross Cultural management, Stress and its Management.

Reference Books :

- 1) Kavita Singh, Organizational Behavior, Vikas Publications
- 2) Robbins, Timothy Judge, SeemaSanghi, Organizational Behavior, Stephen Pearson Prentice Hall, 12 edition
- 3) Fred Luthans, Organizational Behavior, McGraw Hill Inc.
- 4) John Newstrom and Keith Davis, Organizational Behavior, Tata McGraw Hill, 11 edition
- 5) AshwaThapa, Organizational Behavior

Online Resources:

www.algonquincollege.com/ccol/courses/organizational-behaviour/
www.algonquincollege.com/ccol/courses/organizational-behaviour-3
[https://www.imi.edu/delhi/organizational behaviour human resources](https://www.imi.edu/delhi/organizational_behaviour_human_resources)

MOOCs:

<https://www.mooc-list.com/tags/organizational-behavior>
<https://www.openlearning.com/courses/organisational-behaviour-an-overview>
<https://www.coursera.org/learn/managing-people-iese>

BBA CBCS 2018 SEM III

303 : Principles of Marketing

Course Code	303	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40

Learning Objectives:	
1.	To enhance students' knowledge as regards to basics of marketing.
2.	To develop practical insights into application of marketing concepts.

Learning Outcomes: After studying this course students will be able to -	
1.	Understand the need and importance of marketing in the current business scenario.
2.	Analyze the need and importance of market segmentation, targeting and positioning.
3.	Understand the steps involved in developing a marketing plan.
4.	Know the recent trends in marketing.

Unit 1 :Introduction to Marketing (12 Hours)

Marketing - Definition, Evolution, core concepts, Marketing v/s Selling, Role of a Marketing Manager in the current scenario, Marketing Environment – Internal and External Environment.

Unit 2 : Market segmentation, Targeting & Positioning (STP) (12 Hours)

Market Segmentation, meaning, its benefits, Bases for segmenting Consumer market and Industrial market, Market Targeting, Product positioning concept.

Unit 3 : Marketing Research (12 Hours)

Nature & Scope, Marketing Research Process, Questionnaire designing & methods of data collection.

Unit 4 : Marketing Mix (7 P's of Marketing) (12 Hours)

Product :Concept, Levels of Products – core benefit, basic product, expected product, augmented product and potential product, Product Life Cycle - concept, stages and its influence on marketing mix decisions.

Price :Meaning, Pricing objectives, Pricing Strategies - Skimming pricing, Penetration pricing and psychological pricing.

Place : Need and importance of distribution, Factors influencing selection of distribution channel, Channels of Distribution – Manufacturer, wholesaler, retailer, carrying and forwarding agents, e-tailer, Channel Conflict – Concept, types of channel conflict.

Promotion : Promotion Mix – Elements : Advertising, Sales Promotion, Personal Selling, Publicity, Public Relations, Direct Marketing etc.
Brief overview of people, process and physical evidence.

Unit 5 :Recent Trends in Marketing

(12 Hours)

Digital Marketing – Meaning, Importance, Green Marketing - Meaning, Importance, Use of Information Technology in marketing practices – Virtual marketing, E-buying behavior etc

Reference Books:

- 1) Dr. Philip Kotler, Marketing Management.
- 2) Ramswamy&Namkumari, Marketing Management, Indian context.
- 3) RajanSaxena, Marketing Management, Tata McGraw Hill Publication.
- 4) Tapan Panda, Marketing Management, Excel Publication.
- 5) William Stanton, Fundamentals of Marketing.

Journals:

1. Journal of Marketing (American Marketing Association).
2. European Journal of Marketing (Emerald Publishing Limited).

MOOCS:

- a) <https://swayam.gov.in/courses/147-principals-of-marketing-mgmt>
- b) <https://www.coursera.org/browse/business/marketing>
- c) <https://www.mooc-list.com/tags/marketing>
- d) <https://www.bestmarketingdegrees.org/best-moocs-marketing>

Other Readings:

Marketing Whitebook 2018.

BBA CBCS 2018 SEM III

304 : Introduction to Financial Management

Course Code	304	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40

Course Objectives:	
<ol style="list-style-type: none"> 1. To provide a conceptual orientation and application of financial management 2. To provide a basic understanding of financial sources and capital structure. 	
Learning Outcomes:	
<ol style="list-style-type: none"> 1. Students will be able to gain basic understanding of financial management. 2. Students will be able to have knowledge of financial sources and capital structure. 	
Unit 1 : Introduction to Financial Management	(10 Hours)
Finance : Definition, Nature and Scope of Finance Functions Financial Management : Meaning, Scope, Objectives Profit v/s Wealth Maximization, Organization of Finance Function, Role of finance manager in globalised environment	
Unit 2 : Sources of Long term Finance	(10 Hours)
Equity shares, Preference shares, Debentures, Public Deposits, Borrowing from banks : Their Meaning, Types, Merits and Demerits	
Unit 3 : Capital Budgeting Decision	(10 Hours)
Meaning, Importance, Time Value of Money Techniques of evaluation : Payback period, Accounting rate of return, Net present value, Profitability Index, Internal rate of return	
Unit 4 : Capital Structure	(15 Hours)
Meaning, Factors to be considered while framing capital structure Leverage : Operating financial and combined leverage Cost of Capital : Importance and concept, Measurement of cost of debt, cost of preference share capital, equity share capital, cost of retained earnings and weighted average cost of capital Dividend Policy : Meaning and factors affecting Dividend Decision	

<p>Unit 5 : Management of Working Capital (15 Hours) Meaning, Determinants of working capital, Operating Cycle, Estimation of Working Capital, Source of Financing Working Capital : Reserves and Surplus, Bonus Shares and Retained Earnings</p>
<p>Reference Books :</p> <ol style="list-style-type: none"> 1. J. M. Pandey, Financial Management, Vikas Publishing House 2. M.Y. Khan & P.K. Jain: Financial Management Text Problem and Cases, Tata McGraw Hill Pubilshlng Co. Ltd. 3. R. P. Rustogi: Financial Management: Theory Concepts and Practices, Taxmann Publication. 4. Prasanna Chandra, Financial Management, Tata McGraw Hill Publishing co. Ltd., New Delhi 5. R. M. Shrivastava, Pragati Prakashan, Meerut 6. Maheshwari S. N., (2009), Financial Management, Principles and Practice, 9th Edition Sultan Chand & Sons. 7. I.M. Pandey: Financial Management: Theory and Practices, Vikas Publishing House 8. R.A. Brealey, S.C. Myers, F. Allen& P. Mohanty: Principles of Corporate Finance, McGraw Hill Higher Education 9. J.V. Horne & J.M. Wachowicz: Fundamentals of Financial Management Prentice Hall
<p>Online Resources:</p> <ol style="list-style-type: none"> 1. Investopedia for basic financial concept 2. NSE – BSE Official websites 3. Moneycontrol for analytical study
<p>MOOCs:</p> <ol style="list-style-type: none"> 1. Allison 2. Swayam

BBA - CBCS 2018 SEM III

305 : Entrepreneurship Development

Course Code	305	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40

Course Objectives: The aim of this course is

- to provide the students with introduction to the process of creating new businesses, role of entrepreneurs, importance of creativity and innovation in entrepreneurial start-ups.
- To understand the management of family-owned companies, context of social innovation and social entrepreneurship and issues and practices of financing entrepreneurial businesses.

Learning Outcomes:

At the end of the course, the students will have a fair idea about aspects of entrepreneurship development, role of entrepreneurs, and the importance of entrepreneurship in nation building along with the challenges and opportunities.

Unit-1 Introduction to Entrepreneurship Development

Concept of Entrepreneurship – Definition – Meaning – Types – Qualities of an Entrepreneur – Classification of Entrepreneurs – Factors influencing Entrepreneurship – Role of Entrepreneurs in nation building, Difference between entrepreneur and manager.

Unit-2 Entrepreneurship, Creativity And Innovation

Idea Generation, Business idea generation techniques, Identifying Business Opportunities and Evaluation. Stimulating Creativity; Organizational actions that enhance/hinder creativity, Process of Innovation, Sources of Innovation in Business;

Unit 3: Business Plan

Meaning and importance of business plan, Preparation of Business Plan, Feasibility study – Marketing, Finance, Technology & Legal Formalities.

Unit 4:

Financing entrepreneurial ventures

Sources of entrepreneurial finance, Entrepreneurial Development – Agencies – Commercial Banks – District Industries Centre – National Small Industries Corporation – Small Industries Development Organization – Small Industries Service Institute. All India Financial Institutions – IDBI – IFCI – ICICI – IRDBI.

Unit 5: Emerging Forms

Forms of ownership – Sole proprietorship; partnership; limited liability partnership, corporation; advantages/disadvantages. Franchising; advantages /disadvantages of franchising; types of franchise arrangements. Start ups, support of government for startups, case studies of popular startups.

Family Businesses – concept, structure and types. Women entrepreneurs – challenges and growth.

Reference Books :

1. Khanka S. S. – Entrepreneurship Development, S. Chand.
2. Burns, P. (2001). Entrepreneurship and small business. New Jersey:Palgrave.
3. Gersick, K. E., Davis, J. A., Hampton, M. M., &Lansberg, I. (1997). Generation to generation: Life cycles of the family business. Boston: Harvard Business School Press.
4. Holt, D. H. (2004). Entrepreneurship new venture creation. New Delhi: Prentice Hall of India.
5. Kaplan, J. (2004). Patterns of entrepreneurship. Wiley.
6. Khandwalla, P. (2003). Corporate creativity. New Delhi: Tata Mc.Graw Hill.
7. Mullins, J. (2004). New business road test. New Delhi: Prentice Hall.
8. Prahalad, C. K. (2006). Fortune at the bottom of the pyramid ,eradicating poverty through profits. Wharton school Publishing.
9. Stevenson, H. (Ed.). (2007). Perspective on entrepreneurship. Boston:Harvard Business Press.

Online Resources:

<https://www.entrepreneur.com/>

<https://www.toppr.com/guides/business-studies/entrepreneurship-development/>

<https://www.entrepreneur.com/article/238908>

<https://www.Youtube.com/>

<https://www.shopkeep.com/blog/the-7-best-free-resources-for-planning-your-new-business>

<http://dst.gov.in/scientific-programme/t-d-tdb.htm>

MOOCs:

<https://startupindia.upgrad.com/> - Startup India Learning Programme
Swayam

BBA - CBCS 2018

SEM III

306 : Community Work-III (Open Course)

Course Code	306	Course Type	GE
Credits	Three	Examination Pattern	CCA

Course Objectives:

This course aims to expose the students to the societal issues and help them participate in the community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc

- (I) To expose the students towards social reality and role of community development for social upliftment and well being
- (II) To involve students in community work through active involvement and participation

Learning Outcomes:

Students will be able to know the community needs and understand their role towards community development

Unit 1: Community work through Education

Teaching at Schools, Teaching at Orphanages, Teaching to poor children ,study the role of government in the education sector ,study the NGOs particularly working in education sector.

Unit 2:Community Work for Slums

Learn the government facilities ,NGOs which are working for the slums and try to connect any NGO.

UNIT 3: Community Work for Environment

Role of Govt.and NGOs which are working to save the environment, Initiatives like Clean your city drive, Cycle day, Awareness of Dry and wet waste classification, Tree Plantation Drive, Environemnt awareness activities etc.

COMMUNITY HOURS:

Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken.

Reference Books :

1. An Introduction to Community Development, Rhonda Phillips, Robert Pittman – 2014
2. Community Development in Asia and The Pacific, Manohar S. Pawar, 2009,

Online Resources:

<https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-directory.pdf>

<https://www.ahaprocess.com/solutions/community/events-resources/free-resources/>

MOOCs:

<https://alison.com/course/diploma-in-community-development>

BBA - CBCS 2018

SEM III

306 : Start-Up Management (Open Course)

Course Code	306	Course Type	GE
Credits	Three	Examination Pattern	CCA

Course Objectives:

The objectives of the course is

- To Introduce to the students the idea of start ups and their role in the society and nation
- To impart knowledge about the organization and management of start ups

Learning outcomes:

Students will be able to understand the role of start ups and case studies of well known start ups in India.

Unit I:**(06 Hrs)**

Meaning of Start ups, Formation of a start up, idea generation for start ups, scaling up process.

Unit II:**(12 hrs)**

Managing a startup, Customer Development, Market Sizing, Lean Startups, Support by government for startups,

Unit III:**(12 hrs)**

Case Studies on well known startups

Reference Books :

- 1) Khanka S. S. – Entrepreneurship Development, S. Chand.
- 2) Burns, P. (2001). Entrepreneurship and small business. New Jersey:Palgrave.
- 3) Mullins, J. (2004). New business road test. New Delhi: Prentice Hall..

Online Resources:

<https://www.entrepreneur.com/>

<https://www.shopkeep.com/blog/the-7-best-free-resources-for-planning-your-new-business>

MOOCs:

<https://startupindia.upgrad.com/> - Startup India Learning Programme

Swayam

BBA - CBCS 2018

SEM III

306 : Agro Tourism (Open Course)

Course Code	306	Course Type	GE
Credits	Three	Examination Pattern	CCA

Course Objectives:

The objectives of the course is to familiarize students with principles and relationship between tourism and agricultural activities.

Learning outcomes:

Students will be able to obtain and diversify knowledge from tourism, rural tourism and their specific form agri-tourism.

Unit I:**08 Hr.**

Introduction, importance, scope, forms of agro-tourism, advantages and implementations, sustainability component, difficulties involved.

Unit II:**08 Hr.**

Govt. policies and legislations in respect of tourism and agro-tourism and environment protection laws. Requirements for Agro-tourism Farm, forest, garden, fish tank/ponds, residential huts, etc. Introduction to Indian culture through agro tourism.

Unit III:**14 Hr.**

Profiling the tourist for: age, sex, life cycle, education, employment, income, satisfaction and expectations, values, purpose of visit, accommodation, duration of stay, preferences and perceptions regarding area management, environmental concerns, involvement and responsibility, motivations, etc.

Reference Books :

1. Talwar, Prakash. Travel and Tourism Management. Gyan Books Pvt., Ltd., Main Ansari Road, Darya Ganj, New Delhi- 110 002.
2. Bagri, S. C. Trends in Tourism Promotion 2003. International Books Distributors, 9/3, Rajpur Road, Dehradun-248 001 Uttarakhand (India).

Online Resources:

<http://www.agritourism.in>

<http://www.ecoindia.com>

MOOCs:

<https://www.mooc-list.com/tags/tourism>

<https://www.coursera.org/>

<https://swayam.gov.in/>

<https://alison.com/courses?query=agriculture+tourism>

BBA CBCS 2018**SEM IV****401 : Enhancing Personal & Professional Skills**

Course Code	401	Course Type	SEC
Credits	Four. (Theory – 3, Lab – 2)	Examination Pattern	CCA

Course Objectives:

Students will be able

- To understand the importance of soft skills and personality development
- to learn how to build personality
- To stress upon the importance of time management
-

Learning Outcomes:

Students will be able

- to identify their strengths and weaknesses and be motivated to work upon them
- to Speak with clarity and confidence, thereby enhancing their employability skills.
- Identify his/her creative self, and express effectively the same

Unit 1: Introduction to Soft Skills**(12 hours)**

Skills to Master : Meaning and importance of soft skills, Types of soft skills, Social skills, thinking skills, exhibiting and identifying soft skills, improving soft skills.

Self Discovery: SWOT Analysis, JOHARI WINDOW, Developing positive attitude, Examples of positive attitudes, positive attitude and its results, Examples of negative attitudes , Negative attitude and its results.

Exercise: Top 60 soft skills, Measure your soft skills.

Unit 2: Art of Speaking(The Voice) :**(14 hours)**

Importance of voice clarity, Art of public speaking, Modulation, Intonation, Inflection, How to Overcome stage fear. Importance and benefits of public speaking. telephone speaking skills.

Exercise: Extensive exercise to be performed in class room speaking with necessary inputs on grooming, voice modulation eye-contact and consistency.

Unit3: Etiquette and Mannerism:**(12 hours)**

Introduction: Manners and etiquette, practicing good manners, Professional manners: Social skills, interacting with people. Politeness and amicability, sportiveness, valuing time, respectfulness, Mobile manners, Table etiquettes.

Professional etiquettes: Etiquettes at meeting, dining.

Technology Etiquettes: Phone, Email, Social media, Video conferencing, Web interviews.

Business Correspondence: Writing business letters, Memos, placing orders, Invoice, quotations. Exercise: Writing letters.

Exercise :Analytical questions on etiquettes.

Unit 4: Stress and Time Management:**(10 hours)**

Stress Management: Identify the stress source, signs of stress, behavior identified

Time Management: The 80:20 rule. Take a good look at the people around you.

Sense of time management, Three secrets of time management,

Effective scheduling : Grouping of activities, Five steps to successful time management. Overcoming procrastination and time management tips for students.

Exercise: Test your time management skills.

Unit 5: Team Building and Team work:**(12 hours)**

Introduction: Aspects of team building- skills needed for teamwork –A model of team building. Team Vs. Group. Characteristics of effective team. Role of team leader, Inter group collaboration, factors shaping inter-group collaboration.

Exercise: Test your teamwork skills.

Reference Books :

1. Dr. K . Alex: Soft skills, S. Chand
2. Gajendrasingh Chauhan, Sangeeta Sharma ,Soft Skills , Wiley.
3. Covey Steven,Seven Habit of Highly Effective Teens , New York, Fireside Publishers, 1998.
4. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
5. Thomas A Harris,I am ok, You are ok, New York - Harper and Row, 1972
6. Daniel Coleman, Emotional Intelligence , Bantam Book, 2006
7. Jack Canfield , The Success Principles.
8. De. Bono E. “Lateral Thinking”.
9. Kelley T, Kelley D. “Creative confidence Unleashing the creative potential within all of us.”

Website for Online courses:

[https://www.bvrit.ac.in/Freshman_Lab_Manuals/Professional%20Skills%20&%20Personality%20Development%20Lab/Professional%20Skills%20and%20Personality%20Development\(PSPD\).pdf](https://www.bvrit.ac.in/Freshman_Lab_Manuals/Professional%20Skills%20&%20Personality%20Development%20Lab/Professional%20Skills%20and%20Personality%20Development(PSPD).pdf)

<https://www.learningtree.com/courses/297/personal-skills-training-for-professional-excellence/>

MOOCs:

https://onlinecourses.nptel.ac.in/noc17_hs11/preview

<https://www.coursera.org/specializations/wharton-success>

<https://alison.com/courses/personal-development>

<https://www.learningtree.com/courses/297/personal-skills-training-for-professional-excellence/>

BBA CBCS 2018 SEM IV
402: Human Resource Management

Course Code	402	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40

Course Objectives:

- To help students understand the basic elements of Human Resource Management
- To facilitate the students to acquire the specific knowledge and skills associated with human resource management in organizations.

Learning Outcomes:

The course will prepare the students to understand and perform the essential functions of human resource management in organizations.

Unit 1: (12 hours)

Human Resource Management (HRM) : Definition, Nature, Scope, Functions and Objectives of HRM, Organization and functions of HR Department. Changing environment of HRM – globalization, cultural environment, technological advances. HRM issues in Indian organization, Strategic HRM – case of TATA.

Unit 2: (12 hours)

Human Resource Planning (HRP) : Importance and benefits of HRP, Steps in Human resource planning process, Factors affecting HRP, Job analysis, job description and job specification, Job Analysis – importance and methods, Job Design – meaning, steps and benefits, Factors Affecting Job Design.

Unit 3: (12 hours)

Recruitment and Selection: Recruitment - meaning, Recruitment Process, Sources of Recruitment, Outsourcing, Selection Process – meaning and steps, Tests, Interviews, assessment centres, Placement of personnel.

Unit 4: (10 hours)

Induction and Training : meaning, objective and purpose of induction, Training – need for training, benefits of training, identification of training needs, Methods of training.

Unit 5: (14 hours)

Performance Appraisal: Performance Appraisal – meaning, definition, objectives, methods and limitations of performance appraisal, Job Evaluation – concept, objectives and procedures of job evaluation.

Reference Books :

- 1) V. S. P. Rao, Human Resource Management
- 2) Dwivedi R. S., Managing Human Resources and Personnel Management in India Enterprises, Galgotia Publishing Company
- 3) Clarke Liz, The Essence of Change, Prentice Hall of India Pvt. Ltd., 1997
- 4) Dessler G., Human Resource Management, Pearson Education Pvt. Ltd.
- 5) Stephen Robbins, The Management of Human Resource Management

Online Resources:

<https://www.coursera.org/specializations/human-resource-management>
<https://www.humanresourcesedu.org/what-is-human-resources>
<https://fiuonline.fiu.edu/.../online.../master-of-science-in-human-resources-manageme>
<https://www.slideshare.net/Farrah1978/job-analysis-job-design-job-specification>

MOOCs:

<https://www.class-central.com › Coursera>.
<https://www.coursera.org/specializations/human-resource-management>
<https://www.my-mooc.com/.../mooc/managing-human-resources-hospitality-hkpolyux>.

BBA CBCS 2018**SEM IV****403: International Business**

Course Code	403	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40

Course Objectives:

- To acquaint the student with emerging issues in international business
- To study the impact of international environment on foreign market operations of a firm

Learning Outcomes:

- Students will be able to understand and apply the concepts of international business to current global development issues.

Unit 1 : International Business Environment

- Nature, Definition of International Business
- Theories of International Trade / Mercantilism - Ricard's Theory / Smith Theory, Heckscher-Ohlin Theory / Porters Model
- Role of culture in business environment

Unit 2 : Foreign Trade:

- Balance of Trade
- Balance of Payments

Unit 3 : Foreign Exchange Market

- Meaning of Exchange rate
- Determination of Exchange rate – Fixed, Flexible and Managed

Unit 4 : International Financial Institutions

- International Monetary Fund (IMF) – Objectives and functions.
- World Bank – Objective and Functions

Unit 5 : India's Foreign Trade

- Composition and direction of India's Foreign Trade
- Current Foreign Trade Policy of India.

Reference Books :

- 1) Miltiades Chacholiades, International Economics, McGraw Hill Publishing Co., New York, 1990
- 2) W. Charles Sawyer and Richard L. Sprinkle, International Economics, Prentice Hall of India Pvt. Ltd.
- 3) M. L. Jhingan, International Economics, Vrinda Publications, Delhi,
- 4) Charles Hill, Arun Kumar Jain, International Business, Competing in the Global Market Place, Tata McGraw Hill, New Delhi, 2008

Online Resources:

<https://internationalaffairsresources.com/intlbus.html>

<https://www.bestcolleges.com/resources/international-business/>

MOOCs:

<https://www.mooc-list.com/course/international-business-i-coursera>

BBA CBCS 2018 SEM IV			
404: Basics of Business Research			
Course Code	404	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40
Course Objectives:			
<ul style="list-style-type: none"> • To give the learner an understanding of the basic techniques and tools of business research. • To provide an exposure to the learners about business research which they are expected to possess when they enter the industry as practitioners. 			
Learning Outcomes:			
Learner will be able to understand and apply the steps involved in a research project. Students will be able to know the skill of writing a research report.			
Unit I: Introduction to Business Research			(12hours)
Nature and Scope of Research, Definition, objectives and types of business research, Role of Research in decision making. Steps of the Research process, Steps in Problem Formulation, writing the research proposal – objectives, hypothesis, methodology, time frame.			
Unit II: Research designs			(12hours)
Research Design: importance and types - Exploratory, Descriptive, Causal. Sampling – need and importance of sampling, Sampling techniques, representative sample,			
Unit III: Data Sources			(12hours)
Secondary Data - Advantages & Disadvantages, Criteria for evaluating secondary sources, Primary Data Collection: Comparison of different methods of collecting primary data, Observation, interviews – personal and telephone, questionnaire – self administered, mail, email, Qualitative Research Tools: in-Depth Interviews, focus groups and projective techniques; Surveys.			

Measurement: Scales of Measurement -Nominal, Ordinal, Interval and Ratio.
Questionnaire – form & design.

Unit IV: Data Analysis (12hours)

Data Analysis – Basic data analysis - frequency distribution, Diagrammatic and Graphic representation, concept of univariate, bivariate and multivariate analysis.

Unit V: Report Writing (12 hours)

Types of reports, steps in Writing Reports , Format of a good report, Precautions in report writing.

Reference Books :

1. Cooper & Schindler: Business Research Methods McGraw-Hill Education,
2. Aaker, Kumar, Day - Marketing Research. Wiley.
3. Gupta Kirti, Research Methodology - Tools and Techniques, Nirali Prakashan.

Online Resources:

[https://edisciplinas.usp.br/pluginfile.php/2317618/mod_resource/content/1/BLOC O%20 Research%20Methods%20The%20Basics.pdf](https://edisciplinas.usp.br/pluginfile.php/2317618/mod_resource/content/1/BLOC%20Research%20Methods%20The%20Basics.pdf)

http://www.sociology.kpi.ua/wp-content/uploads/2014/06/Ranjit_Kumar-Research_Methodology_A_Step-by-Step_G.pdf

http://edutechwiki.unige.ch/en/Research_methodology_resources

<http://rmit.libguides.com/researchmethods>

<https://study.com/academy/lesson/research-methodology-approaches-techniques-quiz.html>

MOOCs:

<https://www.coursera.org/learn/research-methods>

<https://www.class-central.com/tag/research%20methods>

<https://www.openlearning.com/accounts/login/?force=1&redirectTo=/courses/enrol/?activationCode=&course=courses/introduction-to-research-methodology&inviteData=&cohortName=&redirected=True&enrol=1>

BBA CBCS 2018

SEM IV

405: Business Laws

Course Code	405	Course Type	AECC
Credits	Four.	Examination Pattern	UE + IA: 60:40

Course Objectives:

To educate the students about the different laws related to business

Learning Outcomes:

Student will be able to understand the importance and relevance of the various laws related to business

Unit I:

The Indian Contract Act 1872: Meaning and Essentials of contract; Kinds of contract-Based on: validity, formation & performance, law relating to offer and acceptance, consideration, competency to contract, free consent, Void agreements, performance of contracts, discharge of contracts, breach of contracts and quasi contract, Special contracts: contract of indemnity and guarantee, bailment and pledge, and agency.

Unit II:

Sale of Goods Act 1930: Sale and agreement to sell, implied conditions and warranties,

sale by non-owners, rights of unpaid seller.

Negotiable Instruments Act 1881:

Meaning of negotiable instruments, type of negotiable instruments, promissory note, bill of exchange, cheque.

Unit III:

The Companies Act 2013:

Meaning and types, Incorporation, Memorandum & Articles of association, Prospectus, Issue of shares and bonus shares, rights issue, sweat equity, role of directors, share qualification, company meetings.

The Limited Liability Partnership Act 2008:

Meaning and nature of limited partnership, formation, partners & their

relations, extent and limitation of liability.

Unit IV:

Consumer Protection Act 1986:

Objectives and machinery for consumer protection, defects and deficiency removal, rights of consumers.

Unit V:

The Right to Information Act 2005:

Salient features and coverage of the act, definition of terms information, right, record, public authority; obligations of public authorities, requesting information and functions of PIO.

Reference Books :

1. M.C.Kucchal: Business Law/Mercantile Law, VikasPublishing.House (P) Ltd.
2. M.C.Kucchal,&VivekKucchal: Business Legislation for Management, Vikas Publishing House (P) Ltd.
3. Dr. G. K. Kapoor & Sanjay Dhamija: Company Law and Practice-A comprehensive textbook on Companies Act 2013, latest edition, Taxmann.
4. Avtar Singh: Principle of Mercantile Law, Eastern Book Company Gulshan Kapoor: Business Law, New Age International Pvt Ltd Publishers
6. Maheshwari&Maheshwari: Principle of Mercantile Law, National Publishing Trust
7. Rohini Aggarwal: Mercantile & Commercial Law, Taxmann.

Online Resources:

<https://www.khanacademy.org/>

MOOCs:

<https://alison.com/en>

Generic Electives / Interdisciplinary

BBA CBCS 2018

SEM IV

406: Community Work-IV

Course Code	406	Course Type	GE - Generic Elective / Interdisciplinary
Credits	Three	Examination Pattern	CCA : 50 marks

Course Objectives:

This course aims to expose the students to social issues and help them Participate in community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, nonprofit organization etc

- (I) To expose the students towards social reality and role of community development for social upliftment and well being
- (II) To involve students in community work through active involvement and participation

Learning Outcomes:

Students will be able to know the community needs and understand their role to contribute meaningfully towards community development

Unit 1:

(8 hrs)

Community work in Food and Nutrition related social concerns ,role of government and NGOs in India

Unit 2:

(12 hrs)

Community work for old age people and its related social concerns, role of government and NGOs in India

UNIT 3:

(10 hrs)

Community work for woman empowerment ,its related social concerns ,role of Govt. and NGOs in in India

COMMUNITY HOURS:

Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken

Reference Books :

- a. An Introduction to Community Development, Rhonda Phillips, Robert Pittman – 2014
- b. Community Development in Asia and The Pacific, Manohar S. Pawar, 2009,

Online Resources:

<https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-directory.pdf>

<https://www.ahaprocess.com/solutions/community/events-resources/free-resources/>

MOOCs:

<https://alison.com/course/diploma-in-community-development>

BBA CBCS 2018**SEM IV****406: Basics of Taxation**

Course Code	406	Course Type	GE - Generic Elective / Interdisciplinary
Credits	Three	Examination Pattern	CCA : 50 marks

Course Objectives:

1. To provide a basic knowledge about direct tax system in India
2. To provide a basic knowledge about indirect tax system in India.
3. To upgrade with the latest amendments in taxation policy of India..

Learning Outcomes:

1. Students will be able to have a basic knowledge about direct tax system in India
2. Students will be able to have a basic knowledge about indirect tax system in India.
3. Students will be upgraded and upskilled with the latest amendments in taxation policy of India..

Unit 1: Introduction (5 Lectures)

Basic concepts: Income, agricultural income, person, assessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax; Permanent Account Number (PAN) Residential status; Scope of total income on the basis of residential status Exempted income under section 10

Unit 2: Direct and Indirect Tax (10 Lectures)

Income from Salaries; Income from house property, Profits and gains of business or profession; Capital gains; Income from other sources, Deductions from gross total income; Rebates and reliefs Computation of total income of individuals and firms; Tax liability of an individual
Indirect taxes.

Unit 3: Overview of GST. (5 Lectures)

Overview Of GST: Introduction to GST-Key Concepts – Taxes under GST – Central GST – State GST – Union Territory GST – Integrated GST - Cess

Reference Books :

1. Shukla and Grewal: Advanced Accounts. (S. Chand & Co. Ltd. New Delhi)
2. Jain and Narang: Advanced Accounts.(Kalyani Publishers, Ludhiana)
3. Sr. K. Paul: Accountancy, Volume-I and II.(New Central Book Agency, Kolkata)
4. R. K. Lele and Jawaharlal: Accounting Theory (Himalaya Publishers)
5. Dr. L. S. Porwal: Accounting Theory (Tata McGraw Hill).
6. Robert Anthony, D.F.Hawkins& K.A. Merchant: Accounting Text & Cases (Tata McGrawHill)

Online Resources:

1. <https://incometaxindiaefiling.gov.in/>
2. <https://www.taxmann.com/#>
3. <http://www.gstcouncil.gov.in/>

MOOCs:

Alison
Swayam

BBA CBCS 2018**SEM IV****406: YOGA - I**

Course Code	406	Course Type	GE - Generic Elective / Interdisciplinary
Credits	Three	Examination Pattern	CCA : 50 marks

Course Objectives:

To introduce the practice of yoga and its benefits to students

To impart practices of basic yogic kriyas

Learning Outcomes:

Students will be able to understand the advantages of Yoga and practice basic yog kriyas

UNIT-I

- i) Origin of Yoga & its brief development.
- ii) Meaning of Yoga & its importance
- iii) Yoga as a Science of Art (Yoga Philosophy).
- iv) Meaning of meditation and its types and principles.

UNIT- II

- i) Classification of Yoga/Types of Yoga
- ii) Hatha Yoga , Raja Yoga, Laya Yoga, Bhakti Yoga, Gyan Yoga, Karma Yoga.
- iii) Asthang Yoga.

UNIT -III

- i) Principles of Yogic Practices.
- ii) Meaning of Asana, its types and principles.
- iii) Meaning of Pranayama, its types and principles.
- iv) Meaning of Kriya its types and principles.
- v) Yogic therapies and modern concept of Yoga
- vi) Naturopathy, Hydrotherapy, Electrotherapy, Messothrapy, Acupressure, acupuncture.

Reference Books :

1. Yoga – Asanas, Pranayam, Mudras, Kriya, Vivekananda Ashram
2. Yoga – Sivanand Yog Vedanta Center

Online Resources:

<https://www.yogatoday.com/>

<https://www.youtube.com/user/yogatoday>

<https://m.youtube.com/user/yogawithadriene/playlists>

MOOCs:

Swayam



BHARATI VIDYAPEETH

(DEEMED TO BE UNIVERSITY)

'A' Grade University Status by Ministry of HRD, Govt. of India

Re-Accredited by NAAC with 'A' Grade

FACULTY OF MANAGEMENT STUDIES

BACHELOR OF BUSINESS ADMINISTRATION

Choice Based Credit System

(BBA – 2018- 21) (CBCS)

SYLLABUS

Course Structure

Applicable with effect from 2018-19

Bharati Vidyapeeth
[Deemed to be University], Pune
Faculty of Management Studies
Bachelor of Business Administration Programme (BBA)
Course Structure & Syllabus
(w.e.f. year 2018-2021)

BBA Program Structure 2018-21.
(As per UGC guidelines – template for BBA – 136 credits)

BBA – Sem I and Sem II w.e.f 2018-19

Semester I					Semester II				
Code		Course Title	Credit	Examination Pattern	Code		Course Title	Credit	Examination Pattern
101	AECC	Business English - Communication.	4	UE & IA	201	AECC	Environmental Science	2	CCA
102	C	Business Organization & Systems	4	UE & IA	202	C	Principles of Management	4	UE & IA
103	C	Micro Economics	4	UE & IA	203	C	Macro Economics	4	UE & IA
104	C	Business Accounting.	4	UE & IA	204	C	Management Accounting	4	UE & IA
105	C	Foundations of Mathematics and Statistics	4	UE & IA	205	C	Business Statistics	4	UE & IA
106	GE	Community Work – I	2	CCA	206	GE	Community Work – II	2	CCA
		Career & Life Skills					Swachha Bharat Abhiyan		
		Waste management					Smart Cities Sectoral Analysis		
		Total Credits →	22					20	

Courses Types

- AECC / SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course (Lab / Practical / Demo etc)
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

BBA Program Structure 2018-21.**(as per UGC guidelines – template for BBA – 136 credits)****BBA – Sem III and Sem IV w.e.f 2018-21**

Semester III				Semester IV					
Code		Course Title	Credits	Examination Pattern	Code		Course Title	Credits	Examination Pattern
301	SEC	Computer Applications for Business(Theory - 3 & Lab -2)	4	CCA	401	SEC	Enhancing Personal & Professional Skills (Theory - 3 & Lab -2)	4	CCA
302	C	Organizational Behavior.	4	UE & IA	402	C	Human Resource Management	4	UE & IA
303	C	Principles of Marketing.	4	UE & IA	403	C	International Business	4	
304	C	Introduction to Financial Management	4	UE & IA	404	C	Business Research	4	UE & IA
305	C	Entrepreneurship Development	4	UE & IA	405	C	Business Laws.	4	UE & IA
306	GE	Community Work	3	CCA	406	GE	Community Work	3	CCA
		Start-up Management					Basics of Taxation		
		Agro Tourism					Yoga - I		
		Total Credits→	23					23	

Courses Types

- AECC/SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course (Lab / Practical / Demo etc)
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

BBA Program Structure 2018-21.**(as per UGC guidelines – template for BBA – 136 credits)****BBA – Sem V and Sem VI w.e.f 2018-21**

Semester V				Semester VI					
Code		Course Title	Credit	Examination Pattern	Code		Course Title	Credit	Examination Pattern
501	SEC	Summer Internship Report & Viva	6	CCA	601	SEC	Industrial Exposure. (Mini Project)	5	CCA
502	C	Services Management	4	UE & IA	602	C	Introduction to Strategic Management	4	UE & IA
503	DSE	Elective Paper – I	4	UE & IA	603	DSE	Elective Paper – III.	4	UE & IA
504	DSE	Elective Paper – II	4	UE & IA	604	DSE	Elective Paper – IV	4	UE & IA
505	C	Introduction to Operations Research	4	UE & IA	605		Disaster Management	4	CCA
506	GE	Social Media Management	2	CCA	606	GE	Business Ethics	3	CCA
		Road Safety & Management					Basics of Hospitality Management		
		Event Management					Yoga - II		
		Total Credits →	24					24	

Courses Types

- AECC/SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course (Lab / Practical / Demo etc)
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment

- UE – University Evaluation
- IA – Internal Assessment

Program Objectives :

The Bachelor of Business Administration (BBA) degree program has the following objective:

- To provide students with an in-depth knowledge of Management and Business concepts
- To provide students with a firm foundation in both theoretical and practical concepts and applications to meet the various needs of business organizations at a global level
- To prepare students for the responsibilities and career opportunities with corporations and as entrepreneurs.

BBA- Sem -V (CBCS 2018)
501: Summer Internship – Report & Viva

Course Code	501	Course Type	SEC
Credits	Six	Examination Pattern	UE + IA: 60:40

Course Objectives:

1. Assist the student's development of employer-valued skills such as teamwork, communications and attention to detail.
2. Expose the student to the environment and expectations of performance in private/public companies or government entities.
3. Enhance and/or expand the student's knowledge of a particular area(s).
4. Expose the student to professional role models or mentors who will provide the student with support in the early stages of the internship and provide an example of the behaviors expected in the intern's workplace.

Learning Outcomes:

The internship helps in connecting organizations with student. This access results in opportunities to consult with real-world companies on real-world challenges, building relationships that can result in lasting connections with successful organizations that students continue to benefit from after graduation.

Details:

At the end of Semester IV a student shall be required to prepare a project in any one of the functional areas of business i.e.

- Marketing Management
- Human Resource Management
- Financial Management.
- International Business Management
- Banking and Insurance Management
- Hospitality Management
- Financial Market

The Summer Training should be conducted in an organization under the guidance of a faculty member . The duration will be for 50 days. The report is to be prepared and submitted to the institute during the semester V.

Reference Books : Follow the Monograph and conduct in coordination with Corporate Resource Center of the Institute

BBA- Sem -V (CBCS 2018)**502: MANAGEMENT OF SERVICES**

Course Code	502	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40

Learning objectives:

- To provide in-depth insight in managing and delivering of quality services
- To create awareness about the services sector, the challenges and opportunities therein.
- To understand the need and importance of people , process and physical evidence in services marketing mix.

Learning outcomes

After studying this course students would be able to

- Understand the challenges and opportunities involved in services sector.
- Understand the aspects of developing new services, promoting the services and making it available in a convenient manner.

Unit 1: Introduction to Services and Service sector

Meaning of Services, Differences between goods and services, Characteristics of Services , Classification of Services, Growth of Service Sector in India, Factors responsible for growth of service sector in India.

Unit 2: Marketing of Services :

7Ps in Service Marketing –

Service Product – service life cycle,

Pricing the Service- factors involved in pricing the services,

Service Location (Place) and Channels of Services,

Promotion and Communication of Services – promotion mix,

People in Services – role of service employees, training of service employees,

Process in Services – service as a process,

Physical Evidence in Services.

Unit 3: Quality of Services:

Meaning of service quality, Importance of service quality, quality issues in services. Role of information technology in improving service quality.

Unit 4: Management Demand and Supply of Services

Patterns and determinants of demand, strategies for managing demand, service capacity management.

Unit 5: Introduction To Management Of Different Service Sectors

Banking Services: - Concept – Scope and Importance, Human Resource Management in banking services,

Hotel Services: - Concept, Scope and Importance, Profile of Services, H. R.M and Customer Care, Management of Hotel Services in India.

Management of Insurance Services : Concept, Scope and Importance

Management of Transport Services : Concept, Scope and Importance, – Passenger transport and Goods transport – Road, Rail and Water Transport. Challenges faced.

Management of Consultancy Services: Concept, Scope and Importance. Types of Consultancy Services – Legal, Technical, Financial, Medical and Managerial.

Management of other Services : Tourism, Entertainment, Education and Telecommunication: Introduction, Formulation of Marketing mix of these Services.

Reference Books:

- 1) Service Management & Marketing – Christian Gronroos – Wiley India Edition
- 2) Services Marketing – Text & Cases : Vinnie Jauhari , Kirti Dutta 2nd Edition – Oxford University Press
- 3) Services Marketing – S.M. Jha Himalaya Publishing House
- 4) Services Marketing - Dr. Shahjahan
- 5) Services Marketing – K. Ram Mohan Rao
- 6) Services Marketing - Valarie A, Zeithaml& Mary Joe Bitner, Tata McGraw Hill Publications.

Journals

1. Journal of Service Management- Emerald Insights
2. European Journal of Service Management

Online reference

<https://www.khanacademy.org>

http://www.pondiuni.edu.in/storage/dde/downloads/markiv_sm.pdf

<https://www.scribd.com>

MOOCs

<https://www.mooc-list.com/course/services-marketing-selling-invisible-openlearning>

NPTEL

BBA- Sem -V (CBCS 2018)**505: INTRODUCTION TO OPERATIONS RESEARCH**

Course Code	505	Course Type	Core Course
Credits	Four.	Examination Pattern	UE + IA: 60:40

Course Objective

The objective of the course is to familiarize the students with the tools & techniques of Operation Research.

Learning Outcome

Students will be able to understand the practical importance and applications of various operations research techniques.

UNIT 1

Definition of Operations Research (OR), Origin and Development of OR, Scope of Operation Research, Advantages and Limitations of OR.

UNIT 2

Linear Programming Problem-LPP, Formulation of LP Problem, Graphical solution – Procedure of solving LPP by Graphical method. Applications and limitations of LPP

UNIT 3

Transportation Problem, meaning, definition and applications, Applications of Transportation Problem, Types of Transportation problems. Initial Basic Feasible Solution – North West Corner Rule, Least Cost or Matrix Minima Method, Vogel's Approximation method. Checking for optimality, Finding optimal solution by MODI method.

UNIT 4

Assignment Problem- meaning, definition and applications, Types – unbalanced and maximization, assignment problem. Hungarian method for solving assignment problem.

UNIT 5

Network Analysis - importance of network analysis, construction of networks. Critical Path Method (CPM) - calculation of earliest and latest times, types and computation of floats. Program Evaluation and Review Technique (PERT) - 3 time estimates, expected duration.

Reference Books :

1. Operations Research – Hira and Gupta S. Chand
2. Operations Research – Pai, Oxford University Press
3. Operational Research – Dr. P.R. Vital
4. Operational Research – Handy and A. Tata.
5. Statistical Methods and Operation Research – S.P. Gupta

Online Resources:

<https://www.khanacademy.org>

<http://web.itu.edu.tr/topcuil/ya/OR.pdf>

Moocs:

www:/Alison
www/SWAYAM
www/NPTEL

BBA- Sem -V (CBCS 2018)
506: Social Media Management

Course Code	506	Course Type	GE
Credits	Two.	Examination Pattern	CCA : 50 marks

Course Objectives:

This Course Teaches students to use social media strategically to create value for a client or organisation..

Learning Outcome:

- a) Students will learn by doing assignments focusing on social media, post writing and publishing, management and measurement tools, a social media audit, editorial calendar and crises management.
- b) Students will master the skills necessary to become successful social media managers.

Unit 1: Introduction To Social Media

Introduction to Social Media, importance of social Media, History and evolution of Social Media, Managing Information, Aggregators. Facebook, Twitter, Instagram, LinkedIn, Youtube, Blogs.

Unit 2: Using Social Media

Strategy Plan for Social Media Management, Touchpoint, Analysis Scheduling, Creating Content, Managing Content programmes, Planning Worksheet, Social media campaign.

Unit 3: Evaluating Social Media

- Evaluation of Social Media Platforms
- Tools to manage and measure performance of social media content and campaigns
- Handling critical issues in social media management and legal aspects of social media.

Unit 4: Setting-up own professional site

Content management, design, connectivity with social media

Assignments:

1. Explain atleast one social media management tool in detail.
2. Describe social media analytics tool in brief with example.
3. Detailed social media campaign: The campaign can be any example presented in social media for Lead Generation. Describe the objectives for campaign, outline the tools, prepare budget for campaign.
4. Budget for social media plan: Based on the understanding of your client, prepare a budget for social media management. Include the individual cost of your tactics, your proposed social media campaign and social media tools. Include the total cost as a bottom line of your budget. Include the ROI of your plan and why that budget should be allocated to social media.

5. List different types of content to be used in creating brand by using social media campaigns. Describe merits and demerits of each type of content used in social media.

Reference Books

1. Guy Kawasaki & Peg Fitzpatrick, “The art of social media: power tips for power users
2. Social media marketing all in one for dummies, Jan Zimmerman & Deborah N
3. Social media explained by Mark W. Schaefer

Online resources

http://www.gov.pe.ca/photos/original/IPEI_ebiz_smmkt.pdf

<https://www.coursehero.com/file/10513028/Media-Management-Notes/>

BBA- Sem -V (CBCS 2018)**506: Road Safety Management**

Course Code	506	Course Type	GE / AECC
Credits	Two.	Examination Pattern	CCA : 50 marks

Course Objectives:

The vehicle population in India is growing at an exponential rate. This phenomenon is bringing in its wake a host of health related, environmental, safety and behavioral problems in the society. The problem is compounded due to absence of effective means of mass transportation system in most big cities in India.

Learning Outcomes:**Unit 1 : Introduction to Road Safety Management**

Importance and need of road safety management.

Unit 2: Management of Traffic and Traffic Rules.

Use of traffic signals, signs by hand, knowledge/applications of automatic signals, parking rules, driving around, Traffic islands ,traffic joints, subways and flyovers. Signs of roads: meaning of yellow, green and red lights, zebra crossings, bus stops, use of road by physically disadvantaged persons, elderly persons,women and children, special right of way for ambulance, firefighting vehicles,school bus and V.I.P vehicles

Unit 3 : Management of Road Mishaps and Accidents:

First aid to accident victims- First aid techniques, co-ordination with hospitals and other health centres for emergency treatment of accident victims, role of Insurance companies in providing relief to accidents victims, Management of Ambulance Services, Importance of voluntary blood donation in saving accident victims,Rehabilitation of persons affected by accidents.

Qualities of a good Driver: Good health, tolerance, responsibility, knowledge of rules and laws, self confidence, politeness, familiarity with the vehicle and its maintenance requirements, self discipline.

Reference Books :

- 1) Pratibha Shastri Ranade , Road Safety Management, ICFAI University
- 2) Vijay Vinayak Revankar, Road Safety – Vimleshwar Automobile Industry and Road Safety Community Forum

Online Resources:**MOOCs:**

Alison

BBA- Sem -V (CBCS 2018)**506: Event Management**

Course Code	506	Course Type	GE /AECC
Credits	Two.	Examination Pattern	CCA : 50 marks

Course Objectives:

The basic purpose and spirit of this course is to expose the students to hands- on experience of event management.

Learning Outcomes:

The students are oriented to event management in order to strengthen their skills of planning, organizing and other such management functional skills.

Unit 1:

(8 hours)

Introduction to Event Management

The concept of event. need and importance of events.

Unit 2:

(10 hours)

Types of Events

Different types of event in Corporates, Social Programmes and Private Programmes.

Following units are entirely based on practice part of the event management.

Unit 3: Assessment of Events

(12 hours)

Post event assessment of any 05 programmes

A student or a group of 03 students shall be assigned the event which has taken place in near past at any place and they shall make an inquiry into its success and effectiveness by rating them on the basis of appropriate parameters and shall submit the assignment to the respective teacher .

Preparation of Learning Value report :

A student shall prepare a report on what he learnt from the events and submit it to the concerned teacher. The report shall include mainly the description of occasion, the person involved and what guiding principles they have received from them

Reference Books :

4. S. R. Singh, Event Management, HPH.
5. Alex Genadelik, Event Planning: Management & Marketing For Successful Events: Become an event planning pro & create a successful event series

Online Resources:

<https://blog.komodoplatfrom.com/notes-on-social-media-and-community-management-for-blockchain-cryptocurrency-and-ico-projects-4d0f328bdfb3>

MOOCs:

Alison

BBA- Sem -VI (CBCS 2018)**601 : INDUSTRIAL EXPOSURE (Mini Project)**

Course Code	601	Course Type	AECC
Credits	Five.	Examination Pattern	CCA : 100 marks

Course Objectives:

- i. To enhance the awareness of the students towards the study and use of Trade and Industry directories, business websites, published data & information relating to trade, commerce & industry.
- ii. To enable the students to gain knowledge and understanding of a business system and activities involved therein and acquire experience by seeking association or intervention in the system

Learning Outcomes:

Unit 1 : (12 hours)

The students have to individually visit a service organization like hospital, hotel, bank etc. He has to observe the functioning of the organization. He can have formal and informal discussions with the employees, managers, owners etc. of the organization. Based on this he has to write a report of the visit in the journal.

Unit 2:

(14 hours)

An Industrial Visit should be organized to any manufacturing industry in the vicinity by the Co-ordinator in which all the students have to participate. They have to observe the activities of the organization; they can have formal and informal dialogs with the authorities of the organization. Based on this visit they have to write visit report individually in the Journal.

Unit 3:

(12 hours)

Specific industries like Agriculture, food processing, furniture, garment, insurance, pharmaceuticals, banking, film, wine, paper etc. will be assigned to individual student or a group of two students. The students are expected to collect the information about the industry's history, present practices, products, players in the industry, trends in the industry, contribution of the industry to the development of the nation, future of the industry etc. by referring newspapers, journals, periodicals, business, magazines and different websites etc.

Unit 4:

(10 hours)

Based on data collection in Unit 3, the students have to give the presentation of this industry in the class. The presentations will be evaluated on the basis of its content, information gathering, explanation etc. The students are also expected to prepare a scrapbook for this industry study. The students have to also write an overview of the industry in the Journal.

Unit 5:

(12 hours)

The student will be assigned any specific trade organization like FICCI, Indian Tea Association, Indian Chamber of Commerce & industry, ASSOCHAM, CII, Hotel Association of India, Indian Agro Paper Mills Association etc. By the Co-ordinator. The students have to search the information relating to this trade organization through internet websites and other sources. Students have to write a detailed profile and functioning of the trade organization in the Journal.

Note : Students have to give Viva-Voce at end of the semester based on their performance in the assignments during the term.

Mode of Evaluation:

The performance of the Students in this course will be evaluated as under.

- A) Internal evaluation (Class Participation) – 20 marks
- B) Oral presentation by the student based on the assignments performed in the class during the Term – 20 Marks
- C) Journal maintained by the student – 20 Marks
- D) Viva-voce at the end of the term based on the assignments performed – 40 Marks

BBA- Sem -VI (CBCS 2018)**602 : INTRODUCTION TO STRATEGIC MANAGEMENT**

Course Code	602	Course Type	Core
Credits	Four.	Examination Pattern	UE & IA : 60+40

Course Objectives:

- to understand the concept of strategy formulation and business policies for effective business functioning in an environment of change.
- to identify the opportunities and threats in environment critical internal appraisal of resources within an organization, so as to develop corporate and business strategies.

Learning Outcomes:

The students will learn the main concepts and thought processes in strategic management. Develops strategically as clear thinking rather than the blind use of other people's concepts.

Unit 1: Introduction to Business Policy and Strategic Management.**10 Hr.**

Concept, Nature, Importance, Objectives of Understanding Strategy- meaning and definition, Benefits of strategic management. Introduction, Meaning, Components of strategic management process. Vision, Mission, Objectives and Goals, Levels of Strategies.

Unit 2: Internal and Environmental Analysis.**10 Hr.**

Environmental Analysis- Competitive analysis, Michael Porters- Five forces model.
Internal Analysis- SWOT analysis, Identification of Distinct competencies.

Unit 3: Strategic Analysis and Choice**12 Hr.**

Strategic Analysis and Choice in Business Strategic alternatives
Evaluating and choosing Business strategies BCG matrix, Ansoff Matrix, GE9 Cell.

Unit 4: Corporate and Business Strategies**14 Hr.**

Foundations of Business Strategies, Types of business strategies. Levels of strategies, Various Corporate Strategies.

Unit 5: Strategic Implementation and Control.**14 Hr.**

Designing organizational structures for strategic implementation. Understanding strategic evaluation and control. Types of Control. Techniques of strategic evaluation and control.

Books Recommended:

1. Understanding Strategic Management by Anthony Henry, Oxford University Press
1. Strategic Management by Chandrasekaran & Ananthanarayanan, Oxford
2. Business Policy and Strategic Management; AzharKazmi; Tata McGraw Hill.
3. Business Policy and Strategic Management; N.S. Gupta; Himalaya Publishing House.
4. Management Policy and Strategic Management; Prof. R. M. Srivastava; Himalaya Publishing House.

5. Business Policy and Strategic Management; William F. Glueck / Lawrence R. Jauch; McGraw-Hill series.

Supplementary Readings

1. Gerry Johnson & Kevan Scholes, Exploring corporate strategies, PHI
2. Upendra Kachru: Strategic Management, Excel books
3. Arthur A. Thompson Jr. and A.J. Strickland: Strategic Management –Concepts and Cases, McGraw-Hill Companies
4. Lawrence R. Jauch & William F. Glueck: Business Policy and Strategic Management (Mcgraw Hill Series in Management).

Online Resources: **Web Resources:**

<https://www.strategicmanagementinsight.com/>
http://www.1000ventures.com/bec_bestsites_strategy.html

MOOCs: **MOOCS:**

<https://www.mooc-list.com/>
<https://www.coursera.org/>
<https://swayam.gov.in/>
<https://alison.com/>

BBA- Sem -VI (CBCS 2018)**605: Disaster Management**

Course Code	605	Course Type	GE
Credits	Four.	Examination Pattern	CCA : 100 marks

Course Objectives:

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)

Learning Outcomes:

Students will be able to develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

Unit 1:**(6 hours)**

Introduction to Disasters: Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks)

Unit 2:**(12 hours)**

Disasters: Classification, Causes, Impacts (including social, economic, political, environmental, health, psychosocial, etc.) Differential impacts- in terms of caste, class, gender, age, location, disability Global trends in disasters -urban disasters, pandemics, complex emergencies, Climate change

Unit 3:**(10 hours)**

Approaches to Disaster Risk reduction: Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, Centre, and other stake-holders.

Unit 4:**(8 hours)**

Inter-relationship between Disasters and Development: Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources

Unit 5:**(12 hours)**

Disaster Risk Management in India Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

Project Work: (Field Work, Case Studies) The project /fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located.

Suggestions For Project Work :

- ask students to explore and map Disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teachers could work on ways of addressing these vulnerabilities, preparing plans in consultation with local administration or NGOs.
- Students may conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings)training in first aid. Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work.

Reference Books:

1. Disaster Management by R Subramanian – Vikas Publishing House
2. R. B. Singh, Disaster Management and Mitigation
3. Satish Modh – Introduction to Disaster Management, Macmillan Publishers India
4. Palaveniel Kathireshan, Disaster Management, Allied Publishers 2015.
5. Larry Collins, Disaster Management and Preparedness, CRC Press

Online Resources:

<https://ndma.gov.in/en/>

<https://www.linkedin.com/pulse/disaster-management-definition-process-various-phases-chatterjee/>

MOOCs:

www/Swayam

www/Alison

BBA- Sem -VI (CBCS 2018)**606: BUSINESS ETHICS**

Course Code	606	Course Type	GE /AECC
Credits	Three.	Examination Pattern	CCA : 50 marks

Course Objectives:

The objective of this paper is to make the students more clear about the importance of ethics in business and practices of good corporate governance. It also talks about the corporate social responsibility

Learning Outcomes:

This course exposes the student to the issues of values and ethics in management so that decision making and decision execution are undertaken in a human manner, as this will add to the flexibility and dynamism of the corporate culture.

The course will take the student from managerial ethics to organizational ethics and business sustainability

Unit 1:**(12 hours)**

Ethics – Meaning, and Nature of Ethics. Types of Ethics, Importance of Ethics.

Business Ethics : Meaning, Nature and Importance of ethics in business, meaning of corporate social responsibility, Relation between corporate responsibility & Business Ethics.

Unit 2:**(14 hours)**

Concept of Morals, Values, Beliefs; Moral issues in business, Spirituality and Ethics; Influence of Major religions on ethics: Hinduism, Islam, Christianity, Buddhism, Sikhism, and Zoroastrianism. Influence of spirituality on ethics.

Unit 3:**(12 hours)**

Relationship between Business, Business Ethics & Business Development, Role of Business ethics in building a good society.

Case Studies on Business Ethics

Reference Books :

1. Management by Values; Chakraborty S.K.; OxfordUniversity Press, Kolkata 2005.
2. Professional Ethics by R. Subramanian, Second Edition, OXFORD
3. Theory and Practice of Managerial Ethics; Jayashree S. Sadri S. and Dastoor D.S.; Jaico , Mumbai.
4. New Mantras in Corporate Corridors, Sharma Subash New age International Publishers, New Delhi 2007.
5. Business Ethics and Corporate Governance (towards excellence and sustainability); Sadri S., Jayashree. Himalaya Publishing Co. Mumbai 2011.
6. Managing from the Heart: Unfolding spirit in people and organization; Wakalu, Arun: Response Books, New Delhi
7. Manuel G Velasquez : Business ethics- concepts and cases Pearson.
8. Bhanumurthy K V: Ethics and Social Responsibility of Business, Pearson Education India.

Online Resources:
https://managementhelp.org/businessethics/index.htm
MOOCs:
https://www.edx.org/learn/business-ethics

<p>Course Code : 606</p> <p>BBA- Sem -VI (CBCS 2018)</p> <p>Basics of Hospitality Management</p>	
Credits : Three	CCA
Course Type : GE	
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. Recognize scope and career in the hospitality industry. 2. Identify the major segments and specialization of the industry and their operations. 	
Learning Outcomes:	
<p>Unit 1:</p> <p>Introduction to the Hospitality Industry:</p> <ol style="list-style-type: none"> a. History and scope of the hospitality industry. b. Economic impact of the hospitality and tourism industries. c. Careers in the industry. d. Link between hospitality and travel and tourism. e. Major segments and specialization of the industry. f. medical tourism 	(8 hours)
<p>Unit 2:</p> <p>Recreation/Travel and Tourism:</p> <ol style="list-style-type: none"> a. Operation of recreational facilities such as resorts, spas, theme parks, and clubs. b. Meetings, conventions, exhibitions, banquets, and other events. c. Travel agencies and concierge desks. d. Gaming entertainment industry. 	(10 hours)
<p>Unit 3:</p> <p>Operations:</p> <ol style="list-style-type: none"> a. Leadership and management in the industry. b. Hospitality marketing. c. Human resources and risk management and safety procedures. 	(12 hours)
Reference Books :	
<ol style="list-style-type: none"> 1. Introduction to Hospitality Management, John R. Walker ,Pearson 2. Food and Beverage Service, D.R. Lillicrap,John A. Cousins & Suzanne Weekes, Book Power. 	

3. Food and Beverage Management, Bernard Davis , Sally Stone, Butterworth Heineman Ltd.
4. Hotel House Keeping and Management, Raghubalan, Oxford University Press.
5. Managing Front Office Operations, Michael Kasavanna, Richard Brooks , Charles Steadmon, AH&LA.

Online Resources:
[www/youtube.com](http://www.youtube.com)

MOOCs:
<https://www.ifitt.org/hospitality-and-tourismmoocs/>

Course Code : 606 BBA- Sem -VI (CBCS 2018) Yoga II (OPEN)	
Credits : Three	CCA
Course Type : GE	
Course Objectives: This course is aimed at elucidating the core knowledge contained in the science of Meditation.	
Learning Outcomes:	
Unit 1: <ul style="list-style-type: none"> ▪ Patanjali Yog Shastra Introduction* ▪ Meditation and its origin Concentration and Self Discipline Proper Food and Behaviour ▪ Omkar Meditation Omkar and its effects, Omkar Meditation –Posture, Process, Benefits. 	(12 hours)
Unit 2: <ul style="list-style-type: none"> ▪ Introduction of Kriya, Bandha and Mudra. ii) Importance of Kriya and its scientific approach. iii) Importance of BANDHA and its scientific approach. iv) Importance of MUDRA and its scientific approach. v) Effect of Asanas on various Systems vi) Difference between Asana and Exercise. vii) Difference between Pranayama and deep breathing. iv) Yogic Diet. 	(14 hours)
Unit 3: <ul style="list-style-type: none"> ▪ Yogasanas and Pranayam ▪ Basic Yogasanas for beginners Bhastrika, bhramari, Anulom Vilom Pranayam –process, practice and its benefits ▪ Sun salutation Origin of Suryanamaskara and Yogasanas in India, ▪ Sun Salutation -Process, Practice and Benefits, Influence of suryanamaskar on health and wellness of individual, impact on weight loss 	(12 hours)
Reference Books : 1. Yoga – Asanas, Pranayam, Mudras, Kriya, Vivekananda Ashram 2. Yoga – Sivanand Yog Vedanta Center	
Online Resources: https://www.yogatoday.com/ https://www.youtube.com/user/yogatoday https://m.youtube.com/user/yogawithadriene/playlists	

MOOCs:
Swayam

Marketing Management Elective.		
Elective	Code	Course
Elective – I	M503	Consumer Behavior
Elective – II	M504	Sales and Distribution Management.
Elective – III	M603	Integrated Marketing communication
Elective – IV	M604	Digital Marketing

Finance Management		
Elective	Code	Course
Elective – I	F503	Elements of Financial Services
Elective – II	F504	Introduction to Management Control Systems
Elective – III	F603	Elements of Corporate Finance
Elective – IV	F604	International Finance and Financial Risk Management

Human Resource Management		
Elective	Code	Course
Elective – I	HR503	Performance & Compensation Management
Elective –II	HR504	Training & Development
Elective – III	HR603	Management of Industrial Relations
Elective – IV	HR603	Cross Cultural HRM

International Business Management		
Elective	Code	Course
Elective – I	IB503	International Marketing
Elective – II	IB504	Export Import Procedures and Documentation
Elective – III	IB603	Basics of International Finance
Elective – IV	IB604	Fundamentals of International Economics

Entrepreneurship Development		
Elective	Code	Course
Elective – I	ED503	Entrepreneurship & New Ventures Creation
Elective – II	ED 504	Corporate Entrepreneurship
Elective – III	ED 603	E - Commerce
Elective – IV	ED 604	Managing Family Business

Financial Market		
Elective	Code	Course
Elective – I	FM503	Introduction to Financial Markets and Financial Institutions
Elective – II	FM504	Capital Market Operations
Elective – III	FM603	Commodity Markets
Elective – IV	FM604	Introduction to Derivatives : Equity and Currency

BBA Specialization : Marketing Management

Marketing Management		
Elective	Code	Course
Elective – I	M503	Consumer Behavior
Elective – II	M504	Sales and Distribution Management.
Elective – III	M603	Integrated Marketing communication
Elective – IV	M604	Digital Marketing

BBA- Sem -V (CBCS 2018)
MK 503: Consumer Behavior

Course Code	MK 503	Course Type	Discipline Specific Elective (DSE-II Marketing)
Credits	Four.	Examination Pattern	UE + IA: 60:40

Learning objectives:

- 1 To highlight the importance of understanding consumer behavior in Marketing.
- 2 To study the environmental and individual influences on consumers
- 3 Understand the importance of consumer behaviour in designing marketing strategies.
- 4 To understand consumer behavior in Indian context.

Learning outcomes : After studying this course student are able to

- 1 Understand the consumers' attitude towards a particular product / service in a better manner.
- 2 Use the factors that influence the consumers' buying behaviour in determining the marketing mix strategies.
- 3 Identify new market segments to cater to their needs
- 4 Design effective marketing strategies

Unit 1	INTRODUCTION Meaning of Customers & Consumers, Importance / relevance of consumer behaviour studies in the field of Marketing.	04 Hrs
Unit 2	Individual Determinants of Consumer Behavior Personality & Self Concept: Meaning of Personality, Influence on Purchase Decisions Motivation & Involvement: Types of Buying Motives, Motive Hierarchy, Dimensions of Involvement Learning & Memory: Meaning & Principal Elements of Learning, Characteristics of Memory Systems, Recall Attitudes: Meaning & Characteristics, Strategies for Changing Attitudes	14Hrs
Unit 3	External determinants of consumer behaviour: Culture, subculture, social class & reference group	10 Hrs
Unit 4	Consumers' Buying Decision Making Process, Post-purchase Evaluation & Behavior: Consumer Satisfaction, Dissatisfaction, Customer Delight, Consumer Complaint Behavior and Post- Purchase Dissonance. Types of Buying Behavior: Complex, Extensive, Dissonance Consumer buying Vs. Organizational buying. Consumer Behavior Models Howard Sheth Model, Nicosia model	12Hrs
Unit 5	Diffusion of innovation: meaning and definition, diffusion process. The adoption process.	05 Hrs

Reference books

- | | | |
|---|--|---|
| 1 | Consumer Behaviour by David L. Loudon & Albert J. Della Bitta, | Tata McGraw Hill, 4 th Edition |
| 2 | Consumer Behavior by Leon Schiffman, Leslie Kanuk, S.Ramesh Kumar, | Pearson, 10 th Edition |
| 3 | Consumer Behavior - In Indian Perspective by Suja R. Nair, | Himalaya Publishing House. |
| 4 | Consumer Behaviour & Marketing Action : Henry Assael , | Thompson Learning |
| 5 | The Marketing Whitebook | Current year issue |

Journals and E-journals

1. Journal of Consumer Behaviour
2. Journal of consumer Research
<https://onlinelibrary.wiley.com/journal/14791838>

MOOCS:

1. <https://swayam.gov.in/course/3578-consumer-behaviour>
2. <https://alison.com/courses/applied-psychology-understanding-models-of-consumer-behavior/content>

BBA- Sem -V (CBCS 2018)**MK 504: Sales and Distribution Management.**

Course Code	MK 504	Course Type	Discipline Specific Elective (DSE-II Marketing)
Credits	Four.	Examination Pattern	UE + IA: 60:40

Learning objectives:

1. To acquaint students with fundamentals of Sales and Distribution Management
2. To impart to the students an understanding of Sales and distribution Management principles with a view to prepare them to face challenges of managing businesses in the new era.

Learning outcomes : After studying this course student are able to

- 1 ➤ Understand the challenges and opportunities involved in managing sales and distribution .
- 2 ➤ Manage the issues related to handling sales organization effectively.
- 3 ➤ Understand the aspects of developing distribution channels

Unit 1	Evolution of Sales management, Nature and Importance of Sales Management. Definition, meaning and objectives of Sales Management. Role and skills of sales manager, recent trends in Sales Management. Sales Organisation: Need for Sales Organizations, their structure, Recruitment and selection of sales persons, developing and conducting sales training programmes for newly appointed as well as experienced salespersons.	15 hrs
Unit 2	Sales forecasting: meaning, methods of sales forecasting- quantitative and qualitative methods. Sales quotas: need and importance of sales quotas , types of sales quotas Designing and Administering Compensation Plans – Leading and Motivating the Sales Force .	10 hrs
Unit 3	Sales Territory: meaning , need and Sales force performance appraisal : methods Personal selling: Process, steps involved therein.	10 hrs
Unit 4	Sales Control Techniques-Sales analysis, Sales Audit.	10 hrs
Unit 5	Introduction to Distribution Mix- components, channels of distribution, role and functions of wholesaler and retailer, Channel conflicts. Recent trends in distribution, Case Studies (unit I to unit V)	15 hrs

Reference books

- 1 Sales And Distribution Management Text And Cases-Krishna K.Havaldar, Vasant Kavale Tata

Mc'Graw Hill Publications

- 2 Sales Management- S. A. Chunnawalla- Himalaya Publishing House, Mumbai
- 3 Sales Management – Still R R , Cundiff E W, Govani PHI
- 4 4Channel Management & Retail Management – Meenal Dhotre
- 5 The Marketing Whitebook

Online references:

https://www.tutorialspoint.com/sales_and_distribution.../sales_and_distribution_manag...

<https://www.marketing91.com › SALES MANAGEMENT>

MOOCS:

1. <https://alison.com/course/diploma-in-sales-management>
2. <https://alison.com/course/introduction-to-sales-management>

BBA- Sem –VI (CBCS 2018)
MK 603: Integrated Marketing Communication.

Course Code	MK 603	Course Type	Discipline Specific Elective (DSE-II Marketing)
Credits	Four.	Examination Pattern	UE + IA: 60:40

Learning objectives:

1. To have a working knowledge of the tactical and strategic aspects of IMC
2. Be able to apply specific tools and approaches to common marketing communications challenges
3. Be able to assess the progress of IMC efforts over time
4. To have an opportunity to analyze IMC programs and build innovative programs

Learning outcomes : After studying this course student are able to

- 1 Understand the tactical and strategic aspects of IMC
- 2 Design IMC programs
- 3 Analyze IMC programs

Unit 1	IMC FOUNDATION Overview of Communication and IMC programs - IMC Plan - IMC Components- Above the Line (ATL), Below the line (BTL) and Through The line (TTL) promotion - Push and Pull strategy	06 Hrs
Unit 2	IMC ADVERTISING TOOLS a) Introduction of Advertising- Functions & Types of Advertising - Objections on Advertising- Structure of Advertising Agency – Role and Services offered by Agency- b) Media Mix- Media Vehicle- Ad copy – Appeals in advertising- Advertising budget c) Media planning and execution.-Media Plan and schedule.	12Hrs
Unit 3	IMC PROMOTIONAL TOOLS a) Sales Promotion- Trade promotion -Consumer promotion- coupons, Premiums, contests, Sweepstakes, refund and Rebate, Sampling, Bonus , packs, price off- Sales force promotion b) Public relation(PR), Types of PR-	10 Hrs
Unit 4	IMC CONTEMPORARY TOOLS Recent Trends - Product placement and Branding in films, Product placement on television,	12Hrs
Unit 5	IMC EVALUATING AND CONTROL a) Need & Significance of IMC evaluation and control b) Methods for Measurement of Advertising effectiveness	05 Hrs.

Reference books :

1. Advertising and Promotions IMC Perspectives: Belch and Belch Tata McGraw Hill, 6/e, 2003
2. Advertising 'An IMC Perspective' - S. N. Murthy , U.Bhojanna -Excel Books, 2007.
3. Advertising & Integrated Brand Promotion, O'Guinn, Allen, Semenik, 4/e, Thomson, 2007
4. Integrated Advertising, Promotion, and Marketing Communications, Clow, Baack, 3/e, Pearson Education, 2007
5. Advertising and Promotion: S.A.Chunawalla
6. Foundations of Advertising, Chunawalla & Sethia, HPH, 2007

Journals:

1. Journal of Integrated Marketing Communications
2. Journal Advertising

Online references:

MOOCS:

<https://swayam.gov.in/course/3984-advertising-and-public-relations>

BBA- Sem –VI (CBCS 2018)**MK 604: Digital Marketing**

Course Code	MK 604	Course Type	Discipline Specific Elective (DSE-II Marketing)
Credits	Four.	Examination Pattern	UE + IA: 60:40

Learning objectives:

1. To acquaint students with fundamentals of Digital Marketing and give an overview of benefits of digital marketing.
2. To impart to the students an understanding of applications of digital marketing strategies to business concepts with a view to prepare them to face challenges of managing businesses in the new digital era.

Learning outcomes : After studying this course student are able to

- 1 Students should be able to use internet effectively as a marketing tool
- 2 Students will be able to get insights on how organizations can leverage the benefits of social media.

Unit 1	Introduction to Digital Marketing Introduction, Nature, scope and use of digital marketing, Recent trends in digital marketing. Digital Revolution in India.	10 hrs
Unit 2	The Online Marketing Mix E- Products Segmentation, Targeting and Positioning E-Price The Online Value E-Promotion The digital revolution in India, Understanding the digital business, Increasing customer base through digital marketing strategies.	15 hrs
Unit 3	The Online Consumer Marketing in a virtual world,. Customer expectation and perception, Online Consumer behavior , Establishing trust in Digital Business.	15 hrs
Unit 4	CRM in digital world CRM- Concept, Nature, scope, benefits, e-CRM, Benefits of e- CRM.	10 hrs
Unit 5	Social Media Role of social media in digital marketing, Advantages and disadvantages of social media, Advertising on social networking.	10 hrs

Reference books :

1. Digital Marketing R Prasad
2. Virtual Marketing Sameer Kulkarni
3. Digital Marketing : Vandana Ahuja(Oxford University press)
4. Web Marketing by Arnold, et al

Journals:

- European Journal of Marketing
- Journal of Digital and Social media marketing
- [https://www.amazon.in/Digital-Marketing-Analytics-Making-Consumer/dp/0789750309/ref=pd_sim_14_2? encoding=UTF8&psc=1&refRID=RPS1MEAY5MH5MYHWE03A](https://www.amazon.in/Digital-Marketing-Analytics-Making-Consumer/dp/0789750309/ref=pd_sim_14_2?encoding=UTF8&psc=1&refRID=RPS1MEAY5MH5MYHWE03A)

https://www.amazon.in/Epic-Content-Marketing-Different-Customers/dp/0071819894/ref=pd_sim_14_1? encoding=UTF8&psc=1&refRID=RPS1MEAY5MH5MYHWE03A

Online references:

MOOCS: Online references:

<https://learndigital.withgoogle.com/digitalunlocked/certification>

<https://www.coursera.org/specializations/digital-marketing#courses>

BBA Specialization : Finance Management

Finance Management		
Elective	Code	Course
Elective – I	F503	Elements of Financial Services
Elective – II	F504	Introduction to Management Control Systems
Elective – III	F603	Elements of Corporate Finance
Elective – IV	F604	International Finance and Financial Risk Management

BBA- Sem -V (CBCS 2018)**FM 503: ELECTIVE – I : FINANCIAL MANAGEMENT
(ELEMENTS OF FINANCIAL SERVICES)**

Course Code	FM503	Course Type	Discipline Specific Elective (DSE I - ELECTIVE – I :
Credits	Four.	Examination Pattern	UE + IA: 60:40

- **Learning objectives:**
- To introduce the students about Indian Financial Systems and current developments
- To orient about various financial services available

Learning outcomes : After studying this course student are able to

- 1 • Components of Indian Financial Systems
- 2 • Importance and utility of Financial Services

Unit – I : Introduction to Financial Services. (10 Hrs.)

- Financial systems and Economic Development
- Indian Financial systems and Organization Structure.
- Financial Services – Meaning, Concept and Importance of Financial Services

Unit – II: Types of Financial services: Fund Based and Fee based (15 Hrs.)

- Leasing and Hire Purchase finance.
- Factoring and forfeiting.
- Bills Discounting.
- Concept and Importance of Insurance, Types of Insurance
- Merchant Banking
- Underwriting
- Investment Banking

Unit – III: Mutual Funds and Services. (11 Hrs.)

- Significance of Mutual Funds its Importance, Types and Advantages Current Scenario.
- Parameters for evaluation of Mutual funds Schemes

Unit –I V: Credit Rating. (12 Hrs.)

- Meaning and Importance of Credit Rating.
- Functions and Role of Credit Rating agencies in India

Unit – V: Venture Capital Financing. (12 Hrs.)

- Meaning and features of Venture Capital.
- Types of Venture Capitalist.
- Stages of Venture financing, Factors affecting Venture Capital financing.

Reference books :

- 1) Financial Services – M.Y. Khan. Tata Mc. Graw Hill.

- 2) Indian Financial System – M.Y. Khan Tata Mc. Graw Hill.
- 3) Financial Institutions and markets, L.M. Bhole, Tata Mc. Graw Hill.
- 4) Financial Markets and Services, Gordon, Natarajan.
- 5) Merchant Banking, J.C. Verma, Bharat Publications.

Online references:

MOOCS:

- <https://swayam.gov.in/>
- <https://alison.com/>:

Web resources:

www.moneycontrol.com
www.rbi.org.in
www.icai.org
<https://www.sebi.gov.in>
<https://www.nseindia.com>
<https://www.bseindia.com>

BBA- Sem -V (CBCS 2018)**FM 504: ELECTIVE – II : FINANCIAL MANAGEMENT
(Introduction to Management Control Systems.)**

Course Code	FM 504	Course Type	Discipline Specific Elective (DSE II)
Credits	Four.	Examination Pattern	UE + IA: 60:40

- **Learning objectives:**
- To introduce to the significance and role of Management Control System in the organization
- To orient the students about application of techniques of Management Control

- Learning outcomes :** After studying this course student are able to
- Importance and utility of Management Control System
 - Application of techniques of Management Control

Unit – I : Introduction to Management Control Systems. (12 Hrs.)

- Definition, Concept of Management Control,
- Nature Characteristics of Management Control System,
- Areas and Process of Control,
- Efficiency and Effectiveness of Control

Unit – II: Motivational Techniques. (12 Hrs.)

- Management By Objective.
- Merits of Establishment of MBO in organization.
- Zero Base budgeting.
- How Zero Base Budgeting works and its advantages.

Unit – III: Responsibility Centre and Transfer Pricing. (12 Hrs.)

- Concept of – Cost Centre, Profit Centre, Revenue Centre & Investment Centre.
- Problems of Profit Centre.
- Meaning and Significance of Transfer Pricing.
- Objectives of Transfer Pricing.
- Transfer Pricing Methods.
- Simple problems of Transfer Pricing.

Unit – IV: Budgetary Control and Variance Analysis. (14 Hrs.)

- Objective of Budgetary Control.
- Advantages and Limitations of Budgetary Control.
- Fixed, Flexible and Functional Budgets.
- Problems on Flexible Budget and Cash Budget.
- Concept and Importance of Standard Costing
- Material and Labour variance Analysis (Theory and Practical)

Unit – V: Internal Audit.**(10 Hrs.)**

- Internal Audit under MCS.
- Cost Audit its Objectives and Advantages.
- Management Audit its Objective and Advantages.

Reference books :

- 1) Management Control Systems, Robert N Authony, Vijay Govindrajan, The McGraw Hill.
- 2) Management Control Systems, Joseph A. Maciariello, Calvin j. Kirby. PHI Learning Private Limited.
- 3) Advance Cost and Management Accounting, V.K. Saxena, C.D. Vashist, (Text), Sultan Chang & Sons.
- 4) Cost & Management Accounting, Tukaramrao, New Age International (P) Ltd.
- 5) Management Control Systems, P. Saravanavel, Himalaya Publishing House

Online references:**For MOOCs:**

- <https://swayam.gov.in/>
- <https://alison.com/>:

Web resources:

www.moneycontrol.com
www.rbi.org.in
www.icai.org
<https://www.sebi.gov.in>
<https://www.nseindia.com>
<https://www.bseindia.com>

BBA- Sem -VI (CBCS 2018)**FM 603: ELECTIVE – I : FINANCIAL MANAGEMENT
(Elements of Corporate Finance)**

Course Code	FM 603	Course Type	Discipline Specific Elective (DSE I - I)
Credits	Four.	Examination Pattern	UE + IA: 60:40

- **Learning objectives:**
- To introduce about Sources of Corporate Finance
- To orient about the techniques of Financial Decision making

Learning outcomes : After studying this course student are able to

- 1 • Sources of Corporate Finance available
- 2 • Application of the techniques of Financial Decision making

Unit – I :Financial Planning and Strategy. (12 Hrs.)

- Concept and Importance of Financial forecasting.
- Long range planning and Short range planning.
- Strategic Decision making and planning.
- Strategic financial planning and steps in financial planning.
-

Unit – II: Sources of Corporate Finance. (12 Hrs.)

- Equity Share Capital, Preference Share Capital, Debenture, Public Deposits, Venture Capital.
- Institutional Finance
- International Sources of Finance: ADR, GDR, ECB, FCCB, FDI and FII
-

Unit – III: Capital Budgeting (15 Hrs.)

- Features and Significance of Capital Budgeting.
- Problems and Difficulties of Capital Budgeting.
- Techniques of Evaluations (Theory & Practical) – Payback Period, Discounted Pay Back Period, Accounting Rate of Return, Net Present Value, Profitability Index Method, Internal Rate of Return.
-

Unit – IV: Management of Earning and capital Structure. (09 Hrs.)

- Dividends and Retained Earning.
- Factors affecting Dividends decisions
- Concept and Importance of Capital Structures, Factors affecting Capital Structure

Unit – V: Financial Statement Analysis and Corporate Governance. (12 Hrs.)

- Ratio Analysis (Theory and Practical)
- Funds Flow Statement, Cash Flow Statement (Theory)
- Study of Annual Report – Understanding contents and disclosures.

- Meaning of Corporate Governance.
- Important Elements of Corporate Governance.
- Share Holders Rights

Reference books :

- 1) Financial Management – I.M. Pandey, Vikas.
- 2) Financial Management – Theory & Practice, Prasanna Chandra.
- 3) Basic Financial Management – M.Y. Khan, New Delhi, TMH.
- 4) Corporate Financial Management – Arnold Glen, Pitman.
- 5) Corporate Financial Management – Emery Dogglas, Pearson Edu. Asia.
- 6) Indian Corporate Financial Management – Vijay Gopalan, Himalaya.

Online references:

MOOCS:

- <https://swayam.gov.in/>
- <https://alison.com/>:

Web resources:

www.moneycontrol.com

www.rbi.org.in

www.icai.org

<https://www.sebi.gov.in>

<https://www.nseindia.com>

<https://www.bseindia.com>

BBA- Sem -VI (CBCS 2018)**604 : ELECTIVE – II : FINANCIAL MANAGEMENT
(International Finance & Financial Risk Management)**

Course Code	FM 604	Course Type	Discipline Specific Elective (DSE II)
Credits	Four.	Examination Pattern	UE + IA: 60:40

Learning objectives: After the completion of the course, the students will understand:

- The concept of Risk and Risk Management
- The techniques of Financial Risk Management

Learning outcomes : After studying this course student are able to

- To introduce to the concept of Financial Risk Management
- To orient the students about the techniques of Risk Management

Unit – I :Introduction to International Finance. (12 Hrs.)

- Scope and Importance of International Finance.
- Distinction between Domestic and International Finance.
- Challenges and Risks in International Financial Management
-

Unit – II: Foreign Exchange Market. (12 Hrs.)

- Concept and Features of Foreign Exchange Market
- Structure and Participants of Foreign Exchange Market
-

Unit – III: Methods of International Trade Settlements. (12 Hrs.)

- International trade settlement with special reference “Documentary Credit”.
- Export Finance – Pre and Post Shipment Credit.
- Factoring and Forfeiting.
- ECB Buyers and Suppliers Credit.
-

Unit – IV: Risk Management. (10 Hrs.)

- Concept and Process of Risk Management
- Types of Risks
- Terms – Speculation and Arbitrage

Unit V: Derivatives: (14 Hrs.)

- Definition, Meaning and Importance of Derivatives
- Types of Derivatives(Introduction) : Forward, Future, Options and Swaps

Reference books :

- 1) International Financial Management Financial – P.G. Apte., Tata McGraw – Hill Publications.
- 2) Options, Futures and Derivatives – John C Hull, Pearson Education.
- 3) International Finance and Banking – RajwadeAnmol Publications.
- 4) Report on Currency and Finance by RBI.
- 5) Risk Management and Insurance – Harrington Niehaus.

Online references :

www.moneycontrol.com
www.rbi.org.in
www.icai.org
<https://www.sebi.gov.in>
<https://www.nseindia.com>
<https://www.bseindia.com>

MOOCS :

<https://swayam.gov.in/>
[https://alison.com/:](https://alison.com/)

BBA Specialization – HRM

Human Resource Management		
Elective – I	HR503	Performance & Compensation Management
Elective –I I	HR504	Training & Development
Elective – III	HR603	Management of Industrial Relations
Elective – IV	HR603	Cross Cultural HRM

BBA - CBCS 2018 SEM V
HR 503 Performance & Compensation Management

Course Code	HR503	Course Type	DSE
Credits	Four.	Examination Pattern	UE + IA: 60:40

Objectives of the course:

- To understand the various dimensions of Compensation Management.
- To familiarize with the role of various bodies involved in Compensation Management.

Course Outcomes:

Students will be able to apply the concepts of performance appraisal and compensation management practically.

Unit 1: **(12 hours)**

Concept and objectives of performance management system, Performance appraisal and performance management, Performance Management – definition, objectives, need and measurement

Unit 2 **(12 hours)**

Process of performance appraisal, issues and challenges in performance appraisal, documentation of performance appraisal, Methods of Performance appraisal – traditional methods, modern methods with advantages and disadvantages of each - appraisal interviews, performance feedback and counseling, use of technology and e-PMS, Ethical perspectives in performance appraisal.

Unit 3 **(12 hours)**

Compensation – Definition, Classification and Types. Components of remuneration- basis pay, dearness allowance, flat and indexed DA, allowances and reimbursement, Determining Compensation, Compensation Approaches. Compensation as a Retention Strategy, Financial and non financial compensation

Unit 4: **(12 hours)**

Performance Based Pay Systems, Incentives - incentive plans, developing effective incentive plans. Gain Sharing Incentive Plan – Enterprise Incentive Plan – Profit Sharing Plan- ESOPs – Compensation Management in Multi-National organisations.

Unit 5 **(12 hours)**

Reward systems, Perceptions of Pay Fairness – the legal environment, Legal Constraints on Pay Systems. Employee Benefits.- retirement benefits, perquisites, non-monetary benefits.

Books:

1. Dewakar Goel, PERFORMANCE APPRAISAL AND COMPENSATION MANAGEMENT, PHI Learning, New Delhi.
2. Richard.I. Henderson, COMPENSATION MANAGEMENT IN A KNOWLEDGE BASED WORLD, Prentice Hall India, New Delhi.
3. Richard Thrope& Gill Homen, STRATEGIC REWARD SYSTEMS, Prentice Hall India, New Delhi.
4. Michael Armstrong & Helen Murlis, HAND BOOK OF REWARD MANAGEMENT, Crust Publishing House

Online Resources:

<https://www.ideals.illinois.edu/bitstream/handle/2142/29159/onmeasurementofb1135venk.pdf?sequence=>

MOOCs:

Modern Human Resource Management(Alison).
Principles of Human Resources Management (Swayam).
Managing employee compensation (Coursera)

BBA - CBCS 2018 SEM V
HR 504 Training & Development

Course Code	HR504	Course Type	DSE
Credits	Four.	Examination Pattern	UE + IA: 60:40

Objectives of the course:

1. To familiarize the students with the concept and practice of Training and Development and its role in modern management.
2. To understand the various methods and applications of Training and Development

Course Outcomes: Students will be able to

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Unit 1 **(12 hours)**

Concept of training, terms - education Knowledge, Skills, attitudes, need of training, importance, objectives of training, ADDIE model, Principles of training, concept of executive development: Objectives, importance, process of executive development

Unit 2 **(12hours)**

Training needs analysis (TNA): Meaning and purpose of TNA, TNA at different levels, Process of TNA, output of TNA, setting training objectives, Learning theories – Reinforcement, Social learning, expectancy theory, goal theory

Unit 3 **(12 hours)**

Training and Development methods : On-the-Job & Off-the-job, job instructions training, apprenticeship, internship, demonstrations, self-directed learning, coaching, job rotation, project assignment, simulation methods, lectures, case studies, group discussion, conferences, role playing, management games, in basket exercise, sensitivity training, vestibule training, e-training.

Unit 4 **(12 hours)**

Designing training programme – considerations in designing effective training programs selection of trainers, criteria of selection of methods, selecting and preparing the training site, training material & aids, use of technology in training

Unit 5 **(12 hours)**

Evaluation of training – Need for evaluating training, Kirkpatrick evaluation criteria – reactions, learning, behavior, results, ROI, Cost-benefits analysis

Books:

1. Noe, Raymond A., and Amitabh DeoKodwani, Employee Training and Development, Tata McGraw Hill.
2. Blanchard, P. Nick, James W. Thacker and V. Anand Ram, Effective Training: Systems, Strategies, and Practices, Dorling Kindersley (India) Pvt. Ltd.
3. Prior, John, Handbook of Training and Development, Jaico Publishing House, Bombay

Online Resources:

https://www.researchgate.net/profile/J_Ford/publication/209409925_Transfer_of_Training_A_Review_and_Directions_for_Future_Research/links/565da94908aefe619b266a51.pdf

MOOCs:

[Diploma in Workplace Safety & Health](#) (Advance Learning).
Human Resources (Open2Study).
Preparing to Manage Human Resources (Coursera)

BBA - CBCS 2018 SEM VI
HR 603 Management of Industrial Relations

Course Code	HR 603	Course Type	DSE
Credits	Four.	Examination Pattern	UE + IA: 60:40

Objectives of the course:

Learners will be able to understand the meaning of industrial relations, dispute and role of trade unions. Also they will be exposed to the concept and process of grievances and grievance handling.

Course Outcomes: Students will be able to apply the principles of industrial relations to the current scenarios.

Unit 1: (12 hours)

Meaning and definition of industrial relations (IR), objectives and scope of Industrial relations, parties of IR, Evolution of IR in India, Conditions for congenial IR.

Unit 2: (12 hours)

Trade unions – concept, evolution and functions, types and structure of trade unions, formation of trade unions in India, problems of trade unions.

Unit 3: (12 hours)

Industrial disputes – concept, classification and causes, strikes, types of strikes, lockouts. Impact of industrial disputes.

Unit 4: (12 hours)

Grievance – meaning and definition, causes of grievances, procedure of grievance redressal. Disciplinary action – needs, meaning, aspects of disciplinary procedure. Domestic enquiry.

Unit 5: (12 hours)

Settlement of industrial disputes, statutory methods as per industrial disputes act 1947, formation of works committee, functions of works committee, conciliation, meaning of conciliation, conciliation officer, voluntary and compulsory conciliation. Arbitration, Adjudication- types and process.

Books:

1. Venkataraman, C.S, Indian Industrial Relations, National Institute of Personnel Management.
2. Mamoria&Mamoria, Dynamics of Industrial Relations in India, Himalaya Publishing House
3. Sharma A.M, Aspects and legal frame work of Industrial Relation, Himalaya Publisher

Online Resources:

http://www.pondiuni.edu.in/storage/dde/downloads/hrmiii_irm.pdf

MOOCs: Swayam

BBA - CBCS 2018 SEM VI
HR604 Cross Cultural HRM

Course Code	HR604	Course Type	DSE
Credits	Four.	Examination Pattern	UE + IA: 60:40

Objectives of the course:

- To create awareness about the cross cultural HRM and creating harmonious relationships between employees.

Course Outcomes: Students will be able to understand the issues related to cultural diversity and appreciate the importance of cross cultural management.

Unit 1: (12 hours)

Understanding Culture, Culture dimensions, cross cultural differences and managerial implications, Hofstede study, Significance and impact of cross culture on organizations, role of culture in Strategic Decision Making . Influence of National Culture on Organizational Culture. Shift in Culture: significance of shift in Culture, Influence of economic factors and foreign intervention on shifts in local cultures

Unit 2: (12 hours)

Global business environment , cross cultural perspectives, cultural paradox; cultural diversity and sensitivity, cross cultural leadership and decision making, Cross Cultural Communication and negotiation, cultural intelligence, case study of Cultural Intelligence by P. Christopher Earley and Elaine Mosakowski, HBR.

Unit 3: (12 hours)

International HRM – differences between domestic and international HRM, Expanding the Role of HRM in International Firms; international HRM approaches, HR and expansion strategies.

Unit 4: (12 hours)

International recruitment and selection, performance management, training and development, compensation. Social Responsibility and International HRM; HRM In Cross Culture Mergers & Acquisitions

Unit 5: (12 hours)

International assignments – need and issues. Repatriation, coping with new role demands, labour relations. Managing expatriates.

Research and emergence of different approaches to cross cultural management. Achieving and Sustaining International Competitive Advantage; International Strategic Alliances, Cross-culture ethics: Ethics values across cultures and Ethics dilemma

Books:

1. Shobhana Madhavan, Cross-Cultural Management, Oxford University Press
2. P. Jyothi & D.N. Venkatesh, Human Resource Management, Oxford University Press.
3. K Aswathappa, Sadhna Dash, International Human Resource Management - Text And Cases, Tata McGraw-Hill
4. Paula Caligiuri, David Lepak, Jaime Bonache, Managing The Global Workforce, John Wiley & Sons Ltd.
5. International HRM, P.Subba Rao, HPH
6. Cultures Consequence ; International Differences in Work related Values, G. Hofstede – – Sage
7. International HRM, A. Harzing, Sage
8. International Human Resource Management: Managing People in a Multinational Context by Peter J Dowling et al., Third Edition (South Western).
9. International management: Managing Across Borders And Cultural, 4th Ed, Pearson.
10. Thakur, M., Burton & Gene, E (2002). International Management. Tata McGraw Hill.
11. Hodgetts, R. and Luthens, F. (2003). International Management. McGraw Hill Inc.
12. EsenDrlarry, Rchildress John, The Secret Of A Winning Culture: Building High-Performance Teams, Prentice Ha

Online Resources:

<https://pdfs.semanticscholar.org/7242/bb07d3f9568f1579d5e0d87f189a673c5c65.pdf>

MOOCs:

Swayam

BBA Specialization : International Business Management

International Business Management		
Elective	Code	Course
Elective – I	IB503	International Marketing
Elective – II	IB504	Export Import Procedures and Documentation
Elective – III	IB603	Basics of International Finance
Elective – IV	IB604	Fundamentals of International Economics

BBA- Sem -V (CBCS 2018)

**IB 503: ELECTIVE –I : INTERNATIONAL BUSINESS MANAGEMENT
(INTERNATIONAL MARKETING.)**

Course Code	IB 503	Course Type	Discipline Specific Elective (DSE I)
Credits	Four.	Examination Pattern	UE + IA: 60:40

- **Learning objectives:**
- To enable an understanding of what marketing is and how it operates in the international context.

Learning outcomes : Students will be able to know international markets and international issues. The syllabus is designed to provide a strong practical understanding of the principles, theories, and tools necessary to succeed in businesses.

Unit – I: Introduction to International Marketing. (15 hrs.)

- International dimensions of Marketing; Domestic versus International Marketing; International Marketing – Scope and challenges; international Marketing process.

Unit – II: Global Marketing Environment. (10 hrs.)

- Assessing global marketing opportunities, Environmental Analysis, and its techniques; emerging markets.

Unit – III: Planning for International Marketing. (15 hrs.)

- Marketing research and information systems – meaning, needs and scope in the global context; Market analysis and foreign market entry strategies; Organizing marketing effort for global competition.

Unit – IV: Development Global Marketing Strategies. (10 hrs.)

- Brands in the international markets, products and culture, product adaptation; Marketing consumer services globally; international marketing channels; Integrated marketing communication for global markets; Pricing for international markets.

Unit – V: Global Quality Standards. (10 hrs.)

- Quality issues in global markets; Global Quality standards; International agencies; Quality issues for Indian products in international markets

Reference books :

- 1) International Marketing Strategy by Fram Bradley.
- 2) International Marketing by Alexander Hiam and Charles Shaw.

Online references: MOOCS:

- Management Skills for International Business (Coursera)
- Global Strategy I: How The Global Economy Works (Coursera)

Web resources:

- 1. Exchange control manual – RBI Publications.

- Foreign Trade Policies. (Latest)
- Handbook of Export Import procedure.
- Custom and Baggage Rules.
- RBI Official website
- www.ie.port.com

BBA- Sem -V (CBCS 2018)**IB 504: ELECTIVE –II : INTERNATIONAL BUSINESS MANAGEMENT
(EXPORT IMPORT PROCEDURE DOCUMENTATION)**

Course Code	IB 504	Course Type	Discipline Specific Elective (DSE II - ELECTIVE – II : INTERNATIONAL BUSINESS MANAGEMENT)
Credits	Four.	Examination Pattern	UE + IA: 60:40

- **Learning objectives:**
- To give the conceptual clarity about polices and procedure s related to Export and Import
- To provide the guidelines for applicability of these concepts in Export – Import Business.

Learning outcomes : After studying this course student are able to

1. Understand basic concepts related to International Trade and Foreign Trade Policy
2. Understand the Regulations for Export and Import
3. Knowledge about the EXIM Documentations and International Logistics

Unit – I: Introduction. (9 hours)

- Meaning and Importance of International Trade.
- Meaning, Definition and Significance of Export and Import.

Unit – II: Regulations for Export and Import. (12 hours)

- Obtaining an I.E.C. number.
- Foreign Trade (Development and Regulation) Act.
- Foreign Exchange Management Act (FEMA).
- Pre-Shipment inspection and Quality Control Act and their importance.
- Exchange control manual.
- Foreign Trade Policy.

Unit – III: Export Import Contracts. (10 hours)

- Meaning of Export Import Contract.
- Elements of Export Import Contract.
- FOB and CIF Contract.

Unit – IV: EXIM procedures. (14 hours)

- Export procedure – Registration Stage.
- Pre shipment inspection.
- Sales post Shipment Stage.
- Quality Control and Pre shipment Inspection.

- Sales Tax Exemption.
- Excise Clearance.
- Shipping and Custom Formalities.
- Marine Insurance.

Unit – V: EXIM Documentations and International Logistics.

(15 hours)

- Commercial Documents.
- Principal Export Documents – Commercial Invoice, Packing list, Bill of Landing, Combined transport document, Certificate of Quality Control, Insurance Certificate, Certificate of Origin, Bills of exchange and Shipment advice.
- Auxiliary documents – Pro forma Invoice, Intimation for Inspection, Shipping Instructions, Insurance Declaration, Shipping Order, Certificate of Origin, Letter of Bank.
- Logistics – Clearance of goods against B/L and AWB, Aims and Objective of International trade and logistics.
- Organizations of overseas transport service.

Reference books :

1. C Rama Gopal, Export Import Procedure and Documentation, New age International Publisher's, New Delhi.
2. W.K. Acharya and Jain K.S. Export Import Procedure and Documentation, Himalaya Publishing House, Mumbai.
3. Aseem Kumar, Export and Import Management, Excel Book, New Delhi.
4. P.K. Khurana, Export Management, Galgotia Publishing Co. New Delhi

Journals:

- Indian Ports, published by Indian Port Association
- Indian Shipping – Indian National Ship-owners Association
-

News Paper Readings:

1. Business Standard
2. Financial Express
3. Economic Times

Online references:

For MOOCs:

- <https://alison.com/>
- <https://swayam.gov.in>

Web resources:

- 1. Exchange control manual – RBI Publications.
- Foreign Trade Policies. (Latest)
- Handbook of Export Import procedure.
- Custom and Baggage Rules.
- RBI Official website
- www.ie.port.com

BBA- Sem -VI (CBCS 2018)**IB 603: ELECTIVE – I : INTERNATIONAL BUSINESS MANAGEMENT
(BASICS OF INTERNATIONAL FINANCE)**

Course Code	IB 603	Course Type	Discipline Specific Elective (DSE I - ELECTIVE – I : INTERNATIONAL BUSINESS MANAGEMENT)
Credits	Four.	Examination Pattern	UE + IA: 60:40

- **Learning objectives:**
- To understand the basics of finance function and environment for International Business.
- To find out financial challenges faced by businesses in increasingly globalizing economies.

Learning outcomes : After studying this course student are able to

- 1 At the end of the course students should be able to-
- 2 Understand basic concepts, elements related to International Finance.
- 3 Knowledge about the important Financing Methods for Cross Border Trade.

Unit – I: Introduction (12 hours)

- Meaning and Scope of International Finance
- Globalization and its impact.
- International Finance Vs Domestic Finance
- India's financial Sector reforms after globalization

Unit – II: International Financial Institutions (12 hours)

- The World Bank
 - International Bank for Reconstruction and Development (IBRD)
 - International Development Association
 - International Finance Corporation
 - The multilateral investment guarantee agency (MIGA)
- International Monetary Fund (IMF)- Origins of IMF
- Asian Development Bank (ADB)
- Role of IMF and IBRD.

Unit – III: Financing of Cross Border Trade (Export & Import) (15 hours)

- Concept and importance of Cross Border Trade, Letter of Credit as a method of Export and Import ,parties involved in letter of credit, Steps involved in Letter of Credit
- Concept and significance of Pre Shipment and Post Shipment credit. Suppliers credit, Buyer's credit, Factoring, Forfeiting and Offshore Banking

<p>Unit – IV: Concepts in International Finance (10 hours)</p> <ul style="list-style-type: none"> • Concept and importance of Foreign Direct Investment, • Concept and significance of Foreign Institutional Investment. • Difference between FDI & FII, impact of FDI & FII on the economy
<p>Unit – V: Methods of International Trade Settlement (11 hours)</p> <ul style="list-style-type: none"> • Open account, Advance Payment, Documentary Credit, Documentary Collection, and Consignment Trading, External Commercial Borrowings
<p>Reference books :</p> <ol style="list-style-type: none"> 1) International Financial Management – H.R. Machiraju. 2) International Financial Management by P.G. Apte. 3) International Money & Finance, Prof.Melvin. 4) Reports on Currency & Finance, RBI Publication. 5) International Finance, Levi, Maurice.
<p>Online references:</p> <p>MOOCS:</p> <ul style="list-style-type: none"> • https://alison.com/ • https://swayam.gov.in
<p>Web resources:</p> <ol style="list-style-type: none"> 1. Companies Annual Reports 2. Money control 3. SEBI and RBI Official Websites 4. NSE and BSE Official Websites 5. RBI Official website 6. www.ie.port.com

BBA- Sem -VI (CBCS 2018)
IB 604: ELECTIVE – II :
INTERNATIONAL BUSINESS MANAGEMENT
(FUNDAMENTALS OF INTERNATIONAL ECONOMICS.)

Course Code	IB 604	Course Type	Discipline Specific Elective (DSE II)
Credits	Four.	Examination Pattern	UE + IA: 60:40

Learning objectives: To understand economics of international business. To enable analysis of problems of global economics and formulate strategies for the same. The Bachelor of Business Administration (BBA) is designed to provide a strong practical understanding of the principles, theories, and tools necessary to succeed in businesses.

Learning outcomes : After studying this course student are able to

- 1 Students will be able to know international Trade mechanism and international issues.
- 2 Students will be able to know international Trade mechanism and international issues.
- 3 Students will be able to know international Trade mechanism and international issues.

Unit – I :Introduction to International Economics.	(10 hrs.)
<ul style="list-style-type: none"> • Introduction to international Economics – meaning and scope. • Gains from international trade. • Significance of international Economics. 	
Unit – II: Balance Payments.	(15 hrs.)
<ul style="list-style-type: none"> • Meaning & Structure of BOP. • Equilibrium and Disequilibrium and adjustment in BOP. • Statistical discrepancy. 	
Unit – III: Theories of International Trade.	(15 hrs.)
<ul style="list-style-type: none"> • Mercantilism, Absolute Cost Theory. • H O Theory • Comparative Cost Theory. • Product Life Cycle Theory 	
Unit – IV: Formation of Regional Trade Blocks	(10 hrs.)
<ul style="list-style-type: none"> • BRICS,SAARC,NAFTA,G20,SAFTA 	
Unit – V: Gold Standard Mechanism.	(10hrs.)
<ul style="list-style-type: none"> • Fixed Vs Flexible exchange rate. • Tariff and Non – tariff barriers. • Argument for against protection. 	

- IMF and World Bank

Reference books

- 1) International Economics Koutsiyannis.
- 2) Economics by Samuelson.
- 3) International Economics, Mithai. D.M. Himalaya Publishing House, New Delhi.
- 4) International Economics, Cherunilam, The McGraw Hill Companies.
- 5) International Economics, Salvatore D., Prentice Hall, Upper Saddle River, N.J. New York.

Online references:

Management Skills for International Business (Coursera)

Global Strategy I: How The Global Economy Works (Coursera)

- MOOCS:
- <https://alison.com/>
- <https://swayam.gov.in>

BBA Specialization: Entrepreneurship Development

Elective	Code	Course Title
Elective – I	ED 503	Entrepreneurship & New Ventures Creation
Elective – II	ED 504	Corporate Entrepreneurship
Elective – III	ED 603	E- Commerce
Elective – IV	ED 604	Managing Family Businesses

BBA - CBCS 2018 SEM V

ED 503: Entrepreneurship & New Venture Creation

Course Code	ED 503	Course Type	DSE
Credits	Four.	Examination Pattern	UE + IA: 60:40

Objectives:

The aim of this course is

- to enable the students to understand the nuances of creating new businesses, role of entrepreneurs, importance of creativity and innovation in entrepreneurial start-ups.
- build the skills, framework and knowledge in entrepreneurship and new venture creation in order to acquire the knowledge and spirit for venturing;
- gain knowledge on the characteristics of entrepreneurs and the entrepreneurial process;
- to understand the importance of the planning process and learn how to develop, write and present an effective business plan for a new venture.

Learning Outcomes:

At the end of the course, the students will have a fair idea about entrepreneurship, role of entrepreneurs, and the intricacies of starting a new business. Students will be able to write a business plan successfully.

Unit 1: The entrepreneurial Perspective (12 Hrs.)

Concept of entrepreneur and entrepreneurship, motivations for becoming an entrepreneur, role of entrepreneurs in the present milieu, types of entrepreneurs (e.g. nascent entrepreneurs, social entrepreneurs, entrepreneurs, etc.), Process of entrepreneurial development. Life cycle of an enterprise.

Unit 2: Opportunity Identification and selection (12 Hrs.)

Moving from an Idea to an Entrepreneurial Firm. Developing Successful Business Ideas , Recognizing Opportunities and Generating Ideas Need for Opportunity Identification and selection, Feasibility Analysis, Industry and Competitor Analysis, Writing a Business Plan, Business opportunities in various sectors.

Unit 3: Creating a Business Model (12 Hrs.)

Concept of business model, functions of a business model, Types of business model, Preparing the Proper Ethical and Legal Foundation, entrepreneur's approaches to resources— people, capital, and other assets. issues in the selection and effective utilization of outside professionals, such as members of a board of directors, lawyers, accountants, and consultant,

Unit 4: Setting up a New Venture (12 Hrs.)

Assessing a New Venture's Financial Strength and Viability, Building a New-Venture Team. Financing /Funding of new ventures, Managing and Growing an Entrepreneurial Firm,

Unique Marketing Issues , Commercialization of Ideas, Importance of Intellectual Property Challenges to Growth of an enterprise, Strategies for Firm Growth, Franchising, principal harvest options, including trade sale, going public, and cash flow

Unit 5: Small Businesses.

(12 Hrs.)

Micro Small Medium Enterprises Development(MSMED) Act 2006, Importance of Small Scale industry, Government Grants and Subsidy, clearance and NOC.

Starting a Small Scale unit – structure and ownership, establishment of units, project feasibility, tax benefits, incentives and concessions. Format of start ups. Marketing strategy of small businesses, Role of financial and non-financial institutions for small businesses,

Business Incubation

Definition and evolution of business Incubators, Establishing business incubators, Incubators role in supporting start-ups, Business incubators in India.

References :

1. ArunSahai& V. Sharma – Entrepreneurship and New Venture Creation, Excel Books.
2. Barringer, R.B., Ireland, D.R. (2012) Entrepreneurship: Successfully Launching New Ventures, 4th edition. Pearson Education.
3. Vasant Desai, Dynamics of Entrepreneurship Development ,Himalaya Publication house
4. Malhotra and Gupta, Management of Small Scale industries, Galgotia Publishing Company, New Delhi
5. David Holt Entrepreneurship , New Venture Creation , Prentice Hall India.
6. S.S. Khanka, Entrepreneurial Development S. Chand & Company Ltd. New Delhi
7. Raj Shankar, Entrepreneurship Theory and Practice, Tata McGraw Hill
8. Kumar Arya, Entrepreneurship: Creating and Leading an Entrepreneurial Organization, Pearson, India
9. DrAchutP.Pednekar, Entrepreneurship. Himalaya Publication House

Online Resources:

<https://www.entrepreneur.com/>

<https://www.ashoka.org/en/focus/social-entrepreneurship>

<https://www.toppr.com/guides/business-studies/entrepreneurship-development/>

<https://www.entrepreneur.com/article/238908>

<https://www.Youtube.com/>

<https://www.shopkeep.com/blog/the-7-best-free-resources-for-planning-your-new-business>

<http://dst.gov.in/scientific-programme/t-d-tdb.htm>

MOOCs:

<https://startupindia.upgrad.com/> - Startup India Learning Programme

Swayam

BBA - CBCS 2018 SEM V
ED 504 Corporate Entrepreneurship

Course Code	ED 504	Course Type	DSE
Credits	Four.	Examination Pattern	UE + IA: 60:40

Objectives :

This course will expose the students to the tools, methods and logic that will enable to participate in or lead successful efforts in Corporate Entrepreneurship (CE).

By the end of the course student will:

- Have an overview of the field of Corporate Entrepreneurship
- Be familiar with the various tools, methods, approaches and architectures that organizations are employing and have an in-depth understanding of a few of them

Unit 1: Introduction to corporate entrepreneurship. (12 Hrs.)

Concept and need of corporate entrepreneurship, Forms and antecedents of corporate entrepreneurship, overview of the field of Corporate Entrepreneurship

Unit 2: Promotion of Intrapreneurial culture. (12 Hrs.)

Innovative culture and drivers, innovativeness and new business creation, top management support, leadership for innovativeness, Difference between intrapreneurship and entrepreneurship in concept and practice, Corporate strategy, structure and entrepreneurship, Human resource management and corporate entrepreneurship, Building supportive organizational cultures

Unit 3: Entrepreneurial mindset and entrepreneurship ecosystem (12 Hrs.)

Importance of mindset, Entrepreneurial mindset and its impact, Entrepreneurial mindset enablers, entrepreneurial mindset in employees. Concept of entrepreneurial ecosystem, ecosystem and entrepreneurial mobility.

Unit 4: Challenges and best practices for successful business building inside firms. (12 Hrs.)

Rationale for intrapreneurship, major challenges and hurdles for CE, risks of corporate entrepreneurship, how to successfully and safely navigate Obstacles,

Unit 5: Case studies on Corporate Entrepreneurship (12 Hrs.)

Case studies of TATA, Google, Apple, and others.

[1] Kuratko, D. F., Morris, M. H., & Covin, J. G. 2011. Corporate innovation & entrepreneurship: Entrepreneurial development within organizations (3rd ed.). Mason, OH: South-Western Cengage Learning.

[2] Burns, P. 2013. Corporate entrepreneurship: Innovation and strategy in large organizations (3rd ed.). New York: Palgrave Macmillan.

[3] Hisrich, R. D. & Kearney, C. 2012. Corporate entrepreneurship: How to create a thriving entrepreneurial spirit throughout your company. New York: McGraw-Hill.

[4] Raj Shankar, Entrepreneurship Theory and practice. Tata McGraw Hill

Online Resources:

<https://www.entrepreneur.com/>

<http://www.sciencedirect.com/science/article/pii/S088390261300058X>

<https://www.toppr.com/guides/business-studies/entrepreneurship-development/>

<https://www.entrepreneur.com/article/238908>

<https://www.Youtube.com/>

<https://www.shopkeep.com/blog/the-7-best-free-resources-for-planning-your-new-business>

<http://dst.gov.in/scientific-programme/t-d-tdb.htm>

MOOCs:

<https://startupindia.upgrad.com/> - Startup India Learning Programme

Swayam

BBA - CBCS 2018 SEM VI
ED 603 E-Commerce

Course Code	ED 603	Course Type	DSE
Credits	Four.	Examination Pattern	UE + IA: 60:40

Objectives :

This course aims

- To understand the popular format of e-tailers, ie.online retailers of goods and services.
- To identify the challenges and opportunities of creating, growing and optimizing an e-commerce business.
- To help students conceptualize the various e-commerce business models that exist and to build new ones.

Course Outcome:

By the end of the course student will:

Students will have fair understanding of e-commerce for business growth and development and will get exposure to strategies to grow quickly and profitably through e-commerce strategies.

Unit 1: Introduction to e-Commerce: (8 hours)

Meaning, types, benefits and impact of e-commerce, e-commerce in India. Advantages and disadvantages of e-commerce.

Infrastructure for e-Commerce – Internet and www, Intranet, extranet. E-commerce and internet.

Unit 2: Models of e-commerce (10 hours),

Business to business hub, market places, business to consumer, consumer to consumer, business to government, government to government.

Unit 3: e-marketing and e-CRM (10 hours),

Internet as an advertising media, e-advertising and marketing in India, Search Engines, Directories, Registrations, Solicited targeted E-mails, Interactive sites, Banners, Advertising, Spam Mails, E-mail, Chain letters. E-Advertising Techniques: Banners, Sponsorships, Portals, and Online Coupons, limitations of internet advertising e-CRM – meaning, applications, major trends, e-CRM marketing in India.

Unit 4: Electronic Payment Systems (12 hours)

Introduction to online payment systems, Secure Electronic Transaction (SET) and Secure

Socket Layer (SSL) protocols, Pre-paid and post-paid e-payment system, security requirements for e-payment system., managerial issues for E-payment systems.

Unit 5: Electronic Data Exchange and E-Security (14 hours)

Electronic Data Exchange - definition, applications, advantages and limitations, Privacy issues. Security policy, procedures and practices, cryptology, digital signature, security protocols for e-commerce.

1. Chan, Lee, Dillon & Chang – E-Commerce Fundamentals & Applications, WILEY
2. P.T. Joseph – E-commerce: A Managerial Perspective, PHI.
3. Jeffrey F. Rayport & Bernard J. Jaworski: Introduction to E-commerce, TMH, 2003.
4. David Whiteley: E-Commerce- Strategy technologies and Applications, Tata MacGraw Hill, New Delhi, 2000.
5. C.S.V. Murthy: E-Commerce-Concepts, Models & Strategies, Himalaya Publishing house, Mumbai, 2003.
6. Kamallesh K Bajaj & Debjani Nag: E-Commerce, the Cutting Edge of Business- Tata McGraw-Hill, New Delhi, 2002.
7. Perry: E-Commerce, Thomson Publications, New Delhi, 2003.
8. Elias M. Awad: Electronic Commerce, Prentice-Hall India, New Delhi, 2002

Online Resources:

<https://saif4u.webs.com/E-ommerce-Notes.pdf>

<https://www.entrepreneur.com/>

<https://www.Youtube.com/>

<https://blog.taxjar.com/5-online-resources-for-ecommerce-business-owners/>

<https://www.oberlo.in/blog/top-50-ecommerce-resources>

<https://www.practicalecommerce.com/12-Good-Ecommerce-Resources>

MOOCs:

<https://www.mooc-list.com/course/foundations-e-commerce-coursera>

<https://www.class-central.com/course/coursera-foundations-of-e-commerce-2294>

<https://www.udemy.com/the-wide-world-of-moocs/>

BBA - CBCS 2018 SEM VI
ED 604 Managing Family Businesses

Course Code	ED 604	Course Type	DSE
Credits	Four.	Examination Pattern	UE + IA: 60:40

Objectives of the course:

- Understand the family business dynamics in terms of three elements – the individual, the family, and the business.
- Identify the social and economic impact of family business.

Course Outcomes: Students will be able to

- Apply the specific practices and skills of effective family businesses.
- Integrate entrepreneurial and professional management concepts for strengthening family business organizational performance.

Unit 1 **(12 Hrs.)**

Introduction: Family values , heritage, tradition, Family Relationships and Family Systems
Meaning of family , Concept, structure and forms of Family business, Advantages of Family businesses, Culture and evolution of family firm
The Nature, Importance, and Uniqueness of Family Business

Unit 2 : **(12 Hrs.)**

Conflict resolution: Individual roles/functions in the family Managing Business, family and shareholder relationships ; Conflict and conflict resolution in family firms.

Unit 3 **(12 Hrs.)**

Managing Leadership, succession and continuity. Succession planning and process, - Continuing The Next Generation Entrepreneur, Succession and the Transfer of Power, creating the Strategy for leadership, Choosing and Grooming the successor. Encouraging change in the family business system.

Unit 4 **(12 Hrs.)**

Professionalism in Family business: Orientation of family entrepreneurs, on the job training, Family councils, Family Offices, Management Philosophy and Core values, Strategic Commitment and Family Commitment, Business Vision and Family Vision, Business Strategy Plan and Family business continuity plan. Success factors of family businesses.

Unit 5 **(12 Hrs.)**

Excellence in Family business: Corporate and Family Governance, Best Practices in Family business: Communication, Independence, Vision, Documentation, women's issues in the family business , Case Studies on Family Businesses.

Text Books:

1. Entrepreneurship and Small Business : Paul Burns, Palgrave Publication

2. Entrepreneurship : Rajeev Roy, Oxford Higher Education Publicatio
3. Entrepreneurship (successfully Launching New Ventures) : Bruce Barringer, R. Ireland, Pearson
4. Vasant Desai , Dynamics of Entrepreneursgip Development, Himalaya Publicaion house
1. S.S. Khanka , Entrepreneurial Development S. Chand & company Ltd.
2. Peter f. Drucker , Inoovation and Entreprenurship

Online Resources:

<https://www.entrepreneur.com/>

<https://www.toppr.com/guides/business-studies/entrepreneurship-development/>

<https://www.entrepreneur.com/article/238908>

<https://www.Youtube.com/>

<https://www.shopkeep.com/blog/the-7-best-free-resources-for-planning-your-new-business>

<http://dst.gov.in/scientific-programme/t-d-tdb.htm>

MOOCs:

<https://startupindia.upgrad.com/> - Startup India Learning Programme

Swayam

BBA Specialization : Financial Market

Financial Market		
Elective	Code	Course
Elective – I	FM503	Introduction to Financial Markets and Financial Institutions
Elective – II	FM504	Capital Market Operations
Elective – III	FM603	Commodity Markets
Elective – IV	FM604	Introduction to Derivatives : Equity and Currency

BBA- Sem -V (CBCS 2018)
FMK-503: ELECTIVE – I : FINANCIAL MARKETS
INTRODUCTION TO FINANCIAL MARKETS AND FINANCIAL INSTITUTIONS

Course Code	FMK-503	Course Type	Discipline Specific Elective (DSE I)
Credits	Four.	Examination Pattern	UE + IA: 60:40

- **Learning objectives:**
- To introduce to the theory and practice of Financial Markets and Institutions.
- To help students to gain a thorough understanding of the working of Financial Markets and Features of Financial Instruments
- To introduce to the management of Financial Markets and Institutions in an international context.

Learning outcomes : After studying this course student are able to

- 1 • The working of Financial Markets and Features of Financial Instruments
- 2 • The management of Financial Markets and Institutions in an international context.

Note :Students are expected to keep themselves updated with latest developments in the subject Through- Online Trading Workshop- Training Session, Business News Channel-line CNBC-TV, ZEE Business, NDTV Profit etc.

Unit I: Overview of Financial Market And Institutions: (11 Hrs.)

- Introduction to Indian Financial System & its Development,
- Importance of Capital and Money Market
- Foreign Exchange Market,
- Role of Financial Institutions in Financial Markets

Unit II Capital And New Issue Market and Secondary Market: (15 Hrs.)

- Capital markets: Primary market, Secondary Market
- Advantage of Primary Market
- Difference Between Primary and Secondary market,
- New Issue Market(IPO) – Functions of New Issue market,
- SEBI Guidelines for New Issue Market, Recent Trends in New Issue Market.
- Functions/services of stock exchange- recognition of stock exchange, organization of Stock exchange in India-
- Listing of Securities-Listing Procedure- registration of Stock Brokers- functions of Brokers.
- Methods of Trading in Stock Exchange – Online Trading –BSE-BOLT System- Mobile

Trading, Merits of Online Trading,

Unit III Mutual Funds:-

(12 Hrs.)

- Introduction & Origin of Mutual Fund-
- Types of Mutual Fund, Importance of Mutual Fund
- Concept of Net Assets value

Unit IV Introduction to Derivatives Market

(12 Hrs.)

- Concept of Derivatives, Functions, Types – Forward, Futures, Options Swap

Unit V Financial Institutions :

(10 Hrs.)

- Introduction to Banking and Non Banking Financial Institutions.
- Institutional Finance – IDBI, SIDBI

Reference books :

1. Financial Markets and Services-E Gordon-K.Natrajan-Himalaya Publishing House
2. Gurusamy, Financial Markets and Institutions, 3rd edition, Tata McGraw Hill.
1. Saunders, Financial Markets and Institutions, 3rd edition, Tata McGraw Hill.
2. Thummuluri, Siddaiah, Financial Services, 1st edition, Pearson Education.
3. Khan, Indian Financial Systems, 6th edition, Tata McGraw Hill.
4. Essential: Howells, P., and K. Bain (2007),

Journals:

1. Financial Markets and Institutions, 5th ed. Financial Times/ Prentice Hall. ISBN: 0273709194
Supplementary: Pilbeam, K. (2010),
2. Financial Markets and Institutions, 3rd ed. Palgrave Macmillan. ISBN: 023023321X Valdez, S. and P. Molyneux (2010),
3. An Introduction to Global Financial Markets, 6th ed. Palgrave Macmillan.. ISBN: 0230243096. Mishkin, F. and S. Eakins (2008),
4. Financial Markets and Institutions, 6th ed. Pearson Education. ISBN: 0321552113

Online references:

MOOCS:

- <https://swayam.gov.in/>
- <https://alison.com/>:

Web resources:

www.moneycontrol.com
www.rbi.org.in
www.icai.org
<https://www.sebi.gov.in>
<https://www.nseindia.com>
<https://www.bseindia.com>

BBA- Sem -V (CBCS 2018)**FMK-504: ELECTIVE –II : FINANCIAL MARKETS****CAPITAL MARKET OPERATIONS**

Course Code	FMK-504	Course Type	Discipline Specific Elective (DSE II)
Credits	Four.	Examination Pattern	UE + IA: 60:40

- **Learning objectives:**
- To help the students in understanding the capital market trading, clearing, settlement
To introduce the eligibility criteria for membership of NSE, important regulatory aspects and valuation concepts

Learning outcomes : After studying this course student are able to

- Capital Market Trading, Clearing and Settlement
- regulatory aspects and valuation concepts.

Unit – I: Introduction.**(9 hours)****Unit I: Indian Securities Market – An Overview:****(12 Hrs.)**

- Introduction, Capital Market Intermediaries,
- Industrial Securities market- Government securities Market- Long Term Loan Market Primary market, Secondary market, products
- Participants of Derivatives market

Unit II: Trading Operations:**(12 Hrs.)**

- Introduction, NEAT system, Market types,
- Order Management, trade management, auction, Trade Mechanism
- Introduction to Debt Market, Wholesale Debt Market

Unit III: Clearing and Settlements:**(12 Hrs.)**

- Introduction, Transaction cycle, Settlement process, Settlement agencies, Risks in settlement, Securities settlement, Funds Settlement Shortages handling, Risk containment measures,
- International securities, Identification number, Demat and Electronic transfer of securities, In protection fund

Unit IV: Legal & Regulatory Framework:**(14 Hrs.)**

- Introduction to various Acts governing securities Market –Important provisions of SEBI (Stock Brokers & Sub – Brokers) Regulations, 1992, SEBI (Prohibition of Insider Trading) Regulations, 1992, SEBI (Prohibition of Fraudulent and Unfair Trade Practices Relating to Securities markets) Regulations, 2003.

- The Depositories Act, 1996, Money Laundering Act, 2002.

Unit V: Fundamental and Technical Analysis: (10 Hrs.)

- Fundamental and Technical Analysis, Types of Charts and Technical Indicators
Market Simulation Lab.Market simulation lab sessions on internet based software to develop Keyboarding skills for cash market.

Note : Students are expected to keep themselves updated with latest developments in the subject from financial dailies like The Economic Times, Financial Express etc., watch business channels e.g. CNBC, NDTV Profit, ET Now etc. and get updates from webs SEBI, NSE etc.

Reference books :

1. E-Gorden K.Natrajn –Himalaya Publishing House.
2. Chandra Prasanna, (2009), Investment Analysis, 3rd edition, Tata McGraw Hill.
3. Choudhry, Moorad, (2002), Capital Market Instruments, Prentice Hall.
4. EDMadhusoodanan, (2008), Indian Capital Markets, Quest Publications.
5. Gurusamy, (2009), Capital Markets, 2nd edition, Tata McGraw, Hill.

Online references:

For MOOCs:

- <https://swayam.gov.in/>
- <https://alison.com/>:

Web resources:

www.moneycontrol.com
www.rbi.org.in
www.icai.org
<https://www.sebi.gov.in>
<https://www.nseindia.com>
<https://www.bseindia.com>

BBA- Sem -VI (CBCS 2018)			
FMK-603: ELECTIVE – III : FINANCIAL MARKETS (COMMODITY MARKETS)			
Course Code	FMK-603	Course Type	Discipline Specific Elective (DSE I -)
Credits	Four.	Examination Pattern	UE + IA: 60:40
<ul style="list-style-type: none"> • Learning objectives: • To understand commodities market, products, financial derivatives, pricing mechanism • To know the trading, clearing and settlement operations using NCDEX platform. • To introduce to regulatory framework and taxation aspects. 			
<p>Learning outcomes : After studying this course student are able to</p> <ol style="list-style-type: none"> 1 • Commodities market, products, financial derivatives, pricing mechanism 2 • Regulatory framework and taxation aspects 			
<p>Unit I: Introduction to Commodity : (12 Hrs.)</p> <ul style="list-style-type: none"> • Introduction to derivatives, products, participants and functions, derivatives markets, • Difference between commodity and financial derivatives, • Evolution of commodity exchanges, global commodity derivatives exchanges, latest developments. 			
<p>Unit II: Application of Commodity Futures : (12 Hrs.)</p> <ul style="list-style-type: none"> • Instruments available for trading – Forward contracts, Introduction to futures and options, Payoff for F&O, • Using futures versus options, Cost of carry model, Futures basis; Using commodity futures for hedging, Speculation and arbitrage. • 			
<p>Unit III: Trading, clearing and Settlement : (12 Hrs.)</p> <ul style="list-style-type: none"> • Trading – Futures trading systems, Entities in the trading systems, Commodity futures trading cycle, Order types and trading, Parameters, Margins for trading in futures, Charges, Hedge limits; • Clearing and Settlement – Clearing, Settlement, Risk Management, Introduction to NCDEX 			
<p>Unit IV: Regulatory Framework of Commodity Derivatives : (12 Hrs.)</p> <ul style="list-style-type: none"> • Rules governing Commodity Derivatives Exchange, Participants, Investor grievances and 			

Arbitration

Unit V: Trading In Commodity Markets:

(12 Hrs.)

- Patterns of Trading & Settlement,
- Efficiency of Commodity Markets - Size of volumes of Commodities

SKILL DEVELOPMENT

- Prepare the list of recognized stock exchanges in India
- Prepare the process chart of online trading of shares and debentures.
- Prepare the chart showing Governing Body of the Commodities Market
- Prepare the list of commodities traded on commodity market.
- Enlist the role of NSDL and CSDL

Text Books :

1. Commodities Market Module, Workbook from NSE.
2. Chatnai, (2010), Commodity Markets, 1st edition, Tata McGraw Hill.

Reference Books :

1. Kleinman, George, (2001), Commodity Futures & Options, 2nd (revised illustrated edition), Prentice Hall.
2. Stephens, John, (2001), Managing Commodity Risk, John Wiley & Sons.
3. Hirschey, (2010), Investments: Analysis and Behavior, 1st edition, Tata
4. McGraw Hill.Indian Institute of Banking & Finance, (2007), Commodity Derivatives, Macmillan India Ltd.

Online references:

MOOCS:

<https://swayam.gov.in/>

<https://alison.com/>:

Web resources:

www.moneycontrol.com

www.rbi.org.in

www.icai.org

<https://www.sebi.gov.in>

<https://www.nseindia.com>

<https://www.bseindia.com>

COURSE BBA SEM – VI

BBA- Sem -VI (CBCS 2018)			
FMK-604: ELECTIVE – IV : FINANCIAL MARKETS (INTRODUCTION TO DERIVATIVES : EQUITY AND CURRENCY)			
Course Code	FMK-604	Course Type	Discipline Specific Elective (DSE I - ELECTIVE – II)
Credits	Four.	Examination Pattern	UE + IA: 60:40
<ul style="list-style-type: none"> • Learning objectives: • To understand the concepts of equity and currency derivatives, • Derivatives products and their applications as a risk management tool using different trading strategies on stock exchanges 			
<p>Learning outcomes : After studying this course student are able to</p> <ol style="list-style-type: none"> 1 • Equity and Currency Derivatives 2 • Application of Derivatives as a risk management tool using different trading strategies on stock exchanges. 			
Unit I: Risk Management and Introduction to Derivatives Market:			(12 Hrs.)
<ul style="list-style-type: none"> • Introduction to Risk, Types of Risks and Risk Management Process • Meaning, History and Origin, Elements of a Derivative Contract, • Factors Driving Growth of Derivatives Market, Types of Derivatives, • Participants in Derivatives Market, Advantages and Disadvantages of Trading in Derivatives Market 			
Unit II: Introduction to Currency Markets:			(12 Hrs.)
<ul style="list-style-type: none"> • Introduction to Currency markets, Exchange rates, factors affecting currency market, • Currency futures, Strategies using currency futures, • Hedging, Speculation, Arbitrage, NSE's currency derivatives segment. 			
Unit III: Application of Commodity Futures:			(12 Hrs.)
<ul style="list-style-type: none"> • Instruments available for trading – Forward contracts, Introduction to futures and options 			
Unit IV: Introduction to Options:			(12 Hrs.)
<ul style="list-style-type: none"> • Options: Options Contract Specifications, Call Option, Put Option • Difference between Futures and Options, Trading of Options, Factors Affecting Option Premium, Payoff Charts and Diagrams for Option Contract, • Basic Understanding of Option Strategies. 			
Unit V: Trading, clearing and Settlement:			(12 Hrs.)
<ul style="list-style-type: none"> • Meaning and Concept, SEBI Guidelines, Trading Mechanism – Types of Orders, Clearing Mechanism – • NSCCL – its Objectives and Functions, Settlement Mechanism – Types of Settlement. 			

Text Books :

- Equity Derivatives : A Beginner's Module, Workbook from NSE.
- Currency Derivatives : A Beginner's Module, Workbook from NSE.

Reference Books :

1. Vohra, N.D., and Bagri, B.R. (2009), Futures and Options, 9th edition, Tata McGraw Hill, Publishing Company Ltd.
2. Red Head, (2007), Financial Derivatives : An Introduction to Futures, Forward, Options, Prentice Hall of India.
3. Vohra, (2010), Futures and Options, 2nd edition, Tata McGraw Hill.
4. Vohra, (2010), Derivatives and Risk Management, 1st edition, Tata McGraw Hill

Online references:

MOOCS:

<https://swayam.gov.in/><https://alison.com/>:**Web resources:**www.moneycontrol.comwww.rbi.org.inwww.icai.org<https://www.sebi.gov.in><https://www.nseindia.com><https://www.bseindia.com>

**BHARATI VIDYAPEETH
DEEMED TO BE UNIVERSITY**

PUNE, INDIA

FACULTY OF MANAGEMENT STUDIES

Board of Studies in Computer Applications

Bachelor of Computer Applications Programme

(Under Choice Based Credit System)

To be effective from 2018-19

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE
FACULTY OF MANAGEMENT STUDIES
Board of Studies in Computer Applications and Systems Studies
Bachelor of Computer applications Programme
(Under Choice Based Credit System)
To be effective from 2018-19 at Part I

1. INTRODUCTION:

The BCA Programme is a full time 150 Credits program offered by Bharati Vidyapeeth (Deemed to be University), Pune and conducted at its management institutes in Delhi, Karad, Kolhapur, Pune, Sangli, and Solapur. All the six institutes have excellent faculty, Laboratories, Library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade. The expectations and requirements of the Software Industry, immediately and in the near future, are visualized while designing the BCA programme. This effort is reflected in the Vision and Mission statements of the BCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth University which is to usher in “Social Transformation through Dynamic Education.”

2. VISION STATEMENT OF BCA PROGRAMME:

To create high caliber solution architects and innovators for software development.

3. MISSION STATEMENT OF BCA PROGRAMME:

To teach 'things, not just words', 'how to think', and 'how to self-learn'.

4. OBJECTIVES OF BCA PROGRAMME:

The main objectives of BCA Programme are to prepare the youth to take up positions as system analysts, system engineers, software engineers and programmers. Accordingly the course curriculum aims at developing 'systems thinking' 'abstract thinking', 'skills to analyze and synthesize', and 'skills to apply knowledge', through 'extensive problem solving sessions', 'hands on practice under various hardware/software environments' and 'three projects'. In addition, 'social interaction skills', 'communication skills', 'life skills', 'entrepreneurial skills', and 'research skills' which are necessary for career growth and for leading quality life are also imparted.

5. LEARNING OUTCOMES FROM THE BCA PROGRAMME:

At the end of the course the student should be able to:

- (a) Analyze problems and design effective and efficient software solutions.
- (b) Develop software under latest Application Development Environments.

- (c) Learn new technologies with ease and be productive at all times.
- (d) Read, write, and contribute to technical literature.
- (e) Work in teams.
- (f) Be a good citizen in all respects.

6. ELIGIBILITY FOR ADMISSION TO THIS PROGRAMME:

Admission to the course is open to any candidate who has passed (10+2) or equivalent examination of any recognized board.

Subject to the above condition, the final admission is based solely on the merit at the All India entrance test (BU-MAT) conducted by Bharati Vidyapeeth (Deemed to be University, Pune).

7 DURATION OF THE PROGRAMME:

The duration of this course is three years divided in to six semesters or a minimum of 150 credits whichever is later. The medium of instruction and examination will be only English.

8 SCHEME OF EXAMINATION:

For some courses there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 60 marks and IA will be conducted for 40 marks then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment (CA) the respective institutes will evaluate the students in varieties of ways, three or four times, during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

9 STANDARD OF PASSING:

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA. A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the Head of Passing to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table:

Range of Marks (%)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively. GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

10 Award of Honours:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} < 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} < 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} < 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} < 55$

$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} < 50$
CGPA below 5.0	F	Fail	Marks below 40

RULES OF ATKT:

1. A student is allowed to carry backlog of any number of subjects upto Semester IV.
2. A student must pass Part I (Semester I and II) to appear for Semester V.

SEMESTER-WISE COURSE STRUCTURE FOR BCA

(To be effective from July 2018)

SEMESTER I

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
101	Fundamentals of Information Technology	4	3	1	-	40	60
102	Algorithm and program Design	4	3	1	-	40	60
103	C Programming – I	4	3	1	-	40	60
104	Business organization system	4	3	1	-	40	60
105	Business Mathematics	4	3	1	-	40	60
106	Lab on MS-Office Suite	2	-	-	4	40	60
107	Lab on C Programming – I	2	-	-	4	40	60
108	General course-I: Community Work I / Career & Life Skills / Waste Management	1	2	-	-	50	0
Total		25	17	5	8	330	420

SEMESTER II

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
201	Computer Organization and Architecture	4	3	1	-	40	60
202	DBMS I	4	3	1	-	40	60
203	C Programming - II	4	3	1	-	40	60
204	Financial Accounting	4	3	1	-	40	60
205	Principles of Management	4	3	1	-	40	60
206	Lab on C Programming - II	2	-	-	4	40	60
207	Environmental Studies	2	2	-	-	40	60
208	General Course II : Community Work II (Swacchh Bharat Abhiyan) / Sectoral Analysis / Smart Cities	1	2	-	-	50	0
Total		25	19	5	4	330	420

SEMESTER III

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
301	Operating Systems	4	3	1		40	60
302	Software Engineering	4	3	1		40	60
303	DBMS II	4	3	1		40	60
304	Statistics	4	3	1		40	60
305	Multimedia Technology	4	3	1		40	60
306	Lab on Oracle and Multimedia	2	-	-	4	40	60
307	Lab on Linux Operating System	2	-	-	4	40	60
308	General Course III : Community Work III / Start up management / Agro Tourism	1	2	-	-	50	0
Total		25	17	5	8	330	420

SEMESTER IV

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
401	Computer Networks	4	3	1	-	40	60
402	Software Testing	4	3	1	-	40	60
403	Java Programming	4	3	1	-	40	60
404	Operations Research	4	3	1	-	40	60
405	Entrepreneurship Development	4	3	1	-	40	60
406	Lab on Java	2	-	-	4	40	60
407	Minor Project - I	2	2	-	-	0	100
408	General Course IV: Community work IV / Basics of Taxation / Meditation & Yoga	1	2	-	-	50	0
Total		25	19	5	4	290	460

SEMESTER V

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
501	Introduction to the Internet Technologies	4	3	1	-	40	60
502	Object Oriented Analysis and Design	4	3	1	-	40	60
503	C# Programming	4	3	1	-	40	60
504	Graph Theory	4	3	1	-	40	60
505	Elective I	4	3	1	-	40	60
506	Lab on Internet Technology and C# Programming	2	-	-	4	40	60
507	Minor Project II	2	2	-	-	0	100
508	General Course V: Social Media Management / Road Safety and Management / Event Management	1	2	-	-	50	0
Total		25	19	5	4	290	460

SEMESTER VI

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
601	Data warehousing and Data Mining	4	3	1		40	60
602	Web Programming	4	3	1		40	60
603	Software project Management	4	3	1		40	60
604	Business Analytics	4	3	1		40	60
605	Elective II	4	3	1		40	60
606	Lab on Web programming	2	-	-	4	40	60
607	Major Project	2	2	-	-	0	100
608	General Course VI: Business Ethics / Basics of Hospitality Management / Aptitude	1	2	-	-	50	0
Total		25	19	5	4	290	460

Electives:

Elective No.	Elective Group	Course No	Course Name
01	Information Security	505-1-A	Information Security Concepts
		605-1-B	Information Security Administration
02	Big Data	505-2-A	Introduction to Big Data
		605-2-B	HADOOP
03	Information Systems	505-3-A	E-Commerce
		605-3-B	Knowledge Management

Practical Examinations:

For courses Nos. 106,107, 206, 306, 307,406, 506 and 606 there will be practical examination.

SEMESTER I

Course Number	Course Name	L-T-P- Credits	Year of Introduction
101	Fundamentals of Information Technology	3+1+0 = 4C	2018-19
<p>Course Objective: The main objective is to introduce IT in a simple language to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. The focus of the subject is on introducing skills relating to IT basics, computer applications, programming, interactive medias, Internet basics</p>			
<p>Expected Outcome : At the end of this course, student should be able to (a) Understand basic concepts and terminology of information technology. (b) Have a basic understanding of personal computers and their operations. (c) Be able to identify issues related to information security.</p>			
<p>References (Books, Websites etc) : How to solve computer – Dromey Computer Fundamentals by P. K. Sinha,</p>			
<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
Course Plan			
Unit	Contents		
1	<p>Introduction to Computers: Definition, .Basics of Computer, Characteristics of computers, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer.</p>		
2	<p>Computer Arithmetic: Binary, Binary Arithmetic, Number System: Positional & Non Positional, Binary, Octal, Decimal, Hexadecimal, Converting from one number system to another , 1's Complements, 2's Complements, Computer Codes, Rules and laws of Boolean algebra, Basic Gates (NOT, AND & OR)</p>		
3	<p>Input Output Devices: Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.</p>		

4	<p>Storage Fundamentals: Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Disks. Flash Drives, DVD, Blue-Ray disc.</p>
5	<p>Software: Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w, Algorithms and Flow Charts.</p>
6	<p>Data Communication: Communication Process, Data Transmission speed, Communication Types (modes), Data Transmission Medias, Modem and its working, characteristics, Types of Networks, LAN Topologies, Computer Protocols, Concepts relating to networking. Internet – Web Browsers, Web servers, Internet Protocol, Hyper text Transfer Protocol, Business Data Processing: Introduction, data storage hierarchy, Method of organizing data, File Types, File Organization, File Utilities.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
102	Algorithm and Program Design	3+1+0 = 4C	2018-19
<p>Course Objective: To understand good principles of algorithm design, elementary analysis of algorithms, and fundamental data structures. The emphasis is on choosing appropriate data structures and designing correct and efficient algorithms to operate on these data structures.</p>			
<p>Expected Outcome:</p> <p>This is a first course in data structures and algorithm design. Students will:</p> <ul style="list-style-type: none"> • learn good principles of algorithm design; • learn how to analyze algorithms and estimate their worst-case and average-case behaviour (in easy cases); • become familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles; 			
<p>References (Books, Websites etc) :</p> <ol style="list-style-type: none"> 1. Dromey R. G. : How to Solve it by a Computer. 2. Sartaj Sahni: Data Structure, Algorithms and Applications in C++ (Ch II). 			
<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
Course Plan			
Unit	Contents		
1	<p>Introduction: Concept, of Problem, Procedure and Algorithm, Algorithm Representation through Pseudo - Code and Flow - Charts, Tracing of Algorithms Such as Swapping, Counting, Finding the Sum, Product, maximum, minimum, of a list of numbers.</p>		
2	<p>Concept of Structured Programming and Procedure Oriented Programming: Introduction, Concept, Basic Control Structure, Benefits of Structured Programming and Procedure Oriented Programming</p>		
3	<p>Design of Algorithm: Design of algorithm for problem such as Evaluation of polynomial, Sum of first n factorials, Finding nth term of Fibonacci sequence, Finding largest and second largest of list, Determining nth root of a number, compute, GCD and Base Conversion</p>		
4	<p>Problem Analysis and Design 1: Problem Analysis and Design of Algorithms for problems such as (1) Swapping (2) Counting (3) Finding the Sum, Product, maximum, minimum of a finite list of numbers, and (4) Simple variations of the above problem realization that, there may be alternative algorithm and that one algorithm may be better (in some sense) than the other.</p>		

5	Problem Analysis and Design2: Problem Analysis Design of Algorithms for problems such as (1) Evaluation of a polynomial (2) Sum of first n factorials (3) Finding the nth term of a Fibonacci sequence, (4) Finding the largest and second largest of a finite list, (5) Evaluating in finite series and variations of these problems, (6) Determining nth root of a number.
6	Concept of Array, Sort and Search Technique: Introduction of Array, Array manipulation such as removing the duplicates, Partitioning of an array, listing of prime numbers, finding prime factor of a number, The problem of search and Merge, Linear, Binary search algorithms, The Problem of Sorting, Selection, Insertion and Bubble

Course Number	Course Name	L-T-P- Credits	Year of Introduction
103	C Programming - I	3+1+0 = 4C	2018-19
Course Objective:			
This is a first course in programming. The objective of this paper is to teach the Programming Language C. However, the process of learning a computer language will also be emphasized. Emphasis is also on semantics and problem solving.			
Expected Outcome:			
At the end of the course a student should be able:			
<ul style="list-style-type: none"> • To solve a given problem using programming/algorithm • Understand and use C libraries, • Trace the given C program manually • Effectively use of Arrays and functions • Write C program for simple applications of real life using structures and Unions. 			
References (Books, Websites etc) :			
<ol style="list-style-type: none"> 1. Let us C - Y.Kanetkar, BPB Publications 2. Programming in C - Gottfried B.S., TMH 3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI 4. Programming in ANSI C - Balaguruswami, TMH 5. C- The Complete Reference - H.Sohildt, TMH 6. A Structured Programming Approach using C – B.A. Forouzan & R.F. Gillberg, THOMSON Indian Edition 7. Computer fundamentals and programming in C – Pradip Dey & Manas Ghosh, OXFORD 			
Suggested MOOC :			
Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction to C language Origins of C, Character Set of C, C Tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Declaration of variables as constant, Operators, Types of operators, Precedence and associativity, Expression, Type conversions in expressions, Input and Output functions - printf(), scanf(), getchar(), putchar(), Formatted input and formatted output.		
2	Decision Control and looping Introduction, Control Statements- Sequential, Selection, Iteration Statements, Branching structure- if statement, if-else statement, Nested if-else statement, else if Ladder, Conditional operator, switch statement, Loop control structures- while loop, do-while loop, for loop, Nested for loop, Jump statements-break, continue, goto		
3	Functions Introduction, Purpose of function, Function declaration/ Function prototype, Function definition, Function call, return statement, Function parameters, Types of functions, Call		

	by value , Storage classes, Recursion, Examples on recursive function
4	<p>Arrays and Strings</p> <p>Introduction to one-dimensional Array, Definition, Declaration, Initialization, Accessing and displaying array elements, Arrays and functions, Introduction to two-dimensional Array, Definition, Declaration, Initialization, Accessing and displaying array elements, Introductions to Strings, Definition, Declaration, Initialization, Input, output statements for strings, Standard library functions, Implementations with standard library functions</p>
5	<p>Structures and union</p> <p>Introduction to structure, Defining a structure, Declaring structure variables, Accessing structure members, nested structure, Array of structure, Array within structure, Introduction to union, Definition, Declaration, Differentiate between structure and union</p>
6	<p>Pointers</p> <p>Introduction to pointer, Definition, Declaring and Initializing pointer variable, Indirection operator and address of operator, Accessing variable through its pointer, Pointer arithmetic, Dynamic memory allocation, Pointers & Functions, Pointers & Array, Pointers & Structures</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
104	Business Organization System	3-1-0 = 4C	2018-19
<p>Course Objective: To acquaint students with fundamentals of Business Organization and management systems as a body of knowledge.</p>			
<p>Expected Outcome : 1. Students shall know about business and structure 2. Students shall know about various forms of business 3. Students will have sound knowledge about overall business environment.</p>			
<p>References (Books, Websites etc) :</p> <p>Reference Books: S.A. Sherlekar ,Modern Business Organization and Management – (Himalaya Publishing House) Y.K. Bhushan ,Fundamental of Business Organization & Management – (S Chand Publishers) Basu, C. R.; <i>Business Organization and Management</i>, Tata McGraw Hill, Publishing House, New Delhi, 1998 B S Moshal, J P Mahajan, J S Gujral, Business Organization and Management –. Galgotia Publishing Co, New Delhi Redmond James, Robert Trager , Media Organization and Management –, Biztantra, New Delhi</p>			
<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
<p>Laboratory Experiments:</p>			
1	<p>Nature of Business Concept of Business – Meaning, Definition, Nature and Scope, Characteristics of Business. Business as an Economic Activity. Objectives of Business. Structure of Business (Classification of Business Activities. Requisites for Success in Modern Business.</p>		
2	<p>Evolution of Business Beginning and development of Commerce, Evolution of Industry, Industrial Revolution, Beginning and growth of Indian Business, Industrialization in India.</p>		
3	<p>Forms of Business Ownership Introduction to various forms – Factors affecting choices of an deal form of ownership, features Merits and Demerits of Sole Proprietorship – Joint Hindu Family Business – Partnership – Joint Stock Company – Co-operative Organisation, Public Enterprises.</p>		
4	<p>Formation of a Company Stages in formation and incorporation of a company (e Promotion – incorporation and registration – Capital Subscription – Commencement of Business. - Documents of a Company i.e. Memorandum of Association – Articles of Association – Prospectus.</p>		

5	<p>Establishment of Business Enterprise Various factors to be considered while starting a new Business enterprise i.e. identification of Business Opportunity – Market Assessment – Suppliers – Technology – Location – Human Resource – Finance etc. Small and Medium Enterprises – Meaning Characteristics and objectives. Role of Support Organisation such as Trade Associations and Chambers of Commerce.</p>
6	<p>Organization of Trade Channels of Distribution – Meaning, Functions and types. Internal Trade – Wholesale and Retail External Trade – Import and Export. Role and importance of support services to Business such as Transport Insurance etc. Business Combinations – Mergers and Acquisitions. Franchising. Business Process Outsourcing. Multinationals – Concept and role of MNCs</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
105	Business Mathematics	3+1+0 =4C	2018-19
Course Objective:			
To give general idea about mathematics and its application in Business			
Expected Outcome:			
The students will be able to solve small business problems by using the concepts of Business Mathematics			
References (Books, Websites etc) :			
Discrete Mathematics & its Applications by Kenneth Rosen			
Suggested MOOC :			
Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	Set Theory : Definition of a set, Representation of elements of sets, Methods of representing sets , types of sets, operations on sets , cardinality of a set, Principle of Inclusion and Exclusion , Venn Diagram , Proof by using Venn diagram		
2	Functions and Relations : Definition of Function, Types of Functions ,Composite Function, Relation definition, representation of relations		
3	Logic: Propositions, Logic Operations-Negation, Disjunction, Conjunction, Conditional and Biconditional, Truth Tables of compound propositions, Translating English sentences in to logical statements and vice versa, Logic gates and circuits		
4	Matrices: Matrix Definition, General Form, Representation of matrix in computers, Types of matrices, Operations on matrices: Addition, Subtraction and Multiplication, transpose , row / column transformations , Inverse of the matrix by Co-factor and Adjoint method, solutions to three variable problems by using matrices, application problems of matrices		
5	Permutations and Combinations: Concept- Permutation, Combination, Sum and Product rules, problems on Permutation and combination (with wording atleast, atmost, neither nor, any one etc.)		
6	Probability: Concept and problem solving, general probability, conditional probability, partitions, Bayes Theorm		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
106	Lab on MS-Office Suite	2-0-4 = 4C	2018-19
<p>Course Objective: The objective of this course is to help the student gain proficiency in text editing and formatting, spreadsheet and database management, and presentation preparation. An additional objective of the course is for the student to gain basic knowledge of modern-day computing technology.</p>			
<p>Expected Outcome : Upon completion of this course students will be able to:</p> <ul style="list-style-type: none"> • Demonstrate an advanced knowledge of the Word Processing package, MS Office and a knowledge of how to design & create effective and structured documents like technical reports, letters, brochures, etc., • Demonstrate the skills in the appropriate use of various features of the spread sheet package MS Excel and also to create useful spreadsheet applications like tabulated statements, balance sheets, statistical charts, business statements, etc. • Demonstrate the skills in making an effective presentation with audio and video effects using the MS Excel package • Draw graphical pictures, flow charts, block diagrams etc., using the drawing tools available in MS Word or MS Power Point and incorporate them into documents and presentations. 			
<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
Course Plan			
Unit	Information Technology Essentials, Windows and Internet Explorer:		
1	Verify the components of a typical computer system, Explore, maintain files, and customize the Windows operating system, Review using the Internet Explorer.		
2	<p>MS Word: Introduction: Introduction to MS Word, Menus, Shortcuts, Document types Working with Documents:</p> <ol style="list-style-type: none"> a) Opening Files – New & Existing, Saving Files b) Formatting page and Setting Margins c) Converting files to different formats : Importing, Exporting , Sending files to others d) Editing text documents : Inserting , Deleting ,Cut, Copy, paste , Undo, Redo , Find, Search, Replace e) Using Toolbars, Ruler, Icons and help <p>Formatting Documents:</p> <ol style="list-style-type: none"> a) Setting Font Styles: Font selection – style, size, color etc., Type face – Bold Italic, underline, Case settings, Highlighting, Special symbols b) Setting Paragraph style: Alignments, Indents, Line space, Margins and Bullets 		

	<p>and Numbering</p> <p>c) Setting Page Style: Formatting, Border & Shading, Columns, Header & footer, Setting Footnotes, Inserting manual Page break, Column break and line break, Creating sections and frames, Inserting Clip arts, inserting pictures and other files, Anchoring & Wrapping</p> <p>d) Setting Document Styles: Table of Contents, Index, Page Numbering, data & Time, Author etc., Creating Master Documents</p> <p>Creating Tables: Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, Formula</p> <p>Drawing: Inserting Pictures/Files etc., Drawing Pictures, Formatting & Editing pictures, Grouping and ordering, Rotating</p> <p>Tools: Word Completion, Spell Checks, Macros, Mail merge, Templates, Using Wizards, Tracking, Changes, Security</p>
3	<p>MS Power Point:</p> <p>Introduction: Opening new Presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts</p> <p>Creating a presentation: Setting presentation style, Adding Text to the presentation</p> <p>Formatting a presentation: Adding style, Color, gradient fills, Arranging objects, Adding Header & Footer, Slide background, Slide layout</p> <p>Adding Graphics to the presentation: Inserting pictures, movies, tables, etc into the presentation, Drawing Pictures using Draw</p> <p>Adding effects to the presentation: Setting Animation & transition effect, Adding audio and video</p> <p>Printing Handouts and Generating standalone presentation viewer</p>
4	<p>MS Excel:</p> <p>Introduction: Spreadsheet & its Applications, Opening spreadsheet, Menus & Toolbars & icons, Shortcuts, Using help</p> <p>Working with Spreadsheets: Opening a File, Saving Files, Setting Margins, Converting files to different formats: Importing, Exporting and Sending files to others</p> <p>Spreadsheet addressing: Rows, Columns & Cells, Referring cells and Selecting cells</p> <p>Entering and Editing Data:</p>

	<p>Entering Data, Cut, Copy, paste, Undo, Redo, Find, Search & Replace, Filling continuous rows, columns, Inserting -Data, cells, column, rows & sheets, Manual breaks</p> <p>Computing data : Setting Formula, Finding total in a column or row, Mathematical Operations(Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formula</p> <p>Formatting Spreadsheets: Formatting – Cell, row, column & Sheet: Alignment, Font, Border & shading, highlighting values Hiding/Locking Cells</p> <p>Worksheet : Sheet Name , Row & Column Headers, Row Height, Column Width, Visibility – Row, Column, Sheet , worksheet Security</p> <p>Formatting – worksheet: Sheet Formatting & style - background, color, Borders & shading, Anchoring objects, Formatting layout for Graphics, Clipart etc.,</p> <p>Working with sheets : Sorting, Filtering, Validation, Consolidation, Subtotal , Creating Charts, Selecting charts, Formatting charts, label, scaling etc.,</p> <p>Using Tools: Error Checking, Spell Checks, Macros, Formula Auditing, Creating & using Templates, Tracking changes, customization, printing worksheet</p>
5	<p>Working with Excel Functions: Concept of Functions, Commonly used functions: Sum, Max,Min, Average, Count, Today, Now, Datedif, Countif, CountA, CountBlank, Round, RoundUp, RoundDown, ABS, Sign, Ceiling, Floor, Trim, Value, Clean, sqrt, if, sumif</p>
6	<p>MS Access: What is an Access Database, Opening a Database File, Create Table, Create and modify fields of tables, Construct simple queries, Saving and Running Queries</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
107	Lab on C Programming I	0-0-4- = 2 C	2018
Course Objective :			
This is companion course of C Programming I			
Syllabus Broad Units:			
This Companion course of C programming; Practical aspects of C programming towards problem solving is covered.			
Expected Outcome :			
The students will develop adequate programming skills with respect to following			
<ol style="list-style-type: none"> 1. Implement a real world problem using basic constructs of C language. 2. Develop an application using Decision making and looping 3. Make use of proper operators to solve problem. 4. Make use of Arrays and pointers efficiently and handling strings. 5. Comprehend the dynamic memory allocation and pointers in C. 6. Able to define new data types using enum, structures and typedef. 			
References (Books, Websites etc) :			
<ol style="list-style-type: none"> 1. Let us C - Y.Kanetkar, BPB Publications 2. Programming in C - Gottfried B.S., TMH 3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI 4. Programming in ANSI C - Balaguruswami, TMH 5. C- The Complete Reference - H.Sohildt, TMH 6. A Structured Programming Approach using C – B.A. Forouzan & R.F. Gillberg, THOMSON Indian Edition 7. Computer fundamentals and programming in C – Pradip Dey & Manas Ghosh, OXFORD 			

Outline of Lab on C programming – I

Sr. No	Programming Exercises
1	Compilation and Executing programs Arithmetic operations Use of Symbolic constants Demonstrating the following gcc options -o, -c, -D, -l, -I, -g, -E Programs to demonstrate use of operators and Input/ output <i>gcc or an equivalent compiler is assumed.</i>
2	Program to demonstrate the following – Branching

	<ul style="list-style-type: none"> - Nested Branching - Looping - Selection
3	<p>Working with functions</p> <ul style="list-style-type: none"> - Writing function prototype and definition - Using functions to solve problems (Calling a function) - Using recursion - Storage classes - Using register, extern and static
4	<p>Arrays and Strings</p> <p>1D - Linear Search, Sort</p> <p>2D - Matrix operations</p> <p>Strings: program to do operations on string using library and user defined functions</p> <p>Finding length of string, String concatenation, removing extra spaces, get substring, check whether second string is part of another, converting string to lowercase, uppercase etc.</p>
5	<p>Structures</p> <p>Making use of structures to define new types(user defined types)</p> <p>Arrays of structure, display all elements of array and sorting of them.</p>
6	<p>Pointers,</p> <p>Programs to demonstrate working of pointer; need of pointer</p> <p>Pointer as parameter to function</p> <p>Comparison of pointer with arrays and using pointer to refer an array</p> <p>Creating pointer dynamically by using dynamic memory allocation</p> <p>Array of Pointers, Ragged Arrays, Function pointer</p>

Course Number	Course Name	L-T-P-Credits	Year of Introduction
108	Community Work	2-0-0 =1 C	2018-19
Course Objective:			
This course aims to expose the students to social issues and help them Participate in community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc			
(I) To expose the students towards social reality and role of community development for social upliftment and well being			
(II) To involve students in community work through active involvement and participation			
Expected Outcome:			
Students will be able to know the community needs and understand their role ito contribute meaningfully towards community development			
Course Plan			
Unit	Contents		
1	History, meaning, Goals, values, functions, role and process of community work. Professional and voluntary community work. Attitudes, roles and skills of a community worker .		
2	Social concerns in India: poverty, unemployment, population, problems faced by women – dowry, domestic violence, etc. Social problems - terrorism, corruption, caste conflict, drug abuse, AIDS, ETC.		
3	Types of community work. Caring for needy, helping the poor, fundraising drives-organizing.		
	COMMUNITY HOURS:		
	Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken.		

Course Number	Course Name	L-T-P-Credits	Year of Introduction
108	Career & Life Skills	2-0-0 =1 C	2018-19
<p>Course Objective:</p> <ol style="list-style-type: none"> To help students make well-informed, thoughtful decisions regarding your future as adults. To develop behaviours and attitudes that help students contribute to the community in a positive manner. Give you skills and knowledge to contribute to the well-being and respect of the self and others 			
<p>Expected Outcome: Students will be able to understand self potential and ways to enhance capabilities.</p>			
<p>References (Books, Websites etc) : <i>LifeChoices Series: - LifeChoices: Careers, Healthy & Well, Relationships, Venturing Out</i></p>			
<p>Online Resources:</p> <ol style="list-style-type: none"> the life-changing magic of tidying up: the japanese art of decluttering and organizing - marie kondo how to organize (just about) everything: more than 500 step-by-step instructions for everything from organizing your closets to planning a wedding to creating a flawless filing system – peter walsh <p>Mindset: the new psychology of success -carol s. Dweck</p>			
Course Plan			
Unit	Contents		
1	<p>Unit 1: Introduction to Life Management Life management-definition, scope and application, concept of emotions, self belief, setting realistic goals, understanding system</p>		
2	<p>Unit 2: Developing Emotional Potential and Physical Potential Improving thinking skills, improving study skills, planning education Eating habits, healthy foods, staying healthy, changing habits-the self change model</p>		
3	<p>Developing Your Intellectual Potent Effective communication, effective listening, effective speaking ,getting along with others, functioning in groups, how to delegate. Definition-stress, handling change and stress, managing time, managing money, formulation of career plan, bring it all together</p>		
4	<p>Career and Life Choices Managing personal, lifelong career development. Resource Choices... Making responsible decisions in the use of finances and other resources that reflect personal values and goals as well as a commitment to self and others. Personal Choices... Understand the emotional/psychological, intellectual, social, spiritual, and physical dimensions of health and how these dimensions of health work together to contribute to personal well-being.</p>		

Course Number	Course Name	L-T-P-Credits	Year of Introduction
108	Waste Management	2-0-0 =1 C	2018-19
<p>Course Objective: To expose students to the issue of waste and waste management tools and techniques applicable for waste disposal and management.</p>			
<p>Expected Outcome: After completion of the course students</p> <ul style="list-style-type: none"> • will be able to understand solid waste sources, health and environmental issues related to solid waste management. • will get knowledge about Sources, handling and control of Biomedical, Chemical, Nuclear and e-wastes. <p>will be able to understand the issues regarding waste disposal and management and will become aware of Environment and health impacts due to solid waste mismanagement</p>			
<p>References (Books, Websites etc) :</p> <ol style="list-style-type: none"> 1. D. Bhide and B.B. Sundaresan, “Solid Waste Management – Collection, Processing and disposal” Mudrashilpa Offset Printers, Nagpur, 2001. 2. Biomedical waste (Management and Handling) Rules, 1998. 3. George Tchobanoglous, Hilary Theisen, Rolf Eliassen; Solid Wastes: Engineering Principles and Management Issues; McGraw-Hill. 4. Manual on Municipal Solid Waste Management, New Delhi, Controller of Publications. 5. Freeman H.M. (1988) Standard Handbook of Hazardous Waste Treatment and Disposal, New York, McGraw-Hill. 6. Constitutional Law of India – J.N. Pandey 1997 (31st Edn.) Central Law Agency Allahabad. 7. Diganta Bhusan Das , Diganta Bhusan Das; Solid Waste Management: Principles and Practice 8. George Techobanoglous et al,”Integrated Solid Waste Management” McGraw - Hill, 1993. 9. A Study of Waste Management Systems in Pune Municipality Corporation, Rajendra Jagtap, Ph.D Thesis, Bharati Vidyapeeth University, Pune 			
<p>Online Resources:</p> <ol style="list-style-type: none"> 1. http://www.moef.nic.in/legis/hsm/mswmhr.html 2. en.wikipedia.org/wiki/waste_management 3. http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf 4. http://www.ilo.org/oshenc/part-vii/environmental-pollution-control/item/514-solid-waste-management-and-recycling 5. www.houstontx.gov/solidwaste 6. www.epa.gov/tribalmsw/ 7. www.unc.edu/courses/2009spring/.../SolidWasteIndiaReview2008.pdf 8. http://www.digitalbookindex.org/_search/search010environmenwasterefusea.asp (e-books) 			
Course Plan			
Unit	Contents		

1	<p>Solid Waste Management- Introduction to waste Management Introduction, Meaning, Solid waste including municipal, hospital and industrial solid waste; health and environmental issues related to solid waste management. Provisions in Indian Penal Code for Environmental protection.</p>
2	<p>Biomedical, Chemical, Nuclear and e-wastes Biomedical wastes – Types – Management and handling – control of biomedical wastes, Chemical wastes – Sources –Environmental effects – Need for control – Health and environmental effects. Nuclear waste – Management of nuclear wastes, e-waste- sources and management.</p>
3	<p>Waste reduction at source Treatment and disposal techniques for solid wastes–composting, vermin-composting, autoclaving, microwaving, incineration, non- incineration, Thermal techniques, use of refuse derived fuels, land-filling. Reduce Reuse and Recycling Techniques: Need for the concept-Variou Types - Handmade Paper production –Reuse of materials-Recycle of material</p>

SEMESTER II

Semester II

Course Number	Course Name	L-T-P- Credits	Year of Introduction
201	Computer Organization and Architecture	3-1-0 = 4C	2018-19
<p>Course Objective: Main objective of this paper is to learn structure and functioning of various hardware components of digital computer. Also study the interactions and communication among these hardware components.</p>			
<p>Expected Outcome : At the end of this course, student should be able to understand</p> <ul style="list-style-type: none"> • Simple machine architecture and the reduced instruction set computers. • Memory control, direct memory access, interrupts, and memory organization • Basic data flow through the CPU (interfacing, bus control logic, and internal communications). • Number systems, instruction sets, addressing modes, and data/instruction formats. 			
<p>References (Books, Websites etc) : M Morris Mano Computer systems Architecture third edition Prentice Hall of India Publication</p>			
<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
Course Plan			
Unit	Contents		
1	<p>Introduction To Digital Computer: Data Representation – Data Types – Complements – Arithmetic Operations – Representations – Fixed –Point, Floating – Point , Decimal Fixed – Point – Binary Codes- Logic Gates, Boolean Algebra, Map Simplification – Combinational Circuits: Half-Adder, Full Adder- Flip Flops - Sequential Circuits</p>		
2	<p>Introduction To Digital Components And Micro Operations: ICs – Decoders – Multiplexers – Registers – Shift Registers – Binary Counters – Memory Unit – Register Transfer Language – Register Transfer – Bus And Memory Transfers – Arithmetic, Logic And Shift Micro Operations , Arithmetic Logic Shift Unit.</p>		
3	<p>Computer organization: Instruction Codes – Computer Registers – Computer Instructions – Timing And Control – Instruction Cycle – Memory Reference Instructions – I/O And Interrupt – Machine Language – Assembly Language – Assembler.</p>		
4	<p>Memory Organization: Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management.</p>		
5	<p>Central Processing Unit: General Register Organization – Control Word – Stack Organization – Instruction Format – Addressing Modes – Data Transfer And Manipulation – Program Control, RISC</p>		

6

Input – Output Organization:

Peripheral Devices – Input-Output Interface – Asynchronous Data Transfer – Modes Of Transfer – Priority Interrupt – DMA – IOP – Serial Communication.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
202	Database Management System	3-1-0 = 4C	2018-19
<p>Course Objective: This is a foundational course on Data Modeling. The course aims to impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.</p>			
<p>Expected Outcome : At the end of the course, student should be able to A) Understand the concepts of database and techniques for its management. B) Different Data Models at Conceptual and Logical level. C) Differentiate between the role of DBA and Data Architect D) Understanding Data Security standards and Methods</p>			
<p>References (Books, Websites etc) : 1) Database System Concepts By Henry korth and A. Silberschatz 2) Database Systems Concepts, Designs and Application by Shio Kumar Singh, Pearson 3) Database Management Systems by Debabrata Sahoo ,Tata Macgraw Hill</p>			
<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com www.coursera.com</p>			
Course Plan			
Unit	Contents		
1	<p>Introduction of Database Management System: Difference between Data, Information, Data Processing & Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS, Data Independence. Database users, Types of Database System. Database Languages, DBMS interfaces.</p>		
2	<p>Data Modeling: Data Models, Logical Data Modeling: Hierarchical Data Model, Network Data Model, Relational Data Model, Advantages and Disadvantages of Logical Data Modeling. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial, Strong and Weak Entity Set. Case studies on ERD.</p>		
3	<p>Normalization: Keys: Composite, Candidate, Primary, Secondary, Foreign, Super key, CODD's Rules, Mapping conceptual model into Relational Model. Functional Dependencies, Decomposition, Lossy and Lossless Decomposition, Dependency Preserving Decomposition Advantages and Disadvantages of Normalization, Normal Forms (1NF, 2NF, 3NF,) Case Studies on Normalization.</p>		

4	<p>File Structures and Data Administration: File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing, Data administration, Role and Responsibility of DBA</p>
5	<p>Transaction and Concurrency Control Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs</p>
6	<p>Database Recovery and security Management: Database Recovery, Types of Failures, and Data access. Recovery and atomicity, Recovery Techniques Algorithms: Log Based Recovery, Check points, Shadow Paging, Recovery with concurrent transactions</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
203	C Programming - II	3-1-0 = 4C	2018-19
Course Objective: <ul style="list-style-type: none"> To understand file handling in C. To develop skills to analyze the problem given and to design & develop an efficient solution to given problem To develop capability to choose appropriate data structures for given problems To imbibe programming skills & thereby making industry ready 			
Expected Outcome: After undergoing this course, student will <ol style="list-style-type: none"> Have thorough knowledge about data structures Ability to design& develop program using linear data structures& non linear data structures for solving problems Ability to choose appropriate data structures for problem solving Ability to use combination of these data structures for problem solving. 			
References (Books, Websites etc) : <ol style="list-style-type: none"> Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, Computer Science A Structured Programming Approach Using C Basavraj S Anami, Shanmukhappa Angadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C. Andrew Tenanbaum, Thomson, 2005, Data Structures with C.Robert Kruse & Bruce Leung, Data Structures & Program Design in C, Pearson Education, 			
Suggested MOOC : Data structures and Algorithms, Prof. Sudarshan Iyengar, IITRopar, 8 weeks, Rerun Feb 05, 2018 https://onlinecourses.nptel.ac.in/noc16_cs06 at NEPTEL			
Course Plan			
Unit	Contents		
1	Elementary Data Structures: Basic concepts such as data object, array, and record; Operations and relations on data objects; definition of data structure; Built-in data types as examples of data structures; concept of abstract data type; notation to specify an abstract data type; concepts of pre-conditions and post-conditions; Implementation of an ADT in a language; Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade_card etc.		
2	Linear Data Structures: (Representation in Memory and operations like insertion, deletion and traversal) – one and multidimensional array, Pointer arrays, single link list, circular link list, double link list		
3	Particular Linear Data Structures: Representation in Memory and operations like insertion, deletion and traversal) - Stacks: Applications: implementation of recursion, factorial calculation, queues, circular queue, deque;		

4	File Handling: Creation, reading writing in a file. Pattern Matching and Extraction of data from a file. Reading and writing from files.
5	Hierarchical data structures : General trees and related concepts; depth first and breadth first traversal of trees; n-ary trees and important properties of n-ary trees; binary trees and their properties; binary tree traversal algorithms.
6	The problem of search and Sorting : Linear and binary search and their efficiency; Hash tables, The standard sort algorithms (Bubble/insertion/selection) and their efficiencies; Merge sort and quick sort algorithms and their efficiencies.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
204	Financial Accounting	3-1-0 = 4C	2018-19
Course Objective: <ol style="list-style-type: none"> To impart basic accounting knowledge To lay a foundation for further study of accounting at higher level To enable the students to understand basic accounting principles, practice and its applications in modern business activities. 			
Expected Outcome : <ul style="list-style-type: none"> The knowledge of accounting and its principles at basic level. Practical's in Tally and Excel for Financial Accounting assignments 			
References (Books, Websites etc) : <ol style="list-style-type: none"> Dr. S. N. Maheshwari , Financial Accounting For Management: (Vikas Publishing House) Robert Anthony, David Hawkins, Business Accounting. (Tata McGraw –Hill) M.G.Patkar, Book-Keeping & Accountancy. Std XI(FYJC) Commerce Anil Chowdhry , Fundamentals of Accounting & Financial Analysis (PearsonEducation) M.E.Thukaram Rao, Accounting for Managers.(New Age International Publishers) 			
Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction: Need for Accounting, Meaning and definition of book keeping, System of Book keeping. Financial Accounting-definition, Scope and objectives. Accounting v/s Book Keeping. Limitations of Financial Accounting, End users of financial statement.		
2	Accounting Principles, Concepts and Conventions: Accounting Principles-definition and importance, Accounting Concepts and Conventions, Branches of accounting.		
3	Journal and ledger: Journal-importance and utility, classification of accounts, journalizing of transactions. Ledger- meaning and utility, posting and balancing of account		
4	Subsidiary Books And Trial Balance: Cash book, purchase book, sales book. Trial Balance- meaning and purpose, preparation of a trial balance.		
5	Preparation of final accounts: Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business.		
6	Computerized Accounting: Computers and Financial application, Accounting Software packages. (Orientation level)		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
205	Principles of Management	3+1+0 = 4C	2018-19
Course Objective: To understand the concepts in Management and to develop the skills related to practice of management.			
Expected Outcome: To understand the functions and processes of business management.			
References (Books, Websites etc) : <ol style="list-style-type: none"> 1. Heinz Wehrich & Harold Koontz , Principles and Practice of Management 2. Tripathi & Reddy , Principles of Management 3. Dr. L.M.Prasad, Principles of Management 4. Richard Daft., Management. Thomson South Western Publishers, Australia 			
Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction to Management: Definitions and Meaning of Management, Characteristics of Management, Management Vs. Administration, Levels of Management, Functions of management, Scope and Importance of Management, Henry Fayol' s contribution to Management, Fredrick Taylor's contribution to Scientific Management, Social Responsibility of Management.		
2	Planning: Meaning, Steps in planning process, Nature of planning , Types of plans, Mission and Objectives, Process of setting Objectives, Management by Objectives, Decision making - process.		
3	Organizing: Meaning, Process of Organizing, Organization Structure, Forms of Organization		
4	Staffing: Recruitment and its Sources, Selection process, Payment of Wages and Salaries, Incentives - Types, Motivation - Positive and Negative motivation.		
5	Directing: Defining Leadership, Types of leadership. Authority & Responsibility, Delegation of Authority, Decentralization - Determinants of decentralization, Distinction between Delegation and Decentralization.		
6	Controlling: Meaning, Characteristics of Control, Process of Controlling, Modern methods of controlling, Requirements for Effective Control, Relationship between Planning & Controlling. Use of IT in Controlling. Zero Based Budgeting and Management audit.		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
206	Lab on C Programming -II	0-0-4 = 2C	2018-19
Course Objective :			
This is companion course of C Programming II			
Syllabus Broad Units:			
This Companion course of C programming II; Practical aspects of C programming towards problem solving is covered.			
Expected Outcome :			
The students will develop adequate programming skills with respect to following			
<ol style="list-style-type: none"> 1. Define basic data structures such as Date, Currency and Rational; and using it. 2. Defining and using and updating Linear data structures : arrays and Linked List 3. Should define data types such as stack, queue and List 4. Able to read and write data into files. 5. Able to define hierarchical data types; manipulate and use it. 6. Able to understand searching and sorting mechanism and use various algorithms on it. 			
References (Books, Websites etc) :			
<ol style="list-style-type: none"> 1. Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, Computer Science A Structured Programming Approach Using C 2. Basavraj S Anami, Shanmukhappa Angadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C. 3. Andrew Tenenbaum, Thomson, 2005, Data Structures with C. Robert Kruse & Bruce Leung, Data Structures & Program Design in C, Pearson Education, 			

Lab on C programming -II

Sr. No	Programming Exercises
1	Elementary Data Structures <ul style="list-style-type: none"> - Write a program having functionality of one dimension and two dimension arrays with use of simple data types such as Integer, Float, Date etc. - Write a program wherein mathematical calculations involves such as average, percentage calculation, Factorial calculation and Matrix multiplication - Write program for structure implementation for array and pointers. - Create a object of the class to achieve various functionalities of accounting such as Net Pay calculation, Tax deduction, Gross pay etc.
2	Linear Data Structures <ul style="list-style-type: none"> - Demonstrate various functionalities for Link list, Circular link list and double link list with the reference of array and pointer.

	<ul style="list-style-type: none"> - Write a C program to insert and delete string / integer data from specific place of linked list. - Search a specific string/ integer in a given data set also find how many time it occurs or repeats in a set given
3	<p>Particular Linear Data Structures</p> <ul style="list-style-type: none"> - Write program for implementation of recursion - Demonstrate Insertion, Deletion and Searching functionalities with their nomenclatural for – <ul style="list-style-type: none"> o Stack o Queues o Circular Queues - Do necessary assumption for implementation of it
4	<p>File Handling</p> <ul style="list-style-type: none"> - Program to create and write data into files - Program to read data from files. - Programs on pattern matching on data of files and using this pattern matching at the time of reading and writing data into file
5	<p>Hierarchical data structures</p> <ul style="list-style-type: none"> - Programs for defining data structure to represent a tree. Creating tree and adding data/nodes into it. - Programs to traverse trees: DFS, BFS and other - Deleting and nodes in tree
6	<p>The problem of search and Sorting</p> <ul style="list-style-type: none"> - Programs to use linear/sequential searching and binary searching - Programs to implement standard sorting algorithms with efficiency measurement - Reading data form and using it with various sorting algorithms

Course Number	Course Name	L-T-P- Credits	Year of Introduction
207	Environment Studies	2-0-0 = 2C	2018-19
Course Objective: To Understand and the nature and function of the natural environment affecting society.			
Expected Outcome : Understand the importance of Environment in the life of living things.			
References (Books, Websites etc) : <ul style="list-style-type: none"> • Agrawal K.C.:Environmental Biology:Nidhi Publishers Ltd(2001) • Bharucha Erach: The Biodiversity of India: Mapin Publishing Pvt. Ltd. • Jadhav H and Bhosale V.M.: Environmental Protection and Laws: Himalaya Publishing House. • Miller T.G. Jr.: Environmental Science: Wadsworth Publishing Co. 			
Suggested MOOC :			
Course Plan			
Unit	Contents		
1	<p>The multidisciplinary nature of environment studies: Definition, scope and importance-need of public awareness.</p> <p>Natural Resources: Renewable and non-renewable resources: Forest resources: Use and over- exploitation, deforestation. Case studies. Timber extraction, mining, dams and their effects on forest and tribal people.</p> <p>Water resources: Use and over-utilization of surface and groundwater, floods, droughts, conflicts over water, dams- benefit and Problems.</p> <p>Mineral Resources: Use and exploitation ‘environmental effects of extracting and using mineral resources, case studies.</p> <p>Food resources: World food problems, changes caused by agriculture. Fertilizer-pesticide problems, water logging, salinity, case studies.</p> <p>Energy resources: Growing energy needs, renewable and non-renewable energy resources, use of alternative energy sources.</p> <p>Land resources: Land as resources, land degradation, man induced landslides, desertification. Role of individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles</p>		
2	<p>Ecosystem: Concept of ecosystem, structure and function of an ecosystem, producers, consumers and decomposers .Energy flow in the ecosystem, Ecological succession, food chains, food webs and ecological pyramids, introduction, types, characteristics features structure and function of the following ecosystem, forest ecosystem ,grassland ecosystem, Desert ecosystem, Aquatic ecosystems, ponds, stream, lakes, rivers, estuaries.</p>		
3	<p>Biodiversity and its conservations: Introduction, Definition: genetic, species and ecosystem diversity, Biogeographically classification of India, value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option vales, India as a mega diversity nation, Hot-Spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, Man wildlife</p>		

	conflicts, Endangered and endemic species of India, Conservation of biodiversity: In situ and Ex-situ conservation of biodiversity.
4	<p>Environmental Pollution: Definition- Causes, effects and control measures of:-Air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, and nuclear hazards .Soil waste management: cause, effects and control measures of urban and industrial waste. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquakes, cyclone and landslide.</p>
5	<p>Social issues and Environment: From unsustainable to sustainable development, urban/problems related to energy, water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns Case Studies, Environment ethics: Issues and possible solutions ,wasteland reclamation, Consumerism and waste products, Environment protection Act, Air(presentation and Control of Pollution)Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.</p>
6	<p>Human Population and the Environment: Population growth, variation among nations, population explosion-Family Welfare Programme. Environment and Human health. Human Rights Value Education. HIV/AIDS Women and Child Welfare. Role of Information Technology in Environment and human health.</p>

Course Number	Course Name	L-T-P-Credits	Year of Introduction
208	Community Work – Swachh Bharat Abhiyan	2-0-0 =1 C	2018-19
Course Objective: This course aims to expose the students to Swachh Bharat Abhiyan initiative of the government.			
Expected Outcome : Students will be able to understand the details about the Swachh Bharat Abhiyan and its impact on society.			
References (Books, Websites etc) : www.swachhbharaturban.in/ swachhbharatmission.gov.in			
Course Plan			
Unit	Contents		
1	History, meaning, Goals of Cleanliness initiatives		
2	Initiators of cleanliness drive in India. Sant Ghadage Baba, Mahatam Gandhi, Efforts taken towards the Swachh Bharat Abhiyan, Swachh Bharat Mission		
3	Impact of Cleanliness initiatives. Social Awareness, Case Studies.		
	COMMUNITY HOURS: Internship of 15 days (100 hours) to be undertaken Submit a report on a particular type of community involvement undertaken		

Course Number	Course Name	L-T-P-Credits	Year of Introduction
208	Sectoral Analysis	2-0-0 =1 C	2018-19
Course Objective: <ul style="list-style-type: none"> • To expose the students to the different sectors of the economy • To enable the students to understand the importance and contribution of the sectors to business, economy and global environment • To expose the students towards rural problems To awaken sense of responsibility amongst students towards senior citizens 			
Expected Outcome : Students will get exposure to the different sectors of the economy and their contribution to the national development.			
References (Books, Websites etc) : <ol style="list-style-type: none"> 1. S.A. Sherlekar ,Modern Business Organization And Management – (Himalaya Publishing House) 2. Y.K. Bhushan ,Fundamental Of Business Organization & Management – (S Chand Publishers) 3. Basu, C. R.; <i>Business Organization And Management</i>, Tata Mcgraw Hill, Publishing House, New Delhi, 1998 4. Business World 			
Course Plan			
Unit	Contents		
1	Introduction to the sectors of the economy		
2	Detailed view of the IT, Manufacturing, Agriculture, Banking Insurance, Service Sector, Retail		
3	Project work on detailed analysis of any one sector – national and global scenario		

Course Number	Course Name	L-T-P-Credits	Year of Introduction
208	Smart Cities	2-0-0 =1 C	2018-19
Course Objective: To give exposure to tools and techniques applicable for planning, controlling & monitoring of Smart Infrastructure and Cities. This subject would also enable to develop insight for managing project risks, uncertainties and complexities of smart cities project.			
Expected Outcome : Students will get an understanding of road map for Planning Smart Cities and benchmarking their performance for Indian context.			
References (Books, Websites etc) :			
Suggested MOOC :			
Course Plan			
Unit	Contents		
1	Introduction to Smart Cities, •Introduction to "City Planning", Understanding Smart Cities		
2	Dimensions of Smart Cities, Global Experience of Smart Cities, Smart Cities –Global Standards and Performance, Benchmarks, Practice Codes, India "100 Smart Cities" Policy and Mission		
3	<ul style="list-style-type: none"> •Smart City Planning and Development •Financing Smart Cities Development •Governance of Smart Cities, Case Studies on Smart Cities 		

SEMESTER III

Course Number	Course Name	L-T-P- Credits	Year of Introduction
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301	Operating Systems	3L-1T-0P=4C	2018
Course Objective: <ul style="list-style-type: none"> To provide an understanding of the major operating system components To provide coverage of basic computer system organization The overall aim of this course is to provide a general understanding of how a computer works. This includes aspects of the underlying hardware as well as structure and key functions of the operating system. 			
Expected Outcome : At the end of this course, student should be able to <ul style="list-style-type: none"> Explain the concepts of process, address space and file Compare and contrast various CPU scheduling algorithms Understand functioning and working of Windows as well as Unix Operating System 			
Prerequisite: Students should have basic knowledge of working on an operating system			
References (Books, Websites etc) : <ul style="list-style-type: none"> Operating systems design and implementation by Andrew Tanenbaum and Albert Woodhull Operating systems concept and design by Milan Milenkovic Operating system Concepts by Silberschulz, Abraham and Galvin, peter raer 			
Suggested MOOC: Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction to Operating System: Definition and concept of OS, History of OS, Importance and function of Operating system. Types of OS-Batch System, timesharing, Multitasking, multiprogramming, multiprocessing, online operating system, real time, distributed operating system. Views-command language users view, system call users view, structure of OS- simple, monolithic system and layered system, client server model. User operating-system interface: command line interface, GUI, system calls. Case Study: Unix History, General Structure of Unix, The shell of Unix operating system, The shell of Unix operating system		
2	Process Management: Process concept, Process Control Block, process states and its transitions, context switch, OS services for Process management, scheduling and types of schedulers, scheduling algorithm-First come first served, shortest job first, shortest remaining time next, time slice scheduling, priority based scheduling, multilevel queue, multilevel queue with feedback Case Study: Process management in Unix		
3	Storage Management: Basic concept of storage management, logical and physical address space, swapping, contiguous allocation, non-contiguous allocation, fragmentation, segmentation, paging, demand paging, virtual memory, page replacement algorithms- FIFO, Optimal page		

	replacement algorithm, least recently page replacement algorithm, clock page replacement algorithm, design issue of paging, thrashing,
4	<p>Inter-process communication and synchronization: Need, Mutual Exclusion, Semaphore, Busy-wait Implementation, characteristics of semaphore, queuing implementation of semaphore, producer consumer problem, critical region and conditional critical area. What is deadlock? Conditions to occur the deadlock, deadlock prevention, deadlock avoidance- banker's algorithm. resource request, resource release.</p>
5	<p>File Systems: Files-basic concept, file attributes, operations, file types, file structure, access methods, Directory- structure-single level directory system, two level directory system, hierarchical directory system, directory operations, protection, security, allocation method.</p> <p>Case Study: Unix File Management and Security</p>
6	<p>Input/output System: Principles of I/O hardware, I/O devices, device controller, DMA, Principles of I/O software-goals, interrupt handler, device driver. Mass storage structure-disk structure, disk scheduling (FCFS, SSTF, SCAN, LOOK, C-SCAN, C-LOOK)</p> <p>Case Study: Input output management in Unix</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
302	Software Engineering	3L-1T-0P = 4C	2018
Course Objective: To introduce the current methodologies involved in the development and maintenance of Software over its entire life cycle.			
Learning Outcome : At the end of this course, student should be able to <ul style="list-style-type: none"> Understand life cycle models, Requirement elicitation techniques, understand the concept of Analysis and Design of software. Develop SRS as per any of the existing standards. Implement software engineering concepts in software development to develop quality software. 			
Pre-requisites: Preliminary knowledge of computer, their operations and applications.			
References (Books, Websites etc): <ul style="list-style-type: none"> SOFTWARE ENGINEERING A PRACTITIONERS APPROACH seventh edition BY Roger S. Pressman McGraw Hill International Edition. Software Engineering by Sommerville, Pearson Education, 7th edition Software Engineering by K.K. Aggarwal & Yogesh Singh, New Age International Publishers. 			
Suggested MOOC: Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction to Software Engineering: Software, Program vs Software, software characteristics, Definition of Software Engineering, importance, principles of software engineering, Difference between software engineering and software programming, Members involved in software development.		
2	Software process and Feasibility study: Need of Feasibility study, types of Feasibility study, Cost Benefit Analysis. General software development life cycle with all phases. Overview of software models (Waterfall, Prototyping, and Spiral and Rapid Application Development model).		
3	Requirement Engineering Concepts and Methods: What is Requirement Engineering, Types of requirements, Requirement elicitation techniques- Traditional methods and Modern methods, Verification and validation process. Principles of Requirement Specification, Software Requirement Specification document Outline Characteristics of good SRS: - correct, complete, unambiguous, consistent, modifiable, traceable, Understandable		
4	Analysis and Structured System Design tools: Analysis and Design Tools : Entity-Relationship Diagrams, Decision Tree and Decision Table , Data Flow Diagrams (DFD) , Data Dictionary , Elements of DD		

	<p>Advantage of DD , Pseudo code , Input And Output Design</p> <p>Structured System Design: Modules Concepts and Types of Modules Structured Chart , Qualities of Good Design , Coupling, Types of Coupling , Cohesion, Types of Cohesion, CASE STUDIES (Based on Above Topic)</p>
5	<p>Software Testing and Software Quality Assurance</p> <p>Software Testing: Definition, Test characteristics, Types of testing: Black-Box Testing , White-Box Testing ,Unit testing , Integration testing, Validation, Verification.</p> <p>Quality concept: (Quality, quality control, quality assurance, cost of quality), SQA activities, SQA plan. Formal Technical review: Review meeting, review reporting and review guidelines Software Configuration Management: - What is configuration management, Baseline, Software Configuration items, SCM process- Identification of objects, Version control and Change control.</p>
6	<p>Software Maintenance: What is software maintenance? Problems during software maintenance.</p> <p>Categories of Software Maintenance: Corrective maintenance, Adaptive maintenance, Perfective maintenance, and preventive maintenance. Cost of Maintenance, Maintenance Activities.</p> <p>Maintenance Process and Models: Maintenance processes, Fix Model, Iterative Enhancement Model, Reuse Oriented Model, Boehm Model, and Taute’s Models.</p>

Course Number	Course Name	L – T – P Credits	Year of Introduction
303	DBMS – II	3L – 1T – 0P=4C	2018
<p>Course Objectives: The main objective is to teach the concepts related to database its techniques and operations. SQL (Structured Query Language) is introduced in this subject. This helps creates strong foundation for application of data design.</p>			
<p>Expected Outcome: At the end of this course, the student should be able to:</p> <ul style="list-style-type: none"> • Creating tables, and queries using SQL • Applying SQL Operators and SQL Functions in the created tables in SQL; • Writing and solving complex queries based on joins, sub queries • Writing PL/SQL blocks, objects 			
<p>Text Books: Ivan Bayross. SQL, PL/SQL The Programming Language of Oracle 3rd Revised Edition BPB Publications</p>			
<p>Suggested MOOC: Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com www.coursera.com</p>			
Syllabus			
1.	<p>Introduction to Oracle and SQL: Introduction to Oracle: History, Features, Versions of Oracle, Oracle File Management, Spool command SQL: Defining a database in SQL, Components of SQL: DDL, DML, DCL, DQL, SQL query Rules, Data types, Keywords, Delimiters, Literals. DDL Commands – Defining a database in SQL, Creating table, changing table definition, removing table. DML Commands- Inserting, updating, deleting data. DQL Commands: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table. Data Constraints: Primary key, Foreign Key, NOT NULL, UNIQUE, CHECK constraint.</p>		
2.	<p>Operators: Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect.</p>		
3.	<p>Joins and Oracle Functions: Join Concept. Simple join, equi join, non equi join, Self join, Outer join, Sub queries, Aggregate Functions, Numeric Functions, String Functions, Conversion</p>		

	functions, Date conversion functions, and Date functions.
4.	<p>Database Objects:</p> <p>Index: Creating index, simple index, composite index, unique index, dropping indexes, multiple indexes on table</p> <p>Sequence: Creating sequence, altering sequence, dropping sequence.</p> <p>Views: Concept, creation, usage</p> <p>Objects: declaring and initializing objects in SQL, Manipulating object in PL/SQL</p>
5.	<p>Introduction to PL/SQL programming:</p> <p>Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement</p>
6.	<p>Advanced Programming Techniques of PL/SQL:</p> <p>Cursors:</p> <p>Introduction, Types of Cursors: Implicit Cursor, Explicit Cursors, Parameterized cursors, Programs on cursors</p> <p>Triggers:</p> <p>Introduction, Use of triggers, Types of Triggers, Creating triggers, Examples on Triggers</p> <p>Stored Procedures / Functions:</p> <p>Introduction, How oracle executes procedures/ functions, Advantages, How to create Procedures & Functions, Examples</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
304	Statistics	3L-1T-0P=4C	2018
Course Objective:			
The main objective is to introduce basic concepts of statistics to the students and make them competent in collecting and analyzing the data by using statistical techniques			
Expected Outcome : At the end of this course, student is expected to			
<ul style="list-style-type: none"> • Tabulate the raw data by using frequency distribution and represent the data graphically. • Analyse the data by using measures of central tendency and dispersion • Estimate the value of dependent variable • Generate the relationship between two variables in the form of degree or equation 			
Prerequisite:			
Students should have basic knowledge of use of calculator and research attitude			
References:			
1) Fundamentals of Statistics , S.C. Gupta , Himalaya Publishing House (5th Edition)			
2) Business Statistics , S.P. Gupta, M.P. Gupta –Sultan Chand & Sons, New Delhi (16 th Edition)			
Suggested MOOC:			
Please refer these websites for MOOCS:			
NPTEL / Swayam			
www. edx.com			
www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction to Statistics: Definition of Statistics, Importance of Statistics, Scope of statistics : Economics, Computer Science, Business and Management, limitations of Statistics .		
2	Data Collection and representation: Primary and Secondary data, Sources of Data collection, Tabular Representation of data: Ungrouped and grouped frequency distribution, Graphical representation of data: Simple bar, subdivided bar, percentage bar diagram, pie diagram, histogram, frequency polygon, ogive curves.		
3	Measures of central tendency: a) Mean: Definition, problems on mean for listed data items, discrete distribution and continuous distribution, merits and demerits b) Median: Definition, problems on median for listed data items, discrete distribution and continuous distribution, merits and demerits c) Mode: Definition, problems on mode for listed data items, discrete distribution and continuous distribution, merits and demerits.		
4	Measures of Dispersion: a)Range: Definition, problems on range for listed data items, discrete distribution and continuous distribution, merits and demerits of range b)Mean Deviation: Definition, problems on mean deviation about mean for listed data items, discrete distribution and continuous distribution, merits and demerits		

	<p>c) Standard Deviation: Definition, problems on standard deviation for listed data items, discrete distribution and continuous distribution, merits and demerits.</p> <p>d) Deciles, percentiles, quartiles</p>
5	<p>Regression and Correlation:</p> <p>a) Regression: Definition, regression equations, regression coefficients, problems on finding regression equations and estimations</p> <p>b) Correlation: Definition, Karl Pearson's correlation coefficient, Spearman's Rank correlation with correction factor</p>
6	<p>Time series analysis:</p> <p>Components of Time series Analysis , Fitting a straight line $y=ax+b$, fitting a curve $y=ax^2+bx+c$, 3 yearly and 5 yearly moving averages</p>

Course Number	Course Name	L-T-P-Credits	Year of Introduction
305	Multimedia Technology	3L-1T-0P=4C	2018
Course Objective:			
The main objective of this course is to know the concept of multimedia by students. To know different software tools used in multimedia technology. To know multimedia computing.			
Expected Outcome: After learning this course, student will be able			
<ul style="list-style-type: none"> ▪ To understand about various interactive multimedia devices, the basic concept about images and image formats. ▪ To understand different software tools used in multimedia. 			
Reference Books:			
<ul style="list-style-type: none"> • Principles of Multimedia – Ranjan Parekh, Publisher: Tata McGraw Hills • Multimedia: Making It Work (8th Edition) – by Tay Vaughan, Publisher: Tata McGraw Hills. • Multimedia Communications: Applications, Networks, Protocols and Standards - Fred Halsall, Publisher: Pearson Education. 			
Suggested MOOC:			
<ol style="list-style-type: none"> 1) www.openlearning.com 2) www.mooc-list.com 3) www.coursera.org 			
Course Plan			
Unit	Contents		
1	What is multimedia? History of Multimedia, Steps for Creating multimedia presentation, Delivering multimedia, Where to Use multimedia? (Business, Schools, Home, and Public Places), Multimedia authoring tools, types of multimedia authoring tools, features of multimedia authoring tools.		
2	Storage technology, Magnetic media (Hard disk, RAID), Optical Media (CD Storage, CD standards), DVD (Size and capacity of DVD, DVD video, DVD audio).		
3	Using text in multimedia, text types, designing with text, Hypertext and Hypermedia, Characteristics of Hypertext and Hypermedia. Using image in multimedia, image color models, Dithering, Image file formats, Macintosh formats, Windows formats, Cross-platform formats.		
4	What is sound? Characteristics of Sound, Digital Audio, MIDI audio, MIDI Vs Digital audio, Audio file formats, Copyright issues. Principles of animation, Animation techniques, Animation file formats, Making animation (A Rolling Ball, A Bouncing Ball), Creating animated scene.		
5	Working of video, Video signal formats (Component Video, Composite Video and S-Video), Digital Video, Digital Video Standards (EDTV, CCIR Recommendations), HD Video and HDTV.		

6	Multimedia communications, Multimedia information representation, Multimedia networks, Multimedia applications, Media types, Communication modes, network types, Multipoint conferencing, Network QOS.
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Course Number	Course Name	L – T – P Credits	Year of Introduction
306	Lab on Oracle and Multimedia	0L-0T-4P=2C	2018

Course Objectives:

The main objective is to teach the concepts related to SQL (Structured Query Language) and multimedia. The different SQL commands to be introduced. It helps to the students in writing SQL queries and its implementations. It basically helps to design and develop database structure. This is foundational course for building up database and processing through different queries.

Expected Outcome:

At the end of this course, the student should be able to:

- Creating tables, and queries using SQL
- Applying SQL Operators and SQL Functions in the created tables in SQL;
- Writing and solving complex queries based on joins, sub queries
- Writing PL/SQL blocks, objects
- Creating multimedia file
- Understanding the use of multimedia in web sites

Text Books:

Ivan Bayross. SQL, PL/SQL The Programming Language of Oracle 3rd Revised Edition BPB Publications

Suggested MOOC:

In house on www.bharativedyapeeth.edu

Part A: Lab on Oracle

Q. No.	Question																																								
1	<p>Create following tables in your user with specified constraints.</p> <p><u>Client Master</u></p> <table border="1"> <thead> <tr> <th>Column Name</th> <th>Data Type</th> <th>Size</th> <th>Constraints</th> </tr> </thead> <tbody> <tr> <td>ClientNo</td> <td>VARCHAR2</td> <td>6</td> <td>PRIMARY KEY, First Letter must start with 'C'</td> </tr> <tr> <td>Name</td> <td>VARCHAR2</td> <td>20</td> <td>NOT NULL</td> </tr> <tr> <td>Address</td> <td>VARCHAR2</td> <td>30</td> <td></td> </tr> <tr> <td>City</td> <td>VARCHAR2</td> <td>15</td> <td></td> </tr> <tr> <td>State</td> <td>VARCHAR2</td> <td>15</td> <td></td> </tr> <tr> <td>PinCode</td> <td>NUMBER</td> <td>6</td> <td></td> </tr> <tr> <td>Bal_Due</td> <td>NUMBER</td> <td>10,2</td> <td></td> </tr> </tbody> </table> <p><u>Product Master</u></p> <table border="1"> <thead> <tr> <th>Column Name</th> <th>Data Type</th> <th>Size</th> <th>Constraints</th> </tr> </thead> <tbody> <tr> <td>ProductNo</td> <td>VARCHAR2</td> <td>6</td> <td>PRIMARY KEY, First Letter must start with 'P'</td> </tr> </tbody> </table>	Column Name	Data Type	Size	Constraints	ClientNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'C'	Name	VARCHAR2	20	NOT NULL	Address	VARCHAR2	30		City	VARCHAR2	15		State	VARCHAR2	15		PinCode	NUMBER	6		Bal_Due	NUMBER	10,2		Column Name	Data Type	Size	Constraints	ProductNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'P'
Column Name	Data Type	Size	Constraints																																						
ClientNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'C'																																						
Name	VARCHAR2	20	NOT NULL																																						
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State	VARCHAR2	15																																							
PinCode	NUMBER	6																																							
Bal_Due	NUMBER	10,2																																							
Column Name	Data Type	Size	Constraints																																						
ProductNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'P'																																						

Description	VARCHAR2	20	NOT NULL
ProfitPercent	NUMBER	2,2	NOT NULL
UnitMeasure	VARCHAR2	10	NOT NULL
QtyOnHand	NUMBER	8	NOT NULL
ReOrderLevel	NUMBER	8	NOT NULL
SellPrice	NUMBER	8,2	NOT NULL, Cannot be 0
CostPrice	NUMBER	8,2	NOT NULL, Cannot be 0

SalesMan Master

Column Name	Data Type	Size	Constraints
SalesManNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'S'
Name	VARCHAR2	20	NOT NULL
Address	VARCHAR2	30	
City	VARCHAR2	20	
State	VARCHAR2	20	
SalsAmt	NUMBER	8,2	NOT NULL Cannot be 0
Target	NUMBER	6,2	NOT NULL, Cannot be 0
YtdSales	NUMBER	6,2	NOT NULL, Cannot be 0

2

Insert following records into a related table.

Data for Client_Master

ClientNo	Name	City	PinCode	State	Bal_Due
C00001	Ivan Bayross	Bombay	400054	Maharashtra	15000
C00002	Vandan Saitwal	Madras	780001	Tamil Nadu	0
C00003	Pramada Jaguste	Bombay	400057	Maharashtra	5000
C00004	Basu Navindagi	Bombay	400056	Maharashtra	0
C00005	Ravi Sreedharan	Delhi	100001	Delhi	2000
C00006	Rukmini	Bombay	400050	Maharashtra	0

Data for Product_Master

ProductNo	Description	ProfitPercent	UOM	QtyOnHand	ReOrderLevel	SellPrice	CostPrice
P00001	1.44 Floppies	5	Piece	100	20	525	500
P03453	Monitors	6	Piece	10	3	12000	11280
P06734	Mouse	5	Piece	20	5	1050	1000
P07865	1.22 Floppies	5	Piece	100	20	525	500
P07868	Keyboards	2	Piece	10	3	3150	3050
P07885	CD Drive	2.5	Piece	10	3	5250	5100
P07965	540 HDD	4	Piece	10	3	8400	8000
P07975	1.44 Drive	5	Piece	10	3	1050	1000
P08865	1.22 Drive	5	Piece	2	3	1050	1000

	Data for Salesman_Master																																																																												
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ChallanDate	DATE		
BilledYN	CAHR	1	Values IN('Y','N'), Default 'N'

Challan Details

Column Name	Data Type	Size	Constraints
ChallanNo	VARCHAR 2	6	PRIMARY KEY, FOREIGN KEY referencing Challan_Header
ProductNo	VARCHAR 2	6	FOREIGN KEY referencing Product_Master
QtyDispatched	NUMBER	4,2	NOT NULL

5

Insert following records into a related table.

Data for Sales_Order

SalesOrder No	SalesOrder Date	ClientNo	DelyTy pe	BilledY N	SalesMan No	DelyDate	Orde rStat us
O19001	12-Jan-96	C00001	F	N	S00001	20-Jan-96	IP
O19002	25-Jan	C00002	P	N	S00002	27-Jan-96	C
O46865	18-Feb-96	C00003	F	Y	S00003	20-Feb-96	F
O19003	3-Apr-96	C00001	F	Y	S00001	7-Apr-96	F
O46866	20-May-96	C00004	P	N	S00002	22-May-96	C
O10008	24-May-96	C00005	F	N	S00004	26-May-96	IP

Data for Sales_Order_Details

SalesOrderNo	ProductNo	QtyOrdered	QtyDispatched	ProductRate
O19001	P00001	4	4	525
O19001	P07965	2	1	8400
O19001	P07885	2	1	5250
O19002	P00001	10	0	525
O46865	P07868	3	3	3150
O46865	P07885	3	1	5250
O46865	P00001	10	10	525
O46865	P03453	4	4	1050
O19003	P03453	2	2	1050
O19003	P06734	1	1	12000
O46866	P07965	1	0	8400
O46866	P07975	1	0	1050
O10008	P00001	10	5	525
O10008	P07975	5	3	1050

Data for Challan_Header

ChallanNo	SalesOrderNo	ChallanDate	BilledYN
CH9001	O19001	12-Dec-95	Y

	<table border="1"> <tr> <td>CH6865</td> <td>O46865</td> <td>12-Nov-95</td> <td>Y</td> </tr> <tr> <td>CH3965</td> <td>O10008</td> <td>12-Oct-95</td> <td>Y</td> </tr> </table> <p>Data for Challan_Details</p> <table border="1"> <thead> <tr> <th>ChallanNo</th> <th>ProductNo</th> <th>QtyDispatched</th> </tr> </thead> <tbody> <tr> <td>CH9001</td> <td>P00001</td> <td>4</td> </tr> <tr> <td>CH9001</td> <td>P07965</td> <td>1</td> </tr> <tr> <td>CH9001</td> <td>P07885</td> <td>1</td> </tr> <tr> <td>CH6865</td> <td>P07868</td> <td>3</td> </tr> <tr> <td>CH6865</td> <td>P03453</td> <td>4</td> </tr> <tr> <td>CH6865</td> <td>P00001</td> <td>10</td> </tr> <tr> <td>CH3965</td> <td>P00001</td> <td>5</td> </tr> <tr> <td>CH3965</td> <td>P07975</td> <td>2</td> </tr> </tbody> </table>	CH6865	O46865	12-Nov-95	Y	CH3965	O10008	12-Oct-95	Y	ChallanNo	ProductNo	QtyDispatched	CH9001	P00001	4	CH9001	P07965	1	CH9001	P07885	1	CH6865	P07868	3	CH6865	P03453	4	CH6865	P00001	10	CH3965	P00001	5	CH3965	P07975	2
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6	<p>Describe all tables.</p> <p>Retrieve all records.</p>																																			
7	<p>Based on above created tables Write down following queries.</p> <p><u>Selection, Renaming, Logical Operators and Pattern Matching</u></p> <ol style="list-style-type: none"> Select ProductNo, Description and compute $Sell_Price * 0.05$ and $Sell_Price * 1.05$ for each row retrieved. Rename the columns Increase and New Price respectively. Select client information like client no, name, address, city for all clients in 'BOMBAY' or 'DELHI'. Select ProductNo, Description, and Profit Percent where Profit Percent is between 10 and 30 both inclusive. Select supplier name where the second letter of name is 'r' or 'h'. Select supplier name, city where name is 3-character long and the first two characters are 'ja'. 																																			
8	<p>Based on above created tables Write down following queries.</p> <p><u>Grouping</u></p> <ol style="list-style-type: none"> Select Product No with description and total qty_ordered for each product. Select Product No and description for which total qty_ordered of the products 'P00001', 'P03453'. 																																			
9	<p>Based on above created tables Write down following queries.</p> <p><u>Manipulating Date</u></p> <p>Display the information like SalesOrderNo, ClientNo, SalesOrderDate for all the orders placed by the client in the ascending order of date. The SalesOrderDate should be displayed in 'DD/MM/YY' format.</p>																																			
10	<p>Based on above created tables Write down following queries.</p> <p><u>Joins</u></p> <ol style="list-style-type: none"> Display the information like SalesOrderNo, ClientName, SalesOrderDate for all the orders placed by the client in the ascending order of date. The SalesOrderDate should be displayed in 'DD/MM/YY' format. Select ProductNo, Description and total qty_ordered for each product. 																																			
11.	<p>Based on above created tables Write down following queries.</p>																																			

	Print the information of the client_Master, product_master, sales_order table in the following format fro all records: {Description} worth Rs. {total sales for the product} was ordered in the month of {s_order_date}																												
12.	Based on above created tables Write down following queries. Find the list of clients who stay in city 'Bombay' or city 'Madras' or city 'Delhi'.																												
13.	Based on above created tables Write down following queries. <u>Using UNION, INTERSECT and MINUS Clause</u> a) Select all clients and the salesman in the city of 'Bombay'. b) Select salesman name in 'Bombay' who has at least one client located at 'Bombay'. c) Select all the productno of non-moving items in the product_master table. d) Select the productno, description, qty_on_hand, cost_price of non-moving items in the product_master table.																												
14.	Based on above created tables Write down following queries. a) Retrieve the list of names and the cities of all the clients. b) List the various products available from the product_master table. c) Find the names of the clients having 'a' as the second letter in their names. d) Find the list of clients who stay in city 'Bombay' or city 'Madras' or city 'Delhi'. e) Print the list of clients whose bal_due greater than values 10000. f) Display the Order Information for Clients 'C00002' and 'C00001'. g) Find the products whose selling price is more than 1500 and also find the new selling price as original selling price * 15. h) List the products in sorted order of their description. i) Calculate the average price of all the products. j) Determine the maximum and minimum products prices. Rename the titles as 'Max-Price' and 'Min-Price' respectively. k) Count the number of products having price greater than or equal to 1500. l) Find all the products whose Qty_On_Hand is less than Re_Order_Level. m) Change the Sales_Order_Date of Client_No 'C00001' to 24/07/96. n) Change the cost price of '1.22 Floppy Drive' to Rs. 950.00. o) Delete all records having delivery date before 10 th July' 96																												
15.	Exercise following functions using DUAL Table. <ul style="list-style-type: none"> • <u>Number Functions</u> <table style="width: 100%; border: none;"> <tr> <td>1. ABS ()</td> <td>2. MOD (m, n)</td> <td>3. POWER (m, n)</td> <td>4. ROUND (n, m)</td> </tr> <tr> <td>5. SIGN (n)</td> <td>6. SQRT (n)</td> <td>7. TRUNC (n, m)</td> <td>8. GREATEST ()</td> </tr> <tr> <td>9. LEAST ()</td> <td></td> <td></td> <td></td> </tr> </table> • <u>Aggregate Functions</u> <table style="width: 100%; border: none;"> <tr> <td>1. AVG ()</td> <td>2. MIN ()</td> <td>3. COUNT (*)</td> <td>4. COUNT (expr)</td> </tr> <tr> <td>5. MAX ()</td> <td>6. SUM ()</td> <td></td> <td></td> </tr> </table> • <u>Character Functions</u> <table style="width: 100%; border: none;"> <tr> <td>1. ASCII ()</td> <td>2. CHR ()</td> <td>3. INITCAP ()</td> <td>4. INSTR ()</td> </tr> <tr> <td>5. LENGTH ()</td> <td>6. LOSER ()</td> <td>7. UPPER ()</td> <td>8.LTRIM ()</td> </tr> </table> 	1. ABS ()	2. MOD (m, n)	3. POWER (m, n)	4. ROUND (n, m)	5. SIGN (n)	6. SQRT (n)	7. TRUNC (n, m)	8. GREATEST ()	9. LEAST ()				1. AVG ()	2. MIN ()	3. COUNT (*)	4. COUNT (expr)	5. MAX ()	6. SUM ()			1. ASCII ()	2. CHR ()	3. INITCAP ()	4. INSTR ()	5. LENGTH ()	6. LOSER ()	7. UPPER ()	8.LTRIM ()
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	<p>9. RTRIM () 10. LPAD () 11. RPAD () 12. SOUNDEX ()</p> <ul style="list-style-type: none"> • <u>Date Functions</u> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1. ADD_MONTHS ()</td> <td style="width: 50%;">4. LAST_DATE ()</td> </tr> <tr> <td>2. MONTHS_BETWEEN ()</td> <td>5. NEXT_DATE ()</td> </tr> <tr> <td>3. TRUNC ()</td> <td>6. SYSDATE ()</td> </tr> </table> 	1. ADD_MONTHS ()	4. LAST_DATE ()	2. MONTHS_BETWEEN ()	5. NEXT_DATE ()	3. TRUNC ()	6. SYSDATE ()
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16.	<p>Granting and Revoking Privileges to/from user</p> <ol style="list-style-type: none"> a) Grant all privileges on the table product_master to the user Pradeep. b) Grant SELECT and UPDATE privilege on table client_master to Neeta. c) Grant all privileges on the table client_master to the user Ivan with grant option. d) Select all records from product_master table belonging to Sunita. e) Revoke DELETE privilege on supplier_master from Florian. f) Revoke the remaining privileges on supplier_master that were granted to Florian. 						
17.	<p>Writing PL/SQL Block</p> <ol style="list-style-type: none"> a) Write a PL/SQL Block to generate any n odd and even numbers. b) List the contents of product_master. c) Write a PL/SQL Block that inverse the string or number. [if given number is 8973 then its inverse is 3798]. If the price of the product 'P00001' is < 4000 then change the price to 4000. The price change is recorded in the old_price table along with product_no and the date on which price was changed last. d) Write a PL/SQL block that processes an order for "540 HDD". [Check the availability of the product, if yes update its value.] 						
18.	<p>Writing CURSORS</p> <ol style="list-style-type: none"> 1. Write a PL/SQL block that updates the acctmast table and sets the balance depending upon the account is debited or credited. The updation should be done only for those values that are not processed i.e. the processed flag is 'N' in the accttrans table. acctmast (acctno*, name, balance) accttrans (acctno, trndate, debt_crdt, amount, processed) 2. The HRD manager has decided to raise the salary of employees by 0.15. Write a PL/SQL block to accept the employee number and update the salary of that employee. Display appropriate message based on the existence of the record in the employee table. 3. The HRD manager has decided to raise the salary of employees working as "Programmers" by 0.25. Write a PL/SQL block to accept the employee number and update the salary of that employee. Display appropriate message based on the existence of the record in the employee table. 4. Create following 2 tables item-mast (item-id*, description, bal-stock) item-trans (item-id, description, operation, qty, status) -> the operations are for UPDATE – U, for INSERT –I, for DELETE –D Based on the value in the operation column of table item-trans the records for table item-mast is inserted, updated or deleted. On the basis of success/failure of insert, update and delete operation the status column in the table item-trans is updated with appropriate text indicating success or reason for failure. 						

	<p>Following are the 3-cases which are to be taken care of:</p> <ul style="list-style-type: none"> • if operation = 'I' then the item-id against along with description and qty is inserted into the required columns of the table item-mast. If the insert is successful then the status field of item-trans table is updated to 'SUCCESSFUL' else 'ITEM ALREADY EXIST'. • if operation = 'D' then row from item-mast is deleted whose item-id is equal to the item-id in the table item-trans with the operation column having the value 'D'. If delete is successful then the status column of item-trans table is updated to 'SUCCESSFUL' else 'ITEM DOES NOT EXIST'. • if operation = 'U' then the qty against this operation column is added to bal-stock column of the table item-mast where item-id of table item-mast is same as that of item-trans. if update is successful then the status of item-trans table is updated to 'SUCCESSFUL' else 'ITEM DOES NOT EXIST'. <p>Write a parameterized CURSOR that defines all the above cases.</p>
19.	<p>Writing TRIGGERS</p> <ol style="list-style-type: none"> 1. Create a transparent audit system for a table client-master. The system must keep track of the records that are being deleted or modified and when they have been deleted or modified. client-master (client-no, name, city, state, pin, bal-due) audit-client (client-no, name, bal, operation, o-date) <ul style="list-style-type: none"> • operation: the operation performed on the client-master table • o-date: the date when the operation was performed. 2. Write a database triggers that checks that the qty-on-hand does not become negative.
20	<p>Writing PROCEDURES</p> <p>Create following 2 tables item-mast (item-id*, description, bal-stock) item-trans (item-id, description, operation, qty, status) -> the operations are for UPDATE – U, for INSERT –I, for DELETE –D</p> <p>Base on the value in the operation column of table item-trans the records for table item-mast is inserted, updated or deleted. On the basis of success/failure of insert, update and delete operation the status column in the table item-trans is updated with appropriate text indicating success or reason for failure.</p> <p>Following are the 3-cases which are to be taken care of:</p> <ol style="list-style-type: none"> i. if operation = 'I' then the item-id against along with description and qty is inserted into the required columns of the table item-mast. If the insert is successful then the status field of item-trans table is updated to 'SUCCESSFUL' else 'ITEM ALREADY EXIST'. ii. if operation = 'D' then row from item-mast is deleted whose item-id is equal to the item-id in the table item-trans with the operation column having the value 'D'. If delete is successful then the status column of item-trans table is updated to 'SUCCESSFUL' else 'ITEM DOES NOT EXIST'. iii. if operation = 'U' then the qty against this operation column is added to bal-stock column of the table item-mast where item-id of table item-mast is same as that of item-trans. if update is successful then the status of item-

	<p>trans table is updated to ‘SUCCESSFUL’ else ‘ITEM DOES NOT EXIST’.</p> <p>Write a database procedure which will check for the existence of item-id in the table item-mast. The procedure must have one argument which receives a value for which a matching pattern for item-id in the table item-mast and another which will return value indicating whether a match has been found or not. The value returned by the procedure can be used to make a decision to perform further processing or not.</p>
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Part B: Lab on Multimedia

Q.No.	Question
1	<p>Create a new document in a word processing application. Next, type in a line of text and copy the line five times. Now change each line into a different font. Recopy the entire set of lines three times. Finally, change the size of the first set to 10-point text, the second set to 18-point text, and the third set to 36-point text.</p> <p>a) Which of the smallest lines of text is most readable? b) Which line of text stands out the most?</p>
2	<p>Download three different images from a web site. One should be photographic, one should be a graphic (solid colors or gradients), and one should be a mix. Convert the images to 256 colors. Use the tools available to use different dithering patterns and palettes. Print out the files before and after reducing to 256 colors. Write the file sizes on each one.</p>
3	<p>Visit different web sites. Describe the use of colors for each in subjective terms. Is each site vibrant? childish? muted? subtle? Why? What cultural or other factors determined the color selection? Print out a page from each site, and write a paragraph describing the colors and images used in each one.</p>
4	<p>Open an image in an image-editing program capable of identifying colors. Select three different pixels in the image. Sample the color and write down its value in RGB, HSB, CMYK, and web (hexadecimal) color.</p>
5	<p>Visit three web sites that use sound (you may need to find Flash-based web sites). Where, when, and how is sound used? Does the sound fit the mood of the site? Is there background sound? Can the sounds be turned on and off? Document your findings.</p>
6	<p>Locate three web sites that offer “royalty-free” or “buyout” music. Such sites almost always allow visitors to listen to low-quality samples. What formats are the samples provided in? Listen to some of the samples. Try to identify which are synthesized and which are actual instruments playing the music. What are the license arrangements for using the music? Document your findings, noting the various lengths and formats the music is provided in.</p>
7	<p>Use a search engine to search on the words “animation” and “definition.” Create a document that provides many different definitions of the term animation. Describe the differences among definitions. Which elements make the most difference among them—type of motion, process used for creation, method of playback, or something else? What do all (or, at least, most) of the definitions have in common?</p>
8	<p>Conceptualize a brief animated sequence. Include a number of moving elements that move into and out of the frame. Consider where the key frames should be. How do the elements move? Do they get bigger or smaller? Do they rotate? Do they “deform” (change shape)?</p>

	Create a storyboard with sketches showing at least ten of the key frames.
9	Locate three web sites that include video clips. What format are they served in? Examine the HTML source code to discover what method of video delivery is used. Make a note of your findings.
10	Prepare five graphic images using paint or drawing program. Be sure to include a variety of colors and contrasts. Add text to the images. Use small text, large text, text with serifs, bold text, and text in contrasting and similar colors. Add drop shadows. Add boxes and other shapes to the images, in various weights.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
307	Lab on Linux Operating System	0L-0T-4P=2C	2018
Course Objective: The student would be able <ul style="list-style-type: none"> • To obtain knowledge of how to manage files in Linux system. • To understand Linux commands and write shell programming. • To grasp the concepts of User Management in Linux. • To control the system running Ubuntu operating system. 			
Expected Outcome : The course is to provide the knowledge of the Linux Operating System. This course intends to teach various features that will help the students to use and learn the working of Ubuntu /Red Hat operating system			
Prerequisite: Students should have basic knowledge of working on an operating system. <ul style="list-style-type: none"> • Linux for beginners : An introduction to the linux operating system and command line • Linux: the complete reference, sixth edition paperback by Richard Petersen, McGraw Hill education • Unix shell Programming: by yashwant Kanitkar • UNIX Concepts and Applications - by Sumitabha Das 			
Course Plan			
Unit	Contents		
1	Introduction to Linux Operating system, various flavors of Linux O.S., Learning to use and Install Linux, Booting Any one flavor of Linux like ubuntu, red hat etc, Starting up ,Logging in, Exploring the desktop ,Working with virtual desktops, Getting Everything up and running ,Viewing your hardware , Getting online Using an Ethernet Card ,Joining wireless network ,Configuring Email and instant messaging, Adding a Printer , Configuring a local printer, Configuring a network printer, Setting up digital imaging devices, Transferring photos from digital camera, Configuring scanner, Configuring Bluetooth.		
2	General Purpose Utilities: banner (display a blown-up message), cal (The calendar), date-display the system date, who-Login detail tty-knowing your terminal uname-know your machine name passwd-change your password lock-lock your terminal echo-display message bc-the calculator. who am i,- display login name		
3	Navigating the file system:- pwd-checking your current directory, cd-changing directories, mkdir-Making directories		

	<p>rmdir-moving directories ls-listing files Handling Ordinary files: cat-displaying and creating files, touch-creating empty file cp-copying a file rm-deleting files mv-renaming files more-paging output lp-printing a fiile file-know the file type wc-line, word and character counting split-splitting file in to multiple files cmp-comparing two files comm.-finding common chmod-changing file permission files searches using find command, locate command, mount and unmount command. Understanding vi modes, Using vi to edit the file, Creating a new text file using vi, Searching through files.</p>
4	<p>Filters: pr- paginating files head-displaying the beginning of a file, tail- displaying the end of file cut- slitting a file vertically paste- pasting file sort- ordering file uniq- locating repeated line nl- line numbering tr-translating characters. regular expressions and grep to find text ps-process status kill-terminate process Other process related commands</p>
5	<p>sh command, pattern matching- the wild cards, escaping-the backslash(), quoting, redirection, pipes, tees</p>
6	<p>What is Shell, Different types of shells, Shell as command processor, shell variables, creating command substitution, various shell scripts using functions, conditionals, loops, customizing environment</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
308	Community Work III	2L-0T-0P=2C	2018
<p>Course Objective: This course aims to expose the students to the societal issues and help them participate in the community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, nonprofit organization etc.</p> <ul style="list-style-type: none"> To expose the students towards social reality and role of community development for social upliftment and well being To involve students in community work through active involvement and participation 			
<p>Expected Outcome : Students will be able to know the community needs and understand their role towards community development.</p>			
<p>Reference Books :</p> <ul style="list-style-type: none"> An Introduction to Community Development, Rhonda Phillips, Robert Pittman – 2014 Community Development in Asia and The Pacific, Manohar S. Pawar, 2009 			
<p>Online Resources: https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-directory.pdf https://www.ahaprocess.com/solutions/community/events-resources/free-resources/</p>			
<p>Community Hours: Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken.</p>			
<p>MOOCs: https://alison.com/course/diploma-in-community-development</p>			
Course Plan			
Unit	Contents		
1	<p>Community work through Education: Teaching at Schools, Teaching at Orphanages, Teaching to poor children ,study the role of government in the education sector ,study the NGOs particularly working in education sector.</p>		
2	<p>Community Work for Slums: Learn the government facilities, NGOs which are working for the slums and try to connect any NGO.</p>		
3	<p>Community Work for Environment: Role of Govt. and NGOs which are working to save the environment, Initiatives like Clean your city drive, Cycle day, Awareness of Dry and wet waste classification, Tree Plantation Drive, Environment awareness activities etc.</p>		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
308	Start-Up Management	2L-0T-0P=2C	2018
Course Objective: The objectives of the course is <ul style="list-style-type: none"> To Introduce to the students the idea of start ups and their role in the society and nation To impart knowledge about the organization and management of start ups 			
Expected Outcome : Students will be able to understand the role of start ups and case studies of well known start ups in India.			
Reference Books : <ul style="list-style-type: none"> Khanka S. S. – Entrepreneurship Development, S. Chand. Burns, P. (2001). Entrepreneurship and small business. New Jersey:Palgrave. Mullins, J. (2004). New business road test. New Delhi: Prentice Hall. 			
Online Resources: https://www.entrepreneur.com/ https://www.shopkeep.com/blog/the-7-best-free-resources-for-planning-your-new-business			
MOOCs: https://startupindia.upgrad.com/ - Startup India Learning Programme Swayam			
Course Plan			
Unit	Contents		
1	Meaning of Start ups, Formation of a start up, idea generation for start ups, scaling up process.		
2	Managing a startup, Customer Development, Market Sizing, Lean Startups, Support by government for startups,		
3	Case Studies on well known startups.		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
308	Agro Tourism	2L-0T-0P=2C	2018
Course Objective: The objectives of the course are to familiarize students with principles and relationship between tourism and agricultural activities.			
Expected Outcome : Students will be able to obtain and diversify knowledge from tourism, rural tourism and their specific form agri-tourism.			
Reference Books : <ul style="list-style-type: none"> • Talwar, Prakash. Travel and Tourism Management. Gyan Books Pvt., Ltd., Main Ansari Road, Darya Ganj, New Delhi- 110 002. • Bagri, S. C. Trends in Tourism Promotion 2003. International Books Distributors, 9/3, Rajpur Road, Dehradun-248 001 Uttarakhand (India). 			
Online Resources: http://www.agritourism.in http://www.ecoindia.com			
MOOCs: https://www.mooc-list.com/tags/tourism https://www.coursera.org/ https://swayam.gov.in/ https://alison.com/courses?query=agriculture+tourism			
Course Plan			
Unit	Contents		
1	Introduction, importance, scope, forms of agro-tourism, advantages and implementations, sustainability component, difficulties involved.		
2	Govt. policies and legislations in respect of tourism and agro-tourism and environment protection laws. Requirements for Agro-tourism Farm, forest, garden, fish tank/ponds, residential huts, etc. Introduction to Indian culture through agro tourism.		
3	Profiling the tourist for: age, sex, life cycle, education, employment, income, satisfaction and expectations, values, purpose of visit, accommodation, duration of stay, preferences and perceptions regarding area management, environmental concerns, involvement and responsibility, motivations, etc.		

SEMESTER IV

Course Number	Course Name	L-T-P- Credits	Year of Introduction
401	Computer Networks	3L-1T- 0P = 4C	2018
<p>Course Objectives: The key objective is to acquire a foundational understanding of computer network and communication technologies. Networking concepts will be illustrated using TCP/IP networks. To enable the learner with Network Technologies and applications of Network.</p>			
<p>Learning Outcomes: At the end of this course, student should be able to</p> <ul style="list-style-type: none"> • Students will acquire a good knowledge of the computer network, its architecture and operation. • Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters). • Students will be able to follow trends of computer networks. So, students will get exposed to advanced network technologies like MANET, WSN, and 4G. 			
<p>References (Books, Websites etc) :</p> <ul style="list-style-type: none"> • 1.A.S. Tanenbaum, Computer Networks (4th ed.), Prentice-Hall of India, Latest Edition • 2.W.Behrouz Forouzan and S.C. Fegan, Data Communication and Networking, McGraw Hill, Latest Edition 			
<p>Other Books:</p> <ul style="list-style-type: none"> • Network Essential Notes GSW MCSE Study Notes • Internetworking Technology Handbook CISCO System • Introduction to Networking and Data Communications Eugene Blanchard • Computer Networks and Internets with Internet Applications Douglas E. Comer 			
<p>Suggested MOOC :</p>			
Course Plan			
Unit	Contents		
1	<p>Introduction to Computer Networks: What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, Network software: Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, Network Models: The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model, A critique of OSI Model, A critique of TCP/IP Model, Examples of some networks: Internet, X.25, ISDN, Frame relay, ATM, Ethernet, Wireless Lans- (wi-fi)</p>		
2	<p>Data Transmission and Physical Layer: Signals: Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum Transmission Media& its Characteristics: Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing: FDM, WDM, TDM, Switching: Circuit, Message and Packet Switching, Mobile Telephone Systems: 1G, 2G, And 3G</p>		

3	<p>Network Layer: Network Layer Design Issues; Routing Algorithms: Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms: General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control, IP Addressing: IP- Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask, Subnetting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6</p>
4	<p>Transport and Application Support Protocols,: Transport service, Service Primitives, Internet, and Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, Session Layer: Token Concept Presentation Layer: Data Encryption and Data Security, Message Authentication, Application Layer: Domain Name Service, Telnet, FTP, SMTP, SNMP, MIME, POP, IMAP, WWW,HTTP</p>
5	<p>Advance Networks: Concept of 4G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, Mobile Ad-hoc Networks: Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, Wireless Sensor Networks: Sensor networks overview: Introduction, applications, design issues, requirements.</p>
6	<p>Internet Basics: Concept and Characteristics of Internet , Intranet, Extranet . Structure of Internet through Client Sever . Domain name , Website Development formats for Business Applications.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
402	Software Testing	3L-1T-0P=4C	2018
<p>Course Objective : The main objective is to introduce IT in a simple language to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. The focus of the subject is on introducing skills relating to IT basics, computer applications, programming, interactive medias, Internet basics.</p>			
<p>Expected Outcome : At the end of this course, student should be able to:</p> <ul style="list-style-type: none"> • Understand basic concepts and terminology of information technology. • Have a basic understanding of personal computers and their operations. • Be able to identify issues related to information security. 			
<p>References (Books, Websites etc) :</p> <ul style="list-style-type: none"> • Software Testing by Renu Rajani and Pradeep Oak • Software Engineering by Roger S. Pressman • Software Testing Principles And Practices by Srinivasan Desikan and Gopaldaswamy • Ramesh 			
<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
Course Plan			
Unit	Contents		
1	<p>Introduction to Software Concepts: Introduction, Definition and Characteristics of oftware, Importance of Software, Software types, Software components, Members involved in software development, Overview of SDLC.</p>		
2	<p>Introduction to Testing: What is testing, Why, When and How Testing, Importance of Testing. Testing goals and characteristics, Testing during planning stage, Testing during design stage, Testing during coding stage.</p>		

3	<p>Software Testing Lifecycle & Software Testing Process: Overview of STLC, Principles of Verification and Validation, Techniques of verification (review, inspections, walkthroughs), V testing model Software development V & V Software acquisition V & V Software supply V & V Software Testing Process: Testing process: a) Plan b) Develop c) Execute d) Manage Conventional Software Architectures.</p>
4	<p>Software Testing Strategies: Test strategies for conventional software</p> <ul style="list-style-type: none"> a) Unit Testing b) Integration Testing <ul style="list-style-type: none"> i) Top-Down Integration ii) Bottom-Up Integration iii) Regression Testing iv) Smoke Testing v) Integration test documents c) Validation Testing <ul style="list-style-type: none"> a. Test Criteria b. Configuration Review c. Alpha and Beta Testing a) System Testing <ul style="list-style-type: none"> i) Recovery Testing ii) Security Testing iii) Stress Testing iv) Performance Testing <p>Difference between Testing and Debugging, The Art of Debugging</p> <ul style="list-style-type: none"> a) Debugging Process b) Debugging strategies c) Correcting the Error.

5	<p>Software Testing Techniques:</p> <p>Overview of Black-Box and White-Box Testing, Methods of White-box Testing:</p> <ol style="list-style-type: none"> a) Basis Path Testing <ol style="list-style-type: none"> i) Flow Graph Notation ii) Independent Program Paths iii) Deriving Test Cases iv) Graph Matrices b) Control Structure Testing <ol style="list-style-type: none"> i) Conditional Testing ii) Data Flow Testing iii) Loop Testing <ul style="list-style-type: none"> • Simple Loops • Nested Loops • Concatenated Loop <p>Methods of Black-Box Testing:</p> <ol style="list-style-type: none"> a) Graph Based Testing b) Equivalence Partitioning c) Boundary Value Analysis d) Orthogonal Array Testing <p>Testing of client/server Architectures, Testing Documentation and Help Facilities, Testing for Real-Time Systems:</p> <ol style="list-style-type: none"> a) Task Testing b) Behavioral Testing c) Intertask Testing d) System Testing <p>Testing Patterns:</p> <ol style="list-style-type: none"> a) Pair Testing b) Separate Test Interface c) Scenario Testing
6	<p>Risk Management:</p> <p>Introduction and Characteristics of Risks, Role of Testing in Risk Management, Types of Risks:</p> <ol style="list-style-type: none"> a) Project Risks b) Technical Risks c) Business Risks d) Predictable Risks e) Unpredictable Risks

Course Number	Course Name	L-T-P- Credits	Year of Introduction
403	Java Programming	3L-1T-0P=4C	2018
Course Objective : The Objectives of the course is to introduce Object Oriented Programming using Java, Make student to use Java for implementing OO Concepts and also make them familiarize to use JDK and Java API for concurrent programming, input/output, Java data structures and GUI (AWT) programming using java.			
Expected Outcome : At the end of this course, student should be able to understand <ul style="list-style-type: none"> • Design interfaces, abstract and concrete classes • Use concurrent programming, java Collections and utility classes • Able to achieve object persistence using object serialization. • Design applications using event driven programming. • Get the main features of Java Programming for Business Applications 			
References (Books, Websites etc) : <ul style="list-style-type: none"> • Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007 • Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008 • Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition 			
Suggested MOOC: Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction to Java: Features of Java, Java compiler, JVM, Garbage collection, Data types, concept of class and object, java naming conventions wrapper classes, control structures in java, arrays in java, array of objects.		
2	Class and Object Concepts: Concepts of OOP, Defining a class, creating objects from class, adding attributes and methods to the class, using constructors, Passing values to the functions – pass by value, pass by reference, Function overloading. Modifiers – public, private, protected, default, static, final, Concept of package, Introduction to Exception Handling.		
3	Inheritance and Polymorphism: Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Using abstract and final keywords with class declaration, Concept of interface and class.		

4	<p>Concurrent Programming : Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Introduction to Tread Synchronization .</p>
5	<p>Java Input/Output: Concept of streams, types of streams – byte streams, character streams. The Console: System.out, System.in, and System.err, InputStream class, OutputStream class, File class, FileInputStreams, File OutputStream, Reader class, Writer class, FileReader, FileWriter. Buffered streams – BufferedInputStream, BufferedOutputStream, BufferedReader, BufferedWriter. Object Streams</p>
6	<p>Java Applets and GUI: Applet concept, creating basic applet, applet lifecycle, controlling applet content, introduction to AWT controls – Button, Lable, TextField, TextArea, List, Checkbox and RadioButtons, Scrollbar, Menu etc. (Only AWT Component)</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404	Operations Research	3L-1T-0P=4C	2018
<p>Course Objective : Main objective of this paper is to learn historical development of O.R., need and characteristics of OR in business and management. Formulate a real-world problem as a mathematical programming model. To aware the students about the basic terms in operations research. Students will be able to formulate and solve optimization problems related to job/ work assignments.</p>			
<p>Expected Outcome : At the end of this course, student should be able to understand:</p> <ul style="list-style-type: none"> • Students will be able to describe characteristics and scope of OR. • Students will be able to define and formulate mathematical problems. • Students will be able to select optimal problems solving techniques for a given problem using LP. • Students will be able to formulate and solve transportation, travelling sales problems. • Students will be able to demonstrate and solve simple models of Game theory. • Students will be able to solve different problems related to Network. 			
<p>References (Books, Websites etc) :</p> <ul style="list-style-type: none"> ○ Operations Research: An Introduction by Hamdy Taha, Pearson ○ Operations Research by A M Natarajan, P Balasubramani, A Tamilarasi, Pearson Education Inc ○ Operations Research by P Mariappan, Pearson ○ Operations Research by H N wagner, Prentice hall. ○ Optimization in Operations Research by Ronald Rardin, Pearson Education Inc. ○ Operations Research by R. Paneerselvam, Prentice Hall of India Pvt. Ltd. ○ Quantitative Techniques in Management by N D Vohra, Tata McGraw-Hill 			
Suggested MOOC : List of Open Source Software/learning website: www.nptel.ac.in/			
Course Plan			
Unit	Contents		
1	<p>Basics of Operation Research : Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research, limitations of OR.</p>		
2	<p>Linear Programming : Introduction, Requirement of LP, Basic Assumptions, Formulation of LP, General Statement of LP, Solution techniques of LP: Graphical Methods, Analytical Methods: Simplex Method , Concept of slack, surplus & artificial variables. Manual solutions of L.P.P. upto 3 iterations. Minimization & Maximization Problems.</p> <p>Special Cases – i)Alternative solution (ii) Unbounded solutions (iii) Infeasible solutions to be shown graphically & also by simplex method.</p>		

3	<p>Transportation Model : North-West Corner rule, Least-cost method, Vogel’s approximation method, Final Transportation cost using MODI method, Special cases : i)Degeneracy in transportation problem, ii)unbalanced supply and demand, iii)profit maximization problem iv) prohibited transportation routes</p>
4	<p>Assignment Model: Hungarian method for solution, non square matrix, Special Cases :i) unbalanced problem ii)restriction on assignments iii)Maximization problem iv)alternate solution</p>
5	<p>Network Analysis : Terms used in network analysis, Network or arrow diagram, Fulkerson’s rule, Programme Evaluation and Review Technique (PERT), Critical path method (CPM), Time estimates for activities. Probability of completion of project. Determination of floats (total, free, independent & interfering) , Crashing of Simple Networks.</p>
6	<p>Decision Theory And Decision Tree: Introduction, Decision under certainty, Decision under risk, Payoff table, Regret table, Decision making under uncertainty, Maximin & Maximax criteria,Minimax Regret criterion, Laplace criterion, Hurwicz criterion, Expected Monetary Value criterion, Expected Value of Perfect Information (E.V.P. I), Expected Opportunity Loss (E.O.L.), Decision Tree, Simple examples</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405	Entrepreneurship Development	3L-1T-0P=4C	2018
Course Objectives : To develop an understanding of entrepreneurship concepts To provide sufficient knowledge to students aspiring to be entrepreneurs To provide ways and means to start an enterprise			
Expected Outcome : At the end of this course, student should be able to understand <ul style="list-style-type: none"> • Evolution, definition, characteristics, function and types of entrepreneurs. • Role of Entrepreneurship in Economic Development. • Business Opportunity Identification • Importance of Business plan • Support Agencies • Concept of Intellectual property rights 			
Reference Books : <ul style="list-style-type: none"> • Dr. Dilip Sarwate, Entrepreneurship Development and Project Management, Everest Publishing house • Vasant Desai, Dynamics of Entrepreneurship development and Management, Himalaya Publishing House • David H Holt, Entrepreneurship and New Venture Creation, Prentice Hall • Paul Ajit Kumar, Paul, Entrepreneurship Development, Himalaya Publishing House Mumbai • Raj Shankar – “Entrepreneurship: Theory and Practice” – Vijay Nicole Imprints Pvt. Ltd. • S.S. Khanka – Entrepreneurial Development – S. Chand And Company Ltd., New Delhi – 1999 Websites <ul style="list-style-type: none"> • www.startupindia.gov.in • www.india.gov.in • http://www.makeinindia.com/home 			
Suggested MOOC : Note: <ol style="list-style-type: none"> 1. Case studies to be discussed on various aspects mentioned in the syllabus. 2. Visiting/Interaction with successful local entrepreneurs should be done. 			
Course Plan			
Unit	Contents		
1	Introduction to Entrepreneurship : Evolution, Concept and definition of an entrepreneur, Characteristics, function and types of entrepreneurs, Qualities of an Entrepreneur, Growth of Entrepreneurship in India, role of Entrepreneurship in Economic Development, Women Entrepreneurship in India		
2	Business Opportunity Identification : Search for Business Ideas, Market Assessment, Sources of Information, Environmental Analysis, Entrepreneurial opportunities in India, Business Opportunity identification and selection		

3	<p>Business Plan Preparation : Meaning of Business plan, Significance and Contents of a Business Plan, developing Business Plan, Presenting Business Plan, Elevator Pitch</p>
4	<p>Project Finance : Types of Finance, Sources of Finance, Venture Capital, Start-up and Make-in-India program, MUDRA</p>
5	<p>Support Agencies : Support to Entrepreneurs by DIC, SIDBI, SIDCO, SSIB, NSIC, SISI, Other Institutions etc. Entrepreneurship promotion by Government through various schemes.</p>
6	<p>Entrepreneurial Motivation and Development : Factors motivating entrepreneurs, Basic course contents of EDP's Evaluation of EDP's, Organizations involved in EDP's. Basics of Intellectual property rights</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
406	BCA-II-SEM-IV	2	2018
Course Objective :			
To develop logical abilities of students using Java Programming language			
Expected Outcome: Provide foundation for programming and Enable the students to analyze and efficiently solve the problems using Java Programming.			
References (Books, Websites etc) :			
<ul style="list-style-type: none"> • Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007 • Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008 • Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition 			
Sr. No.	Contents		
1	Program to demonstrate the following: <ol style="list-style-type: none"> 1. Branching Statements 2. Looping Statements 3. Classes and objects 4. Wrapper classes 5. Arrays 6. Array of objects. 		
2	Design Programs on following concepts: <ol style="list-style-type: none"> 1. Constructor 2. Constructor Overloading 3. Pass by value 4. Method Overloading 5. Package 6. Exception Handling 		
3	Working with Inheritance and Interface: <ol style="list-style-type: none"> 1. Programs to demonstrate working of Inheritance, types of inheritance and Polymorphism – function overriding. 2. Making use of abstract and final keywords with class declaration. 3. Programs to demonstrate working of interface. 		
4	Design Programs on following concepts: <ol style="list-style-type: none"> 1. Thread class, Runnable interface and Tread Synchronization. 		
5	Program to demonstrate Java Input/Output : <ol style="list-style-type: none"> 1. Concept of streams, byte streams, character streams. 2. The Console: System.out, System.in, and System.err 3. Making use of InputStream class, OutputStream class, File class, FileInputStreams, File OutputStream, Reader class, Writer class, FileReader, FileWriter. Buffered streams – BufferedInputStream, BufferedOutputStream, BufferedReader, BufferedWriter. Object Streams 		
6	Working with Java Applets and GUI: <ol style="list-style-type: none"> 1. Design program to demonstrate Applet concept. 		

	2. Making use of AWT controls through programs– Button, Lable, TextField, TextArea, List, Checkbox and RadioButtons, Scrollbar, Menu etc.
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Course Number	Course Name	L-T-P- Credits	Year of Introduction
407	Minor Project I	2 Credits	2018-19

Course Objective :

Student has to complete a Minor project work under the guidance of the faculty member in the institute. Students has to develop any software using C in a group of 2 to 3. Each team has to give 4 minimum PPT presentation to the Project Guide during the semester. Final project viva will be conducted as per University Time Table.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
408	Community Work-IV	2L-0T-0P=2C	2018
<p>Course Objective: This course aims to expose the students to social issues and help them Participate in community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, nonprofit organization etc.</p> <ul style="list-style-type: none"> To expose the students towards social reality and role of community development for social upliftment and well being To involve students in community work through active involvement and participation 			
<p>Expected Outcome : Students will be able to know the community needs and understand their role to contribute meaningfully towards community development.</p>			
<p>Reference Books :</p> <ol style="list-style-type: none"> An Introduction to Community Development, Rhonda Phillips, Robert Pittman – 2014 Community Development in Asia and The Pacific, Manohar S. Pawar, 2009, 			
<p>Online Resources: https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-directory.pdf https://www.ahaprocess.com/solutions/community/events-resources/free-resources/</p>			
<p>MOOCs: https://alison.com/course/diploma-in-community-development</p>			
<p>COMMUNITY HOURS: Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken</p>			
Course Plan			
Unit	Contents		
1	Community work in Food and Nutrition related social concerns ,role of government and NGOs in India		
2	Community work for old age people and its related social concerns, role of government and NGOs in India		
3	Community work for woman empowerment ,its related social concerns ,role of Govt. and NGOs in in India		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
408	Basics of Taxation	2L-0T-0P=2C	2018
Course Objective: <ul style="list-style-type: none"> To provide a basic knowledge about direct tax system in India To provide a basic knowledge about indirect tax system in India. To upgrade with the latest amendments in taxation policy of India. 			
Expected Outcome : <ul style="list-style-type: none"> Students will be able to have a basic knowledge about direct tax system in India Students will be able to have a basic knowledge about indirect tax system in India. Students will be upgraded and upskilled with the latest amendments in taxation policy of India. 			
Reference Books : <ol style="list-style-type: none"> Shukla and Grewal: Advanced Accounts. (S. Chand & Co. Ltd. New Delhi) Jain and Narang: Advanced Accounts.(Kalyani Publishers, Ludhiana) Sr. K. Paul: Accountancy, Volume-I and II.(New Central Book Agency, Kolkata) R. K. Lele and Jawaharlal: Accounting Theory (Himalaya Publishers) Dr. L. S. Porwal: Accounting Theory (Tata McGraw Hill). Robert Anthony, D.F.Hawkins& K.A. Merchant: Accounting Text & Cases (Tata McGrawHill) 			
Online Resources: <ol style="list-style-type: none"> https://incometaxindiaefiling.gov.in/ https://www.taxmann.com/# http://www.gstcouncil.gov.in/ 			
MOOCs: Alison Swayam			
Course Plan			
Unit	Contents		
1	Introduction : Basic concepts: Income, agricultural income, person, assessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax; Permanent Account Number (PAN) Residential status; Scope of total income on the basis of residential status Exempted income under section 10		
2	Direct and Indirect Tax: Income from Salaries; Income from house property, Profits and gains of business or profession; Capital gains; Income from other sources, Deductions from gross total income; Rebates and reliefs Computation of total income of individuals and firms; Tax liability of an individual Indirect taxes.		
3	Overview of GST: Overview Of GST: Introduction to GST-Key Concepts – Taxes under GST – Central GST – State GST – Union Territory GST – Integrated GST - Cess		
Course Number	Course Name	L-T-P- Credits	Year of Introduction

408	YOGA - I	2L-0T-0P=2C	2018
Course Objective: <ul style="list-style-type: none"> To introduce the practice of yoga and its benefits to students To impart practices of basic yogic kriyas 			
Expected Outcome : Students will be able to understand the advantages of Yoga and practice basic yog kriyas			
Reference Books : <ul style="list-style-type: none"> Yoga – Asanas, Pranayam, Mudras, Kriya, Vivekananda Ashram Yoga – Sivanand Yog Vedanta Center 			
Online Resources: https://www.yogatoday.com/ https://www.youtube.com/user/yogatoday https://m.youtube.com/user/yogawithadriene/playlists			
MOOCs: Swayam			
Course Plan			
Unit	Contents		
1	i) Origin of Yoga & its brief development. ii) Meaning of Yoga & its importance iii) Yoga as a Science of Art (Yoga Philosophy). iv) Meaning of meditation and its types and principles.		
2	i) Classification of Yoga/Types of Yoga ii) Hatha Yoga , Raja Yoga, Laya Yoga, Bhakti Yoga, Gyan Yoga, Karma Yoga. iii) Asthang Yoga.		
3	i) Principles of Yogic Practices. ii) Meaning of Asana, its types and principles. iii) Meaning of Pranayama, its types and principles. iv) Meaning of Kriya its types and principles. v) Yogic therapies and modern concept of Yoga vi) Naturopathy, Hydrotherapy, Electrotherapy, Messothrapy, Acupressure, acupuncture.		

SEMESTER V

Course Number	Course Name	L-T-P- Credits	Year of Introduction
501	Introduction to the Internet Technologies	3L-1T-0P = 4C	2018
<p>Course Objective :</p> <ul style="list-style-type: none"> To teach the basic internet concepts and train them to develop internet applications. An overview of the HTML5 specification Practical knowledge to implement new HTML5 elements and attributes. Overview of Javascript 			
<p>Pre-requisites: Preliminary knowledge of computer, their operations and applications.</p>			
<p>Expected Outcome :</p> <ul style="list-style-type: none"> Describe and use client-side technologies of the World Wide Web: HTML5, CSS3, Javascript. To implement different constructs and programming techniques provided by Java Script. 			
<p>References (Books, Websites etc) :</p> <p>Text Books:</p> <ol style="list-style-type: none"> The Complete Reference HTML -Thomas A.Powell The ABC's of JavaScript –Lee Purcell & May Jane Mara Internet Technology at work - Hofstetterfred Beginning HTML5 & CSS3 - Christopher Murphy, Richard Clark &oliStudholme <p>Reference Books :</p> <ol style="list-style-type: none"> Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl CGL –Bayross Ivan Internet Technology at work Hofstetterfred Web Design Technology-D.P. Nagpal- S. Chand Technical JavaScript Bible <p>Reference Sites:</p> <ol style="list-style-type: none"> www.w3schools.com www.devguru.com 			
<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com www.coursera.com</p>			
Course Plan			
Unit	Contents		
1	<p>Overview Of Internet And Intranet: Understanding internet and its need, concept of intranet, difference between internet and intranet, a brief history, internet applications, Internet Service Providers (ISP) concept of client and server, concept of a web browser and web server, communicating on the internet, concept of domain- Physical domain, virtual domain,</p>		

	registering a domain, need of IP addressing, process to assign IP addresses, World Wide Web
2	<p>Introduction To HTML: Introduction: Overview of HTML, need of HTML, Use of HTML HTML Tags: concept of Tag, types of HTML tags, structure of HTML program Text formatting through HTML: Paragraph breaks, horizontal rules, heading style, line breaks, background and BGcolor attributes Emphasizing material in a web page: Heading styles, drawing lines, text styles. Text styles and other text effects-centering, spacing, controlling font size & color Lists: Using unordered, ordered, definition lists Adding Graphics To HTML Documents: Using Image tag, attributes of Image tag, changing width & height of image</p>
3	<p>Tables, Frames And Linking Documents: Handling Tables: To define header rows & data rows, use of caption tag, changing height & width of table, cellpadding, cellspacing, bgcolor, colspan, rowspan Linking Documents: Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, Images as hyperlinks Frames: Introduction To frames, using frames & frameset tags, named frames. Forms : INPUT tag, TYPE Attribute : text, password, button, checkbox, radio button, image</p>
4	<p>Introduction to CSS: Introducing CSS, Types of style sheets: inline, embedded and external Style. Working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, Various types of CSS selectors: universal, class, ID, child, descendent, adjacent sibling, attribute and query.</p>
5	<p>Introduction To HTML5 and CSS3: Features of HTML5 and CSS3 with few elements.</p>
6	<p>Introduction To JavaScript: Introduction to scripting: overview of Java Script, Advantages, Features of JavaScript, Client side java Script, writing JavaScript into HTML, First Hello World Program Basic JavaScript Techniques: Data types, literals, variables and operators, Java Script arrays, dense array, operators, expressions Java Script Programming Construct: Assignment, data declaration, if, switch, while, for, do while, label, break, Continue Functions and Objects-Built-In Function and User defined function. User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions, String, Date, Math Objects Dialog boxes -Alert dialog box, prompt dialog box, confirm dialog box, Working with form- Forms and Form elements and the associated events. Form validation.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
502	Object Oriented Analysis and Design	3L-1T-0P – 4C	2018
Course Objective :			
<ul style="list-style-type: none"> To Understand concept of system design using UML. 2. To understand system development through object oriented techniques. 			
Expected Outcome :			
At the end of course students will know –			
<ul style="list-style-type: none"> Advantages of using OOP platforms for development. Process carried out while designing Object Oriented Systems. 			
References (Books, Websites etc) :			
<ul style="list-style-type: none"> The Unified Modeling Language User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson. Object Oriented Software Engineering by Ivar Jacobson 3. Software Engineering by Pressman 			
Suggested MOOC : Refer NPTEL			
Course Plan			
Unit	Contents		
1	Object Oriented Concepts, Modeling and UML: What is Object Orientation : (Introduction to class, object, inheritance, polymorphism), Model : Introduction of Modeling, Object Oriented Modeling , Object oriented system development: Function/data methods, Object oriented analysis, Object oriented construction, Object oriented testing		
2	Iterative Development and UML: Understanding requirements, Rational Unified process & RUP Phases – Inception, Elaboration, Construction, Transition UML : Designing Tool for OOAD : Introduction to UML, Overview of UML, Conceptual Model of UML, Diagrams in UML, Advantages of UML Behavioral Modeling Use Case Diagram : Realization of Use Cases, Finding Actors, Defining Relations among Use case, Writing Use Cases, Activity Diagram		
3	Basic and Advanced Structural Modeling Class Diagram : Identifying the elements of an object model, Identifying classes and objects, Specifying the attributes, Defining operations, Finalizing the object definition, Advanced class Modelling, Interface, Types and Roles Diagrams Based on Classes : State Chart Diagram, Package Diagram, Object Diagram		

4	<p>Interaction Modelling :</p> <p>Introduction to Interaction Diagrams, Need of Interaction Diagrams, Interaction Diagrams, Collaboration Diagram, Sequence Diagram</p>
5	<p>Architectural Modeling</p> <p>Component Diagram: Need of Component Diagram, Realization of Components, Relating Components.</p> <p>Deployment Diagram : Purpose of deployment diagram, Architecture of System, Different Architectures used for System, Representing Architecture using Deployment Diagram</p>
6	<p>Object Oriented Programming Styles</p> <p>Object Oriented Style with reference to Reusability and Extensibility, Robustness, 3 Programming in the Large, Discussion on case Studies e.g. Library Management System, Hospital Management System, . Online Shopping, Nukari.com website, Matrimonial website</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
503	C# Programming	3L-1T-0P-=4C	2018
Course Objectives <ul style="list-style-type: none"> • Learn the fundamentals of C# programming in Visual Studio. • To Use .Net Framework • To Handle Exceptions in C# • To implement Object oriented technology in C# • To operate with Arrays • To use Class Designer and Object Test Bench tools. 			
Expected Outcome : This COURSE focuses on building applications with a graphical user interface (GUI) for the Microsoft Windows operating system although GUI interfaces on other operating systems, and on the Web Topics include: event-driven programming, Win32 API, dialog boxes and standard GUI controls, dynamic link libraries, .NET Framework. The C# programming languages will be used to build applications.			
Reference Books: <ul style="list-style-type: none"> • The Complete Visual C# Programmer's Guide • A Programmer's Introduction to C# 2.0, Third Edition • 3. C# and the .NET Platform, Second Edition 			
Course Plan			
UNIT	Contents		
1	The .net Framework: Introduction, common language runtime, common type system, common language specification, the base class library, the .net class library, Intermediate language, Just in time compilation, garbage collection, assemblies, web services, COM, localization		
2	Introduction to C # : Evaluation of C#, characteristics of C#, application of C#,difference between C++ and C#, difference between Java and C#.Introduction to C# environment : The .NET strategy, the origins of the .NET technology, the .NET framework, the common language runtime, framework base classes, user and programs interface, visual studio .NET, .NET languages, benefits of the .NET approach, C# and .NET. Data types, identifiers, variables, constants, C# statements, OOPs concept,array and strings, operators, control statements, type conversions, Mathematical functions.		
3	Classes and Objects : Basic principles of OOP's, class, objects, constructors, static members, static constructors, private constructors, copy constructors, destructors, member initialization, the this reference, nesting of classes, constant members, read only members, properties, indexers.Inheritance and polymorphism : overloading, inheritance, overriding, interfaces		
4	Visual studio IDE features, introduction to Window forms, components, control: textbox, label, linklabel, status bar, checkedlistbox, combobox, listbox, listview, radiobutton, button, panel, groupbox, dialog box, menu control, properties, methods, events of controls.		
5	ADO.net: the component model, creating database connection, database command, data repeater, connecting to data sources, choosing a .net data provider, manage a connection, building		

	command objects, executing commands, building datasets and datatables, data adapter
6	Managing Console I/O operations : Console class, console input, console output, formatted output, numeric formatting, standard numeric format, custom numeric format. Managing Errors and Exceptions : Types of errors, exceptions, syntax of exception handling code, multiple catch statement, the exception hierarchy, general catch handler, using final statement, nested try blocks, throwing our own exceptions, checked and unchecked operators, using exceptions for debugging.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504	Graph Theory	3L-1T-0P =4C	2018-19
Course Objective :			
The aims of this Graph theory is a delightful playground for the exploration of proof techniques in discrete mathematics and its results have applications in many areas of the computing ,social and natural science			
Expected Outcome :			
At the end of the course student should be able to:			
<ul style="list-style-type: none"> • Use graphs as models in a variety of areas. • Formulate several real world problems in mathematical terms 			
References (Books, Websites etc) :			
Introduction to Graph theory - PHI by Douglas B.West			
Discrete Mathematics and its Applications Edition 6 th - Tata McGraw Hill by Kenneth H. Rosen			
Suggested MOOC :			
NPTEL			
Course Plan			
Unit	Contents		
1	Fundamental Concepts : Definition, Graph Models, Sub Graph, Decomposition and special Graphs, Connection in Graphs, Bipartite Graph, Degree, Directed Graph, Undirected Graph, weighted graph, Regular Graph, dual graph, Representing Graph in computer memory, Examples		
2	Connectivity: Walk, paths, trail, circuits, Connected Graph, Bridge, Isomorphism, Eulerian Circuits, Euler's path, Euler graph, Hamiltonian Graph and Graph Algorithm, Konigsberge Bridge problem, shortest path problems, city route,puzzle problem, Seating arrangement problem, Travelling salesman problem, Examples		
3	Algorithms : Fleury's algorithm, Warshall's algorithm, Floyde's algorithm, Dijkstra's algorithm, Depth-First Search/ Breadth First search in Directed Graph, Examples		
4	Coloring of Graphs and planarity: Vertex Coloring and upper bonds, Graph with Large Chromatic Number, 4 color theorem,Applications of graph coloring, Planar Graph, Euler's Formula, Homomorphism, Theorems, Examples		
5	Trees and Distance: Concept of Trees, Definition and properties of Trees, Application of Trees, Trees as Models, Game Trees, Tree Traversal, Infix and Postfix notation of arithmetic expression, Binary Trees and its Properties, Binary Search Trees, Spanning Tree, Minimum spanning Tree, Depth First search, Breadth –First search, Back tracking applications, Kruskal algorithm, Prims algorithm, Huffman's algorithm Excercises		
6	Matchings : Matching, Hall's Condition, MinMax Theorem, covers, Maximum Bipartite Matching, Weighted Bipartite Matching, Maximum Networks Flow, Examples		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
506	Lab on Internet Technology and C# Programming	3L-1T-0P=4C	2018-19
Course Objective : <ul style="list-style-type: none"> To teach the basic internet concepts and train them to develop internet applications. An overview of the HTML5 specification Practical knowledge to implement new HTML5 elements and attributes. Overview of Javascript Learn the fundamentals of C# programming in Visual Studio. To Use .Net Framework To Handle Exceptions in C# To implement Object oriented technology in C# To operate with Arrays To use Class Designer and Object Test Bench tools. 			
Expected Outcome : <ul style="list-style-type: none"> Describe and use client-side technologies of the World Wide Web: HTML5, CSS3, Javascript. To implement different constructs and programming techniques provided by Java Script. This COURSE focuses on building applications with a graphical user interface (GUI) for the Microsoft Windows operating system although GUI interfaces on other operating systems, and on the Web Topics include: event-driven programming, Win32 API, dialog boxes and standard GUI controls, dynamic link libraries, .NET Framework. The C# programming languages will be used to build applications. 			
References : <ul style="list-style-type: none"> Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl CGI –Bayross Ivan Internet Technology at work Hofstetterfred Web Design Technology-D.P. Nagpal- S. Chand Technical, JavaScript Bible The Complete Visual C# Programmer's Guide A Programmer's Introduction to C# 2.0, Third Edition 3. C# and the .NET Platform, Second Edition 			
Suggested MOOC : Swayam			
Course Plan			
Unit	Contents		
Internet Technology:			
Design A webpage which have student's biodata with proper formatting and having student name as title.			
Design a form using HTML that accepts information about your qualification, extra curricular activities, achievements, skill sets, hobbies, and expectation for a particular job.			
Design a website for a class which shows student's list linked with their biodata pages			

Design a website for PNG jewelers, having images of different types of jewelries which are linked with the pages giving details about the items.

Design a Style sheet to give following effects
The first letter of the paragraph should have 150% font size
The first line of the paragraph should have purple as background color and white as the fore color.

Design a website for the college which lists all the faculties(ordered lists), courses (definition lists) every course explains details (fees, duration, intake capacity) as unordered list.

Design a website for Samsung products using frames having design as-

<logo>	<title>		
<Links to various products>	<images products>	of	<form to purchase the product>

Design a website for a college showing features of the university, college and list of different courses running in the institute. Course names have links with the pages having details of the courses having similar design using stylesheets.

Design a CSS(inline) that displays the regular text at the center with green as background color and white as fore color and should be bold, using class

Design a web page to display the following output

- List of subjects
 - Semester III
 - C++
 - Dot.Net
 - Semester IV
 - Java
 - Industrial Projects
- Internet Programming
- a. HTML
 - b. VBScript
 - c. Java Script
 - d. DHTML

Design a webpage which accepts users information with validations(name, std code(should not exceed 4 digits),landline number(no. of digits should be between 5 to 7), mobile number(exactly 10 digits),email(should have @ and .))

Write a HTML code to display timetable of your class.

Write a HTML code to display the mark sheet of entered seat number

Write an HTML code to accept the students's

Design a website which accepts a number from user and performs the selected operation(even/odd, prime/not prime, positive/negative)
Design a webpage which provides calculator facilities.
Design webpage which accepts no of lines and prints it in the form of triangular shaped pyramid.
Write JavaScript to display table of numbers 2-10 (use form and form elements)
Write a JavaScript code which contains “show” button. When user clicks on show button, first 10 terms of Fibonacci series will be displayed in text box on another HTML page. This page contains button “back”. With this button user can come back to original page.
Create a form having textboxes, radio button and check boxes and reset button. On clicking the reset button the entire form should be reset.
Design a webpage for a restaurant which accepts online order from user and shows the calculated total amount.
Accept login name and password from user and display biodata of the corresponding user.
Design a page for a user to create his login by accepting desired login name, password and confirm the password.
Accept data of a student wants to appear for entrance(name, marks at matriculation, higher secondary and graduation). Ask student to select the course he want to take admission. If the student scores above 55 at matriculation, above 60 at higher secondary and graduation then he is eligible for any course. If he has science degree or maths at 11th and 12th then only he is eligible for MCA.Design the form accordingly. Give the according message.
Design a webpage to conduct aptitude for maths. The test is objective, each question having 4 options. Let the students select the option. For every correct option he scores 2 marks and for every wrong answer he loose 1 mark. Calculate & show score of a student.
Design the registration form for a Web site and when the user clicks on Submit button the login form should be appeared on screen.
Create a purchase order form using Javascript.
Create a Java script code with show button. User click on show button, all string functions should be implemented.
Write JAVA script that finds occurrence of letter “m” in the string entered by user in textbox and replace it with “a” and write string to page.
Develop HTML form to accept mathematical expression in one textbox and display its result in another textbox after clicking on button showing mathematical operations.

C#	
SET-I	Basic Console Applications

	<ul style="list-style-type: none"> • Write a C# Program to design simple calculator • Write a C# Program to Check whether the Entered Number is Even or Odd. • Write a C# Program to Swap 2 Numbers • Write a C# Program to Get a Number and Display the Sum of the Digits • Write a C# Program to Get a Number and Display the Number with its Reverse • Write a Program in C# to demonstrate Command line arguments processing • Write a Program in C# to demonstrate boxing and Unboxing.
SET-II	Date and Time
	<ul style="list-style-type: none"> • Write a C# Program to Display the Date in Various Formats • Write a C# Program to Check Whether the Entered Year is a Leap Year or Not • Write a C# Program to find difference between Two Dates
SET-III	Classes
	<ul style="list-style-type: none"> • Write a program to demonstrate abstract class and abstract methods in C#. • Find the sum of all the elements present in a jagged array of 3 inner arrays. • Write a program to demonstrate Operator overloading. • Demonstrate arrays of interface types (for runtime polymorphism) with a C# program.
SET-IV	<ul style="list-style-type: none"> • Consider the Database STUDENT consisting of following tables: Course (C_ID: int, C_Name: string) • Student (RollNo:int, S_Name: string, Address: string, C_ID: int, Admissiyear: int) Develop suitable windows application using C#.NET having following options: <ol style="list-style-type: none"> 1. Entering new course details. 2. Entering new student details. 3. Display the details of students (in a Grid) who belong to a particular course. 4. Display the details of the students who have taken admission in a particular year • write a program in C# to demonstrate error handling.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
507	Minor Project II	2 Credits	2018-19

Course Objective :

Student has to complete a Minor project work under the guidance of the faculty member in the institute. Students has to develop any software using Java in a group of 2 to 3. Each team has to give 4 minimum PPT presentation to the Project Guide during the semester. Final project viva will be conducted as per University Time Table.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
508	Social Media Management	2L-0T-0P=2C	2018
Course Objective: This Course Teaches student to use social media strategically to create value for a client or organization.			
Expected Outcome : <ul style="list-style-type: none"> Students will learn by doing assignments focusing on social media, post writing and publishing, management and measurement tools, a social media audit, editorial calendar and crises management. Students will master the skills necessary to become successful social media managers. 			
Reference Books : <ul style="list-style-type: none"> Guy Kawasaki & Peg Fitzpatrick, “The art of social media: power tips for power users Social media marketing all in one for dummies, Jan Zimmerman & Deborah N Social media explained by Mark W. Schaefer 			
Online resources http://www.gov.pe.ca/photos/original/IPEI_ebiz_smmkt.pdf https://www.coursehero.com/file/10513028/Media-Management-Notes/			
MOOCs: Swayam			
Course Plan			
Unit	Contents		
1	Introduction To Social Media: Introduction to Social Media, importance of social Media, History and evolution of Social Media, Managing Information, Aggregators. Facebook, Twitter, Instagram, LinkedIn, Youtube, Blogs.		
2	Using Social Media: Strategy Plan for Social Media Management, Touchpoint, Analysis Scheduling, Creating Content, Managing Content programmes, Planning Worksheet, Social media campaign.		
3	Evaluating Social Media: <ul style="list-style-type: none"> Evaluation of Social Media Platforms Tools to manage and measure performance of social media content and campaigns Handling critical issues in social media management and legal aspects of social media.		

4	Setting-up own professional site Content management, design, connectivity with social media
	Assignments: <ol style="list-style-type: none">1.Explain atleast one social media management tool in detail.2.Describe social media analytics tool in bried with example.3.Detailed social media campmaign: The campaign can be any example presented in social media for Lead Generation. Describe the objectives for campaign, outline the tools, preapare budget for campaign.4.Budget for social media plan: Based on the understanding of your client, prepare a budget for social media management. Include the individual cost of your tactis, your proposed social media campaign and social media tools. Include the total cost as a bottom line of your budget. Include the ROI of your plan and why that budget should be allocated to social media. <p>List different types of content to be used in creating brand by using social media campaigns. Describe merits and demerits of each type of content used in social media.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
508	Road Safety Management	2L-0T-0P=2C	2018
<p>Course Objective: The vehicle population in India is growing at an exponential rate. This phenomenon is bringing in its wake a host of health related, environmental, safety and behavioral problems in the society. The problem is compounded due to absence of effective means of mass transportation system in most big cities in India.</p>			
<p>Reference Books :</p> <ul style="list-style-type: none"> • Pratibha Shastri Ranade , Road Safety Management, ICFAI University • Vijay Vinayak Revankar, Road Safety – Vimleshwar Automobile Industry and Road Safety Community Forum 			
<p>MOOCs: Alison</p>			
Course Plan			
Unit	Contents		
1	<p>Introduction to Road Safety Management: Importance and need of road safety management.</p>		
2	<p>Management of Traffic and Traffic Rules: Use of traffic signals, signs by hand, knowledge/applications of automatic signals, parking rules, driving around, Traffic islands ,traffic joints, subways and flyovers. Signs of roads: meaning of yellow, green and red lights, zebra crossings, bus stops, use of road by physically disadvantaged persons, elderly persons, women and children, special right of way for ambulance, firefighting vehicles, school bus and V.I.P vehicles.</p>		
3	<p>Management of Road Mishaps and Accidents: First aid to accident victims- First aid techniques, co-ordination with hospitals and other health centres for emergency treatment of accident victims, role of Insurance companies in providing relief to accidents victims, Management of Ambulance Services, Importance of voluntary blood donation in saving accident victims,Rehabilitation of persons affected by accidents. Qualities of a good Driver: Good health, tolerance, responsibility, knowledge of rules and laws, self confidence, politeness, familiarity with the vehicle and its maintenance requirements, self discipline.</p>		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
508	Event Management	2L-0T-0P=2C	2018
Course Objective: The basic purpose and spirit of this course is to expose the students to hands- on experience of event management.			
Expected Outcome : The students are oriented to event management in order to strengthen their skills of planning, organizing and other such management functional skills.			
Reference Books : <ul style="list-style-type: none"> • S. R. Singh, Event Management, HPH. • Alex Genadelik, Event Planning: Management & Marketing For Successful Events: Become an event planning pro & create a successful event series 			
Online Resources: https://blog.komodoplatform.com/notes-on-social-media-and-community-management-for-blockchain-cryptocurrency-and-ico-projects-4d0f328bdfb3			
MOOCs: Alison			
Course Plan			
Unit	Contents		
1	Introduction to Event Management: The concept of event. need and importance of events.		
2	Types of Events : Different types of event in Corporates, Social Programmes and Private Programmes. Following units are entirely based on practice part of the event management		
3	Assessment of Events : Post event assessment of any 05 programmes A student or a group of 03 students shall be assigned the event which has taken place in near past at any place and they shall make an inquiry into its success and effectiveness by rating them on the basis of appropriate parameters and shall submit the assignment to the respective teacher . Preparation of Learning Value report : A student shall prepare a report on what he learnt from the events and submit it to the concerned teacher. The report shall include mainly the description of occasion, the person involved and what guiding principles they have received from them.		

SEMESTER VI

Course Number	Course Name	L-T-P- Credits	Year of Introduction
601	Data Warehousing And Data Mining	3L-1T-0P= 4C	2018
Course Objective : <ul style="list-style-type: none"> To introduce the basic concepts of Data Warehouse and Data Mining techniques. Examine the types of the data to be mined and apply preprocessing methods on raw data. Discover interesting patterns, analyse and estimate the accuracy of the algorithms. 			
Expected Outcome : At the end of this course, student should be able to understand <ul style="list-style-type: none"> Process raw data to make it suitable for various data mining algorithms. Discover and measure interesting patterns from different kinds of databases. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data. 			
References (Books, Websites etc) : <ul style="list-style-type: none"> Jiawei Han and Micheline Kamber , “Data Mining Concepts and Techniques” ELSEVIER M.Humphires, M.Hawkins, M.Dy,“Data Warehousing: Architecture and Implementation”, Pearson Education Kargupta, Joshi., “Data Mining: Next Generation Challenges and Future Directions”, Prentice Hall of India 			
Suggested MOOC: Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction to Data warehousing: Data Warehousing, Difference between operational database system and data warehouse, Data Warehouse Users, Benefits of Data Warehousing, Metadata, Classification of Metadata, and Importance of Metadata. Data Marts, Reasons for creating Data Marts, Building Data Marts: Top down Approach & Bottom up Approach, Data Warehouse Architecture, Two Tier Architecture, Three Tier Architecture. Data Warehouse Schema, Star, Snow Flake & Fact Constellation Schema. OLAP, Need for OLAP, OLAP Operations, OLAP Models.		
2	Data Preprocessing: Need, Objectives and Techniques, Descriptive data summarization, Data Cleaning, Data Integration, Data Transformation, Data Reduction.		
3	Introduction to Data Mining: Introduction, Need for Data Mining, KDD Process, Data Mining Architecture, Data		

	Mining Functionalities, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System
4	Mining Frequent Items and Associations: Frequent Item Set, Closed Item Set, Association Rule Mining, Market Basket Analysis, Classification of Association Rules, Apriori Algorithm
5	Classification and Prediction: Classification & Prediction, Issues regarding classification & Prediction, Comparing Classification Methods, Classification by Decision Tree Induction
6	Clustering: Introduction, Cluster Analysis, Need, Categorization of Major clustering methods. Types of Data in Cluster Analysis, Partitioning Methods: K-Means Method, K-Medoids Method, Applications of data mining in various sectors

Course Number	Course Name	L-T-P- Credits	Year of Introduction
602	Web Programming	3L-1T- 0P= 4C	2018-19
Course Objective :			
To make students able to design, develop the various types of web based applications.			
Expected Outcome :			
By using JavaScript, PHP and My SQL, at the end of the course student should be able to :			
<ul style="list-style-type: none"> • Design web pages • Knowledge about different types of web sites • Navigation amongst web pages • Knowledge about presenting information on web interfaces 			
References (Books, Websites etc) :			
<ul style="list-style-type: none"> • PHP and MySQL Web Development by Welling Thomson Fourth Edition, Pearson publication • Teach Yourself PHP, MySQL and Apache by Julie C. Meloni Pearson publication 			
Suggested MOOC :			
Please refer these websites for MOOCS:			
NPTEL / Swayam			
www.edx.com			
www.coursera.com			
Course Plan			
Unit	Contents		
1	Introduction To PHP: Installing and configuring PHP, Building blocks of PHP:PHP tags, variables, data types, operators, expressions, constants, Control Structures: conditional statements, loops, switch statement		
2	Working With Functions And Arrays: Working with functions: What is a function? Function declaration and definition, Calling function, user defined functions, variable scope, working with arrays: Creating, sorting and reordering arrays, PHP classes.		
3	String Manipulation: Working with strings, dates and time: Formatting, investigating and manipulating strings with PHP, using date and time functions in PHP, working with forms: Creating a simple input form. File Handling: Saving data, storing and retrieving Bob's order, processing files, opening file, writing to a file, closing a file, reading from a file, uses other useful file functions.		
4	Working With Cookies And Sessions : Working with cookies: Introducing cookies, setting and deleting cookies with PHP Working with session: starting a session, working with session variables, passing session IDs in the query string, destroying sessions and unsetting variables, using sessions		

5	<p>MYSQL :</p> <p>Creating web database: Using MySQL monitor, logging into MySQL, creating databases and users, setting users and privileges, column data types</p> <p>Working with MySQL database: Inserting data into database, retrieving data from the database, retrieving data with specific criteria, retrieving data from multiple tables, retrieving data in particular order, grouping and aggregate data, using sub queries, updating records, deleting records from databases, dropping table and database.</p>
6	<p>Accessing MYSQL Database From Web With PHP :</p> <p>Web database architecture, Querying database from the web: checking and filtering input data, setting up connection, Choosing database to use, querying database, retrieving the query result, disconnecting from the database.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
603	Software Project Management	3L-1T-0P= 4C	2018-19

Course Objective :

To provide basic project management skills with a strong emphasis on issues and problems associated with delivering successful IT projects. The course is designed to provide an understanding of the particular issues encountered in handling IT projects and to offer students methods, techniques and 'hands-on' experience in dealing with them.

Expected Outcome :

At the end of this course, student should be able to understand

- Understand and practice the process of project management and its application in delivering successful IT projects;
- Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities;
- Identify the resources required for a project and to produce a work plan and resource schedule.

References (Books, Websites etc) :

- Information Technology Project Management: Kathy schwalbe, International student edition, THOMSON course Technology, 2003.
- B)Software project management : Bob Hughes and Mike Cottrell, Third edition, Tata McGraw-Hill
- Microsoft office Project 2003 Bible: Elaine Marmel, Wiley publishing Inc.
- **Software Requirement:** Microsoft project Tool.

Suggested MOOC:

Please refer these websites for MOOCS:

NPTEL / Swayam

www.edx.com

www.coursera.com

Course Plan

Unit	Contents
1	Introduction to project management: Project, project management, Importance, characteristics of project how software projects are diff. than other projects, Problems with software projects, Phases: Initiation phase, planning phase, execution phase, monitoring and controlling phase, and closing phase. All parties involved in project, Role of Project Manager, Project management framework, Software tool for project management
2	Project planning: Integration management: What is integration management, plan development and execution, What is scope management, methods for selecting project, scope statement, Work Breakdown Structure, main steps in Project planning: identify project scope and

	objective, identify project infrastructure, analyze project characteristics, identify project products and activities, estimate effort for each activity, identify risk activity, allocate resources, review plan, execute plan. Use of software (Microsoft Project) to assist in project planning activities.
3	Project scheduling: Time management: importance of Project schedules, schedules and activities, sequencing and scheduling activities, Network Planning models, duration estimation and schedule development, Critical path analysis, PERT, Use of software(Microsoft project) to assist in project scheduling.
4	Project cost management: Importance and principles of project cost management, Resource planning, Attributes to be considered in cost estimation, factors affecting the cost, various costs involved in it. Traditional method: Estimation by analogy, Expert judgment, Parkinson, price to win, top down, bottom up. COCOMO Model, Function point analysis, Function point analysis, Cost control, Use of software(Microsoft project) to assist in cost management.
5	Project quality management: Quality of information technology project, Stages of software quality management, PMBOK, Quality standards, Tools and techniques for quality control.
6	Project risk management: The importance, Top risk in projects, Common sources of risk in IT projects, elements in risk mgt., Risk identification, Risk quantification, Risk response development and control, using software to assist in project risk management.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
604	Business Analytics	3L-1T-0P=4C	2018-19
Course Objective : <ul style="list-style-type: none"> To gain an understanding of how decision makers use business analytics to formulate and solve business problems and to support Information System based decision making. To become familiar with the processes needed to develop, report, and analyze business data 			
Expected Outcome : At the end of this course, student should be able to understand <ul style="list-style-type: none"> Identify and prioritize information & data modelling. Identify and prioritize threats to information assets. Define an Geographical information system. Understand various types of Analytics and its significance. Understand text & web mining Applications of business analytics 			
References (Books, Websites etc) : <ol style="list-style-type: none"> Efraim Turban, Ramesh Sharda : Decision Support and Business Intelligence systems : PHI 8th Edition 			
Suggested MOOC : NPTEL, SWYAM			
Course Plan			
Unit	Contents		
1	Business Analytics & Data Visualization: Business Analytics (BA), Overview of Areas where Business Analytics is applied, OLAP, Reports & Queries, Multidimensionality, Advanced Business Analytics, Data Visualization, Geographical Information system, Real time Business Intelligence Automated Decision support, and Competitive Intelligence, BA & Web, Usage benefits & success		
2	Visualization and Data Issues: Organization of Source of Data, Importance of Data Quality, Dealing with Missing or incomplete data, data classification, Introduction to Data Mining, Data mining process, data mining tools XL MINER.		
3	Data, Text & Web Mining : Data Mining concepts & applications, Data Mining Techniques & Tools, Data Mining Project Processes, Text Mining, Web Mining		
4	Applications of Business Analytics : Risk - Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing, Market share estimation and Sensitivity Analysis		
5	Loyalty Analytics, Customer Life Time Value, Propensity Analytics, Churn Analytics, Customer Analytics Customer Segmentation, Cross- Sell or Up sell Models		

6	Recruitment Analytics, Compensation Analytics, Talent Analytics, Training Analytics, Human Resource Retention Analytics, Workforce Analytics Project Work
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Course Number	Course Name	L-T-P- Credits	Year of Introduction
606	Lab on Web Programming	0L-0T-4P=2C	2018-19

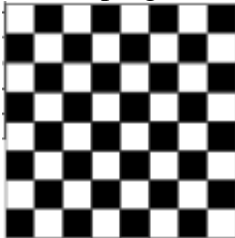
1. Write a Program for finding the biggest number in an array without using any array functions.
2. Write a program to square of a number.
3. Write a program to print Factorial of any number.
4. Write a program in PHP to print Fibonacci series.
5. Write a program to find whether a number is Armstrong or not.
6. Write a program to find HCF of two numbers
7. Write a program to demonstrate four built in functions.
8. Program to print the below format

```

*****
*****
*****
*****
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*****
*****
*****
*****
*****
*****
*****

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9. Write a program to make a chess:



10. Create the following form and based on the user selection print a message in the format given below:

Please select your favourite car

Nissan

Toyota

Mitsubishi

Your favourite car is: Nissan

11. Write a PHP script to accept personal details of student (rno, name, class) on first page. On second page accept marks of six subjects (out of 100). On third page print marklist (rno, name, class, marks, total, percentage)
12. Write a PHP file that will output a form containing 2 fields: username and password. Upon submission of the form, the code should check against the database to see whether the username-password pair was correct. If so, display a welcome message. If not,

display the message “Invalid username or password” followed by the same login form.

13. Write a PHP file that can be added to other PHP files using the include or require functions. This file should:

- a. Make a connection to a MySQL database, and log in with valid credentials. The connection resource should be stored in a variable with an appropriate name.
- b. Create a database TEST if it does not exist.
- c. Select the TEST database.
- d. Create a table USER exerciseusers if it does not exist with the following fields:
 - i. USERNAME VARCHAR(100) , PASSWORD_HASH CHAR(40),
PHONE VARCHAR(10)
- e. The USERNAME field should be designated as UNIQUE.
- f. If any of these operations cause an error, stop execution and print the error message

14. Design a web page that accepts inputs(username and password) and authenticate the username and password from a given database using PHP.

Note : Similar experiments can be designed.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
607	Major Project	2 Credits	2018-19

Course Objective :

Student has to complete a Major project work under the guidance of the faculty member in the institute. Students has to develop any software using Web Development / Dot Net Framework in a group of 2 to 3. Each team has to give 4 minimum PPT presentation to the Project Guide during the semester. Final project viva will be conducted as per University Time Table.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
608	Business Ethics	2L-0T-0P=2C	2018
<p>Course Objective: The objective of this paper is to make the students more clear about the importance of ethics in business and practices of good corporate governance. It also talks about the corporate social responsibility</p>			
<p>Expected Outcome : This course exposes the student to the issues of values and ethics in management so that decision making and decision execution are undertaken in a human manner, as this will add to the flexibility and dynamism of the corporate culture. The course will take the student from managerial ethics to organizational ethics and business sustainability.</p>			
<p>Reference Books :</p> <ul style="list-style-type: none"> • Management by Values; Chakraborty S.K.; OxfordUniversity Press, Kolkata 2005. • Professional Ethics by R. Subramanian, Second Edition, OXFORD • Theory and Practice of Managerial Ethics; Jayashree S. Sadri S. and Dastoor D.S.; Jaico , Mumbai. • New Mantras in Corporate Corridors, Sharma Subash New age International Publishers, New Delhi 2007. • Business Ethics and Corporate Governance (towards excellence and sustainability); Sadri S., Jayashree. Himalaya Publishing Co. Mumbai 2011. • Managing from the Heart: Unfolding spirit in people and organization; Wakalu, Arun: Response Books, New Delhi • Manuel G Velasquez : Business ethics- concepts and cases Pearson. • Bhanumurthy K V: Ethics and Social Responsibility of Business, Pearson Education India. 			
<p>Online Resources: https://managementhelp.org/businessethics/index.htm</p>			
<p>MOOCs: https://www.edx.org/learn/business-ethics</p>			
Course Plan			
Unit	Contents		
1	Ethics – Meaning, and Nature of Ethics. Types of Ethics, Importance of Ethics. Business Ethics : Meaning, Nature and Importance of ethics in business, meaning of corporate social responsibility, Relation between corporate responsibility & Business Ethics.		
2	Concept of Morals, Values, Beliefs; Moral issues in business, Spirituality and Ethics; Influence of Major religions on ethics: Hinduism, Islam, Christianity, Buddhism, Sikhism, and Zoroastrianism. Influence of spirituality on ethics.		
3	Relationship between Business, Business Ethics & Business Development, Role of Business ethics in building a good society.		

	Case Studies on Business Ethics
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Course Number	Course Name	L-T-P- Credits	Year of Introduction
608	Basics of Hospitality Management	2L-0T-0P=2C	2018
Course Objective:			
<ul style="list-style-type: none"> • Recognize scope and career in the hospitality industry. • 2. Identify the major segments and specialization of the industry and their operations. 			
Reference Books :			
<ul style="list-style-type: none"> • Introduction to Hospitality Management, John R. Walker ,Pearson • Food and Beverage Service, D.R. Lillicrap,John A. Cousins & Suzanne Weekes, Book Power. • Food and Beverage Management, Bernard Davis , Sally Stone, Butterworth Heineman Ltd. • Hotel House Keeping and Management, Raghubalan, Oxford University Press. • Managing Front Office Operations, Michael Kasavanna, Richard Brooks , Charles Steadmon, AH&LA. 			
Online Resources:			
www/youtube.com			
MOOCs:			
https://www.ifitt.org/hospitality-and-tourismmoocs/			
Course Plan			
Unit	Contents		
1	Introduction to the Hospitality Industry: <ol style="list-style-type: none"> a. History and scope of the hospitality industry. b. Economic impact of the hospitality and tourism industries. c. Careers in the industry. d. Link between hospitality and travel and tourism. e. Major segments and specialization of the industry. f. medical tourism 		
2	Recreation/Travel and Tourism: <ol style="list-style-type: none"> a. Operation of recreational facilities such as resorts, spas, theme parks, and clubs. b. Meetings, conventions, exhibitions, banquets, and other events. c. Travel agencies and concierge desks. d. Gaming entertainment industry. 		
3	Operations: <ol style="list-style-type: none"> a. Leadership and management in the industry. b. Hospitality marketing. c. Human resources and risk management and safety procedures. 		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
608	Aptitude	2L-0T-0P=2C	2018
<p>The objective of this paper is to increase the capabilities of the student required by the industry. As per the need of the industry, the students will be trained in the latest Mathematical, Statistical, Logical, Verbal Ability, Current Trends in IT etc by the industry experts.</p>			

ELECTIVES:**Elective Group: (I) Information Security**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-1-A	Information Security Concepts	3L+1T+0P=4C	2018
Course Objective: Introduce the learner to concepts involved in Information Security domain			
Expected Outcome : Theoretical understanding of Information Security Concepts			
References (Books, Websites etc) : CEH Study Guide - Sybex			
Suggested MOOC : SWAYAM			
Syllabus			
Unit	Contents		
1	Information Security Concepts: Confidentiality, Integrity and Availability of Information, Identification, Authentication and Authorization, Security Principles and Models		
2	Physical Security: Facility Requirement, Perimeter Security, Fire Protection, Fire Suppression, Power Protection, General Environmental Protection, Equipment Failure Protection		
3	Network Security: Secure Network design, Firewalls, WLAN Security, VPNs, Types and Sources of Network Threats		
4	Operating System Security: Windows, Linux/UNIX		
5	Database Security: MS SQL		
6	Web Application Security: Web Application Vulnerabilities, Secure Coding Techniques, Continuous Security Testing and Assessments		
7	Compliance Standards : IT Act, ISO 27001, ITIL Framework		

Elective Group (I) Information Security

Course Number	Course Name	L-T-P- Credits	Year of Introduction
605-1-B	Information Security Administration	3L+1T+0P=4C	2018
Course Objective: Introduce the learner to concepts involving security administration			
Expected Outcome : Practical understanding of setting, managing and securing Information Systems			
References (Books, Websites etc) : Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus			
Suggested MOOC : SWAYAM			
Syllabus			
Unit	Contents		
1	Setup a Client: Introduction to client-side devices, Setup, Manage and Secure a Desktop PC Setup, Manage and Secure a Mobile Device		
2	Setup a LAN: Introduction to LAN devices, Simulate a LAN, Setup, Manage and Secure a Local Area Network		
3	Connect a LAN to the Internet: Introduction to WAN devices, Setup, Manage and Secure a Connection to the Internet		
4	Share an Internet Connection across a LAN: Introduction to Internet Connection sharing, Introduction to NAT and PAT Setup, Manage and Secure a Proxy Server		
5	Share resources over a LAN: Setup, Manage and Secure a Print Server, Setup, Manage and Secure a File server		
6	Host a Website: Introduction to website hosting, Setup, Manage and Secure a Web Server		
7	Setup support servers: Setup, Manage and Secure a Mail Server, Setup, Manage and Secure a FTP Server, Setup, Manage and Secure a Boot Server, Setup, Manage and Secure a DNS Server		

Elective Group II- Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-2-A	Introduction to Big Data	3L-1T-0P= 4C	2018
<p>Course Objective : To introduce learner with Big Data Concept, decision making by doing analysis on the data and managing the data using Big Data Tools like Apache Hadoop, Pig and Hive. What are the problems of Big Data and how it can be solved by different tools.</p>			
<p>Pre-requisites: Preliminary knowledge of computer, Data Mining, Data Warehousing Concepts.</p>			
<p>Expected Outcome :</p> <ul style="list-style-type: none"> • Good knowledge of Big Data Concepts • Knowledge of Decision making using analysis on the Big Data • Introduction to Big data Tools like Hadoop and Weka. 			
<p>Reference Books :</p> <ol style="list-style-type: none"> 1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo 2. Edureka lectures Link:- https://www.youtube.com/watch?v=A02SRdyoshM 			
Course Plan			
Unit	Contents		
1	<p>Introduction: Big Data History, The Big Data Business Opportunity- Business Transformation Imperative, Big Data Business Model, Business Impact of Big Data</p>		
2	<p>Big Data In Organization: Data Analytics Lifecycle, Data Scientist Roles and Responsibilities – Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, New Organizational Roles, Liberating Organizational Creativity.</p>		
3	<p>Decision Theory And Strategy: Business Intelligence Challenge, Big Data User Interface Ramifications, Human Challenge of Decision Making, Strategy for Decision Making- Big Data Strategy Document, Case Study.</p>		
4	<p>Value Creation Process: Understanding Big Data Value Creation, Value Creation Drivers, Michael Porter’s Value Creation Models- Michael Porter’s Five Forces Analysis, Michael Porter’s Value Chain Analysis, Case Study.</p>		
5	<p>Big Data User Experience: The Unintelligent User Experience, Understanding the Key Decisions to Build a Relevant User Experience, Using Big Data Analytics to Improve Customer Engagement, Uncovering and Leveraging Customer Insights, Big Data can Power a New Customer Experience.</p>		
6	<p>Big Data Use Cases: The Big Data Envisioning Process –1. Research Business Initiatives, 2. Acquire and Analyze your Data, 3. Brainstorm New Ideas , 4. Prioritize Big Data Use Cases, 5. Document Next Steps, The Prioritization Process.</p>		

7

Big Data Architecture:

New Big Data Architecture, **Introducing Big Data Technologies** – Apache Hadoop, MapReduce, R, WEKA etc.

Elective Group II Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
605-2-B	HADOOP	3L-1T-0P= 4C	2018
Course Objective : To introduce learner with HADOOP Tool for Business Intelligence, decision making by doing analysis on the data using HADOOP Tool and also managing the Big Data using HADOOP.			
Pre-requisites: Preliminary knowledge of computer, Big Data Analysis and Business Intelligence. Also students must know Core Java, C Programming and Data Structure Languages.			
Expected Outcome : <ul style="list-style-type: none"> • Good knowledge of HADOOP Tool. • Knowledge of Decision making using HADOOP analysis on the Big Data • Hands-on Big Data tools- Hadoop, Pig, Hive, HBase 			
Reference Books : <ol style="list-style-type: none"> 1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo 2. www.tutorialspoint.com 			
Course Plan			
Unit	Contents		
1	BIG DATA Overview : What is Big Data?, What Comes Under Big Data?, Benefits of Big Data, Big Data Technologies Operational vs. Analytical Systems, Big Data Challenges.		
2	Introduction To HADOOP: Hadoop Architecture, MapReduce, Hadoop Distributed File System, How Does Hadoop Work?, Advantages of Hadoop.		
3	HDFS Overview: Features of HDFS, HDFS Architecture, Starting HDFS, Listing Files in HDFS, Inserting Data into HDFS, Retrieving Data from HDFS, Shutting Down the HDFS.		
4	MAPREDUCE: What is MapReduce?, The Algorithm for MapReduce, Inputs and Outputs (Java Perspective), Analyze different use-cases where MapReduce is used, Differentiate between traditional way and MapReduce way.		
5	Introduction To Hadoop Features: New Big Data Architecture, Introducing HADOOP Features – Apache Hive, Apache HBase, Pig.		
6	Multi Node Cluster: Multi Node Cluster, Install Java, Creating User Account, Mapping the Nodes, Installing Hadoop, Configuring Hadoop, Start Hadoop Services, Adding New Data Node in the Hadoop Cluster, Removing New Data Node from the Hadoop Cluster.		
7	Environment Setup: Pre-installation Setup, Installing Java Downloading Hadoop Hadoop Operation Modes Installing Hadoop in Standalone Mode Installing Hadoop in Pseudo Distributed Mode Verifying Hadoop Installation, Implement basic Hadoop commands on terminal.		

Elective Group: (III) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-3-1	E-Commerce	3L-1T-0P-4C	2018-19
Course Objective : <ul style="list-style-type: none"> • To thoroughly understand the information technology for supporting E-commerce; • To understand the necessary infrastructure and functional components to develop Ecommerce systems; • To understand the design and application of E-commerce systems. 			
Expected Outcome : Upon successful completion of the course students will be able to: <ul style="list-style-type: none"> • Recognize the impact of Information and Communication technologies, especially of the Internet in business operations • Recognize the fundamental principles of e-Business and e-Commerce • Use tools and services of the internet in the development of a virtual e-commerce site 			
References : <ul style="list-style-type: none"> • E-commerce - C.S.V. Murthy, Himalaya Publishing House • E-commerce A Managerial Perspective - P.T. Joseph, Prentice Hall Of India • Frontiers of Electronics Commerce - Kalakota and Whinston, Pearson Education 			
Suggested MOOC : Swayam			
Course Plan			
Unit	Contents		
1	Introduction to E-Commerce: Definition, E-commerce fundamentals, different types of E-commerce E-Commerce Infrastructure - The Internet and World Wide Web, Web system, Internet basics, Characteristics of Internet, Components of Internet – Uniform Resource Locators, Internet Protocol, Hypertext Transfer Protocol (HTTP), Internet Service Provider (ISP), Types of ISP, domain name, domain name types E-commerce vs Traditional Commerce, Networking Categories, Mobile Commerce		
2	Business Models for e-commerce: Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), Business-to-Business(B2B) Electronic Data Interchange Requirement of EDI, types of EDI, Advantages and Disadvantages of EDI		
3	E-commerce Payment System: Limitations of traditional payment system, requirement of e-payment system, Internet payment systems - Credit card payment (e.g., SET protocol), E-cash, E-check, smart card, Electronic Funds Transfer, Digital Token Based E-Payment Systems, Modern Payment Systems, Steps for Electronic Payment, Payment Security, Net Banking		

4	<p>Applications of E-Commerce: E-commerce in banking, retailing, online publishing, online marketing, e-advertising, e-branding.</p>
5	<p>E-commerce Security: Security issues, Privacy issues, Computer Security, security threats, security tools, Denial-of-Service attacks, Viruses, Unauthorized access to a computer network, Vulnerability of Internet Sites requirements, malicious code, intruders, attacking methods, Cryptography- encryption and decryption, public key encryption, private key cryptography, message digest, digital signature, digital certificate, firewalls, SSL. Firewall – Packet filtering, Application gateways.</p>
6	<p>Implementation of E-Commerce: WWW.EBAY.COM - B2C Website – Registration, Growth of eBay, PayPal – New Trend in Making Payments Online, National Electronic Funds Transfer.</p>

Elective Group: (III) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
605-3-B	Knowledge Management	3L+1T+0P=4C	2018
<p>Course Objective: The objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.</p>			
<p>Pre-requisites: Knowledge about Information System and MIS with Implementation of MIS</p>			
<p>Expected Outcome : After going through this course a student should be able to understand :</p> <ul style="list-style-type: none"> • Will be able to understand the concepts of Knowledge and knowledge management . • Can be able to design and develop Knowledge management systems for Business applications . • Implementation of KM to various areas of Interest in Business Organizations . 			
<p>References (Books, Websites etc.):</p> <ol style="list-style-type: none"> 1. Madhukar Shukla:Competing Through Knowledge-Building a learning Organisation(Response Books, New Delhi. 2. Tiwana, The Knowledge Management Toolkit: Practical Techniques for building a Knowledge Management Systemes, 2/e, Pearson Edu. 3. Honey Cutt : “Knowledge Management Strategies”, PHI, New Delhi. 4. A wad, KM, Pearson Edn, 2007. 5. Barnes, Knowledge Management Systems, 1/e, Thomson 2006. 6. Ikudiro Nonka & Hirotaka Takeuchi, “ The Knowledge – Creating Company”, Oxford University Press, London. 			
<p>Suggested MOOC: Please refer these websites for MOOC’s: NPTEL / Swayam www.edx.com www.coursera.com</p>			
Syllabus			
Unit	Contents		
1	<p>Introduction: Definition, Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM, Organizational knowledge, Characteristics and Components of Organizational Knowledge</p>		
2	<p>Drivers of knowledge Management: Pillars of knowledge Management, KM framework , Supply Chain of KM , Formulation of KM strategy.</p>		
3	<p>Technology and KM: Technology components of KM – IT & KM , Ecommerce and KM</p>		

4	<p>Total Quality Management and KM: TQM and KM , Bench marking and KM.</p>
5	<p>Implementation of KM: Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM</p>
6	<p>KM and Organizational Restructuring: The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements, Corporate Transformation.</p>
7	<p>Case studies in Knowledge Management Knowledge management in Health Care, Knowledge Management in Human Resource Management</p>

**Bharati Vidyapeeth Deemed To Be University,
Pune**

Faculty of Management Studies

Board of Studies in Computer Applications

Master of Computer Applications Programme

(2020 Course)

(Under Choice Based Credit System)

To be implemented from

2020-21

Master of Computer Applications Programme (2020 Course)
(Under Choice Based Credit System)
To be effective from 2020-21 at Part I

1. INTRODUCTION:

The MCA Program is a full time 102 credits programme offered by Bharati Vidyapeeth (Deemed to be University), Pune and is conducted at its Management Institutes in Pune, Karad, Kolhapur, Sangli, and Solapur. All the five institutes have excellent teaching staff, laboratories, library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade (3rd cycle). The expectations and requirements of the software industry, immediately and in the near future, are visualized while designing the MCA programme. This effort is reflected in the Vision and Mission statements of the MCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed to be University which is to usher in “Social Transformation through Dynamic Education.”

2. VISION STATEMENT OF MCA PROGRAMME:

Achieve excellence in Computer Applications with respect to teaching, learning and researching to meet the growing needs of the industry and society.

3. MISSION STATEMENT OF MCA PROGRAMME

- Promote outcome-based learning strategies in-order to meet global industry standards.
- Encourage innovations and problem-solving capabilities in students and the faculty.
- Cultivate collaborative research in both students and faculty members through industry interactions and collaborations.
- Enhance entrepreneurship skills among students.

4. PROGRAMME EDUCATION OBJECTIVES (PEO)

PEO1: To build a strong foundation for students to become proficient in all academic concepts and technical skills necessary to become an IT Professional.

PEO2: To provide a conducive environment for designing, implementing and testing various software applications through Software Development Cell.

PEO3: To keep the students and faculty abreast with the emerging technologies in the field of computer applications.

PEO4: To bring professionalism amongst the students and promote holistic development.

PEO5: To involve students in sustainable IT practices and community services.

5. PROGRAMME OUTCOMES (PO)

PO1: Computational Knowledge: Apply knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.

PO2: Problem Analysis: Apply fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem.

PO3: Design/Development of Solutions: Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.

PO4: Conduct researching in Information Systems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Use of modern tools for delivering milestones like problem analysis, design, development, testing and deployment.

PO6: Professional Ethics: Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.

PO7: Lifelong Learning: Acknowledge the need for continuous professional development and practice it through self-motivated, independent learning.

PO8: Management Domain: Involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.

PO9: Communication Efficacy: Demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.

PO10: Innovation and Entrepreneurship: Provide conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.

6. ELIGIBILITY FOR ADMISSION TO THIS PROGRAMME:

Admission to the programme is open to any candidate (Graduate) of any recognized University satisfying the following conditions.

1. Passed BCA/ Bachelor Degree in Computer Science or Engineering or equivalent Degree.
OR Passed B.Sc. / B.Com. / B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University).
2. Obtained at least 50% marks (45% marks in case of candidates belonging to SC/ST category) in the qualifying Examination.

7. DURATION OF THE PROGRAMME

The duration of this programme is two years divided in to four semesters. The medium of instruction and examination will be only in English.

8. SCHEME OF EXAMINATION:

For some courses, there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 60 marks and IA will be conducted for 40 marks. Then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment (CA), the respective institutes will evaluate the students in varieties of ways during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

9. STANDARD OF PASSING:

For all courses, both UE and IA constitute separate Heads of Passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the Heads of Passing to secure the GPA required for passing.

The 10 point Grades and Grade Points are according to the following table:

Range of Marks (%)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

10. AWARD OF HONOURS:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.5 ≤ CGPA ≤ 10	O	Outstanding	80 ≤ Marks ≤ 100
9.0 ≤ CGPA ≤ 9.49	A+	Excellent	70 ≤ Marks < 80
8.0 ≤ CGPA ≤ 8.99	A	Very Good	60 ≤ Marks < 70
7.0 ≤ CGPA ≤ 7.99	B+	Good	55 ≤ Marks < 60
6.0 ≤ CGPA ≤ 6.99	B	Average	50 ≤ Marks < 55
5.0 ≤ CGPA ≤ 5.99	C	Satisfactory	40 ≤ Marks < 50
CGPA below 5.0	F	Fail	Marks below 40

SEMESTER WISE COURSE STRUCTURE

	Semester I	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
101	Applied Database Management Systems	4	3	1	-	40	60
102	Computer Networks	4	3	1	-	40	60
103	Java Programming	4	3	1	-	40	60
104	Computational Statistics	4	3	1	-	40	60
105	Management Concepts and Applications	4	3	1	-	40	60
106	Lab on Applied Database Management Systems	3	1	0	4	40	60
107	Lab on Java Programming	3	0	0	6	40	60
108	MOOCS Based General Course 1 (Soft Sills) (GE-1)	2	0	-	-	50	00
		28	16	05	10	330	420

	Semester II	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
201	Object Oriented Software Engineering	4	3	1	-	40	60
202	Cloud Computing Concepts	4	3	1	-	40	60
203	Data structures using Python	4	3	1	-	40	60
204	Data Warehousing and Data Mining	4	3	1	-	40	60
205	Web Supporting Technologies	4	2	1	4	40	60
206	Lab on Data Structures using Python	3	0	0	6	40	60
207	Minor Project – 1	3	3	-	-	00	100
208	MOOCS Based General Course 2 (GE-2)	2	0	-	-	50	00
		28	17	05	10	290	460

	Semester III	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
301	Software Design Patterns	4	3	1	-	40	60
302	Artificial Intelligence	4	3	1	-	40	60
303	Information Security	4	3	1	-	40	60
304	EL-GRP-1 (A)	3	2	1	-	100	-
305	EL-GRP-2 (A)	3	2	1	-	100	-
306	Lab on Software Testing	3	1	0	4	40	60
307	Minor Project – 2	3	3	-	-	00	100
308	MOOCS Based General Course 3 (GE-3)	2	0	-	-	50	00
		26	17	05	04	410	340

	Semester IV	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
401	Seminar on Recent Trends in IT [#]	4	-	-	-		100
402	EI-GRP - 1 (B)	3	2	1	-	100	-
403	EI-GRP –2 (B)	3	2	1	-	100	-
404	Major Internship Project	10	-	-	-	-	100
		20	04	02	-	200	200

List of Elective Groups:

Elective Code	Elective Group	Subject Code	Subjects
01	Cloud Computing	A	Virtualization
		B	AWS
02	Data Science	A	Statistical Programming in R
		B	Introduction to Data Science
03	Linux	A	Linux Desktop Environment, Shell Programming and System Administration
		B	Linux Internals and Network Administration
04	Open Source Technologies	A	Perl Scripting
		B	Ruby
05	Mobile Computing	A	Java Script
		B	Android
06	Dot Net Technologies	A	C# Programming and Applications
		B	ASP Dot Net with MVC
07	Net Centric Technologies	A	HTML 5
		B	AJAX Programming
08	Information Systems	A	Recommender System
		B	Knowledge Management
09	IOT	A	IoT Architecture Sensors and Fundamentals with Hands-on lab
		B	Internet Of Things: Sensing And Actuator Devices and Smart city use case
10	Big Data	A	Introduction to Big Data
		B	Business Intelligence Tools With Hadoop
11	Cyber Security	A	Introduction to Information Security
		B	Information Security Threats and Mitigation Strategies

Practical Examinations:

For courses 106, 107, 205, 206 and 306, University Practical Examination will be held and marks will be reported to the University.

MOOC'S based General Course (108, 208, 308):

Students will complete MOOCS course prescribed by institute from NPTEL / Swayam in respective semesters and will be evaluated at institute level based on the assignments submitted by the students and the institute level exam on that subjects. The respective institute will report the marks obtained by students in these courses at the end of the semester.

Project Guidelines:**Minor Project I (207) and Minor Project II (307)**

Students are expected to choose a problem which will provide software solutions. The project should be based on the courses learnt by the student in previous semester. The projects can be completed as individual project or if the scope of the project is comprehensive then project can be divided into modules by the project guide and a group of student can work on it. The number of students in the group can be decided by project guide and it should not be less than 2 and more than 4. Every student or group must have meeting about progress of project with their project guide regularly as specified in time table or if required at a communicated by guide.

The project dissertation/document is expected to be created and it should have the following contents.

- a. SRS – Problem Statement, BRD- Business Requirement Document
- b. General Requirement
- c. Requirement as per user Role
- d. System design (RED/Class Diagrams, DFD/Activity diagrams)
- e. User screen design and client side validation
- f. Database Design
- g. User interface design /user manual
- h. Test cases
- i. Scope and limitation
- j. Conclusion
- k. Bibliography

Major Internship Project (404)

The student is expected to get exposure of industry through 'Major Internship Project'. Guidelines about project are as bellow.

1. Every project will be evaluated by University appointed panel of examiners at the end of the semester.
2. Student must report about the progress of project to the internal project guide regularly as specified in time table or if required at a time given by guide.

Seminar on Recent Trends in IT: (401)

Student will select any topic of interest and study it thoroughly throughout the semester. At the end of the semester, student will give a presentation on the topic before the panel appointed by the University and submit the seminar report.

Bridge Course:

This course of 30 hours duration is designed and compulsory for the students from Non-IT background. The course can be conducted concurrently with semester I courses . The evaluation of this course will be at institute level for 100 marks. The student must score minimum 40 marks to pass in this course. There will be no credits assigned to this Bridge Course. A separate course work completion certificate will be issued to students.

Subject Name	Course Work
No. of Credits	00
Pre Requisite	Basic Mathematics and MSCIT course
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Basic formula for finding areas, volumes, graphical representation of data is to be remembered.
Understanding	The calculations by using formulas, algorithm ,C program structure are to be understood
Applying	Application of basic knowledge of mathematics and computers is to be applied for calculations and for writing programming codes.
Analyzing	Programs which are to be written are analysed and put in a particular format such as graphs, trees for effective working
Evaluating	New programs or problems are to be evaluated through algorithms,logic
Creating	Creating proper program logic so as to reduce lines of codes is expected .
Syllabus	
	Unit 1: (4 Hours) Algorithm ,flow charts, integers, division, relations, relations and their types, representation of relation in computer memory, number conversion systems.

	<p>Unit 2: (4 Hours) Set theory, predicate logic, Graph terminologies, types of graphs , representation of graph in computers, Paths, Euler and Hamilton graphs, graph colorings.</p>
	<p>Unit 3 : (3 Hours) Trees ,applications of trees, tree traversal algorithms, minimum spanning trees</p>
	<p>Unit 4 : (5 Hours) Fundamentals of C programming, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Declaration of variables as constant, Operators, Types of operators, Input and Output functions - printf(), scanf(), getchar(), putchar(), Formatted input and formatted output.</p>
	<p>Unit 5: (7 Hours) Control Statements- Sequential, Selection, Iteration Statements, Branching structure- if statement, if-else statement, Nested if-else statement, else if Ladder, Conditional operator, switch statement, Loop control structures- while loop, do-while loop, for loop, Nested for loop, Jump statements-break, continue, goto statements.</p>
	<p>Unit 6: (5 Hours) Function call, return statement, Function parameters, Types of functions, Arrays and functions</p>
	<p>Unit 7: (2 Hours) Introduction to OOP concepts.</p>
Text Books	<p>1.Discrete Structures by Kenneth Rosen 2.C programming by Yashwant Kanetkar 3.Object Oriented Programming by Balguruswamy</p>
Reference Books	<p>C Programming language by Brain W. Kernighan</p>

SEMESTER I

Subject Name	101 Applied Database Management Systems
No. of Credits	4 Credits
Pre Requisite	Basics of Computing and Data Storage
Course Objectives	<ul style="list-style-type: none"> • To teach the fundamentals of the database systems at a master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases. • To impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	<ul style="list-style-type: none"> • Remember the definitions of concepts
Understanding	<ul style="list-style-type: none"> • Understand the concept of database and techniques for its management • Understand data security standards and methods. • Understand the fundamentals of Distributed Database Systems
Applying	<ul style="list-style-type: none"> • Design different data models at conceptual and logical level and translate ER Diagrams to Relational Data Model. • Normalize the database.
Analyzing	<ul style="list-style-type: none"> • Identify and study the file organization schemes for DBMS. • State and Describe features for Concurrency and Recovery.
Evaluating	<ul style="list-style-type: none"> • Convert the relational algebra statements to the SQL statements.
Creating	<ul style="list-style-type: none"> • Write queries using Relational Algebra
Syllabus	<p>Unit 1. Introduction to DBMS (5 Hours) Difference between Data, Information, Data Processing & Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS, Data Independence. Database users, Types of Database System. Database Languages, DBMS interfaces.</p>
	<p>Unit 2. Data Modeling in Database (7 Hours) Data Models, Logical Data Modeling : Hierarchical Data Model, Network Data Model, Relational Data Model. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Relationship set, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial, Strong and Weak Entity Set.The extended entity relationship (EER) model, Subclass, Superclass, generalization, specialization, Attribute Inheritance. Relational Data Model : Codd's Rules for RDBMS, Translating ER Diagram to Relational Database.</p>
	<p>Unit 3.Normalization and Relational Algebra: (7 Hours)</p>

	<p>Normalization: Normalization Vs De-Normalization, Decomposition, Lossy and Lossless Decomposition, Functional Dependencies, Normal forms 1NF, 2NF, 3NF, BCNF, Case Studies on Normalization.</p> <p>Relational Algebra: Keys: Composite, Candidate, Primary, Secondary, Foreign, Relational Algebra Operators: Select, Project, Divide, Rename. Set Operations: Union, Intersect, Difference, And Product, Joins: Outer Joins, Inner Joins with example.</p>
	<p>Unit 4. File Structures and Data Administration: (6 Hours) File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing.</p>
	<p>Unit 5. Concurrency Control And Recovery Techniques: (7 Hours) Concurrency Control: Single User and Multiuser systems, Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, Need for Concurrency control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs, Starvation</p> <p>Recovery Techniques: Database Recovery, Types of Failures, Storage Structure: Volatile, Non Volatile and stable storage, Data access. Recovery and atomicity, Recovery Techniques / Algorithms: Log Based Recovery, Check points, Shadow Paging.</p>
	<p>Unit 6. Data Administration And Security: (7 Hours) Data administration, Role and Responsibility of DBA, Creating/Deleting/Updating table space, Database Monitoring, User Management. Basic data security principles – user privileges, data masking, encryption and decryption. Data Security Implementation, revalidation of user, role, privileges. Data Quality Management, Basic quality principles, data quality audit, data quality improvement</p>
	<p>Unit 7. Introduction to Distributed Database, NOSQL and MongoDB (6 Hours) Heterogeneous and Homogeneous Databases, Distributed database features and needs, Advantages and Disadvantages, Distributed Database Architecture. Levels of distribution, transparency, replication. Fragmentation.</p> <ul style="list-style-type: none"> • Introduction to NoSQL – Architecture, Sharding , Replica sets • NoSQL Assumptions and the CAP Theorem

	<ul style="list-style-type: none"> • Strengths and weaknesses of NoSQL • MongoDB Functionality Examples
Text Books	1. "Database System and Concepts" A Silberschatz, H Korth, S Sudarshan, published by McGraw-Hill.
Reference Books	<ol style="list-style-type: none"> 2. "Fundamentals of Database Systems" Global Edition By Ramez Elmasri, Shamkant B. Navathe 3. "Practical MongoDB" by Shakuntala Gupta Edward, Navin Sabharwal published by APress.
Suggested MOOC	Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com , www.coursera.com

Subject Name	102. Computer Networks
No. of Credits	4 Credits
Pre Requisite	Knowledge about hardware , network devices and data communication concepts
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of Computer Hardware and Network terminology for development of basic networks in the organization.
Understanding	By remembering students the basic concepts students will understand the concepts of Network topology, network operating systems and how the networks are developed ad per the need of the organization
Applying	Students will Have thorough knowledge about Computer Network and its use for the Information Sharing, device sharing and use of various new network technologies.
Analyzing	Students will acquire a good knowledge of the computer network, its architecture and operation. Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters). Students will be able to follow trends of computer networks. So, students will get exposure to advanced network technologies like MANET, WSN, and 4G.
Evaluating	Ability to select proper method to design the network systems, selecting the proper tool to design the network protects the network from misuse.
Creating	Design and create their own procedure to protect the computer network and use the sharing proper resources.
Syllabus	Unit 1: Introduction to Computer Networks (6 Hours) Basic concepts of computer hardware and network terminology, What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, Network software in brief: Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, Network Models: The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model, A critique of OSI Model, A critique of TCP/IP Model, Examples of some networks: Internet, X.25, ISDN, Frame relay, ATM, Ethernet, Wireless LANs- (wi-fi)
	Unit 2: Data Transmission and Physical Layer: (7 Hours) Signals: Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum Transmission Media& its Characteristics: Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing: FDM, WDM, TDM, Switching: Circuit, Message and Packet Switching.

	<p>Unit 3: Network Layer: (7 Hours) Network Layer Design Issues; Routing Algorithms: Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms: General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control, IP Addressing: IP-Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask.</p>
	<p>Unit 4: Transport and Application Support Protocols (7 Hours) Transport service, Service Primitives, Internet, and Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, Session Layer: Token Concept Presentation Layer: Data Encryption and Data Security, Message Authentication,</p>
	<p>Unit 5 : Advance Networks: (7 Hours) Concept of 4G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, Mobile Ad-hoc Networks: Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, Wireless Sensor Networks: Sensor networks overview: Introduction, applications, design issues, requirements.</p>
	<p>Unit 6: Internet Basics (7 Hours) Concept and Characteristics of Internet , Intranet, Extranet . Structure of Internet through Client Sever . Domain name , Website Development formats for Business Applications. Practical Application on: Domain Name Service, Telnet, FTP, SMTP, SNMP, MIME, POP, IMAP, WWW,HTTP, TCP/IP, LAN, WAN Some basic Operations and commands.</p>
	<p>Unit 7 : Mobile Network - (7 Hours) Mobile Telephone Systems: various generations mobile technology , Smart Mobile facilities and Apps on Mobile . Sub netting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6</p>
Text Books	<p>1.A.S. Tanenbaum, Computer Networks (4th ed.), Prentice-Hall of India, Latest Edition 2.W.Behrouz Forouzan and S.C. Fegan, Data Communication and Networking, McGraw Hill, Latest Edition 3. William Stalling “Data and Computer Communication”</p>
Reference Books	<ol style="list-style-type: none"> 1. Network Essential Notes GSW MCSE Study Notes 2. Internetworking Technology Handbook CISCO System 3. Introduction to Networking and Data Communications Eugene Blanchard 4. Computer Networks and Internets with Internet Applications Douglas E. Comer. 5. Computer Network in Brief : - http://www.nripesheschool.com 6. Jyoti Biradar (Patil),Anil Gaikwad “Software Project Management -Made Easy” Lambert Academic Publishing House

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MOOC on NPTEL	https://nptel.ac.in/courses , http://www.freetechbooks.com/computer network , In house on www.bharativedyapeeth.edu , Computer Network in Brief : - http://www.nripesheschool.com/

Subject Name	103. Java Programming
No. of Credits	4 Credits
Pre Requisite	Any programming Language and Concepts of OOP
Cognitive Abilities	At the end of this course, student should be able to <ul style="list-style-type: none"> • Design interfaces, abstract and concrete classes needed, given a problem specification • Implement classes designed using object oriented programming language • Make them comfort to muse Java API for Input/output and Java Collections and utility classes • Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming
Remembering	<ul style="list-style-type: none"> ▪ Java language Data Types, control structures, OOP concepts, ▪ Java API to handle numbers, strings ▪ Get knowledge about core Java API (Wrapper classes; String classes, Math class) ▪ Java API hierarchy for Input/output, collections and concurrent programming
Understanding	<ul style="list-style-type: none"> ▪ Understanding how to write, compile and run a Java program. ▪ Structure of class and using Inheritance among them. ▪ How to create Arrays. ▪ Come to know need of inheritance, abstract class and interface and how to use them ▪ Get knowledge about core Java API, API hierarchy for Input/output, collections and concurrent programming
Applying	<ul style="list-style-type: none"> ▪ Design classes and interfaces for given problem statement by making use of OOP concepts. ▪ Using proper I/O classes and Collections classes for given problem statement.
Analyzing	<ul style="list-style-type: none"> ▪ Analyze a given problem statement to identify classes and relationships among them and making use of Java API efficiently.
Evaluating	<ul style="list-style-type: none"> ▪ Given a problem statement; students should able to decide/ best mechanism of class design using is_a or has_a relationships. ▪ Read/listen a problem statement and able to decide which I/O classes to be used. ▪ Able to debate about when make to use of threads and which collection implementation should be used.
Creating	Writing Java Applications with use of classes, interfaces and taking advantages of polymorphism.
Syllabus	

	<p>Unit 1:Introduction to Java (9 Hours) Java Basics: Features of Java, History of Java, Installations of JDK and eclipse as IDE Writing and executing first Java program. Understanding role Java compiler, JVM, Understanding how Java is platform independent and secure. Java data types, variables, operators, expressions, type conversion and casting in Java. Control structures in java: if, if-else and switch statements, using iterative/looping statements in Java: while, do-while and for. Writing functions: Need of functions/methods, Writing and using static method; concepts of passing values and returning</p>
	<p>Unit 2: Class and Object Concepts: (7 Hours) Introduction to Object Oriented concepts, Defining a class, creating objects from class, adding attributes and methods to the class, using constructors, Java naming conventions for class, properties and methods/functions. Passing values to the functions – pass by value, pass by reference, Function overloading. Modifiers – public, private, protected, default, static, final Understanding use of Wrapper classes and Garbage collection in Java</p>
	<p>Unit 3: Arrays and Strings (6 Hours) One dimensional arrays, Multidimensional arrays, exploring String class and methods, String Buffer class. Packages - creating and accessing a package, importing, packages, creating user defined packages, Concept of package. Introduction to Exception Handling and user defined exceptions.</p>
	<p>Unit 4: Inheritance and Polymorphism(6 Hours) Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Overriding methods with throws clause. Using abstract and final keywords with class declaration, Concept of interface, Comparison of Interface and class. Access modifiers and data accessibility in derived classes, method access modifier and method overriding.</p>
	<p>Unit 5 :Concurrent Programming (7 Hours) Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods .</p>
	<p>Unit 6: Java Input/Output (7 Hours) Concept of streams, types of streams – byte streams, character streams, The Console: System.out, System.in, and System.err Understanding File class, InputStream class, OutputStream class, FileInputStreams, FileOutputStream, Using character oriented Reader and Writer class, FileReader, FileWriter.</p>

	<p>Introduction to Buffered streams – DataInput and DataOutput Streams using BufferedReader, BufferedWriter.</p> <p>Making use of Object Streams for Serialization and deserialization</p>
	<p>Unit 7:Java Collections and Utility Classes (8 Hours)</p> <p>Introductions to generics: generic types and methods</p> <p>Collection Basics- A Collection Hierarchy, Using ArrayList and Vector, LinkedList, making use of Iterator to access collection elements.</p> <p>Set: HashSet, LinkedHashSet, TreeSet , Role of Comparable and Comparator interfaces,</p> <p>Introduction Map: Hashmap, HashTable, TreeMap, LinkedHashMap</p> <p>Understanding bounded types, erasures.</p>
Text Books	Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media;
Reference Books	<ol style="list-style-type: none"> 1. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007 2. Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008 3. Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition

Subject Name	104 Computational Statistics
No. of Credits	4 Credits
Pre Requisite	
Course Objectives	<ul style="list-style-type: none"> • To build a strong foundation for students to become a proficient in all Statistics concepts and their Application. It is necessary to become a Data science Professional. • To provide a conducive environment for understanding, implementing and Prediction on various Historical data. • To keep the students and faculty abreast with the emerging technologies in the field of computer applications. • To bring professionalism amongst the students and promote holistic development.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	<ul style="list-style-type: none"> • Remember the definitions of concepts
Understanding	<ul style="list-style-type: none"> • Understand the concept of Statistics and their methods for its Data Analytics • Understand data engineering and standards and methods. • Understand the fundamentals of statistics and their Application
Applying	<ul style="list-style-type: none"> • Data engineering and their concept
Analyzing	<ul style="list-style-type: none"> • Identify and study the data for analytics purpose. • State and Describe features for Analytics
Evaluating	<ul style="list-style-type: none"> • Future Prediction for historical data
Creating	<ul style="list-style-type: none"> • Write programming of R for Data Analysis
Syllabus	
	<p>Unit 1. Introduction to Statistics (4 Hours): Meaning of Statistics as a Science, Importance of Statistics Scope of Statistics, Types of data: Primary data, Secondary data, Cross-sectional data, time series data, directional data, classification data and its classification, ungrouped frequency distribution,, grouped frequency distribution, cumulative frequency distribution, and relative frequency distribution.</p>
	<p>Unit 2. Measures of Central Tendency (15 Hours): Concept of central tendency of statistical data, Statistical averages, characteristics of a good statistical average. Arithmetic Mean (A.M.): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean. Mode and Median: Definition, formulae (for ungrouped and grouped data), merits and demerits, Quartiles, Deciles and Percentiles (for ungrouped and grouped data), Geometric Mean (G.M.): Definition, formula, merits and demerits. Harmonic Mean (H.M.): Definition. Formula, merits and demerits. mean Weighted Mean: weighted A.M., G.M. and H.M. Measures of Dispersion :Concept of dispersion, characteristics of good measure of dispersion.</p>

	<p>Range, Quartile deviation Mean deviation: Definition, merits and demerits, Variance and standard deviation</p>
	<p>Unit 3. Moments, Skewness and Kurtosis (6 Hours) : Concept of Raw and central moments, Formulae for ungrouped and grouped data (only first four moments), relation between central and raw moments upto fourth order. (without proof) , Measures of Skewness, Types of skewness, Pearson's and Bowley's coefficient of skewness, Measure of skewness based on moments, Measure of Kurtosis: Types of kurtosis, Measure of kurtosis based on moments</p>
	<p>Unit 4. Correlation (5 Hours): Bivariate data, Scatter diagram and interpretation, Concept of correlation between two variables, positive correlation, negative correlation, no correlation. variance between two variables , Karl Pearson's coefficient of correlation (r) , Spearman's rank correlation coefficient, compute Karl Pearson's correlation coefficient between ranks</p>
	<p>Unit 5. Regression (5 Hours) Meaning of regression, difference between correlation and regression, Concept of error in regression, error modeled as a continuous random variable. Simple linear regression model Estimation of a, b by the method of least squares. Interpretation of parameters.</p>
	<p>Unit 6. Time Series(5 Hours) Meaning and utility , Components of time series , Additive and multiplicative models , Methods of estimating trend : moving average method, least squares method and exponential smoothing method(with graph and interpretation)</p>
	<p>Unit 7. Introduction to R Programming(15 Hours) Concept of R, Installation of R, Data Types , Vector, List, Frame, Array, Matrix, Statistics Commands, Base graphics, Data manipulation with data table ,concept of cluster, Concept of Prediction Model ,Analysis of Real world Problem</p>
Text Books	
Reference Books	<p>1.Fundamental of Statistics by S.C.Gupta 2. Freedman, David, Robert Pisani, & Roger Pervis(2007).<i>Statistics</i>.New York: W. W. Norton. 3.James, Gareth, Daniela Witten, Trevor Hastie, & Robert Tibshirani(2013).<i>An Introduction to Statistical Learning: With Applications in R</i>. New York: Springer. Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com</p>

Subject Name	105. Management Concepts and Applications
No. of Credits	4 Credits
Pre Requisite	General awareness about the organization and atomization used
Remembering	Students are expected to recalling day to day management concepts that are unknowingly applied in real life situations
Understanding	Gathering information about management, its origin and the contributions of some of the management gurus is achieved.
Applying	Students will learn implementation of management functions in real life cases so as to justify decision being taken and through ERPs availability
Analyzing	Students will learn fact finding in a situation using the objectives of each functions' achievement and its effective utilization in e commerce environment
Evaluating	Generating or creating the ability amongst the students in fact finding techniques and evaluating the actual performance with the planned.
Creating	Students are expected to capture the new cases in real life situation and create a solution in the form of model so as to resolve the problem such as ERPs
Syllabus	<p>Unit 1: Management: (9 Hours) Definition and Meaning ,Nature and purpose ,Evolution of Management thoughts, Contributions of F.W Taylor ,Contributions of Henry Fayol, Human relations approach, System approach to management, Skills and Functions of a manager</p> <p>Unit 2: Planning (9 Hours) Definition and Importance ,Types of Plans, Types of Planning , Steps in Planning ,Limitations of Planning ,Planning Premises, Management by Objectives (MBO):Concept, Objective setting Process, Benefits and Weaknesses, concept of software project planning</p> <p>Unit 3 : Organization (9 Hours) Definition ,nature of organizing, importance , process of organizing ,organization chart ,structure of IT organization , New Organisational Designs – Project, Matrix, Organic Structure & Mechanistic Structure Challenge of Modern Organisation, Virtual Organisation,Case study</p> <p>Unit 4 : Staffing (8 Hours) Nature & Significance, A brief knowledge of Recruitment, Selection, Training & Development, Performance Appraisal in IT organisation. Case study (8)</p> <p>Unit 5: Directing and Controlling: (15 Hours) Nature, Concept of Leadership, Leadership Styles, Theories of Leadership, Charismatic Leadership Theory, Role of Software Team Leader, case study , Concept and Importance of Control, Control Process, Types of Control Mechanism, Responsibility and authority , Management by Exceptions, case study.</p> <p>Unit 6:Decision making (6 Hours) Decision making and its process, Decision making conditions , need of computer based decision making , decision support system, expert</p>

	system.
	<p>Unit 7 :Introduction to E-commerce (6 Hours) E commerce types,E commerce spread in recent years ,E commerce importance ,Security measures under E commerce, introduction to Enterprise Resource Planning (ERP) ,ERP advantages, Introduction to SAP</p>
Text Books	<p>1.Principles of Management by L M Prasad, Sultan Chand Publications 2.E – Commerce: Strategy, Technologies and Applications” by David Whiteley</p>
Reference Books	<p>1. Principles of management by T Ramaswamy , Himalaya Publications 2. Principals of Management by Tripathi and Ready, 3. New Era of Management by Richard Daft ,South Western Sangage Learning 4.Management Principles and Practices by Lallan Prasad and SS Gulshan. Publications :Excel Books India. 5.Decision Support System , Janaki Raman ,PHI publications</p>

Subject Name	106 Lab on Applied Database Management Systems
No. of Credits	3 Credits
Pre Requisite	Concept of Database Management Systems, Familiarity with data processing concepts and applications.
Course Objective	<ul style="list-style-type: none"> •To practice the application of the concepts related to database its techniques and Operations. •SQL (Structured Query Language) is introduced in this subject.This helps to create strong foundation for application of database design.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	<ul style="list-style-type: none"> • Make use of different operators as per the questions
Understanding	<ul style="list-style-type: none"> • Understand the theoretical and physical aspect of a relational database.
Applying	<ul style="list-style-type: none"> • Implementation of RDBMS concepts through Oracle.
Analyzing	<ul style="list-style-type: none"> • Observe the performance of the query with different data sets.
Evaluating	<ul style="list-style-type: none"> • Test the results obtained from the different queries, PL/SQL blocks, functions
Creating	<ul style="list-style-type: none"> • Construct Simple and complex queries on sample datasets • Writing PL/SQL blocks
Syllabus	<p>Unit 1 Introduction to Oracle and SQL: (8 Hours) History, Features, Versions of Oracle, Database Structure: Logical Structure and Physical Structure, Oracle Architecture: System Global Area Processes: Server Processes, Background Processes, Tools of Oracle: SQL * Plus, PL/SQL, Forms, Reports, Pre Compilers:SQL Loader, Import, Export.</p> <p>Introduction to SQL : Keywords, Delimiters, Literals, Data Types, Components of SQL: DDL Commands– Defining a database in SQL, Creating table, changing table definition, removing table, Creating Tables with constraints on row level and column level, primary key, foreign key, check. Altering Constraints. DML Commands- Inserting, updating, deleting data, DQL Commands: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table, Creating table from a table, Inserting data from other table, Table alias, and Column alias. DCL commands- Granting and Revoking Permissions</p>
	<p>Unit 2 Operators and Functions: (5 Hours) Operators:Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect, Grouping data. Functions : Aggregate Functions, Numeric Functions, String Functions, Date Functions, Conversion Functions, Miscellaneous Sub queries Joins:Relating data through join concept. Simple join, equi join, non equi join, Self join, Outer join</p>

	<p>Unit 3 Database Objects: (5 Hours) Views:Introduction, Creating a View, Selecting data from a view, Updateable views, Views on multiple tables, Destroying a View. Sequences:Introduction, Creating a Sequence, Altering a Sequence, Referencing a Sequence, Dropping a Sequence. Index:Introduction, Creating Index, Simple Index, Unique Index, Reverse Key Index, Dropping Index.</p>
	<p>Unit 4 Introduction To PL/SQL: (5 Hours) Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, PL/SQL Block: Attributes %type, %rowtype, Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement, Commit, Rollback, Savepoint</p>
	<p>Unit 5 : Cursor Management and Triggers: (5 Hours) Cursor:Explicit & Implicit Cursor, Declaring Cursor Variables, Constrained & Unconstrained Cursor Variables, Opening Cursor, Fetching Cursor into Variables, Closing Cursor, Cursor For Loops, Parametric Cursors. Triggers:Definition, Syntax, Parts of triggers: statement, body, restricted, Types of triggers: Enabling & disabling triggers.</p>
	<p>Unit 6 : Stored Procedures / Functions and Exception Handling: (5 Hours) Introduction, How oracle executes procedures/ functions, Advantages, How to create Procedures & Functions, Examples. Error Handling in PL/SQL: Exception Handling & Oracle Engine, Oracles Named Exception Handlers, User Named Exception Handlers.</p>
	<p>Unit 7 : MongoDB (7 Hours) Installation of MongoDB, Checking Shell, Creating Users and Enabling Authorization, Basic Querying Using Shell, sorting, indexing – single indexing and compound indexing, Using Conditional Operators in queries</p>
Text Books	<p>References (Books, Websites etc.): 1. Ivan Bayross SQL, PL/SQL The Programming Language of Oracle 3rd Revised Edition BPB Publications 2. “Practical MongoDB” by Shakuntala Gupta Edward, Navin Sabharwal by A Press.</p>
Reference Books	<p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayamwww. edx.com ; www.coursera.com</p>

Subject Name	107. Java Programming
No. of Credits	3 Credits
Pre Requisite	Any programming Language and Concepts of OOP
Cognitive Abilities	At the end of this course, student should be able to <ul style="list-style-type: none"> • Design interfaces, abstract and concrete classes needed, given a problem specification • Implement classes designed using object oriented programming language • Make them comfort to muse Java API for Input/output and Java Collections and utility classes • Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming
Remembering	<ul style="list-style-type: none"> ▪ Java language Data Types, control structures, OOP concepts, ▪ Java API to handle numbers, strings ▪ Get knowledge about core Java API (Wrapper classes; String classes, Math class) ▪ Java API hierarchy for Input/output, collections and concurrent programming
Understanding	<ul style="list-style-type: none"> ▪ Understanding how to write, compile and run a Java program. ▪ Structure of class and using Inheritance among them. ▪ How to create Arrays. ▪ Come to know need of inheritance, abstract class and interface and how to use them ▪ Get knowledge about core Java API, API hierarchy for Input/output, collections and concurrent programming
Applying	<ul style="list-style-type: none"> ▪ Design classes and interfaces for given problem statement by making use of OOP concepts. ▪ Using proper I/O classes and Collections classes for given problem statement.
Analyzing	<ul style="list-style-type: none"> ▪ Analyze a given problem statement to identify classes and relationships among them and making use of Java API efficiently.
Evaluating	<ul style="list-style-type: none"> ▪ Given a problem statement; students should able to decide/ best mechanism of class design using is_a or has_a relationships. ▪ Read/listen a problem statement and able to decide which I/O classes to be used. ▪ Able to debate about when make to use of threads and which collection implementation should be used.
Creating	Writing Java Applications with use of classes, interfaces and taking advantages of polymorphism.
Syllabus	
	Programming Exercises

1	<p>Introduction to Java</p> <p>Writing, compiling and Executing Java programs using basic language constructs as bellow</p> <ul style="list-style-type: none"> - Using Operators : arithmetic, relational, logical and bitwise - Control structures (if, if-else, switch) - Iterative statements (while, do-while, for)
2	<p>Class and Object Concepts</p> <ul style="list-style-type: none"> - Wring a class, creating objects and using it - Using constructors to initialize object - Programs to demonstrate parameter passing - Making use of access modifiers
3	<p>Arrays and Strings</p> <ul style="list-style-type: none"> - Programs to work with single dimensional and multidimensional arrays - Searching and sorting - Programming with string and operations on it - Programs to understand and study string literal pool
4	<p>Inheritance and Polymorphism</p> <ul style="list-style-type: none"> - Defining classes as generic types ; using it to write new class/classes - Need and example of method overriding - Writing abstract class and interface - Using abstract classes to write concrete classes - Using interface as base type to write new interface and implementing it to write new concrete class/classes - Anonymous and inner classes
5	<p>Concurrent Programming</p> <ul style="list-style-type: none"> - Designing and using Thread class and Runnable interface - Thread synchronization - Program to demonstrate Thread priorities, thread join and making use of yield - Programs with classes making use of thread and inter communication between them.
6	<p>Java Input/Output</p> <ul style="list-style-type: none"> - Programs to make using InputStream and OutputStream classes. - Reading and Writing data into files - Making use to console to read data. - Using readers and writers to write data into Files - Making use of Buffered Streams and reader and writer - Programs to take advantages of serialization
7	<p>Java Collections and Utility Classes</p> <ul style="list-style-type: none"> - Programs to make use collections (ArrayList, Vector, Set and Maps) - Writing user defined generic data types types - Programs to illustrate bounded types and erasures

SEMESTER II

Subject Name	201. Object Oriented Software Engineering
No. of Credits	4 Credits
Pre Requisite	Programming skills, Database Concepts.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Should be able to remember various steps carried out in development of software.
Understanding	Should be able to understand requirements of the user.
Applying	Should be able to apply object oriented concepts and UML diagrams to the defined problem.
Analyzing	Should be able to analyze requirements of the user and convert to functionalities of the software.
Evaluating	Should be able to Evaluate design of the existing software.
Creating	Should be able to de Design their own software.
Syllabus	<p>Unit 1 .Software and Software Engineering (5 Hours) The nature of software, Software Engineering Concept, SDLC, Process Models: Waterfall Model, V Model, Prototyping Model, Spiral Model, RAD (Rapid Action Development) Model</p>
	<p>Unit 2 .Object Oriented Concepts, Modeling and UML(5 Hours) 2.1 What is Object Orientation? (Introduction to class, object, inheritance, polymorphism) 2.2 Modeling 2.2.1 Introduction of Modeling 2.2.2 Object Oriented Modeling 2.3 UML (Unified Modelling Language) 2.3.1 History of UML 2.3.2 UML Diagrams 2.4 Iterative Development with RUP and Phases of RUP</p>
	<p>Unit 3 : Requirement Understanding and Requirement Modelling with Use Case Diagram (5 Hours) 3.1 Requirement Engineering 3.2 Requirement Elicitation 3.3 Developing Use Cases 3.4 Use Case Diagram 3.4.1 Realization of Use Cases 3.4.2 Finding Actors 3.4.3 Defining Relations among Use case 3.4.4 Writing Use Cases 3.5 Activity Diagram</p>
	<p>Unit 4 : Basic and Advanced Structural Modeling (10 Hours) 4.1 Class Diagram 4.1.1 Identifying the elements of an object model</p>

	<ul style="list-style-type: none"> 4.1.1 Identifying classes and objects 4.1.2 Specifying the attributes 4.1.3 Defining operations 4.1.4 Finalizing the object definition 4.1.5 Advanced class Modelling 4.1.6 Interface, Types and Roles <p>4.2 State Chart Diagram</p> <p>4.3 Package Diagram</p> <p>4.4 Object Diagram</p>
	<p>Unit 5 : Interaction Modelling (5 Hours)</p> <ul style="list-style-type: none"> 5.1 Introduction to Interaction Diagrams 5.2 Need of Interaction Diagrams 5.3 Interaction Diagrams <ul style="list-style-type: none"> 5.3.1 Collaboration Diagram 5.3.2 Sequence Diagram
	<p>Unit 6 : Architectural Modeling (5 Hours)</p> <ul style="list-style-type: none"> 6.1 Component Diagram <ul style="list-style-type: none"> 6.1.1 Need of Component Diagram 6.1.2 Realization of Components 6.1.3 Relating Components 6.2 Deployment Diagram <ul style="list-style-type: none"> 6.2.1 Software Architecture 6.2.2 Architectural Styles 6.2.3 Representing Architecture using Deployment Diagram
	<p>Unit 7 : Case Studies (10 Hours)</p> <p>7.4 Discussion on following case Studies-</p> <ul style="list-style-type: none"> a. Library Management System b. Hospital Management System c. Online Shopping d. Nukari.com website e. Matrimonial website
Text Books	1. Software Engineering by Pressman Publisher BPB
Reference Books	<ul style="list-style-type: none"> 1. The Unified Modeling Language User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson. Publisher Addison-Wesley Professional 2. Object Oriented Software Engineering Use case driven approach by Ivar Jacobson Publisher Pearson 3. UML Distilled by Martin Fowler Publisher Addison-Wesley Professional 4. UML Toolkit 2 by Hans-Erik Eriksson Publisher Wiley.

Subject Name	202. Cloud Computing Concepts
No. of Credits	4 Credits
Pre Requisite	1. Knowledge of Web technologies 2. Knowledge of Web services and multimedia 3. Knowledge of DBMS
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	How to provide Flexible and scalable infrastructures
Understanding	Increased availability of high-performance applications to small/ medium-sized businesses
Applying	Reduces implementation and maintenance costs
Analyzing	The case studies will help us to understand more of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Syllabus	Unit 1: Cloud Computing Fundamentals: (10 Hours) Definition of Cloud Computing, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds
	Unit 2: Virtualization And Cloud Computing: (7 Hours) Role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications, Visualizing Virtualization, Managing Virtualization, Taking Virtualization into the Cloud
	Unit 3: Service Oriented Architecture And The Cloud : (7 Hours) Defining Service Oriented Architecture, Understanding the Coupling, Implementation of Service Oriented Architecture (SOA), Understanding Services in the Cloud, Serving the Business with SOA and Cloud Computing.
	Unit 4: Cloud Applications : (7 Hours) Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.
	Unit 5: Management Of Cloud Services: (7 Hours) Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)
	Unit 6: Application Development: (7 Hours)

	Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.
	Unit 7: Cloud It Model: (7 Hours) Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)
Text Books	<ol style="list-style-type: none"> 1. Cloud Computing: Principles and Pardigms by Rajkumar Buyya, james Broberg and Andrzej M.Gos cinski, Wiley, 2011. 2. Distributed & Cloud computing, Kai Hwang, Geoffery C.Fox,jack Elsevierm,2012 3. Cloud Computing implementation,management and security by John W.Rittinghouse,James E Ransome,CRC Press,Taylor & Francis group,2010 4. Cloud Computing a practical approach by Anthony T.Velte,Toby J.Velte Robert Elsenpeter,Tata Mc Graaw Hill edition,2010
Reference Books	<ol style="list-style-type: none"> 1. Cloud Application Architecture by George Reese,Oreilly publishers 2. Cloud computing and SOA convergence in your enterprise,by David S.Linthicum,Addison- Wesley

Subject Name	203. Data Structures and Algorithms using Python
No. of Credits	4 Credits
Pre Requisite	School Level Mathematics. It does not assume any prior knowledge of programming.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.
Understanding	Students will get acquainted built in data structures in python, understand features and programming constructs of python language. During this course, they will understand main control structures of procedural programming languages. understand the complexity of various algorithms
Applying	They will make of function to reduce problem into small modules, To familiarize with exceptions and mechanism to handle it , make use of python to read and write data into files, implement ADT for various user defined data structures, implement data structures like: Stack, Queue, Link List, Tree.
Analyzing	Compare efficiency of various data structures for solving a particular problem. Analyzing performance of a algorithm.
Evaluating	Ability to choose appropriate data structures for problem solving Ability to use combination of these data structures for problem solving. Evaluating the performance of various Algorithms and Data Structures.
Creating	Design and create their own data structure for solving a real life problem
Syllabus	<p>Unit 1: (6 Hours) Basics of Python: Python Installation, writing and executing first python script, using python editors to write and execute python scripts Identifiers and Operators: Writing get familiar with python variables and data types, variables and assignments, Operator understanding and its usage, Python Control structures in Python: Conditionals and Loops: if statement, else Statement, el-if Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, Working strings in python: String type, strings concatenations and comparing strings, using string functions</p>
	<p>Unit 2: (6 Hours) Working with functions and Built in data structures Functions: Writing a simple function and using it, functions and parameters, functions retuning values, functions and variable scope, Variable number of arguments, passing objects and collections in function, understanding recursive functions, writing and using recursive functions.</p>

	<p>Variable number of arguments to functions</p> <p>Python data Structures: List: Crating and using list and tuples. Operations on list and tuples, Special Features of Lists and tuples, introduction to List comprehensions Dictionaries: Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, Using Set data structure, Arrays</p>
	<p>Unit 3: (8 Hours) Handling Exceptions and File Input/Output : Need of exception Handling, Simple mechanism to handle exception, Using if exceptions to handle the code cracks, Using else clause while handling exceptions, Handling generic and specific exceptions, handling multiple exceptions, Raising exception, File Objects, creating a file object, reading File contents, Writing data into file, reading and writing CSV files, using with clause, Using Exception handling with file operations,</p>
	<p>Unit 4: (9 Hours) Introduction ADT : Writing a simple Class in Python, creating object of class, Instance Methods, Class Variables and special methods. Understanding ADT, Defining ADT using pseudo-code, Defining ADT for Date, Stack and Queue, Implementation of Date, Stack and Queue ADT. Concepts of circular and double ended queue. Applications of Stack and Queue.</p>
	<p>Unit 5: (8 Hours) Linked Lists: Defining List as ADT, Implementation of Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, The Positional List ADT, Sorting a Positional List, Link-Based vs Array-Based Sequences. Implementation of Stack and Queue using Link List. Applications of Linked List (polynomial Equations)</p>
	<p>Unit 6: (9 Hours) Trees: Concepts of tress and Binary Trees, Defining binary tree as ADT, Implementing Binary Trees, Tree Traversal Algorithms Search Trees: Binary Search Trees ,Balanced Search Trees ,Python Framework for Balancing Search Trees ,AVL Trees ,Splay Trees, Red-Black Trees Heaps, Maps, Hash Tables, and Skip Lists</p>
	<p>Unit 7: (9 Hours) Searching , Sorting and Analysis of Algorithms Need of searching, linear search, using binary search for efficient search. Need of sorting and various sorting algorithms: insertion sort, bubble</p>

	<p>sort, selection sort; Merge sort and quick sort algorithms. Python's Built-In Sorting Functions, Selection Algorithms.</p> <p>Analysis of Algorithms: Measuring Algorithm Efficiency, Asymptotic Analysis, The Big-O Notation, Find the complexity of Algorithms: Linear Search, Binary Search, Sorting Algorithms. Compare complexity of various searching and sorting Algorithms.</p>
Text Books	<p>Data Structures and Algorithms in Python Paperback – 2016 by Michael T. Goodrich (Author), Roberto Tamassia (Author), Michael H. Goldwasser (Author) WILEY PUBLICATION</p> <p>Data Structure and Algorithmic Thinking with Python Paperback – 2015 by NarasimhaKarumanchi (Author)</p>
Reference Books	<p>Problem Solving in Data Structures & Algorithms Using Python: Programming Interview Guide by Hemant Jain</p>
MOOC on NPTEL	<p>https://nptel.ac.in/courses/106/106/106106145/#</p>

Subject Name	204. Data Warehousing and Data Mining
No. of Credits	4 Credits
Pre Requisite	Thorough understanding of Relational database normalization techniques , Physical design of a database, Concepts of algorithm design and analysis, Basic understanding of: Software engineering principles and techniques, Probability and statistics
Course Objectives	This course will enable to expose the students to Study various design and implementation issues and techniques in data warehousing and data mining.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Remembering the fundamentals of Database technology and its application in data warehousing and data mining.
Creating	Creating multi dimensional data models using star, snowflake and fact constellation schemas.
Understanding	Understand the components, architecture and other important tools of data warehousing and data mining.
Applying	Apply the techniques of clustering, classification, association and other data mining algorithms to real world data.
Analyzing	Gather and analyze large sets of data to gain useful information using data mining techniques.
Evaluating	Producing and interpreting quantitative analysis using various data mining algorithms.
Syllabus	<p>Unit 1. Business Intelligence: (5 Hours) Business Environment and Computerized Decision Support, Managerial Decision Making, Computerized support for Decision Making, Decision Support System, Early Framework for Computerized Decision Support, Business Intelligence, Importance of BI, BI for Decision makers, The BI process, A framework for Business Intelligence.</p>
	<p>Unit 2: Data warehousing: (10 Hours) OLTP and OLAP Systems, Introduction to Data Warehouse, Differences between OLTP Systems and Data Warehouse, Characteristics of Data Warehouse; Advantages of Data Warehouse; Data Warehouse Users, Metadata, Classification of Metadata, and Importance of Metadata. Data Marts, Reasons for creating Data Marts, Building Data Marts: Top down Approach & Bottom up Approach, Data Warehouse Architecture, Two tier Architecture, Three Tier Architecture. Data Warehouse Schema, Star, Snow Flake & Fact Constellation Schema. OLAP Operations, OLAP Models.</p>
	<p>Unit 3. Data Preprocessing: (5 Hours) Need, Objectives and Techniques of data preprocessing. Descriptive Data Summarization: Measuring the Central Tendency, Measuring the Dispersion of Data, Graphic Displays of Basic Descriptive Data Summaries</p>

	<p>Data Cleaning: Handling of Missing values and Noisy Data, Data cleaning as a process</p> <p>Data Integration and Transformation: Data Integration: Schema integration, Controlling redundancies using correlation. Data Transformation: Smoothing, Aggregation, Generalization, Attribute construction, Normalization</p> <p>Data Reduction: Data Cube Aggregation; Attribute Subset Selection, Dimensionality Reduction, Numerosity Reduction, Discretization & Concept Hierarchy Generation for Numerical Data and for Categorical Data.</p>
	<p>Unit 4. Introduction Data Mining : (5 Hours) Evolution of database system technology, introduction to data mining, architecture of a typical data mining system, Types of data that can be mined, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.</p>
	<p>Unit 5: Mining Association Rules : (5 Hours) Introduction, Market Basket Analysis, Multi-Level and single level Mining, Mining Association Rules on Transactional database, Multi-Dimensional Association Rules From Relational Databases & Data Warehouses, From Association Mining To Correlation Analysis, Constraint Based Association Mining, Association Rule mining using Apriori Algorithm, and FP Growth algorithm. Generalized association rule.</p>
	<p>Unit 6: Classification & Prediction: (5 Hours) Introduction to Classification and Prediction; Basics of Supervised & Unsupervised Learning; Preparing the Data for Classification and Prediction; Comparing Classification and Prediction Methods, Classification by Decision Tree Induction, Tree Pruning, Rule-based Classification Using IF-THEN Rules for Classification; Rule Extraction from a Decision Trees; Bayesian Classification: Bayes' Theorem, Naïve Bayesian Classification. Prediction using Regression analysis.</p>
	<p>Unit 7. Cluster Analysis: (5 Hours) Introduction to Cluster Analysis; Types of Data in Cluster Analysis; Classification of clustering methods-Partitioning Method, Hierarchical Method, Density-based Method, Grid-Based Method, Model-Based Method, Constraint-based Method Partitioning Methods: K-Means and K-Medoids</p>
Text Books	<p>References (Books, Websites etc.):</p> <ul style="list-style-type: none"> • Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Harcourt India Pvt., 2011.

Reference Books

- Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP, McGrawHill, 2004
- D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011

Subject Name	205. Web Supporting Technologies
No. of Credits	4 Credits
Pre Requisite	Any pre-requisite knowledge is not required.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	The students will get information of the basics of internet with the help of examples. It will help them to identify and remember Web supporting concepts.
Understanding	Remembering the definitions will help the students to understand basic concepts of HAML, JavaScript, CSS and PHP etc. In this subject, students will understand various tags, programming constructs of JavaScript, technical issues, cascading Style Sheets, forms and PHP concepts.
Applying	Students will Have thorough knowledge of HTML and JavaScript. They will be able to design various forms as per requirements. They will be able to apply CSS concepts in scripting. The students will also apply their creativity to display the output.
Analyzing	The students will relate real life problem with the JavaScript solution. They will analyze the problem and solve it.
Evaluating	Ability to use JavaScript construct for problem solving, handling technical issues etc.
Creating	Design and create their own forms for solving a real-life requirement.
Syllabus	<p>Unit 1: Basics of Internet: (4 Hours) Understanding internet and intranet, difference between internet and intranet, Introduction to WWW, Concept of client and server, Introduction to web server and web browser, using Apache as web server, Internet Service Providers (ISP)</p> <p>Unit 2: Introduction to HTML: (14 Hours) Overview of HTML, concept of Tag, types of HTML tags, structure of HTML program, Text Formatting Through HTML: Emphasizing Material in a Web Page, Using Image tag, attributes of Image tag, Lists: Using unordered, ordered, definition lists, Handling Tables: To define header rows & data rows, use of caption tag, changing height & width of table, BGcolor, Handling Tables: cell padding, cell spacing, colspan, row span, handling table data, images in table, Frames: Introduction To frames, using frames & framesets, named frames, Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, image as hyperlinks</p> <p>Unit 3: Cascading Style Sheets: (4 Hours) Introducing CSS, Types of style sheets: inline, embedded and external style sheets, working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, various types of CSS selectors, Using class and span tag, External style sheets,</p>

	<p>Unit 4: Introduction to JavaScript (Client-Side Scripting): 16 Hours) Introduction to scripting, overview of Java Script, advantages, client-side java Script, capturing user input, writing JavaScript into HTML, Advantages and limitations of JavaScript, JavaScript Basics: Data types, literals, variables and operators, Java Script arrays, dense array, operators, expressions, JavaScript Programming Constructs: Assignment, data declaration, if, switch, while, for, do while, label, break, continue, function call, return, with, delete, method of invocation Dialog boxes -Alert dialog box, prompt dialog box, confirm dialog box, window objects JavaScript Functions- Types of functions in Java Script- Built in functions, User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions Arrays- Introduction to arrays, arrays with methods</p>
	<p>Unit 5: Forms: (14 Hours) Interactive web pages concepts, difference between static & dynamic web pages, Concept of form, how form works, Different elements - text, password, button, submit, reset, checkbox, Radio, Text Area, select & option, properties of form elements, form object's Method, Other built-in Object: String object, math object, date object, Regular Expressions, Form validation</p>
	<p>Unit 6: JavaScript Events: (4 Hours) What is an Event? Onclick Event Type, onsubmit Event Type, onmouseover and onmouseout, onchange, onload, onkeydown, working with DOM, Concept of Cookies and sessions, when and how to use cookies and sessions,</p>
	<p>Unit 7: Introduction to PHP: (8 Hours) Server-side web scripting, Adding PHP to HTML, Syntax and Variables, PHP control structures, Establishing connectivity with MySQL database</p>
Text Books	<ol style="list-style-type: none"> 1. Ivan Bayross (2006) Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, BPB Publications
Reference Books	<ol style="list-style-type: none"> 1. Thomas Powell, Web Design The complete Reference, Tata McGrawHill 2. Thomas Powell and Fritz Schneider JavaScript 2.0 : The Complete Reference, Second Edition 3. PHP: The Complete Reference By Steven Holzner, Tata McGrawHil 4. Luke Welling, PHP and MySQL Web Development, Pearson Education; Fifth edition

MOOC on NPTEL	NPTEL / Swayam www.edx.com www.coursera.com www.w3schools.com
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Subject Name	206. Lab on Data Structures using Python
No. of Credits	4 Credits
Pre Requisite	School Level Mathematics. It does not assume any prior knowledge of programming.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.
Understanding	By remembering students the basing concepts students will understand the concepts of searching and sorting algorithms, dynamic programming and backtracking, as well as topics such as exception handling and using files. As far as data structures are concerned, the course covers Python dictionaries as well as classes and objects for defining user defined data types such as linked lists and binary search trees.
Applying	Students will Have thorough knowledge about data structures and will be able to design & develop program using linear data structures& non linear data structures for solving problems
Analyzing	Compare efficiency of various data structures for solving a particular problem.
Evaluating	Ability to choose appropriate data structures for problem solving Ability to use combination of these data structures for problem solving.
Creating	Design and create their own data structure for solving a real life problem
Syllabus	Unit 1 (4 Hours) Informal introduction to programming, algorithms and data structures via gcd, Downloading and installing Python,gcd in Python: variables, operations, control_flow - assignments, conditionals, loops, functions.
Suggested Programs	Installation of Python IDE, understand various platforms for Python (google collaborator, Jupitar notebook) <ul style="list-style-type: none"> • Basic program to understand Data Types • creating variables, accepting input variable from user and printing their datatype • Mathematical functions (apply various operations on data +, -, /, *) • Conditional Statements (if, else, , • Create functions to <ul style="list-style-type: none"> ○ Find average of marks of five subjects

	<ul style="list-style-type: none"> ○ Find sum of first n prime numbers
	<p>Unit 2 (8 Hours) Python: types, expressions, strings, lists, tuples, arrays Python memory model: names, mutable and immutable values List operations: slices etc - Binary search Inductive function denitions: numerical and structural induction Elementary inductive sorting: selection and insertion sort In-place sorting.</p>
Suggested Programs	<ul style="list-style-type: none"> • Operations on Strings, Lists , tuples and arrays <ul style="list-style-type: none"> ○ Creating lists/tuple/array and accessing list elements using index ○ Access the list/tuple element using –ve index ○ Extract specific element from list/tuple/array ○ Use len(), del(), remove() and range functions on list/tuple • Applying different searching and sorting algorithm on data (list)
	<p>Unit 3 (7 Hours) Basic algorithmic analysis:input size,asymptotic,omplexity,O() notation Arrays vs lists Merge sort Quicksort Stable sorting. Dictionaries More on Python functions: optional arguments, default values Passing functions as arguments Higher order functions on lists: map, lter, list comprehension.</p>
Suggested Programs	<ul style="list-style-type: none"> • Write a program for sorting given list using Quick Sort • Fuction calling (passing the variables) <ul style="list-style-type: none"> ○ Find factorial of a number ○ Find fibbonacci series for a given number • Create Dictionaries with key,value pair, and access various elements of Dictioneries, Various operation using Dictionaries. • Usage of map, lter functions on list
	<p>Unit 4 (7 Hours) Exception handling Basic input/output Handling files String processing.</p>
Suggested Programs	<ul style="list-style-type: none"> • Read, write, search operations on File data structure • Write Programs based on exception handling • Write program for various operations on string variables
	<p>Unit 5 (7 Hours) Backtracking: N Queens, recording all solutions Scope in Python: local, global, nonlocal names Nested functions Data structures: stack, queue Heaps.</p>
Suggested Programs	<ul style="list-style-type: none"> • Creation and various operations on Stack • Creation and various operations on queue

	<ul style="list-style-type: none"> • Creation and various operations on heap • Defining scope variables in Python
	Unit 6 (9 Hours) Abstract datatypes Classes and objects in Python "Linked" lists: find, insert, delete Binary search trees: find, insert, delete Height-balanced binary search trees.
Suggested Programs	<ul style="list-style-type: none"> • Creation of class data structure ,Abstract classes • Creation of Link List and various operations on Link List • Implementation of tree data structure using class concept
	Unit 7 (9 Hours) Efficient evaluation of recursive denitions: memoization Dynamic programming: examples Other programming languages: C and manual memory management Other programming paradigms: functional programming.
Suggested Programs	Comparison of all discussed algorithm with their implementation in C and compare memory usage.
Text Books	Data Structures and Algorithms in Python Paperback – 2016 by Michael T. Goodrich (Author), Roberto Tamassia (Author), Michael H. Goldwasser (Author) WILEY PUBLICATION Data Structure and Algorithmic Thinking with Python Paperback – 2015 by Narasimha Karumanchi (Author)
Reference Books	Problem Solving in Data Structures & Algorithms Using Python: Programming Interview Guide by Hemant Jain
MOOC on NPTEL	https://nptel.ac.in/courses/106/106/106106145/#

SEMESTER III

Subject Name	301. Software Design Patterns
No. of Credits	4 Credits
Pre-Requisite	This course assumes students should have following knowledge: <ul style="list-style-type: none"> • OOAD and UML. • Software Engineering • Java Programming
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Ability to identify the structure, framework of Design Patterns for a given problem
Understanding	Ability to understand the meanings, concepts and types of Design Patterns
Applying	Ability to decide and suggest a design pattern for the given problem
Analyzing	Exploit the possibilities and limitations of basic design patterns for a given problem and ability to analyze a software development problem
Evaluating	Ability to evaluate, assess the design pattern that are appropriate for a given problem
Creating	Create software design that are scalable, robust and easily maintainable and consisting multiple modules
Syllabus	
	Unit 1: Introduction to Design Patterns (4 Hours) Reusable design Patterns: Meaning & Use of Design Patterns, Organizing the Patterns, describing pattern, how to use the patterns while solving the problem, Applications of different design patterns in various cases. Selection of a Design Pattern
	Unit 2: Creational Patterns (8 Hours) Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences and Implementation of following Creational Patterns: - Factory Method, Abstract Factory, Builder, Prototype, Singleton. Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Creational design pattern.
	Unit – 3: Structural Patterns (8 Hours) Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of Following Structural Patterns Adapter (class), Adapter (object), Bridge, Composite, Decorator. Façade, Flyweight, Proxy. Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Structural design patterns.
	Unit 4: Behavioral Patterns – I (8 Hours) Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern Interpreter, Template Method, Chain of Responsibility, Command, Iterator

	Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Patterns – I
	<p>Unit 5: Behavioral Patterns – II (8 Hours)</p> <p>Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern Mediator, Memento, Observer, State, Strategy, Visitor</p> <p>Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Patterns – II</p>
	<p>Unit 6: JEE Patterns (6 Hours)</p> <p>Presentation Layer Design Pattern, Business Layer Design Pattern, Integration Layer Design Pattern</p> <p>Tutorial: Tutorials should be conducted in LAB using JAVA for implementing above Patterns</p>
	<p>Unit 7: Case Study (4 Hours)</p> <ul style="list-style-type: none"> • Designing a parking lot • Designing Movie Ticket Booking System • Design Logistic System • Online Hotel Booking System OYO
Text Books	Head First Design Patterns, Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates,
Reference Books	<ul style="list-style-type: none"> • Design Patterns Elements of Reusable Object-oriented Software- Erich Gama, Richard Helm, Ralph Jonson • Ben Schneiderman, Designing the User Interface, Pearson Education, 1998
MOOCs on NPTEL	https://nptel.ac.in/courses/106/105/106105224/
Web Resources	https://www.tutorialspoint.com/design_pattern/index.htm https://www.javatpoint.com/design-patterns-in-java

Subject Name	302. Artificial Intelligence
No. of Credits	4 Credits
Pre Requisite	The Student should be well aware with: Strong hold on Mathematics, Strong experience of programming languages, Writing algorithm for finding patterns and learning, Strong data analytics skills, Good knowledge of Discrete mathematics, Strong will to learn machine learning languages.
Expected Outcome	At the end of the course a student should be able: <ul style="list-style-type: none"> • Understand various search methods. • Use various knowledge representation methods. • Understand various Natural Language Processing techniques. • Use Python Programming language using Numpy and Pandas.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some motivating examples to remember and quickly builds up basic concepts such as visual perception, speech recognition, decision-making, and translation between languages
Understanding	By remembering the basic concepts students will understand the concepts of Natural-language understanding (NLU) or natural-language interpretation (NLI), as well as topics such as simulation process of human intelligence by machines and special computer systems. As far as artificial intelligence is concerned the course covers natural language processing, Knowledge Representation Issues, Symbolic Reasoning under Uncertainty as well as Machine Learning (ML) using Python.
Applying	Students will have thorough knowledge about various level of mathematics, including probability, statistics, algebra, calculus, logic and algorithms. Bayesian networking or graphical modeling, including neural nets. Physics, engineering and robotics, Computer science, programming languages and coding. Knowledge of Python is essential.
Analyzing	Compare efficiency of various Theories of Intelligence and learning from experience for solving a particular problem.
Evaluating	Ability to choose appropriate Knowledge based approach for problem solving. Ability to use combination of these artificial intelligence theories for problem solving.
Creating	Design and create their own artificial intelligence applications for solving a real life problem
Syllabus	
	Unit1:Introduction: (4 Hours) What is AI? ,The AI Problems, Background/history, What Is An AI Techniques, The Level Of The Model, Criteria For Success, Some General References, High-level overview of field, State of the art.
	Unit 2 : Introduction and historical perspective, Hard and Soft AI

	<p>(7 Hours)</p> <p>Disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, Problems, State Space Search & Heuristic Search Techniques: Defining The Problems as A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate – And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.</p>
	<p>Unit 3: Knowledge Representation Issues(6 Hours)</p> <p>Representations And Mappings, Approaches To Knowledge Representation. Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Representing knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning</p>
	<p>Unit 4 : Symbolic Reasoning under Uncertainty(5 Hours)</p> <p>Introduction To Non-monotonic Reasoning, Logics For Non monotonic Reasoning. Statistical Reasoning: Probability And Bays’ Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, Dumpster-Shafer Theory, Fuzzy Logic.</p>
	<p>Unit 5:Natural Language Processing(5 Hours)</p> <p>Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking.</p> <p>Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI.</p>
	<p>Unit 6: Introduction to machine learning (7 Hours)</p> <p>Introduction Machine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, ,</p> <p>Introduction to Numpybasics, creating numpy arrays ,structure and content of arrays, subset, slice, index and iterate through arrays, multidimensional arrays, python lists vs numpy arrays, introduction to numpy operations on numpy arrays , operations on arrays basic linear algebra operations.</p>
	<p>Unit 7 : Introduction to pandas (8 Hours)</p> <p>Introduction, pandas basics, indexing and selecting data, merge and append, grouping and summarizing data frames, lambda function & pivot tables, reading delimited and relational databases, reading data from websites, getting data from apis, reading data from pdf files, cleaning datasets.</p>

	<p>Case study: For example, to explore a dataset stored in a CSV on your computer. Pandas will extract the data from that CSV into a Data Frame — a table, basically — then let you do things like:</p> <p>Calculate statistics and answer questions about the data, like</p> <ol style="list-style-type: none"> 1) What’s the average, median, max, or min of each column? 2) Does column A correlate with column B? 3) What does the distribution of data in column C look like? 4) Clean the data by doing things like removing missing values and filtering rows or columns by some criteria 5) Visualize the data with help from Matplotlib. Plot bars, lines, histograms, bubbles, and more. 6) Store the cleaned, transformed data back into a CSV, other file or database
Text Books	<ol style="list-style-type: none"> 1) Artificial Intelligence : A Modern Approach, Stuart Russel, Peter Norvig 2) Artificial Intelligence and Machine Learning by Chandra S.S.V, PHI
Reference Books	<ul style="list-style-type: none"> • “Artificial Intelligence” -By Elaine Rich And Kevin Knight (2nd Edition) Tata McGraw-Hill • Artificial Intelligence A New Synthesis :Nilson, Elsevir • Introduction to Artificial Intelligence and Expert System- Patterson, Prentice Hall India. • Shai shalev-shwartz, Shai Ben-David: Understanding Machine Learning from Theory to algorithms, Cambridge University press.
Refer these websites for MOOC’s	<p>NPTEL / Swayam</p> <p>www.edx.com</p> <p>www.coursera.com</p>

Subject Name	303. Information Security
No. of Credits	4 Credits
Pre Requisite	Basic Knowledge about Software Development Life Cycle, System Analysis
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of software development and software engineering Information can be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of Information , Characteristics , Levels of Information, Information Security Measures and various stages in Information testing Life Cycle .
Applying	Students will Have thorough knowledge about Measures of Information Security and Cyber security at higher level , network security measures and various scanner and cleaners
Analyzing	To Measure the risk of Information loss or theft and over come the Information Security by scientific and proper methods .
Evaluating	Ability to select proper method to protect the information from misuse and make the organization full proof from various Information threats.
Creating	Design and create their own procedure to protect the important data and information at all the levels.
Syllabus	<p>Unit 1: Introduction and Background (5 Hours) Basic concepts of Information, Information Characteristics, sources of Information, Types of Information, Generating Information in Organizations. Business Application of Information and Information System, What is Information security? Need for Information Security , Types of Organization , Functions of Business organization , Levels of Organization , How Organizations manage the information , flow of information.</p> <p>Unit 2: Basics of Networking for Security Purpose (8 Hours) Network Installations, Types of Networks and their security issues, Types of Network of OS. Functions of Information security officer. Different measures to safe guard the important information in the organization. Network policy for protecting important resources of the Network. Basic concept of MIS and Organization flow of Information.</p> <p>Unit 3: Importance of Information Security (7 Hours) Improvement in corporate reputation based on the height of the level of information security, threat to business continuity due to accidents related to information systems, cyber space, information assets, threats, and vulnerabilities. Information Security Measures. Threats :- Ty p e s of threats physical threats (accident, disaster, fault, destruction, theft, unauthorized intrusion, etc.), technical threats (unauthorized access, eave</p>

	<p>S dropping , spoofing, alteration, error, cracking, etc.), man-made threats (operational error, loss, damage, peep, unauthorized use, social engineering, etc.), cyber-attack, information leakage, intent, negligence, mistake, fraudulent behavior, sabotage, DoS attack, rumor, flaming, SPAM e-mail, file sharing software [Malware / malicious programs] computer virus, macro virus, worm, bot (botnet, remote operated virus), Trojan horse, spyware, ransom ware, key logger, root kit, backdoor, fake anti-virus software</p>
	<p>Unit 4: Information security technology (cryptography) (7 Hours) CRYPTREC ciphers list, cryptography (encryption key), decryption (decryption key), decoding, symmetric cryptography (common key), public key cryptography (public key, private key)), AES (Advanced Encryption Standard), S/MIME (Secure MIME), PGP (Pretty Good Privacy), hybrid encryption, hash function (SHA-256, etc.), key management, disk encryption, file encryption, compromise. digital signature (signature key, verification key), timestamp (time authentication), message authentication, MAC (Message Authentication Code), challenge-response authentication. Human assets (people, and their qualifications, skills, and experience), intangible assets, service, risk management (JIS Q 31000), monitoring, information security events, information security incidents.</p>
	<p>Unit 5: Information security Management (7 Hours) Management of information based on the information security policy, information, information assets, physical assets, software assets Risk analysis and evaluation (Information asset review / Classification) information assets review, classification and management by importance of information assets, information assets ledger Risk analysis and evaluation (Risk type)loss of property, loss of responsibility, loss of net earnings, human cost, operational risk, supply chain risk,</p>
	<p>Unit 6: Information security regulations (8 Hours) (Company regulations including information security policy) organizational operation according to the information security policy, information security policy, information security purpose, information security measures criteria, information management regulations, security control regulations, documentation control regulations, regulations on measures to be taken against computer virus infection, regulations on measures against accidents, information security education regulations, privacy policy (personal information protection policy), employment agreement, office regulations, penal provisions, outward explanation regulations, regulations for exceptions, regulations for updating rules, procedure for approving regulations</p>
	<p>Unit 7: Management of Information Asset. (8 Hours) Security Incidents management, reducing risk in Information loss and keeping the information safe from unauthorized users and threats .</p>

	<p>Information Technology Act, Cyber Crimes and Cyber Laws. -What are cyber-crimes? Types of cyber-crimes. Categories of Cyber Crime, Online business threats , Online business frauds Safety tips for online business. , IT Policy for Information protecting. risk involved in usage of external service, risk involved in distribution of information by SNS, moral hazard, estimated annual loss, scoring method, cost factor .</p>
Text Books	<ol style="list-style-type: none"> 1. Information Security Management Handbook, Sixth Edition, Volume 5-2012 Amazon Books Edited by - Micki Krause Nozaki, Harold F. Tipton. 2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Nina Godbole and Sunit Belpure, Publication Wiley. 3. Information Security: Principles and Practice 1st , Kindle Edition -2005 Amazon Books Author - Mark Stamp 4. “Cryptography and information Security” V.K. Pachghare, PHI Learning Private Limited, Delhi India. 5. Analyzing Computer Security by Charles P. Pfleeger, Shari Lawrance Pfleeger, Pearson Education India 6. Anil Gaikwad , Jyoti Biradar (Patil) “Basic Concepts of System Analysis” Lambert Academic Publication Dec. 2019 .
Reference Books	<ol style="list-style-type: none"> 1. Practical Information Security Management: A Complete Guide to Planning and Implementation-Dec-2016 Amazon Books . Tony Campbell 2. Managing Risk and Information Security :- Protect to Enable 3. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management Made Easy Lambert Academic Publication Dec 2019.
MOOC on NPTEL	<p>https://nptel.ac.in/courses/, http://www.freetechbooks.com/managing-risk-and-information-security-protect-to-enable-t1150.html</p>

Subject Name	306. Lab on Software Testing
No. of Credits	3 Credits
Pre Requisite	<ul style="list-style-type: none"> • Fundamental knowledge of computer. • Fundamental knowledge of Software Engineering, System Analysis and Design.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	The purpose of this course is to build the skills necessary to perform software testing at the function, class and application level.
Understanding	Concepts of developing test plan, test cases, execution of test cases etc.
Applying	Work on automated software testing tools like bugzilla, winrunner, selenium, test link etc.
Analyzing	Analyse the requirements for the given problem statement Find defects which may get created by the programmer while developing the software.
Evaluating	Gain confidence to write and execute test cases. To get the knowledge about automated testing and automated testing tools.
Creating	Design and implement the solution for given problem in any programming language. Derive test cases and execute test cases for any given problem.
Syllabus	<p>Unit 1: Introduction Software Testing (6 Hours)</p> <p>Basic testing vocabulary, Quality assurance versus Quality control, Cost of quality, Software quality factors, How quality is defined? Why do we test software? What is a defect?, defect life cycle. The Multiple roles of the software tester, Scope of testing, When should testing occur?, Testing constraints, Life cycle testing, Independent testing, Levels of testing, The “V” Concept of testing</p> <p>Unit 2: Testing Techniques (7 Hours)</p> <p>Structural versus Functional Technique Categories, Verification versus Validation, static versus Dynamic Testing, Examples of Specific Testing Techniques like white box testing and black box testing, Test Planning, Customization of the Test Process, Budgeting, Scheduling, Different test phases, difference between retesting and regression testing.</p> <p>Unit 3: Test Plan and test management tool: Test Director (7 Hours)</p> <p>Prerequisites to test planning, Understand the Characteristics of the Software Being Developed, Build the Test Plan, Write the Test Plan. Necessity of test management tool, understand test life cycle, defect life cycle. Demonstrate different test & defect life cycles through testing tool , Overview of Test management and bug tracking tools</p> <p>Unit 4: Test cases (6 Hours)</p>

	<p>Test Cases, Test case Design, Building test cases, Test data mining, Test execution, Test Reporting, Defect Management, Test Coverage: Traceability matrix</p> <p>Test Metrics: Guidelines and usage, Test reporting: Guidelines for writing test report, Test Tools used to Build Test Reports</p> <p>Manual testing Case Study • Requirements / User Story Study Hands on • Test planning Hands on • Test design Hands on • Test execution Hands on</p>
	<p>Unit 5 : Performance Testing (4 Hours)</p> <p>What is performance testing , why do we do performance testing, Types of performance testing , common performance problems, performance test metrics, performance testing tools.</p>
	<p>Unit 6:Automation Testing (5 Hours)</p> <p>Basics of automation testing – why, when, how to perform automation testing, , Progression vs Regression test automation, Factors for choosing a particular tool, An overview for the major functional testing tools. Overview of Test management and bug tracking tools.</p>
	<p>Unit 7: Automation testing tools (10 Hours)</p> <p>Study of bug tracking tool: Bugzilla. Study of winrunner, study of web testing tool selenium.</p> <p>Study of open source testing tool: test link, Case study for automation testing</p>
Text Books	<p>Hetzel, The Complete Guide to Software Testing, John Wiley & Sons.</p> <p>Software Testing by Renu Rajani and Pradeep Oak</p>
Reference Books	<p>1. Testing in 30+ Open Source Tools, Rahul Shende, Shroff Publishers & Distributor Pvt. Ltd, ISBN 13: 9789350231005 (page numbers from 15 to 117)</p> <p>2. http://seleniumhq.org/</p> <p>3. http://sourceforge.net/projects/sahi/</p> <p>4. http://testng.org/doc/index.html</p>
MOOC on NPTEL	<p>www.SWAYAM.com</p> <p>www.NPTEL.com</p> <p>www.edx.com</p> <p>www.coursera.com</p>

ELECTIVES
ELECTIVE GROUP (01): CLOUD COMPUTING

Subject Name	01(A) Virtualization
No. of Credits	3 Credits
Pre Requisite	Knowledge of Cloud Computing Concepts Knowledge of Virtualization Knowledge of Cloud security Knowledge of Web technologies
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	How to provide Flexible and scalable infrastructures as per user requirement
Understanding	Understanding the components of Virtualization
Applying	Carrying out practical's through Virtualization
Analyzing	The case studies will help us to understand more of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Syllabus	Unit 1: Overview Of Virtualization : (Lectures/practical's : 7) Introduction to Virtualization, Virtualization Approaches, Virtualization for Server Consolidation and Containment, Hardware Support for Virtualization, Para-Virtualization, vmWare's Virtualization Solutions
	Unit 2: Understanding Virtualization: (Lectures/practical's :7) The Roots of Virtualization, Making Better Use of Your Systems with Virtualization, Approaches to Virtualization, Understanding the Virtualization Ecosystem, Reasons to Invest in Virtualization Hardware. vmWare : what is VmWare, Virtualization with Vmware, VmWare Products,Data Center and Cloud Infrastructure, Networking and Security, SDDC Platform, Storage and Availability, The vmWare Approach to the Cloud, vmWare vSphere 4, Server Consolidation and Containment
	Unit 3: Hypervisor: (Lectures/practical's : 7) What is Hypervisor, Type 1 Hypervisor, Type 2 Hypervisor, Types of Hardware Virtualization : Full Virtualization, Emulation Virtualization, Para virtualization., Installing Hyper-V In Windows Server 2012,
	Unit 4: Types Of Virtualization: (Lectures/practical's : 7) Server Virtualization, Client & Desktop Virtualization Services and Applications Virtualization, Network Virtualization, Storage Virtualization
	Unit 5: Tools For Virtualization: (Lectures/practical's : 05) Virtualization with Xen, Virtualization with Bochs and QEMU,

	Virtualization with Lguest, Virtualization with KVM
	Unit 6: Virtualization For Businesses: (Lectures/practical's:05) Need for Virtualization in a Business, Implementation of Virtualization in a Business, Cost-Benefit Analysis of Virtualization
	Unit 7: Openstack And Its Role In Virtualization: (Lectures/practical's : 05) Understanding Openstack, nine Core key components of openstack. CASE STUDIES OF VIRTULIZATION : Xen Hypervisor, OpenVZ Hypervisor, MS Virtual Server 2005 R2, Oracle VM
Text Books	References: 1. "Virtualization" – A Manager's Guide, By Dan Kusnetzky, O'reilley Publications, 2. "Virtualization for Dummies", 1st Edition, Kindle Edition, by Bernard Golden.
Reference	Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com

ELECTIVE GROUP (01): CLOUD COMPUTING

Subject Name	(01)B Cloud Computing Services (Amazon Web Services)
No. of Credits	3 Credits
Pre Requisite	Knowledge of Cloud Computing Concepts Knowledge of Virtualization Knowledge of Cloud security Knowledge of Web technologies Knowledge of IaaS, PaaS, SaaS & DaaS
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	How to provide Flexible and scalable infrastructures as per user requirement
Understanding	Understanding the components of AWS
Applying	Carrying out practical's through AWS
Analyzing	The case studies will help us to understand more of practice of cloud computing in the market.
Evaluating	Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
Creating	Creating flexible and scalable infrastructure suitable to the organizational need
Syllabus	Unit 1: Cloud Computing Fundamentals: (Lectures/practical's : 10) Definition of Cloud Computing , private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds
	Unit 2: Infrastructure & Networking (Lectures/practical's :10) Introduction to Amazon Web Services AWS Global Infrastructure Introduction to Network Switches & Virtual Private Cloud VPC & Subnets Internet Gateways, VPC Peering & NAT Gateways IP Addressing in AWS Understanding AWS Security Groups Launching our first EC2 instance EC2 instance types & Pricing Models
	Unit 3: Storage (Lectures/practical's : 10) Introduction to Block & Object storage mechanism Introduction to Elastic Block Store - EBS EBS Snapshots EBS Volume Types Instance Store Volumes Introduction to Simple Storage Service (S3) Features of S3
	Unit 4: Elastic Load Balancers –(Lectures/practical's : 10) Understanding High Availability Configuration ELB Configuration

	Elasticity Auto Scaling Identity & Access Management Understanding the IAM Policies IAM User, IAM Policy and IAM Role
	Unit 5: Relational Databases (Lectures/practical's : 05) Introduction to Relational Databases Creating our first database structure in MySQL Getting started with DynamoDB
	Unit 6: Domain Name System (Lectures/practical's : 05) Introduction to DNS Understanding DNS Records Introduction to Route53
	Unit 7: AWS Lambda and API (Lectures/practical's : 05) Getting started with AWS Lambda Introduction to API Understanding working of API Building our API with API Gateway
Text Books	<ol style="list-style-type: none"> 1. Cloud Computing: Principles and Pardigms by Rajkumar Buyya, james Broberg and Andrzej M.Gos cinski, Wiley, 2011. 2. Amazon Web Services for Dummies – Wiley Brand. 3. Learning AWS – Design, Build and Deploy responsive applications using AWS cloud components by Aurobindo Sarkar, Amit Shah
Reference Books	<ol style="list-style-type: none"> 1. Learn AWS – David Clinton 2. AWS Lab by Zoom Technologies

ELECTIVE GROUP (02): DATA SCIENCE

Subject Name	(02) A - Statistical Programming in R
No. of Credits	3 Credits
Pre Requisite	Statistical Knowledge required
Course Objectives	<ul style="list-style-type: none"> • To teach the Beginners of R Programming of the a master level. A variety of topics will be covered that are important for Data science in order to prepare the students for real life prediction of data engineering. • To impart knowledge of the concepts related to Probability and Application on data sets. It also gives the idea how data is managed in various environments with emphasis on Predictions measures as implemented in data sets.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	<ul style="list-style-type: none"> • Remember the definitions of concepts and their Implementation in R.
Understanding	<ul style="list-style-type: none"> • Understand the concept of data and techniques for its Implementation • Understand data data standards and methods. • Understand the fundamentals of Data science
Applying	<ul style="list-style-type: none"> • Design different data behaviors and their Predictions. • Predictions Model Develop.
Analyzing	<ul style="list-style-type: none"> • Analyzing Data set • Studying Historical Data.
Evaluating	<ul style="list-style-type: none"> • Convert the historical Data into Prediction Model.
Creating	<ul style="list-style-type: none"> • Write R coding for Prediction Model.
Syllabus	<p>Unit 1. Introduction of Probability (8 Hours) : Concept, Types of Probability, Permutation and Combination concept ,Addition and Multiplication Theorem, Condition Probability, Bayes's Theorem</p>
	<p>Unit 2. Random Variable (5 Hours) : Concept, Discrete and Continuous Random Variable, Probability density function, Mathematical Expectation and their Theorem</p>
	<p>Unit 3. Data Distribution (7 Hours) : Distribution, Types of Data distribution, Exponential distribution, Binomial distribution, Normal distribution, Poisson distribution, Random number generation, Monte Carlo Simulation.</p>
	<p>Unit 4. Testing of Hypothesis (5 Hours): Procedure of Testing Hypothesis, Standard Error and Sampling distribution, Estimation, Student's t-distribution, Chi-Square test and goodness of fit, F-test and analysis of variance. Factor analysis.</p>
	<p>Unit 5. Introduction to R programming language (5 Hours): Getting R, Managing R, Arithmetic and Matrix Operations, Introduction to Functions, Control Structures. Working with Objects and Data: Introduction to Objects, Manipulating Objects, Constructing Data Objects, types of Data items, Structure of Data items, Reading and Getting Data, Manipulating Data, Storing Data.</p>

	<p>Unit 6. Graphical Analysis using R (5 Hours): Basic Plotting, Manipulating the plotting window, BoxWhisker Plots, Scatter Plots, Pair Plots, Pie Charts, Bar Charts.</p>
	<p>Unit 7. Advanced R (10 Hours): Statistical models in R, Correlation and regression analysis, Analysis of Variance (ANOVA), creating data for complex analysis, Summarizing data, and case studies.</p>
Text Books	"Fundamentals of Statistics" Seven Edition By S.C.Gupta
Reference Books	<ol style="list-style-type: none"> 1. "Fundamentals of Statistics" Seven Edition By S.C.Gupta 2. "R Programming Fundamentals by Kaelen Medeiros 3. " Reinforcement Learning e-book. 4. Learning R Programming Guide on line <p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com</p>

ELECTIVE GROUP (02): DATA SCIENCE

Subject Name	(02) B - Introduction to Data Science
No. of Credits	3 Credits
Pre Requisite	Statistical and Programming Knowledge required
Course Objectives	<ul style="list-style-type: none"> • To teach the Beginners of Data analysis through R /Python Programming of the a master level. A variety of topics will be covered that are important for Data science in order to prepare the students for real live Project Analysis • To impart knowledge of the concepts related to Machine Learning and implement and variety Application on data sets. It also gives the idea how data is managed in various environments with emphasis on Analysis measures as implemented .
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	<ul style="list-style-type: none"> • Remember the definitions of concepts and their Programming skills.
Understanding	<ul style="list-style-type: none"> • Understand the concept of coding and techniques for its Implementation • Understand data different Methods . • Understand the fundamentals of Data science
Applying	<ul style="list-style-type: none"> • Design different Model and their validity check. • Concept applying in other domain area.
Analyzing	<ul style="list-style-type: none"> • Analyzing Data set. • Comparing different Model .
Evaluating	<ul style="list-style-type: none"> • Convert the analysis in Modern approaches.
Creating	<ul style="list-style-type: none"> • Write R/Python coding for Analysis
Syllabus	<p>Unit 1. Association Rule (5 Hours): Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Association Rules, the Apriori Algorithm Classification and Prediction</p>
	<p>Unit 2. Classification(5 Hours) : Classification, Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub sampling</p>
	<p>Unit 3. Prediction (5 Hours) : Prediction, Issues Regarding Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor. Clustering : Cluster Analysis, Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic, Evaluation of Clustering.</p>
	<p>Unit 4. Linear Regression (5 Hours): Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection.</p>

	<p>Unit 5. Logistic Regression (5 Hours): Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables.</p>
	<p>Unit 6. Deep Learning (10 Hours): History, Scope and specification, why deep learning now, building block of neural network, neural networks, Deep learning hardware. Backward and forward neural networks, XOR model, cost function estimation (maximum likelihood), units, activation functions, layers, , normalization, hyper-parameter tuning, Convolution neural networks, architecture</p>
	<p>Unit 7. Case study (10 Hours) : Iris Data set ,Loan Data set, Titanic survival Data set ,Share Market Data set, Covide -19 Data set etc.</p>
Text Books	An Introduction to Machine Learning Springer by Gopinath Rebala
Reference Books	<p>1. "Fundamentals of Statistics" Seven Edition By S.C.Gupta 2.An Introduction to Machine Learning Springer byGopinath Rebala 3.Deep Learning MIT Press by John D.Kelleher. Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com</p>

ELECTIVE GROUP (03): LINUX

Subject Name	(03) A- Linux Desktop Environment, Shell Programming and System Administration
No. of Credits	3 Credits
Pre Requisite	Knowledge of any operating system
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Linux Architecture and Shell Commands
Understanding	Understanding of Linux operating system and environment
Applying	Use Linux operating system for configuring the environment.
Analyzing	
Evaluating	Writing shell scripts and evaluating them
Creating	Creating small applications for smart home/city using Arduino
Syllabus	<p>(UNIT 1- 8 Hour) Linux Installation Using Shell Interface:</p> <ul style="list-style-type: none"> ▪ Introduction to Linux ▪ Internal and external commands ▪ General purpose utilities ▪ Navigating the file system ▪ Handling ordinary files <p>Using GUI Environments:</p> <ul style="list-style-type: none"> ▪ GNOME desktop environment ▪ KDE desktop environment
	<p>(UNIT II- 8 Hour) Using open source office suite</p> <ul style="list-style-type: none"> ▪ Word processor application ▪ Spreadsheet application ▪ Presentation application ▪ Desktop database application <p>Using the Internet</p> <ul style="list-style-type: none"> ▪ World wide web ▪ FTP ▪ Telnet <p>Using Multimedia</p> <ul style="list-style-type: none"> ▪ Graphics ▪ Audio Video
	<p>(UNIT III- 8 Hour) Introduction to shell</p> <ul style="list-style-type: none"> ▪ Introduction to 'bash' shell ▪ Redirection ▪ Pipes ▪ Tees ▪ Command substitution ▪ Introduction to other shells: Korn shell, C Shell etc. <p>Shell environment</p> <ul style="list-style-type: none"> ▪ Shell variables

	<ul style="list-style-type: none"> ▪ Handling the command line arguments ▪ Login scripts ▪ Terminal characteristics ▪ Aliases <p>Text editors ‘vi’ editor , ‘emacs’ editor</p>
	<p>(UNIT IV- 5 Hour)</p> <p>Shell commands</p> <ul style="list-style-type: none"> ▪ General purpose utilities ▪ File management ▪ Process management ▪ Communication management <p>Regular expressions</p> <ul style="list-style-type: none"> ▪ Pattern matching ▪ Wild cards ▪ Regular expressions ▪ Utilities: grep, egrep, fgrep etc. <p>Filters</p> <ul style="list-style-type: none"> ▪ Introduction to filters <p>Utilities: pr, head, tail, cut, paste, sort, uniq, nl, tr etc.</p>
	<p>(UNIT V- 6 Hour)</p> <p>Shell scripting</p> <ul style="list-style-type: none"> ▪ Introduction to shell scripting ▪ Programming constructs ▪ Mathematical operators ▪ Logical operators ▪ String manipulation ▪ Interactive scripts <p>Handling command line arguments</p>
	<p>(UNIT VI- 6 Hour)</p> <p>Understanding system administration:</p> <ul style="list-style-type: none"> ▪ Introduction to the routine activities in system administration ▪ Shell commands for system administration ▪ Administrative tools <p>Managing file systems and disk space</p>
	<p>(UNIT VII- 8 Hour)</p> <p>Setting up and supporting users:</p> <ul style="list-style-type: none"> ▪ Managing user accounts ▪ Providing support to the users <p>Automating system tasks:</p> <ul style="list-style-type: none"> ▪ Aut System initialization ▪ System startup and shutdown ▪ Scheduling system tasks omating system tasks: <p>Backing up and restoring files:</p> <ul style="list-style-type: none"> ▪ Backup and restore strategy ▪ Backup and restore tools <p>Computer security issues:</p> <ul style="list-style-type: none"> ▪ Password protection <p>FirewallsImplement one small project</p>

Text Books	Textbook: <ul style="list-style-type: none">▪ Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus
Reference Books	UNIX Concepts and Applications - by Sumitabha Das
MOOC on NPTEL	

ELECTIVE GROUP (03): LINUX

Subject Name	(03)B -Linux Linux Internals and Network Administration
No. of Credits	3 Credits
Pre Requisite	Basics of Operating System
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Remembering Linux Internal and Network Management commands
Understanding	Understanding of Linux operating system and Network administration.
Applying	Creating Proxy, server, File server, web server
Analyzing	Analyzing inter process communication
Evaluating	Performance of different servers
Creating	Use of Linux administration for creation of server and management
Syllabus	<p>UNIT 1: (8 Hour) Setup And Manage a Local Area Network: Basic Networking, Introduction to networking, OSI Model, IP addressing (IPV4, IPV6) & LAN establishment with Linux , Configuring internet in Linux through broadband, dial-up, data card & through mobile (gprs). Setup And Manage Proxy Server : Basics of proxy services, Configuring proxy services, Creating ACL's for controlling access to internet, SQUID: Proxy server setup, Blocking Websites, content filtering, Bandwidth Management</p>
	<p>UNIT 2 :(8 Hour) Setup And Manage FILE Server: NFS: network file sharing & resource sharing across Linux environment. YUM server: Setting up local YUM, FTP YUM, HTTP YUM, EPEL, REMI & RPMForge like YUM configuration, DHCP: Dynamic Host Configuration Protocol setting up, Allocating IP, Subnet mask, default gateway and hostname, communication with DNS and other protocols. Setup And Manage FTP Server</p>
	<p>UNIT 3: (8 Hour) Setup And Manage Web Server : Basics of Web Services, Introduction to Apache, Configuring Apache for main site, Configuring Apache for multiple sites using IP-based, port based and name-based, Web Server: Apache installation, configuring dedicated server, shared server, user based authentication, load balancing and apache tuning. NIS, LDAP: (user's liberty to sit into remote machine) MAIL Server: knowing MUA, MTA & MDA, setting up and configuring POSTFIX, POP3s v/s IMAPs, Squirrel mail, accessing via Outlook, Thunderbird and evolution. Multi/virtual domain management, email security. Postfix Administration.</p>
	<p>UNIT 4 (5 Hour) Setup And Manage boot Server : What is booting and boot process of Linux?, Init Process or Run levels Setup And Manage DNS Server : Basics of Internet, Basics of DNS and BIND 9, Configuring DNS</p>

	primary server, DNS:master DNS, slave DNS with forward & reverse zone, one DNS resolving multiple domain, dynamic DNS etc
	<p>(UNIT 5 (6 Hour) Architecture of Linux, User and Kernel Space, Introduction to System Calls, System Calls in Detail, trace – Tracing system calls.</p> <p>Process management Introduction to Process and process attributes, process vs. Program, Process States, Creating Process, Process termination, process commands Special case of processes.</p> <p>Inter Process Communication Introduction to IPC, Pipe, FIFO, Shared Memory, Advantages and Disadvantages of various IPC mechanisms, Application of IPC</p>
	<p>(UNIT 6 (6 Hour) Working with Signals and Threads Thread and Process Synchronization Threads and resources management, Race condition in multi-threaded applications, writing thread safe code, Mutex, POSIX Semaphores, Usage of Binary semaphores and Mutex Race condition in multi-process applications, Limitations of shared memory, Semaphore Implementation.</p>
	<p>UNIT 7 (8 Hour) Linux Networking OSI and TCP/IP models, Addressing in TCP/IP, IPv4 and IPv6 differences, TCP three-way handshake, Network packet analysis in Linux, Networking commands in Linux, Using socket API to implement client server communication, Working with TCP and UDP sockets, Synchronous I/O</p>
Text Books	<ol style="list-style-type: none"> 1. Linux Administration : A Beginner’s Guide, Shah, TMH 2. LINUX: The Complete Reference, Petersen, TMH 3. LINUX Network Administrator’s Guide, Kirch, SPD/O’REILLY
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (04): OPEN SOURCE TECHNOLOGIES

Subject Name	(04) A. Perl Scripting
No. of Credits	3 Credits
Pre Requisite	
Course Objectives	Course Objective : To introduce basic concepts of Perl Programming and write, modify, and run simple Perl scripts and study working with files and using perl as an object oriented language
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of Perl scripting terminology for development of applications for organization.
Understanding	By remembering students will understand concepts of perl language and how to develop and implement various types of programs as per need of organization
Applying	Students will Have thorough knowledge about programming of Perl.
Analyzing	Students will acquire a good knowledge of programming with perl. Student will be able to pursue his study in object oriented concepts also using perl.
Evaluating	Ability to select proper programming concept to design applications to solve real world problem.
Creating	Design and create ir own applications using procedures, functions, file handling & OOP objects.
Course Plan	
Unit	Contents
	Unit 1: Perl – Introduction : (5 Hours) What is Perl? Perl features , Perl – Syntax Overview, Perl – Data Types , Numeric Literals String Literals , Perl – Variables , Creating Variables, Perl– Scalars, Scalar Operations ,Perl – Arrays Perl – Hashes
	Unit 2: Control Flow and Looping Statement: (6 Hours) if statement , if else statement, if elsif else statement, unless statement, switch statement, ? : Operator Perl – Loops : while loop , until loop, for loop, For each loop do while loop nested loops, next statement, last statement, continue statement, redo statement, go to statement, Infinite Loop
	Unit 3: Perl – Operators : (6 Hours) What is an Operator? Perl Arithmetic Operators, Perl Equality Operators, Perl Assignment Operators, Perl Bitwise Operators, Perl Logical Operators, Quote-like Operators, Perl – Date and Time, GMT Time Format, Date & Time, Epoch time, POSIX Function strftime()
	Unit 4: Perl – Subroutines : (8 Hours) Define and Call a Subroutine, Passing Arguments to a Subroutine, Passing Lists to Subroutines, Passing Hashes to Subroutines, Returning Value from a Subroutine, Private Variables in a Subroutine, Temporary Values via local(), State Variables

	<p>via state() Subroutine, Call Context</p> <p>Perl – References : Create References Dereferencing Circular References, References to Functions</p> <p>Perl – Formats Define a Format Using Format, Define a Report Header Number of Lines on a Page, Define a Report Footer , String and Mathematical Functions</p>
	<p>Unit 5: Perl – File I/O : (7 Hours)</p> <p>Opening and Closing Files, Open Function, Sysopen Function, Close Function, Operator getc Function, read Function, print Function, Copying Files Renaming a file, Deleting an Existing File Positioning inside a File</p> <p>Perl – Directories :Display all Files, Create new Directory, Remove a directory, Change a Directory</p>
	<p>Unit 6: Perl – Regular Expressions : (6 Hours)</p> <p>Pattern Matching, Match Operator Match Operator Modifiers Matching Only Once Regular Expression Variables. Substitution Operator Substitution Operator Modifiers. Translation Operator Translation Operator Modifiers More Complex Regular Expressions Matching Boundaries Selecting Alternatives Grouping Matching. \G Assertion Regular-expression Examples</p>
	<p>Unit 7: Introduction to Object Oriented Programming in Perl : (5 Hours)</p> <p>Object Basics, Defining a Class Creating and Using Objects, Defining Methods, Inheritance Method Overriding , Default Auto loading, Destructors and Garbage Collection, Object Oriented Perl Example</p>
<p>References (Books, Websites etc) :</p> <ul style="list-style-type: none"> • Mastering Perl : Brian, O'Reilly • www.tutorialspoint.com/perl/index.htm 	
<p>Suggested MOOC : Swayam</p>	

ELECTIVE GROUP (04): OPEN SOURCE TECHNOLOGIES

Subject Name	(04)B- Ruby
No. of Credits	3 Credits
Pre Requisite	
Course Objectives	Course Objective : Main objective of this paper is to learn, object-oriented programming with Ruby, Rails fundamentals and how to create basic online applications. How to work with HTML controls, use models in Rails applications, and work with sessions. Details on working with databases and creating, editing and deleting database records, Methods for handling cookies and filters and for caching pages.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of Ruby scripting for development of applications for organization .
Understanding	By remembering students will understand concepts of ruby rails and how to develop and implement various types of programs as per need of organization
Applying	Students will Have thorough knowledge about object-oriented programming with Ruby.
Analyzing	Students will acquire a good knowledge of programming with HTML controls, use models in Rails applications, and work with sessions. Student will be able to pursue his study in object oriented concepts for online application development..
Evaluating	Ability to select proper programming concept to design applications to solve real world problem.
Creating	Design and create ir own applications using OOP objects & rails application development.
	Contents
	Unit 1:Introduction to Ruby : (5 Hours) Creating a first web application, getting started with Ruby, Checking ruby documentation, working with numbers in ruby, working with strings in ruby.
	Unit 2:Variables and Constants in Ruby : (7 Hours) Storing data in variables, creating constants, interpolating variables in Double-Quoted strings, reading text on command line, creating symbols in ruby, working with operators, Handling operator precedence, working with Arrays, using Two Array Indices, working with Hashes, working with ranges.
	Unit 3:Conditional Loops, Methods and Blocks: (5 Hours) If Statement, Using case statement, using loops, creating and calling a method, making use of Scope, working with Blocks
	Unit 4: Classes: (6 Hours) creating a class, creating an object Data Encapsulation, Data Abstraction, Polymorphism, Inheritance
	Unit 5: Objects: (6 Hours) Understanding Ruby's object Access, overriding method, creating class variables, creating class methods, creating Modules, creating Mixins

	<p>Unit 6: Rails: (6 Hours) Putting Ruby to Rails, introducing Model View Controller Architecture, giving view something to do, mixing ruby code and HTML inside view, passing data from an action to a view, escaping sensitive text, adding a second action.</p>
	<p>Unit 7: Building Simple Rails Applications : (5 Hours) Accessing data user provides, using rails shortcuts for HTML controls, working with models, tying controls to models, initializing data in controls, storing data in sessions</p>
<p>References (Books, Websites etc.):</p> <ul style="list-style-type: none"> • Programming Ruby: Pragmatic Programmers' Guide, Second Edition • Agile Web Development with Rails, Third Edition • www.webtechlearning.com 	
<p>Suggested MOOC : SWAYAM</p>	

ELECTIVE GROUP (05): MOBILE COMPUTING

Subject Name	(05) A- JavaScript Programming
No. of Credits	3 Credits
Pre Requisite	Basic Knowledge about website development.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of programming be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of programming structure
Applying	Students will Have thorough knowledge about website working
Analyzing	To study the form elements and its working
Evaluating	Ability to select proper functionality of a page and form.
Creating	Design and create their own websites with proper validation
Syllabus	Unit 1 Introduction to Javascript: (5 Hours) JavaScript Overview , JavaScript Programming Basics, Variables and Operators : Variables and Data Types , Operators , Array
	Unit 2 Control Statements: (5 Hours) Controlling the Flow: JavaScript Control Statements, Functions : Parameters and working, The Window Object : The Window Object, Dialog Boxes ,Window function
	Unit 3: The Document Object: (4 Hours) The Document Object, Writing to Documents, Document related functions Forms and Forms-based Data : The Form Object , Working with Form Elements and Their Properties ,Event related with form
	Unit 4: Form Validation (4 Hours) A Process, Testing Data , Preparing Data for Validation and Reporting Results, Validating Non-text Form.
	Unit 5 : Frames: (6 Hours) HTML Frames Review, Scripting for Frames The String and RegExp Objects : The String Object, Properties and methods of String Object, Using String Object Methods to Correct Data Entry Errors, The RegExp Object Dates and Math: The Date Object, Properties and methods of Date Object, The Math Object , Properties and methods of Math Object
	Unit 6: AJAX (8 Hours) Animation: Frequently used Animation function, Manual and Automated animation. AJAX: Introduction to AJAX, Interacting with the Web Server using XMLHttpRequest Object, Need of Web server
	Unit 7: JS Frameworks & Libraries (8 Hours)

	Need of JSON , RESTful API with JSON, jQuery, Intro ,Effects and animations DOM/HTML Updates, jQuery and Ajax
Reference Books	1.JavaScript and JQuery: Interactive Front-End Web Development, by Jon Duckett 2.JavaScript: The Definitive Guide, by David Flanagan 3.Learn JavaScript VISUALLY, by Ivelin Demirov
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105084/ https://youtu.be/uUhOEj4z8Fo

ELECTIVE GROUP (05): MOBILE COMPUTING

Subject Name	(05)B - Android
No. of Credits	3 Credits (2 Lectures + 1 Tutorial)
Pre Requisite	Basic Knowledge about Java language
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of programming with GUI .
Understanding	By remembering students the basing concepts students will understand the concepts of program structure with layout
Applying	Students will Have thorough knowledge how programming affects on layout, output design.
Analyzing	To see various parts of design and its elements
Evaluating	Ability to create effective layout.
Creating	Design and create their own screen with proper view.
Syllabus	<p>Unit 1 : Introduction to Android (5 Hours) Evolution of Android ,Advantages of Android, SDK Tools for Android Overview of Android Platform : Android Development IDE Understand the Working of Android, The Android Application Framework, Screen Layout Design, User Interface Design, Introduction to Graphics and Animation Design, Interactivity, Introduction to Content Providers, Intent and Intent Filters</p>
	<p>Unit 2: Android Development Environment (8 Hours) Setting up the Android Development Environment : Installing Android Development Environment, Updating the Android SDK Setting up AVDs and Smartphone Connections Introduction to the Android Software Development Platform : Understanding Java SE and Dalvik Machine, The Directory Structure of an Android Project, Android XML, Android Application Resources ,Launching an Android Application, Creating first Hello Application</p>
	<p>Unit 3: Overview of Android Framework: (7 Hours) Overview of Object Oriented Programming, Overview of XML The Anatomy of an Android Application, Components of an Android Application, Android Intent Objects, Android Manifest XML</p>
	<p>Unit 4: Screen Layout Design: (7 Hours) Android View Hierarchies, Activity Lifecycle, Defining Screen Layouts (Screen size, pixel density) User Interface Design: Using Common UI Elements, Using Menus in Android , Adding Dialogs(Date picker, Time picker, Custom Dialog, Alert Dialog</p>

	<p>Unit 5: Introduction to Graphics Resources: (7 Hours) Introduction to Drawables, Using Bitmap Images, Using Transitions, Creating 9-Patch Custom Scalable Images, Playing Video in Android Apps</p> <p>Handling User Interface Events: An Overview of UI Events, Handling onClick Events for all Views, Android Touch-screen Events: onTouch</p> <p>Touch-screen's Right-Click Equivalent: onLongClick, Keyboard Event Listeners: onKeyUp, onKeyDown, Context Menus: onCreateContextMenu, Controlling the Focus</p>
	<p>Unit 6: (8 Hours)</p> <p>Understanding Content Providers: An Overview of Android Content Providers, defining a Content Provider, Working with a Database</p> <p>Intents and Intent Filters : Understanding the Intents, Android Intent Messaging via Intent Objects, Intent Resolution, Using Intents with Activities, Android Services, Using Intents with Broadcast Receivers</p>
	<p>Unit 7 : Bars and Views : (8 Hours) Action Bar, Toolbar, Navigation Drawer, TextView, EditText, Button, WebView, ImageView ,ListView etc</p>
Reference Books	<p>1.Android Application Development All-in-One For Dummies- Barry A. Burd</p> <p>2.Android Programming: The Big Nerd Ranch Guide Programming Android:</p> <p>3.Java Programming for the New Generation of Mobile Devices- Authors: Zigurd R. Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura</p>
MOOC on NPTEL	<p>https://nptel.ac.in/courses/106/106/106106147/ https://youtu.be/bBt5sTXaOJA</p>

ELECTIVE GROUP (06): DOT NET TECHNOLOGIES

Subject Name:	(06) A- C# Programming and Applications
No. of Credits:	3 Credits
Pre Requisite:	Basic Knowledge of Object-Oriented Programming, Event Driven Programming was and Database Applications.
Cognitive Abilities:	Course Outcome as per Blooms Taxonomy
Remembering:	Using basic concepts of object-oriented programming, event driven programming and database application programming in C# can be understood and remembered.
Understanding:	By remembering basic concepts students can understand how to work with programming in C#. Students need to understand programming structures of OOP in C#. Needs to understand methods and properties of various controls of windows forms application along with database objects and their methods.
Applying:	Students will have detailed knowledge of Abstraction, Inheritance, Polymorphism, Encapsulation, Exception Handling, Windows forms applications and database applications
Evaluating:	Students will have ability to use proper methods of C# to solve object oriented problems.
Creating:	Students can apply the concepts of C# programming to create console based and windows based applications.
Syllabus:	<p>Unit 1: Introduction to C#: (7 Hours)</p> <p>Programming Features of C#, Keywords in C#, Namespaces, Data Types, Variables, Operators, Type Conversions, The ‘?:’ Operator, Control Statements.</p> <p>Methods, Passing Method Parameters, Method Overloading, Array, ArrayList class, String Methods, foreach loop.</p>
	<p>Unit 2: Classes and Objects: (7 Hours)</p> <p>Basic Principles of OOP, Define a Class, Member Access Modifiers, Constructors, Types of Constructors (Default Constructor, Overloaded Constructor, Static Constructor, Private Constructor and Copy Constructor), Destructors, ‘this’ Reference, Constant Members, Properties, Auto Implemented Properties, Object Initializer, Collection Initializer, Anonymous Types, Extension Methods, Partial Class, Partial Methods, Indexers.</p>

	<p>Unit 3: Inheritance and Polymorphism: (8 Hours)</p> <p>Define Inheritance, Types of Inheritance, Method Overriding, Abstract Class, Abstract Methods, Sealed Class and Methods, Define Polymorphism, Static Polymorphism: Function Overloading Operator Overloading, Overloadable and Nonoverloadable Operators, Dynamic Polymorphism, Defining Interface, Extending interface, Interface and Inheritance, Explicit Interface.</p>
	<p>Unit 4: Errors and Exception Handling: (7 Hours)</p> <p>Types of Errors, Exceptions, Syntax for Exceptions Handling Code, Multiple catch Statements, finally Statement, Nested try Block, Throwing Our Own Exception.</p>
	<p>Unit 5: Working with Windows Form Controls: (7 Hours)</p> <p>Properties, Events and Examples of: Button, Label, LinkLabel, TextBox, RichTextBox, ListBox, ListView, ComboBox, RadioButton, CheckBox, CheckedListBox, DateTimePicker, PictureBox, Timer, ProgressBar, TrackBar, HScrollBar, VScrollBar.</p>
	<p>Unit 6: Menus, MDI and Containers: (7 Lectures)</p> <p>ContextMenuStrip, MenuStrip, StatusStrip, ToolStrip, SDI and MDI, Visual Inheritance, GroupBox, Panel, TreeView, SplitContainer, TabControl Example.</p>
	<p>Unit 7: Data Access and Data Bindings: (7 Hours)</p> <p>ADO.NET Overview, .NET Data Providers, ADO.Net Objects, Connections, Commands, Data Adapters, Data Readers , Data Sets , Data Tables , Data Views , Data Bindings, Reports.</p>
References (Books, Websites etc)	<ul style="list-style-type: none"> • C#: The Complete Reference, McGraw-Hill Osborne Media- Herbert Schildt. • C # Programming- Wrox publication. • Programming in C# -A Primer. E. Balaguru
Suggested MOOC:	<ol style="list-style-type: none"> 1) Coursera (www.coursera.org) 2) mymooc (www.my-mooc.com) 3) Class Central (www.class-central.com) 4) edX (www.edx.org) 5) Mooc List (www.mooc-list.com)

ELECTIVE GROUP (06): DOT NET TECHNOLOGIES

Subject Name:	(06)B- ASP.Net with MVC
No. of Credits:	3 Credits
Pre Requisite:	Basic Knowledge of Website Development, JavaScript, Validations, State Management etc..
Cognitive Abilities:	Course Outcome as per Blooms Taxonomy
Remembering:	Using basic concepts of website development, methods and properties ASP. Net in C# can be understood and remembered.
Understanding:	By remembering basic concepts students can understand how to work with web designing in C#. Students need to understand methods and properties of various client and server side controls. Working of state management is also needs to understand.
Applying:	Students will have detailed knowledge of Website design and development, validation, state management, use of web parts and Ajax controls.
Evaluating:	Students will have ability to use proper client side and server side controls of C# to design modern web design.
Creating:	Students can apply the concepts of C# programming for designing a programs for desktop or mobile, as well as web application.
Syllabus	<p>Unit 1: Introduction to ASP.Net: (7 Hours) Introduction to ASP.Net, ASP.Net Architecture, ASP.Net Page Life Cycle, Page Life Cycle Events, ASP.Net Directives., FileUpload Control, Calendar Control, AdRotator Control, MultiView Control, and Wizard Control Examples, Validation Controls, Menu, SiteMapPath, TreeView Control.</p>
	<p>Unit 2: Master Pages, CSS, and JavaScript: (8 Hours) Working With Master Pages, Nested Master Pages, CSS Overview, Adding Style Sheets into, Web Pages, Editing Styles, Applying Styles to Master Pages, Applying Styles to Web Page, JavaScript Overview, Adding JavaScript files into ASP.Net, Editing JavaScript Files, Applying JavaScripts to Master Pages, Applying JavaScripts to WebPage.</p>
	<p>Unit 3: State Management: (7 Hours) View State, Hidden Field, Session State, Application State, QueryString,</p>

	HttpContext, Cookies, Caching, Types of Caching.
	Unit 4: Data Access in ASP.Net: (7 Hours) Data Source Controls, DataList, DataPager, GridView, DetailsView, FormView, Object Data Sources, ListView, DataPager, Repeater.
	Unit 5: ASP. Net Web Parts: (7 Hours) Introduction, Advantages of Web Parts, WebPartsManager, CatalogPart, PageCatalogPart, EditorPart, WebPartZone,, EditorZone, CatalogZone Controls.
	Unit 6 : Ajax Controls: (7 Hours) AJAX control toolkit, Building a ASP.NET Page with Ajax ScriptManager Control, UpdatePanel Control, UpdateProgress Control, Timer Control
	Unit 7: Working with MVC: (7 Hours) Introduction to .Net MVC Framework, MVC Framework Features, MVC Architecture, MVC Components, MVC Application Folders, Configuration files- global.asax, packages.config, web.config, Working with Views, Woking with Controls.
Reference Books:	<ul style="list-style-type: none"> • ASP.Net: The Complete Reference, Matthew MacDonald • Professional ASP.Net (4/4.5) in C #- Wrox publication
Suggested MOOC:	<ol style="list-style-type: none"> 1) Coursera (www.coursera.org) 2) mymoo (www.my-mooc.com) 3) Class Central (www.class-central.com) 4) edX (www.edx.org) 5) Mooc List (www.mooc-list.com)

ELECTIVE GROUP (07): NET CENTRIC TECHNOLOGIES

Subject Name	(07)-A HTML 5.0
No. of Credits	3 Credits
Pre Requisite	Basic concepts of Languages and HTML tags with functions.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Understand the Concepts of HTML 5 & the Applications of HTML 5 to Website Development.
Understanding	By remembering students the basic concepts of HTML and the applications of advanced features of HTML 5. 0 for web development. .
Applying	Students will Have thorough knowledge about practical approach in designing website for various business applications..
Analyzing	To Measure the knowledge about website development and practical applications of advanced features to the web applications
Evaluating	Ability to select proper method to use better tools for website development using HTML 5.0 features and apply security measures to the websites also use useful functions of HTML 5.0
Creating	Design and Develop Websites for various Business Applications. Check information inputted into a Database and validate it.
Syllabus	Unit-1 Introduction to HTML: (7 Hours) MIME Types, Standards for the Internet, Evolution of HTML, Introduction to XHTML, Introduction to Working Group, W3C
	Unit-2 Features of HTML5: (6 Hours) Detection of HTML5 Support, Modernizr: An HTML5 Detection Library, Canvas, Canvas , Text, Video, Video Formats, Local Storage, Web Workers, Offline Web Applications, Geolocation, Input Types, Placeholder Text, Form Autofocus, Microdata
	Unit-3 Elements of HTML5: (7 Hours) The Doctype, The Root Element, The <head> Element, New Semantic Elements in HTML5, Handling of Unknown Elements by the Browsers, Headers, Articles, Dates and Times, Navigation, Footers
	Unit-4 :Drawing Surface: (7 Hours) Introduction to Canvas, Simple Shapes, Canvas Coordinates, Paths, Text, Gradients, Images
	Unit-5 :Video on the web (6 Hours) Video Containers, Video Codecs, Audio Codecs
	Unit-6 :Geolocation and Local Storage for Web Applications (7 Hours) Geolocation API, Handling Errors, geo.js Library, Evolution of Local Storage, Introduction to HTML5 Storage
	Unit-7 :Web Forms and Offline Web Application (6 Hours) Introduction to Web Forms, Placeholder Text, Autofocus Field, e-Mail, Addresses, Web Addresses, Numbers as Spinboxes, Numbers as Sliders, Date Pickers, Search Boxes, Color Pickers, Introduction to

	Offline Web application, The Cache Manifest
Text Books	<ol style="list-style-type: none"> 1. .Anil Gaikwad , Jyoti Biradar (Patil) Basic Concepts of System Analysis Lambert Academic Publication Dec. 2019 . 2. Brian Albers, Frank Salim, and Peter Lubbers “Pro HTML 5.0 Programming
Reference Books	<ol style="list-style-type: none"> 1. Bruce Lawson, Remy Sharp –Introducing HTML 5.0 –Google Books 2010. 2. Jeffrey Zeldman and Jeremy Keith “HTML 5 for Web designers – Google Books-2010. 3. Christopher Murphy, Divya Manian, and Richard Clark :Beginning HTML5 and CSS3.2012. 4. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management Made Easy Lambert Academic Publication 2019 Dec .
MOOC on NPTEL	Please refer these websites for MOOC’s: NPTEL / Swayam www.edx.com www.coursera.com

ELECTIVE GROUP (07): NET CENTRIC TECHNOLOGIES

Subject Name	(07) B - AJAX PROGRAMMING
No. of Credits	3 Credits
Pre Requisite	Basic concepts of Languages and HTML tags with functions.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Understand the Concepts of Basic Programming skills and how to use AJAX Programming for software development .
Understanding	Understand the Concepts of AJAX Programming & the Applications of AJAX to Website Development. Design and Develop Websites for various Business Applications using AJAX Programming. Check information and handle database in websites..
Applying	Students will Have thorough knowledge about practical approach in AJAX programming language for Software development .
Analyzing	Computer programming detail knowledge , An intermediate knowledge on Programming Languages and its structure for developing professional web applications for business organizations.
Evaluating	Ability to select proper method to use better tools for website development using AJAX programming language . Use maximum features of AJAX language and know the details about security features of the language .
Creating	Design and Develop Web applications or web sites for various Business Applications.
Syllabus –	Unit-1 Introduction to AJAX (6 Hours) Introduction to Web Architecture, Traditional Web Communication Processes and Technologies , Introduction to AJAX
	Unit-2 Interacting with the Web Server using XMLHttpRequest Object: (7 Hours) Introduction to Interaction with Web Server, Create an XMLHttpRequest Object, Interact with the Web Server
	Unit-3 : Working with PHP and AJAX: (6 Hours) Introduction to PHP , Process Client Requests , Accessing Files Using PHP
	Unit-4 Manipulating XML Data: (7 Hours) Basics of XML , Create an XML Document Using DOM , Retrieve Data from XML
	Unit-5 : Working with XSLT and AJAX: (7 Hours) Basics of XSLT , Transform Responses Using XSLT
	Unit-6 : Working with JSON: (6 Hours) Introduction to JSON Format, Create Data in JSON Format , Implement JSON on the Server Side scripting.
	Unit-7: Using Frameworks in AJAX: (6 Hours) Understand AJAX Frameworks , Use Prototype and Script.aculo.us , Use jQuery

	<p>Applying Basic AJAX Techniques Download Images Using AJAX, Auto-Populate Select Boxes</p> <p>Implementing Security and Accessibility in AJAX Applications Create Secure AJAX Applications , Create Accessible Rich Internet Applications</p>
Text Books	<ol style="list-style-type: none"> 1. Anil Gaikwad , Jyoti Birada (Patil) Basic Concepts of System Analysis Lambert Academic Publication Dec. 2019 . 2. Brian Albers, Frank Salim, and Peter Lubbers “Pro HTML 5.0 Programming.
Reference Books	<ol style="list-style-type: none"> 1. Ajax: The Definitive Guide: Interactive Applications by Anthony T. Holdener -2014. 2. Kris Hadlock “Ajax for Web Developers Amazon Books 2012. 3 Ajax: The Complete Reference by Thomas A. Powell-Amazon Books 2013 4. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management Made Easy Lambert Academic Publication Dec. 2019
MOOC on NPTEL	Please refer these websites for MOOC"s: NPTEL / Swayam www.edx.com www.coursera.com Website :- https://www.amazon.com/Learn-JavaScript-Ajax-w3Schools-W3Schools/dp/0470611944/

ELECTIVE GROUP (08): INFORMATION SYSTEMS

Subject Name	(08) A -Recommender System
No. of Credits	3 Credits
Pre Requisite	Basic Knowledge about Relational Database Management system and Software Development , Knowledge about Business Organizations and its functions , Theory of Recommender Systems and Decision Making process .
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of software databases ,development stages and software development also software engineering Information can be understood and remembered .
Understanding	By remembering students the basing concepts students will understand the concepts of Recommender system , Internet and database concepts .
Applying	Students will Have thorough knowledge about practical approach in database design and design the recommender systems for business applications
Analyzing	To Measure the Information systems applications with respect to business benefits . reduce the risk of decision making
Evaluating	Ability to select proper method to use proper recommender system for business applications and make it useful for business functions.
Creating	<p>Design and create own recommender system as per the requirements of the business and functions of the business After going through this course a student should be able to understand :</p> <ul style="list-style-type: none"> • Will be able to understand the concepts of Decision Making Process. • Can be able to design and develop Recommender for Business applications. <p>Implementation of Recommender System for various areas of Interest in Business Organizations.</p>
Syllabus –	<p>Unit-1 : Introduction to Basic Concepts: (7 Hours) Collaborative Recommendation: User Based Nearest Neighbor recommendation, Item Based Nearest Neighbor recommendation, model based and pre-processing based approaches. Recent practical approaches and systems. Content based Recommendation: content representation and content similarity, similarity based retrieval, other text classification methods, Knowledge Based Recommendation: Knowledge representation and reasoning, interacting with constraint based recommenders, interacting with case based recommenders,</p>
	<p>Unit-2 :Hybrid recommendation approaches: (6 Hours) Opportunities for hybridization, Monolithic hybridization design, parallelized hybridization design, pipelined hybridization design,</p>
	<p>Unit 3:Evaluating recommender systems : (6 Hours) General properties of Evaluation research, popular evaluation designs, evaluation on historical datasets, alternate evaluation design</p>
	<p>Unit 4: Recent developments: (7 Hours) Attacks on collaborative recommender systems, Online consumer decision making</p>
	<p>Unit 5: Recommender systems and the next-generation web (7 Hours) Recommendations in ubiquitous environments.</p>

	<p>Unit 6: Explanations in recommender systems (6 Hours)</p> <p>Explanations in constraint-based recommenders, explanation in case based recommenders, explanation in collaborative filtering recommenders.</p>
	<p>Unit-7 :Case studies on Recommender System for various Business applications (7 Hours)</p>
Text Books	<ol style="list-style-type: none"> 1. “Innovation Management A Business Development Approach - Anil Gaikwad , Rajesh Kanthe –Lambert Academic Publication Dec 2019. 2. “Recommender systems An Introduction” by Dietmar Jannach, Markus Zanker, Alexzander Felfering, Gerhard friedrich by Cambridge university press 2011 3. Recommender systems handbook [book] by francesco ricci, lior Rokach, Paul b. Kantor in books
Reference Books	<ol style="list-style-type: none"> 1. Amazon books Recommender System Practical Approach Dec-2019 Amazon Books . 2. Tony Campbell Managing Risk and Information Security :- Protect to Enable. A-Press Open Access Book (Free). 3. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management made Easy Lambert Academic Publication 2019
MOOC on NPTEL	<p>https://nptel.ac.in/courses/, NPTEL / Swayam www.edx.com www.coursera.com</p>

ELECTIVE GROUP (08): INFORMATION SYSTEMS

Subject Name	(08) B - Knowledge Management
No. of Credits	3 Credits
Pre Requisite	Knowledge about Information System and MIS with Implementation of MIS
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Using some basic concepts of software development , information system and applications of databases o business problems The objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.
Understanding	By remembering students the basic concepts of Knowledge management students will understand the concepts of applications of knowledge management to the business problems .
Applying	Students will Have thorough knowledge about practical approach in designing knowledge management systems for business functions and apply the various advanced tools of software development .
Analyzing	To Measure the knowledge management applications with respect to business benefits . reduce the risk of decision making
Evaluating	Ability to select proper method to use proper knowledge management system for business applications and make it useful for business functions.
Creating	Design and create own knowledge management After going through this course a student should be able to understand : Will be able to understand the concepts of Knowledge and knowledge management . Can be able to design and develop Knowledge management systems for Business applications . Implementation of KM to various areas of Interest in Business Organizations .
Syllabus	Unit 1: Introduction: (6 Hours) Definition, Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM, Organizational knowledge, Characteristics and Components of Organizational Knowledge
	Unit 2: Drivers of knowledge Management: (7 Hours) Pillars of knowledge Management, KM framework , Supply Chain of KM , Formulation of KM strategy.
	Unit 3: Technology and KM: (6 Hours) Technology components of KM – IT & KM , Ecommerce and KM
	Unit 4: Total Quality Management and KM: (7 Hours) TQM and KM , Bench marking and KM.
	Unit 5: Implementation of KM: (7 Hours) Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM
	Unit 6: KM and Organizational Restructuring: (7 Hours) The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements,

	Corporate Transformation.
	Unit 7: Case studies in Knowledge Management (6 Hours) Knowledge management in Health Care, Knowledge Management in Human Resource Management and other areas of Business Applications.
Text Books	<ol style="list-style-type: none"> 1. “Innovation Management A Business Development Approach - Anil Gaikwad , Rajesh Kanthe –Lambert Academic Publication Dec 2019. 2. Honey Cutt : “Knowledge Management Strategies”, PHI, New Delhi.
Reference Books	References (Books, Websites etc.): 1. Madhukar Shukla: Competing Through Knowledge-Building a learning Organization (Response Books, New Delhi). 2. Awad, KM, Pearson Edn, 2007. 3. Barnes, Knowledge Management Systems, 1/e, Thomson 2006. Ikudiro Nonka & Hirotaka Takeuchi, “ The Knowledge – Creating Company”, Oxford University Press, London. 4. Anil Gaikwad , Jyoti Biradar (Patil) Software Project Management made Easy Lambert Academic Publication 2019
MOOC on NPTEL	Please refer these websites for MOOC’s: NPTEL / Swayam www.edx.com www.coursera.com

ELECTIVE GROUP (09): IOT

Subject Name	(09) A - IoT Architecture Sensors and Fundamentals with Hands-on lab
No. of Credits	3
Pre Requisite	School Level Mathematics. Basics of Programming and Networking
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Learning the concepts of IOT, Networking for IOT, Type of Sensor Network, Arduino Programming
Understanding	IOT Standards, connecting Technologies, Machine to Machine Communication
Applying	Implementing IOT with Arduino
Analyzing	Find the usability of IOT in various applications
Evaluating	Evaluate the performance of IOT solution and upgradation
Creating	Creating small applications for smart home/city using Arduino
Syllabus	<p>UNIT 1 (8 Hour) IOT concepts:</p> <ul style="list-style-type: none"> • Technologies that led to evolution of IOT • IOT and SCADA • IOT and M2M • IOT and Big Data <p>Relevance of IOT for the future</p> <ul style="list-style-type: none"> • IOT in everyday life • Internet of Everything • IOT and Individual Privacy. <p>Sensing, Actuation, Basics of Networking: layered architecture, important protocols (MQTT, CoAP, REST, XMPP, AMQP)</p>
	<p>UNIT 2 (8 Hour) IOT Standards : Requirement of international standard (case study) IOT standards in practice. Operating platforms /systems connectivity Technologies: 802.15.4, Zigbee, 6LoWPANs, RFID, HART, Bluetooth, ZWAVE, ISA 100.11-A</p>
	<p>UNIT 3 (8 Hour) Sensor Networks: components of sensor networks, deriving data from sensor nodes, different types of sensor networks and behavior of node in a sensor network, target tracking, wireless multimedia sensor network, nano networks, relationship between coverage and connectivity, stationary wireless sensor networks, mobile wireless sensor networks, UAV Networks</p>
	<p>UNIT 4 (5 Hour) Machine-to-Machine Communications: exchanging data between machines without human intervention, Low-end sensor nodes, mid-end sensor nodes, M2M ecosystem</p>
	<p>UNIT 5 (6 Hour) Interoperability in IoT, syntactic and semantic interoperability Introduction to Arduino Programming:</p>

	<p>Features of Arduino Arduino IDE Sketch Structure Arduino Function Libraries: Example : blink LED Operators, control statements, arrays, string, random number, Interrupts</p>
	<p>UNIT 6 (6 Hour) Integration of Sensors and Actuators with Arduino: Sensor interface with Arduino, DTH Sensor Library, Type of Motor Actuators, integration of Actuator with Arduino</p>
	<p>UNIT 7 (8 Hour) IOT Applications: Lighting as a service (case study) Intelligent Traffic systems (case study) Smart Parking (case study) Smart water management (case study) Implement one small project</p>
Text Books	<ul style="list-style-type: none"> • Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications • Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-onApproach)”, 1 st Edition, VPT, 2014.
Reference Books	<ol style="list-style-type: none"> 1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014. 2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI 3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer 46. <p>http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm</p>
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (09): IOT

Subject Name	(09) B - Internet Of Things: implementation with Python and Raspberry Pi
No. of Credits	3 Credits
Pre Requisite	School Level Mathematics. Basics of Programming and Networking
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	Understand IoT sensors and technological challenges faced by IoT devices
Understanding	Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
Applying	Implementing IOT with Python and Raspberry Pi
Analyzing	Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi
Evaluating	Evaluate the performance of IOT solution and upgradation
Creating	Creating small applications for smart home/city using Python and Raspberry Pi
Syllabus	<p>UNIT 1 (8 Hour) Introduction to Python Programming: Pyton IDE (Spider, Anaconda), Data Types in Python, control statements, functions, file read/write operations, image read/write operations, Networking in Python,</p> <p>UNIT 2 (8 Hour) Introduction to Rasberry Pi: Basic architecture, installation, Rasberry Pi GPIO, OS setup, using GPIO pins, Taking Pictures using PiCam using Python on Rasberry Pi</p> <p>UNIT 3 (8 Hour) Implementation of IOT with Rasberry Pi, integration of sensors for data collection, dissemination of data for processing, visualization of data</p> <p>UNIT 4 (5 Hour) Software Defined Networking: Origin of SDN SDN Architecture Rule Placement OpenFlow Protocol APIs in SDN Controller Placement Integration of SDN with IoT</p> <p>UNIT 5 (6 Hour) Cloud Computing: Introduction, Service Model Service Management Sensor-cloud Fog Computing</p> <p>UNIT 6 (6 Hour) Smart Cites, Smart Homes, connected vehicles, Industrial IOT</p> <p>UNIT 7 (8 Hour) Data Handling and Analytics Implement one small project</p>
Text Books	<ul style="list-style-type: none"> • Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications • Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on

	Approach)”, 1 st Edition, VPT, 2014.
Reference Books	<p>1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014.</p> <p>2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI</p> <p>3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer 46.</p> <p>http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm</p>
MOOC on NPTEL	https://nptel.ac.in/courses/106/105/106105166/

ELECTIVE GROUP (10): BIG DATA

Subject Name	(10) A - Introduction to Big Data
No. of Credits	3 Credits
Pre Requisite	Preliminary knowledge of computer, Data Mining, Data Warehousing Concepts.
Course Objectives	To introduce learner with Big Data Concept, decision making by doing analysis on the data and managing the data using Big Data Concept like Business Intelligence Concept, decision making by Business Intelligence Tools on Applications such as Finance, Marketing, Education etc.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	<ul style="list-style-type: none"> Remember the definitions of concepts of Big Data and Business Intelligence Tools.
Understanding	<ul style="list-style-type: none"> Understand the concept of Big Data and Business Intelligence Tools. Understand decision making Theory and Strategies for Big Data. Understand different Business Intelligence Applications. Understanding the use of Business Intelligence for AI and Security.
Applying	<ul style="list-style-type: none"> Knowledge of Decision making using analysis on the Big Data Applying on different Big Data Applications in Industries
Analyzing	<ul style="list-style-type: none"> Identify and study the Big Data Analysis by Decision Theory and Strategy. User experience on Big Data and Business Intelligence Tools.
Evaluating	<ul style="list-style-type: none"> Applying Decision Making Theory on Big Data.
Creating	<ul style="list-style-type: none"> Case Studies: Knowledge about different applications used in industries. Using Business Intelligence in AI. Using Business Intelligence for Security
Syllabus	<p>Unit 1. Introduction: (Hours -5) Big Data History, The Big Data Business Opportunity- Business Transformation Imperative, Big Data Business Model, Business Impact of Big Data, Big Data In Organization: Data Analytics Lifecycle, Data Scientist Roles and Responsibilities – Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, New Organizational Roles, Liberating Organizational Creativity.</p>
	<p>Unit 2. Decision Theory And Strategy: (Hours -7) Business Intelligence Challenge, Big Data User Interface Ramifications, Human Challenge of Decision Making, Strategy for Decision Making- Big Data Strategy Document, Case Study. Value Creation Process: Understanding Big Data Value Creation, Michael Porter’s Value Creation Models: Michael Porter’s Value Chain Analysis, Case Study.</p>
	<p>Unit 3. Big Data User Experience: (Hours -6) The Unintelligent User Experience, Understanding the Key Decisions to Build a Relevant User Experience, Using Big Data Analytics to Improve Customer Engagement, Uncovering and Leveraging Customer Insights, Big Data can Power a New Customer Experience, Big Data Use Cases: 1. Research Business Initiatives, 2. Acquire and Analyze your Data, 3. Brainstorm New Ideas, 4. Prioritize Big Data Use Cases, 5. Document Next Steps, The Prioritization Process.</p>

	<p>Unit 4. Introduction To Business Intelligence Applications: (Hours -6) Introduction to Big Data, Business Intelligence Data Mining, and Data Warehousing, What are Business Intelligence Applications (BIA). Features of BIA. Sales, Finance And Marketing: Introduction to Sales, Finance and Marketing Concept, Education And Learning: Introduction to Education System, Learning Concept.</p>
	<p>Unit 5. Vertical AI Applications: (Hours -7) Overview of AI, What is Vertical AI, Features of Vertical AI, Use of Business Intelligence in Vertical AI, Case Study.</p>
	<p>Unit 6. Security: (Hours -7) Define Security, Security in Big Data, Problems with Security, Business Intelligence for Security, Case Study.</p>
	<p>Unit 7. Lifescience: (Hours -7) Introduction to Life Science, Life Science Intelligence, Features of Life Science Intelligence, Use of Life Science Intelligence in Decision Making, Case Study.</p>
Text Books	
Reference Books	<p>1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo 2. Edureka lectures Link:- https://www.youtube.com/watch?v=A02SRdyoshM 3. Business Intelligence Strategy -By John Boyer, Bill Frank, Brain Green, Tracy Harris</p> <p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com</p>

ELECTIVE GROUP (10): BIG DATA

Subject Name	(10) B -Business Intelligence Tools with HADOOP
No. of Credits	3 Credits
Pre Requisite	Preliminary knowledge of computer, Big Data Analysis and Business Intelligence.
Course Objectives	To introduce learner with Big Data Concept and HADOOP tool for Business Intelligence. Using different Advance Excel Functions (like Optimization) and implementing it on Big Data for decision making. By solving Case Studies the students will get real example of using BI Tools in industry. It will also introduce learner with decision making by doing analysis on the data using HADOOP Tool and also managing the Big Data using HADOOP.
Cognitive Abilities	Course Outcome as per Blooms Taxonomy
Remembering	<ul style="list-style-type: none"> Remember the concepts of Business Intelligence Tools and HADOOP.
Understanding	<ul style="list-style-type: none"> Understand the Excel Tools for Business Intelligence. Understand working with Macros. Understand HDSF, Mapping and Reducing in HADOOP Environment. Understanding the Clusters and Nodes in HADOOP Environment.
Applying	<ul style="list-style-type: none"> Knowledge of Decision making using analysis on the Big Data using Excel Tools. Knowledge of Decision making using HADOOP analysis on the Big Data
Analyzing	<ul style="list-style-type: none"> Applying the Excel Tools or Mapping and Reducing on Big Data. Implementing Environment Setup of HADOOP.
Evaluating	<ul style="list-style-type: none"> Applying HADOOP Environment for Analysis on Big Data.
Creating	<ul style="list-style-type: none"> Case Studies: for Big Data Analysis using Excel tools or HADOOP Using features of Macros.
Syllabus	<p>Unit 1. Introduction To Big Data and Business Intelligence (Hours -5) Overview of - Data Mining, Data Warehousing, Big Data, How Business Intelligence is useful for Big Data, Big Data Problems. Introduction to BI, Data Cleaning- Editing a Workbook, Data Cleaning Using Text Functions, Using Validation To Keep Data Clean, Working with Multidimensional Data- Pivot Tables, Pivot Charts.</p>
	<p>Unit 2. Applications Of Business Intelligence and Excel Tools (Hours - 6) CRM Domain, Banking Domain, Health Care Domain, Mobile Industry Domain, Creation of a New Product, Providing Personalized Services, Optimization Modeling With Solver: Introduction to MS-Excel and MS-Excel Formulas, Understanding Optimization Modeling, Setting Up a Solver Worksheet, Solving an Optimization Modeling Problem, Reviewing the Solver Reports, Working With Solver: Working With the Solver Options, Setting a Limit on Solver, Understanding the Solver Error Messages, Case Studies (Solver Problems).</p>
	<p>Unit 3. Advance Excel Tools: (Hours -7) Using Shared Work Books- Sharing a workbook, Opening and editing a</p>

	shared workbook, Tracking changes, Resolving conflict in a shared workbook, Multiple workbooks- Linking workbooks, Editing the Link, Consolidating the workbook.
	Unit 4. Working With Macros: (Hours -6) Introduction to Macros? Where are Macros, Features of Macros, Working with Macros- Display the developer Tab, Changing Macro security Settings, Recording and running a Macro.
	Unit 5. Introduction To HADOOP: (Hours -6) Hadoop Architecture, MapReduce, Hadoop Distributed File System, How Does Hadoop Work?, Advantages of Hadoop. HDFS Overview: Features of HDFS, HDFS Architecture, Starting HDFS, Listing Files in HDFS, Inserting Data into HDFS, Retrieving Data from HDFS, Shutting Down the HDFS.
	Unit 6. MAPREDUCE: (Hours -7) What is MapReduce?, The Algorithm for MapReduce, Inputs and Outputs (Java a Perspective), Analyze different use-cases where MapReduce is used, Differentiate between traditional way and MapReduce way. Introduction To Hadoop Features: New Big Data Architecture, Introducing HADOOP Features – Apache Hive, Apache HBase, Pig.
	Unit 7. Multi Node Cluster: (Hours -8) Multi Node Cluster, Install Java, Creating User Account, Mapping the Nodes, Installing Hadoop, Configuring Hadoop, Start Hadoop Services, Adding New Data Node in the Hadoop Cluster, Removing New Data Node from the Hadoop Cluster. Environment Setup: Pre-installation Setup, Installing Java Downloading Hadoop Hadoop Operation Modes Installing Hadoop in Standalone Mode Installing Hadoop in Pseudo Distributed Mode Verifying Hadoop Installation, Implement basic Hadoop commands on terminal.
Text Books	
Reference Books	<ul style="list-style-type: none"> ▪ Tutorials Point for advance Excel Tools. ▪ Excel 2010 Bible by John Walkenbach, John Wiley & Sons, 2010 Edition. ▪ https://office.live.com/start/Excel.aspx ▪ https://www.talend.com/ ▪ www.tutorialspoint.com <p>Suggested MOOC : Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com, www.coursera.com</p>

ELECTIVE GROUP (11): CYBER SECURITY

Title of the Course	(11) A -Introduction to Information Security
Number of Credits	3 Credits
Pre-Requisites	Information about computer hardware, system and application software, and networking
Course Outcomes as per Bloom's Taxonomy	
Remember	Concepts involved in information systems
Understand	Security concerns involving information systems
Apply	Understanding of concerns to improve information security
Analyze	Real-life scenarios with respect to information systems
Evaluate	Scenarios involving information systems and security concerns
Create	Information security awareness to address real-world scenarios
Syllabus (45 Hours)	<p>Unit-1: Information Security Concepts (10 Hours)</p> <ul style="list-style-type: none"> ▪ Confidentiality, Integrity and Availability of Information ▪ Identification, Authentication and Authorization ▪ Security Principles and Models
	<p>Unit-2: Physical Security (5 Hours)</p> <ul style="list-style-type: none"> ▪ Facility Requirement ▪ Perimeter Security ▪ Fire Protection ▪ Fire Suppression ▪ Power Protection ▪ General Environmental Protection ▪ Equipment Failure Protection
	<p>Unit-3: Network Security (10 Hours)</p> <ul style="list-style-type: none"> ▪ Secure Network design ▪ Firewalls ▪ WLAN Security ▪ VPNs ▪ Types and Sources of Network Threats
	<p>Unit-4: Operating System Security (5 Hours)</p> <ul style="list-style-type: none"> ▪ Windows ▪ Linux/UNIX
	<p>Unit-5: Database Security (5 Hours)</p> <ul style="list-style-type: none"> ▪ MS SQL

	Unit-6: Web Application Security (5 Hours) <ul style="list-style-type: none"> ▪ Web Application Vulnerabilities ▪ Secure Coding Techniques ▪ Continuous Security Testing and Assessments
	Unit-7: Compliance Standards (5 Hours) <ul style="list-style-type: none"> ▪ IT Act ▪ ISO 27001 ▪ ITIL Framework
Text Book	Shimonski R., <i>Certified Ethical Hacker - Study Guide</i> , Sybex
Reference Book	Lammle T., <i>CCNA - Routing and Switching - Complete Study Guide</i> , Sybex
Supplementary SWAYAM Course	Cyber Security (https://swayam.gov.in/nd2_cec20_cs15/preview)

Title of the Course	(11) B - Information Security Threats and Mitigation Strategies
Number of Credits	3 Credits
Pre-Requisites	Information about computer hardware, system and application software, and networking
Remember	Concepts involved information security domain
Understand	Security vulnerabilities and threats
Apply	Understanding of security threats to mitigate them
Analyze	Real-life scenarios with respect to information security
Evaluate	Scenarios involving information security threats
Create	Awareness about mitigation of information security threats in real-world scenarios
Course Outcomes as per Bloom's Taxonomy	
Syllabus (45 Hours)	Unit-1: Introduction to Information Security Threats (10 Hours) <ul style="list-style-type: none"> ▪ TCP/IP Fundamentals ▪ Operating System Fundamentals ▪ Web Application and Database Fundamentals ▪ Introduction to Ethical Hacking ▪ Advanced Persistent Threats
	Unit-2: Information Gathering (10 Hours) <ul style="list-style-type: none"> ▪ Footprinting ▪ Advanced Google Hacking ▪ Nmapping the network ▪ Fingerprinting
	Unit-3: Exploitation (5 Hours) <ul style="list-style-type: none"> ▪ Hacking Networks ▪ Hacking Servers ▪ Hacking Databases ▪ Password Cracking
	Unit-4: Advanced Exploitation (5 Hours) <ul style="list-style-type: none"> ▪ Hacking WLANs ▪ Evading IDS, Firewalls ▪ Web Application Hacking ▪ Advanced Web Hacking ▪ Hacking Web Browsers
	Unit-5: Social Engineering (5 Hours) <ul style="list-style-type: none"> ▪ Introduction to Social Engineering ▪ Common Types of Attacks ▪ Online Social Engineering
	Unit-6: Cryptography (5 Hours)

	<ul style="list-style-type: none"> ▪ Introduction to Cryptography ▪ Encryption and Decryption ▪ Cryptographic Algorithms ▪ Digital Signature ▪ Cryptography Tools ▪ Cryptography Attacks
	Unit-7: Malware Attacks (5 Hours) <ul style="list-style-type: none"> ▪ Viruses ▪ Worms ▪ Trojans
Text Book	Shimonski R., <i>Certified Ethical Hacker - Study Guide</i> , Sybex
Reference Book	Howard M., <i>Writing Secure Code</i> , Microsoft Press
Supplementary SWAYAM Course	Introduction to Cyber Security (https://swayam.gov.in/nd2_nou20_cs02/preview)



BHARATI VIDYAPEETH

(Deemed to be University), Pune

'A+' Accreditation (Third Cycle) by 'NAAC' in 2017

Category - I - Deemed to be University Grade by UGC

**'A' Grade University Status by MHRD Govt. of India
Ranked 63rd By NIRF – 2020 Under University**

FACULTY OF MANAGEMENT STUDIES

MASTER OF BUSINESS ADMINISTRATION

MBA (General)

CHOICE BASED CREDIT SYSTEM (CBCS)

SYLLABUS

Applicable with effect from 2020-21

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BHARATI VIDYAPEETH (DEEMED to be UNIVERSITY), PUNE
Faculty of Management Studies
Master of Business Administration– (MBA-General)
Revised Course Structure (To be effective from 2020-2021)

I. Title:

- a) **Name of the Programme: Master of Business Administration (General)**
- b) **Nature & duration of the Programme: FULL TIME Post-Graduate Degree Programme of TWO YEARS (approved by AICTE).**

II. Introduction :

The Master of Business Administration (General) is a full time two-year program offered by Bharati Vidyapeeth (Deemed to be University), Pune and conducted at its Management Institutes in Pune, New Delhi, Karad, Kolhapur, Sangli, and Solapur. All the institutes have experienced faculty members, excellent Laboratories, Library, and other modern facilities to provide proper learning environment to the students. This programme is very well received by the industry.

III. Rationale for Syllabus revision:

The Vision and Mission statements of the MBA (General) program embodies the spirit of the mission of the University and vision of Hon'ble Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth (Deemed to be University), Pune, which is to usher in "Social Transformation through Dynamic Education

In view of the dynamic nature of the market, economy and evolving expectations of the stakeholders such as students, faculty members and industry in particular, the syllabus is revised periodically. Last revision was in the year 2016-17.

Over the past four years, feedback was received from various stakeholders and considering the changes that in the macro environment, a need was felt to revise the syllabus so as to suffice the requirements of the industry and society. This revised draft is the result of inputs received from the industry, academia, alumni and all stakeholders. This revised draft is the result of inputs received time to time from the industry, academia, alumni and all stakeholders

IV. Vision Statement of MBA (General) Program :

To facilitate creation of Dynamic and Effective Business Professionals, Managers and Entrepreneurs who can transform the corporate sector, cater to the needs of the society and contribute towards Nation building.

V. Objectives of the MBA (General) Program :

At Bharati Vidyapeeth (Deemed to be University), Pune the objective of MBA (General) Program is to provide world class Business Education and develop dynamic managers, entrepreneurs and business leaders. The Program aims to enhance decision

making capabilities of upcoming managers by imparting critical thinking and analytical abilities.

VI. MBA Program: Program Outcomes

On the successful completion of this Program a student shall be able to:

1. Apply the knowledge of management theories and practices to solve business problems.
2. Foster analytical and critical thinking abilities for data-based decision making.
3. Learn new technologies with ease and be productive at all times
4. Ability to understand, analyze and communicate global, economic, legal and ethical aspects of business.
5. Read, write, and contribute to Business literature
6. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

VII. Eligibility for Admission:

Admission to the programme is open to any graduate (10+2+3) of any recognized university satisfying the following conditions:

1. The candidate should have secured at least 50% (45% for SC/ST) in aggregate at graduate level university examination.
2. The Candidate studying in final year of Bachelor's degree may also apply. Admission of such candidates will remain provisional until submission of final result certificates in original.
3. Subject to the above conditions, the final admission is based solely on
 - a) The merit at the All India entrance test (B-MAT) followed by Group Discussion & Personal Interview conducted by Bharati Vidyapeeth (Deemed to be University), Pune
 - b) Submission of Migration Certificate, Transference Certificate, anti-ragging affidavit etc.

VIII. Structure of the Program:

The MBA-General program is of **102** credits which need minimum two years divided into four semesters to complete. During third semester students have to opt for

specialization(s) and study the specialization courses in depth. The programme also includes Summer Internship / Summer Training of 50 days. The medium of instruction and examination will be only English.

A student would be required to complete the course within FOUR academic years from the date of admission.

IX. Credits – 102

The definition of credits is based on the following parameters;

- i) Learning hours put in by the learner
- ii) Learning outcomes
- iii) Contents of the syllabus prescribed for the course etc.

In this system each credit can be described as a combination of 03 (**THREE**) components such as Lectures (L) + Tutorials (T) + Practice (P).

These components are further elaborated for an effective teaching learning process;

- Lectures (L): Classroom lectures delivered by Faculty member in an interactive mode.
- Tutorials (T): Sessions that includes participatory discussions, presentations by the students, case study discussions etc.
- Practice (P): It includes LAB sessions for IT related courses & Business Communication and practice sessions for courses like Accounts, Mathematics, Statistics and field assignments etc.

- ONE Credit = 12 Hours ; In terms of a Semester of 15 (FIFTEEN) weeks,

- Every ONE hour session per week of Lecture (L) = 01 (one) credit per Semester

- TWO hour sessions per week of Tutorial (T) = 01(one) credit per Semester

- TWO hour sessions per week of Practice (P) = 01(one) credit per Semester

 - a) Every **ONE** hour session per week of Lecture (L) = 01 (one) credit per Semester

 - b) **TWO** hour sessions per week of Tutorial (T) = 01(one) credit per Semester

 - c) **TWO** hour sessions per week of Practice (P) = 01(one) credit per Semester

X: Examination :

1. A) Scheme of Examination:

Courses having Internal Assessment (IA) and University Examinations (UE) shall be evaluated by the respective institutes and the University at the term end for 50(fifty) and 50(fifty) Marks respectively. The total marks of IA and UE shall be 100 Marks and it will be converted to grade points and grades.

For courses having *only Internal Assessment (IA)* the respective institutes will evaluate the students in various ways through *Class Test, Presentations, Field Assignments and Mini Projects* for a total of 100 marks during the term. Then the marks will be converted to grade points and grades.

Open Courses shall be evaluated for 100 marks only (hundred marks only).

B) Components of continuous evaluation system (CES) :

Following are the suggested components of CES,

- a) Case Study/ Caselet/Situation Analysis- (Group Activity or Individual Activity)
- b) Class Test
- c) Field Assignment
- d) Role play
- e) Industry Analysis (Group Activity or Individual Activity)
- f) Business plan
- g) Quiz
- h) Workbook / scrapbook
- i) Presentations
- j) Mini Research Projects

Breakup of CES marks (50)

Class Participation / Attendance	10
Mid-term	15
End-term	15
Class Tests, Assignments, MOOCs, Presentation / Mini-Project, Case Study/Lab work etc.	10

2. Grading System for Programmes under Faculty of Management Studies:

The Faculty of Management Studies, Bharati Vidyapeeth (Deemed to be University), Pune has suggested the use of a 10-point grading system for all programmes designed by its different Board of Studies.

The 10 point Grades and Grade Points according to the following table

Range of Marks (%)	Grade	Grade Point
80≤Marks≤100	O	10
70≤Marks≤80	A+	9
60≤Marks≤70	A	8
55≤Marks≤60	B+	7
50≤Marks≤55	B	6
40≤Marks≤50	C	5
Marks < 40	D	0

Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

- If learner fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at UE.
- A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA he/she has to reappear only at IA as backlog candidate and clear the Head of Passing to secure the GPA required for passing.
- The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 50% and 50% respectively.
- GPA is calculated by adding the UE marks out of 50 and IA marks out of 50. The total marks out of 100 are converted to grade point, which will be the GPA.

Formula to calculate Grade Points (GP)

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set $x = \text{Max}/10$ (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all the courses since his/her enrollment. The CGPA of learner when he /she completes the program is the final result of the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

where, C_k is the Credit value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the following formula

$$CGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

where, C_k is the Credit value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrollment and also during the semester for which CGPA is calculated. **The CGPA shall be calculated up to two decimal place accuracy.**

The formula to compute equivalent percentage marks for specified CGPA:

% marks (CGPA)	10 * CGPA-10	If 5.00 ≤ CGPA ≤ 6.00
	5 * CGPA+20	If 6.00 ≤ CGPA ≤ 8.00
	10 * CGPA-20	If 8.00 ≤ CGPA ≤ 9.00
	20 * CGPA-110	If 9.00 ≤ CGPA ≤ 9.50
	40 * CGPA-300	If 9.50 ≤ CGPA ≤ 10.00

Award of Honours:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed.

The criteria for the award of honors are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA below 5.0	F	Fail	Marks below 40

3. ATKT Rules:

A student is allowed to carry any number of backlog papers of Semester I and Semester II while going into Semester III. However, a student must clear all papers of Semester I and Semester II so as to become eligible for appearing in Examinations at Semester IV.

XI: A. Dual Specialization:

M.B.A (General) Programme 2020-21 offers Dual Specialization to the students in second year of MBA Programme. Under dual specialization students are required to select any **Two Specialization Groups** from the list given below :

i) Prerequisite for offering a combination of Specialization Groups

The Institute will offer the Specializations proposed only if minimum **Ten** students opt for the same.

ii) Specialization Combinations:

Two Specializations may be chosen from the following choices :

Specialization Choices
Marketing Management
Financial Management
Human Resource Management
Information Technology Management
International Business Management
Production & Operations Management
Agribusiness Management
Retail Management

B. Summer Internship:

At the end of Semester II, each student shall undertake Summer Internship in an Industry for 50 (**Fifty Days**). It is mandatory for the students to seek written approval from the Faculty Guide about the Topic and the Organization before commencing the Summer Internship.

During Summer Internship students are expected to take necessary guidance from the faculty guide allotted by the Institute. To do it effectively they should be in touch with their guide through e-mail or phone.

Summer Internship Project should be a research project or it may be an operational assignment that involves working by the students in an organization.

In case of an operational assignment

- 1) Students are expected to do a project work in an organization wherein they are doing Summer Internship.
- 2) The students should identify specific problems faced by the organization in a functional area in which the assignment is given.
e.g.
 - a) Sales - sales targets are not achieved for a particular product or service in a given period of time.
 - b) Finance – mobilization & allocation of financial resources.
 - c) HR – Increase in employee turnover ratio.
- 3) In this study students should focus on
 - Identifying the reasons / factors responsible for the problems faced by the organization
 - Collection of data(Primary & Secondary) related to reasons /factors responsible for these problems
 - Data Analysis tools & interpretation
 - Findings & observations.
 - Suggestions (based on findings & observations) for improving the functioning of the organization.

The ***learning outcomes and the utility to the organization*** must be highlighted in Summer Internship Project Report.

- 4) General chapterization of the report shall be as under;
- 1) Introduction and Literature Review: - This chapter will give a reader the background of problem area, specific problem & how you come across it?
 - 2) Company profile: -
 - 3) Objectives of the study:-
 - 4) Data collection: -
 - 5) Data analysis & interpretation: -
 - 6) Findings & observations: -
 - 7) Suggestions:-

Annexure: -

- Questionnaire
- References.

5. Technical details:

1. The report shall be printed on A-4 size white bond paper.
2. 12 pt. Times New Roman font shall be used with 1.5 line spacing for typing the report.
3. 1” margin shall be left from all the sides.
4. Considering the environmental issues, students are encouraged to print on both sides of the paper.
5. The report shall be hard bound as per the standard format of the cover page given by the Institute and shall be golden embossed.
6. The report should include a Certificate (on company’s letter head) from the company duly signed by the competent authority with the stamp.
7. The report shall be signed by the respective guide(s) & the Director of the Institute 10 (Ten) days before the viva-voce examinations.
8. Student should prepare two hard bound copies of the Summer Internship Project Report and submit one copy in the institute. The other copy of the report is to be kept by the student for their record and future references.
9. In addition to this, students should prepare two soft copies of their SIP reports & submit one each in Training & Placement Department of the Institute & Library

The Summer Internship shall be assessed out 100 Marks. The break-up of these marks is as under;

Sr. No.	Assessment Criteria	Marks
1	Summer Internship Report	50 (Fifty only)
2	Viva- voce examination	50 (Fifty only)

TOTAL MARKS

100

The examiners' panel shall be approved as per the University Guidelines.

The viva –voce shall evaluate the project based on

- i. Actual work done by the student in the organization
- ii. Student's knowledge about the company & Business Environment
- iii. Learning outcomes for the student
- iv. Utility of the study to the organization

Question Paper Pattern for University Examinations

The pattern of question paper for the courses having University Examinations will be as follows:

Title of the Course

Day: **Total Marks: 50**

Date: **Time: 02 Hours**

Instructions:

- a. Attempt any **THREE** questions from Section I and any **TWO** questions from **SECTION II**.
- b. All questions carry **EQUAL** marks.
- c. Answers to both the Sections should be written in the **SAME** answer book.

	SECTION – I	30 Marks
<i>It should contain 05 questions covering the syllabus & should test the conceptual knowledge of the students.</i>		
Question		Marks
Q.1	(10 marks)
Q.2		(10 marks)
Q.3		(10 marks)
Q.4		(10 marks)
Q.5.	Write Short Notes on ANY TWO	(10 marks)
SECTION – II		
20 Marks		
<i>It should contain 03 questions covering the entire syllabus & should be based on application of the Concepts</i>		
Q.6.		(10 marks)
Q.7.		(10 marks)
Q.8		(10 marks)

XII. Structure of the Syllabus

The MBA Programme as per Semesters, Credits and Marks is as follows:

Semester	Credits	Marks Distribution
I	25	900
II	25	900
III	31	1000
IV	21	800
Total	102	3600

The detailed structure is as follows

MBA – (General)- Semester I

Course Code	Semester – I	Credits	IE	UE	Total Marks
101	Management Concepts & Applications	3	50	50	100
102	Managerial Economics	3	50	50	100
103	Financial & Management Accounting	3	50	50	100
104	Organizational Behaviour	3	50	50	100
105	Statistical Techniques	3	50	50	100
106	Legal Aspects of Business	3	50	50	100
107	Business Communication	3	50	50	100
108	Data Analysis Using Advance - Excel	2	100	-	100
See below	Open 1	2	100	-	100
Total No. of Credits		25	550	350	900

Open Courses: Students can opt any one course from the following

Course Code	Open Course
109	Computers Application for Business
110	Social Media Management
111	Current Affairs

**** In addition to the above ;Add on Course having 02 (TWO) credits may be offered by the Institute on Extra fees for the course from the student.**

MBA - (General)- Semester II

Course Code	Semester II	Credits	IE	UE	Total Marks
201	Marketing Management	3	50	50	100
202	Financial Management	3	50	50	100
203	Human Resource Management	3	50	50	100
204	International Business	3	50	50	100
205	Production & Operations Management	3	50	50	100
206	Research Methodology	3	50	50	100
207	Business Environment	3	50	50	100
208	Business Ethics and Corporate Governance	2	100	-	100
See below	Open	2	100	-	100
Total No. Credits		25	550	350	900

Open Courses: Any one course from the following

Course Code	Open course
209	Introduction to Business Analytics
210	E-commerce Applications
211	Managerial Skills for Effectiveness

**** In addition to the above ;Add on Course having 02 (TWO) credits may be offered by the Institute on Extra fees for the course from the student.**

MBA -(General)- Semester III

Course Code	Semester – III	Credits	IE	UE	Total Marks
301	Strategic Management	3	50	50	100
302	Operations Research for Managers	3	50	50	100
303	Entrepreneurship Development and Innovation Management	3	50	50	100
See groups	Specialization I - E-(i)	3	50	50	100
	Specialization I - E-(ii)	3	50	50	100
See groups	Specialization II - E-(i)	3	50	50	100
	Specialization II - E-(ii)	3	50	50	100
304	**Summer Internship	6	50	50	100
305	Change Management	2	100	-	100
See below	Open	2	100	-	100
	Total No. of Credits	31	600	400	1000

Open Courses: Students can opt any one course from the following

Course Code	Open Course
306	Digital Marketing
307	Corporate Taxation
308	Negotiation Management

**** In addition to the above ;Add on Course having 02 (TWO) credits may be offered by the Institute on Extra fees for the course from the student.**

MBA - (General) -Semester IV

Course Code	Semester IV	Credits	IE	UE	Total Marks
401	Project Management	3	50	50	100
See groups	Specialization I - E-(iii)	3	50	50	100
	Specialization I - E-(iv)	3	50	50	100
See groups	Specialization II - E-(iii)	3	50	50	100
	Specialization II - E-(iv)	3	50	50	100
402	Environment & Disaster Management	2	100	-	100
403	E-Business Management	2	100	-	100
See below	Open	2	100	-	100
	Total No. Credits	21	550	250	800

Open Courses: Any one course from the following

Course Code	Open course
404	Cyber Security
405	Artificial Intelligence for Managers
406	Rural Entrepreneurship

**** In addition to the above ;Add on Course having 02 (TWO) credits may be offered by the Institute on Extra fees for the course from the student.**

LIST OF SPECIALIZATION - ELECTIVES

Elective: Marketing Management :

Sem III	
Code.	Name of the Course
MK01	Consumer Behaviour
MK02	Services Marketing
Sem IV	
MK03	Sales & Distribution Management & B2B
MK04	Integrated Marketing Communication

Elective: Financial Management

Sem III	
Code.	Name of the Course
FM01	Investment Analysis & Portfolio Management
FM02	Management of Financial Services
Sem IV	
FM03	Corporate Finance
FM04	International Financial Management

Elective: Human Resource Management

Sem III	
Code.	Name of the Course
HR01	Human Resource Planning and Development
HR02	Labour Laws
Sem IV	
HR03	Compensation and Benefits Management
HR04	Competency Mapping and Performance Management

Elective: International Business Management

Sem III	
Code.	Name of the Course
IB01	Regulatory Aspects of International Business
IB02	Export Import Policies, Procedures and Documentation
Sem IV	
IB03	International Marketing
IB04	Global Business Strategies

Elective: Production & Operations Management

Sem III	
Code.	Name of the Course
PM01	Quality Management
PM02	Business Process reengineering
Sem IV	
PM03	Logistics & Supply Chain Management
PM04	World Class Manufacturing Practices

Elective: Information Technology Management

Sem III	
Code.	Name of the Course
IT01	System Analysis & Design
IT02	Information System Security & Audit
Sem IV	
IT03	RDBMS with Oracle
IT04	Enterprise Business Applications

Elective: Agribusiness Management

Sem III	
Code.	Name of the Course
AM01	Rural Marketing
AM02	Supply Chain Management in Agribusiness
Sem IV	
AM03	Use of Information Technology in Agribusiness Management
AM04	Cooperatives Management

Elective: Retail Management

Sem III	
Code.	Name of the Course
R01	Introduction to Retailing
R02	Retail Management & Franchising
Sem IV	
R03	Merchandising, Display & Advertising
R04	Supply Chain Management in Retailing

SYLLABUS
(w.e.f. 2020_21)

MBA - (GENERAL)

SEMESTER – I

Programme: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	101	Management Concepts and Applications	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :
<ol style="list-style-type: none"> 1) To understand the basic Management Concepts and Skills. 2) To study the Principles and Functions of Management. 3) To learn the Applications of Principles of Management. 4) To familiar with the Functional areas of management. 5) To study the Leadership styles in the organization. 6) To expose to the Recent trends in management.
Learning Outcomes:
<p>On completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1) Understand the Management Concepts and Managerial Skills. 2) Focus on the Principles and Functions of Management. 3) Learn to apply the Principles of Management in practice. 4) Familiarize with the Functional areas of management. 5) Use the effective Leadership styles in the organization. 6) Recognize the Recent trends in management.

Unit	Contents	Sessions
1	Introduction to Management: Definition and meaning of Management, Characteristics of Management, Scope of Management, Scientific Management Approach by F.W. Taylor, Principles of Management by Henry Fayol, Levels of management, Managerial Skills, Functions of Management - Planning, Organizing, Staffing, Directing and Controlling. concept of "POSDCORB".	06
2	Planning: Meaning of Planning, Nature and importance of Planning, Process of Planning, Principles of Planning, Types of Plans - Single Use Plans - Repeated Use Plans, Types of Objectives, Setting Objectives, Management by Objectives (MBO), Decision making- Process of Decision making, Decision making models: classical, Administrative, Political and Vroom-Jago Model.	06
3	Organizing: Meaning of Organizing, Process of Organizing and Creation of Organization structure, Types of organizational structures - Formal and Informal, Staffing: Meaning of Staffing, Human Resource Planning - Job Analysis, Recruitment - Sources of Recruitment, Selection - Process of Selection, Placement of employees, Departmentalization - Bases of Departmentalization, Line and Staff Relationship.	07
4	Directing: Meaning of Directing, Principles of Directing, Leadership Styles, Span of	08

	Management - Determinants of Span of Management, Centralization and Decentralization, Authority, Responsibility and Accountability, Delegation of Authority - Advantages of Effective Delegation. Barriers to effective delegation-Guidelines for effective delegation-Distinctions between Delegation & Decentralization.	
5	Controlling: Meaning of Controlling, Need for effective controlling, Process of Controlling, Techniques of Controlling, Relationship between Planning and Controlling, Use of IT for Controlling, Control techniques, Zero Base Budgeting and Management audit.	08
6	Functional Departments And Sections - HR, Marketing, Production & Operations, Finance, etc. Introduction To Business Sectors: Manufacturing (Automobile, Pharmaceutical, etc), Service (IT, Telecom, Banking, Insurance, etc), Management of SMEs.	10

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	S.A. Sherlekar and V.S. Sherlekar	Principles of Business Management		Himalaya Publishing House.
2 – National	Dr. T. Ramasamy	Principles and Practice of Management		Himalaya Publishing House.
3 – National	L.M. Prasad	Principles and Practice of Management,		Sultan Chand & Sons
4 – International	Koontz, Weihrich and A. RamchandraAryasri	Principles of Management		Tata McGraw-Hill.
5 – International	Peter F. Drucker	Practice of Management		Harper Business.
6 – International	Richard L. Daft	Principles of Management		Cengage Learning.

Online Resources:

Online Resources No	Web site address
1	http://www.ft.com/business-education .
2	http://www.makeinindia.com/policy/new-initiatives . https://india.gov.in/ http://www.makeinindia.com/policy/new-initiatives https://mygov.in/group/digital-india www.skilldevelopment.gov.in/World%20Youth%20Skills%20Day.html

MOOCs:

Resources No	Web site address
1	https://www.coursera.org/learn/management-fundamentals-healthcare-administrators

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	102	Managerial Economics	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :		
Subject / Course Objectives :		
<ul style="list-style-type: none"> i) To acquaint learners with basic concepts and techniques of economic analysis and their application to managerial decision making. ii) To prepare the students for the use of managerial economics tools and techniques in specific business settings. iii) Comprehend how changes in the environment in which firms operate influence their decision-making. iv) To develop managerial skills for developing business strategy at the firm level. v) To understand recent developments in strategic thinking and how it is applied to economic decision making. vi) Identify possible external and internal economic risks and vulnerabilities to economic growth and identify policies to address them. 		
Learning Outcomes:		
<ul style="list-style-type: none"> i) Understand the role of managers in firms. ii) Analyze the demand and supply conditions and assess the position of a company. iii) Estimation of production function and finding out optimal combination of input using Isoquant and Isocost. iv) Design competition strategies including costing, pricing and market environment according to the nature of the product and structure of market. v) Enable to know the importance of various sectors of the economy and their contribution towards national income. vi) Investigate potential output and compute output gaps and diagnose the outlook for the economy. 		
Unit No.	Contents	Hrs.
1	Introduction to Economics For Business -Nature and Scope of Managerial Economics, Firm and its Objectives, Theories of Firm, Role of Managerial Economics in Decision Making.	5
2	Demand Theory and supply- Demand and its Determination - Law of Demand, Types of Demand, Demand Function, Economic Concept of Elasticity (Price, Cross and Income Elasticity). Concept of Supply, Demand and Supply Equilibrium, Shift in Demand and Supply.	9
3	Theory of Production -Production function, Law of Diminishing Marginal Returns, Three stages of Production, The Long run Production function, Isoquant and Isocost curve, Importance of Production function in managerial decision making.	8
4	Theory of Cost - Classification of Costs - Short Run and Long Run Cost, Cost Function, Scale Economies, Scope Economies, Dual Relationship Between Cost and Production Function, Least cost combination of input (Producer Equilibrium).	7

5	Market Structure - Introduction to different types of Market- <i>Price Determination under Perfect Competition</i> - Introduction, Market and Market Structure, Perfect Competition, Price-Output Determination under Perfect Competition, Short-run Industry Equilibrium, Short-run Firm Equilibrium, Long-run Industry Equilibrium, Long-run Firm Equilibrium under Perfect Competition. <i>Pricing Under Imperfect Competition</i> - Introduction, Monopoly, Price Discrimination under Monopoly, Monopolistic Competition, Oligopoly (Kinked Curve), Game theory.	9
6	Macroeconomic markets and Integration -Product Market: Saving and Investment Function, consumption function. Aggregate demand and Aggregate supply. Fiscal Policy and Monetary Policy for uplifting the economy. Types of Business Cycle.	7
Activity	Students are required to prepare workbook (practical file) -Hands on practice towards diagrams of Demand, Supply, Markets and price determination. News from economic times –For Policy Making, Industry related and country specific. Applications of managerial economics in different firms. Comparing the GDP and other key indicators across the countries. Macroeconomic indicators and the role of fiscal policy in uplifting economy.	

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 National	DN Dwivedi	Managerial Economics	2015	Vikas Publishing
2 National	G.S Gupta	Managerial Economics: Micro Economic	2004	McGraw Hill
3 National	H.L.Ahuja	Managerial Economics	2017	S. Chand
4 International	D. Salvatore	Managerial Economics	2015	Oxford
5 International	R.Dornbusch, S.Fischer	Macro Economics	2018	McGraw Hill
6 International	A.Koutsoyiannis	Micro Economics	1979	Mac Millan

Online Resources:

Online Resources No	Web site address
1	www.rbi.org.in
2	www.economicshelp.org
3	www.federalreserve.gov
4	www.economist.com
5	www.bbc.com
6	International Journal of Economic policy in Emerging Economies https://www.inderscience.com/jhome.php?jcode=ijepee
7	Journal of International Economics https://www.journals.elsevier.com/journal-of-international-economics/

MOOCs:

Resources No	Web site address
1	Swayam –IIT https://swayam.gov.in/nd1_noc20_mg20/preview
2	Swayam –IIM https://swayam.gov.in/nd2_imb19_mg16/preview
3	EDX –IIM https://www.edx.org/course/introduction-to-managerial-economics-2
4	Coursera https://www.coursera.org/specializations/managerial-economics-business-analysis

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	103	Financial and Management Accounting	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :

- i) To acquaint the learners with the fundamentals of Financial Accounting.
- ii) To orient to the Accounting mechanics involved in preparation of Books of Accounts and Financial Statements of a sole proprietor
- iii) To make the students familiar with International Accounting Standards and International Financial Reporting Standards (IFRS)
- iv) To introduce the concepts of Cost and Management Accounting
- v) To orient the students about application of budgetary control as a technique of Management Accounting
- vi) To acquaint the students with application of Standard Costing and Marginal Costing as techniques of Management Accounting.

Learning Outcomes :

- I. Learners will able to know the fundamentals of Financial Accounting and Accounting Principles
- II. Learners will demonstrate the ability to prepare Financial Statements of a sole proprietor
- III. Learners will understand the utility and importance of International Accounting Standards and International Financial Reporting Standards (IFRS)
- IV. Learners will be familiar with concepts of Cost and management Accounting
- V. Learners will be able to apply the technique of Budgetary Control
- VI. Learners will be able to apply the technique of Standard Costing and Marginal Costing.

Name : -	Syllabus – Financial and Management Accounting	Hrs.
Unit No : 1	Introduction to Financial Accounting Financial Accounting: Definition, Objectives and Scope Accounting Concepts and Conventions, GAAP, Branches of Accounting Accounting Cycle, End Users of Financial Statements	7
Unit No : 2	Accounting Mechanics Principles of Double Entry Book-Keeping, Journal Ledger and Preparation of Trial Balance (Theory only) Preparation of Trading, Profit & Loss Account and Balance Sheet of a Sole Proprietor	11
Unit No : 3	Introduction to International Accounting Standards Development of international accounting Standards and financial reporting rules Need and Advantages of International Financial Reporting Standards (IFRS) IFRS for Small and Medium Enterprises(SMEs).	5
Unit No : 4	Introduction to Cost and Management Accounting Cost Accounting: Meaning and Importance Classification of Costs, Preparation of Cost Sheet (Theory only) Management Accounting: Definition, Nature and Scope Distinction between Financial Accounting and Management Accounting	6
Unit No : 5	Techniques of Management Accounting (Budgetary Control)	8

	Meaning, Objectives, Advantages and Limitations of Budgetary Control Types of Budgets Preparation of Flexible Budget and Cash Budget	
Unit No : 6	Techniques of Management Accounting (Standard Costing and Marginal Costing) Meaning of Standard Costing, Steps to implement Standard Costing Variance Analysis of Material and Labour Costs Marginal Costing – Meaning of Marginal Cost, Characteristics and Advantages of Marginal Costing, Cost-Volume-Profit Analysis – Profit/Volume ratio, Break-Even Analysis and Margin of Safety	11

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	S.N. Maheswari	An Introduction to Accounting	11 th edition	Vikas
2 – National	Ambarish Gupta	Financial Accounting for Management	5 th edition	Pearson
3 – National	Ashok Seghal, Deepak Seghal	Taxman’s Financial Accounting	2015 edition	Taxman
4 – International	Colin Drury, Huddersfield	Cost and Management Accounting	7 th 2011	Cengage Learners
5 – International	Pauline Weetman Fin	Financial and Management Accounting – An introduction,	7 th 2015	Pearson
6 – International	Jan Williams , Sue Haka , Mark Bettner , Joseph Carcell	Financial & Managerial Accounting,	18 th edition	McGraw hill

Online Resources:

Online Resources No	Web site address
1	https://www.moneycontrol.com/
2	www.icai.org
3	https://www.ifrs.org/
4	https://icmai.in/icmai
5	https://www.rbi.org.in/

MOOCs:

Resources No	Web site address
1	https://www.coursera.org/learn/wharton-accounting
2	https://www.classcentral.com/course/whartonaccounting-769
3	https://swayam.gov.in/nd2_cec19_cm04/preview
4	https://swayam.gov.in/nd1_noc19_mg36/preview
5	https://www.coursera.org/learn/accounting-for-managers

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	104	Organizational Behavior	
Type	Credits	Evaluation	Marks
Full Credit	3	CES	UE:IE = 50:50=100

Course Objectives:

- i) To create Dynamic and Effective Business Professionals and Leaders.
- ii) To transform the individuals to cater to the needs of the society and contribute to Nation building
- iii) To develop entrepreneurs to register different aspects of their business under remedial individual and team behavior.
- iv) To improve Organizational Behavior by having a sound knowledge of cultural differences.

Learning Outcomes :

- i) Understand the expected individual and team behavior in business world.
- ii) The awareness of applicable leadership qualities for entrepreneurs / corporate / managers.
- iii) To develop skills and inculcate motivational concepts.
- iv) To be aware of individual, cultural difficulties of organizations and to be able to master over them.

Unit No.	Contents	Hrs.
1	Introduction to Organizational Behaviour – Definition - Evolution of the Concept of OB- Contributions to OB by major behavioural science disciplines - Challenges and Opportunities for OB managers - Models of OB study	8
2	Individual Behavior : Perception – Factors influencing perception, Process, Perception distortion- halo effect, stereotyping, projection, Attitudes and Job Satisfaction - Components of Attitude - Major Job Attitudes - Job Satisfaction, Job involvement, Organizational Commitment. Personality and Values - Personality Determinants - MBTI, Big - Five Model, Values - Formation - Types of Values, Learning- Theories of Learning – reinforcement	8
3	Motivation Concepts to applications: Concept of motivation - Definition - Theories of Motivation - Maslow's' need Theory, Herzberg's Two factor theory, McClelland, Porter and Lawler Model, ERG Theory - Theory X and Theory Y Equity Theory - Vroom's Expectancy Theory – Application of Motivation concept, Individual motivation and motivation in the organization, Cultural Differences in Motivation, Intrinsic and Extrinsic Motivation, The Job Characteristics model – Work Redesign	8
4	Group Behavior: Group - Formation of Group - Classification - informal and formal groups, Group Properties - Roles, norms, status, size and	8

	cohesiveness - Group decision making – Group Shift, Group Think, Teams: team building: selecting team members, team roles, stages in team development, team building, team identity, team loyalty, commitment to shared beliefs, multi-disciplinary teams, Team Dynamics: decision-making behaviour, dysfunctional teams, Understanding teams - creating effective teams. Conflict - Process - Conflict management	
5	Leadership: Concept of Leadership - Traits of good Leader - Difference between Leader and Manager - Theories of Leadership – Trait theory, Behavioral theory and Contingency theory, Ohio State and Michigan Studies - Blake and Mouton theory - Fielders model - Likert's model. Managers as leaders. 3D leadership model. Leadership Styles. The management Grid, Future perspectives of Leadership	8
6	The Organization System : Stress: meaning and types, burnout, causes and consequences of stress, strategies to manage stress, Workforce diversity- Diversity management strategies. Culture - Definition, Culture's function, need and importance of Cross Cultural training – Organizational Change – Forces for change, resistance to change, Managing organizational change.	8

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 National	Kavita Singh	Organizational Behaviour	2015, 3 rd edition	Pearson Publication
2 International	Robbins, Timothy Judge, SeemaSanghi	Organizational Behaviour	12 th edition	Stephen Pearson Prentice Hall
3 National	M N Mishra	Organizational Behaviour	2010	Vikas Publishing House Pvt. Limited
4 International	Fred Luthans	Organizational Behaviour	13 th edition	Mc Grow Hill Inc
5 International	John Newstrom and Keith Davis	Organizational Behaviour	11 th edition	Tata McGraw Hill

Online Resources No	Web site address
1	www.bretsimmons.com ...
2	https://www.youtube.com/watch?v=Jla7vP3gyL4
3	www.positivesharing.com
4	https://www.youtube.com/watch?v=r2Xv9Am7PWQ

MOOCs:

Resources No	Web site address
1	Alisons
2	Swayam

Course : MBA CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	105	Statistical Techniques	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:

- I. To introduce to the learner the importance of statistical techniques in business applications
- II. To familiarize with the basic concepts of statistical techniques.
- III. To expose to the Graphical representation of data.
- IV. To impart skills in computation and application of correlation and regression.
- V. To understand the basics of probability and testing of hypotheses

Learning Outcomes:

After learning the concepts of Statistical Techniques, students will be able to have a

- I) Develop numerical ability to solve examples on various topics and specifically formation and Testing of Hypothesis
- II) Have clear understanding of various statistical tools and their applications in Business.
- III) Analyze the importance of Statistical Techniques in different functional areas of Management.
- IV) Apply Correlation and Regression Techniques in Business applications.
- V) To apply the statistical techniques to small data sets for analysis and interpretation

Name : -	Contents	Hrs.
Unit No : 1	Introduction to Statistics: Introduction to Statistics, Importance of Statistics in modern business environment. Scope and Applications of Statistics. Advantages and limitations of Statistics. Sources of data – Primary and secondary, Universe or Population, Sample, Concept of Sampling, Advantages of Sampling, Types of Sampling. Classification, Tabulation and Presentation of Data, Requisites of a good classification, Types of classification, Methods of classification, Tabulation - Frequency and Frequency Distribution, Diagrammatic and graphic representation of Data – Bar diagrams, Pie chart, Histogram, Frequency polygon, Frequency curve, Ogive curves	08
Unit No :2	Measures of Central Tendency and Dispersion: Statistical Averages - Arithmetic mean, Median and Mode, Positional averages - Quartiles, deciles and percentiles. Dispersion – Range - Quartile deviations, Mean deviation, Standard Deviation - Properties of standard deviation, Variance, Coefficient of Variation. Applications in business and management.	10
Unit No :3	Correlation: Correlation, Types of Correlation, Scatter diagram, Karl Pearson's correlation coefficient, Properties of Karl Pearson's correlation	08

	coefficient, Spearman's Rank Correlation Coefficient. Association of attributes.	
Unit No : 4	Regression - Regression analysis, Regression lines, Regression coefficients. Business application.	06
Unit No : 5	Elementary probability concepts, Probability Distributions- Binomial, Poisson and Normal Distribution	06
Unit no 6	Introduction to Testing of Hypothesis: Null and alternate hypothesis, Significance Level, type I and Type II error, Chi – Square Test.	08

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	S.C.Gupta & Indira Gupta	Business Statistics	2016	Himalaya Publishing House
2 – National	Bhardwaj R. S.	Business Statistics	2009	Excel Books India
3 – National	R.P. Hooda	Statistics for Business and Economics	2013	Vikas Publishing House
4 – International	Richard I. Levin & David	Statistics for Management	1994	Prentice Hall
5 – International	Robert S. Witte, John S. Witte	Statistics	2014	John Wiley & Sons
6 – International	Dr. Jim McClave, Dr. Terry Sincich	Statistics for Business and Economics	2011	Pearson

Online Resources:

Online Resources No	Web site address
1	http://www.yourarticlelibrary.com
2	https://en.wikipedia.org
3	https://managementhelp.org
4	https://www.cleverism.com
5	https://commercemates.com

MOOCs:

Resources No	Web site address
1	www.swayam.gov.in
2	www.udemy.com
3	www.coursera.org

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	106	Legal Aspects of Business	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:
<p>Subject / Course Objectives :</p> <ul style="list-style-type: none"> i) To create Dynamic and Effective Business Professionals ii) To transform the stake holders to cater to the needs of the society and contribute to Nation building iii) To improve decision making by having a sound knowledge of law. iv) To develop entrepreneurs to register different aspects of their business under the law.
Learning Outcomes :
<ul style="list-style-type: none"> I) extrapolate the legal knowledge to business. II) The graduates' attributes reflect legal knowledge and understanding global Competencies. III) To demonstrate domain comprehensive knowledge. IV) To articulate with business skills. V) To inculcate the culture of abiding law. VI) To Develop a coherent approach.

Units	Contents	Hours
Unit 1	- Introduction to Business laws, structure and sources of law, Law of contract- The Indian Contract Act,1872 –Introduction, Objectives, Definition of a Valid Contract, Offer and Acceptance, Capacity to Contract, Consent ,Consideration, Performance of Contracts, Discharge of Contracts, Breach of Contract and Void Agreements, Quasi Contracts Contracts of Guarantee and indemnity, Bailment, Pledge	05
Unit 2	Contract of Agency – Introduction, Agent and Agency, general rules, Modes of creation of Agency, Classification of Agents, Duties and Rights of Agents, Principal's Duties to the Agent and his Liability to Third Parties	10
Unit 3	Law of sales of Goods – Essentials of contract of sale, Goods and their classification, Sale, Agreement to Sell and Hire Purchase, Conditions and Warranties (Implied and Expressed), Unpaid seller and his rights, rights of buyer.	10

	Law of Negotiable Instruments – Negotiable instruments, Promissory notes, Bills of exchange, Cheques, Dishonour,	
Unit 4	Consumer Protection Act -Introduction, Definitions – consumer, complaint, complainant, Rights of Consumers, Nature and Scope of Complaints, Remedies Available to Consumers The Partnership Act, 1932 - types of partners, formation of partnership, rights and liabilities of partners.	10
Unit 5	The Company’s Act, 2013 (Amended) : Introduction and types of companies, Formation of a Company, Memorandum of Association, Articles of Association, Winding up. Arbitration and Conciliation Act, 1996 – Types of Arbitration, Alternative Dispute Resolution, Arbitration agreement, Arbitral Tribunal, Arbitral proceedings.	05
Unit 6	Information Technology Act, 2000 Amended 2018 , Definition - —Certifying Authority, Controller, Digital Signature and electronic governance, Role of certifying authorities, Functions of controller, Offences Intellectual Property Laws- Introduction and types of IPR,	05

Land mark case laws to be cited and discussed.

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	N.D. Kapoor	Mercantile Law	2019	Eastern Book Company
2 – National	Narayan	Intellectual Property Laws	2019	
3 – National	Bare Act	The Patent Act	2019	
4 –National	Bare Act	The Trademark Act	2019	
5 – International	Bare	The Negotiable Act	2019	

Online Resources:

Online Resources No	Web site address
1	https://www.mca.gov.in/Ministry/pdf/CompaniesAct2013.pdf
2	http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_43_1_trade-marks-act.pdf
3	http://legislative.gov.in/sites/default/files/A1996-26.pdf
4	http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_31_1_patent-act-1970-11march2015.pdf
5	https://www.youtube.com/watch?v=vlk40C91HqQ

MOOCs:

Resources No	Web site address
1	Alisons

Course : MBA (General) CBCS 2020 - w.e.f. - Year 2020 - 2021			
Semester	Course Code	Course Title	
	107	Business Communication	
Type	Credits	Evaluation	Marks
Core	03	CES	UE:IE =50:50

Course Objectives:
i) To familiarize the students with the process of communication, make them understand the principles and techniques of Business Communication. ii) To enable students to comprehend the different dimensions of Business Communication. iii) To enlighten about the communications strategy for managers.
Learning Outcomes:
i) The Students should be able to communicate effectively in professional circles. ii) There should be a positive change in the oral and written communication skills of the students after studying the subject. iii) The students should be able to draft business letters, give effective presentations write formal reports and deliver speeches independently.

Unit No.	Contents	Hours
01	<u>Basic Principles of Communication:</u> Introduction, Understanding Communication, the Communication Process, Barriers to Communication, the Importance of Communication in the Workplace, Types of Communication channels, their effectiveness and limitations	06
02	<u>Communication in Organizations</u> Communication needs of business organization, Strategies for improving Organizational communication, direction of flow of communication in organization, networks of flow of communication– wheel network, chain network, Y network, circle network. Feedback, types of feedback, importance of feedback Intra-organizational communication, inter-organizational communication. Inter-cultural communication – guidelines for effective communication across cultures	06
03	<u>Developing Oral Business Communication Skills:</u> Introduction, Advantages of Oral Communication, Speech Writing, Creative Writing, Public Speaking, Presentation Skills –Techniques for effective Presentations, Qualities of a skillful Presenter. Exercises for Oral Communications – Individual and Group Presentations, Extempore, Role Playing, Debates and Quiz	06
04	<u>The Importance of Listening and Reading Skills:</u> Introduction, what is listening? Barriers to Listening, Strategies for Effective Listening, Listening in a Business Context Reading Skills for Effective Business Communication: Introduction,	06

	what is reading? Types of reading, SQ3R Technique of Reading.	
05	<p><u>Guidelines for Written Business Communication:</u> Introduction, General Principles of Writing, Principles of Business Writing</p> <p><u>Internal Business Communication:</u> Writing Memos, Circulars and Notices: Introduction, What is a Memo? Circulars and Notices, Meetings, Notices, agenda, minutes of the meeting Communicating through Email, Communication with Shareholders</p> <p><u>External Business Communication– Writing Business Letters:</u> Introduction, Principles of Business Letter Writing, Types of Business Letters, Format for Business Letters (Types of business letters: office order, office circular, invitation letters, enquiry letters, trade reference letters, etc Letters from Purchase department, Letters from the Sales/Marketing Department, Accounts department, Personnel department, Letters of social significance, Tenders, Quotations and Orders, Banking Correspondence, Letters of enquiry, dealing with complaints) Exercises for Written Communications: Essay writing, Poster Making, Writing, an Advertisement Copy, Slogans, Captions, & preparing Press notes, Letter Of Acceptance, Letter Of Resignation</p> <p><u>Writing Business Reports:</u> Introduction, What is a Report? Types of Business Reports, Format for Business Reports, Steps in Report Preparation</p> <p><u>Employment Communication – Resumes and Cover Letters:</u> Introduction, Writing a Resume, Writing Job Application Letters, Other Letters about Employment</p> <p>Group Discussions and Interviews: Introduction, What is a Group Discussion? Attending Job Interviews, Preparation for GD and Interviews.</p>	15
06	<p><u>Technology enabled communication</u>–role of technology, different forms of technology for communication, Telephone Etiquette, Netiquette</p> <p><u>Communication Strategy for Managers:</u> Communicating different types of messages – positive or neutral messages, negative messages, persuasive messages, effective team communication, motivational communication</p>	06

Reference Books:

Sr. No.	Name of Author	Title of the Book	Publisher
1 National	MeenakshiRaman,Prakash Singh	Business Communication	Oxford Higher Education
2 National	R.K.Madhukar	Business Communication	Vikas Publications
3 National	UrmilaRai, S M Rai	Business Communication	Himalaya Publications
4 International	Shirley Taylor	Communication for Business	Pearson Longman Publications

5 International	<u>Kerry Patterson, Joseph Grenny</u>	Crucial Conversations: Tools for Talking When Stakes Are High	McGraw-Hill
6 International	John V. Thill, Courtland L. Bovee	Excellence in Business Communication	Pearson Publications

Online Resources:

Resource No.	Website Address
01	https://www.freebookcentre.net/business-books-download/Business-Communication.html
02	https://open.umn.edu/opentextbooks/textbooks/business-communication-for-success
03	https://courses.lumenlearning.com/wm-businesscommunicationmgrs/

MOOCs:

Sr. No.	Details
01	www.coursera.org
02	www.udemy.com
03	my-mooc.com

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	108	Data Analysis Using advance -Excel	
Type	Credits	Evaluation	Marks
Open	2	CES	IE = 100

Course Objectives:

- i) To train the student for using the spreadsheet package MS-Excel for business applications.
- To impart skills of analyzing data and presenting it using MS-Excel.

Learning Outcomes :

Understand the different functions of MS Excel
Use MS Excel for analysis of Data

Unit No.	Contents	Hrs.
1	Introduction to Excel MS excel screen elements – Tool bar, title bar, ribbon, formula bar, status bar. Moving around a Worksheet, entering and formatting (e.g. Number, Text, Date and Currency) data. Cell referencing (relative, absolute, mixed), using formulae, Use of Find, Replace, Goto.	5
2	Working with Excel Insert, delete - cells, rows, columns. Sorting (basic, custom), filtering, grouping, ungrouping data, dealing with subtotals and grand totals. Validating data, protecting cells. Create, manage, and format pivot tables and pivot charts.	5
3	Conditional Formatting Once defined, it will automatically change the formats as per conditions user inputs. Work with functions to manipulate strings of text and data	5
4	Commonly used functions Sum, Max, Min, Average, Count, Today, Now, Datedif, Countif, CountA, CountBlank, Round, Roundup, Round Down, ABS, Sign, Ceiling, Floor, Trim, Value, Clean, sqrt, if, sumif	5
5	Data Viewing and Reviewing Inserting comments, spell checks and changes to the worksheet data etc, Viewing data in different ways eg. Page break, normal etc	5
6	Creating and managing charts Create and modify graphs / charts like Column, Line, Pie, Bar, Area, Scatter, 3D etc. Working with multiple sheets, hyper linking Work with spark lines. Perform Look UP tables.	5

Reference Books:

1. Albright : Data Analysis and Decision Making Using MS Excel
2. StwphenNelson : Data Analysis ForDuMmIES
3. Narayan Ash Sah: Data Analysis Using Microsoft Excel 1/e, Excel Bools

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	109	Computers Application for Business	
Type	Credits	Evaluation	Marks
Core Elective	2	CES	IE = 100

Course Objectives
<ul style="list-style-type: none"> i) To impart the IT skills and Knowledge required for managers. ii) To help the students understand the basics of computer technology and Networking iii) To help the students develop the use of Tools like Microsoft Word, Microsoft Excel and Power point iv) To orient the students about the E-Commerce technology and its applications in Business world. v) To help the students understand various Information Systems implemented in organizations vi) To acquaint the students with various current trends and concepts of computer Technology.
Learning Outcomes:
<ul style="list-style-type: none"> i) Students will be able to gain the basic knowledge of Computer Technology ii) Students will be able to know the basics of computer technology and Networking iii) Students will be able to practically use the tools like Microsoft Word, Microsoft Excel and Power point iv) Students will understand the E-commerce technology and its applications v) Students will have a greater understanding of with Information Systems implemented in organizations vi) Students will be familiar with new terms and trends of computer technology

Unit No.	Contents	Hrs.
1	Introduction to Computer Technology , Basic operations and connecting Devices and External Operating devices, Types of Software: (system, Utility, Applications) types of application software (content access, end user, enterprise, simulation, application suite), examples, selecting and acquiring software options for procuring the software (licensed, sold, public domain, open source, freeware, shareware), software trends and issues (mobile applications, integration of in-house and outsourced services strategy, cloud based enterprise solutions), Data Base, Data Base Management Systems	05
2	Networking: Definition of Network, Types of Networks, Advantages of Networks, Internet: Definition , concept, advantages, threats, applications	02

3	<p>Microsoft Word, Microsoft Excel, Microsoft PowerPoint : IT Skills: Lab sessions necessary Microsoft Office- Introduction and working with MS Word, Features - insert headers and footers, insert table and table options, Mail Merge.etc MS Power point- Basic introduction, features, Creating & Formatting Content Collaborating – Track, Edit, Add, Delete Comments, Merge Managing & Delivering Presentations, design a template, entering data to graph, organization chart, slide transitions, creating slide shows.</p>	05
4	<p>E-COMMERCE : E-commerce : Definition, evolution, advantages. Types of E-commerce: B2B, B2C, C2C, E-governance,. Impact of E-commerce on Banking Industry. How Banking Industry has evolved post E-commerce applications.</p>	05
5	<p>Introduction to MIS: Principles of MIS, Characteristics, functions, structure & Classification of MIS, information for decisions; MIS in Manufacturing, Marketing, Finance Human Resource Management, Materials & Project Management; Types of information systems(TPS, MIS, DSS, ESS, ES, KWS), GIS Information systems and functional areas- Transaction processing system, Human Resource systems</p>	05
6	<p>Current trends- Integrated enterprise system (ERP, CRM, and SCM), COBIT- IT governance tool, changing role of CIO. Concept of SMAC (Social, Mobile, Analytics and Communication), use of Social media face book, tweeter, LinkedIn etc. for general communication and business communication, social media for marketing, email and video conferencing tools for business communication, Analytical tools of data interpretation.</p> <p>Latest terms in computer technology: Definition and concept of Agile Development, Big Data, Business Intelligence, Cloud Computing, Content Management, Disruptive Technology, Green Technology, Artificial Intelligence, Wearable devices, Machine Learning, GUI (Graphical user Interface)</p>	08

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Ramesh Bahl	Information Technology for Managers		Tata Macgraw Hill
2 – National	Pradeep K. Sinha	Computer Fundamentals		BPB Publications
3 – National	A. K. Saini, Pradeep Kumar	Computer Application in Management		Anmol Publications
4 – International	Geoff Walsham	“Interpreting Information Systems in Organizations”		The Global Text Project , 2011, http://www.saylor.org/site/extbooks/Information%20Systems%20for%20Business%20and%20Beyond.pdf
5 – International	Henry C. Lucas	“Information Technology for Management”		McGraw-Hill/Irwin , 2009
6 – International	David T. Bourgeois	“Information Systems for Business and Beyond”		Saylor Foundation , 2014

Online Resources:

Online Resources No	Web site address
1	https://www.webopedia.com/
2	http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf
3	https://www.managementstudyguide.com/understanding-e-commerce.htm
4	https://www.sigc.edu/department/mba/studymet/ManagmentInformationSystem.pdf
5	https://www.tutorialspoint.com/management information system/basic information concepts.htm

MOOCs:

Resources No	Web site address
1	https://www.coursera.org/browse/information-technology
2	https://www.udemy.com
3	https://alison.com

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	110	Social Media Management	
Type	Credits	Evaluation	Marks
Core	2	CES	100

Course Objectives:

- i) To understand the concept of Social Media and its utility in marketing efforts.
- ii) To study the implementation of social media campaign.
- iii) To study the importance of social media in the promotion of a product or service.

Learning Outcomes:

- i) Effective utilization of Social Media in connecting with the target market.
- ii) Using the social media for the implementation of marketing strategies

Unit No.	Contents	Hrs.
1	Defining your target customer based on the usual demographics, age, gender, identifying your target customer's marital status, where they live, or what their hobbies are, understanding their basic needs, identifying the topics of interests by studying the customer's feedback research analysis,	2
2	Customer acquisition elements with human approach, why you'll use social media for business, and identify KPIs, Building a Community, designing a media planning strategy, use of social media for marketing strategies, four critical steps you'll need to take to stand out and learn the processes behind taking each step	4
3	Designing the metrics with which you can measure the growth based on: <ul style="list-style-type: none"> • Number of group members • Engagement on your live videos • Engagement on your daily posts • Questions your group is asking 	8
4	Increase brand awareness, use of metrics to assess brand awareness, boost engagement, customer engagement strategies based on their basic needs, targeting the customers and target strategy	4
5	Criteria of choosing the right social network to engage audience, monthly active users, utility and usage study of Twitter, facebook, Instagram, Pinterest, youtube and other social media sites, asses their pros and cons before launching your website or social media channel	2
6	Characteristics of creating content that will engage target audience, planning content calendar, designing keywords: transactional, informational, and navigational, create a content plan, building trust through consistent engagement, measure progress Project/blog or website in development of content and hosting youtube channel to be designed by the students in the area of their interest	10

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
4 – International	Jeff Abston	Youtube Growth Hacking	2018	CreateSpace Independent Publishing Platform
5 – International	Gary Vaynerchuk	Crushing It	2018	Harper Business
6 – International	Donald Miller	Building a StoryBrand: Clarify Your Message So Customers Will Listen	2017	HarperCollins Leadership

Online Resources:

Online Resources No	Web site address
1	https://www.socialmediaexaminer.com/how-to-create-social-media-marketing-content-plan-in-7-steps/
2	https://sproutsocial.com/insights/social-media-content-strategy/
3	https://www.smartinsights.com/social-media-marketing/social-media-strategy/creating-social-media-content-strategy-plan/
4	https://blog.hootsuite.com/books-social-media-manager-read/
5	https://business.linkedin.com/marketing-solutions/success/marketing-case-studies?src=go-pa&trk=sem_lms_gaw&veh=Google Search APAC IN NB-Social Beta DR English 249875649279 %2Bsocial%20%2Bmedia%20%2Bcontent_c_aud-790231220534:kwd-

MOOCs:

Resources No	Web site address
1	https://www.udemy.com/course/social-media-content-creation-101/?utm_source=adwords&utm_medium=udemyads&utm_campaign=DSA_Catchall_1_a.EN_cc.INDIA&utm_content=deal4584&utm_term=.ag_82569850245.ad_398023114490.kw.de.c.dm.pl.ti_dsa-302692350888.li_9061696.pd.&matchtype=b&gclid=CjwKCAjwguzzBRBiEiwAgU0FT4Nw0wI0EFDvWkNXjH5HJAVwbz0wGrBf-w1sPG825KK75SXokKSHWRoCmwwQAvD_BwE
2	https://www.upgrad.com/digital-marketing-and-communication-pgc-mica/?utm_source=Google&utm_medium=Search&utm_campaign=mv_dm_pgc_google_search_highintent-25-64_t1_all&utm_content=social_media_course&utm_term=%2Bsocial%20%2Bmedia%20%2Bcourse&gclid=CjwKCAjwguzzBRBiEiwAgU0FTwsPEZYDW61_qg_cc4F6ZtE9L3B15Z_Ldr343-RNgNUa-r-a7LdQNhoCTUgQAvD_BwE

3	https://www.coursera.org/specializations/social-media-marketing
4	https://iversity.org/en/courses/digital-and-social-media-marketing

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	111	Current Affairs	
Type	Credits	Evaluation	Marks
Core	2	CES	100

Course Objectives :	
i)	Apply the knowledge of management theories and practices in resolving the business problems.
ii)	Foster analytical and critical thinking abilities for data-based decision making.
iii)	Learn new technologies with ease and be productive at all times
iv)	Read, write, and contribute to Business literature
v)	Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.
Learning Outcomes:	
I)	To enable the students to take decisions related to critical current business issues.
II)	To be able to Interpret and understand the current business issues.
III)	To analyze business current affairs.
IV)	To acquaint with the current happenings in the business.
vi)	To comprehend the current affairs and its implications on businesses at national and international level.

Unit	Contents	Sessions
1	Economics, Sports, Awards, Politics, Emerging sectors, Finance and Banking sector, IT Sector, ecommerce, Energy sector etc.,	6
2	Population Census, National Issues, Indian Economy, Indian Judiciary, State Animals and Symbols, Awards and their importance, Name of the Scientist who got Noble prize for important discoveries, Important Days	6
3	Social Schemes, Reports, Committee and Commission, Accident and calamities, First in India, Environment, Science and Technology,	6
4	International leadership, International Reports, International committees and recommendations, Geographical event around the world, International Awards, First in the world	6
5	Summary of Important Books, such as Wings of fire- An autobiography of APJ Abdul Kalam, Mahatma Gandhi Autobiography : The story of my experiments with truth., The Discovery of India by Jawaharlal Nehru, The First- Time Manager, A Survival Guide. Networking For Success., Medici Effect, .ABC's of Selling etc.,	6
6	Students are required to prepare workbook (practical file) for assimilating data of different events. Make presentations, Study the related topic independently and analyse and relate the current decision with the issue.	

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1..National	Dr. Abdul Kalam& Arun Tiwari	Wings of fire- An autobiography of APJ Abdul Kalam	1999	University Press
2. National	Mahatma Gandhi	Mahatma Gandhi Autobiography : The story of my experiments with truth.	1948	Dover Publication
3 – National	Jawaharlal Nehru	The Discovery of India by Jawaharlal Nehru	2008	Penguin
4 – International	Loren B. Belker, Gary S. Topchick	The First- Time Manager	2005	Amacom
5 – International	Bear Grylls	A Survival Guide for life – How to achieve your goals, thrive in adversity, and grow in character.	2013	July
6 – International	Frans Johanson	The Medici Effect- What Elephants & Epidemics can teach us about Innovation.	2004	HBS Press
7 – International	Charles Futrell	ABC's of Selling	1989	Irwin

Online Resources:

Online Resources No	Web site address
1	https://dea.gov.in
2	https://finmin.nic.in
3	www.wto.org
4	www.commerce.nic.in
5	www.weforum.com
6	https://www.journals.elsevier.com/
7	http://www.iibs.net/
8	Open Textbook Library https://open.umn.edu/opentextbooks/textbooks/international-business

MOOCs:

Resources No	Web site address
1. Economics	https://www.es.corporatefinanceinstitute.com
2. Politics	https://www.classcentral.com/course/edx-contemporary-issues-in-world-politics-11431?utm_source=mooc_report&utm_medium=web&utm_campaign=new_courses_october_2018
3. Business	EDX https://www.edx.org/learn/international-business
4. Leadership	https://www.classcentral.com/course/edx-agile-leadership-principles-and-practices-11920?utm_source=mooc_report&utm_medium=web&utm_campaign=new_courses_october_2018
5. International Financial Environment	https://nptel.ac.in/courses/110105031/

SYLLABUS
(w.e.f. 2020_21)

MBA - (GENERAL)

SEMESTER – II

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	201	Marketing Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:

Course Objectives :

- i) To understand the core concepts of Marketing and approaches to Marketing.
- ii) To differentiate the Marketing and Selling processes.
- iii) To study the Marketing Environment and understand its influence on Marketing Decisions.
- iv) To study the concept of Segmentation, Targeting and Positioning.
- v) To understand the Marketing Mix Elements and their utility in Marketing.
- vi) To Study the concept of Marketing Research and Marketing Information Systems.

Course Outcomes:

- i) Gain a solid understanding of key marketing concepts and skills.
- ii) Identify and demonstrate the dynamic nature of the environment in which marketing decisions are taken and appreciate the implications for marketing strategy determination and implementation.
- iii) Develop the students' skills in applying the analytical perspectives on the concepts of marketing and the decisions related to segmentation, targeting and positioning, determining marketing mix etc.
- iv) Develop an understanding of the underlying concepts, strategies and the issues involved in the exchange of products and services and control the marketing mix variables in order to achieve organizational goals.
- v) Develop strong marketing research plans and persuasively communicate your recommendations and rationale.
- vi) Discuss the scope and managerial importance of marketing research and its role in the development of marketing strategy

Unit No.	Contents	Hrs.
1	Basics of Marketing: Definition and meaning of Marketing, Core concepts of Marketing - Need, Want, Demand, Value, Exchange, Customer satisfaction & Customer delight, Differentiation between Sales and Marketing, Approaches to Marketing - Product, Production, Sales, Marketing, Societal and Relational. Marketing environment - Micro and Macro marketing environment	06
2	Definition and meaning of consumer behaviour, importance of consumer behaviour, different buying roles, buying motives and its types, buying decision making process.	5
3	Segmentation, Targeting and Positioning: Meaning, need and importance, bases for consumer market segmentation and industrial market segmentation, evaluation of identified segments and selection and evaluation of target market. Targeting strategies: Levels of market segmentation: segment marketing, niche marketing, local marketing, individual marketing. Positioning and Differentiation: meaning, concept, product, service, people and image differentiation, ways to position the product.	10
4	Marketing Mix: Concept, Seven P's of marketing mix: Product – meaning, levels of product, product mix- product line – decisions : line stretching, filling, pruning , width, length, depth. Product life cycle (PLC) – Concept, stages in PLC, characteristics and strategies for each stage of PLC. New product development process, Brand – Concept, Brand Creation Price – meaning, objectives of pricing, pricing approaches- cost based, competition based, and market based, pricing strategies- skimming pricing, penetrative pricing, psychological or odd pricing, perceived value pricing, loss leader pricing etc. Place- Importance of distribution in marketing of products or services, Types of intermediaries, levels of channels, Channel Management Decisions- factors considered for selection and motivation of dealers and retailers, channel conflict- concept, types of channel conflict, ways to resolve channel conflicts Promotion- Elements of promotion mix: meaning of advertising- 5 Ms. of Advertising, sales promotion, personal selling, public relations, publicity, direct marketing and event marketing and sponsorship.	14
5	Marketing Research: Need and Importance of Marketing Research, Marketing Research Process, Types of Marketing Research. Marketing Information System- overview.	4
6	Marketing Planning and Control: Marketing Planning Process, nature and contents of a	6

marketing plan. Need of marketing control, Annual plan control, productivity control, efficiency control and strategic control- marketing audit.	
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Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year and edition	Publisher Company
1 – National	Dr. Rajan Saxena	Marketing Management	2016, Fifth edition	Tata McGraw Hill Publications
2 – National	V.S. Ramaswami and S. Namakumari	Marketing Management- Indian Context *Global Perspective	2013, fifth edition	Tata McGraw Hill Publications
3 – National	Dr. Tapan Panda	Marketing Management	2009, second edition	Excel Books India
4 – International	Philip Kotler, Garry Armstrong, Prafulla Agnihotri	Principles of Marketing	2018, seventeenth edition	Pearson Education
5 – International	Philip Kotler, Kavin Lane Keller	Marketing Management	2015, fifteenth edition	Pearson Education India
6 – International	Michael J. Etzel, Bruce J. Walker, William J. Stanton	Marketing	2005, fourteenth edition-revised	McGraw Hill Higher Education

Online Resources:

Online Resources No	Web site address
1	https://managementhelp.org
2	https://bookboon.com/en/marketing-and-law-ebooks

MOOCs:

Resources No	Web site address
1	https://alison.com/course/introduction-to-marketing-management-revised
2	https://alison.com/course/understanding-your-audience-market-segmentation
3	https://alison.com/course/marketing-management-analysing-competitors-and-customers-revised
4	https://swayam.gov.in/nd1_noc19_mg48/preview

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	202	Financial Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:	
i)	To introduce the fundamentals of Financial Management
ii)	To orient on the skills set required for Financial Decision Making Techniques
iii)	To orient on Financial Statement Analysis and Interpretation
iv)	To develop analytical skills which would help decision making in Business.
v)	To develop the entrepreneurial mind set
Learning Outcomes :	
i)	Development of basic skill sets required for Financial Decision Making
ii)	Development of analytical skill set to understand and interpret Financial Statements
iii)	Graduates are able to improve their knowledge about functioning business, identifying potential business opportunities, evolution of business enterprises and exploring entrepreneurial opportunities (BEDK)
iv)	Graduates are expected to develop skills on analyzing the business data, application of relevant analysis, problem solving in the functional areas, i.e. Critical thinking- Business Analysis-Problem Solving and Innovative Solutions (CBPI)
v)	Developing Social Responsiveness to contextual social issues/ problems and exploring solutions. Graduates are expected to identify problems, explore the opportunities, design the business solutions and demonstrate ethical standards in organizational decision making.(SRE)

Unit No 1	Contents	Hrs.
1	Introduction Meaning of Financial Management, Scope and Functions of Financial Management, Objectives of Financial Management Profit Vs Wealth Maximization, Finance Functions: Investment Decision, Liquidity Decision, Financing Decision and Dividend Decision	7
2	Investment Decision: Capital Budgeting Decision Meaning, Importance and process of Capital Budgeting, Concept of Time Value of Money, Capital Budgeting Techniques - Problems & case studies- Accounting Rate of Return, Payback Period, Net Present Value, Profitability Index, Discounted Payback Period, Internal Rate of Return Capital Budgeting under Risk and Uncertainty Concept and Techniques (Theory only)	10
3	Liquidity Decision: Working Capital Management: Meaning, Need and Types of Working Capital, Components of Working Capital, Factors determining Working capital, Estimation of Working Capital, Problems and Case Studies on Estimation of Working Capital, Sources of Working Capital Financing	6
4	Financing Decision: Sources of Long Term Domestic Finance: Shares, Debentures, Retained Earnings, Capital Structure: Meaning and Principles of Capital Structure Management, Factors affecting Capital Structure, Cost of Capital: Meaning, Components, Cost of Debt, Cost of Preference Share, Cost of Equity Share, Cost of Retained Earnings, and Weighted Average Cost of Capital.	8

	(Theory and Problems), Leverage: Concept and Types of Leverage(Problems on Leverages),	
5	Dividend Decision: Factors determining Dividend policy, Theories of Dividend-Gordon Model, Walter Model, MM Hypothesis, and Forms of Dividend Payment: Cash Dividend, Bonus Share and Stock Split, Stock Repurchase, Dividend Policies in Practice.	4
6	Financial Statement Analysis: Meaning and Types, Techniques of Financial Statement Analysis: Common Size Statement, Comparative Statement, Trend Analysis and Ratio Analysis. (Orientation level Problems on Ratio analysis) Funds Flow Statement and Cash Flow Statement. (Theory only)	10

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	SheebaKapil	Fundamentals of Financial Management		Pearson Publications
2 – National	I.M. Pandey	Financial Management		Vikas Publication
3 – National	Khan and Jain	Financial Management		TATA McGraw Hill
4- National	R.P. Rustogi	Financial Management		
4 – International	Eugene F. Brigham, Michael C. Ehrhardt	Financial Management – Theory and Practice	11th edition.	
5 – International	Jonathan Berk, Peter DeMarzo and Ashok Thampy	Financial Management		Pearson Publication
6 – International	Journal of International Financial Management And Accounting By Wiley Publication			
7– International	Journal of Business Finance And Accounting By Wiley Publication			

Online Resources:

Online Resources No	Resources Name	Web site address
1	Google Scholar	https://scholar.google.com/
2	Gutenberg	https://www.gutenberg.org/
3	Open Culture	http://www.openculture.com/free_ebooks
4	Open Library	https://openlibrary.org/

MOOCs:

Resources No	Resources Name	Web site address
1	Alison - free technology, language, science, health, humanities, business, math, marketing and lifestyle courses.	https://alison.com/
2	Khan Academy - free online courses and lessons	https://www.khanacademy.org/
3	Futurelearn	http://www.openculture.com/free_eboo

		ks
4	SWAYAM which is a India MOOCs platform for which University Grants Commission has allowed upto 20% credit transfer facility.	https://swayam.gov.in/
5	University of Florida	www.coursera.org
6	University of London	www.cefims.as.uk
7	IIM ,Bangalore	www.edx.org

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	203	Human Resource Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:	
i.	To explain the significance of HRM and changing role of HRM
ii.	To explain the process of HRP, Recruitment and Selection.
iii.	To discuss the concept of training and development
iv.	To illustrate the job evaluation and wage determination concepts.
v.	To bring out the role of HR in organization's effectiveness and employee performance
Learning Outcomes :	
i.	Understand and apply Human resource Management functions for effective management of organization.
ii.	Ability of designing job analysis and ability to understand various manpower forecasting techniques
iii.	Understand the techniques of recruitment, selection and interview and ability to conduct the recruitment process
iv.	Understand the training needs in the organization and ability to design suitable training plan
v.	Understand the components of wages and salary and factors affecting it.
vi.	Ability to analyze issues related to performance appraisal, career planning and rewards management.

Unit No.	Contents	Hrs.
1	Introduction to HRM : Definition, Nature and Scope of HRM, Evolution of HRM, Challenges of HRM, HR Profession and HR Department, Functions of HRM, Global perspective of HRM	06
2	Human Resource Planning: HRP, Demand and Supply forecasting, factors Affecting HRP, Job analysis and Job Design, Recruitment and Selection – Recruitment Process, Sources and Methods of Recruitment, Steps in selection.	08
3	Training and Development: Need and Importance of Training and Development, Training Need Analysis and techniques, Design Training Programme, Methods of training, Training evaluation, Executive Development, Concept of Career Development	09
4	Wages and salary Management Job Evaluation-Process and methods. Wage Determination, Types of Wages, Salary Structure, Fringe benefits, Executive Compensation	10
5	Performance Appraisal: Need and Importance of Performance Appraisal ,Performance Appraisal Process, Methods of Performance Appraisal	07

6	Overview of Employee Relations Management- Meaning and importance of Employee Relations Management, Employee Relation Management Tools, Issues in Employee Relation Management	05
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Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	. SeemaSanghi	Human Resource Management	2011	Macmilan Publication,
2 – National	V.S.P. Rao	Human Resource Management	2006	Excel Books
3 – National	. K. Ashwathappa	Human Resource Management	2007	Tata McGraw--Hill
4 – International	Gary Dessler, BijuVarkey	Human Resource Management	2016	Pearson Publication, 12 th Edition
5 – International	Ronald J. Burke Cary L Cooper	Reinventing Human resources Management: Challenges and new Directions	2005	Routledge Place of Publishing London

Online Resources:

Online Resources No	Web site address
1	https://hbsp.harvard.edu/cases/
2	https://open.umn.edu/opentextbooks/textbooks/human-resource-management
3	https://www.icmrindia.org/case%20volumes/Case%20Studies%20in%20Human%20Resource%20Management%20Vol%20I.htm
4	https://www.citehr.com/
5	https://www.hr-guide.com/

MOOCs:

Resources No	Web site address
1	https://www.coursera.org/specializations/human-resource-management
2	https://swayam.gov.in/nd1_noc20_mg15/preview
3	https://alison.com/course/introduction-to-modern-human-resource-management
4	https://www.classcentral.com/course/managing-human-resources-5462
5	https://swayam.gov.in/nd1_noc20_mg15/preview

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	204	International Business	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:

- vii) To prepare the students thoroughly with the domain knowledge and global issues of International business.
- viii) To discuss the reason of entering into International business through various trade theories propounded by economist and practical aspects.
- ix) To demonstrate through trade data analytics as to what to export and where to export from India.
- x) To discuss the role and functions of International organizations and trade organisation that is IMF, World Bank and WTO.
- xi) To familiarize the students with the key trade blocks such as NAFTA, EU etc.
- xii) To demonstrate the role of exchange rates in global markets.

Learning Outcomes :

- V) To enable the students to take decisions related to global issues and policies.
- VI) To be able to Interpret Foreign trade policy and avail incentives offered under various schemes.
- VII) To analyze the trade data for decision making as to what to export and where to export.
- VIII) To recall the role and functions of Global Institutions IMF, WTO and World Bank.
- IX) To acquaint with the trade blocks SAARC, NAFTA, EU etc.
- X) To comprehend the exchange rates practically and its implications on trade.

Unit No.	Contents	Hrs.
1	Introduction of International Business and Entry Strategies- Definition of International Business, Nature and Scope of International Business, Domestic Trade versus International Trade, Forms of Countertrade. Market Entry Strategies – Exporting, Importing, Joint venture, Franchising, Merger and acquisition.	06
2	Globalization and Cultural Issues - Definition of Globalization, Globalization of Markets, Pros and cons of Globalisation, Drivers of Globalization , Cultural environment in International Business (Hofstede Theory – Application in trade). Ease of Doing Business (Parameters given by world bank) in India and across BRICS.	06
3	Trade Theories, Trade Policy, Trade Analytics - Trade theories – Mercantilism, Absolute Advantage, Revealed Comparative Advantage, H.O Theory and Porters Diamond Model. International Trade Classification and Harmonized System (HS), Current Foreign Trade Policy in force (General Provisions), Incentives offered under FTP (Ch-3 and Ch-4 of Foreign Trade Policy). Trade Map Analytics and calculation of RCA, TII for various products, Ease of Doing Business.	10
4	Balance of Payment and FEMA Act - Components of BOP (Current and Capital Account) , Credit and Debit Entries in BOP, Differentiate between	08

	BOT and BOP , Key Provisions of FEMA Act 1999 and difference between FERA and FEMA. Country Risk Analysis and Lessons from ASIAN financial Crisis in 1997.	
5	International Financial and Trade Organizations - Role of GATT, WTO, IMF and World Bank group. Dispute settlement mechanism through WTO. Levels of trade integration. Basic conceptual note of NAFTA, SAARC and European Union. Role of BRICS.	09
6	Foreign Exchange Market and Types of exchange rates - Direct and indirect Quotes, Concept of Nostro and Vostro Account, Types of Exchange -Fixed vs. Flexible Exchange Rate (Independent and Managed Float) , Factors affecting Foreign Exchange Rate , Role, Functions and Participants of Foreign Exchange Market	06
Activity	<p>Students are required to prepare workbook (practical file) -Hands on experience on trade data analytics to find out the trade related ratios such as RCA (Revealed Comparative Analysis) and TII (Trade Intensity index). Students are advised to prepare assignment/file using HS codes given and find out the competitiveness to decide which market to enter and what products should be exported from India.</p> <p>Compare BRICS on EODB Ratings using data from world bank reports.</p> <p>Cultural differences of at least five countries by a group of students to be done. Globalisation Index to be understood in order to find out the reasons for those who are highly globalized versus those who are less globalized. Cultural differences across the countries to be explained using Hofstede theory. Key Exports from India and major markets to be studied through data analytics.</p>	

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Rakesh Mohan Joshi (IIFT)	International Business	2009	OXFORD
2 – National	V.K Bhalla	International Business	(1 December 2013)	S. Chand
3 – National	K. Aswathappa	International Business	6 th Edition 2017	McGraw Hill Education
4 – International	Donald Ball and Micheal Geringer	International Business: The Challenge of Global Competition	9 th Edition	McGraw-Hill Education
5 – International	Charles W. L. Hill	International Business: Competing in the Global Market Place	10 edition (1 July 2017)	McGraw Hill Education
6 – International	Prashant Salwan John D. Daniels, Lee H. Radebaugh, Daniel P. Sullivan (Author)	International Business, 15/e Fifteenth	Fifteenth edition (28 July 2016)	Pearson

		Edition, Kindle Edition		
7 – International	Ricky W. Griffin (Author), Michael Pustay (Author)	International Business, Global Edition	8th Edition on (May 15, 2014)	Pearson

Online Resources:

Online Resources No	Web site address
1	www.imf.org
2	www.wto.org
3	www.trademap.org
4	www.commerce.nic.in
5	www.dgft.gov.in
6	International Business Review https://www.journals.elsevier.com/international-business-review
7	Journal of International Business Studies http://www.jibs.net/
8	Open Textbook Library https://open.umn.edu/opentextbooks/textbooks/international-business

MOOCs:

Resources No	Subject	Web site address
1	International Business	https://www.openlearning.com/courses/GFMA2023/
2	International Business Environment and Global Startegy –IIMB (SushilVachani)	EDX https://www.edx.org/course/international-business-environment-and-global-stra
3	International Business	EDX https://www.edx.org/learn/international-business
4	International Business I (Coursera) Taught by -Doug E Thomas (university of New Mexico)	COURSERA https://www.coursera.org/learn/international-business
5	International Financial Environment	https://nptel.ac.in/courses/110105031/

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	205	Production and Operations Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :	
i)	To understand fundamentalsofProduction and Operations Management.
ii)	To develop an understanding of the strategic importance of Production and Operations Management.
iii)	To understand Production System.
iv)	To learn EOQ concept.
v)	ToacquaintthestudentswithconceptsofallthefunctionsundertheManufacturingactivitiesby introducingtheUnits Maintenance Management,SCM,JIT,QAand ISOCertificationetc.
Learning Outcomes :	
After learning the concepts of Production and Operations Management, students will-	
I) Understand various concepts of Production and Operations Management.	
II) Analyze the importance of Production and Operations Management and compare various issues particular to manufacturing industry.	
III) Classify various Production Systems.	
IV)Develop numerical ability to solve examples on EOQ.	
V) Describe the advantages of Maintenance Management, SCM, JIT, QA and ISO Certification.	

Unit No.	Conents	Hrs.
1	Introduction to POM Nature, Scope, Importance and Functions of POM, Production Process, Difference between Production and Service operations, Responsibilities of Production Manager, Production process selection decisions, Production System, Classification of Production System.	7
2	Production Planning Control Objectives of PPC & it's various functions of common and optional nature, Co-ordination of PPC with other departments. Job sequencing, Assembly Line Balancing.	6
3	Plant Location and Layout Plant Location: Meaning, Need for selecting a suitable Location, Factors affecting Plant Location Decision, Plant Layout: objectives, types of Plant Layout.	8
4	Maintenance Management Concepts, Need of maintenance, Objectives & types of maintenance.	6
5	Inventory management Concept, Importance, Classification of Inventory System, EOQ Model with numerical, Basic concept of Material Requirement Planning(MRP).	8
6	Emerging Trends in POM Supply Chain Management(SCM),Just in Time (JIT),QualityControl,QualityAssurance(QA),ISOCertification,Enterprise Resource Planning(ERP), Total Quality Management(TQM),TPM, Quality Circles.	10

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Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	L.C.Jhamb	Production Operations Management	2009	Everest Publishing House
2 – National	Chunawala & Patel	Production and Operations Management	2009	Himalaya Publishing House
3 – National	S.N.Chary	Production and Operations Management	2004	Tata McGraw Hill Ltd.
4 – International	Everett Adams & Ronald Ebert.	Production and Operations Management	1992	Prentice Hall
5 – International	Martin Kenneth Starr	Production and Operations Management	2008	Cengage Learning
6 – International	James B. Dilworth, White	Production and Operations Management: An Overview	1993	Thomson Learning

Online Resources:

Online Resources No	Web site address
1	http://www.yourarticlelibrary.com
2	https://en.wikipedia.org
3	https://managementhelp.org
4	https://www.cleverism.com
5	https://commercemates.com

MOOCs:

Resources No	Web site address
1	www.swayam.gov.in
2	www.udemy.com
3	www.coursera.org

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	206	Research Methodology	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:

- i) To introduce the role of research in business and management
- ii) To introduce the concepts of scientific research and methods of conducting scientific enquiry
- iii) To identify various sources of information for literature review and data collection.
- iv) To familiarize the learners with the key concepts in sampling techniques and instruments for data collection
- v) To develop basic understanding of conducting surveys and reporting the research
- vi) To educate on the ethical issues in conducting applied research.

Learning Outcomes :

At the end of the course the learner will

- I) Develop understanding on different applications of research for managerial decision making
- II) Explain key research and summarize the research articles and research reports
- III) Have basic awareness of data analysis-and hypothesis testing procedures
- IV) Design questionnaires and administer simple survey based projects.
- V) Describe sampling methods, measurement scales and instruments, and appropriate uses of each
- VI) Explain the rationale for research ethics

Unit No.	Contents	Hrs.
1	Introduction to Research Methodology Meaning, definition and objectives of research, motivations for research, type of research, Importance of research in managerial decision making , research in Research in functional / business areas. Qualities of a good researcher.	06
2	Research process: Steps in research process, Defining the research problem, Problem formulation and statement, Framing of hypothesis Research design: Meaning, characteristics, advantages and importance of research design. Measurement – types and errors in measurement. Development and designing of tools of data collection – Attitude measurement scales, Levels of measurement and questions of validity and reliability Designing of research projects – research proposal, Pilot surveys	08

3	<p>Sampling and Data Collection: Census and sample survey. Need and importance of sampling, probability and non-probability sampling technique. Data collection – Primary and secondary sources of data, methods of collecting primary data - interview, observation, questionnaires, schedules through enumerators, surveys. Advantages and Limitations of different methods of data collection. Use of secondary data, precautions while using secondary data.</p>	08
4	<p>Processing and Analysis of Data Meaning, importance and steps involved in processing of data. Use of statistical tools and techniques for analysis of data. Testing of Hypotheses, Basic concepts, importance of hypothesis. Procedure of testing of hypothesis. Chi-square test – Problems on Basic application of chi square test. Analysis and Interpretation of data – Interpretations of results, Concept of Univariate, Bi-variate and multivariate analysis of data</p>	10
5	<p>Reporting of research : Importance of research reports, types of reports, Format of a research report, Precautions in writing a research report.. Plagiarism and its types. References and Bibliography. Dissemination of research results. Ethical issues in conducting research.</p>	08
6	<p>Role of ICT in research Information and Computer Technology(ICT), Important characteristics, Computer Applications for research, Use of Statistical Software Packages for research</p>	06

Pedagogy- Teaching methods include readings, lectures, group discussions, exercises, and assignments and Mini Projects..

Evaluation: Assignments Presentation , Mini-project/End-Term Paper

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Kothari C R	Research Methodology – Methods & Techniques	2014	PHI Pvt Ltd New Delhi
2 – National	Uma Sekharan	Research Methods for business	2016	Oxford
3 – National	Ranjit Kumar	Research Methodology	2009	Pearson Education
4 – International	Donald Cooper and PS Schindler	Business Research Methods	2015	Tata McGraw Hill
5 – International	Neuman, W.L.	Social Research Methods – Qualitative and Quantitative	2008	Pearson
6 – International	Saunders, M., Lewis, P., & Thornhill, A.	Research Methods for Business Students	2011	Pearson

Online Resources:

Sr	Web site address
1	https://www.manaraa.com/upload/43ef7b58-5c8a-4371-8aea-699609cd2aaf.pdf
2	http://ebooks.lpude.in/commerce/mcom/term_2/DCOM408_DMGT404_RESEARCH_METHODOLOGY.pdf
3	https://www.methodspace.com/open-access-sage-journals-with-a-research-methods-focus/
4	https://www.researchgate.net/deref/https%3A%2F%2Fwww.amazon.com%2Fhow-research-todays-tips-tools-ebook%2Fdp%2Fb01i5jjdxc http://www.ala.org/tools/research/larks/researchmethods
5	https://www.intechopen.com/online-first/research-design-and-methodology
6	https://lecturenotes.in/m/21513-research-methodology-
7	http://ebooks.lpude.in/commerce/mcom/term_2/DCOM408_DMGT404_RESEARCH_METHODOLOGY.pdf

MOOCs:

Resources No	Web site address
1	https://swayam.gov.in/nd2_cec20_hs17/preview
2	https://www.classcentral.com/course/researchmethods-1767
3	https://www.coursera.org/learn/research-methods
4	https://www.classcentral.com/course/swayam-introduction-to-research-5221
5	https://www.edx.org/course/introduction-to-social-research-methods
6	https://www.coursera.org/learn/qualitative-methods

Continuous Assessment in percentage = total for 50 marks)

Class participation	Quizzes/class test	Mini Project	MOOCs /assignment	MID SEM
10%	20%	40%	10	20%

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	207	Business Environment	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :
i) To enable the students to understand the overall business environment within which an organization has to function. ii) To enable students to understand its implication for decision making in business organizations.
Learning Outcomes :
On the successful completion of this course the learner will be able to; i) Understand the role of managers in firms. ii) Design and develop strategic plans for the organization iii) Understand the importance of various sectors of the economy and their contribution towards national income.

Unit	Contents	Sessions
1	Introduction to Business Environment: - Nature and scope of business, goals meaning of environment of business, objectives, environmental analysis, significance/benefits of environmental analysis, environmental factors/types, techniques of environmental forecasting, limitations of environmental forecasting.	7
2	Economic Environment: - Nature of economy, structure of economy, understanding economic system, economic policies- Industrial Policy and Trade Policy, Fiscal Policy, Monetary Policy, National Income and GDP, composition and growth trends.	10
3	Regulatory Environment: - Functions of state, Economic role of Government, Government and Legal System, the constitutional environment, forms of Government regulations, state intervention and control, business- Government interference.	6
4	Socio-Cultural Environment: - Business and Society- social responsibility of business social orientation of business, the Indian scenario, social audit, impact of culture on business, other socio-cultural factors and business, Consumer Protection Act, Consumer rights, Right to information Act, business ethics and corporate governance.	10
5	Natural and Technological Environment: - Natural Environment, technological environment and their impact on business, innovation and business technology and competitive advantage, economic effects of technology, technology policy and government promotional facilities.	4
6	Global Environment and Institutions: - Globalisation- meaning, features, benefits, challenges, globalization of Indian businesses GATT and WTO – understanding WTO, functions, structure, implications for India, regulation of foreign trade- Foreign Trade Act, EXIM policy, FEMA.	8

Reference Books :-

Sr. No.	Name of the Author	Title of the Book
1 National	Raj Agarwal	Business Environment
2 National	Francis Cherunilam	Business Environment
3 National	K. Aswathappa	Essentials of Business Environment

Online Resources:

Online Resources No	Web site address
1	www.rbi.org.in
4	www.economist.com
5	www.bbc.com

MOOCs:

Resources No	Web site address
1	Swayam
2	Coursera

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	208	Business Ethics and Corporate Governance	
Type	Credits	Evaluation	Marks
Core Elective	02	CES	IE = 100

Course Objectives:
i) To help the students understand the importance of ethical values and principles in life. ii) To enable students to comprehend the different dimensions of Business Ethics. iii) To enlighten about the corporate social responsibility in the corporate business.
Learning Outcomes :
i) The Students should be able to understand the importance of ethics and values in personal and professional life. ii) There should be a positive change in the attitude of the students towards morals, values and ethics after studying the subject. iii) The students understand their responsibility towards the society while running any business or as an employee.

Unit No.	Contents	Hours
01	Overview of Business Ethics: Importance and need for Business Ethics, Theories of Ethics, Ethical Issues in Business, Ethics and Management. Ethics and values,, Norms, Beliefs, Morality	05
02	Spirituality and Ethics: What is Spirituality? Importance, relationship between spirituality and ethics. Influence of Major religions on ethics: Hinduism, Islam, Christianity, Buddhism, Sikhism, and Zoroastrianism. Indian culture, Ethos and Values- Role of Indian ethos in managerial practices, management lessons from Vedas, Mahabharat, Bible, Quran, Kautilya's Arthshastra.	06
03	Ethical Decision Making : Ethical Decision Making process. Framework for ethical decision making. Ethical Dilemma, resolving ethical dilemmas, Ethical dilemmas in different business areas, finance, Marketing, HRM, IB, and technology etc. Ethical culture in organizations, Developing code of ethics and conduct, professional ethics.	05
04	Corporate Governance: Meaning and importance of corporate governance, Difference between governance and management, purpose of good governance, key pillars of corporate governance. Stakeholders: Rights and privileges; problems and protection, Board Of Directors – Role in Governance; Role and responsibilities of auditors Whistle blowing – concept of whistle blowing, whistle blowers, policy for whistle blowing . Corporate Social Responsibility (CSR)– concept and models of CSR, CSR initiatives in India.	06

05	Social, Environmental and Ethical Issues in Business: Business action that affects society (Ethical issues), Social responsibility of Business, Ethics and the Environment (pollution control and conserving depletable resources), Legal and Regulatory Issues	04
06	Implementation of Business Ethics Need for organizational ethics program, Codes of Conduct, Ethics Audit and its 4 process, Corruption and Scams, Impact of Corruption on Society and Economy, Anti-Corruption Laws, Agencies such as Central Vigilance Commission(CVC) and Central Bureau of Investigation(CBI) for anti-corruption cases, Professional values for business and managerial values Case studies: Major Corporate Governance Failures : Enron (USA); World.com (USA); Vivendi (France); Satyam computer (India); Sahara (India); Kingfisher Ltd (India); etc.	04

Reference Books:

Sr. No.	Name of Author	Title of the Book	Publisher
1 National	Murthy CSV	Business Ethics	Himalaya Publishing House
2 National	Hartman L, Chatterjee A	Perspectives in Business Ethics	McGraw Hill Publishing Co. Ltd
3 National	Ananda Das Gupta	Business Ethics –An Indian Perspective	Springer Publications
4 International	Velasquez Manuel G	Business Ethics	Eastern Economy Edition
5 International	Ferrell O C, Fraedrich John Paul, Ferrell Linda	Business Ethics, Ethical Decision Making and Cases	Biztantra
6 International	Boatright John	Ethics and the conduct of Business	Pearson Education

Online Resources:

Resource No.	Website Address
01	https://www.ethicssage.com/ethics-resources.html
02	https://maag.guides.yzu.edu/businessethics/web
03	https://www.researchgate.net/publication/226607374_Business_Ethics_Resources_on_the_Internet

MOOCs:

Sr. No.	Details
01	www.coursera.org
02	www.udemy.com
03	my-mooc.com

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	209	Introduction to Business Analytics	
Type	Credits	Evaluation	Marks
Open	2	CES	IE = 100

Subject / Course Objectives :

- i) To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- ii) To become familiar with the processes needed to develop, report, and analyze business data

Learning Outcomes :

After successful completion of this course the learner will be able to :

- i) Make sound managerial decisions aimed at furthering the business interests of the company.
- ii) Identify, analyze and understand the problems faced by the company.
- iii) Provide concrete solution to the identified business problems.

Unit No.	Contents	Hrs.
1	Introduction, What is Business Analytics, Overview of Areas where Business Analytics is applied	02
2	Visualization and Data Issues, organization of Source of Data, Importance of Data Quality, Dealing with Missing or incomplete data, data classification,	04
3	Data Mining: Introduction to Data Mining- classification, basic concepts, Data mining process, data mining tools XL MINER.	06
4	Applications of Business Analytics - Risk - Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing, Market share estimation and Sensitivity Analysis	06
5	Tableau: Extracting data into Tableau, data preparations, dimensions, transformation of variables, creating views , working with charts, exporting visualizations	07
6	CAPSTONE: A multifaceted assignment on any one of the following: Recruitment Analytics, Compensation Analytics, Talent Analytics, Training Analytics, Human Resource Retention Analytics, Workforce Analytics	05

Reference Books :-

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 National	PurbaHalady Rao	Business Analytics – an application focus	2013	PHI Learning
2 National	Tanushree Banerjee Arindam Bannerjea	Business Analytics – Text and Cases	2019	SAGE Publications
3 International	Essentials of Business Analytics	BhimasankaramPochiraju, Sridhar Seshadri	2018	Springer
4 International	Gert H.N. Laursen, JesperThorland	Business Analytics for Managers	2010	Wiley and SAS Business Series
5 International	Mark J. Schniederjans, Dara G. Schniederjans and Christopher M Starkey	Business Analytics- Principles, Concepts and Applications	2014	Pearson
6 International	Jay Liebowitz	Business Analytics: An Introduction	2013	CRC Press, Taylor and Francis

Online Resources:

No	Web site address
1	https://www.managementstudyguide.com/business-analytics.htm
2	https://www.academia.edu/35314419/Bernard Marr Key Business Analytics The 60 business analysis tools every manager needs to know.pdf
3	https://www.researchgate.net/publication/320685945 Understanding the Role of Business Analytics Some Applications

MOOCs:

Resources No	Web site address
1	Swayam
2	https://www.coursera.org/specializations/business-analytics
3	https://www.edx.org/course/people-management-3
4	https://www.edx.org/course/data-models-and-decisions-in-business-analytics
5	https://www.classcentral.com/course/intro-business-analytics-12295

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	210	E-commerce Application	
Type	Credits	Evaluation	Marks
Open	2	CES	IE = 100

Course Objectives:	
i)	To enable basic concepts about E-commerce.
ii)	To study knowledge of business models
iii)	To learn need of e-commerce security.
iv)	To enable knowledge about E-payment system.
v)	To know the e-commerce Applications.
vi)	To have an overview of M-commerce.
Course Objectives:	
i)	Basic concepts about E-commerce will be studied.
ii)	Knowledge of business models will be used.
iii)	Students will implement e-commerce security.
iv)	Better usage will be down with help of E-payment system.
v)	Where e-commerce Applications are used.
vi)	Use of M-commerce technology.

Unit No.	Contents	Hrs.
1	Introduction to E-Commerce Brief history of e-commerce, definitions of e-commerce, technical components and their functions, e-commerce versus traditional business, requirements of e-commerce. Advantages and disadvantages of e-commerce, Value chain in e-commerce, current status of e-commerce in India.	5
2	Business Models for e-commerce Types of business models (B2B, B2C, C2B,C2C) with examples. EDI Requirement of EDI, types of EDI, advantages and disadvantages of EDI. ISP, Types of ISP, Choosing an ISP, domain name, domain name types, how to register domain name.	5
3	Business Models for e-commerce Types of business models (B2B, B2C, C2B,C2C) with examples. EDI Requirement of EDI, types of EDI, advantages and disadvantages of EDI. ISP, Types of ISP, Choosing an ISP, domain name, domain name types, how to register domain name.	5
4	E-commerce Payment System Overview of Electronic payment technology, limitations of the traditional payment system, requirements of e-payment system. B2B Electronic Payments, Third-Party Payment Processing, Electronic Payment Gateway Electronic or digital cash, properties of digital cash, how it works. Online credit cardpayment system, smart card.	5

5	E-Commerce Applications E-Commerce and banking, e-commerce and retailing, e-commerce and online publishing, online marketing, e-advertising, e-branding.	5
6	Mobile Commerce Overview of M-Commerce - Wireless Application Protocol (WAP), Generations of Mobile Wireless Technology, Components of Mobile Commerce, Networking Standards for Mobiles Examples of M-Commerce, Current Status of M-Commerce in India, M-commerce applications, Mobile information Services, Mobile banking and trading.	5

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	C.S.V. Murthy	E-Commerce		Himalaya Publishing House
2 – National	P.T.Joseph	E-Commerce A Managerial Perspective		Prentice Hall of India
3 – International	Kalakota and Whinston	Frontiers of Electronic Commerce		Pearson Education

Online resources ;

Online Resources No	Web site address
1	www.udemy.com

MOOCs:

Resources No	Web site address
1	Alison
2	Sayam
3	Coursera

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	211	Managerial Skills for Effectiveness	
Type	Credits	Evaluation	Marks
Elective	2	CES	IE = 100

Course Objectives:

Subject / Course Objectives :	
i)	To offer exposure of essential managerial skills to students and developing these skills in the students.
ii)	To emphasize the development of the skills and knowledge required for successful managerial performance.
iii)	To focus on such areas as developing self-awareness
iv)	To develop creative problem-solving, supportive communication
v)	To focus on the use of power and influence, motivation techniques
vi)	To manage conflict
Learning Outcomes:	
I)	Demonstrate applicable knowledge of the common skills needed for managerial effectiveness within the functions of management.
II)	Demonstrate applicable knowledge of various human behavior and motivation techniques relating to leading individuals and teams.
III)	Demonstrate comprehension of values, power, and influence relating to organizational culture, change, and ethical decision-making in global contexts.
IV)	Identify and critically assess assumptions that influence decisions and actions on management, leadership, teamwork and relationship building
V)	Receive and integrate feedback on decision-making practices, conflict resolution skills, and teamwork behaviors with the support of a team-based coach
VI)	Demonstrate writing business messages and reports

Unit No.	Contents	Hrs.
1	Introduction to skills & personal skills: Importance of competent managers, skills of effective managers, developing self-awareness on the issues of emotional intelligence, self-learning styles, values, attitude towards change, learning of skills and applications of skills.	05
2	Problem solving and building relationship: Problem solving, creativity, innovation, steps of analytical problem solving, limitations of analytical problem solving, impediments of creativity, multiple approaches to creativity, conceptual blocks, conceptual block bursting. Skills development and application for above areas.	05
3	Building relationship Skills for developing positive interpersonal communication, importance of supportive communication, coaching and counseling, defensiveness and disconfirmation, principles of supportive communications. Personal interview management. Skill analysis and application on above areas.	05
4	Team building: Developing teams and team work, advantages of team, leading team, team membership. Skill development and skill application.	05
5	Empowering and delegating: Meaning of empowerment, dimensions of	05

	empowerment, how to develop empowerment, inhibitors of empowerment, delegating works. Skills development and skill application on above areas.	
6	Communication related to course: How to make oral presentations, conducting meetings, reporting of projects, reporting of case analysis, answering in Viva Voce, Assignment writing	05

Evaluation and Grading:

Assignments ... 25%

Assignment on Report Writing ... 25%

Online Course ... 25%

Class Participation and Attendance ... 25%

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year /Edition	Publisher Company
1 – National	V.S.P.Rao	Managerial Skills	2010	Excel Books, New Delhi
2 – National	Bovee, Courtland L, Thill, John V. and Raina, RoshanLal	Business Communication Today	2017	Pearson Education, New Delhi
3 – National	Ramnik Kapoor	Managerial Skills		PathMakers, Bangalore
4 – International	Barun K. Mitra	Personality Development and Soft skills		Oxford University Press
5 – International	R. Alec Mackenzie	The Time Trap: The Classic book on Time Management		
6 – International	David A Whetten, Cameron	Developing Management skills	2008	Prentice Hall

Online Resources:

Online Resources No	Web site address
1	www.futurelearn.com
2	www.classcentral.com
3	www.onlinembapage.com
4	www.businessnewsdaily.com
5	www.alison.com

MOOCs:

Resources No	Web site address
1	www.mooc-list.com
2	www.mbacentral.org
3	www.my-mooc.com
4	www.accreditedschoolsonline.org